Natural Disaster Risk Assessment and Area Business Continuity Plan Formulation for Industrial Agglomerated Areas in the ASEAN Region

Risk Assessment Reports for ASEAN and its Countries

March 2014

AHA CENTRE

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OYO International Corporation

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Part I

Composition of the Report

I Composition of the Report

The Risk Assessment Report for ASEAN and its Countries (the Report) consists of the following three parts.

Part I Composition of the Report
Part II Country Report Draft
Part III Lessons Learned from Extreme Natural Disasters

Part I Composition of the Report explains the contents of the Report.

Part II Country Report Draft contains information on the 10 ASEAN member states of Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, the Philippines, Singapore, Thailand, and Vietnam.

These country reports are reference documents for organizations of the public and private sectors wishing to prepare an Area Business Continuity Plan (Area BCP) and develop an Area Business Continuity Management System (Area BCM System).

Each country report contains information on natural disaster risks, industrial parks and investment risk, key infrastructure and lifeline systems, as well as issues to consider during natural disasters. It also presents an outline of economy and trade, an outline of physical distribution, and current practices for implementing business continuity management (BCM) in the country.

Part III Lessons Learned from Extreme Natural Disasters outlines lessons from major natural hazards including earthquakes and tsunamis, floods, hurricanes/typhoons, and volcanic activity and eruptions.

Part II

Country Report Draft

1. **BRUNEI DARUSSALAM**
2. **CAMBODIA**
3. **INDONESIA**
4. **LAO PDR**
5. **MALAYSIA**
6. **MYANMAR**
7. **PHILIPPINES**
8. **SINGAPORE**
9. **THAILAND**
10. **VIETNAM**

BRUNEI DARUSSALAM

Table of Contents

Chapter 1 Introduction

The report is a draft version of the Country Report for Brunei, which will be a reference document for organizations of the private and public sectors wishing to prepare an Area Business Continuity Plan (Area BCP) and develop an Area Business Continuity Management System (Area BCM System).

The country report contains information on natural disaster risks, industrial parks and investment risk, key infrastructure and lifeline systems, as well as issues to consider during natural disasters. It also presents an outline of economy and trade, an outline of physical distribution, and current practices for implementing business continuity management (BCM) in the country.

The draft report will be refined and finalized at the end of the Project.

Chapter 2 Overview of the Country

Brunei is located on the north side of the island of Borneo (Kalimantan Island) and divided into east and west areas by Malaysia. Its capital Bandar Seri Begawan is located at the mouth of the Brunei River which runs through the western part of Brunei.

The country is rich in oil and natural gas, and is characterized by its high economic level and well-developed social welfare system supported by abundant income from oil/natural revenues.

Brunei joined ASEAN on January 8, 1984 after it became independent from the UK. Brunei is an economically strong country with the second highest GDP per capita among the ASEAN countries after Singapore.

Brunei's government is a constitutional monarchy, and the current sultan is King Hassanal Bolkiah. In order to prepare for the depletion of natural resources, the country is actively promoting foreign investments. It is expected that Brunei will promote the development of other industries that will support the country's economy after the era of fossil fuel production.

Basic Information of Brunei

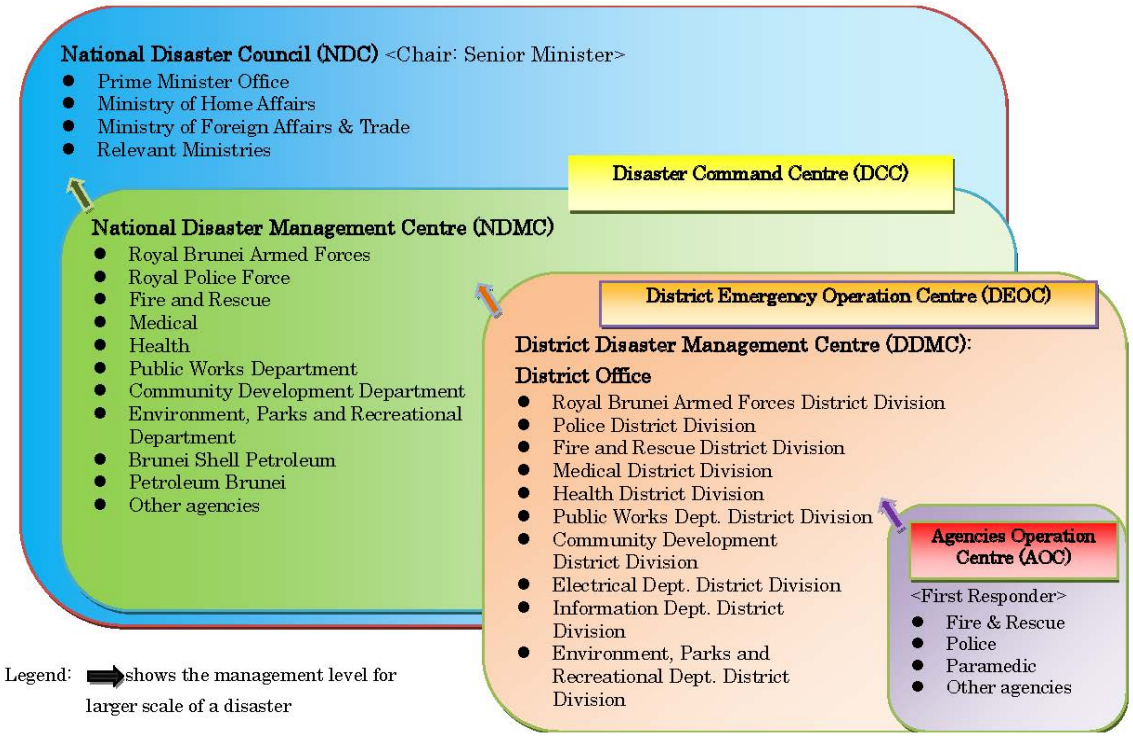
National Flag

Capital	Bandar Seri Begawan
Ethnic Groups	Malays (65.7%), Chinese (10.3%), Others (24.0%)
Languages	Malay (official language), English, Chinese
Religions	Islam (official religion) (67%), Buddhism (13%), Christianity (10%), Others (10%)
Area (km^2)	Total: 5,770 Land: 5,270 Inland Water: 500

Population	412,238
Population density(people/ km^2 of land area)	78
Population growth (annual %)	1.4
Urban population (% of total)	76
GDP (current US$) (billion)	17
Economic growth rate (annual %)	2.2
GNI per capita, PPP (current international $)	49,000
Agriculture, value added (% of GDP)	1
Industry, value added (% of GDP)	71
Services, etc., value added (% of GDP)	28

Features of Disasters

Frequent disaster in Brunei is flood and flash flood, which occurred 6 times since 1960, and killed 10 people. Although Brunei is not located on a major earthquake area, low level earthquakes and tremors were felt in the country in the past two decades. Brunei has experienced small earthquakes with the range of 4-5 magnitude in 1992 and 2005. Tsunami disaster is considered to occur due to strong earthquake occurred in South China Sea.



Source: NDMC <Edited by JICA Study Team>

Sources; Map and Flag: CIA(Central Intelligence Agency) website (2014) (https://www.cia.gov)

Capital, Ethnic Groups, Languages and Religions: Ministry of Foreign Affairs website (2013) (http://www.mofa.go.jp)

Area, Population, Population density, Population growth, Urban population, GDP, Economic growth rate, Agriculture, value added, Industry, value added and Services, etc., value added: The World Bank Data Bank website (2012) (http://data.worldbank.org), GNI per capita, PPP: The World Bank Data Bank website (2009) (http://data.worldbank.org)

Chapter 3 Natural Disaster Risk

3.1 Floods

(1) Risk

Summary of flood disaster

Floods occur in the rainy season (October to May), but the country is seldom affected by typhoons because the country is not located in a typhoon path.

Notable floods and disasters in recent years

In recent years, no large flood disasters have occurred. However, heavy rainfalls have caused local inundation in the urban area. Storm rainfalls on January 21, 2009 and January 15, 2010, caused inundation damage in the capital city of Bandar Seri Begawan. These damages were not recorded in the EM-DAT (The International Disaster Database).

(2) Background

Characteristics of floods

Although floods are generally caused by storm rainfalls in the rainy season (October to May), large-scale flood damage has not occurred. Most of the residential areas are located on coastal plains and easily inundated, and transportation facilities are affected by local inundation.

Notable examples of flood disasters

None.

Frequently flooded area

None.

(3) Efforts by the central government, local governments, and disaster management organizations

✓ National Disaster Management Committee (NDMC)

- Coordinates all activities of relevant organizations

(4) Hazard and risk Information sources

Disaster risk reduction organizations

Table 3.1.1 List of Organizations for Disaster Risk Reduction

Organization	Post	Web Address
THE National Disaster Management Centre (NDMC)		
Brunei Darussalam Meteorological Service (BDMS)		http://www.bruneiweather.com.bn/
University of Brunei Darussalam (UBD)		http://www.ubd.edu.bn/
Institute Technology Brunei (ITB)		http://www.itb.edu.bn/modules/web/index.php

Reports

Table 3.1.2 List of Reference Reports for Risk Analysis

Organization	Post	Title/ Web Address	Form
Asia Development Bank	Asian Water Development Outlook	Asian Water Development Outlook 2013; Asia-Pacific Water Forum	Report
		http://www.adb.org/publications/asian-water-development-outlook-2013	
World Bank	ASEAN Disaster Risk Management Initiative	Synthesis Report on Ten Asian Countries Disaster Risks Assessment: December 2012	Report
		http://www.unisdr.org/files/18872_asean.pdf	
The Nature Conservancy	ASEAN Disaster Risk Management Initiative	World Risk Report 2012: October 2012	Report
		http://www.ehs.unu.edu/article/read/worldriskreport-2012	
World Bank	Framework and Options for Implementation	Advancing Disaster Risk Financing and Insurance in ASEAN Countries: April 2012	Report
		https://openknowledge.worldbank.org/bitstream/handle/10986/12628/714530v20ESW0W0AN0appendices0June12.pdf?sequence=1	
International Development Research Centre	Economy and Environment Program for Southeast Asia (EEPSA)	Climate Change Vulnerability Mapping for Southeast Asia: January 2009	Report
		http://web.idrc.ca/uploads/user-S/12324196651Mapping_Report.pdf	
UNEP, GRID, UNISDR		Global Risk Data Platform	Web Map
		http://preview.grid.unep.ch/index.php?preview=map&lang=eng	

Abbreviations

BDMS	Brunei Darussalam Meteorological Service
ITB	Institute Technology Brunei
NDMC	The National Disaster Management Center
UBD	University of Brunei Darussalam

References:

1) Ministry of Foreign Affairs of Japan (2013): “Information on Brunei in Japanese,” 06 2013.
2) The Daily Brunei Resources (2009): “The Brunei Flood,” February 06, 2009.
3) The Brunei Times (2009): “Kg Tanjong Maya hit by worst floods,” February 7, 2009.
4) Hard Break Kid (2010): “2010 flash flood in Brunei,” January 15, 2010.

3.2 Earthquakes

(1) Risk

Earthquake disasters are not common in Brunei. There is no record of significant disaster caused by earthquakes.

Figure 3.2.1 shows earthquake risk in the Asia-Pacific region. The zones indicate where there is a probability of 20% that degrees of intensity shown on the map will be exceeded in 50 years. This probability figure varies with time; i.e., it is lower for shorter periods and higher for longer periods. The Brunei region is categorized as VI on the Modified Mercalli Intensity Scale VI.

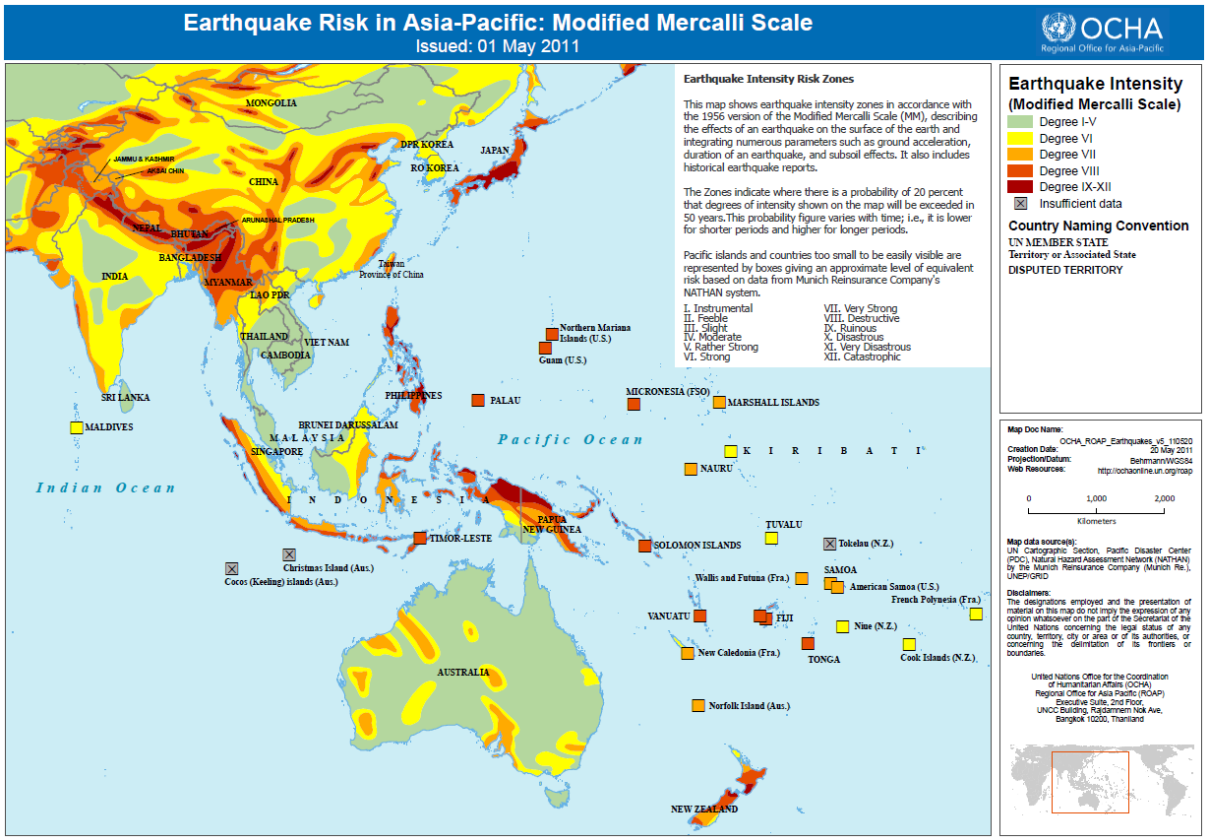


Figure 3.2.1 Earthquake Risk in Asia-Pacific

(2) Efforts by the central government, local governments, and disaster management organizations

There are no special measures focusing on earthquake disaster.

References:

1) EM-DAT: The OFDA/CRED International Disaster Database – www.emdat.be – Université Catholique de Louvain – Brussels – Belgium.
2) Japan International Cooperation Agency (JICA) (2012): "Data Collection Survey on ASEAN Regional Collaboration in Disaster Management"

3) United Nations Office for the Coordination of Humanitarian Affairs (OCHA), Regional Office for Asia Pacific (ROAP) (2011): "Earthquake Risk in Asia-Pacific: Modified Mercalli Scale," Downloaded from http://reliefweb.int/sites/reliefweb.int/files/resources/map_613.pdf

3.3 Tsunami

(1) Risk

It is well known that tsunamis are generated by sea floor earthquakes. However, an undersea volcanic eruption, an undersea landslide, or other disturbances above or below water can also generate a tsunami. There is very low probability that a large earthquake along the coast of Brunei will generate a tsunami and cause a major disaster. In fact, there is no record of significant disaster caused by a tsunami.

However, tsunami disasters may occur due to large earthquakes occurring outside the country. For example, it is possible that a large earthquake occurring in the Manila Trench may affect the coastal area of Brunei.

(2) Efforts by the central government, local governments, and disaster management organizations

The meteorological agency of Brunei is monitoring and receiving international tsunami information through its existing networks.

Currently, Brunei does not have its own tsunami monitoring system and is dependent on the information gathered by international institutions and/or other countries. However, the National Disaster Management Center (NDMC) plans to install a new tsunami warning system.

(3) Hazard and risk information sources

Ministry of Home Affairs
http://www.home-affairs.gov.bn/
The Disaster Command Center (DCC)
National Disaster Management Center (NDMC)
Brunei Darussalam Meteorological Department, Ministry of Communications
http://bruneiweather.com.bn/?mode=0

References:

1) EM-DAT: The OFDA/CRED International Disaster Database – www.emdat.be – Université Catholique de Louvain – Brussels – Belgium.

4) Japan International Cooperation Agency (JICA) (2012): "Data Collection Survey on ASEAN Regional Collaboration in Disaster Management"

3.4 Volcanoes

(1) Risk

There is a volcano called "Bombalai" at the north east end of Borneo Island, but there are no volcanoes in Brunei. Also, there is no record of significant disaster caused by volcano.

Major hazards caused by volcanic eruption are lava flow, pyroclastic flow, "Lahar" (volcanic mud flow), and volcanic ash fall. Lava flow is a flow of melted rock along the slope. Pyroclastic flow is the flow of a mixture of hot dry masses of fragmented volcanic materials and volcanic gas along the slope. "Lahar" is originally an Indonesian term and is also called volcanic mud flow. It is the flow of a mixture of volcanic materials and water along the slope. These flows cause enormous damage to the side and foot of the volcano, but generally do not have an extended reach. However, volcanic ash fall often spreads widely via trade winds or the westerlies, causing damage over an extensive area. Therefore, there is a possibility that a volcanic eruption in neighboring countries might wreak a volcanic ash fall on Brunei.

Figure 3.4.1 shows the volcanoes in the Asia-Pacific region which erupted during the Holocene. The Holocene is a geological epoch from 10,000 years ago to the present. The map indicates that many volcanic eruptions have occurred in Indonesia, Philippines, and other neighboring countries.

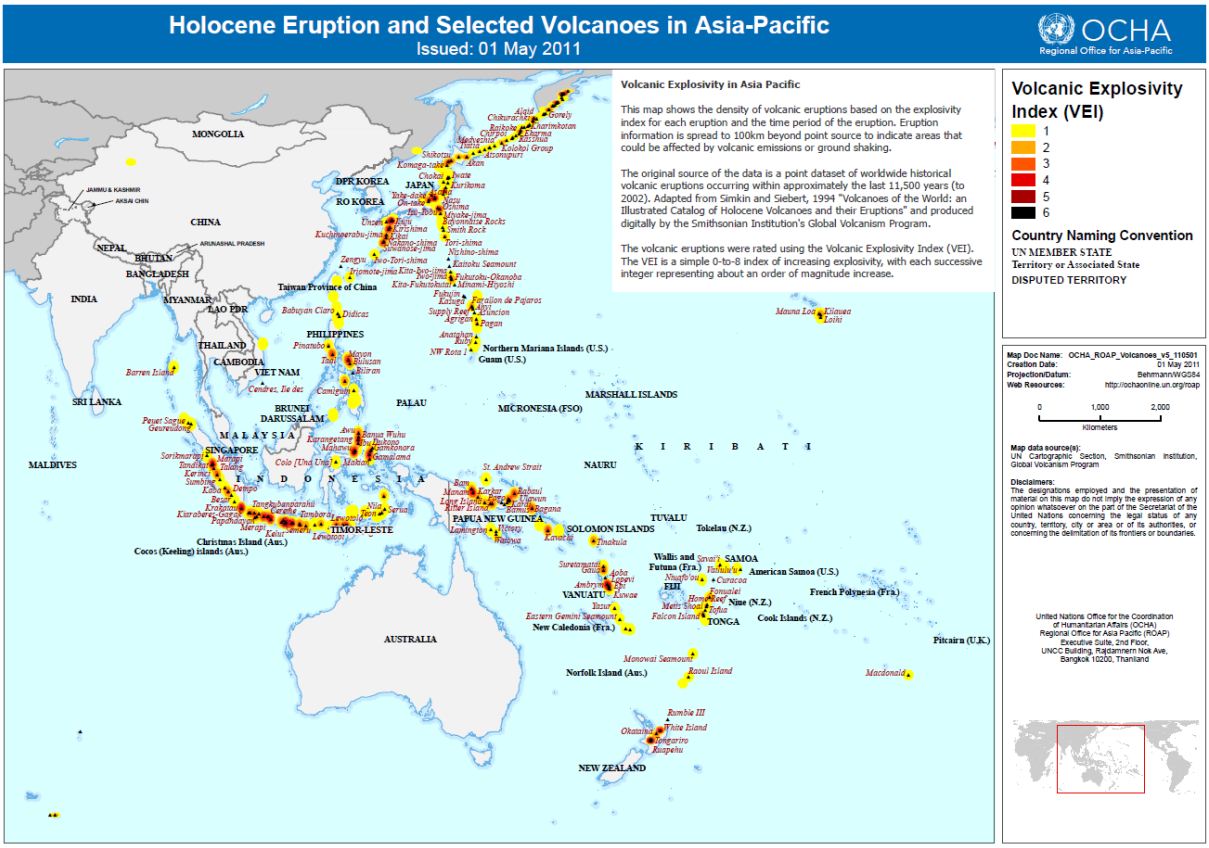


Figure 3.4.1 Holocene Eruption and Selected Volcanoes in Asia-Pacific

(2) Efforts by the central government, local governments, and disaster management organizations

There are no special measures focusing on volcanic disaster.

References:

1) Lee Siebert, Tom Simkin, and Paul Kimberly (2011): "Volcanoes of the World - Third Edition," Smithsonian Institute/University of California Press
2) EM-DAT: The OFDA/CRED International Disaster Database – www.emdat.be – Université Catholique de Louvain – Brussels – Belgium.
3) Japan International Cooperation Agency (JICA) (2012): "Data Collection Survey on ASEAN Regional Collaboration in Disaster Management"
4) United Nations Office for the Coordination of Humanitarian Affairs (OCHA), Regional Office for Asia Pacific (ROAP) (2011): "Holocene Eruption and Selected Volcanoes in Asia-Pacific," Downloaded from:http://reliefweb.int/sites/reliefweb.int/files/resources/map_619.pdf

3.5 Cyclone (Meteorological) Hazards

(1) Risk

The climate of Brunei is generally hot and wet throughout the year as a result of its location on the northwest coast of Borneo within the equatorial tropics. It faces the South China Sea. It is hot and humid with a tropical climate on the plains, while the highlands have a subtropical climate. The country is located between the equator and latitude 10° to the north. It is not affected by typhoons or tropical cyclones. Table 3.5.1 lists the weather disasters which have occurred in Brunei in the past. The impact of weather disasters on the whole country is low. Most disasters are attributed to flash floods due to short-term rainfall.

Two women died in Brunei during the worst floods to hit the country in the past 40 years. Heavy rains started late on a Tuesday in May 2013 in the oil-rich capital of Bandar Seri Begawan, causing flash floods and landslides, interrupting power supply, and shutting down some telephone lines.

Table 3.5.1 Weather Disasters in Brunei

Year (Month)	Disaster	Daily Precipitation
1999	Flash flood during La Niña	-
2008	Temburong Flash flood	-
January 2009	Extensive flash flood in Muara, Tutong and Belait district	145.8mm
May 2013	Bandar Seri Begawan Flash flood	181.0mm

(2) Background

The annual movement of the Intertropical Convergence Zone (ITCZ) and the associated trade wind fields produce two main seasons in Brunei separated by two transitional periods. However, the country is not affected by typhoons or tropical cyclones. Flooding (flash floods) caused by short-term heavy rains is the main weather disaster in Brunei. The Tutong and Belait districts have been identified as areas prone to flood damage.

Extreme weather events associated with El-Niño were reported to be more frequent and intense during the past 20 years. A projected sea level rise is likely to result in the significant loss of coastal ecosystems and people will likely be at risk from coastal flooding.

(3) Efforts by the central government, local governments, and disaster management organizations

The Brunei Darussalam Meteorological Service is responsible for meteorological observation and weather forecast in this country. In terms of numerical weather prediction products, precipitation and ensemble forecasts have been carried out. Currently, one radar is in operation.

Table 3.5.2 Brunei Meteorological Service Authorities

Institution	Department	Contact information
Brunei Darussalam Meteorological Service http://www.bruneiweather.com.bn/	Administration	Tel: +673 2381342 (ext: 110)
	Weather Forecast Office	Tel: +673 2381342 (ext: 114)

	Climatological Data	Tel: +673 2381342 (ext: 1888)

(4) Hazard and risk information sources

Hazard risk assessment results related to tropical cyclones (meteorological disasters) are as follows.

Table 3.5.3 Sources of Information on Tropical Cyclones (Meteorological Disasters)

Institution	Literature
Economy and Environment Program for Southeast Asia (2010)	Climate Change Vulnerability Mapping for Southeast Asia http://css.escwa.org.lb/sdpd/1338/d2-5a.pdf
UNISDR (2010)	Synthesis Report on Ten ASEAN Countries Disaster Risks Assessment http://www.unisdr.org/files/18872_asean.pdf

Abbreviations

ITCZ Intertropical Convergence Zone

Explanation of terms

ITCZ: This is a low-pressure (convergence) zone formed near the equator. In the lower levels (near the surface), the northeastern trade wind blows into the northern area from the ITCZ and the southeastern trade wind blows into the southern area from the ITCZ.

References:

1) Dagar L., et al and (2013): "A Numerical Weather Prediction-Based Infrastructure for Tropical Meteorology Research and Operations in Brunei," Symposium on the Next Level of Predictions in Tropical Meteorology.
2) Brunei Darussalam Meteorological Service (Website):http://www.bruneiweather.com.bn/

3.6 Landslides

(1) Risk

The risk of landslide is very low.

One landslide was recorded in 2007 and one in 2008. A landslide is also assumed to have occurred in 2009. These landslides were caused by heavy rain.

(2) Background

The landslide that occurred in 2009 blocked roads, but no fatalities were recorded. No landslides related to climate change have been confirmed.

(3) Efforts by the central government, local governments, and disaster management organizations

✓ National Disaster Management Committee（NDMC）

- Coordinates all the activities of the relevant organizations

(4) Hazard and risk information sources

Reports

✓ Synthesis Report on Ten Asian Countries Disaster Risks Assessment; December 2012
ASEAN Disaster Risk Management Initiative, World Bank
http://www.worldbank.org/

- Summarizing natural hazard and risks in 10 ASEAN countries.
- World Bank reported risks with respect to countries and categories of disaster.
- Although the data is only available up to 2009, the report is well assembled.

✓ World Risk Report 2012; October 2012, Alliance Development Works, The Nature Conservancy
http://www.nature.org/

- Natural disaster risks in 173 countries in the world are ranked in this report.
- Intended period is from 2002 to 2011.
- Vulnerabilities are assessed with respect to categories.
- The report is effective for comparing countries.

✓ Advancing Disaster Risk Financing and Insurance in ASEAN Countries: April 2012, Framework and Options for Implementation, Volume 2: Appendix 1
https://www.gfdrr.org/

- Summarizing natural hazards and risks in 10 ASEAN countries.
- Intended period is from 1970 to 2011.
- Summary of countries are well assembled.

✓ Climate Change Vulnerability Mapping for Southeast Asia: January 2009, Economy and Environment Program for Southeast Asia (EEPSA)
http://www.idrc.ca/

- Natural disaster risks in Southeast Asia are mapped in the report.
- The report contains information on risks in states/provinces.

Risk Map

- ✓ Global Risk Data Platform; UNEP (United Nations Environment Programme)/GRID, UNISDR (United Nations Office for Disaster Risk Reduction)
  http://preview.grid.unep.ch/
  - Disaster sites from all over the world are mapped.
  - The map shows disaster hotspots.

References:

1) Economy and Environment Program for Southeast Asia (EEPSEA) (2009): "Climate Change Vulnerability Mapping for Southeast Asia," p. 19

3.7 Predominant Natural Hazards

The records of natural disasters that have affected the country are classified based on the impacts and frequency of occurrence. The results have been plotted on the impacts - frequency matrix and the most prevailing hazards studied.

3.7.1 Employed Data

The disaster records compiled in Appendix A3 are employed in this study. The records for the last 30 years, namely from 1983 to 2012, are used because the number of events included in the database before 1980 is significantly less than after 1980. The records of large disasters through earthquakes, tsunamis and volcano eruptions before 1983 are also used because the frequencies of occurrence for these hazards are significantly lower than floods, cyclones and landslides.

3.7.2 Study Method

The “Damage Amount / GDP” and ‘Number of Deaths” are used as indices to show the impacts of the disasters considered and 6 natural hazards will be studied and compared. At the beginning of the study, only the “Damage Amount / GDP” was used as an index because the results can be used for Area BCP planning. However, the scarcity of information related to damage amounts became clear as the study progressed. As the information on the “Number of Deaths” is substantial compared to the damage amount, the “Number of Deaths” has been added as an index of impact.

The process of the study is as follows;

1) Based on the Damage Amount / GDP or Number of Deaths, each disaster is classified according to the ranking system outlined in Table 3.7.1,
2) The number of disaster events for each country is added by type of hazard and disaster rank, and then classified into Table 3.7.2 below,
3) The above information is then plotted on the impacts - frequency matrix by country,

4) As for earthquakes, tsunamis and volcanic hazards, if an event occurred before 1983 that was of the same (or higher) disaster rank as the maximum disaster rank recorded between 1983 to 2012, a point is plotted on the matrix which corresponds to the relevant disaster and frequency rank (=1).

Table 3.7.1 Disaster Rank and Damage

Disaster Rank	Damage Amount / GDP[1]	Number of Deaths
5	1.0% -	10,001 -
4	0.1% - 1.0%	1,001 - 10,000
3	0.01% - 0.1%	101 - 1,000
2	0.001% - 0.01%	11 - 100
1	- 0.001%	- 10

Table 3.7.2 Frequency Rank and Number of Events

Frequency Rank	Number of Events from 1983 to 2012	Average Frequency (Events / Year)
5	7 or more	1/5 -
4	4 to 6	1/10 - 1/5
3	2 to 3	1/15 - 1/10
2	1	1/30
1	Large Events that occurred before 1983	-

3.7.3 Study Results

The following results are based on the available existing information. Not all information relating to the impacts of disasters was collected. Furthermore, the purpose of this study is not intended to evaluate the precise damage amounts or number of deaths. The purpose of this study is to rank 6 natural hazards according to their impacts.

Only 3 slight disasters by flood have been recorded in the last 30 years, but no one was killed by these events. No other disasters have been recorded.

[1] Gross domestic product based on the purchasing-power-parity (PPP) valuation of the country's GDP, according to the International Monetary Fund, World Economic Outlook Database, October 2012

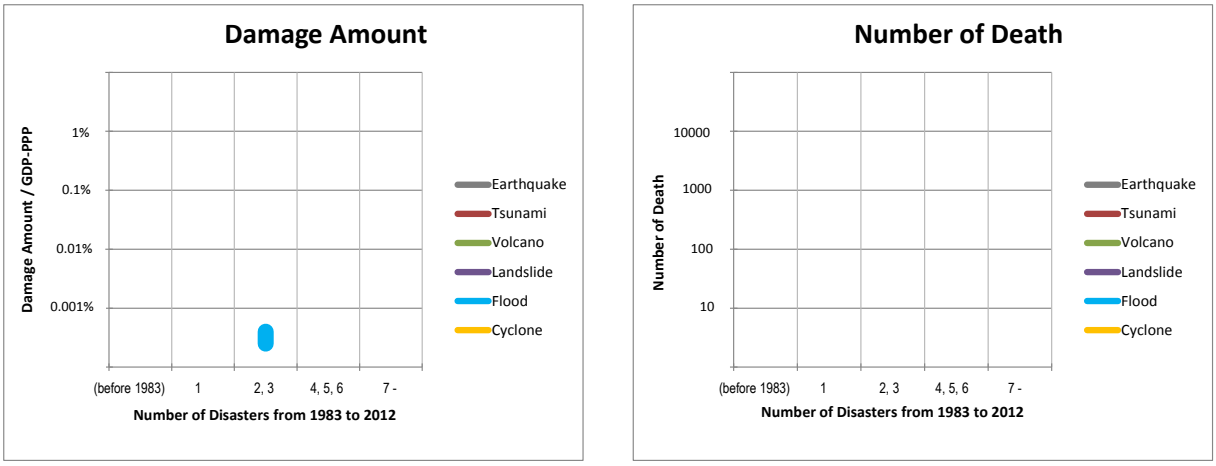


Figure 3.7.1 Impact of hazards in Brunei

3.8 Existing Investigations and Studies

3.8.1 Methods and Scope of the Survey

This section reviews studies and research that have been conducted in the ASEAN region with a focus on natural hazards, risks, and vulnerability assessments. The target hazards are: floods, earthquakes, volcanoes, tsunamis, cyclones (typhoons)/meteorological disasters, and landslides. Information and study reports were reviewed from those that are available for the public and on the internet. The purpose of this section is to first gain an overview of the existing study results regarding hazard trends, encountering risks, and degrees of vulnerability throughout the entire ASEAN region as well as in each ASEAN member state. Another purpose it to produce a compilation of assessment reports of the region, which will be accessible as a reference for those who wish to plan an Area BCP.

Table 3.8.1 Methodology of Information Collection and Scope of Survey

Information Collected	Methodology	Scope of Survey
Existing studies and research	To collect existing studies and reports from public sources including the internet.	To summarize the studied hazards, areas, contents of hazard and risk analysis, vulnerability assessment of existing studies, and other research.

3.8.2 Outline of Collected Information and Data

Table 3.8.2 shows the outline of collected information and data. Summaries of existing studies and reports are compiled as data sheets in Appendix A4.

Table 3.8.2 Outline of the Collected Information and Data

Appendix A4 Subsection	Hazards	Outline
A4.1	Flood	Flood hazard, risk assessments, hazard maps, and vulnerability assessment have been conducted in ASEAN countries using data on rainfall, inundation areas, affected population, and monetary assessment. Hazard maps were produced with GIS tools. The usage of GIS tools for assessments is widely recognized and its usage has been explored to produce hazard maps. Some runoff analyses were conducted for selected areas. Limited information and data available for Brunei Darussalam.
A4.2	Earthquake	Many of the earthquake hazard studies in the area are probabilistic seismic hazard analyses (PSHA), not scenario earthquake studies. This is to quantify the probability of exceeding a specific ground-motion level at a site given all possible earthquakes. This methodology is descended from the Global Seismic Hazard Assessment Program (GSHAP). GSHAP was launched in 1992 by the International Lithosphere Program (ILP) with the support of the International Council of Scientific Unions (ICSU), and endorsed as a demonstration program in the framework of the United Nations International Decade for Natural Disaster Reduction (UN/IDNDR). Earthquakes are not equally distributed around the globe because of the generating mechanism. In the ASEAN region, many earthquakes are observed in and around Indonesia and Philippines, which are located in the convergent boundary (subduction) zone and fewer earthquakes are observed in and around Myanmar, which is in the transform boundary zone. There are fewer or no earthquakes observed in other regions. However, some regions are sometimes affected by the earthquakes which occur in neighboring countries. The northern regions of ASEAN countries are sometimes affected by the earthquakes that occur in the Yunnan province of China. A number of investigations and studies reflect this trend.
A4.3	Tsunami	There are only few investigations and studies about tsunami hazard or risk in the region, and most of them are compilations of past disasters. There is no probabilistic study as there is for earthquakes. There is a hazard map that encompasses several tsunami scenarios. There are studies targeting the Asia-Pacific area because tsunamis propagate in the sea. Large-sized tsunamis are caused by major earthquakes in the ocean. This is the reason that tsunamis are also not equally distributed around the globe. However, tsunamis affect a wider area than the ground-motion of earthquakes, as seen in the tsunami caused by the Sumatra earthquake on December 26th in 2004. Thus, tsunamis are sometimes studied in countries with few or no earthquakes.
A4.4	Volcano	Most volcanoes are also located along the convergent boundary (subduction) zone. This is the reason why volcanoes are also not equally distributed around the globe. Disasters caused by volcanic eruptions are lava flow, pyroclastic flow, lahar, and ash fall. Ash is scattered widely via the prevailing westerlies, but the other disaster types do

		not have an extensive reach. Regarding volcanic hazard, many investigations and studies are a compilation of areas affected by lava flow, pyroclastic flow, lahar, and ash fall from past volcanic eruptions for each volcano.
A4.5	Cyclone	Research on cyclone and meteorological hazard, and risk assessments have been conducted in ASEAN countries using data on tracks, damaged areas, and storm rainfall. The impact of climate change is also included in this research. Limited information and data available for Brunei Darussalam and Singapore.

3.8.3 Summary of Survey

(1) Floods

Some useful studies on flood hazard, risk, and vulnerability are publicly available presenting assessment results, case studies of countermeasures, as well as different methodological approaches. There are a few types of methodologies to assess risks and vulnerability including, for example, risks involving exposure to flooding events and population density. Vulnerability can be defined as a function of exposure, adaptive or coping capacity, and land-use etc. There are slightly different combinations of these factors with different studies for use. Therefore, these concepts must be defined in advance to plan a methodology for an assessment, in terms of which definitions are to be used in a certain analysis.

A summary of existing studies and reports is shown in Table 3.8.3 by country. A list of collected existing studies and reports is shown in Table 3.8.4.

Table 3.8.3 Summary of Existing Studies and Reports by Country: Flood

Country/Region	Summary of Existing Studies and Reports
ASEAN	There are a few reports that study natural disasters for ASEAN and the Pacific regions at large in recent years. Disaster risks are assessed by scenario, exposure, vulnerability, damage, and loss. An assessment framework is also sought to give an overview of risks, hazard and vulnerability.
Brunei	Information for the public is rather limited and a comprehensive report is not available.

Table 3.8.4 Existing Studies and Research: Flood

No	Country	Province/ City	Coordinates		Risk Assessment		Vulnera-bility Assess-ment	Organiza tion Produced	Document No. in Appendix A4.1
			Latitude	Longitude	Area	Popu-lation			
1	ASEAN	-	-	-	○	○	×	UNISDR/ WB	FL_001

Note: ○ indicates the existence of information. × indicates that information was not found in public resources.

(2) Earthquakes

Useful information and studies on earthquake hazard, risk, and vulnerability were collected from resources available in the public domain including websites. The information and studies include methodologies with analysis and assessment.

There is no standardized or authorized methodology for risk and vulnerability assessment. Therefore, the methodology should be selected or updated in accordance with the purpose when risk and vulnerability assessments are required.

A summary of existing studies and reports is shown in Table 3.8.5 by country. A list of collected existing studies and reports is shown in Table 3.8.6.

Table 3.8.5 Summary of Existing Studies and Reports by Country: Earthquake

Country/Region	Summary of Existing Studies and Reports
ASEAN	There are natural hazard assessment reports for ASEAN region created by international organizations like World Bank etc. They summarize frequency, vulnerability, loss, and others subject for each disaster. Some reports describe the methodology and assessment points/items.
Brunei	There is no record of earthquake disaster in Brunei and no investigations or studies limited to this country and its regions were found.

Table 3.8.6 Existing Studies and Research: Earthquake

No	Country	Province/ City	Hazard Assessment			Risk Assessment		Vulnera-bility Assess-ment	Organi-zation Produced	Document No. in Appendix A4.2
			Scena rio	Probabi listic	Method ology	Human Loss	Econom ic Loss			
1	Worldwide	-	×	○	×	○	○	○	UNISDR	EQ_001
2	ASEAN	-	×	○	×	×	×	×	GSHAP, USGS	EQ_002

(3) Tsunamis

Useful information and studies on tsunami hazard, risk, and vulnerability were collected from resources available in the public domain including websites. The information and studies include methodologies with analysis and assessment.

There is no standardized or authorized methodology for risk and vulnerability assessment. Therefore, methodology should be selected or updated in accordance with the purpose when risk and vulnerability assessment are required.

A summary of existing studies and reports is shown in Table 3.8.7 by country. A list of collected existing studies and reports is shown in Table 3.8.8.

Table 3.8.7 Summary of Existing Studies and Reports by Country: Tsunami

Country/Region	Summary of Existing Studies and Reports
ASEAN	Tsunami induced by the Sumatra earthquake on December 26, 2004 caused major damage to ASEAN countries. The disaster is summarized by organizations like ADB.
Brunei	There is no record of tsunami disaster in Brunei and no investigations or studies limited to this country and its regions were found.

Table 3.8.8 Existing Studies and Research: Tsunami

No	Country	Province/ City	Hazard Assessment			Risk Assessment		Vulnera-bility Assess-ment	Organi-zation Produced	Document No. in Appendix A4.3
			track record	Scena rio	Metho dology	Human Loss	Economic Loss			
1	ASEAN	-	○	×	×	○	○	×	ADB	TN_002

(4) Volcanoes

Useful information and studies on volcanic hazard, risk, and vulnerability were collected from resources available in the public domain including websites. The information and studies include methodologies for analysis and assessment.

There is no standardized or authorized methodology for risk and vulnerability assessment. Therefore, methodology should be selected or updated in accordance with the purpose when risk and vulnerability assessment are required.

A summary of existing studies and reports is shown in Table 3.8.9 by country. A list of collected existing studies and reports is shown in Table 3.8.10.

Table 3.8.9 Summary of Existing Studies and Reports by Country: Volcano

Country/Region	Summary of Existing Studies and Reports
ASEAN	UNOCHA summarized the scale of the explosion of volcanoes around the Asia-Pacific region using the Volcanic Explosivity Index (VEI).
Brunei	There is no record of volcanic disaster in Brunei and no investigations or studies limited to this country and its regions were found.

Table 3.8.10 Existing Studies and Research: Volcano

No	Country	Province/ City	Hazard Assessment			Risk Assessment		Vulnera-bility Assess-ment	Organi-zation Produced	Document No. in Appendix A4.4
			Track record	Scena rio	Metho dology	Human Loss	Economic Loss			
1	ASEAN Asia-Pacific	-	○	×	×	×	×	×	OCHA -ROAP	VE_001

(5) Cyclone (Typhoon) and Meteorological Hazard

"Cyclone" is a term to describe many types of of low pressure systems, of which tropical cyclones/typhoons are the main types creating disasters in the ASEAN region. Under the framework of WMO, leading countries implement monitoring/detection of tropical cyclones on a regional basis. Table 3.8.11 indicates the responsible territory allocated to ASEAN members and its leading country.

Table 3.8.11 Members of WMO Tropical Cyclone Committee

	Warning Zones	Members（ASEAN）	Leading Country
Western North Pacific Ocean and South China Sea	0° - 60°(N) 0° - 100°(E)	Cambodia, Lao PDR, Malaysia, Philippines, Singapore, Thailand, Vietnam	Japan
Bay of Bengal and the Arabian Sea	5°S - 45°(N) 30°E - 90°(E)	Myanmar, Thailand	India
South Pacific and South-East Indian Ocean	0°-50°(S) 90° - 170°(E)	Indonesia	Fiji

The dates and information utilized in this report have been acquired from various reports on the studies and research conducted on tropical cyclones and meteorological hazards published on the internet. Collected documents include evaluation results of hazards/risks, as well as their evaluation methods. With regard to tropical cyclones/typhoons, a meteorological organization of each country compiles a summary on the damage situation, including the number of casualties or loss of human lives, and the estimated amount of damage, etc.

A summary of existing studies and reports is shown in Table 3.8.12 by country. A list of collected existing studies and reports is shown in Table 3.8.13.

Table 3.8.12 Summary of Existing Studies and Reports by Country: Cyclone and Meteorological Hazard

Country/Region	Summary of Existing Studies and Reports
ASEAN	Study reports on natural disasters in the whole ASEAN region are available.
Brunei	There is no indication of tropical cyclones or meteorological hazards.

Table 3.8.13 Existing Studies and Research: Cyclone and Meteorological Hazard

No	Country	Province/ City	Coordinates		Risk Assessment		Vulnera-bility Assess-ment	Organiza tion Produced	Document No. in Appendix A4.5
			Latitude	Longitude	Area	Popu-lation			
	No data								

(6) Landslides

A summary of existing studies and reports is shown in Table 3.8.14 by country. A list of collected existing studies and reports is shown in Table 3.8.15.

Table 3.8.14 Summary of Existing Studies and Reports by Country: Landslide

Country/Region	Summary of Existing Studies and Reports
ASEAN	There have been a few reports that study landslides for ASEAN and the Pacific region at large in recent years. Disaster risks are assessed by scenario, exposure, vulnerability, damage, and loss. An assessment framework is also sought to give an overview of risks, hazard, and vulnerability.
Brunei (Seri Begawan)	Only three landslide events were identified in this country. The hazard map LS-08 indicates a low level of distribution near the border with Malaysia. Although 1/3 of prior disasters are landslides, assessments of risk and vulnerability are very low level.

Table 3.8.15 Existing Studies and Research: Landslide

No	Country	Province/ City	Coordinate		Risk Assessment		Vulnera-bility Assess-ment	Organization Produced	Document No. in Appendix A4.6
			Latitude	Longitude	Area	Popu-lation			
1	ASEAN				○	○	×	UNISDR/World Bank	LS-006
2	ASEAN				○	○	×	EEPSEA	LS-013
3	World				○	○	○	WB	LS-007

Referencess:

Flood

1) Shigenobu Tanaka et al (2010). Progress Report on Flood Hazard Mapping in Asian Countries. PWRI.
2) Velasquez, Jerry et al (ed.) (2012). Reducing vulnerability and exposure to disasters: Asia-Pacific disaster report 2012, ESCAP/UNISDR AP
3) World Bank (2011). Advancing Disaster Risk Financing and Insurance in ASEAN Countries: Framework and Options for Implementation, Washington: Global Facility for Disaster Reduction and Recovery
4) World Bank, UNISDR (2010). Synthesis Report on Ten ASEAN Countries Disaster Risks Assessment.

Earthquake

1) UNISDR (2009). Global assessment report on disaster risk reduction, Risk and poverty in a changing climate

Tsunami

1) ADB (2005). From Disaster to Reconstruction: A Report on ADB's Response to the Asian Tsunami

Volcano

1) OCHA -ROAP (2011). Holocene Eruption and Selected Volcanoes in Asia-Pacific

Cyclone (Typhoon) and Meteorological Hazard

1) ESCAP/WMO Typhoon Committee. (http://www.typhooncommittee.org/)
2) WMO National Meteorological or Hydrometeorological Services of Members (http://www.wmo.int/pages/members/members_en.html)
3) WMO (2010). First Meeting of the Task Team on "Meteorological, Hydrological and Climate Services for Improved Humanitarian Planning and Response", WMO Headquarters, Geneva, Switzerland (31 August - 2 September, 2010)

Landslide

1) World Bank, UNISDR (2010). Synthesis Report on Ten ASEAN Countries Disaster Risks Assessment

Figure 3.8.1 Existing Study on Natural Hazards in Brunei

Chapter 4 Industrial Agglomerated Areas and Investment Risk

4.1 Historical Evolution of Industrial Agglomerated Areas

The development of industrial sites by government agencies for foreign and domestic investment is relatively recent in Brunei. The Brunei Economic Development Board (BEDB) was set up in November 2001 to promote Brunei as an investment destination. As a one-stop shop for potential investors, one of its key focus areas is to promote foreign direct investments in export-oriented manufacturing and services, as well as research collaboration. The BEDB focuses on a small number of large projects. While these include oil and gas-related ones, one of the BEDB objectives is also to promote economic diversification through private sector development outside of the oil and gas industries, including through the creation and management of industrial parks.

In January 2003, the BEDB launched its first two projects, the development of the Sungai Liang area into a hub for petrochemical industries – which included the creation of Sungai Liang Industrial Park (SPARK) - and the construction of a deep water port facility at the island Palau Muara Besar. Since then, its management of industrial parks has steadily increased. Currently, the following industrial sites are managed by the BEDB: Seria (oil and gas), SPARK (petrochemicals), Telisai (mixed industries), Bukit Panggal (energy intensive industries), Anggerek Desa (technology park), Rimba (ICT & High Tech), Lambak Kanan East (light industries), Pulau Muara Besar (oil & gas related industries), Bandar Seri Begawan (financial center), Agrotech Park (halal and business center), Tasek Merimbun (ecotourism) and Ulu-Ulu Temburong (ecotourism). In Lambak Kanan East, a site for the food and beverage, pharmaceuticals and light manufacturing industries, the Canadian company Viva Pharmaceutical is a main investor, and there are plans for an expansion of the site. The main current development project under the BEDB is Pulau Muara Besar (PMB) for oil and gas related industries. Surbana Consortium was appointed as master planner for PMB development in 2008. The Chinese company Zhejiang Hengyi has been contracted to construct a refinery and aromatics complex, the USD 4 billion phase 1 of which is targeted to start in 2015.

A second government agency responsible for industrial sites is the Brunei Industrial Development Agency (BINA), a department under the Ministry of Industry and Primary Resources (MIPR). BINA was created in April 1996, through the merger of the Department of Co-operative Development, Ministry of Home Affairs, and the Industrial Unit, Ministry of Industry and Primary Resources. It is a government-facilitating agency tasked with the promotion of industrial and co-operative development for export-oriented SMEs, through assisting industrial establishment, attracting FDI and stimulating trade. BINA provides a first point of contact for investors in the manufacturing and related support services sectors. It plays a fourfold role in industrial development: catering to the provision of industrial sites and complexes; allocating industrial projects; managing industrial sites; and providing support services for companies established in the BINA-managed industrial sites.

BINA's involvement with industrial parks increased notably in 2007, when nine industrial parks were allocated by the MIPR through BINA to accommodate SMEs: Beribi, Lambak Kanan Barat, Lambak Kanan Timur, Salar, Serasa, Serambangun, Sungai Bera, Pekan Belait and Batu Apoi. Scattered across Brunei Darussalam's four districts, these parks cover a total area of 422 ha. These BINA-managed sites are fully developed with complete infrastructure facilities, including road access, electricity, water, telecommunications and sewerage. Apart from prepared industrial land, BINA also provides units for monthly rent. In addition, BINA also manages three readily available industrial complexes: Beribi, Serambangun and Pekan Belait. Most of the nine industrial sites provided since 2007 are fully occupied. In response, BINA began the development of Kuala Lurah, a tenth industrial site. Kuala Lurah is to be developed in three phases. Its first phase, covering 33 ha, offers 27 lots for construction-related industries.

4.2 Recent Trends and Japanese Investment

Substantial Japanese investment was initially channeled into Brunei's oil and gas industry. In 1972 a liquefied natural gas (LNG) plant was completed in Lumut as a joint venture between the Brunei government, Shell Overseas Holdings Limited and Japanese Mitsubishi Corporation. Since then, Japanese investment has grown. There are eight Japanese companies currently operating in Brunei Darussalam. None of these are located in BINA-managed industrial parks. Four Japanese companies operate either in or directly adjacent to industrial sites under the BEDB. The other four operate outside of industrial parks.

In SPARK, the only resident Japanese project is the Brunei Methanol Company (BMC), which was established by the Japan-Brunei consortium Mitsubishi Gas Chemical Co Inc, Itochu Corporation and Brunei Petroleum. The USD 600 million methanol plant started commercial operation in May 2010 with a capacity to produce 850,000 metric tonnes of methanol per annum. In August 2011, a second project was approved for the site; a USD 2.8 billion integrated petrochemical complex to be developed by Mitsui Consortium. Pharmex Japan Co. Ltd. signed a MoU with the BEDB in 2008 to set up a pharmaceutical packaging plant in Brunei, where medicines are to be packaged under the Brunei Halal brand. In 2010, a supplement agreement was signed, and plans to establish a USD 250 million plant in the Agro-Technology Park were announced. Marubeni Power Systems Corporation has won several big power projects in Brunei, some of which power industrial parks. In 2000, the company was awarded a contract for the 100mW Gadong simple cycle power station, completed in 2003. In 2005, Marubeni Corp. was awarded a JPY 10 billion contract for the Bukit Panggal Combined Cycle Power Station phase 1.

Outside of the industrial parks, Tobishima Corporation is based in Bandar Seri Begawan. It is one of the major construction firms in Brunei Darussalam. Tokio Marine Life Insurance, also based in Bandar Seri Begawan, has operated in Brunei since 1957. In 2011, the company announced that it would strengthen its presence in Brunei.

4.3 Observations from Data Collection

Industrial sites in Brunei appear to be generally well run, though most are relatively small and full or nearly fully-occupied. It is also worth noting that as all of Brunei's parks are government-run with limited resources, they do not offer the level of investor service or support that larger, private parks offer in countries such as Thailand or Vietnam, where competition drives high levels of support and service.

For BINA managed parks, infrastructure is provided and fairly current information about the parks (such as details on location, total site size, number of slots, slot availability, type of industry targeted and rent) is available online in English. For any further information, it is necessary to contact BINA directly, as no contact information is available for the individual parks. For BEDB parks, fairly current information in English is available online (such as details on location, type of industry targeted, and total site size). As the BEDB deals with larger projects than BINA, information on rent is not available. Staff at BINA and the BEDB are helpful and responsive, though their responses can sometimes be slow. Both the BEDB and BINA are tasked with attracting foreign investment and enquiries by foreign investors are treated with priority.

4.4 Industrial Agglomerated Areas and Natural Disaster Risk

(1) Political Risk

Brunei enjoys a high degree of political stability. The Sultan has traditionally wielded complete authority, although this is slowly changing, with the introduction of a new-look parliament in September 2005, which will – in time – house elected representatives. It is, however, expected to take several years before the processes for elections are in place. The country's vast hydrocarbon wealth, which the government has attempted to distribute through a comprehensive welfare system and public sector employment, helps to ensure that the population acquiesces in the continuation of an undemocratic political system and there is still little room for open dissent. Some discontent may come to the fore in the longer term if the government fails to maintain Brunei's high standard of living. Nonetheless, at present the ruling royal family, which endorses a moderate form of Islam, is widely popular. As such, political instability and related business disruption are not an issue in Brunei.

Brunei has been ruled by decree under a regularly renewed state of emergency since an abortive revolt in December 1962. In July 2004, the Sultan surprised his subjects and most foreign observers by announcing that the system of government would be transformed from an absolute monarchy to a limited parliamentary democracy through the reactivation of the Legislative Council (Legco) that had been suspended since 1984. To this end, in September 2004 the Legco met for the first time since independence and voted to increase its representation from 21 members to 45, 15 of whom would be elected. Although the Legco has convened on a regular basis to review the government's budget in recent years, the reform is still incomplete. In June 2011, a new Legco was appointed for a

five-year term, consisting of 33 appointed members. No organized opposition has materialized and it is expected to take several years before the processes for elections are in place.

(2) Economic Risk

Thanks to its significant hydrocarbon wealth, Brunei has one of the highest per-capita incomes in South-East Asia; however growth itself has been mediocre for most of the past 15 years and is unlikely to accelerate over the next five years. About half of GDP and 90% of exports are hydrocarbon related, making this one of the most oil-dependent economies in the world. Even though reserves are declining, efforts to diversify the economy, such as developing Brunei into an offshore financial center, have so far registered little success. There is a lack of political consensus on the country's long-term economic strategies, and significant vested interests have slowed reforms. As long as hydrocarbon revenues remain substantial enough to allow the government to maintain current social programs, reforms in other areas of the economy will continue to lack a sense of immediacy.

The oil and gas sector slowed economic growth in 2012, highlighting Brunei's economic dependence on this industry. Despite moderately robust growth in the non-oil and gas sector, which expanded 3.3% y/y, overall GDP growth stood at a sluggish 0.6% y/y during 2012. The reason for this disappointing performance was an outright contraction in the energy sector, which began in late 2011 and extended into 2012. Within the non-energy sector, production was driven by solid expansion in the agricultural sector, as well as steady gains in the service sector, particularly in private services.

The Brunei dollar is linked to the Singaporean dollar through a currency board arrangement, so the exchange rate mirrors movements in the Singaporean dollar, which is likely to maintain financial stability. The currency board regime has been instrumental in promoting price and exchange-rate stability; indeed, Brunei has seen little exchange-rate volatility and has traditionally been a very-low-inflation country. Brunei's foreign-exchange reserve coverage has consistently surpassed 100% of the money supply. Inflation is likely to remain subdued over the next few years, facilitated by the same macroeconomic forces that have kept them so low in the past – exchange-rate stability and domestic price controls. In addition, increased labor imports should prevent domestic production costs from increasing rapidly, which would support a low-inflation outlook. IHS expects consumer price inflation to settle at just over 1.0% over the next couple of years.

(3) Legal Risk

The country's legal system is based on English common law and the Indian penal code and incorporates elements of sharia (Islamic law). It comprises an independent judiciary, a body of written common law judgments and statutes as well as legislation enacted by the Sultan. For Muslims, Brunei's civil law is superseded in a number of areas by sharia; this is not currently applied to non-Muslims. However, Brunei is working to establish a hybrid legal system under which sharia is integrated into civil law in a way that renders the latter sharia-compliant. This will involve reviewing

legislation to ensure it is sharia-compliant. The aim is to replace two parallel systems with one system in which crimes considered serious under sharia are contested in separate courts. In October 2011 Sultan Hassanal Bolkiah made it clear that he supported the implementation of this system. Civil law lacks the provisions allowing companies or individuals to sue the government, which traditionally resolves disputes with generous, non-negotiable settlements, or alternatively refuses to settle.

Brunei's company law is based on the British Companies Act, providing a good environment in which to conduct business. Businesses must be registered with the Registrar of Companies. A company incorporated in Brunei must have at least two directors and at least half of the directors should be residents of Brunei. The law recognizes a range of business entities; the most common is a limited liability or private company (Senidirian Berhad). Other forms include public companies and the branch of a foreign company. Foreigners can register for these business entities without approval. Foreigners cannot do business as sole proprietorships. Approval is required for foreigners to form joint ventures or partnerships. In the latter case, at least one partner must be either a Bruneian or a resident of Brunei. Information is widely available on Brunei's corporate law and the government has a positive attitude towards foreign investment. Nevertheless, the process of starting a business is difficult. A high number of procedures is required and the length of the average length of the process is 101 days. Brunei has been seeking to improve corporate governance, prompted by a number of high-profile fraud cases and questionable business practices. Brunei's Auditor General has indicated that more comprehensive checks will be carried out on the business and financial management of companies to ensure that the best corporate governance is achieved, in light of increased incorporation of government-owned companies to spearhead industrial growth in Brunei. To facilitate this task, Internal Audit Units have been established in all government ministries and departments.

(4) Tax Risk

Brunei offers a generous tax regime. There is no direct personal income tax, and corporate tax rates are low by regional and Organization for Economic Co-operation and Development (OECD) standards. The trend has been for the corporate tax rate to be reduced, falling from 30% to 22% between 2009 and 2011, and dropping further down to 20% on 1 January 2013. Brunei has also endorsed more than 10 double-taxation agreements that may reduce the rates further or eliminate them altogether. The Brunei economy's excessive dependence on hydrocarbon revenues has distorted the tax system; higher taxes on companies in the petroleum sector permit unusually low tax rates elsewhere in the economy, and reduce the pressure on the state to reform. Moreover, Brunei's reliance on a single source of revenue carries with it the risk that taxes on other sectors could be raised in response to a sustained fall in petroleum production or prices.

Brunei's foreign policy priorities are to ensure the country's security by developing relations with a wide variety of states, while limiting involvement in formal alliances. Hence, Brunei joined the Non-Aligned Movement in 1992. The main focus points of Brunei's foreign policy are on

maintaining good relations with fellow Association of Southeast Asian Nation (ASEAN) countries, the US and its former colonial power the UK. Although the richest country per capita within ASEAN, Brunei's size and its sidelining within the grouping has ensured that the sultanate lacks influence over ASEAN decisions.

Brunei has generally good relations with Malaysia, as the two countries share a number of cultural ties that aid international co-operation. However, the relationship with Malaysia is, in terms of the potential threat if ties are not managed well, Brunei's most complex and therefore most crucial diplomatic challenge. Tensions in relations stem from the then-sultan's decision not to join the Malaysian Federation and from the subsequent 1962 "Brunei revolt", variously ascribed to Indonesian, Malaysian and UK machinations intended to either push the country into the federation or keep it out. Brunei and Malaysia also have a long history of territorial spats, including a long-running dispute over the timber-rich Malaysian-held Limbang province. Maritime disputes with Malaysia, including over the Spratly Islands in the South China Sea, are likely at the very most to result in minor boat skirmishes and boarding of vessels in the next one to three years. As such, there are no business continuity threats resulting from war risks.

(5) Terrorism Risk

Brunei is unlikely to face threats from domestic or regional terrorist networks. As such, terrorism is not a threat to business continuity in Brunei. The government provides its citizens with sufficient welfare, meaning that the probability of radicalization is low. There are no domestic militant groups and new groups are unlikely to be formed, as the sultanate's small size and retention of colonial-era security legislation makes it unlikely that any such movement would go unnoticed. Moreover, Brunei's defense expenditure in recent years has focused on efforts to control its maritime and land borders.

(6) Civil Unrest Risk

Brunei is a secure country in which to live and do business. The risk of civil unrest is low, with its circumscribed political opposition, hydrocarbon wealth, effective security forces and unified society. This means that protests and strikes pose little risk to business continuity. Brunei has not experienced any recent political violence or internal conflict. Although this could be largely ascribed to the tight restrictions that hinder the formation of political groups, there is also little significant opposition to the governing royal family. A prolonged decline in hydrocarbon revenues could force the government to introduce austerity measures which could prove unpopular, particularly if they led to cuts in the public service. Brunei also has a sizeable population of "stateless" people and permanent residents – mostly ethnic Chinese – who have not been accorded citizenship and its attendant rights. Although there is dissatisfaction surrounding the issue, there has been no incidence of violence as yet. It is also possible that religious tension could develop, although this is unlikely to result in violence. Despite constitutional provisions guaranteeing the full and unconstrained exercise of religious freedom, the government routinely restricts the practice of non-Islamic religions and of non-Shafi'i

Islamic groups. Such tactics have been used to reinforce the legitimacy of the hereditary monarchy and the observance of traditional Islamic values through a national ideology known as the Melayu Islam Beraja, or "Malay Muslim Monarchy". There have been cases of Brunei's internal security apparatus investigating and detaining non-Muslims or people suspected of practicing radical Islam; for example, the Islamist Al-Arqam movement and the Bahai faith remain banned.

4.5 Industrial Agglomerated Areas and Natural Disaster Risk

Several distribution maps are shown overlaying natural disaster risk as follows. List of industrial agglomerated areas are attached at the end of this report.

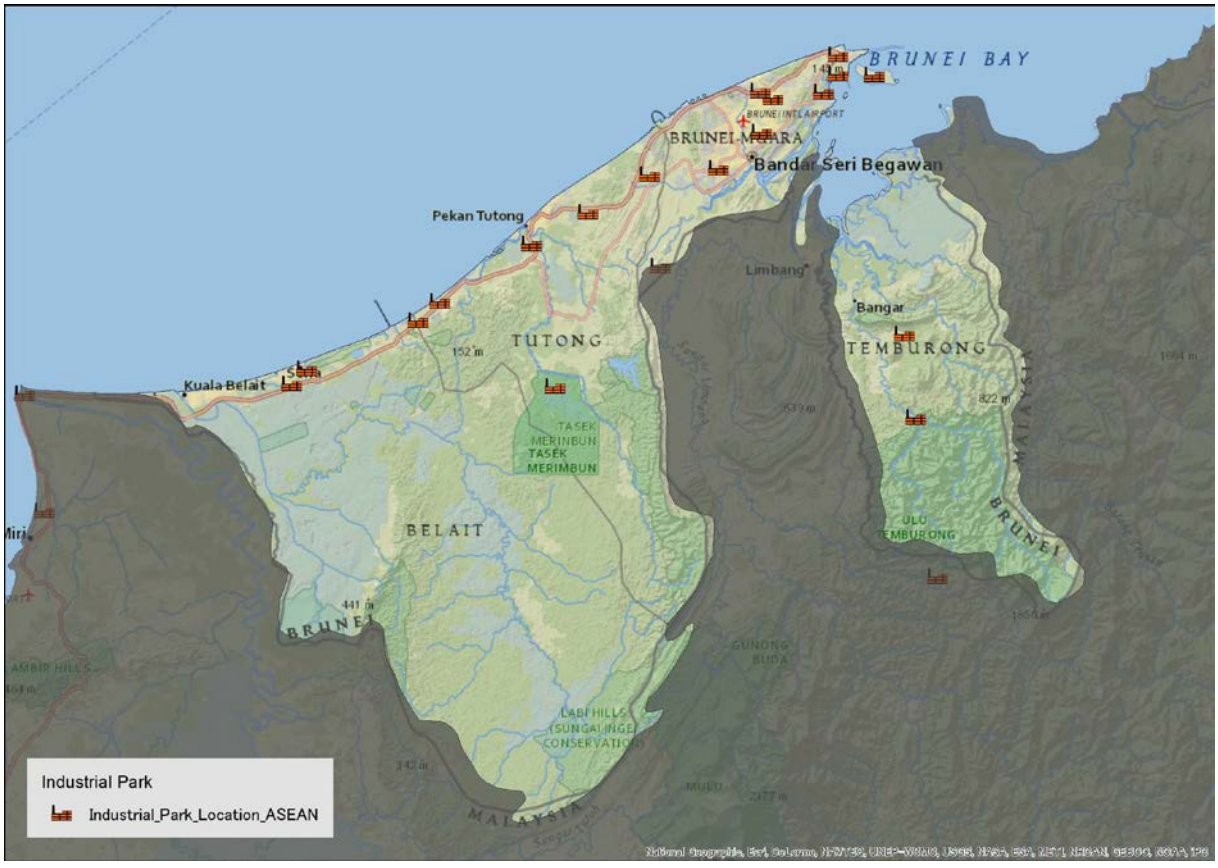


Figure 4.5.1 Distribution of Industrial Park

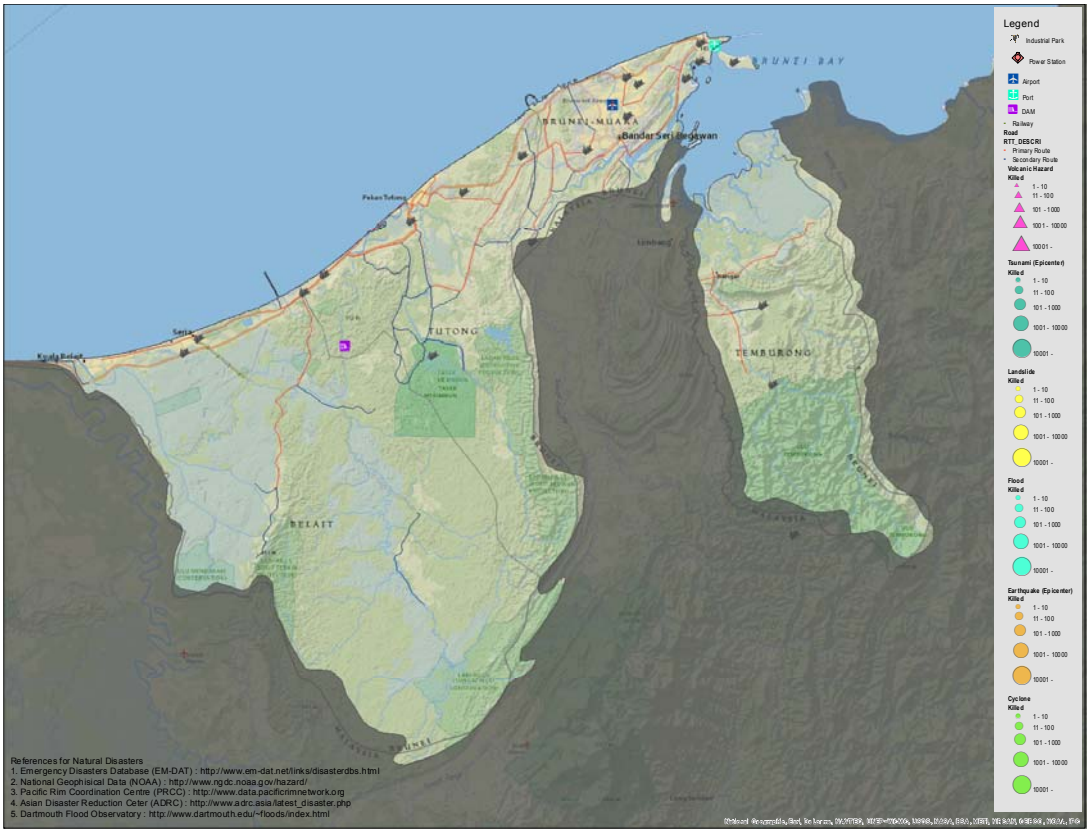


Figure 4.5.2 Distribution of Industrial Park, Major Infrastructures and Natural Hazards on number of killed in Brunei

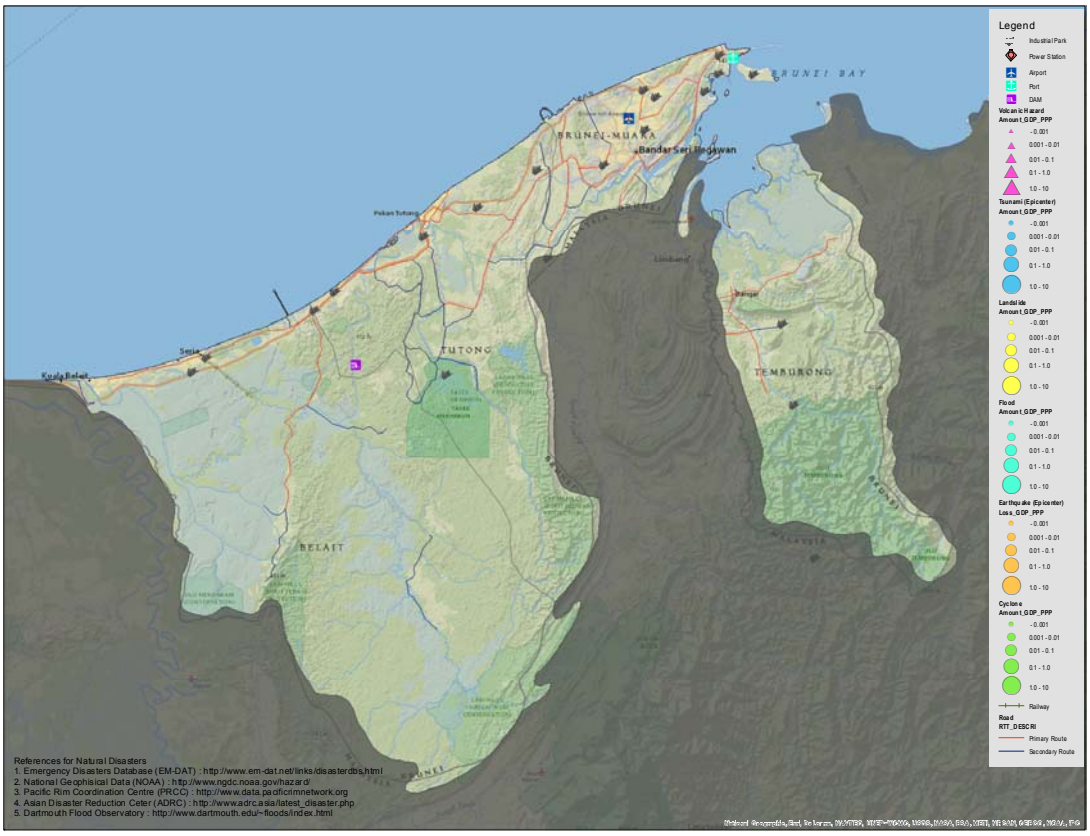


Figure 4.5.3 Distribution of Industrial Park, Major Infrastructures and Natural Hazards on loss rate to GDP in Brunei

Chapter 5 Relevant Infrastructure and Natural Disaster Issues

5.1 Infrastructure Conditions

5.1.1 Roads

Various road networks such as highways, connecting roads, elevated roads, and roundabout interchanges have been developed. The Brunei National Roads System is the major national road network. It has been constructed and maintained by the Public Works Department of Brunei (JKRB).

All national highways are two-lane roads, and road signs use white characters on a green background. The speed limit is 100 km/h.

There are six (6) highways.

1) Muara-Tutong Highway
2) Sultan Hassanai Bolkiah Highway
3) Tungku Highway
4) Kuala Belait Highway
5) Telisai- Lumit Highway
6) Brunei-Temburong Highway including Temburong Bridge

The road density in 2010 was 52.50 km/km², and the density level remained at the same level after a drop in 2007. The total length of road is 2,836 km, of which 423 km is highways.

5.1.2 Ports

In Brunei, there are three ports: Muara Port, Kuala Belait Port, and Bangar Port, which are under the jurisdiction of the Ports Department of the Ministry of Communication. The facilities of Muara Port are of the local highest level. Muara Port is located about 28 km from the capital city. The water at the port is deep and it is the major entrance for international trading.

More than 90% of import and export items except oil and gas go through Muara Port. According to 2008 statistical data, 948,033 tons of cargo and 90,372 container TEUs were handled. It has two main terminals: a convention terminal and a container terminal. Their combined area is are 24 hectares. There are also some oil-related facilities belonging to Royal Dutch Shell.

Moreover, Brunei Shell Oil (Brunei Shell Petroleum) has established an institution to support operations offshore along the Muara Port.

5.1.3 Railways

There is no railway in Brunei.

5.1.4 Airports

In Brunei, there are two main airports: Brunei International Airport in Bandar Seri Begawan City and Anduki Airfield in the Seria Anduki District. Brunei International Airport is managed by the Government of Brunei and the runaway is 3,658 m×46 m. Brunei International Airport is used as the base for Royal Brunei Airlines, while Anduki Airfield is a commercial airport managed by Brunei Shell Petroleum.

The passenger terminal of Brunei International Airport has a maximum capability of handling 2 million passengers per year, and there were 1,827,465 passengers in 2010.

5.2 Public Services

5.2.1 Electricity

In Brunei, there are four (4) dams and ten (10) thermal power plants. The Ministry of Energy (MOE) is under the Prime Minister's Office, and the Department of Electrical Services (DES) is established within the MOE. There are seven (7) energy service companies, of which only five (5) are currently generating electricity.

Table 5.2.1 Energy Service Companies in 2011

Company	Total (MWh)	(%)	Number of Power Plant
Dept. of Electrical Serv.	2,292,070	75	4
Berakas Power Management Co.	420,603	14	3
Brunei Lng Sdn Bhd	253,610	8	1
Sultanate Of Brunei	38,971	1	1
Brunei Shell Petroleum Co. Ltd.	31,575	1	1
Brunei Economic Dev. Board	0	0	1
Mitsubishi Corp.	0	0	1

Sources:Enipedia, Brunei/Energy Companies

5.2.2 Water

(1) Water supply

The Department of Public Works is responsible for overseeing planning, design, and management, and provides 99.9% of the potable water to the people of Brunei Darussalam.

Table 5.2.2 Water Supply Facilities in Brunei

Facility	Quantity
Dams	5 (one (1) is under construction)
Water treatment plant	8
Water inspection facility	8
Barrage	2
Reservoir	56
Distribution pipelines ≤ D=400 mm	2,600 km

Transmission pipelines ≥ D=400 mm	320 km
Sub-office	5
Booster Pumping Stations	13
Tanker Trucks	13

Source: Jabatan Kerja Brunei Darussalam, Water Services

(2) Sewerage

The Department of Public Works is responsible for ensuring the sewerage system is clean and safe.

Table 5.2.3 Sewage Facilities

District	Sewage Treatment Plants	Major Sewerage Pumping Stations	Subsidiary Sewerage Pumping Stations	Sewer Pipes (km)
Brunei Muara	9	29	122	550.07
Tutang	4	1	16	48.1
Belait	3	15	6	140.5
Temburong	1	-	4	0.7
Total	17	45	148	739.37

Source: Jabatan Kerja Brunei Darussalam, Water Services

5.2.3 Communications

(1) Internet and broadband

The government is responding to the spread of broadband, and announced a broadband plan and a radio broadband access plan in 2008. However, the internet diffusion rate in 2011 was still low at 5.5%. There are approximately 22,000 subscribers. Currently the government is working on the spread of optical fiber networks.

(2) Mobile phones

In the mobile communications market of Brunei, DST Communications, TelNru (entered the market in 2008), and b-mobile (joint venture company with QAF Comserveno) provide services.

The diffusion rate is over 109.2% and exceeded one mobile per person in 2011.

(3) Fixed-line phones

The Department of Electricity and Communication, which offers fixed-line communication, was privatized in April 2006 to create TelBru. This company has monopolized the market. Landline subscribers have been influenced by mobile phones and are decreasing yearly, with the diffusion rate dropping to 19.7% in 2011.

(4) Terrestrial broadcasting

The national broadcasting company Radio Television Brunei (RTB) offers television broadcasting. There is only one commercial broadcasting company, and satellite broadcasting company Kristal-Astro offers both television and a radio broadcasts.

5.2.4 Waste

In 2000, the volume of general waste was approximately 153,700 tons, and the volume of industrial waste was 25,640.87 thousand tons. This calculates to 1.4 kg of waste per person/day is 1.4 kg or 189,000 tons in a year; this amount is increasing every year.

The amount of general waste by area is shown as follows.

1) Bruinei Muara: 129,000 tons/year
2) Tutong: 21,700 tons/year
3) Belait: 31,000 tons/year
4) Temburong: 6,300 tons/year

According to a survey conducted in 2005, the components of the waste are: food (36%), paper (18%), plastic (16%), garden waste (6%), and disposable diapers (6%). At present, there are six (6) landfill sites.

Brunei Economic Development Board (BEDB) has constructed and manages the disposal facility in Muara, which has the capability to treat 300 tons per day using osmotic water treatment.

5.3 Natural Disaster Issues

Floods occur in the rainy season (October to May), but the country is seldom affected by typhoons because the country is not located in a typhoon path.

In Brunei, the number of people who have been affected by landslides is 128,000, which is much more than the 28,000 persons affected by flooding. Even if floods occur, the damage would be minimal, although there may be some inundation in the vicinity. Moreover, there is no risk of typhoons. Therefore, landslides seem to be the most prevalent high-risk natural disaster in Brunei.

Figure 5.3.1 Major Infrastructures in Brunei

Chapter 6 Economy, Industry, and Trade

In this survey, the general outline of economy and trade in Brunei Darussalam and the cases in which disaster impact analyses were conducted are examined. The purpose is to estimate the impact of a disaster on the economy of the nation and surrounding regions in the event that an industrial agglomerated area in Brunei is hit by a disaster.

The following topics were explored using existing data and information from sources such as the internet, research papers, reports, and other materials.

- Overview of the economy and industry of Brunei
- Overview of trade in Brunei

In order to understand the conditions of the economy and trade in Brunei, relevant information was gathered/organized based on a review of reference materials listed below.

No.	Reference	Remarks
1	ASEAN-JAPAN CENTRE website http://www.asean.or.jp/	Statistical data on economy, industry, and trade of ASEAN
2	JETRO 2009, “ASEAN Economic Community (in Japanese)”	Regional corporation framework in East Asia
3	ASEAN Stats database http://aseanstats.asean.org/	Trade values of ASEAN by commodity and partner country, etc.
4	ASEAN website (2013), "Key basic ASEAN indicators in 2011, Last update 14 January 2013"	Key basic indicators of ASEAN
5	International Monetary Fund, World Economic Outlook Database	Macroeconomic indicators of ASEAN
6	Industrial agglomerated areas in ASEAN, IHS	Detailed information on industrial agglomerated areas in ASEAN
7	Ministry of Foreign Affairs of Japan http://www.mofa.go.jp/index.html	Information on regional affairs, etc.

6.1 Overview of the economy

The GDP of Brunei is 16.4 billion USD (2011). This is the third smallest in ASEAN, after Laos and Cambodia. Conversely, its GDP per capita is 41,662 USD (2011), which is second highest after Singapore. The reason of this gap is due to the fact that, while Brunei has only a small population, the country is rich in oil/natural gas production, and the economy is largely dependent on exports.

The economic growth rate of Brunei fluctuates largely. The reason for this volatility is that Brunei’s economy depends on the economic conditions of the countries to which Brunei exports its products. It is expected that the pace of economic growth of Brunei will continue to be different from the economic growth of ASEAN. Foreign direct investment in Brunei is very small, accounting for only 0.6% of total foreign direct investment in ASEAN (2010).

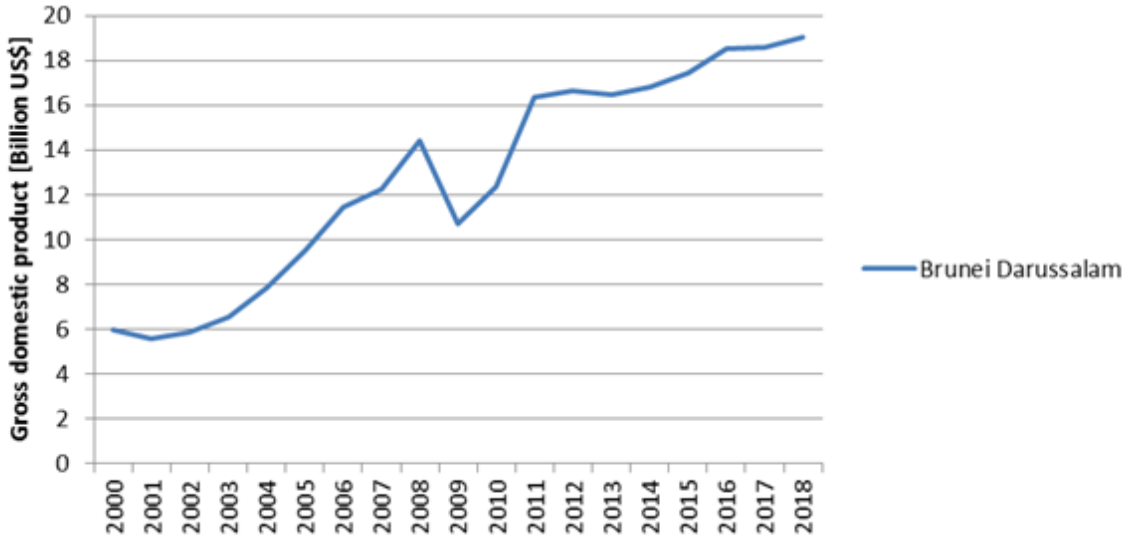
Since 2010, the country has maintained a low unemployment rate in the 2% range. It is estimated that the unemployment rate will continue to be within this range. (Cf. The unemployment rate in Japan as of 2012 is 4.4%.)

As for industrial composition, the oil/natural gas sector accounts for most of the economic activity in the country. It is expected that Brunei will continue to promote the manufacture of industrial products to diversify its economic base in order to prepare for the future depletion of natural reserves.

Major industrial parks in Brunei, in which many Japanese companies are operating, are summarized in the table below.

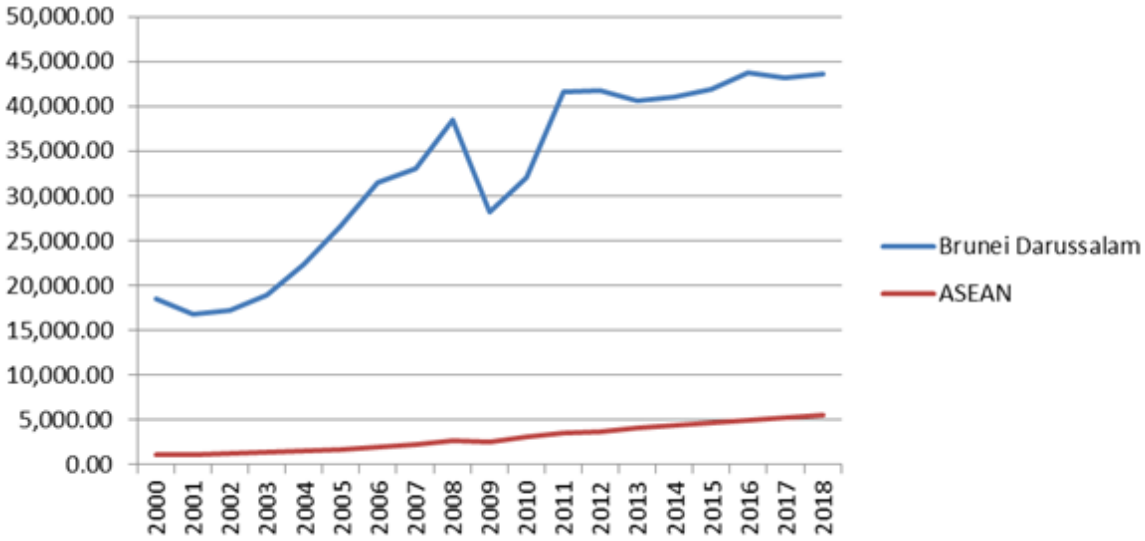
Name of Industrial Park	Number of Japanese companies operating	Feature
Sungai Liang	1	Located 76 km east of Bandar Seri Begawan. Companies engaged in methanol manufacturing are operating in this Park.
SPARK	(8)	Located 66 km west of Bandar Seri Begawan. Occupied mainly by companies engaged in chemical manufacturing.

Reference: The table was created based on information from ASEAN-Japan Centre (https://www.asean.or.jp/)
Note) Numbers shown in parentheses were obtained from resources provided by IHS.



Source: International Monetary Fund, World Economic Outlook Database, April 2013

Figure 6.1.1 Gross Domestic Product in Brunei, ASEAN countries, and Japan (2000-2018), current prices (Estimation starting from 2012)



Source: International Monetary Fund, World Economic Outlook Database, April 2013

Figure 6.1.2 Gross Domestic Product per capita in Brunei, ASEAN countries, and Japan (2000-2018), current prices (Estimation in Brunei starting from 2012; in ASEAN starting from 2007)

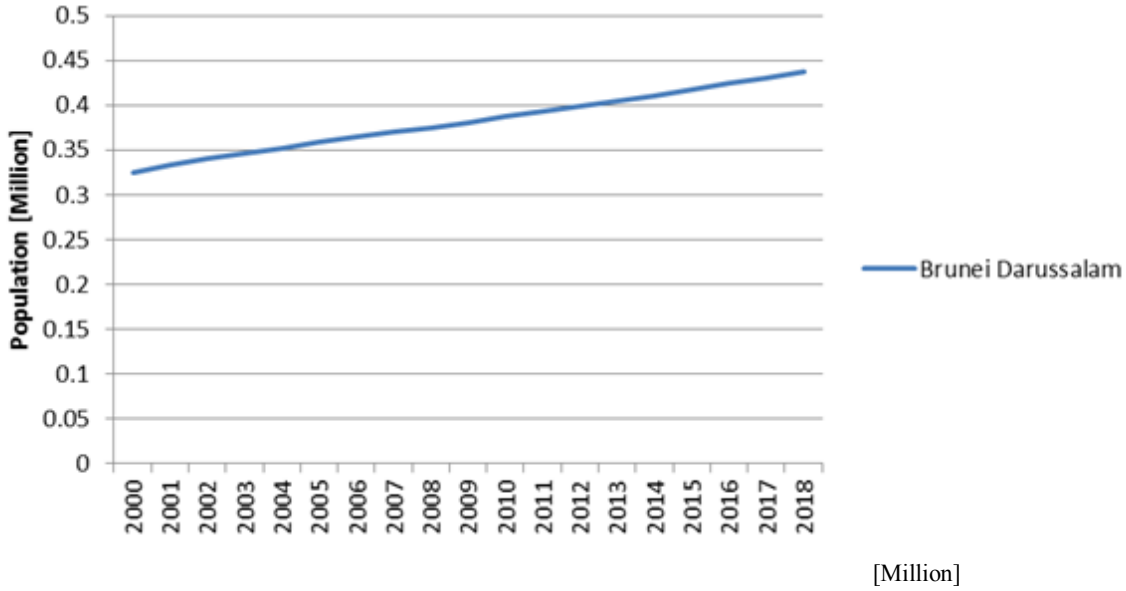
Source: International Monetary Fund, World Economic Outlook Database, April 2013

Figure 6.1.3 Economic Growth Rate in Brunei, ASEAN countries, and Japan (2000-2018), current prices (Estimation in Brunei and ASEAN starting from 2012; in Japan starting from 2013)

Table 6.1.1 Average growth rate in Brunei, ASEAN countries and Japan (2013-2017)

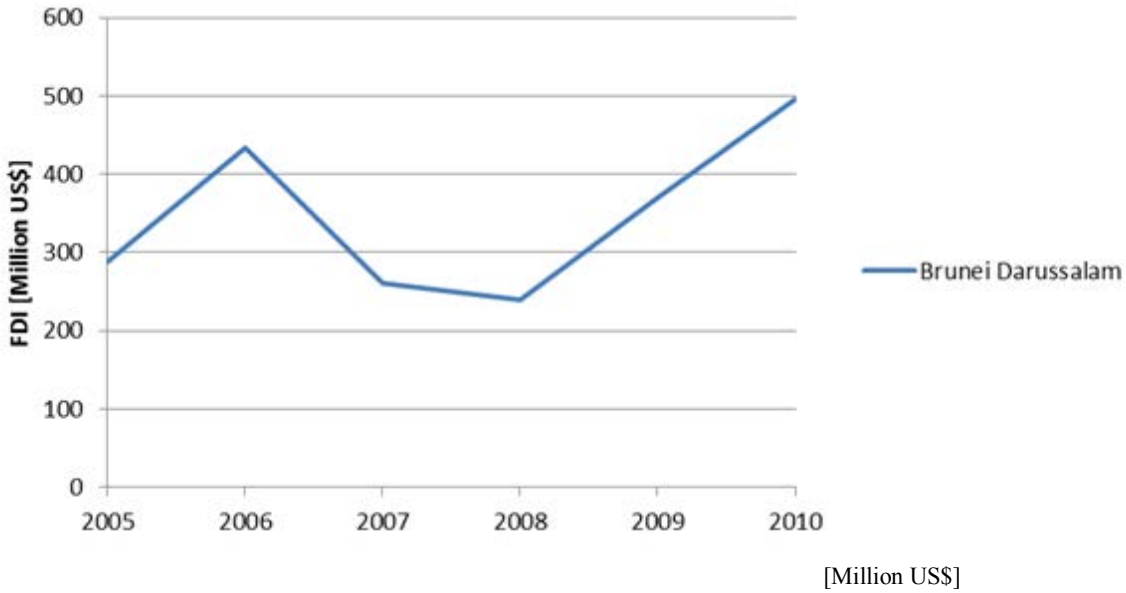
	Brunei	ASEAN	Japan
Average growth rate (2013-2017) (%)	2.3	8.5	-0.53

Source: International Monetary Fund, World Economic Outlook Database, April 2013, calculated by MRI



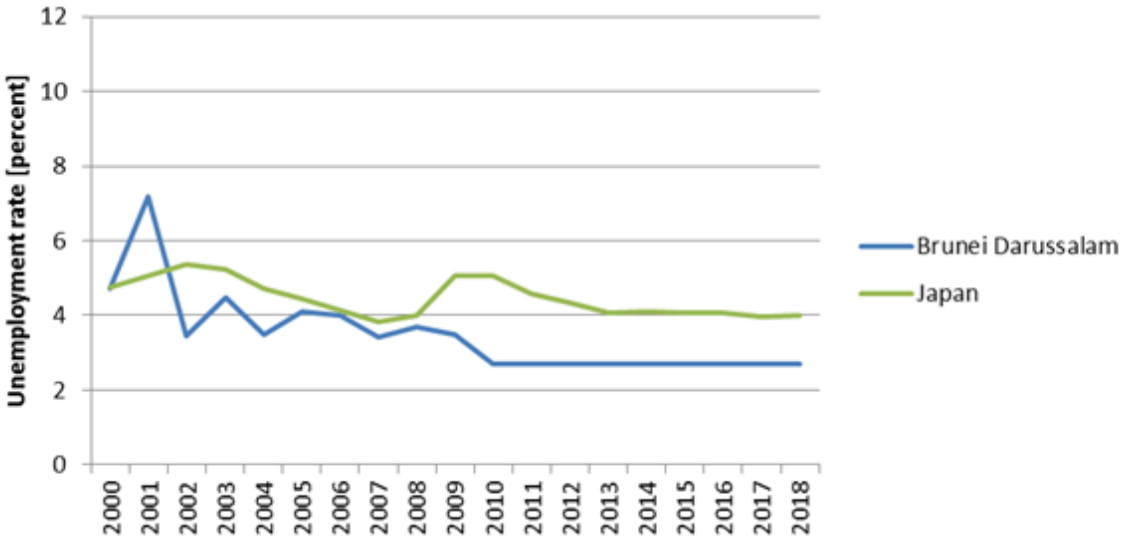
Source: International Monetary Fund, World Economic Outlook Database, April 2013

Figure 6.1.4 Population (2000-2018) (Estimation starting from 2012)



Source: ASEAN-Japan Centre website

Figure 6.1.5 Foreign Direct Investment to Brunei and ASEAN (2005-2010)



Source: International Monetary Fund, World Economic Outlook Database, April 2013

Figure 6.1.6 Unemployment rate in Brunei and Japan (2000-2018)
(Estimation in Brunei starting from 2012; in Japan starting from 2013)

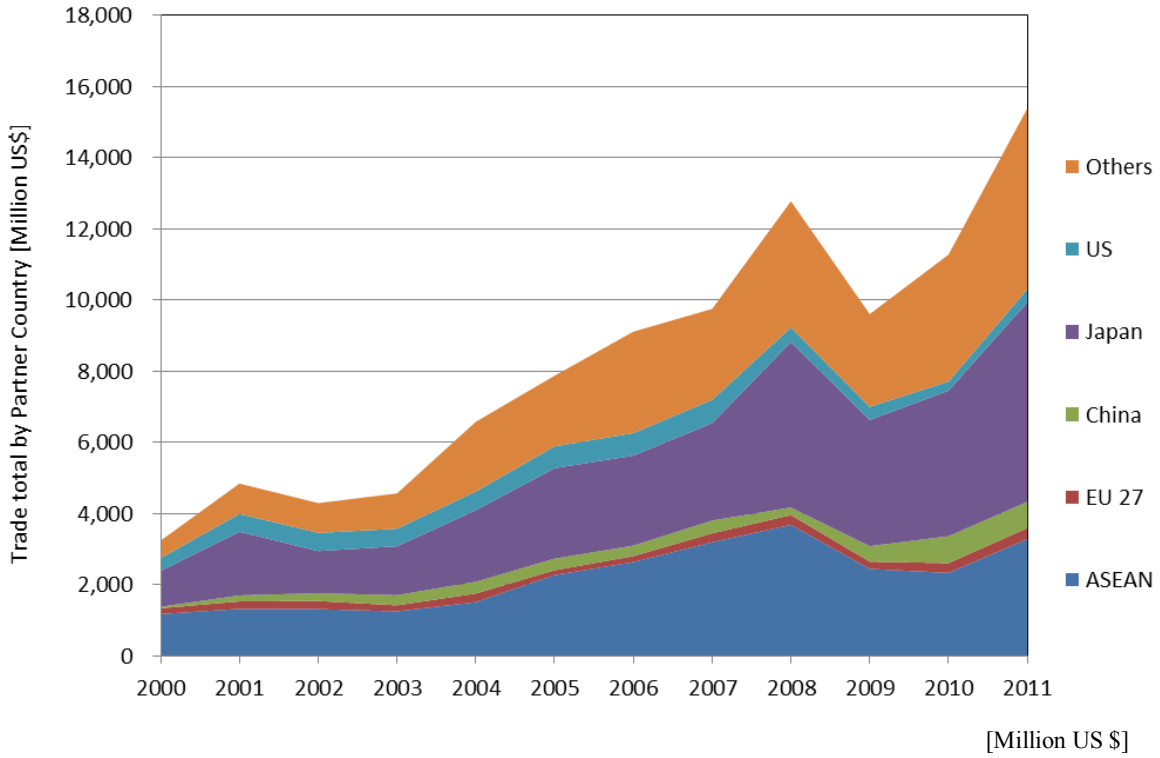
6.2 Overview of trade

(1) Amount of foreign trade/major trading partners

Trends in Brunei's foreign trade by partner countries (2004 – 2011) are illustrated in the figure below. It shows that the external trade value has been growing steadily since 2000. Although foreign trade dropped in year 2009, after the collapse of Lehman Brothers in the fall of 2008, all regions recovered quickly from the crisis.

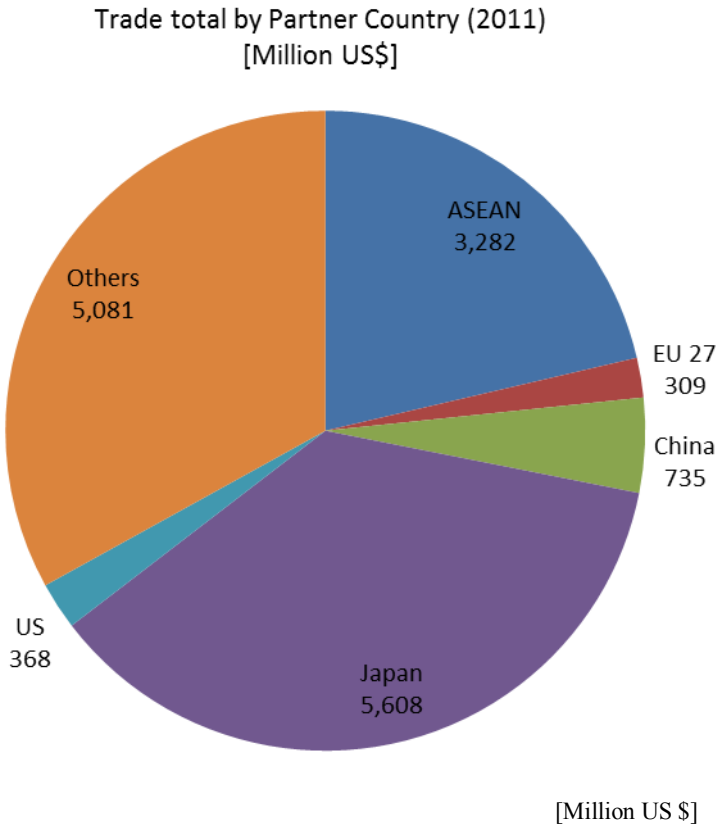
As of 2011, the largest trading partner of Brunei is Japan, accounting for 36% of the total trade. The second largest trading partner is ASEAN countries, accounting for roughly 21%. China comes next, with 5%, followed by the EU and the USA, both accounting for approximately 2%.

Looking at the trend in recent years, it is observed that while Brunei's foreign trade is increasing with all trading partners, the growth rate of trade with Asian countries such as Japan, China and ASEAN countries is higher than the growth rate of trade with EU and the USA.



Source: ASEAN Stats database (http://aseanstats.asean.org/)

Figure 6.2.1 External Trade Value by Partner - Total (2000-2011)



Source: ASEAN Stats database (http://aseanstats.asean.org/)

Figure 6.2.2 External Trade Value by partner - Total (2011)

(2) Categories of major trading commodities

Export values of Brunei by commodity (2011) are shown in the table below.

Examining the export values by major export commodities, it can be observed that the largest group of products exported from Brunei is mineral fuels, which accounts for 96% of the total export value (11,888 million USD). Machinery and transport equipment comes next, accounting for 1.8% of the total exports (220 million USD).

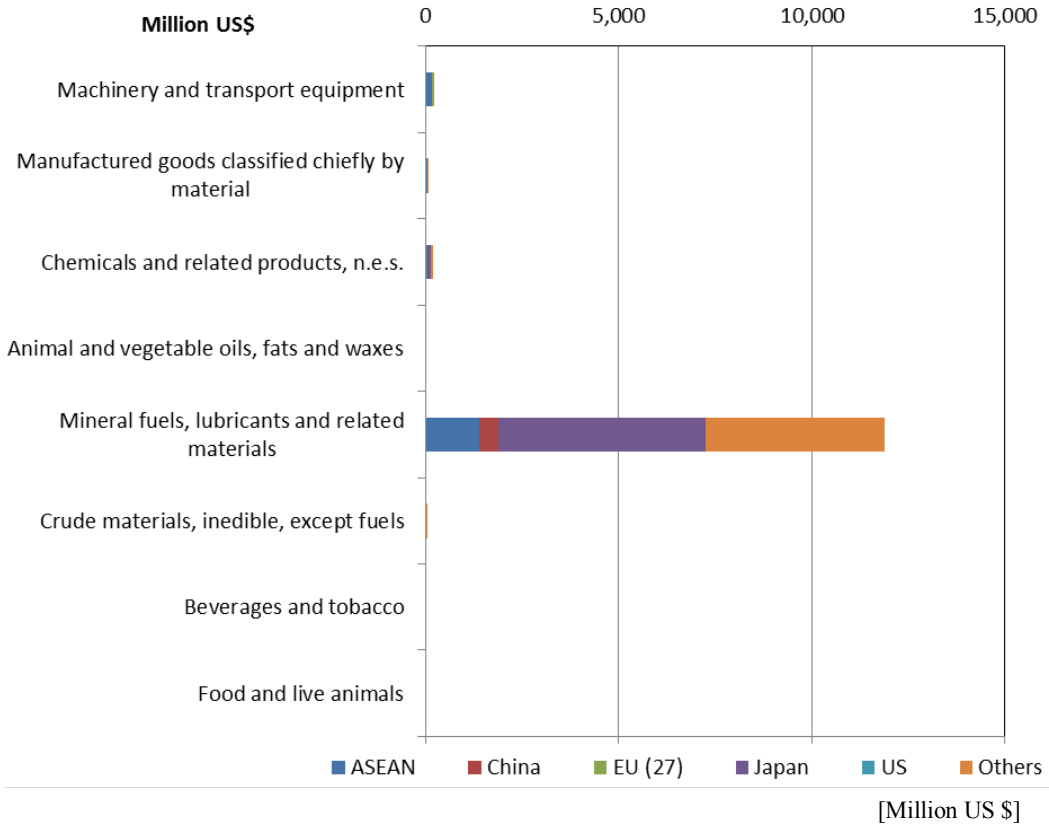
The largest export destination for mineral fuels is Japan, buying 5,387 million USD. This is followed by ASEAN countries and China, with export values of 1,392 million USD and 479 million USD, respectively.

Table 6.2.1 Trade values (exports) of Brunei by commodity and partner country (2011)

[Million US $]

Category	ASEAN	China	EU (27)	Japan	US	Others	WORLD
Food and live animals	3	0	0	0	0	0	3
Beverages and tobacco	0	0	0	0	0	1	2
Crude materials, inedible, except fuels	11	0	0	0	0	1	12
Mineral fuels, lubricants and related materials	1,392	479	0	5,387	0	4,631	11,888
Animal and vegetable oils, fats and waxes	0	0	0	0	0	0	0
Chemicals and related products, n.e.s.	75	36	0	15	8	69	202
Manufactured goods classified chiefly by material	46	0	1	0	0	3	50
Machinery and transport equipment	163	0	17	0	2	38	220

Source: ASEAN Stats database (http://aseanstats.asean.org/)



[Million US $]

Source: ASEAN Stats database (http://aseanstats.asean.org/)

Figure 6.2.3 Trade values (exports) of Brunei by commodity and partner country (2011)

Import values of Brunei by commodity (2011) are shown in the table below.

Examining the import values by major import commodities, it can be observed that the largest group of products imported by Brunei is machinery and transport equipment, which accounts for 34% of the total import value (900 million USD). Manufactured goods comes next, accounting for 26% of the total imports (683 million USD).

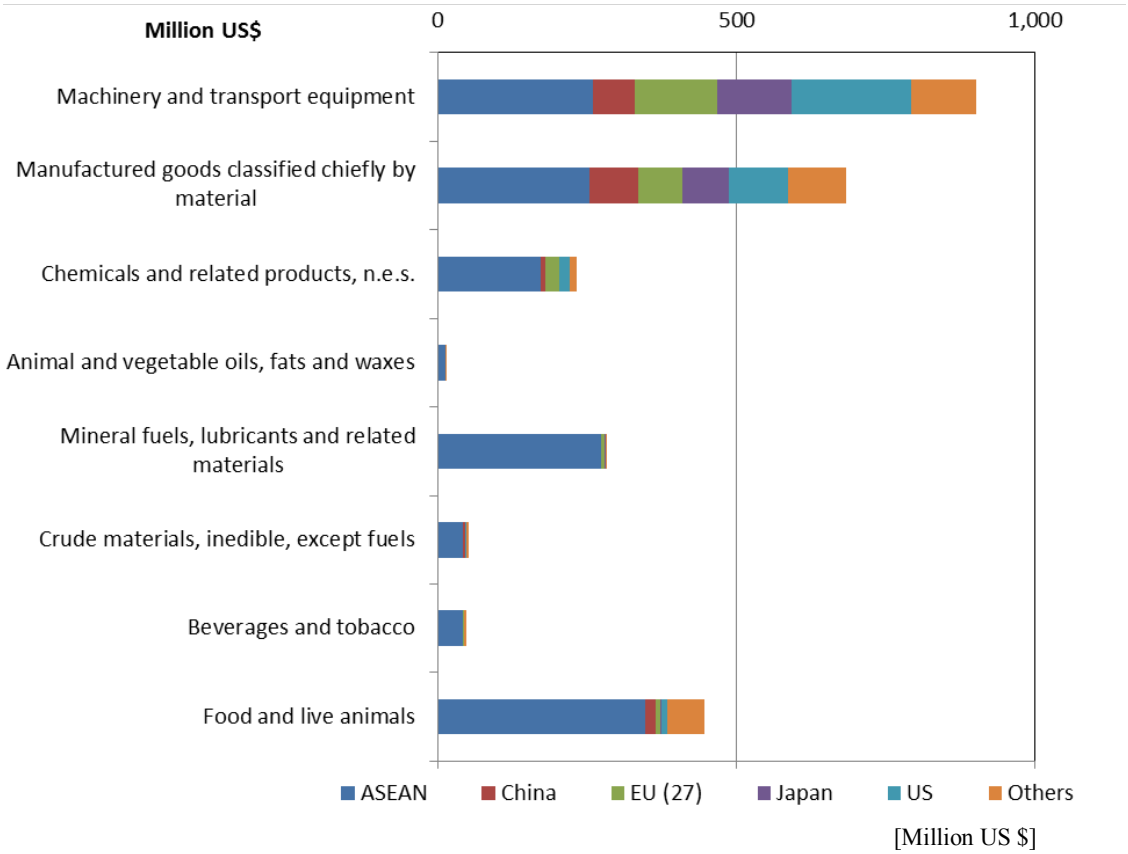
The largest exporter of machinery and transport equipment to Brunei is ASEAN, exporting a total of 260 million USD. This is followed by the USA and the EU, with import values of 199 million USD and 138 million USD, respectively. Imports from Japan were 124 million USD.

Table 6.2.2 Trade values (imports) of Brunei by commodity and partner country (2011)

[Million US $]

Category	ASEAN	China	EU (27)	Japan	US	Others	WORLD
Food and live animals	347	18	9	1	10	62	446
Beverages and tobacco	43	0	1	0	0	3	47
Crude materials, inedible, except fuels	42	3	1	0	1	5	52
Mineral fuels, lubricants and related materials	273	0	7	0	1	1	282
Animal and vegetable oils, fats and waxes	13	0	0	0	0	0	13
Chemicals and related products, n.e.s.	172	9	23	1	17	11	233
Manufactured goods classified chiefly by material	255	81	74	77	98	98	683
Machinery and transport equipment	260	70	138	124	200	109	900

Source: ASEAN Stats database (http://aseanstats.asean.org/)



Source: ASEAN Stats database (http://aseanstats.asean.org/)

Figure 6.2.4 Trade values (imports) of Brunei by commodity and partner country (2011)

Chapter 7 Physical Distribution Network

The themes of this survey are divided into three categories as follows: 1) Understanding of Supply Chain Circumstances in ASEAN Countries, 2) Understanding of Circumstances on Physical Distribution Network, and 3) Organizing the framework of vulnerability analysis for natural disasters on the ASEAN Logistics Network.

7.1 Understanding of Supply Chain Circumstances in Brunei

(1) Relation to Logistics Performance Index on International Physical Distribution

No Logistics Performance Index (LPI) of international logistics is available for Brunei; nevertheless, those for other ASEAN member countries are shown in the following table:

Table 7.1.1 International LPI (Logistics Performance Index) *[1] Ranking 2012

Rank	Country	LPI	Customs	Infrastructure	International Shipment	Logistics Competence	Tracing & Tracking	Timeliness
2	Singapore	4.09	4.02	4.22	3.86	4.12	4.15	4.23
29	Malaysia	3.44	3.11	3.5	3.5	3.34	3.32	3.86
35	Thailand	3.29	3.02	3.16	3.27	3.16	3.41	3.73
44	Philippines	3.14	2.67	2.57	3.4	2.95	3.29	3.83
53	Vietnam	2.96	2.68	2.56	3.04	2.89	3.1	3.44
75	Indonesia	2.76	2.43	2.54	2.82	2.47	2.77	3.46
118	Lao PDR	2.46	2.17	1.95	2.7	2.14	2.45	3.23
129	Cambodia	2.37	2.28	2.12	2.19	2.29	2.5	2.84
133	Myanmar	2.33	1.94	1.92	2.37	2.01	2.36	3.29
	Brunei	**N.A**						

Source: World Bank Connecting to Compete 2012 Trade Logistics in the Global Economy

(2) Features of Physical Distribution in Relation to Main Industries in Industrial Parks

The lists of ASEAN-JAPAN CENTER (AJC) web-site*[2] have no specific time of investigation by year/month, but it is considered that the general current status of industry agglomeration at the time of the investigation can be obtained.

The industries in industrial parks are classified into the following 13 categories:

1) Fishery/Foodstuff, 2) Textile/Apparel, 3) Pulp/Paper, 4) Chemicals, Oil, Rubber/Ceramic, 5) Steel/Nonferrous metal, 6) Transport machines (Cars), 7) Electrical/Electronics/Precision apparatus, 8) Other industries, 9) Commerce (wholesale, retail), 10) Real estate, 11) Logistics/Warehouse, 12) Finance/Insurance/Other services, and 13) Information/Telecommunication.

Based on the industrial classifications above, the characteristics of distributions of the products from industrial parks are estimated.

The objective industrial parks are selected based on the criterion such as: 1) Degree of geographic accumulation, 2) Having sufficient operational experiences, 3) The size and number of Japanese companies, 4) Located in the pilot area in case of Vietnam, the Philippines and Indonesia.

Since no information about Japanese affiliated companies' operation is provided in the list of AJC, features of physical distribution are inferred from the trade structure.

Top three share of the major export/import items of Brunei are as follows (Ministry of Foreign Affairs of Japan, country and regional situation, Brunei, Economy)*[3]:

- Export: Crude oil, Natural gas, Methanol
- Import; Machine/ Transportation Equipment, Industrial goods, Articles of food.

Brunei exports oil, natural gas and the other oil industry-related products, and imports commodities necessary for daily life. From this trade structure, daily life goods are supposed to be transported by roads from Maura Port, directly to consumers through some distribution and delivery centers.

(3) Supply Chain Circumstances

Physical distribution is evolving by the stages of Physical Distribution Development Phasing (PDDP) as follows:

1) Physical distribution control: Company's own sphere of materials/ products distribution (PDC).
2) Logistics management: Company's own distribution management by the market-in strategy (LGM).
3) Supply chain management: Integrated distribution management from company's own to systemized one by the collaboration with other logistics operator resources (SCM)

Other criteria can be considered applicable, so that the development phase may be justified, based on industrial categories, and their products' varieties and volumes in the selected industrial parks/ SEZ.

1) Kinds and diversity of products (intermediate or final products).
2) Whether production of high valued goods like cars, electrical/ electronic/ precision devices or not, and the levels.
3) Correspondence of export/import major items of goods to, classification of intermediate/ final products
4) Existence of a regional head office of a company which power is vested from the headquarter, and the power strength in management term.
5) Existence of logistics operator as a 3PL and maturity of the business
6) Inter dependency of industrial parks/ SEZ with megalopolises in the vicinity.

The result of assessment is shown in the table below which is made by LPI of the World Bank and by supply chain circumstances determined by above mentioned industries in the industrial park as well as major export/import items in the light of the above three stages of PDDP. The evaluation is shown by relative evaluation of five levels among ASEAN countries. Since there are no distinction time and contents wise in PDDP, the level of development is indicated as a continuous line in the table below.

Table 7.1.2 Physical Distribution Development Phasing

LPI	Country	PDDP								
					Criteria					
		PDC	LGM	SCM	Products diversified	High valued goods	Export/ Import	Regional head office	Logistics operator	Products diversified
N/A	**Brunei**				**1**	**1**	**1**	**1**	**1**	**1**

Source: JICA Study Team

7.2 Current Status and Trends of Brunei Logistics Network

(1) Domestic Physical Distribution Network

Highways and city streets connecting Muara port with industrial parks and the capital city of Bandar Seri Begawan play a major role in the distribution network in Brunei.

The road connecting Bintulu port in Malaysia is also an important route in terms of the trade and logistics for both countries.

(2) Intra-ASEAN Physical Distribution Network

According to ASEAN Strategic Transport Plan 2011-2015, intra-ASEAN physical distribution quantity is reported to be two thirds (2/3) of the total Brunei Cargo transport, in the order of Singapore, Malaysia, Thailand, and Indonesia in terms of trade partnership country.

Aside of road transportation to Malaysia, the majority of physical distribution in Brunei relies on sea transportation.

(3) Extra-ASEAN Physical Distribution Network

Physical distributions to and from Extra-ASEAN are either by sea and air. At present, marine transportation is the most commonly-used means of transportation on both weight and value basis.

In the marine transport, containerized cargo is a typical form of transport at this moment among the general cargo, except bulk cargo.

Since cargo traffic volume of Brunei is quite small, such as annual container handling of in the level of 90,000TEU at Muara Port, the most of extra ASEAN logistics flow is considered to be transshipped at Port of Singapore.

7.3 Analysis Frame on ASEAN Physical Distribution Network

This section studies frame for assessment of the vulnerability of logistics network against natural disasters in consideration of the actual situation of supply chain, as a preparedness of formulation of area BCP.

The vulnerability itself is to be assessed after the further survey.

Table 7.3.1 Natural Disaster Prevention Countermeasures in relation to vulnerability Assessment

Industrial Park Name represented	Not designated yet
Features	Place: Operation commenced in: Nos of Operating Enterprises : Total IPK Annual Turn-over (Mill.US$):
Vulnerability Assessment Frame for Each Industrial Park (IPK)	
Natural Disaster Risk(NDR): Extract from Survey Report 1 "Chapter 5 Existing Investigations and Studies"	
■ Flooding	Flood hazard is rare throughout the country. Reported damages are limited to only a few cases in the database.
■ Seismic intensity/ Tsunami	Earthquake hazard level in Brunei is low. No earthquake disaster is recorded in the database. A tsunami hazard level of Brunei is low. No tsunami disaster is recorded in the database.
■ Volcano	Volcano hazard level of Brunei is low. No volcanic disaster is recorded in the database.
■ Cyclone, Meteorological Disaster, Landslide	The impact of cyclone hazard on whole the country is low. According to 1980 - 2012 records, no storm has devastated Brunei. Only a few landslides hazards distribute near the border with Malaysia.
Brief Descriptions on Counter-measures (CMS) for NDR:	
1) Private sector facilities: To follow further Survey	
Land, In-park Roads:	
Plant facilities:	
Physical Distribution Facilities:	
Others, if any:	
2) Infrastructures	
• Road：Roads network consisting of expressways, linking roads, transverse viaduct, and rotary-type interchange in the whole area of Brunei has been developed.	
Railway :	
Port: • Since road networks in Brunei extend to connect with those of Sabah and Sarawak states in Malaysia, Bintulu Port in Malaysia which is connected by this road network will become alternative function of Muara Port when a kind of natural disaster occurs.	
Airport: • Brunei International Airport is a key airport of 15 minutes form City central and of international linkage of air transport which is fully equipped with state of the art technology and 24 hours operation services since 1974. • In this respect, the airport will be able to provide international alternative aero-services, in case an ASEAN major airport comes across a disastrous incident.	
Electric power/Fuel:	
Water-supply:	
Sewage:	
Solid waste:	
Telecommunication: • Telecommunication in Brunei is in high grade, which use of ICT is ranked 52 of 180 countries of the world. • As far as mobile phone services are concerned, B-Mobile has begun 3.5 G high speed internet services, so as to provide continuing improved services to customers. This advanced telecommunication situation will help restoration work just after a possible disaster happening. • This telecommunication situation will highly help at an incident of natural disaster.	

Note:

*1 The summary of "Logistics Performance Index" by the World Bank is as follows.

(1) LPI score and category wise score is indicated by each country

(2) Score is ranked from one to five

(3) LPI of international logistics is scored based on the interviewing following six items to major importers and logistics companies in the neighboring countries (total of over 1000 companies).

1) Efficiency of the clearance process i.e. Speed, simplicity and predictability of formalities by border control agencies, including Customs

2) Quality of trade and transport related infrastructure e.g. Ports, railroads, roads, information technology
3) Ease of arranging competitively priced shipments
4) Competence and quality of logistics services e.g. transport operators, customs brokers
5) Ability to track and trace consignments)
6) Timeliness of shipments in reaching destination within the scheduled or expected delivery time.

*2 http://www.asean.or.jp/ja/invest/about/country_info/brunei/invest_info/industrialestate/

*3 http://www.mofa.go.jp/mofaj/area/brunei/data.html#04

References :

1) ASEAN-JAPAN CENTER, Lists of Industrial Parks/Estate/SEZ by Member Country (in Japanese)
2) World Bank Connecting to Compete 2012 Trade Logistics in the Global Economy
3) Shinya Nakata (2012), Introduction to Logistics, NIKKEI Newspapers in Japan (in Japanese)
4) JETRO (2008), ASEAN Physical Distribution Network 2008 (in Japanese)
5) ERIA: ASEAN Strategic Transport Plan 2011-2015.
6) ASEAN Secretariat, ASEAN Statistics on Intra and Extra_ ASEAN trade 2011

Chapter 8 Legislative Systems

A survey on the legislative systems concerned with disaster management, business continuity, environmental pollution, and development in Brunei is conducted in this chapter.

The survey of Brunei is mostly based on research through the websites of the several leading international institutes that contributed to disaster research such as the Asia Disaster Reduction Center and Asian socioeconomic research institutes such as JETRO. Laws, regulations, national implementation plans, and statutes are referred to within the scope of the survey.

The table below shows the methodology for collecting information.

Information Collected	Methodology	Scope of Survey
Legislative Systems for Disaster Management	To collect information from the internet, which is published by international agencies such as ADRC and disaster management institutes in each country. And to refer to the report by the JICA research team.	Policies and laws for disaster management. Action plans for disaster risk regulations.
Regulations and Standards for BCM / BCP	To collect information from the internet. No official institutes regulating the BCM/BCP exist in Brunei.	Policies, standards, and regulations indicating BCM/BCP. No standards or policies are found in Brunei.
Legislative Systems for Environment and Pollution	To collect information from the internet. Few websites of governmental agencies in Brunei are found.	Laws and regulations for environmental management.
Legislative Systems for Development including Land Use, River and Building Regulations	To collect information from the internet. Few websites of governmental agencies in Brunei are found.	Laws for land use and town planning. No official building standards exist in Brunei.

Laws, regulations, decrees, and guidelines regulating the indicated fields defined above are compiled in this survey. The results of the survey in Brunei are summarized below.

Scope	Information
Legislative Systems for Disaster Management in Brunei	[Strategies and Plans] "Disaster Management Order, 2006" [Regulations, Standards, and Guidelines] "Strategic National Action Plan for Disaster Risk Reduction 2012-2025", "RBPF (Royal Brunei Police Force) Standard Operating Procedures"
Regulations and Standards for BCM / BCP in Brunei	No regulations, standards or guidelines for business continuity management in time of disaster have been identified in Brunei.
Legislative Systems for Environment and Pollution in Brunei	[Laws for Environment] "Proposed Environmental Protection and Conservation Order, 2010"
Legislative Systems for Development including Land Use, Rivers, and Building Regulations in Brunei	"Land Code, Chap 40", "Land Acquisition Act, Chap 41", "Town and Country Planning Act, Chap 142", "Forest Act, Chap 46", "National Land Use Master Plan 2006-2025"

The available results on the survey about the laws and regulations for disaster management, BCP/BCM, environmental conservation, and provisions for development in Brunei are summarized below.

According to a survey on legislative systems in Brunei, no regulations, standards, or guidelines defining Business Continuity Management have been determinably established.

8.1 Legislative systems for disaster management

(1) Disaster management laws

Table 8.1.1 Laws and Regulations of Disaster Management in Brunei

	Laws / Regulations	Supervisory Authority	Matter
Government Order	Disaster Management Order, 2006	National Disaster Management Centre	Disaster Management

In Brunei, there is no specific law about disaster management. Instead, the Disaster Management Order (2006) defines the legal basis for disaster management. Responsibilities and authority of the National Disaster Management Centre (NDMC) are defined in this order.

(2) Disaster management strategies and plans

Table 8.1.2 Strategies and Plan for Disaster Management in Brunei

	Laws / Regulations	Supervisory Authority	Matter
Plan	Strategic National Action Plan for Disaster Risk Reduction 2012-2025	National Disaster Management Centre	General Disaster
Plan	RBPF (Royal Brunei Police Force) Standard Operating Procedures	Royal Brunei Police Force	General Disaster

In Brunei, development of a National Disaster Management Plan is defined in the Disaster Management Order. The National Disaster Management Plan is based on RBPF Standard Operating Procedures and the Strategic National Action Plan for Disaster Risk Reduction 2012-2025. NDMC held talks with RBPF in January 2012 to discuss implementation of the RBPF Standard Operating Procedures in case of emergency.

8.2 Regulations and standards for business continuity management

No regulations, standards or guidelines for business continuity management in time of disaster have been identified in Brunei.

8.3 Legislative systems for the environment and pollution control

(1) Environmental laws and regulations

Table 8.3.1 Laws and Regulations regarding the Environment in Brunei

	Laws / Regulations	Supervisory Authority	Matter
Government Order	Proposed Environmental Protection and Conservation Order, 2010	Ministry of Development	Environment Management

The Proposed Environmental Protection and Conservation Order was promulgated in 2010 as a central laws/regulation concerning environmental conservation in Brunei. This order stipulates the protection and management of the environment, and the integration of environmental concerns into private and public decision-making.

(2) Pollution control laws and regulations

The information released about laws and regulations for environmental pollution control concerning domestic companies in Brunei is limited, making details unclear.

8.4 Legislative systems for development including land use, rivers, and building codes

Table 8.4.1 Laws and Regulations for Land, Rivers, and Building Code in Brunei

	Laws / Regulations	Supervisory Authority	Matter
Law	Land Code, Chap 40	Land Department	Land Use
Law	Land Acquisition Act, Chap 41	Land Department	Land Acquisition
Law	Town and Country Planning Act, Chap142	Ministry of Development	Development
Law	Forest Act, Chap 46	Ministry of Industry & Primary Resources, Forestry Department	Forestry
Plan	National Land Use Master Plan 2006-2025	Land Department	Land Use

Regulations about the possession and use of land are stipulated in the Land Code. However, acquisition of land is defined separately in the Land Acquisition Act. The National Land Use Master Plan 2006-2025 contains determinations about land use.

In Brunei, the Town and Country Planning Act stipulates development of city and rural areas. There are no items regarding land use or urban development in times of disaster, restoration, and/or reconstruction in any of the Acts.

Sufficient information could not be collected in this investigation about regulations for rivers or building standards

Chapter 9 Situation of Implementation of BCP

9.1 Major natural disasters and disaster management awareness

Floods caused by heavy rain, flash floods, and wind disasters such as gusting wind and haze are the main natural disasters expected to cause damage in Brunei. On the other hand, earthquakes and cyclones do not occur. Moreover, according to records of past disasters, floods have seldom brought extensive damage during heavy rain, and large-scale disasters are not expected. The risk that the economy and business conditions may suffer due to natural disaster damage in Brunei is considered quite low by the government and enterprises.

9.2 Current state of BCP implementation

The concept of BCP is not generally recognized by enterprises in Brunei. Even among governmental agencies, BCP is not well known, with the exception of disaster-related ministries or departments such as the National Disaster Management Centre (NDMC). Although some major enterprises or enterprises handling utilities, oil, and other hazardous materials are thought to have prepared a BCP, most enterprises have not yet developed them. Additionally, most enterprises believe that disaster risk mitigation is not required because of their lack of experience with disasters, nor are they familiar with disaster risk management. A Standard Operating Procedure (SOP) is commonly developed by most enterprises including SMEs. Some SOPs contain a contingency management plan for natural disasters.

9.3 Efforts on furthering BCP implementation

The national disaster policy of the Brunei government primarily consists of a disaster management system based at the community level. Conversely, disaster management systems for corporations initiated by the government have not been promoted sufficiently. Although NDMC planned to hold seminars on corporate BCP due to the pandemic of new strains of influenza in 2008, awareness and understanding of BCP among governmental agencies not related to disaster issues and private enterprises have not encouraged implementation.

In Brunei, natural disasters are not regarded as a significant risk on business conditions. To date, no efforts for BCP dissemination have been implemented by government or private agencies.

9.4 BCP implementation problems

With the exception of some major enterprises, risk management for natural disasters is regarded as less important than other corporate risks due to the expected low frequency and impact of natural disasters. To encourage the development of a BCP or disaster management system in companies, a proper risk assessment is needed.

In addition, the government is requested to determine the roles of each ministry and department for BCP implementation. International support is also required to spread BCP in Brunei due to a lack of knowledge and experience in BCP development.

List of Agglomerated Areas

ID	Short List	LongList	COUNTRY	PROVINCE	PARK NAME	ADDRESS
BN0001			Brunei		Baru Apoi	Jalan Selapon Brunei Darussalam
BN0002			Brunei		Beribi	Jalan Gadong Bandar Seri Begawan, Brunei Darussalam
BN0003			Brunei		Lambak Kanan - East	Simpang 29 Lambak Kanan BC2315, Brunei Darussalam
BN0004		**XXBN02**	Brunei		Lambak Kanan - West	Lebuhraya Muara-Tutong Bandar Seri Begawan, Brunei Darussalam
BN0005			Brunei		Muara Export Zone	Jalan Stadium Bandar Seri Begawan, Brunei Darussalam
BN0006			Brunei		Pekan Belait	Jalan Lorong 3 Barat Seria, Brunei Darussalam
BN0007			Brunei		Salar	Jalan Batu Marang Mentiri, Brunei Darussalam
BN0008		**XXBN03**	Brunei		Serambangun	Lebuhraya Tutong - Telisai Kampung Serambangun, Brunei Darussalam
BN0009		**XXBN04**	Brunei		Serasa	Simpang 276 Serasa, Brunei Darussalam
BN0010			Brunei		Sungai Bera	Jalan Tengah Seria, Brunei Darussalam
BN0011	**XXBN05**	**XXBN05**	Brunei		Sungai Liang (SPARK)	Simpang 1027 Sungai Liang, Brunei Darussalam
BN0012	**XXBN01**	**XXBN01**	Brunei		Kuala Lurah	Jalan Kuala Lurah Limau Manis, Brunei Darussalam
BN0013			Brunei		Pulau Muara Besar	Jalan Pelumpong Muara, Brunei Darussalam
BN0014			Brunei		Meragang	Muara-Tutong Hwy Brunei Darussalam
BN0015			Brunei		Lugu	Jalan Lugu Kampung Katimahar, Brunei Darussalam
BN0016			Brunei		Bukit Panggal	Jalan Bukit Panggal Kampong Bukit Panggal, Brunei Darussalam
BN0017			Brunei		Telisai	Jalan Tengah Seria, Brunei Darussalam
BN0018			Brunei		Seria	Jalan Lorong 3 Barat Seria, Brunei Darussalam
BN0019			Brunei		Tasek Meirmbun	Jalan Rambai Rambai, Brunei Darussalam
BN0020			Brunei		Agrotech Park	No Address
BN0021			Brunei		Ulu-Ulu Temburong	Jalan Batang Duri Batang Duri, Brunei Darussalam

CAMBODIA

Table of Contents

Chapter 1 Introduction

The report is a draft version of the Country Report for Cambodia, which will be a reference document for organizations of the private and public sectors wishing to prepare an Area Business Continuity Plan (Area BCP) and develop an Area Business Continuity Management System (Area BCM System).

The country report contains information on natural disaster risks, industrial parks and investment risk, key infrastructure and lifeline systems, as well as issues to consider during natural disasters. It also presents an outline of economy and trade, an outline of physical distribution, and current practices for implementing business continuity management (BCM) in the country.

The draft report will be refined and finalized at the end of the Project.

Chapter 2 Overview of the Country

Cambodia is located at the south of the Indochina Peninsula, and the land area is about half the size of Japan. The country shares borders with Thailand, Vietnam, and Laos. The Mekong River, the largest river in Southeast Asia, flows through the east side of central Cambodia. Tonle Sap Lake is located at the west central side of the country, and the population is concentrated on the plain surrounding the river and the lake.

Cambodia joined ASEAN on April 30, 1999. Currently, Cambodia is known as the last country that joined ASEAN.

Cambodia is a constitutional monarchy and the present king is Norodom Sihamoni. The Cambodian People's Party (leading party) and the Funcinpec Party form a coalition government and Prime Minister Hun Sen leads the government. Cambodia has experienced a long history of civil conflict, and suburban areas are still facing the problem of land-mine removal.

Basic Information of Cambodia

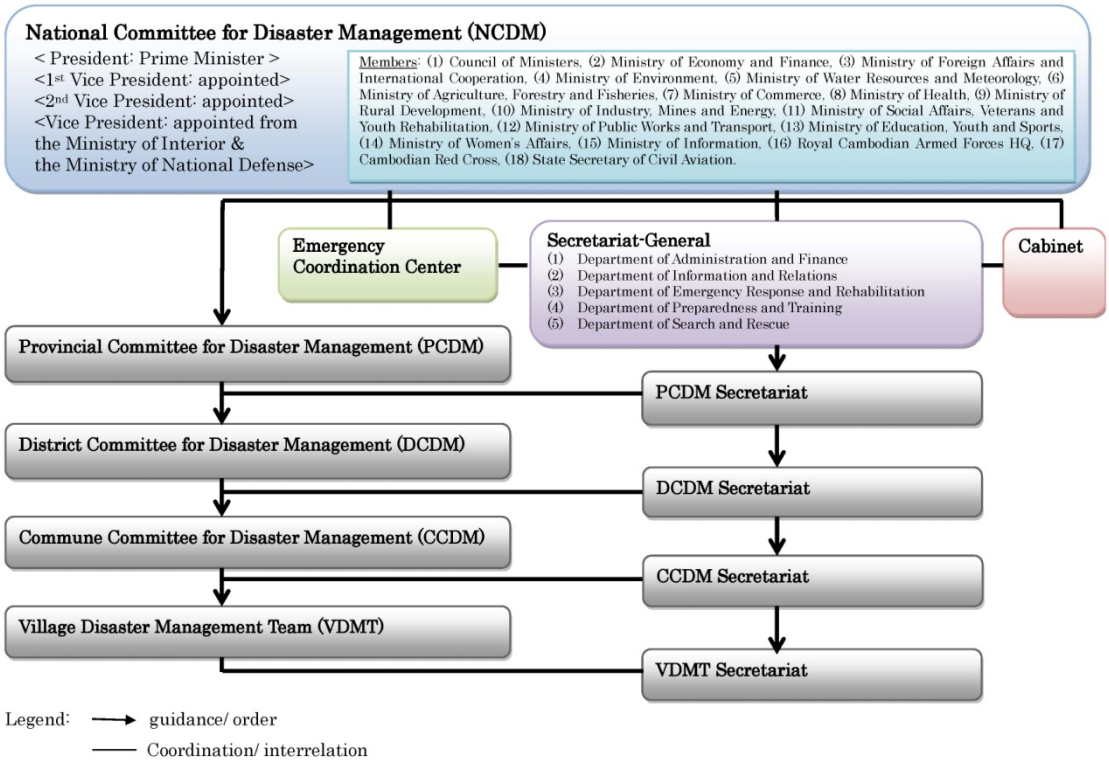
National Flag

Capital	Phnom Penh
Ethnic Groups	Cambodian (Khmer) 90%
Languages	Khmer
Religions	Buddhism (some ethnic minority groups practice Islam)
Area (km^2)	Total: 181,040 Land: 176,520 Inland Water: 4,520

Population	14,864,646
Population density(people/ km^2 of land area)	84
Population growth (annual %)	1.8
Urban population (% of total)	20
GDP (current US$) (billion)	14
Economic growth rate (annual %)	7.3
GNI per capita, PPP (current international $)	2,330
Agriculture, value added (% of GDP)	36
Industry, value added (% of GDP)	24
Services, etc., value added (% of GDP)	40

Features of Disasters

65% of the total number of disasters occurred in 1980-2011 were related to flood followed by drought (22%). It was noted that 75% of the disaster experienced were "water related hazard" (flood 65% and storm 13%). Similarly, flood affected 62% of the total number of people followed by drought (37%). However, all death caused by disaster were due to "water related hazard" (flood and storm), though most of the estimated damage cost were due to flood (87%) and drought (13%). Flood, storm, and drought are the major disasters in Cambodia.



Source: A presentation material provided by NCDM [September 2012] and "NCDM-DMIS Aide Memoire", a document provided by NCDM [September 2012].

Sources; Map and Flag: CIA(Central Intelligence Agency) website (2014) (https://www.cia.gov)

Capital, Ethnic Groups, Languages and Religions: Ministry of Foreign Affairs website (2013) (http://www.mofa.go.jp)

Area, Population, Population density, Population growth, Urban population, GDP, Economic growth rate, GNI per capita, PPP, Agriculture, value added, Industry, value added and Services, etc., value added: The World Bank Data Bank website (2012) (http://data.worldbank.org)

Chapter 3 Natural Disaster Risk

3.1 Floods

(1) Risk

Summary of flood disaster

Floods cause damage on the plains in the rainy season. Floods caused by storm rainfall in the upper reach of the Mekong River inundate a large part of the Mekong Delta. Flash floods also occur because of the devastation of forest area in the upper basin. At the same time, the Tonle Sap (Great Lake) also causes floods. There are have only been a few typhoons and minimal damage caused by storm surges.

Notable floods and damage in recent years

Recent notable floods occurred in August 2000, on August 18, 2002, and August 10, 2011, all caused by storm rainfall. Mekong River flooding in August 2000 was caused by heavy rain, which started in the last eleven days of July. According to the EM-DAT (International Disaster Database), the flood caused large inundation damage including 1,100 fatalities with 6.5 million people affected by the disaster. The economic losses totaled approximately USD 780 million.

The flood on August 18, 2002 caused 30 fatalities with 1.5 million people affected by the disaster. The flood on August 10, 2011 caused 250 fatalities with 1.6 million people affected by the disaster.

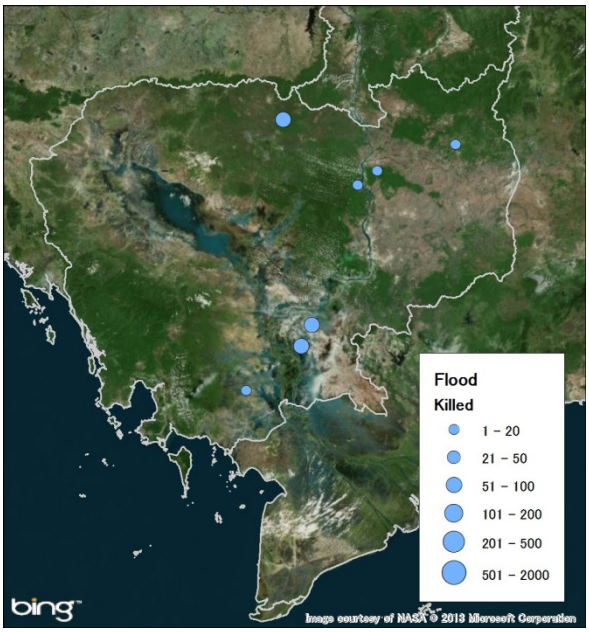


Figure 3.1.1 Flood Disaster: Human Losses

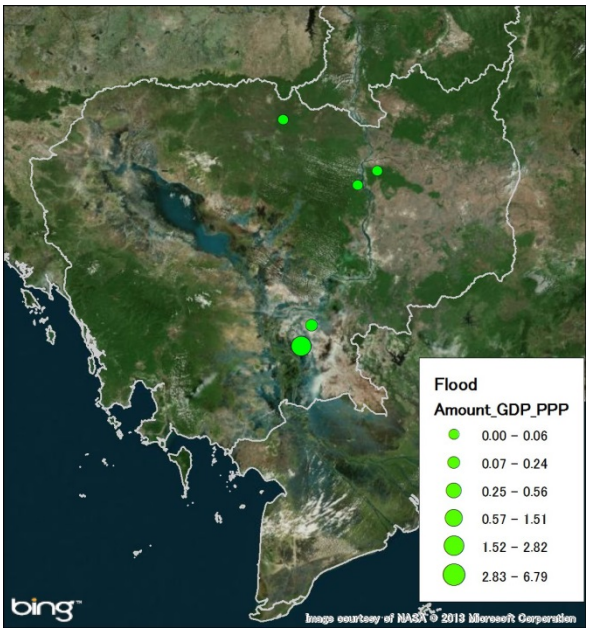


Figure 3.1.2 Flood Disaster: Economic Losses (% of GDP)

(2) Background

Characteristics of floods

Floods caused by storm rainfalls occur in the rainy season from July to October. Though about a half of the country is located in the alluvial plains of the two big rivers of the Mekong River Basin and the Tonle Sap River Basin, flood damage is extensive.

There are two types of floods. One is a long-term flood from the Mekong River and the other is flooding from the Tonle Sap River, which is caused by a sudden increase in the Tonle Sap (Great Lake) water level. Major cities in the alluvial plains have been damaged every year. The flood control measures for Phnom Penh city include protection through ring dykes and channels to drain to the marsh to the rear.

Notable floods and damage in recent years

1. The flood of September 2000 was caused by storm rainfall in the upper basin of Lao PDR. Overflowing of the Mekong River caused the flood and a state of emergency was declared in Phnom Penh and the three regions of Stung Treng, Kratie, and Kompong Chamn. The road/ embankment (National Road No.1) was cut to protect the central part of Phnom Penh from the flood. This flood caused the most extensive damage in recent years.
2. The flood on August 18, 2002 occurred in the northeast and the southeast parts of the country along the left bank of the Mekong River. In southern areas, there was severe drought damage.
3. The flood on August 10, 2011 caused 250 fatalities and affected 1.6 million people. This flood is said to have been the largest flood since 2000, but Phnom Penh was able to escape severe flood damage.

Frequently flooded areas

- Mekong Delta region
- Tonle Sap vicinity

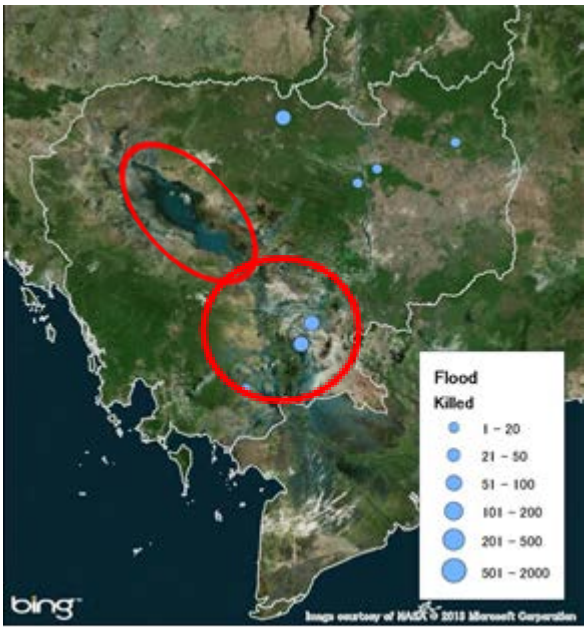


Figure 3.1.3 Hotspots of Human Loss

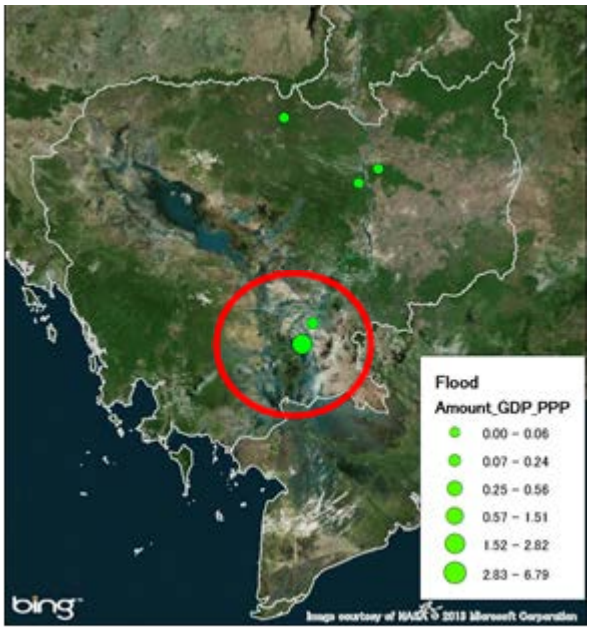


Figure 3.1.4 Hotspots of Economic Loss

(3) Efforts by the central government, local governments, and disaster management organizations

✓ National Committee for Disaster Management (NCDM): http://www.ncdm.gov.kh/

- Established as a disaster management organization.
- Cooperates closely with Cambodia Red Cross (CRC) in case of emergency.

✓ Committee for Disaster Management (CDM) at local government levels

- Acts as an administrative office and formulates specific action plans in cooperation with the CRC.

(4) Hazard and risk information sources

Disaster risk reduction organizations

Table 3.1.1 List of Organizations for Disaster Risk Reduction

Organization	Post	Web Address
National Committee for Disaster Management (NCDM)		http://www.ncdm.gov.kh/
Province Committee for Disaster Management (PCDM) District Committee for Disaster Management (PCDM)		
Ministry of Water Resources and Department of Meteorology Cambodia (DOM)		http://www.cambodiameteo.com/map?menu=3&lang=en
Institute of Cambodia of Technology (ICT)		http://www.itc.edu.kh/itc/en/

Reports

Table 3.1.2 List of Reference Reports for Risk Analysis

Organization	Post	Title/ Web Address	Form
Asia Development Bank	Asian Water Development Outlook	Asian Water Development Outlook 2013: Asia-Pacific Water Forum	Report
		http://www.adb.org/publications/asian-water-development-outlook-2013	
World Bank	ASEAN Disaster Risk Management Initiative	Synthesis Report on Ten Asian Countries Disaster Risks Assessment: December 2012	Report
		http://www.unisdr.org/files/18872_asean.pdf	
The Nature Conservancy	ASEAN Disaster Risk Management Initiative	World Risk Report 2012: October 2012	Report
		http://www.ehs.unu.edu/article/read/worldriskreport-2012	
World Bank	Framework and Options for Implementation	Advancing Disaster Risk Financing and Insurance in ASEAN Countries: April 2012	Report
		https://openknowledge.worldbank.org/bitstream/handle/10986/12628/714530v20ESW0W0AN0appendices0June12.pdf?sequence=1	
International Development Research Centre	Economy and Environment Program for Southeast Asia (EEPSA)	Climate Change Vulnerability Mapping for Southeast Asia: January 2009	Report
		http://web.idrc.ca/uploads/user-S/12324196651Mapping_Report.pdf	
UNEP, GRID, UNISDR		Global Risk Data Platform	Web Map
		http://preview.grid.unep.ch/index.php?preview=map&lang=eng	

Abbreviations

NCDM	National Committee for Disaster Management
PCDM	Province Committee for Disaster Management
DCDM	District Committee for Disaster Management
DOM	Ministry of Water Resources and Meteorology Department of Meteorology Cambodia
ICT	Institute of Cambodia of Technology

References:

1) Ministry of Foreign Affairs of Japan (2013): *"Information on Cambodia in Japanese," 01 2013*
2) ADRC: *"Countries: Cambodia," Information on Disaster Risk Reduction of the Member*
3) ADRC: *"Cambodia, Flood, 2000/08"*
4) Relief Web, OCHA (2000): *"Published, Cambodia: Floods Appeal No. 22/2000 Situation Report No. 4," Report from IFRC, 27 Oct 2000*
5) ADPC (2000): *"Mitigating flood risk in Cambodian communities"*
6) ADRC: *"Cambodia, Flood,2002/08/27"*
7) Relief Web, OCHA (2002):*"Cambodia - Floods OCHA Situation Report No. 1," Report from UN Office for the Coordination of Humanitarian Affairs, 27 Aug 2002*
8) ADRC: *"Cambodia, Flood,2002/08/27"*
9) Relief Web, OCHA (2011): "Worries about long-term flood fallout," Report from IRIN, 17 Oct 2011

10) NPO, Think the Earth (2011): *"Flood in Cambodia in Japanese (2011.12.17 update)"*
11) UNITAR / UNOSAT, Map produced by UNOSAT: *"Flood in Cambodia,2011"*

3.2 Earthquakes

(1) Risk

Earthquake disasters are not common in Cambodia. There is no record of significant disaster caused by earthquakes.

Figure 3.2.1 shows seismic and other natural hazard risks in Cambodia. The zones indicate where there is a probability of 20% that degrees of intensity shown on the map will be exceeded in 50 years. This probability figure varies with time; i.e., it is lower for shorter periods and higher for longer periods. All of Cambodia is categorized as V and below on the Modified Mercalli Scale.

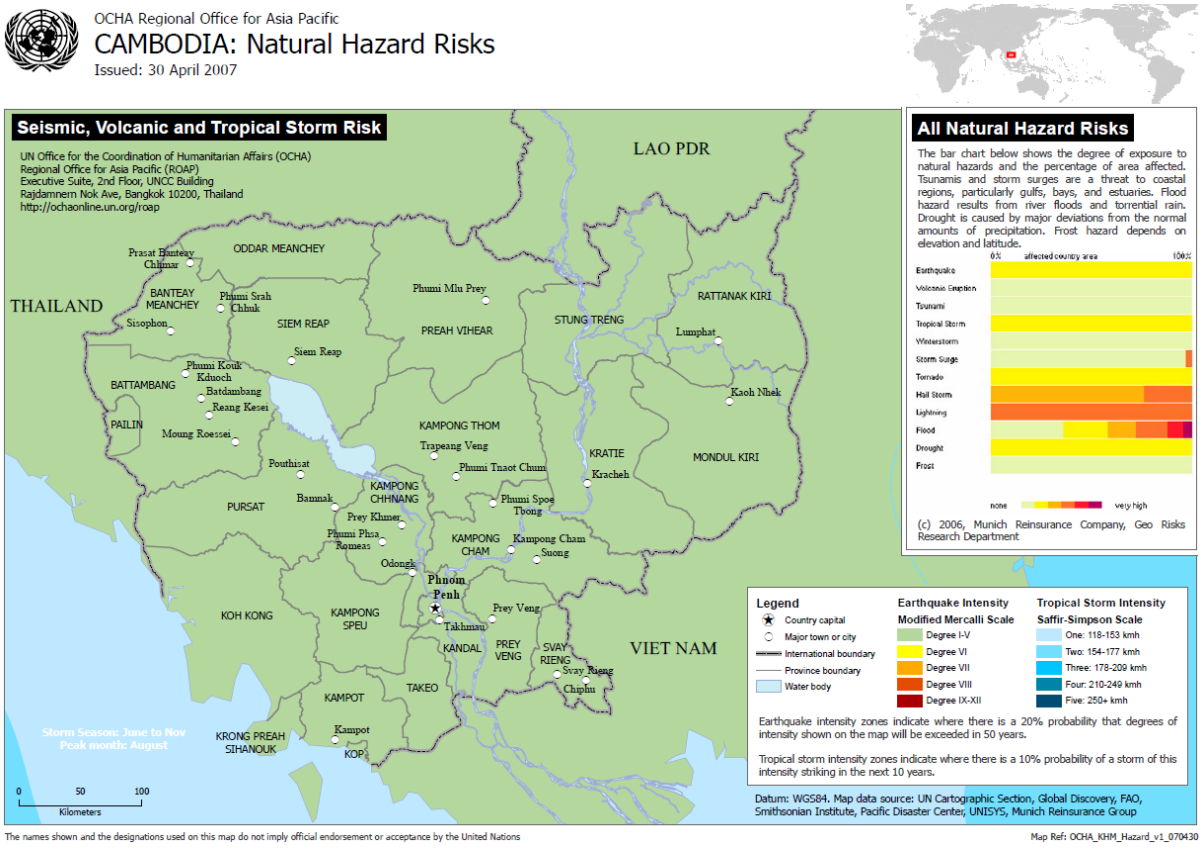


Figure 3.2.1 Natural Hazard Risks of Cambodia (Seismic, Volcanic, and Tropical Storm Risk)

(2) Efforts by the central government, local governments, and disaster management organizations

There are no special measures focusing on earthquake disaster.

References:

1) EM-DAT: The OFDA/CRED International Disaster Database – www.emdat.be – Université Catholique de Louvain – Brussels – Belgium.
2) Japan International Cooperation Agency (JICA) (2012): "Data Collection Survey on ASEAN Regional Collaboration in Disaster Management"
3) United Nations Office for the Coordination of Humanitarian Affairs (OCHA), Regional Office for Asia Pacific (ROAP) (2011): "Cambodia: Natural Hazard Risks," Downloaded from http://reliefweb.int/sites/reliefweb.int/files/resources/0635CB2C3B54A768C12572DB0025F816-ocha_ND_khm070430.pdf

3.3 Tsunami

(1) Risk

It is well known that tsunamis are generated by sea floor earthquakes. However, an undersea volcanic eruption, an undersea landslide, or other disturbances above or below water can also generate a tsunami. There is very low probability that a large earthquake along the coast of Cambodia will generate a tsunami and cause a major disaster. In fact, there is no record of significant disaster caused by a tsunami.

However, tsunami disasters may occur due to large earthquakes occurring outside the country.

(2) Efforts by the central government, local governments, and disaster management organizations

There are no special measures focusing on tsunami disaster.

References:

1) EM-DAT: The OFDA/CRED International Disaster Database – www.emdat.be – Université Catholique de Louvain – Brussels – Belgium.
2) Japan International Cooperation Agency (JICA) (2012): "Data Collection Survey on ASEAN Regional Collaboration in Disaster Management"

3.4 Volcanoes

(1) Risk

Yeak Loam Lake is known as a crater lake. However, there are no active volcanoes in Cambodia. Also, there is no record of significant disaster caused by volcano.

Major hazards caused by volcanic eruption are lava flow, pyroclastic flow, "Lahar" (volcanic mud flow), and volcanic ash fall. Lava flow is a flow of melted rock along the slope. Pyroclastic flow is the flow of a mixture of hot dry masses of fragmented volcanic materials and volcanic gas along

the slope. "Lahar" is originally an Indonesian term and is also called volcanic mud flow. It is the flow of a mixture of volcanic materials and water along the slope. These flows cause enormous damage to the side and foot of the volcano, but generally do not have an extended reach. However, volcanic ash fall often spreads widely via the trade winds or the westerlies, causing damage over an extensive area. Therefore, there is a possibility that a volcanic eruption in neighboring countries might wreak a volcanic ash fall on Cambodia.

Figure 3.4.1 shows the volcanoes in the Asia-Pacific region which erupted during the Holocene. The Holocene is a geological epoch from 10,000 years ago to the present. The map indicates that many volcanic eruptions have occurred in Indonesia, Philippines, and other neighboring countries.

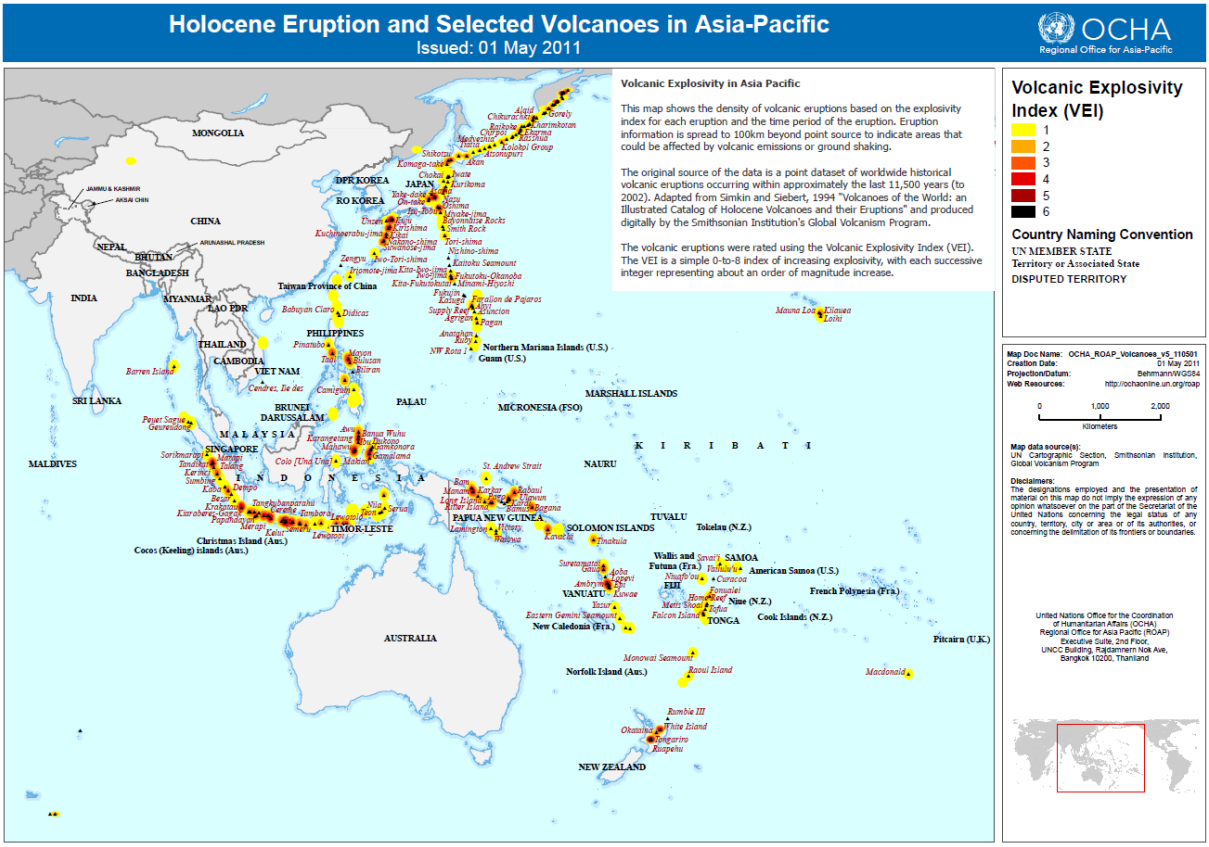


Figure 3.4.1 Holocene Eruption and Selected Volcanoes in Asia-Pacific

(2) Efforts by the central government, local governments, and disaster management organizations

There are no special measures focusing on volcanic disaster.

References:

1) Lee Siebert, Tom Simkin, and Paul Kimberly (2011): "Volcanoes of the World - Third Edition," Smithsonian Institute/University of California Press
2) EM-DAT: The OFDA/CRED International Disaster Database – www.emdat.be – Université Catholique de Louvain – Brussels – Belgium.

3) Japan International Cooperation Agency (JICA) (2012): "Data Collection Survey on ASEAN Regional Collaboration in Disaster Management"
4) United Nations Office for the Coordination of Humanitarian Affairs (OCHA), Regional Office for Asia Pacific (ROAP) (2011): "Holocene Eruption and Selected Volcanoes in Asia-Pacific," Downloaded from: http://reliefweb.int/sites/reliefweb.int/files/resources/map_619.pdf

3.5 Cyclone (Meteorological) Hazards

(1) Risk

Cambodia is located between latitudes 10° and 15° to the north and 102° and 108° to the east. The climate of the country is divided into two seasons: rainy season (mid-May to October) and dry season (mid-November to mid-March). Moist air is drawn towards land from the ocean, bringing southwest monsoon rains to Cambodia. Monsoon rains are fairly predictable with afternoon rains usually lasting no more than 2-3 hours. The annual rainfall in the central flat regions is about 1,500 mm. Conversely, the annual monthly rainfall is 10 mm in January and February and 200 mm in September and October. Furthermore, the annual rainfall varies from 2,000 mm in the eastern mountains to more than 4,000 mm in the southwest coastal area.

Though the landfall of tropical cyclones and typhoons does not occur often in Cambodia, they often affect the country indirectly from July to November.

Table 3.5.1 Tropical Cyclone Disasters in Cambodia (EMDAT: 1980 - 2012)

Year (Month)	Cause	Fatalities	Total Affected
November 1997	Tropical Cyclone (Linda)	25	-
October 1999	Flood (Storm Surge)	-	124,475
November 2009	Tropical Cyclone (Sancti)	2	-
September 2009	Tropical Cyclone (Ketsana)	17	178,091

Flooding is a major meteorological hazard in Cambodia. The country is prone to frequent floods alongside the Mekong River and the Tonle Sap Lake. Due to this proximity, the extent and amount of damages caused by floods are amplified. As one-fourth of the plains in the country are damaged annually, it has become a major obstacle to economic development.

Flooding patterns in Cambodia are of two types: inundations due to overflow from dykes and flash floods. The water level in the Mekong River indicates the changes throughout the year. For example, before the rainy season (late-March to May) the water level in the Mekong River is normally 2 m. During the rainy season, the water level usually rises up to about 9 m. When the water level reaches the height of the dyke, excess water overflows from the top of the dyke. Crops usually suffer the most, while human suffering is limited since the water level rises gradually. However, heavy rains due to typhoons and tropical cyclones coinciding with the rainy season causes water levels to rise rapidly, resulting in significant human loss due to flash floods.

Disasters were recorded 15 times during the past 30 years. In recent years, Cambodia has experienced destructive floods in 2000 and 2011. In most cases, flood damage occurred near the Tonle Sap Lake and the Mekong River Basin, as well as in some provinces facing the Gulf of Thailand.

Table 3.5.2 Weather Disasters in Cambodia (EMDAT: 1984 ~ 2013)

Cause	No. of events	Killed	Total Affected	Damage (millions U.S. $)
Drought	5	-	6,550,000	138
Flood (including flash flood)	15	1,396	11,120,662	919.1
Storm	4	44	302,566	0.01

According to a report compiled by the National Committee for Disaster Management (NCDM) on 16 November 2000, the death toll was at 347 (80%of which were children). Of the 750,618 families (3,448,629 individuals) affected by the flooding, 85,000 families (387,000 individuals) had to be temporarily evacuated. Furthermore, 317,975 houses were damaged while 7,068 were destroyed. Based on the same report, the total physical and direct damages were estimated to be around US$ 150 million. The flood of 2000 affected all four countries in the Mekong River Basin including Lao PDR, Cambodia, Vietnam, and Thailand. It was, however, in Cambodia where the most severe effects of the flood occurred, based on reports compiled by the Mekong River Commission (MRC). The deaths in Cambodia constituted 43% of the total deaths (800) from all countries, while direct damages represent 40% of the total damages, estimated to be around US$ 400 million.

(2) Background

During mid-May to October in Cambodia, heavy rains are brought about by the southwest monsoon, especially in September and October. Due to the heavy rainfall coming from the upstream area, the country suffers from flood damages resulting from overflows from the Tonle Sap Lake in the mid-western area of the country and the Mekong River in the mid-eastern region.

In August of 2000, floods brought serious damage to the northern, eastern and southern provinces, especially Takeo Province. Three provinces along the Mekong River (Stung Treng, Kratie, and Kompong Cham) and the Municipality of Phnom Penh all declared a state of emergency. 121,000 families were affected, more than 170 people were killed, and around $10 million worth of rice crops were destroyed. Immediate needs included food, shelter, the repair or replacement of homes, household items, and sanitation facilities as water levels in the Delta continued to fall.

As the southwest monsoon begins to blow in on the Indochina Peninsula, it signals the start of the rainy season. Generally, as the southwest monsoon and ITCZ become active, it accumulates a large amount of rainfall. The provinces located along the Mekong River are immediately affected by floods due to heavy rains in the northeastern parts of the country caused by storms and rainfall in neighboring countries (Lao PDR and Thailand). Due to these heavy rains in the upper Mekong countries, water levels in Cambodia may rise (flood stage level). Since Cambodia already receives

much rain around this time, flooding may occur. This could then lead to damage, as Cambodia is located in a very low part of the Mekong River Delta. Cambodia is not as prone to typhoons as its neighbors, Lao PDR and Vietnam. Despite this, some provinces of Cambodia have been hit by storms and typhoons. In 1997, Typhoon Linda hit the Poulo Wei islands, causing the destruction of 81 fishing boats and affecting hundreds of residents.

Climate change vulnerability and impact in Cambodia are as follows.

- Cambodia's temperature may increase by up to 1.35 - 2.50 °C in 2100. Annual rainfall may increase between 3 to 35 percent from current conditions. The lowland areas seem to be more likely to be affected by climate change than the highland areas by 2100.
- In Koh Kong province (1,160 km^2), if the sea level rises by 1 m, about 0.4 per cent (4,444 ha) will be under water. The rainfall of the 4 main river basins of Koh Kong may increase between 2 percent to 15 percent, resulting in increased water flow of 2-10 m^3/s.

(3) Efforts by the central government, local governments, and disaster management organizations

All relevant ministers and institutions collaborate closely with the National Disaster Management Committee (NCDM) as necessary during an emergency situation. In addition, the NCDM adopts the Cambodian Red Cross as its main partner to jointly conduct relief operations in times of disaster. The NCDM has a General Secretariat which acts as an implementing unit within the NCDM Headquarters and which provides advice to the Royal Government on DM issues. There are also CDM structures at the provincial/municipal and district levels.

The Department of Meteorology (DOM), which is under the Ministry of Water Resources and Meteorology (MoWRAM), is responsible for meteorological services in Cambodia. However, the Department of Hydrology and River Works (DHRW) from the same Ministry is responsible for flood forecasting. The main missions of both institutions can be found below.

<u>DOM</u>

- To establish and manage Cambodian meteorological stations.
- To provide weather forecasts in short- and long-term ranges for all concerned sectors.
- To predict abnormal meteorological phenomena and issue alerts to enable the establishment of protective procedures.
- To increase knowledge and communicate with national and international actors on meteorology technologies.
- To strengthen and broaden Cambodian cooperation on meteorology with other meteorological organizations, United Nations agencies, and the World Meteorological Organization.
- To prepare annual reports on meteorological conditions in the Kingdom of Cambodia.

DHRW

- To prepare plans on the installation of hydrological stations on the main streams to facilitate water resources development.
- To prepare short-, medium- and long-term strategic plans on the prevention and protection of erosion, sedimentation, and river banks.
- To research and monitor surface and ground water regimes by managing installed hydrological stations and collating data to serve various water related sectors.
- To implement and monitor water levels, water discharge, and sediment in the river basins system.
- To implement water quality monitoring activities at main hydrological stations.
- To study and research hydrological phenomena, models, computations, and surface and ground water potentials.
- To manage and exchange hydrological information; to issue forecasts and early warnings for possible floods and droughts to facilitate the timely adoption of mitigation measures.
- To establish a geographical information system (GIS) relevant to all river basin features, hydrological networks and locations of water resources development infrastructures and so on.

Table 3.5.3 Cambodia Meteorological Service Authorities

Institution	Contact information
Department of Meteorology (DOM) http://www.cambodiameteo.com/map?menu=3&lang=en	Tel: **+85-5 - 23 72 60 44**
Department of Hydrology and River Works (DHRW) http://www.dhrw-cam.org/	**Tel: +85-5 - 23 72 60 44**

(4) Hazard and risk information sources

Hazard risk assessment results related to tropical cyclones (meteorological disasters) are as follows.

Table 3.5.4 Source of Information on Tropical Cyclones (Meteorological Disasters)

Institution	Literature name
Economy and Environment Program for Southeast Asia (2010)	Climate Change Vulnerability Mapping for Southeast Asia http://css.escwa.org.lb/sdpd/1338/d2-5a.pdf
UNISDR (2010)	Synthesis Report on Ten ASEAN Countries Disaster Risks Assessment http://www.unisdr.org/files/18872_asean.pdf

Abbreviations

NCDM	National Committee for Disaster Management
ITCZ	Intertropical Convergence Zone
MoWRAM	Minister of Water Resources and Meteorology
DOM	Department of Meteorology
DHRW	Department of Hydrology and River Works
UNODRR	UN Office for Disaster Risk Reduction

OCHA UN **Office for the Coordination of Humanitarian Affairs**

Explanation of terms

ITCZ: This is a low-pressure (convergence) zone formed near the equator. In the lower levels (near the surface), the northeastern trade wind blows into the northern area from the ITCZ and the southeastern trade wind blows into the southern area from the ITCZ.

References:

1) Mekong River Commission (2011): "Flood Situation Report 2011," MRC Technical Report Paper No. 36 2011, pp.25-27, pp.33-34
2) IPCC Fourth Assessment Report: Climate Change 2007
3) Asian Disaster Preparedness Center: "Overview of early Warning Systems for Hydrometeorological Hazards in selected countries in Southeast Asia," pp.23-26
4) Department of Meteorology (Website): http://www.cambodiameteo.com/map?menu=3andolang=en
5) Department of Hydrology and River Works (Website) : http://www.dhrw-cam.org/

3.6 Landslides

(1) Risk

There is no record of landslides.

(2) Background

Hazard areas for landslides have been confirmed in mountain areas near the Gulf of Thailand.[1)]

(3) Efforts by the central government, local governments, and disaster management organizations

✓ National Committee for Disaster Management (NCDM): http://www.ncdm.gov.kh/

- Established as a disaster management organization.
- Cooperates closely with Cambodia Red Cross (CRC) during emergencies.

✓ Committee for Disaster Management (CDM) at local government levels

- Acts as an administrative office and formulates specific action plans in cooperation with the CRC.

(4) Hazard and risk information sources

Reports

✓ Synthesis Report on Ten Asian Countries Disaster Risks Assessment; December 2012
ASEAN Disaster Risk Management Initiative, World Bank
http://worldbank.org/

- Summarizing natural hazard and risks in 10 ASEAN countries.
- World Bank reported risks with respect to countries and categories of disaster.
- Although the data is only available up to 2009, the report is well assembled.

✓ World Risk Report 2012; October 2012, Alliance Development Works, The Nature Conservancy
http://www.nature.org/

- Natural disaster risks in 173 countries in the world are ranked in this report.
- Intended period is from 2002 to 2011.
- Vulnerabilities are assessed with respect to categories.
- The report is effective for comparing countries.

✓ Advancing Disaster Risk Financing and Insurance in ASEAN Countries: April 2012, Framework and Options for Implementation, Volume 2: Appendix 1
https://www.gfdrr.org/

- Summarizing natural hazard and risks in 10 ASEAN countries.
- Intended period is from 1970 to 2011.
- Summary of countries are well assembled.

✓ Climate Change Vulnerability Mapping for Southeast Asia: January 2009, Economy and Environment Program for Southeast Asia (EEPSA)
http://www.idrc.ca/

- Natural disaster risks in Southeast Asia are mapped in the report.
- The report contains information on risks in states/provinces.

Risk Map

✓ Global Risk Data Platform; UNEP (United Nations Environment Programme)/GRID, UNISDR (United Nations Office for Disaster Risk Reduction)
http://preview.grid.unep.ch/

- Disaster sites from all over the world are mapped.
- The map shows disaster hotspots.

References:

1) Economy and Environment Program for Southeast Asia (EEPSEA) (2009): "Climate Change Vulnerability Mapping for Southeast Asia," p. 19

3.7 Predominant Natural Hazards

The records of natural disasters that have affected the country are classified based on the impacts and frequency of occurrence. The results have been plotted on the impacts - frequency matrix and the most prevailing hazards studied.

3.7.1 Employed Data

The disaster records compiled in Appendix A3 are employed in this study. The records for the last 30 years, namely from 1983 to 2012, are used because the number of events included in the database before 1980 is significantly less than after 1980. The records of large disasters through earthquakes, tsunamis and volcano eruptions before 1983 are also used because the frequencies of occurrence for these hazards are significantly lower than floods, cyclones and landslides.

3.7.2 Study Method

The "Damage Amount / GDP" and 'Number of Deaths" are used as indices to show the impacts of the disasters considered and 6 natural hazards will be studied and compared. At the beginning of the study, only the "Damage Amount / GDP" was used as an index because the results can be used for Area BCP planning. However, the scarcity of information related to damage amounts became clear as the study progressed. As the information on the "Number of Deaths" is substantial compared to the damage amount, the "Number of Deaths" has been added as an index of impact.

The process of the study is as follows;

1) Based on the Damage Amount / GDP or Number of Death, each disaster is classified according to the ranking system outlined in Table 3.7.1,
2) The number of disaster events for each country is added by type of hazard and disaster rank, and then classified into Table 3.7.2 below,
3) The above information is then plotted on the impacts - frequency matrix by country,
4) As for earthquakes, tsunamis and volcanic hazards, if an event occurred before 1983 that was of the same (or higher) disaster rank as the maximum disaster rank recorded between 1983 to 2012, a point is plotted on the matrix which corresponds to the relevant disaster and frequency rank (=1).

Table 3.7.1 Disaster Rank and Damage

Disaster Rank	Damage Amount / GDP[1]	Number of Death
5	1.0% -	10,001 -
4	0.1% - 1.0%	1,001 - 10,000
3	0.01% - 0.1%	101 - 1,000
2	0.001% - 0.01%	11 - 100
1	- 0.001%	- 10

[1] Gross domestic product based on purchasing-power-parity (PPP) valuation of country GDP, International Monetary Fund, World Economic Outlook Database, October 2012

Table 3.7.2 Frequency Rank and Number of Events

Frequency Rank	Number of Events from 1983 to 2012	Average Frequency (Events / Year)
5	7 or more	1/5 -
4	4 to 6	1/10 - 1/5
3	2 to 3	1/15 - 1/10
2	1	1/30
1	Large Events occurred before 1983	-

3.7.3 Study Results

The following results are based on the available existing information. Not all information relating to the impacts of disasters was collected. Furthermore, the purpose of this study is not intended to evaluate the precise damage amounts or number of deaths. The purpose of this study is to rank 6 natural hazards according to their impacts.

Several flood disasters with more than 100 dead or damage amounting to more than 1% of GDP have been recorded. If we include smaller disasters, flood disasters with a loss of life occurred every 2 years on average. Cyclone disasters have been recorded but their impact was smaller than that of floods.

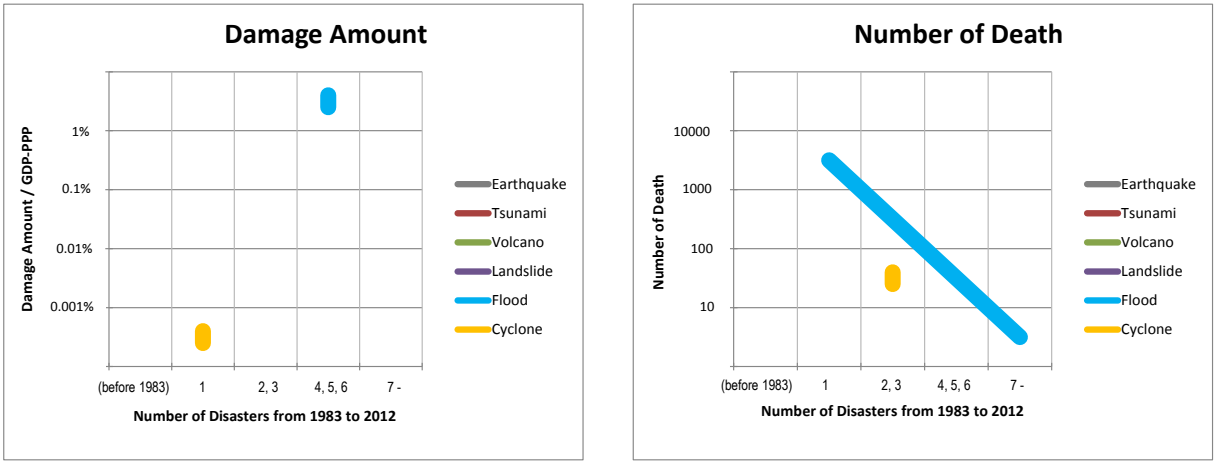


Figure 3.7.1 Impact of hazards in Cambodia

3.8 Existing Investigations and Studies

3.8.1 Methods and Scope of the Survey

This section reviews studies and research that have been conducted in the ASEAN region with a focus on natural hazards, risks, and vulnerability assessments. The target hazards are: floods, earthquakes, volcanoes, tsunamis, cyclones (typhoons)/meteorological disasters, and landslides. Information and study reports were reviewed from those that are available for the public and on the

internet. The purpose of this section is to first gain an overview of the existing study results regarding hazard trends, encountering risks, and degrees of vulnerability throughout the entire ASEAN region as well as in each ASEAN member state. Another purpose it to produce a compilation of assessment reports of the region, which will be accessible as a reference for those who wish to plan an Area BCP.

Table 3.8.1 Methodology of Information Collection and Scope of Survey

Information Collected	Methodology	Scope of Survey
Existing studies and research	To collect existing studies and reports from public sources including the internet.	To summarize the studied hazards, areas, contents of hazard and risk analysis, vulnerability assessment of existing studies, and other research.

3.8.2 Outline of Collected Information and Data

Table 3.8.2 shows the outline of collected information and data. Summaries of existing studies and reports are compiled as data sheets in Appendix A4.

Table 3.8.2 Outline of the Collected Information and Data

Appendix A4 Subsection	Hazards	Outline
A4.1	Flood	Flood hazard, risk assessments, hazard maps, and vulnerability assessment have been conducted in ASEAN countries using data on rainfall, inundation areas, affected population, and monetary assessment. Hazard maps were produced with GIS tools. The usage of GIS tools for assessments is widely recognized and its usage has been explored to produce hazard maps. Some runoff analyses were conducted for selected areas. Limited information and data available for Brunei Darussalam.
A4.2	Earthquake	Many of the earthquake hazard studies in the area are probabilistic seismic hazard analyses (PSHA), not scenario earthquake studies. This is to quantify the probability of exceeding a specific ground-motion level at a site given all possible earthquakes. This methodology is descended from the Global Seismic Hazard Assessment Program (GSHAP). GSHAP was launched in 1992 by the International Lithosphere Program (ILP) with the support of the International Council of Scientific Unions (ICSU), and endorsed as a demonstration program in the framework of the United Nations International Decade for Natural Disaster Reduction (UN/IDNDR). Earthquakes are not equally distributed around the globe because of the generating mechanism. In the ASEAN region, many earthquakes are observed in and around Indonesia and Philippines, which are located in the convergent boundary (subduction) zone and fewer earthquakes are observed in and around Myanmar, which is in the transform boundary zone. There are fewer or no earthquakes observed in other regions. However, some regions are sometimes affected by the earthquakes which occur in neighboring countries. The northern regions of ASEAN countries are sometimes affected by the earthquakes that occur in the Yunnan province of China. A number of

		investigations and studies reflect this trend.
A4.3	Tsunami	There are only few investigations and studies about tsunami hazard or risk in the region, and most of them are compilations of past disasters. There is no probabilistic study as there is for earthquakes. There is a hazard map that encompasses several tsunami scenarios. There are studies targeting the Asia-Pacific area because tsunamis propagate in the sea. Large-sized tsunamis are caused by major earthquakes in the ocean. This is the reason that tsunamis are also not equally distributed around the globe. However, tsunamis affect a wider area than the ground-motion of earthquakes, as seen in the tsunami caused by the Sumatra earthquake on December 26th in 2004. Thus, tsunamis are sometimes studied in countries with few or no earthquakes.
A4.4	Volcano	Most volcanoes are also located along the convergent boundary (subduction) zone. This is the reason why volcanoes are also not equally distributed around the globe. Disasters caused by volcanic eruptions are lava flow, pyroclastic flow, lahar, and ash fall. Ash is scattered widely via the prevailing westerlies, but the other disaster types do not have an extensive reach. Regarding volcanic hazard, many investigations and studies are a compilation of areas affected by lava flow, pyroclastic flow, lahar, and ash fall from past volcanic eruptions for each volcano.
A4.5	Cyclone	Research on cyclone and meteorological hazard, and risk assessments have been conducted in ASEAN countries using data on tracks, damaged areas, and storm rainfall. The impact of climate change is also included in this research. Limited information and data available for Brunei Darussalam and Singapore.

3.8.3 Summary of Survey

(1) Floods

Some useful studies on flood hazard, risk, and vulnerability are publicly available presenting assessment results, case studies of countermeasures, as well as different methodological approaches. There are a few types of methodologies to assess risks and vulnerability including, for example, risks involving exposure to flooding events and population density. Vulnerability can be defined as a function of exposure, adaptive or coping capacity, and land-use etc. There are slightly different combinations of these factors with different studies for use. Therefore, these concepts must be defined in advance to plan a methodology for an assessment, in terms of which definitions are to be used in a certain analysis.

A summary of existing studies and reports is shown in Table 3.8.3 by country. A list of collected existing studies and reports is shown in Table 3.8.4.

Table 3.8.3 Summary of Existing Studies and Reports by Country: Flood

Country/Region	Summary of Existing Studies and Reports
ASEAN	There are a few reports that study natural disasters for ASEAN and the Pacific regions at large in recent years. Disaster risks are assessed by scenario, exposure, vulnerability, damage, and loss. An assessment framework is also sought to give an overview of risks, hazard and vulnerability.
Cambodia	The National Committee for Disaster Management and Ministry of Planning has recognized flooding as one of the major disasters and has created a strategic plan. However, hazard, risk, and vulnerability assessments are limited to a level of a rough situation analysis. There is an identification of risky areas for the whole country. In some areas there are more exploratory studies to assess risks as well as implementation of countermeasures.

Table 3.8.4 Existing Studies and Research: Flood

No	Country	Province/ City	Coordinates		Risk Assessment		Vulnera-bility Assess-ment	Organiza tion Produced	Document No. in Appendix A4.1
			Latitude	Longitude	Area	Popu-lation			
1	ASEAN	-	-	-	○	○	×	UNISDR/ WB	FL_001
2	Cambodia	Phnom Pehn	11.57489	104.9173	○	○	×	ADB	FL_002
3	Cambodia	Tonle Sap	12.99118	104.0703	○	×	×	NCDM/ ESCAP	FL_014

Note: ○ indicates the existence of information. × indicates that information was not found in public resources.

(2) Earthquakes

Useful information and studies on earthquake hazard, risk, and vulnerability were collected from resources available in the public domain including websites. The information and studies include methodologies with analysis and assessment.

There is no standardized or authorized methodology for risk and vulnerability assessment. Therefore, the methodology should be selected or updated in accordance with the purpose when risk and vulnerability assessments are required.

A summary of existing studies and reports is shown in Table 3.8.5 by country. A list of collected existing studies and reports is shown in Table 3.8.6.

Table 3.8.5 Summary of Existing Studies and Reports by Country: Earthquake

Country/Region	Summary of Existing Studies and Reports
ASEAN	There are natural hazard assessment reports for ASEAN region created by international organizations like World Bank etc. They summarize frequency, vulnerability, loss, and others subject for each disaster. Some reports describe the methodology and assessment points/items.
Cambodia	There is no record of earthquake disaster in Cambodia and no investigations or studies limited to this country and its regions were found.

Table 3.8.6 Existing Studies and Research: Earthquake

No	Country	Province/ City	Hazard Assessment			Risk Assessment		Vulner a-bility Assess-ment	Organi-zation Produced	Document No. in Appendix A4.2
			Scena rio	Probabi listic	Method ology	Human Loss	Econom ic Loss			
1	Worldwide	-	×	○	×	○	○	○	UNISDR	EQ_001
2	ASEAN	-	×	○	×	×	×	×	GSHAP, USGS	EQ_002

(3) Tsunamis

Useful information and studies on tsunami hazard, risk, and vulnerability were collected from resources available in the public domain including websites. The information and studies include methodologies with analysis and assessment.

There is no standardized or authorized methodology for risk and vulnerability assessment. Therefore, methodology should be selected or updated in accordance with the purpose when risk and vulnerability assessment are required.

A summary of existing studies and reports is shown in Table 3.8.7 by country. A list of collected existing studies and reports is shown in Table 3.8.8.

Table 3.8.7 Summary of Existing Studies and Reports by Country: Tsunami

Country/Region	Summary of Existing Studies and Reports
ASEAN	Tsunami induced by the Sumatra earthquake on December 26, 2004 caused major damage to ASEAN countries. The disaster is summarized by organizations like ADB.
Cambodia	There is no record of tsunami disaster in Cambodia and no investigations or studies limited to this country and its regions were found.

Table 3.8.8 Existing Studies and Research: Tsunami

No	Country	Province/ City	Hazard Assessment			Risk Assessment		Vulner a-bility Assess-ment	Organi-zation Produced	Document No. in Appendix A4.3
			track record	Scena rio	Metho dology	Human Loss	Economic Loss			
1	ASEAN	-	○	×	×	○	○	×	ADB	TN_002

(4) Volcanoes

Useful information and studies on volcanic hazard, risk, and vulnerability were collected from resources available in the public domain including websites. The information and studies include methodologies for analysis and assessment.

There is no standardized or authorized methodology for risk and vulnerability assessment. Therefore, methodology should be selected or updated in accordance with the purpose when risk and vulnerability assessment are required.

A summary of existing studies and reports is shown in Table 3.8.9 by country. A list of collected existing studies and reports is shown in Table 3.8.10.

Table 3.8.9 Summary of Existing Studies and Reports by Country: Volcano

Country/Region	Summary of Existing Studies and Reports
ASEAN	UNOCHA summarized the scale of the explosion of volcanoes around the Asia-Pacific region using the Volcanic Explosivity Index (VEI).
Cambodia	There is no record of volcanic disaster in Cambodia and no investigations or studies limited to this country and its regions were found.

Table 3.8.10 Existing Studies and Research: Volcano

No	Country	Province/ City	Hazard Assessment			Risk Assessment		Vulnera-bility Assess-ment	Organi-zation Produced	Document No. in Appendix A4.4
			Track record	Scena rio	Metho dology	Human Loss	Economic Loss			
1	ASEAN Asia-Pacific	-	○	×	×	×	×	×	OCHA -ROAP	VE_001

(5) Cyclone (Typhoon) and Meteorological Hazard

"Cyclone" is a term to describe many types of of low pressure systems, of which tropical cyclones/typhoons are the main types creating disasters in the ASEAN region. Under the framework of WMO, leading countries implement monitoring/detection of tropical cyclones on a regional basis. Table 3.8.11 indicates the responsible territory allocated to ASEAN members and its leading country.

Table 3.8.11 Members of WMO Tropical Cyclone Committee

	Warning Zones	Members（ASEAN）	Leading Country
Western North Pacific Ocean and South China Sea	0° - 60°(N) 0° - 100°(E)	Cambodia, Lao PDR, Malaysia, Philippines, Singapore, Thailand, Vietnam	Japan
Bay of Bengal and the Arabian Sea	5°S - 45°(N) 30°E - 90°(E)	Myanmar, Thailand	India
South Pacific and South-East Indian Ocean	0°-50°(S) 90° - 170°(E)	Indonesia	Fiji

The dates and information utilized in this report have been acquired from various reports on the studies and research conducted on tropical cyclones and meteorological hazards published on the

internet. Collected documents include evaluation results of hazards/risks, as well as their evaluation methods. With regard to tropical cyclones/typhoons, a meteorological organization of each country compiles a summary on the damage situation, including the number of casualties or loss of human lives, and the estimated amount of damage, etc.

A summary of existing studies and reports is shown in Table 3.8.12 by country. A list of collected existing studies and reports is shown in Table 3.8.13.

Table 3.8.12 Summary of Existing Studies and Reports by Country: Cyclone and Meteorological Hazard

Country/Region	Summary of Existing Studies and Reports
ASEAN	Study reports on natural disasters in the whole ASEAN region are available.
Cambodia	Typhoon landings in the center of Vietnam sometimes bring heavy rain to Cambodia. The Meteorological Doppler Radar System was introduced in 2012 for the improvement of accuracy in weather forecasting.

Table 3.8.13 Existing Studies and Research: Cyclone and Meteorological Hazard

No	Country	Province/ City	Coordinates		Risk Assessment		Vulnera-bility Assess-ment	Organiza tion Produced	Document No. in Appendix A4.5
			Latitude	Longitude	Area	Popu-lation			
1	Cambodia							ADPC	CM_001

(6) Landslides

A summary of existing studies and reports is shown in Table 3.8.14 by country. A list of collected existing studies and reports is shown in Table 3.8.15.

Table 3.8.14 Summary of Existing Studies and Reports by Country: Landslide

Country/Region	Summary of Existing Studies and Reports
ASEAN	There have been a few reports that study landslides for ASEAN and the Pacific region at large in recent years. Disaster risks are assessed by scenario, exposure, vulnerability, damage, and loss. An assessment framework is also sought to give an overview of risks, hazard, and vulnerability.
Cambodia	The occurrence of landslide disaster in Cambodia is unconfirmed. Hazard map LS-08 indicates a low level of hazard distribution in the mountainous area near the coast, but no hazard area are distributed in the Mekong lowland area near the capital city of Phnom Penh. There is no assessment of landslide in LS-008, but some weak exposure is recognized near the border with Thailand in LS-013. There are on-going projects on early warning systems and hazard mapping in connection with DHRW.

Table 3.8.15 Existing Studies and Research: Landslide

No	Country	Province/ City	Coordinate		Risk Assessment		Vulnera-bility Assess-ment	Organization Produced	Document No. in Appendix A4.6
			Latitude	Longitude	Area	Popu-lation			
1	ASEAN				○	○	×	UNISDR/World Bank	LS-006
2	ASEAN				○	○	×	EEPSEA	LS-013
3	Cambodia	Entire Country	11.566	104.918	×	×	○	UNISDR	LS-008
4	World				○	○	○	WB	LS-007

Indicates Capital

References:

Flood

1) Arief Anshory Yusuf & Herminia Francisco (2009). Climate Change Vulnerability Mapping for Southeast Asia, Singapore: EEPSEA
2) Asian Urban Disaster Mitigation Program (2011). Coping with Flood in Cambodian communities, Enhancing Community Solidarity. Pathumthani: Asian Disaster Preparedness Center
3) EngRinbo (2008) Cambodia: Mainstreaming Flood and Drought Risk Mitigation in East Mekong Delta: Bangkok
4) Royal Haskoning, Deltares, Unesco-IHE. (2009) Flood Risk Management in the Border Zone between Cambodia and Vietnam: The Mekong River Commission Secretariat
5) Velasquez, Jerry et al (ed.) (2012). Reducing vulnerability and exposure to disasters: Asia-Pacific disaster report 2012, ESCAP/UNISDR AP
6) World Bank (2011). Advancing Disaster Risk Financing and Insurance in ASEAN Countries: Framework and Options for Implementation, Washington: Global Facility for Disaster Reduction and Recovery
7) World Bank, UNISDR (2010). Synthesis Report on Ten ASEAN Countries Disaster Risks Assessment.

Earthquake

1) UNISDR (2009). Global assessment report on disaster risk reduction, Risk and poverty in a changing climate

Tsunami

1) ADB (2005). From Disaster to Reconstruction: A Report on ADB's Response to the Asian Tsunami

Volcano

1) OCHA -ROAP (2011). Holocene Eruption and Selected Volcanoes in Asia-Pacific

Cyclone (Typhoon) and Meteorological Hazard

1) ESCAP/WMO Typhoon Committee. (http://www.typhooncommittee.org/)
2) JMA/WMO Workshop on Quality Management in Surface, Climate and Upper-air Observations in RA II (Asia) 2011
3) WMO National Meteorological or Hydrometeorological Services of Members (http://www.wmo.int/pages/members/members_en.html)
4) WMO (2010). First Meeting of the Task Team on "Meteorological, Hydrological and Climate Services for Improved Humanitarian Planning and Response", WMO Headquarters, Geneva, Switzerland (31 August - 2 September, 2010)

Landslide

1) World Bank, UNISDR (2010). Synthesis Report on Ten ASEAN Countries Disaster Risks Assessment
2) World Bank, UNISDR (2011). Disaster Risk Management Programs for Priority Countries- 2nd edition

Figure 3.8.1 Existing Study on Natural Hazards in Cambodia

Chapter 4 Industrial Agglomerated Areas and Investment Risk

4.1 Historical Evolution of Industrial Agglomerated Areas

Industrial parks in Cambodia that offer incentives to foreign investors are all classified as Special Economic Zones (SEZs). Such zones were briefly introduced during Prince Sihanouk's Sangkum Reastr Niyum-regime in the 1960s, but none of these initial projects survived the rise of the Khmer Rouge government. SEZs did not start to develop on a significant level until much more recently. In December 2005, SEZs were introduced by Sub-decree Numbers 147 and 148. Sub-decree 147 restructured the Council for the Development of Cambodia (CDC), Cambodia's highest decision-making body for public and private investment, and set up the Cambodian Special Economic Zone Board (CSEZB) as a branch of the CDC. Sub-decree Number 148 laid the legal foundation for the establishment and management of SEZs. SEZ development began in 2005 with Manhattan SEZ in Svay Rieng province. To date, the Cambodian government has approved 22 SEZs, less than half of which are currently in operation.

SEZs near the capital Phnom Penh and the coastal town Sihanoukville have attracted relatively high levels of investment. In Phnom Penh and neighboring Kandal province, the Phnom Penh SEZ and Goldfame Pak Shun SEZ (Kandal) are in operation. In Sihanoukville (in Preah Sihanouk province), four SEZs have been approved, three of which are currently in operation: Sihanoukville SEZ 1, Sihanoukville SEZ 2 (established in 2010 as a cooperation zone between Cambodia and China), and the Sihanoukville Port SEZ (a joint initiative between the Cambodian and Japanese governments inaugurated in 2012).

The majority of the SEZs are however located along Cambodia's borders with Thailand and Vietnam. Most of these remain undeveloped and have yet to attract investment. Exceptions are, on the Vietnamese-Cambodian border, Manhattan SEZ and Tai Seng SEZ (both in Bavet town, in the southeastern Svay Rieng province). Also in operation, on the Thai-Cambodian border, are Neang Kok Koh Kong SEZ (in southwestern Koh Kong province), and Poi Pet O'Neang SEZ (in Western Banteay Meanchey province).

Currently, SEZs in Phnom Penh and Preah Sihanouk province continue to receive the majority of investments, while border area SEZs experience continuing problems with lack of infrastructure and power supply, precluding investment. In 2012, the General Director of the Ministry of Commerce pledged that the government will establish infrastructure and electricity in border SEZs to drive their development. However, a detailed plan of how this will be achieved and funded has not been issued. Between 2006 and 2011, SEZs received 96 investment projects with a total value of USD 1.15 billion, which generated 61,400 jobs. Since 2011, the CDC says that these figures rising, with total investment in SEZs increasing by 683% year-on-year in 2011. In 2010, there were 22 investments worth USD 91.25 million. In 2011, there were 39 investments worth USD 715.25 million. 2012 figures are not available, so it is unclear if this trend has continued.

4.2 Recent Trends and Japanese Investment

Japanese investment is most significant in the Phnom Penh SEZ (PPSEZ). The PPSEZ is a Cambodian-Japanese joint venture company, run by a Japanese manager, Mr. Hiroshi Uematsu. As of October 2012, 15 out of 33 companies operating in the PPSEZ were Japanese, one was joint Chinese/Japanese, and one was joint Korean/Japanese. Japanese companies include Tiger Wing (shoes), Ajinomoto (food processing), Sumi Wiring (automobile wiring), and Minebea (cellphone parts). In 2009, Ajinomoto invested USD 6 million in the PPSEZ. Since 2011, there has been an increase in Japanese investment in the automotive and electronics sectors. In 2011, investments included an electric equipment assembly plant set up by Marunix. Sumi Wiring Systems Co Ltd, a local subsidiary of Sumitomo Corp., started operations in May 2012. In January 2013, Denso Corp. announced that it will begin making motorcycle parts in PPSEZ in July 2013, with total investment projected at JPY 35 million. In March 2013, Japanese Combi Corp. also announced plans for a new baby-product factory to open in 2014, with total investment estimated at to USD 1.5 million. Despite this trend, a lack of skilled human resources in the manufacturing sector has to date largely prevented Japanese investment in high-tech areas.

There is some Japanese investment in coastal Sihanoukville. In Sihanoukville SEZ 2, 2 out of a total of 26 companies operating in the SEZ are Japanese; ASLE Electronic (Cambodia) Co. Ltd. (produces electronic wires) and Izumi Electronics (Cambodia) Co. Ltd. (produces TV frames). Japanese investment in this area is expected to grow as the Sihanoukville Port SEZ is developed. The SEZ was developed as a Japanese government ODA project starting in 1996. Its development was financed by Japanese soft loan of JPY 3.6 billion. The Sihanoukville Autonomous Port was inaugurated in 2012. Given this, the Sihanoukville Port SEZ is projected to become a key site for Japanese investment, though its infrastructure is still being developed. The Japanese government is to fund at USD 75 million multi-purpose terminal to be built in 2013.

There is also some Japanese investment in SEZs along Cambodia's borders, though this is not expected to grow until significant infrastructure improvements are made. In Tai Seng Bavet, Svay Rieng province, 2 out of a total of 11 companies operating are Japanese: Towa (Cambodia) Co. Ltd. (menswear), and Nakayama Shoji (Cambodia) Co. Ltd. (baby underwear). In Manhattan SEZ, Svay Rieng province, 1 out of a total of 22 companies is Japanese, Morofuji Packaging Co. Ltd (plastic bags).

4.3 Observations from Data Collection

While 22 SEZs have been registered, there is a vast difference in the level of development between these SEZs, with few offering high-level infrastructure and facilities for foreign investors. SEZs around Phnom Penh and Sihanoukville are most developed, while the majority of parks in border areas are undeveloped. The relatively more developed SEZs are better equipped to communicate with foreign investors. A few of these have their own websites: Phnom Penh SEZ, Sihanoukville SEZ, the Port Authority of Sihanokville, Tai Seng Bavet SEZ, and Manhattan SEZ. However,

information on these websites is often incomplete or out of date, especially in the case of Tai Seng Bavet SEZ and Manhattan SEZ. Contacting SEZ staff outside of the more developed SEZs in Phnom Penh and Sihanoukville is difficult, as few staff speak English or Japanese. This suggests that most of these sites are ill prepared to support foreign investors.

The CSEZB also has limited ability to support foreign investors. It provides some online information on SEZs on location, size, level of development, and, in some cases, a list of tenant companies. This information is generally reliable, but can also be incomplete or out of date. It is difficult to contact the CSEZB through official channels. None of the email addresses provided on the official CSEZB website are operational. We were also unable to locate any English or Japanese-speaking staff at the CSEZB.

4.4 General Investment Risk

(1) Political Risk

The government is stable, with little risk of political instability or changes to development policy threatening business continuity. The Cambodian People's Party (CPP) has wielded power for some 30 years, with Prime Minister Hun Sen practicing a model of "guided democracy." This involves promoting increased economic liberalization and infrastructure development while the party retains a tight grip on political control. In the last parliamentary election in July 2008, the CPP cemented its dominant position by securing a large majority. This has allowed the CPP to govern without a coalition partner. The CPP is also expected to win a clear majority in the upcoming 28 July 2013 general election, which will allow Hun Sen – who enjoys the confidence of his party and will stand for re-election – to further consolidate his power. Hun Sen is likely to expand his extensive personal business patronage network, especially over the lucrative hydrocarbons sector through the Cambodian National Petroleum Authority, which falls under his direct control.

The CPP faces no real threat to its effective monopoly over politics, the judiciary, and the security forces amid weak political opposition. The government's stability is likely to ensure the continuity of pro-business policies and of contracts signed by the current government. These include hydrocarbon exploration rights to six offshore blocks in the Gulf of Thailand (Chevron Corporation is currently drilling the largest block), hydropower projects developed by Chinese and Vietnamese companies and SEZ development plans. Corruption remains a severe risk, especially in the absence of any substantial checks on the government. Contracts and licenses risk being revoked if personal relationships with senior government officials are not maintained adequately through bribes.

(2) Economic Risk

Cambodia remains one of the poorest countries in Asia, with per capita income just now crossing the USD 1,000 mark. Political stability since 1998 has laid the foundation for larger foreign direct investment (FDI) inflows, which have so far primarily targeted the garment and textile sectors. The

garment and footwear industries received a big boost in 2011 when the European Union relaxed its rules of origin and granted Cambodia duty-free access to the European market. Investment in the sector will probably increase further in coming years, especially given repeated minimum-wage hikes in neighboring Thailand that will further boost Cambodia's relative cost competitiveness. Cambodia's relatively stable inflation profile also compares favorably with developments in neighboring Vietnam. Construction, agriculture, manufacturing, and services should all continue to grow in 2013, supporting economic growth of nearly 7.0%.Tourism has also revived in recent years and there is considerable potential for further expansion. The discovery of offshore oil reserves represents a significant upside potential for medium- and longer-term growth as well.

Nevertheless, given the high poverty incidence, massive infrastructure development needs, limited scope for domestically generated investment, and the hesitance of the financial crisis-weathered foreign investors, the country is expected to remain quite aid-dependent for many years to come. Continued macroeconomic reforms and steady FDI flow remain crucial for future development. Cambodia is one of the most highly dollarized economies in the world, reflecting the historical legacy of money abolition during the Khmer Rouge rule. Although this does not, in and of itself, impose severe constraints on business operations, the weak and underdeveloped domestic financial sector does. Deepening financial intermediation is a very important priority for Cambodia's policymakers. At the moment, most large-scale investment projects are financed externally since the domestic financial sector lacks the resource depth to support such activities. Overall, HIS anticipates that foreign investor interest in Cambodia will continue to intensify in coming years, which should support a solid average growth rate of 8.0% per year over 2015–2019.

(3) Legal Risk

Cambodia's legal system is still evolving after more than two decades of armed conflict that ended in 1991 and summarily dismantled the legal system. Cambodia is a civil law country; the new Civil Code came into effect in December 2011. The new system is a hybrid of customary law, and has also been influenced by Japanese and French legal traditions. The political will to make the country attractive to investors and, above all, the attainment of World Trade Organization membership in 2004 have driven forward the development of the legal system.

Nevertheless, daunting challenges remain: the rule of law is weak and the court system struggles to enforce its judgments. A significant shortage of trained judges and other legal personnel remains also a challenge. While there is no systematic discrimination against foreign investors in Cambodia through a regulatory regime, both corruption and political overlay obstruct transparency. In addition, Cambodia still lacks some key commercial laws.

The Law on Commercial Enterprise 2005 is the first comprehensive company law in Cambodia. Under the law, the definition of a foreign business is: a legal entity formed under the laws of a foreign country where it has a place of business and which is doing business in Cambodia. It may conduct business in Cambodia as a commercial representative office, commercial relations office or

agency ("representative office"); a branch; or a subsidiary. The passage of the law did not ease the procedure of setting up a business in Cambodia, which takes an average of 9 procedures and 85 days.

(4) Tax Risk

The tax regime in Cambodia is largely undeveloped. The tax base is small and poor tax collection has contributed to low revenues. However, a range of tax incentives for investors and relatively low corporate income tax rates render the country more attractive to foreign-invested enterprises. Corporate tax is levied at a flat rate of 20%, which is one of the lowest in the region. Due to the government's preoccupation with other development issues, the rapid development of a more sophisticated system should not be expected and, as a result, the system will continue to lack sophistication, nor will it enjoy any expansion in the short term. Cambodia does not have any double-taxation agreements in place, but it has entered into various investment promotion and trade agreements with a number of countries. Companies operating within SEZs benefit from income tax, customs, import duty and VAT incentives.

(5) War Risk

The government has good relations with neighboring Laos and Vietnam and their borders are clearly demarcated. Relations with Thailand are strained over a disputed border area around the Preah Vihear temple complex bordering Thailand's Sisaket province. In October 2008, skirmishes broke out between Cambodian and Thai forces in that area and recurred sporadically. While the fighting mostly consisted of small arms firing, artillery was occasionally used, causing thousands of villagers to flee. The skirmishes subsequently tapered off after the election of the Puea Thai party in Thailand in August 2011. The Puea Thai is the party of former Thai Prime Minister Thaksin Shinawatra who has good relations with Cambodia's Premier Hun Sen. In April 2013 both governments began arguing their cases at an International Court of Justice hearing, which will announce its verdict in October 2013. However, irrespective of the decision, if the Puea Thai loses power the risk of renewed fighting will increase.

During the recent skirmishes, the regional grouping Association of Southeast Asian Nations (ASEAN), of which both Cambodia and Thailand are members, helped to de-escalate the situation. ASEAN would likely be involved again if fresh fighting breaks out. ASEAN's involvement plus the reluctance of Cambodia and Thailand to enter a full conflict over their border dispute, which concerns a small, rural area without significant commercial relevance, means it is unlikely any fighting will involve the use of air power or the countries' naval forces.

Cambodia and Thailand also have not fully demarcated their maritime border in the Gulf of Thailand, but this has been dealt with in a more cooperative manner, making it unlikely to result in maritime skirmishes or conflict. Offshore energy resources are present in the disputed area with three blocks containing as estimated 10-11 trillion cubic feet of gas reserves subject to overlapping claims with Thailand. Cambodia wants to jointly develop the overlapping areas with Thailand so as to begin

bidding rounds as quickly as possible, but Thailand prefers that the countries justify the existing claims instead. Talks are unlikely to take place in the next year given the Thai government's reluctance to negotiate. As Cambodia is eager to proceed quickly and reach an agreement with Thailand, it is unlikely that its naval vessels will intentionally harass commercial vessels working at Thai offshore facilities including those of Chevron Corporation and Salamander Energy plc.

(6) Terrorism Risk

A significant militant attack is unlikely. There are no international or regional militant groups operating in the country. While IEDs have been used in politically-motivated attacks, this is rare. Since 2007, there have only been two such attacks. In January 2009, three IEDs were placed near the Ministry of National Defense and a TV station, but were found and destroyed by police. In July 2007, a 10kg IED exploded at the Cambodia-Vietnam friendship monument in a park near the prime minister's residence, causing limited property damage.

A historic regional rivalry with Thailand has led to an attack on Thai-owned asset that caused serious property damage. In January 2003 the Cambodian press wrongly attributed comments to a Thai actress claiming Thai ownership of the historic Angkor Wat temple in Cambodia. Subsequent anti-Thai protests destroyed the Thai Embassy in Phnom Penh and several Thai-owned businesses.

A largely defunct anti-communist movement, the Cambodian Freedom Fighters (CFF), led by California-based Cambodian-American Chun Yasith, is assessed as posing a negligible threat. Formed in 1998 when political upheaval sent some Cambodians into exile, reports suggest the CFF never exceeded 100 armed fighters in strength. Its only noteworthy activity was a November 2000 armed attack on government buildings in Phnom Penh in which members of the security forces were wounded and the attackers killed or wounded. In April 1999, around five CFF members were arrested in connection with a plot to detonate an IED at a fuel depot. The CFF is not known to have engaged in any militant activity since the 2000 attack and in our view is a spent force.

Armed criminal gangs pose a moderate risk of cargo theft, especially between Kratie and Stung Treng provinces in central-east Cambodia, where Highway 7 is particularly at risk. These gangs are also likely to extort transport vehicles. There is also a moderate risk of armed theft in the inland waterways and on the railway system.

(7) Civil Unrest Risk

While foreign direct investment has doubled since 2010 and manufacturing has relocated to Cambodia due to low wages, the government has not correspondingly improved land rights or worker treatment. As such, we assess industrial unrest and land protests will likely become more frequent in the two-year outlook. Industrial protests, involving strikes and demonstrations over pay and working conditions, occur almost every month, many in the garment sector. They are generally peaceful and conducted amongst heavy police presence, thus posing a low risk to property. Strikes

are generally localized to one factory and coordination between factories is normally poor, reducing risks of significant or widespread business disruption due to strikes.

No large-scale ethnic divide threatens stability in Cambodia. However, the country suffers from sporadic unrest in both rural and urban areas, due to land seizures and growing economic inequality. A particularly contentious issue has been the awarding of land to private enterprises and individuals, often requiring seizures and evictions. In the last few years a growing number of contentious land grabs and forced evictions, particularly in the capital Phnom Penh, have met with large-scale protests and violent confrontations with authorities. Until the authorities are able to adequately compensate those who have lost their land, these kinds of violent incidents are bound to recur. These protests are particularly likely in Rattanak Kiri, Banteay Meanchey, Kratie and Preah Sihanouk, and in cities including Phnom Penh, Sihanoukville and Siem Reap.

Local communities and environmentalists are likely to protest peacefully against the construction of hydroelectric dams on the Mekong River, which, they claim will have negative repercussions on the environment. Political violence has traditionally been more prevalent during election campaigns, where recourse to targeted killings has been more likely. However, as the popularity of the CPP has grown and it has consolidated its power since the 2008 elections, the level of political violence has fallen.

4.5 Industrial Agglomerated Areas and Natural Disaster Risk

Several distribution maps are shown overlaying natural disaster risk as follows. List of industrial agglomerated areas are attached at the end of this report.

Figure 4.5.1 Distribution of Industrial Park

Figure 4.5.2 Distribution of Industrial Park, Major Infrastructures and Natural Hazards on number of killed in Cambodia

Figure 4.5.3 Distribution of Industrial Park, Major Infrastructures and Natural Hazards on loss rate to GDP in Cambodia

Chapter 5 Relevant Infrastructure and Natural Disaster Issues

5.1 Infrastructure Conditions

5.1.1 Roads

The total road system is 47,207 km long as of 2012, of which 5,600 km is national roads and 6,607 km provincial roads. The entire road system is under the jurisdiction of the Ministry of Public Works and Transport (MPWT). The total road system was 39,618 km long in 2009, and new roads have been constructed year by year as an important national task. The road density is 0.26 km/km^2 as of 2012.

Table 5.1.1 Road Networks

Road Type	Road Distance (km)	Pavement Distance (km)	Pavement Rate (%)	Jurisdiction
1-Digit National Roads	2,258	2,115	94	MPWT
2-Digit National Roads	3,342	1,868	56	
Provincial Roads	6,607	1,000	15	
Rural Roads	35,000			MRD
Total Length	47,207	4,983		

Source: MPWT, Infrastructure Development and Transport Logistics 2012

As an international road, the Asian Highway links Cambodia to neighboring countries. The Asian Highway consists of the National Roads 1, 3, 5, 6, 7, 33, and 48. Their total length is 1,345 km.

5.1.2 Ports

Sihanoukville Autonomous Port (PAS) is the sole international and commercially deep seaport of the Kingdom of Cambodia. The total operational land area is 129.6 ha, and new container yards are under construction. The recent container throughputs at Sihanoukville Autonomous Port are shown in the following table. The annual throughput has increased largely, which reflects recovery from the economic crisis of 2008.

Table 5.1.2 Container Throughput at Sihanoukville Autonomous Port

	2008	2009	2010	2011	2012
Container Throughput (TEUs)	258,775	207,861	222,928	237,941	260,000 (estimate)

Source: MPWT, Infrastructure Development and Transport Logistics 2012

International container freight is also handled at Phnom Penh Port. Currently the annual throughput is one (1) million tons and 50,000 TEUs, but development work to increase its capacity to handle five (5) million throughputs a year is in preparation.

5.1.3 Railways

In Cambodia, there are two railway networks: one is the southern line (264 km) which links Phnom Penh to Sihanoukville, and another is the northern line (386 km) which links Phnom Penh to Poipet. The latter includes 48 km of missing rail from Sereysophoan to Poipet. Narrow gauge 1,000 mm rails are used for the track.

The southern line is capable of transporting a 20-ton axle load and consists of 29 stations (currently 7 stations are under operation). The northern line is capable of transporting a 15-ton axle load and consists of 49 stations (currently 7 stations are under operation). New container yards are under construction between Sihanoukville Port and railway stations.

If the missing link of the northern line is restored, it may become easier to access Thailand and a major increase in railway transport is expected. By restoring tourism, revitalization of the region is also expected.

5.1.4 Airports

Currently, there are 16 airports in Cambodia, of which only 3 airports (Phnom Penh International Airport (PPIA), Siem Reap International Airport (SRIA), and Sihanoukville International Airport) operate regular flights. Sihanoukville International Airport was reopened in 2007, but only two (2) airline companies have been operating there. Regular flights have been operating between Sihanoukville and Siem Reap since December 2011, but the number of passengers does not reach the level of other two (2) airline companies.

Table 5.1.3 International Airports

Airport	Runway	Area(ha)	Administrator	Remark
Phnom Penh	3,000 m×45 m	387	RGC / SCA	
Siem Reap	2,550 m×45 m	197	RGC / SCA	
Sihanoukville	2,500 m×40 m	124	RGC / SCA	Reopened in July 2007

RGC / SCA: Royal Government of Cambodia / Societe Concessionaire I' Aero port
Source: ASEAN-Japan Center, Cambodia Investment Guide, January 2012

Table 5.1.4 Number of Flights and Passengers at Phnom Penh International Airport 2010

Number of Flights		Passenger	
Domestic (PPIA)	16,855	Arrival (Domestic)	52,286
International (PPIA)	3,301	Departure (Domestic)	57,375
		Arrival (International)	832,064
		Departure (International)	774,689

Source: ASEAN-Japan Center, Cambodia Investment Guide, January 2012

Table 5.1.5 Number of Flights and Passengers at Siem Reap International Airport 2010

Number of Flight		Passenger	
Domestic (SRIA)	15.354	Arrival (Domestic)	60,191
International (SRIA)	5,093	Departure (Domestic)	55,128
		Arrival (International)	716,012
		Departure (Internationa	732,968

Source: ASEAN-Japan Center, Cambodia Investment Guide, January 2012

5.2 Public Services

5.2.1 Electricity

The Electricity Law was promulgated in February 2001 with the view to regulate the electric power sector, and the Electricity Authority of Cambodia (EAC) was established to integrate the electric power supply. For domestic utilization, more than 80% of the energy used is electricity in urban area, while mainly kerosene is used in rural area. It has been planned to provide electricity services to all the villages by 2020. Thus, it is anticipated that energy usage will transition to electricity in these areas, with the electricity demand expected to increase rapidly.

The construction of transmission lines to import electricity from Thailand and Vietnam will be completed by the end of 2012, and the power lines which connect Laos and other neighboring countries are also to be completed in 2016. Construction work on hydroelectric power stations or thermal power plants as electric power sources are also proceeding simultaneously.

Table 5.2.1 Power Demand Prediction (MW)

In 2012	In 2015	In 2018	In 2020
1,062	1,643	2,283	2,770

Source: ASEAN-Japan Center, Cambodia Investment Guide, January 2012

Electric power generation and distribution has been conducted by the state-run Electricite de Cambodia (EDC) and an Independent Power Producer (IPP). Electricity imports from neighboring countries cover the shortage.

Table 5.2.2 Electric Power Generation (MW)

Country	2007	2008	2009	2010	2011
Laos	0	0	0	6	7
Vietnam	77	100	518	1,155	1,392
Thailand	90	274	324	385	431
Cambodia	1,349	1,484	1,235	968	1,018
Total	1,516	1,858	2,077	2,514	2,848

Source: Okayama Prefecture Cambodia Business Supporting Desk Report, Situation of Electricity in Cambodia

In Cambodia, diesel power generation is the main source of energy.

Table 5.2.3 Types of Electric Power Generation

Type	%
Diesel	89.21
Hydropower	5.00
Coal-Fired Power	4.61
Biomass Power	1.18

Source: Cambodia Business Supporting Desk Report, Okayama Prefecture, Japan, Situation of Electricity in Cambodia

Table 5.2.4 Energy Sources used for Household Lighting 2008 (%)

Sources	Cambodia	Urban Area	Rural Area	Phnom Penh	Preah Vihear
Urban Generation	22.5	82.5	9.3	89.9	7.6
Generator	1.7	1.9	1.7	1.8	2.5
Urban Generation ＋G	2.2	2.7	2.1	3.1	1.9
Kerosene	39.0	7.4	45.5	1.7	55.3
Candle	0.4	0.4	0.4	0.3	0.6
Battery	34.1	5.0	40.0	2.9	14.4
Others	0.5	0.2	0.6	0.3	17.6

Source: JANUS, CDM Feasibility Study 2011

5.2.2 Water

(1) Water supply

The Ministry of Water Resources and Meteorology (NOWRAM) is responsible for water resource development and management, while the Ministry of Rural Development (MRD) is responsible for water supply and sanitation in rural areas. In addition, the Ministry of Industry, Mines and Energy (MINE) is responsible for the supply of drinking water in small and medium rural cities. It is also responsible for the management and control of private companies that enter into the water supply business.

In Phnom Penh, Phnom Penh Water Supply Authority (PPWSA) is responsible for the water supply. In Siem Reap, Siem Reap Water Supply Authority (SRWSA) is responsible for the water supply. In urban areas, 87 % of people have access to the water supply system, while in rural areas, the rate falls to 58%.

Moreover, in urban areas, 67.4 % of the residents can obtain water piped into their lots. However, in farm villages, the rate is as low as 29.4%. Obtaining water from outside sources involves heavy labor. Currently, the diffusion rate of piped water remains as low at 14%.

Table 5.2.5 Distribution of households by location of drinking water source 2008

	Households		
	Total	Urban Areas	Rural Areas
Number of Water Sources	2,817,637	506,579	2,311,058
Total	100.0 %	100.0 %	100.0 %
On the premises	36.2 %	67.4 %	29.4 %
Other	63.8 %	32.6 %	70.6 %

Source: ASEAN-Japan Center, Cambodia Investment Guide 2012.1

(2) Sewerage

In Cambodia, the sewerage coverage ratio is 11%, and the total length of sewer system is 150 km. Private companies have not yet entered the sewerage market. In Phnom Penh, the sewerage coverage ratio is 20%, with coverage ratio decreasing considerably in the area outside its 10 km radius.

The sewerage system has a close relationship with the storm water drainage system. In Phnom Penh, inundation damage is frequent. This is because the maintenance work was not conducted on storm water drainage facilities during the civil war from 1970 to 1980s, causing and the drainage capacity to be decreased.

5.2.3 Communications

(1) Internet

After the liberalization of telecommunication services market in 2002, 37 companies received ISP (Internet Service Provider) licenses. Among these companies, about 15 companies currently provide commercial services. The number of broadband subscribers is 22,000 people, and the diffusion rate is 0.15%.

(2) Mobile phones

Resulting from the prevalence of a prepaid payment system which enables low-income people to use mobile phones, this sector shows a high annual growth rate of 51.5 %. Two (2) companies, Metfone and CamGSM, hold almost the entire market share. New companies such as Smart Mobile and CADCOMMS continue to enter the market.

(3) Fixed-line phones

Since Metfone started commercial services in February 2009, the number of subscribers has increased sharply.

(4) Terrestrial broadcasting

Broadcasting services are provided by TVK and other 11 networks. TVK and TV5 provide coverage for the entire country.

(5) Satellite broadcasting

There are said to be about 120,000 satellite broadcast subscribers.

5.2.4 Waste

(1) General

Data for the national level is not obtained for an investigation of the whole country. The Environmental Association has issued a 3R National Strategy and conducts workshop with relevant organizations and agencies. Data is available only for Phnom Penh.

(2) Waste Disposal in Phnom Penh

The Department of Public Works and Transport (DPWT) is responsible for waste management in Phnom Penh. Waste is classified into city waste and hazardous waste. City waste is handled by public company CINTRI, and hazardous waste is handled by the organizations that generated it. The main component of waste is food.

Table 5.2.6 Summary of Daily Disposal 2003

Items	City Waste (Tons per day)	Household Waste Only (Tons per day)
Average of both seasons	890.6	584.1
Average of dry season	905.7	597.3
Average of rain season	875.4	570.9

Source: Tokyo Metropolitan Government Bureau of Environment, Cambodia Phnom Penh City 2012

(3) Final Disposal Site

More than 3,500 tons of waste is incinerated annually.

Table 5.2.7 Outline of Final Disposal Plants in Phnom Penh

Disposal Methods	Open Dumping	Sanitary Landfill
Number of Plants	1	1
Location	Stung Mean Chey Disposal Site	Dong Kor Landfill Site
Disposal Area	6.8ha	26ha (11ha land filled)

Throughput	361,000 tons	438,000 tons
Administration	PPWM	

Source: Tokyo Metropolitan Government Bureau of Environment, Cambodia Phnom Penh City 2012

5.3 Natural Disaster Issues

Floods cause damages on the plains in the rainy season. Floods caused by storm rainfall in the upper reach of the Mekong River inundate a large part of the Mekong Delta. Flash floods also occur because of the devastation of forest area in the upper basin. At the same time, the Tonle Sap (Great Lake) also causes floods. There are have only been a few typhoons and minimal damage caused by storm surges.

In Cambodia, flooding is the most serious natural disaster from the viewpoint of the extent of damages, and drought ranks second. When a disastrous flood occurred in Thailand in 2011, Cambodia was also damaged seriously as it is located downstream of Thailand. In the 2011 flooding, various infrastructure such as roads, bridges, schools, and riverbeds were destroyed or damaged, with houses, farmlands, farm facilities, and hospitals are experiencing damage.

Many Japanese companies operate business in economic zones (SEZ), so damage to infrastructure such as roads and bridges caused by flooding has a grave impact on freight distribution. After a large flood in 2000, flood barriers were installed around Phnom Penh and three other cities in the east, national and provincial roads were rehabilitated, and bridges and canals were improved. However, these measures were not sufficient to handle the scale of the disaster in 2011.

Flooding spreads easily due to the impacts of the Tonle Sap Lake which is located in the mid-western area and has a high water level, the international Mekong River which is located in the mid-eastern area, and the east mountain area which blocks flow.

Moreover, flash floods may occur due to deforestation in the forest zone and defective irrigation facilities. These factors have likely played a role in spreading flood waters.

It is recommended that industrial parks be located on higher ground, with evacuation routes secured.

Figure 5.3.1 Major Infrastructures in Cambodia

Chapter 6 Economy, Industry, and Trade

In this survey, the general outline of economy and trade in the Kingdom of Cambodia and the cases in which disaster impact analyses were conducted are examined. The purpose is to estimate the impact of a disaster on the economy of the nation and surrounding regions in the event that an industrial agglomerated area in Cambodia is hit by a disaster.

The following topics were explored using existing data and information from sources such as the internet, research papers, reports, and other materials.

- Overview of the economy and industry of Cambodia
- Overview of trade in Cambodia

In order to understand the conditions of the economy and trade in Cambodia, relevant information was gathered/organized based on a review of reference materials listed below.

No.	Reference	Remarks
1	ASEAN-JAPAN CENTRE website http://www.asean.or.jp/	Statistical data on economy, industry, and trade of ASEAN
2	JETRO 2009, “ASEAN Economic Community" (in Japanese)”	Regional corporation framework in East Asia
3	ASEAN Stats database http://aseanstats.asean.org/	Trade values of ASEAN by commodity and partner country, etc.
4	ASEAN website (2013), "Key basic ASEAN indicators in 2011, Last update 14 January 2013"	Key basic indicators of ASEAN
5	International Monetary Fund, World Economic Outlook Database	Macroeconomic indicators of ASEAN
6	Industrial agglomerated areas in ASEAN, IHS	Detailed information on industrial agglomerated areas in ASEAN
7	Ministry of Foreign Affairs of Japan http://www.mofa.go.jp/index.html	Information on regional affairs, etc.

6.1 Overview of the economy

The GDP of Cambodia is 12.9 billion USD (2011), which is the second lowest in ASEAN after Laos. The GDP per capita is 853 USD (2011 (estimated figure)), which is the second lowest in ASEAN after Myanmar. It is one of the least economically developed countries in ASEAN that is also a rapidly growing region.

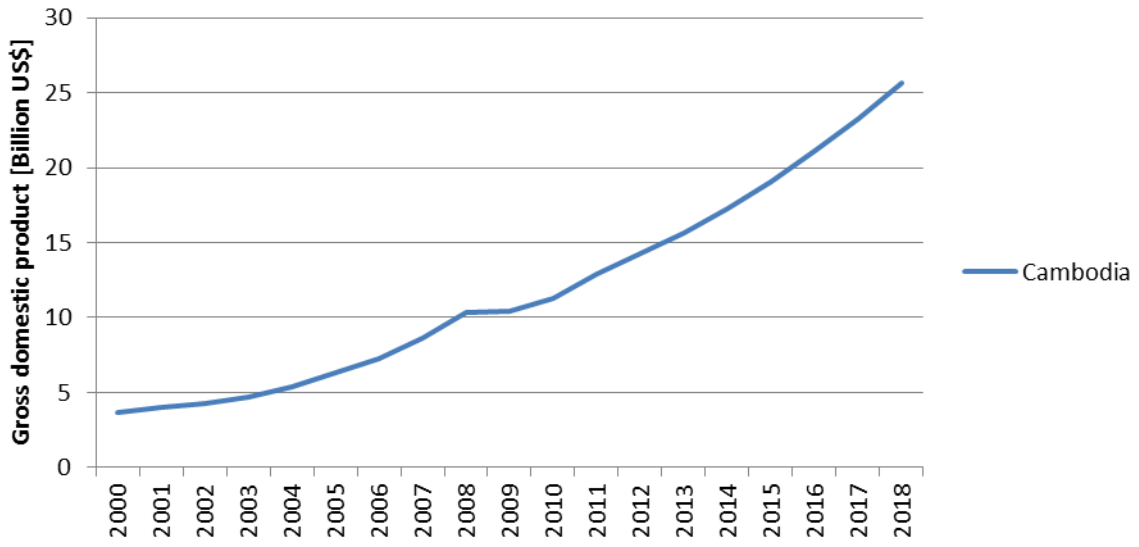
The country’s economic growth rate is 14.5%, which is almost the same as the ASEAN average (15.7% (2011)). This shows that the country’s economy is growing at a rate roughly in line with the economic growth of ASEAN. It is expected that Cambodia’s economy will grow at a rate slightly faster than the growth rate of ASEAN in the future. Foreign direct investment in Cambodia accounts for 1.0% of total foreign direct investment in ASEAN (2010). Recently, foreign direct investment in Cambodia has been increasing, and it is expected that investments will continue to grow steadily.

As for the industrial composition of the GDP, the agriculture sector is the largest, accounting for 32.8%. The garment manufacturing sector, construction sector, and tourism sector are also active in the country. These three sectors are growing steadily.

Major industrial parks in Cambodia, in which many Japanese companies are operating, are summarized in the table below.

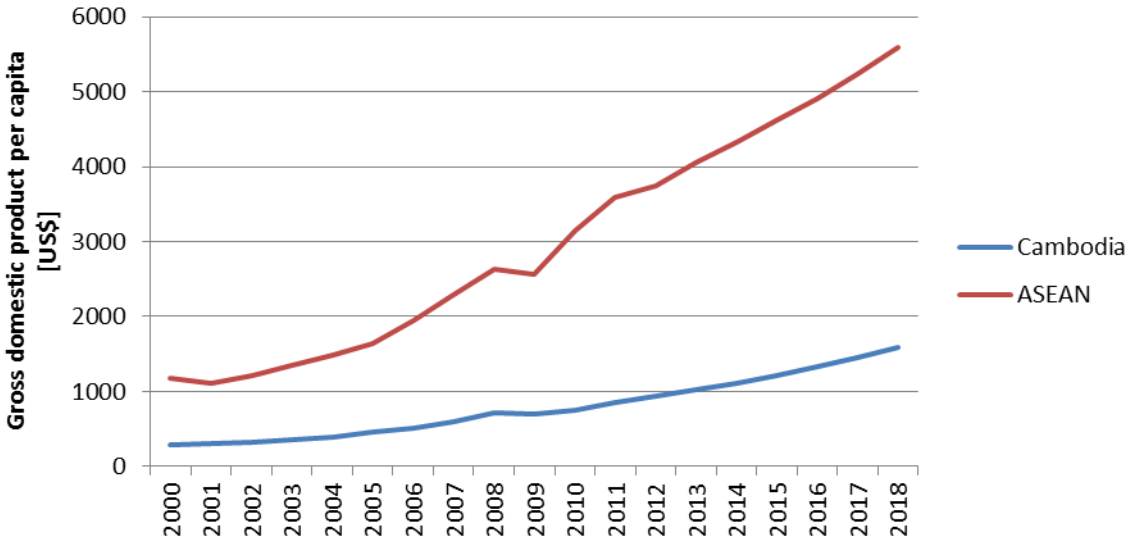
Name of Industrial Park	Number of Japanese companies operating	Feature
Phnom Penh SEZ	20 (15)	Located 8 km from Phnom Penh International Airport. Many companies handling leather products or engaging in Japanese dressmaking are operating in this industrial park, as well as companies handling metallic parts.
Tai Seng Bavet SEZ	10 (2)	Located 161 km Southeast of Phnom Penh. Most of the companies are engaging in garment manufacturing.

Reference: The table was created based on information from ASEAN-Japan Centre (https://www.asean.or.jp/)
Note) Numbers shown in parentheses were obtained from resources provided by IHS.



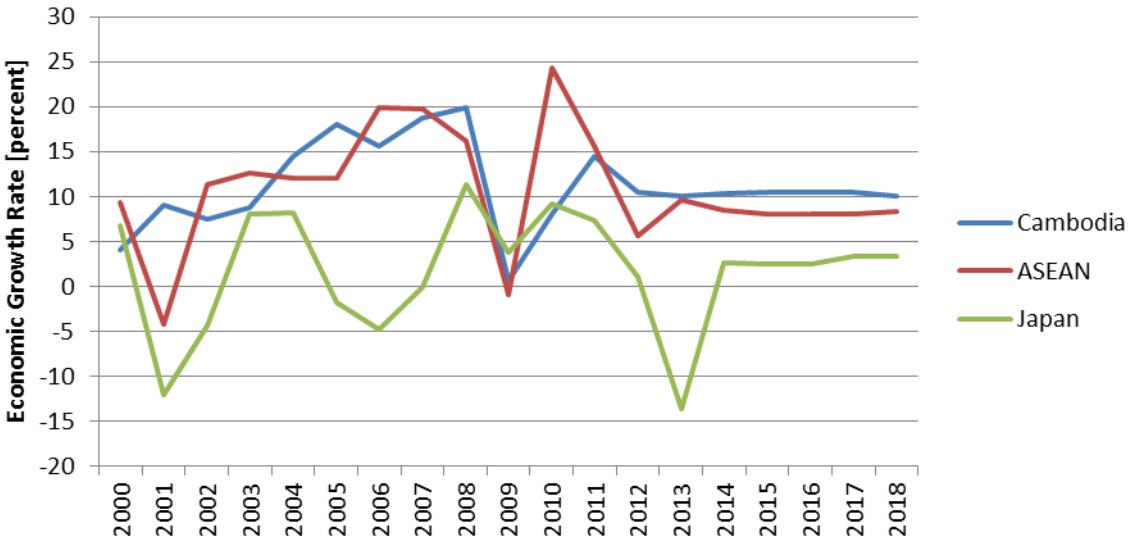
Source: International Monetary Fund, World Economic Outlook Database, April 2013

Figure 6.1.1 Gross Domestic Product in Cambodia, ASEAN countries and Japan (2000-2018), current prices (Estimation starting from 2012)



Source: International Monetary Fund, World Economic Outlook Database, April 2013

Figure 6.1.2 Gross Domestic Product per capita in Cambodia, ASEAN countries and Japan (2000-2018), current prices (Estimation in Cambodia starting from 2009; in ASEAN starting from 2007)



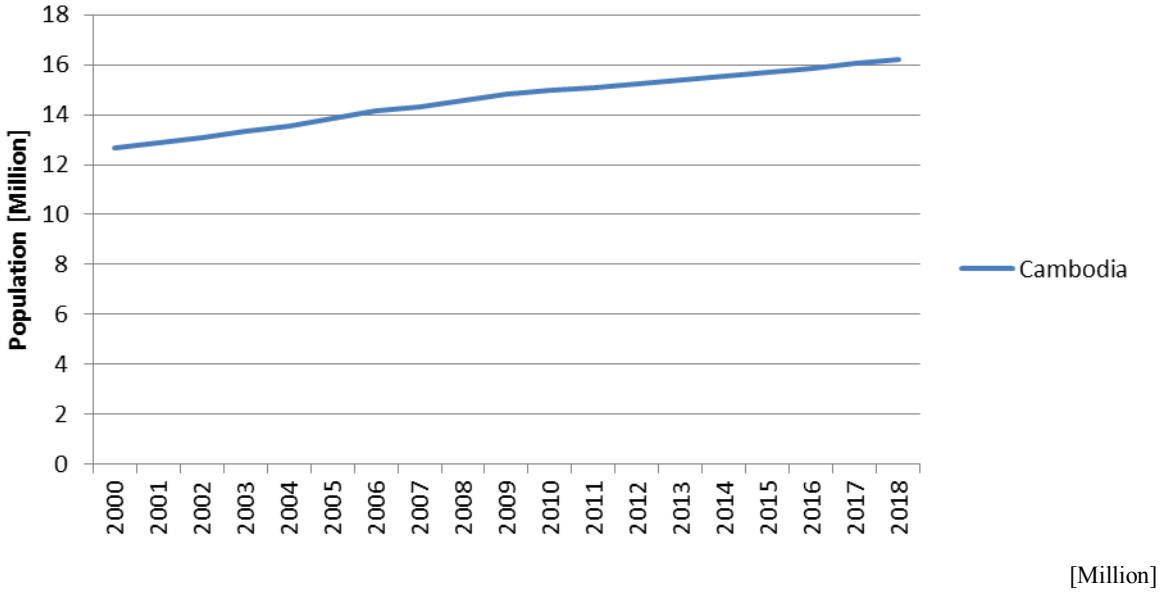
Source: International Monetary Fund, World Economic Outlook Database, April 2013

Figure 6.1.3 Economic Growth Rate in Cambodia, ASEAN countries and Japan (2000-2018), current prices (Estimation in Cambodia and ASEAN starting from 2012; in Japan starting from 2013)

Table 6.1.1 Average growth rate in Cambodia, ASEAN countries and Japan (2013-2017)

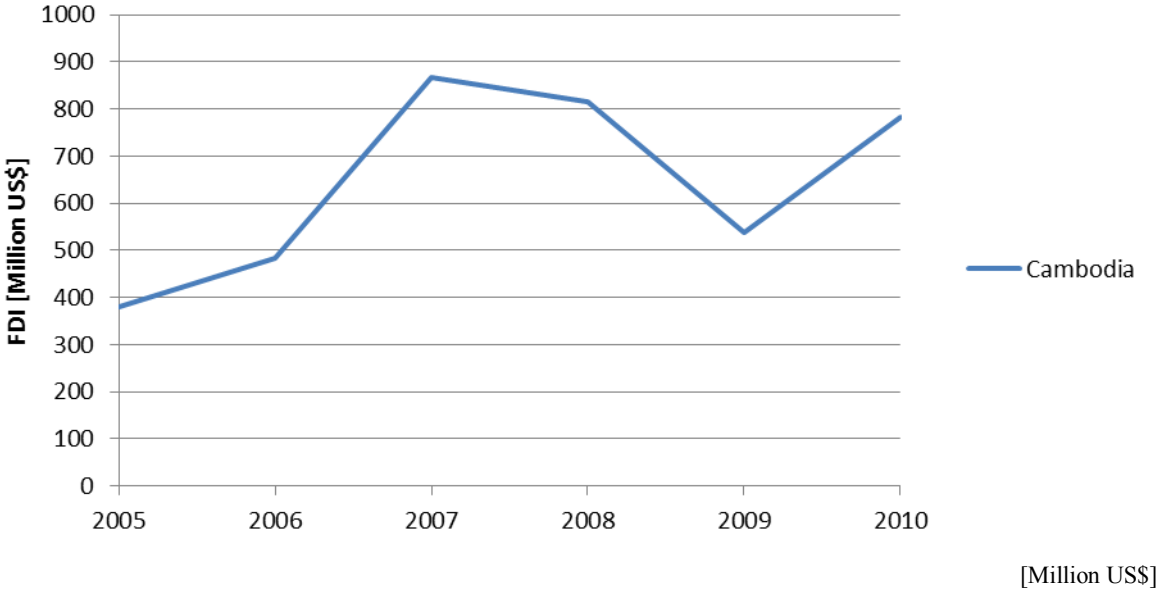
	Cambodia	ASEAN	Japan
Average growth rate (2013-2017) (%)	10.3	8.5	-0.53

Source: International Monetary Fund, World Economic Outlook Database, April 2013, calculated by MRI



Source: International Monetary Fund, World Economic Outlook Database, April 2013

Figure 6.1.4 Population (2000-2018) (Estimation starting from 2009)



Source: ASEAN-Japan Centre website

Figure 6.1.5 Foreign Direct Investment to Cambodia and ASEAN (2005-2010)

6.2 Overview of trade

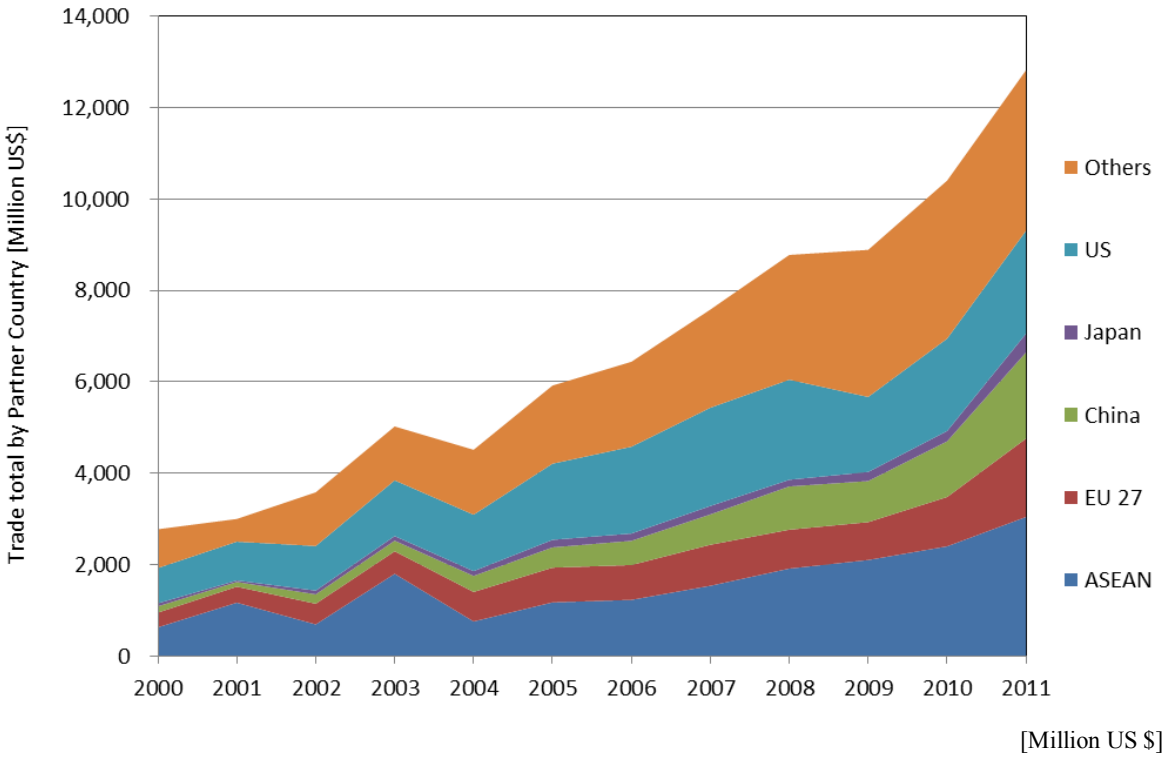
(1) Amount of foreign trade/major trading partners

Trends in Cambodia's foreign trade by partner countries (2000 – 2011) are illustrated in the figure below. Cambodia's foreign trade has been growing steadily since 2000. The country suffered less

impact than other countries from the crisis caused by the collapse of Lehman Brothers in the fall of 2008.

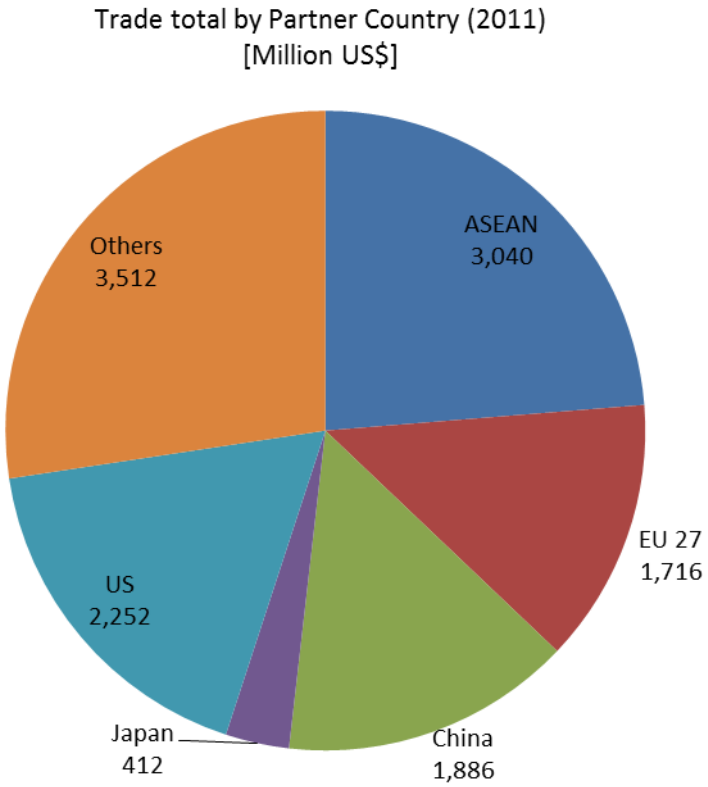
As of 2011, the largest trading partner of Cambodia is other ASEAN countries, with 24% of the total trade being associated with the countries in this region. The second largest trading partner is the USA, accounting for 18% of the total trade. China comes next, with 15%, followed by the EU and Japan with a 13% and 3% share, respectively.

Looking at the trend in recent years, it is observed that while Cambodia's foreign trade is increasing with all trading partners, the growth rate of trade with the ASEAN countries and China is higher than the growth rate of trade with developed countries such as the EU, the USA, and Japan.



Source: ASEAN Stats database (http://aseanstats.asean.org/)

Figure 6.2.1 External Trade Value by Partner - Total (2000-2011)



Source: ASEAN Stats database (http://aseanstats.asean.org/)

Figure 6.2.2 External Trade Value by Partner - Total (2011)

(2) Categories of major trading commodities

Export values of Cambodia by commodity (2011) are shown in the table below.

Examining the export values by major export commodities, it can be observed that the largest group of products exported from Cambodia is machinery and transport equipment, which accounts for 40% of the total export value (321 million USD). Crude materials, etc. (except fuel) comes next, accounting for 32% of the total exports (253 million USD).

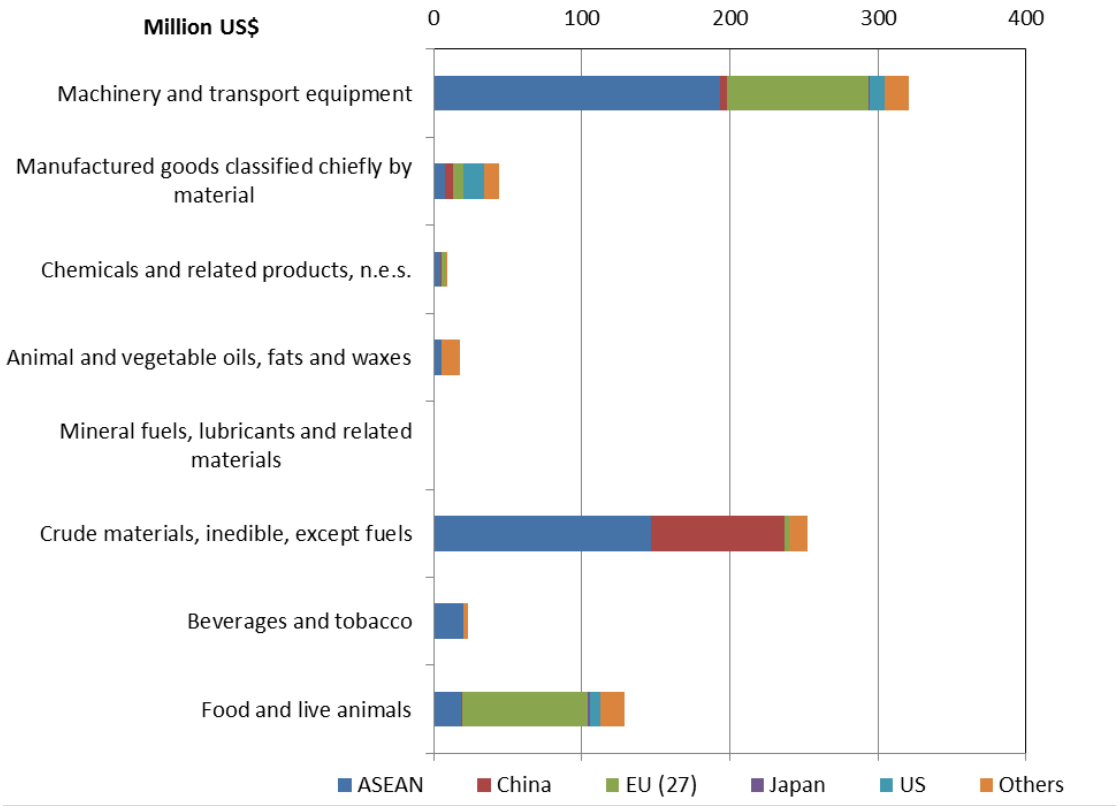
The largest export destination for machinery and transport equipment is the EU, buying 193 million USD. This is followed by ASEAN countries and the USA, with export values of 95 million USD and 9.8 million USD, respectively. Exports to Japan were 1.1 million USD.

Table 6.3.1 Trade values (exports) of Cambodia by commodity and partner country (2011)

[Million US $]

Category	ASEAN	China	EU (27)	Japan	US	Others	WORLD
Food and live animals	18	1	84	1	7	17	129
Beverages and tobacco	20	0	0	0	0	3	23
Crude materials, inedible, except fuels	147	90	3	0	0	13	253
Mineral fuels, lubricants and related materials	0	0	0	0	0	0	0
Animal and vegetable oils, fats and waxes	5	0	0	0	0	12	17
Chemicals and related products, n.e.s.	4	1	3	0	0	1	9
Manufactured goods classified chiefly by material	8	6	6	0	14	10	44
Machinery and transport equipment	193	5	95	1	10	16	321

Source: ASEAN Stats database (http://aseanstats.asean.org/)



[Million US $]

Source: ASEAN Stats database (http://aseanstats.asean.org/)

Figure 6.2.3 Trade values (exports) of Cambodia by commodity and partner country (2011)

Next, import values of Cambodia by commodity (2011) are shown in the table below.

Examining the import values by major import commodities, it can be observed that the largest group of products imported by Cambodia is manufactured goods which accounts for 50% of the total import value (2,746 million USD). Machinery and transport equipment comes next, accounting for 21% of the total imports (1,170 million USD).

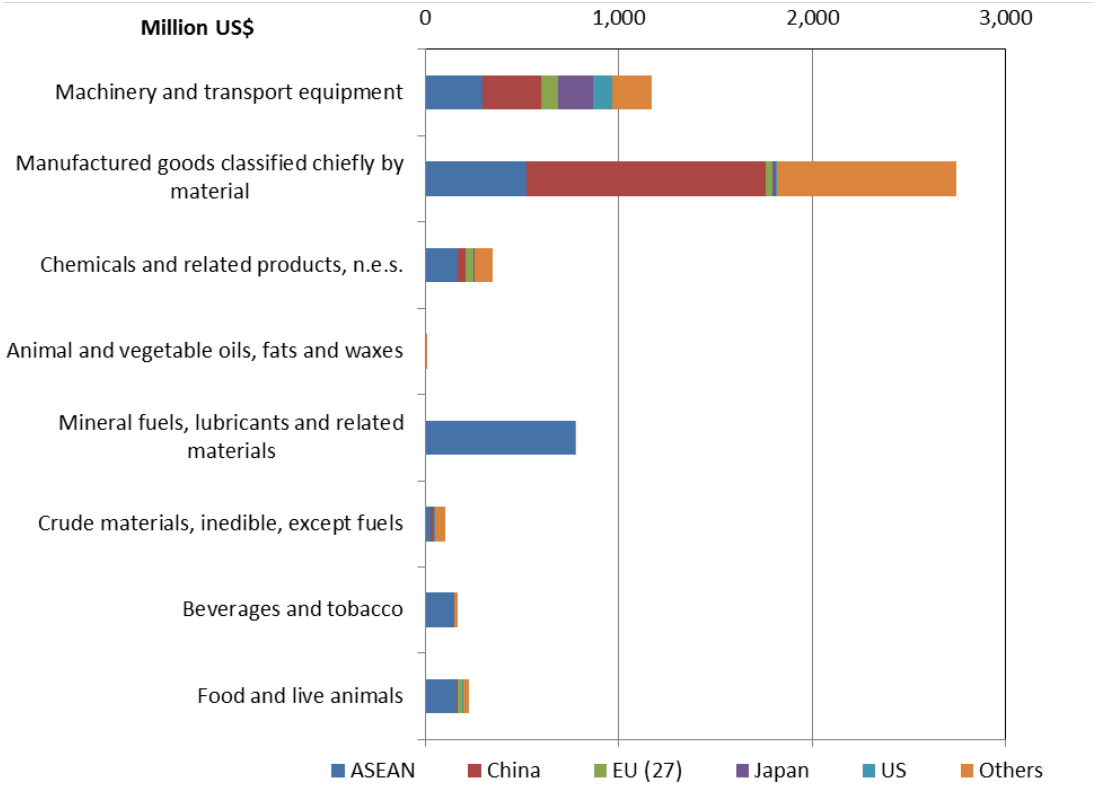
The largest exporter of manufactured goods to Cambodia is China, exporting a total of 1,236 million USD. This is followed by ASEAN countries and EU, with the import value of 525 million USD and 31 million USD, respectively. Imports from Japan were 21 million USD.

Table 6.2.2 Trade values (imports) of Cambodia by commodity and partner country (2011)

[Million US $]

Category	ASEAN	China	EU (27)	Japan	US	Others	WORLD
Food and live animals	162	5	22	1	9	29	228
Beverages and tobacco	147	2	3	0	0	16	167
Crude materials, inedible, except fuels	29	8	1	8	5	50	101
Mineral fuels, lubricants and related materials	773	2	0	0	0	3	778
Animal and vegetable oils, fats and waxes	5	0	0	0	1	0	6
Chemicals and related products, n.e.s.	166	41	44	3	3	90	347
Manufactured goods classified chiefly by material	525	1,236	31	21	3	930	2,746
Machinery and transport equipment	295	304	87	183	94	207	1,170

Source: ASEAN Stats database (http://aseanstats.asean.org/)



[Million US $]

Source: ASEAN Stats database (http://aseanstats.asean.org/)

Figure 6.2.4 Trade values (imports) of Cambodia by commodity and partner country (2011)

Chapter 7 Physical Distribution Network

The themes of this survey are divided into three categories as follows: 1) Understanding of Supply Chain Circumstances in ASEAN Countries, 2) Understanding of Circumstances on Physical Distribution Network ,and 3) Organizing the framework of vulnerability analysis for natural disasters on the ASEAN Logistics Network.

7.1 Understanding of Supply Chain Circumstances in Cambodia

(1) Relation to Logistics Performance Index on International Physical Distribution

Table 7.1.1 International LPI (Logistics Performance Index) [*1] Ranking 2012

Rank	Country	LPI	Customs	Infrastructure	International Shipment	Logistics Competence	Tracing & Tracking	Timeliness
129	**Cambodia**	**2.37**	**2.28**	**2.12**	**2.19**	**2.29**	**2.5**	**2.84**

Source: World Bank Connecting to Compete 2012 Trade Logistics in the Global Economy

(2) Features of Physical Distribution in Relation to Main Industries in Industrial Parks

The lists of ASEAN-JAPAN CENTER (AJC) web-site*2 have no specific time of investigation by year/month, but it is considered that the general current status of industry agglomeration at the time of the investigation can be obtained.

The industries in industrial parks are classified into the following 13 categories:

1) Fishery/Foodstuff, 2) Textile/Apparel, 3) Pulp/Paper, 4) Chemicals, Oil, Rubber/Ceramic, 5) Steel/Nonferrous metal, 6) Transport machines (Cars), 7) Electrical/Electronics/Precision apparatus, 8) Other industries, 9) Commerce (wholesale, retail), 10) Real estate, 11) Logistics/Warehouse, 12) Finance/Insurance/Other services, and 13) Information/Telecommunication.

Based on the industrial classifications above, the characteristics of distributions of the products from industrial parks are estimated.

The objective industrial parks are selected based on the criterion such as: 1) Degree of geographic accumulation, 2) Having sufficient operational experiences, 3) The size and number of Japanese companies, 4) Located in the pilot area in case of Vietnam, the Philippines and Indonesia.

In the AJC list, 22 numbers of SEZ are registered, including developments under way. Of the above SEZ, Phnom Penh SEZ, Sihanoukville SEZ 1, and Neang Kok Koh Kong SEZ have got Japanese affiliated tenant companies in operation at the time of survey.

Main products in those SEZs are clothes, heat proof chemicals/ceramics, motor cycle parts, electric appliances parts and sundry goods including their wrapping and packaging materials.

Since there are no final goods manufactures, intermediate goods/parts are guessed to be exported to neighbor countries like Thailand, Vietnam, and China.

The major export/import items of Cambodia are as follows (Ministry of Foreign Affairs of Japan, country and regional situation, Cambodia, Economy)[*3]:

- Export：Needle work products, Rubber product
- Import：Textile, Petloreum products, Transportation equipment

The main means of shipping will be by truck and shipment by sea will be from Sihanoukville Port and by riverine transport from Phnom Penh Port.

(3) Supply Chain Circumstances

Physical distribution is evolving by the stages of Physical Distribution Development Phasing (PDDP) as follows:

1) Physical distribution control: Company's own sphere of materials/ products distribution (PDC).
2) Logistics management: Company's own distribution management by the market-in strategy (LGM).
3) Supply chain management: Integrated distribution management from company's own to systemized one by the collaboration with other logistics operator resources (SCM)

Other criteria can be considered applicable, so that the development phase may be justified, based on industrial categories and their products' varieties and volumes in the selected industrial parks/ SEZ.

1) Kinds and diversity of products (intermediate or final products).
2) Whether production of high valued goods like cars, electrical/ electronic/ precision devices or not, and the levels.
3) Correspondence of export/import major items of goods to, classification of intermediate/ final products
4) Existence of a regional head office of a company which power is vested from the headquarter, and the power strength in management term.
5) Existence of logistics operator as a 3PL and maturity of the business
6) Inter dependency of industrial parks/ SEZ with megalopolises in the vicinity.

The result of assessment is shown in the table below which is made by LPI of the World Bank and by supply chain circumstances determined by above mentioned industries in the industrial park as well as major export/import items in the light of the above three stages of PDDP. The evaluation is shown by relative evaluation of five levels among ASEAN countries. Since there are no distinction time and contents wise in PDDP, the level of development is indicated as a continuous line in the table below.

Table 7.1.2 Physical Distribution Development Phasing

LPI	Country	PDDP								
					Criteria					
		PDC	LGM	SCM	Products diversified	High valued goods	Export/ Import	Regional head office	Logistics operator	Products diversified
2.37	**Cambodia**	[redacted]			**2**	**2**	**2**	**1**	**2**	**2**

Source: JICA Study Team

7.2 Current Status and Trends of Cambodia Logistics Network

(1) Domestic Physical Distribution Network

Central, Southern and East-West Corridor of GMS economic zone forms the main distribution network in Cambodia running through the national territory.

Recent reformation of the international supply chain within Mekong economic zone is attracting increasing number of companies in the industrial park near Phnom Penh.

The importance of above three corridors will increase as the major international distribution route along with the further development of GMS economic zone.

In Cambodia, Sihanoukville Port, Phnon Penh Port, national highway connecting the capital city Phnom Penh and each industrial parks as well as arterial streets in the cities and in the suburbs form the major distribution network.

According to the recent trend, the demand of Mekong River waterway logistics from Phnom Penh Port to Ho Chi Minh Port in Vietnam is estimated to grow.

(2) Intra-ASEAN Physical Distribution Network

According to ASEAN Strategic Transport Plan 2011-2015, intra-ASEAN trade of Cambodia is reported to be about 55% of the total amount, in the order of Thailand, Vietnam, Singapore in terms of main trade partner country.

Transportation method with Thailand is mostly by truck, with Vietnam is land and barge transportation utilizing the Mekong River. Singapore plays roles for cargo transshipment within and outside the ASEAN region.

(3) Extra-ASEAN Physical Distribution Network

Physical distributions of Cambodia to and from Extra-ASEAN are either by sea and air. At present, marine transportation is the most commonly-used means of transportation on both weight and value basis.

In the marine transport, containerized cargo is a typical form of transport at this moment among the general cargo, except bulk cargo.

According to ASEAN Strategic Transport Plan 2011-2015, the container annual cargo traffics are shared by Sihanoukville Port of about 26,000TEU and by Phnon Penh Port of about 47,000TEU.

Main trade partners are USA, China, and Hong Kong in this order.

From above situation being overviewed, it is considered that most of extra-ASEAN logistics cargo flows are to be transshipped at both Port of Singapore and Hong Kong.

7.3 Analysis Frame on ASEAN Physical Distribution Network

This section studies frame for assessment of the vulnerability of logistics network against natural disasters in consideration of the actual situation of supply chain, as a preparedness of formulation of area BCP.

The vulnerability itself is to be assessed after the further survey.

Table 7.3.1 Natural Disaster Prevention Related Matters in relation to vulnerability of Physical Distribution Facilities

Industrial Park Name represented	Not designated yet
Features	Place: Operation commenced in: Nos of Operating Enterprises : Total IPK Annual Turn-over (Mill.US$):
Vulnerability Assessment Frame for Each Industrial Park (IPK)	
Natural Disaster Risk(NDR): Extract from Survey Report 1 "Chapter 5 Existing Investigations and Studies"	
■ Flooding	Flood hazard possibility is high through the Mekong River from the Tonle Sap Lake area to Vietnam. Reported cases of damage in Cambodia are about 20 cases in the database.
■ Seismic intensity/ Tsunami	Earthquake hazard level in Cambodia is low. No earthquake disaster is recorded in the database. Tsunami hazard level of Cambodia is low. No tsunami disaster is recorded in the database.
■ Volcano	Volcano hazard level of Cambodia is low. No volcanic disaster is recorded in the database.
■ Cyclone, Meteorological Disaster, Landslide	The impact of cyclone hazard on whole the country is not so high. Typhoons sometimes affect Cambodia after landing on Vietnam. According to 1980-2012 records, four storm disasters have occurred in the country. For landslide, some hazards distribute in the mountain area near coast, however, no hazard is distributed in Mekong low land area around the capital city of Phnom Penh.
Brief Descriptions on Counter-measures (CMS) for NDR	
1) Private sector facilities: To follow further Survey	
Land, In-park Roads:	
Plant facilities:	
Physical Distribution Facilities:	
Others, if any:	
2) Infrastructures	
Road：Cambodia locates at the heart of Thailand, Vietnam and Lao having important role in international logistics and regional integration. Existing road improvement and maintenance is necessary prior to developing new roads construction. Completion of rehabilitation including NH5, NH6 and bridge along NR45 is an essential complement on the missing section of GMS highway.	
Railway：In order to meet the demand of container transportation by railway, the new container yard is planned between Sihanoukville port and the railway station. This railway logistics is important as a alternative route to road network.	
Port: Sihanoukville port is the only one deep water port in Cambodia. At present 12 berths with modern cargo handling equipment are installed. Sihanoukvill port handles almost all general cargo in Cambodia, but handling amount of container cargo still lag behind the Phnom Penh port. Phnom Penh port is a river port of Mekong River having weakness in flood	

disaster. Therefore, increasing container handling capacity in Sihanouvkille port is important.
Airport: Judged from the current economic and industrial structure, demand for air cargo is low and expect to correspond to the passenger for the time being.
Electric power/Fuel: Cambodian government is already developed power development plan 2008-2021 and transmission line is under construction in accordance with plan. However, the improvement of power generation capacity is an important issue since Cambodia still imports power from neighboring countries.
Water-supply:
Sewage:
Solid waste:
Telecommunication: Out of telephone subscribers, 98.8% is a user of the mobile phone. Internet is operated by Telecom Cambodia under the name of Cam Net. About two-thirds of the country is covered by optical cable.

Note:

*1 The summary of "Logistics Performance Index" by the World Bank is as follows.

(1) LPI score and category wise score is indicated by each country

(2) Score is ranked from one to five

(3) LPI of international logistics is scored based on the interviewing following six items to major importers and logistics companies in the neighboring countries (total of over 1000 companies).

1) Efficiency of the clearance process i.e. Speed, simplicity and predictability of formalities by border control agencies, including Customs
2) Quality of trade and transport related infrastructure e.g. Ports, railroads, roads, information technology
3) Ease of arranging competitively priced shipments
4) Competence and quality of logistics services e.g. transport operators, customs brokers
5) Ability to track and trace consignments)
6) Timeliness of shipments in reaching destination within the scheduled or expected delivery time.

*2 http://www.asean.or.jp/ja/invest/about/country_info/brunei/invest_info/industrialestate/

*3 http://www.mofa.go.jp/mofaj/area/brunei/data.html#04

References :

1) ASEAN-JAPAN CENTER, Lists of Industrial Parks/Estate/SEZ by Member Country (in Japanese)
2) World Bank Connecting to Compete 2012 Trade Logistics in the Global Economy
3) Shinya Nakata (2012), Introduction to Logistics, NIKKEI Newspapers in Japan (in Japanese)
4) JETRO (2008), ASEAN Physical Distribution Network 2008 (in Japanese)
5) ERIA: ASEAN Strategic Transport Plan 2011-2015.
6) ASEAN Secretariat, ASEAN Statistics on Intra and Extra_ ASEAN trade 2011

Chapter 8 Legislative Systems

A survey on the legislative systems concerned with disaster management, business continuity, environmental pollution, and development in Cambodia is conducted in this chapter.

The survey of Cambodia is mostly based on research through the websites of Cambodian ministries and agencies, and also several leading international institutes that contributed to disaster research such as the Asia Disaster Reduction Center. Laws, regulations, national implementation plans, and statutes are referred to within the scope of the survey.

The table below shows the methodology for collecting information.

Information Collected	Methodology	Scope of Survey
Legislative Systems for Disaster Management	To collect information from the internet, which is published by international agencies such as ADRC and disaster management institutes in Cambodia. And to refer to the report by the JICA research team.	Laws and decrees of disaster management. National strategies on development, action plans on disaster risk management, and contingency plans.
Regulations and Standards for BCM / BCP	To collect information from the internet. No official institutes regulating the BCM/BCP exist in Cambodia.	Standards or regulations related to BCM. No standards or policies are found in Cambodia.
Legislative Systems for Environment and Pollution	To collect information from the websites of ministries and agencies responsible for environment management.	Laws and decrees for environmental assessment. Sub-decrees of industrial activities for environmental pollution control.
Legislative Systems for Development including Land Use, River and Building Regulations	To collect information from the websites of ministries and agencies related to land use.	Laws and ordinances describing land use, rivers. No official building standards exist in Cambodia.

The laws, regulations, decrees, and guidelines regulating the target fields defined above are compiled in this survey. The results of the survey in Cambodia are summarized below.

Scope	Information
Legislative Systems for Disaster Management in Cambodia	[Strategies and Plans] "Law on National Disaster Management", "Sub-decree No.35 ANK", "Sub-decree No.61 ANK". [Regulations, Standards, and Guidelines] "National Policy on Emergency Management, 1997", "National Contingency Policy for Flood, 2011", "NCDM Institutional Development Strategy in 2001", "Strategic National Action Plan for Disaster Risk Reduction 2008-2013", "National Strategy Development Plan 2009-2013"
Regulations and Standards for BCM / BCP in Cambodia	No regulations, standards, or guidelines for business continuity management in time of disaster have been identified in Cambodia.
Legislative Systems for Environment and Pollution in Cambodia	[Laws for Environment] "Law on Environmental Protection and Natural Resources Management, 1996", "Law on the Water Resources Management, 2007", "Sub-Decree No.72 Anrk.bk on Environmental Impact Assessment Process, August 1999". [Laws and Regulations for Environmental Pollution Control] "Sub-Decree No.27 Anrk.bk on Water Pollution Control, April 1999", "Sub-Decree No.42 Anrk.bk on Air Pollution Control and Noise Disturbance, July 2000", "Sub-Decree No.36 Anrk.bk on Solid Waste Management, April 1999"

Legislative Systems for Development including Land Use, Rivers, and Building Regulations in Cambodia	"Law on Land, 2001", "Law on Forestry, 2002", "Sub-Decree On Community Forestry Management", "Sub-Decree on River Basin Management"

The available results on the survey about the laws and regulations for disaster management, BCP/BCM, environmental conservation, and provisions for development in Cambodia are summarized below.

According to a survey on legislative systems in Cambodia, no regulations, standards, or guidelines defining Business Continuity Management have been determinably established.

8.1 Legislative systems for disaster management

(1) Disaster management laws

Table 8.1.1 Laws and Regulations of Disaster Management in Cambodia

	Laws / Regulations	Supervisory Authority	Matter
Law	Law on National Disaster Management (Draft)	National Committee for Disaster Management	Disaster Management
Decree	Sub-decree No.35 ANK	under survey	Disaster Management, Organization
Decree	Sub-decree No.61 ANK	under survey	Organization

Laws for disaster management have not been developed in Cambodia. In the absence of disaster management law, Sub-decree No. 35 ANK has been a core principle for disaster management and defined the establishment of the National Committee for Disaster Management (NCDM). In addition, based on Sub-decree No.61 ANK, the Commune Committee for Disaster Management has been established at the local level.

The NCDM has been discussing the development of the Law on National Disaster Management since 2011. A draft of the Law on National Disaster Management has been published and is to be enacted in 2013.

(2) Disaster management strategies and plans

Table 8.1.2 Strategies and Plan for Disaster Management in Cambodia

	Laws / Regulations	Supervisory Authority	Matter
Policy	National Policy on Emergency Management, 1997	under survey	General Disaster
Policy	National Contingency Policy for Flood, 2011	under survey	Flood
Strategy	NCDM Institutional Development Strategy in 2001	NCDM	General Disaster
Plan	Strategic National Action Plan for Disaster Risk Reduction 2008-2013	NCDM	General Disaster
Plan	National Strategy Development Plan 2009-2013	NCDM	General Disaster

In the Strategic National Action Plan for Disaster Risk Reduction 2008-2013, developed in 2009, activities for disaster risk reduction have been identified and include: protecting rural areas from

the natural hazards of flood and drought, enabling communities for disaster preparedness and risk reduction, and reducing the vulnerability of the poor to external factors including natural hazards. As of 2012, however, the Action Plan has not been implemented.

The NCDM developed the Institutional Development Strategy, which stipulates the establishment of an effective inter-ministerial system for dealing with disaster preparedness, response, and rehabilitation for five years from 2001.

For our report, documents regarding the National Policy on Emergency Management and the National Contingency Policy for Flood have not been found, thus details about the policies are not clear.

8.2 Regulations and standards for business continuity management

No regulations, standards or guidelines for business continuity management in time of disaster have been identified in Cambodia.

8.3 Legislative systems for the environment and pollution control

(1) Environmental laws and regulations

Table 8.3.1 Laws and Regulations regarding the Environment in Cambodia

	Laws / Regulations	Supervisory Authority	Matter
Law	Law on Environmental Protection and Natural Resources Management, 1996	Ministry of Environment	Environmental Assessment
Law	Law on the Water Resources Management, 2007	Ministry of Environment	Water Pollution
Decree	Sub-Decree No.72 Anrk.bk on Environmental Impact Assessment Process, August 1999	Ministry of Environment	Environmental Assessment

The Law on Environmental Protection and Natural Resources Management requires the implementation of environmental assessments for all domestic development projects in Cambodia. The target projects and environmental assessment processes are defined in the Sub-Decree No.72 Anrk.bk.

In addition, the Law on Water Resources Management has been established and the basic policy for management of water resources is regulated by this law.

(2) Pollution control laws and regulations

Table 8.3.2 Laws and Regulations for Environmental Pollution Control in Cambodia

	Laws / Regulations	Supervisory Authority	Matter
Sub-Decree	Sub-Decree No.27 Anrk.bk on Water Pollution Control, April 1999	Ministry of Environment	Water pollution
Sub-Decree	Sub-Decree No.42 Anrk.bk on Air Pollution Control and Noise Disturbance, July 2000	under survey	Air pollution
Sub-Decree	Sub-Decree No.36 Anrk.bk on Solid Waste	under survey	Solid Waste

	Management, April 1999		

Regulations on environmental pollution control in Cambodia are regulated by sub-decrees.

The sub-decrees defining environmental pollution regulation related to industrial activities are listed above. Sub-Decree No.27 Anrk.bk regulates water quality and effluent in rivers, Sub-Decree No.42 Anrk.bk regulates air and noise pollution, and Sub-Decree No.36 Anrk.bk regulates the of management of solid industrial waste.

8.4 Legislative systems for development including land use, rivers, and building codes

Table 8.3.1 Laws and Regulations for Land, Rivers, and Building Code in Cambodia

	Law / Regulations	Supervisory Authority	Matter
Law	Law on Land, 2001	Minister of Land Management, Urban Planning and Construction	Land use
Law	Law on Forestry, 2002	under survey	Forest
Decree	Sub-Decree On Community Forestry Management	under survey	Forest
Decree	Sub-Decree on River Basin Management (Draft)	under survey	River

Legal provisions pertaining to land use and forests are stipulated in the Law on Land and the Law on Forestry.

Regulations for the development and use of river basins are to be enacted by governmental sub-decree. A draft of the document has already been published.

In our research, a specific building codes enacted in Cambodia could not be verified.

Chapter 9 Situation of Implementation of BCP

9.1 Major natural disasters and disaster management awareness

The major natural disasters that are expected to have a higher risk of causing damage in Cambodia are heavy rain and floods. The expectation for damage by flooding has seemed to rise due to climate change in recent years. However, high tide disasters and storm surges are not considered, because urban regions including Phnom Penh city are located inland. There has not been any severe damaged caused by landslide disasters.

In Phnom Penh, most enterprises consider that damage caused by floods is not a consideration for their business and the economy, even though minor flooding on roads is a frequent occurrence due to undeveloped drainage facilities in the city. In addition, because of lack of experience with natural disasters, their awareness of disaster risk is underdeveloped.

In rural regions, floods cause major damage in the farming industry. Moreover, people also consider avian influenza epidemics to be a hazardous disaster needing a governmental control policy.

9.2 Current state of BCP implementation

The concept of BCP is not known among government agencies and enterprises in Cambodia. BCP is also unknown even in non-governmental agencies such as the Chamber of Commerce and Industry. Currently, there appear to be no enterprises or agencies that have considered developing a BCP.

Most Cambodian enterprises have little interest in preparing for corporate risk management of natural disasters. Only some major companies have tried to establish policies for disaster contingency plans.

Though some enterprises such as automotive parts manufacturers, located mainly in Thailand with branches or factories in Cambodia, may have advanced schemes for disaster risk management, most enterprises generally do not expect and are not prepared for disaster risks.

9.3 Efforts on furthering BCP implementation

The National Committee for Disaster Management (NCDM) is in charge of the national disaster management system in Cambodia. Since national disaster management policy consists of the preparation and development of disaster mitigation systems at the community level, the government does not place importance on disaster risk mitigation for the economy and business, but instead on human damage and public life as the contingency policy. The dissemination of BCP is regarded as a goal for the future, with first priority placed on the development of disaster risk mitigation systems among enterprises and local governments.

Regarding disaster risk management, strategic conferences by national specialized institutions and projects for meteorological disasters by non-governmental international institutes are being conducted due to the increased attention placed on climate change.

9.4 BCP implementation problems

A lack of funds, knowledge, and other resources regarding disaster risk management discourages enterprises and individuals from developing disaster preparedness plans. In order to disseminate BCP in Cambodia, it is necessary to first raise BCP awareness among enterprises through seminars or other educational tools. International agencies specializing in disaster risk must provide support for enhancing knowledge and skills pertaining to disaster risk management.

List of Agglomerated Areas

ID	Short List	LongList	COUNTRY	PROVINCE	PARK NAME	ADDRESS
KH0001			Cambodia		D&M Bavet SEZ	Bavet commune, Chantrea District, Svay Rieng Province
KH0002			Cambodia		Doung Chhiv Phnom Den SEZ	No Address
KH0003		**XXKH01**	Cambodia		Goldfame Pak Shun SEZ	Middle of Phnom Penh and Takeo
KH0004			Cambodia		Kampong Saom SEZ	Mittapheap Kampuchea Soviet
KH0005			Cambodia		Kampot SEZ	Kipling Ln Kampot
KH0006			Cambodia		Kiri Sakor Koh Kong SEZ	Boutum Sakor National Park
KH0007		**XXKH02**	Cambodia		Manhattan (Svay Reing) SEZ	Bavet Commune, Chantrea District, Svay Rieng Province
KH0008			Cambodia		MDS THMORDA SEZ	No Address
KH0009			Cambodia		N.L.C SEZ	No Address
KH0010			Cambodia		Neang Kok Koh Kong SEZ	No Address
KH0011			Cambodia		Oknha Mong SEZ	Oknha Mong Reththy,Phnom Penh
KH0012			Cambodia		P (SEZ) I C	Salatean and Preytob Village, Chhrokmates Commune, Svay teap District,Svey Rieng
KH0013	**XXKH03**	**XXKH03**	Cambodia		Phnom Penh SEZ	Unnamed Rd Phnom Penh Special Economic Zone
KH0014			Cambodia		Poi Pet O'Neang SEZ	No Address
KH0015			Cambodia		S.N.C SEZ	National Highway 6
KH0016			Cambodia		Sihanoukville Port SEZ	Krong Preach Sianouk KHAN Mittapheap
KH0017			Cambodia		Sihanoukville SEZ 1	Near air port Mittapheap Kampuchea Krong Preah Sianouk
KH0018	**XXKH04**	**XXKH04**	Cambodia		Sihanoukville SEZ 2	Near air port Mittapheap Kampuchea Krong Preah Sianouk
KH0019			Cambodia		Stung Hav SEZ	No Address
KH0020			Cambodia		Suoy Chheng SEZ	No Address
KH0021		**XXKH05**	Cambodia		Tai Seng Bavet SEZ	Bavet District, Svay Rieng Province
KH0022			Cambodia		Thary Kampong Cham SEZ	216 Preah Norodom Blvd Phnom Penh

INDONESIA

Table of Contents

Chapter 1 Introduction

The report is a draft version of the Country Report for Indonesia, which will be a reference document for organizations of the private and public sectors wishing to prepare an Area Business Continuity Plan (Area BCP) and develop an Area Business Continuity Management System (Area BCM System).

The country report contains information on natural disaster risks, industrial parks and investment risk, key infrastructure and lifeline systems, as well as issues to consider during natural disasters. It also presents an outline of economy and trade, an outline of physical distribution, and current practices for implementing business continuity management (BCM) in the country.

The draft report will be refined and finalized at the end of the Project.

Chapter 2 Overview of the Country

Indonesia is the largest archipelago in the world comprised of 18,110 islands, extending 5,110 km from east to west. In Indonesia and the surrounding region, several ocean plates collide with each other, and form part of the Circum-Pacific orogenic belts. For that reason, Indonesia has many volcanoes, including Krakatoa. Indonesia is the fourth most populous nation, with the world's largest Muslim population.

Indonesia is one of the founding members of ASEAN (founded on August 8, 1967), and the Headquarters of ASEAN is located in Jakarta, the capital of Indonesia. It is the most populous country in ASEAN, with approximately 40 percent of the total population of ASEAN living in the country.

The country adopts a presidential system, and the government is classified as a republican government. The current president of Indonesia is Susilo Bamban Yudhoyono. The Yudhoyono administration identified economic development, use of natural resources, and improvement of human resources as the country's highest priority areas. It is expected that the country will continue to promote mining and processing of resources, and the manufacturing of industrial products.

Basic Information of Indonesia

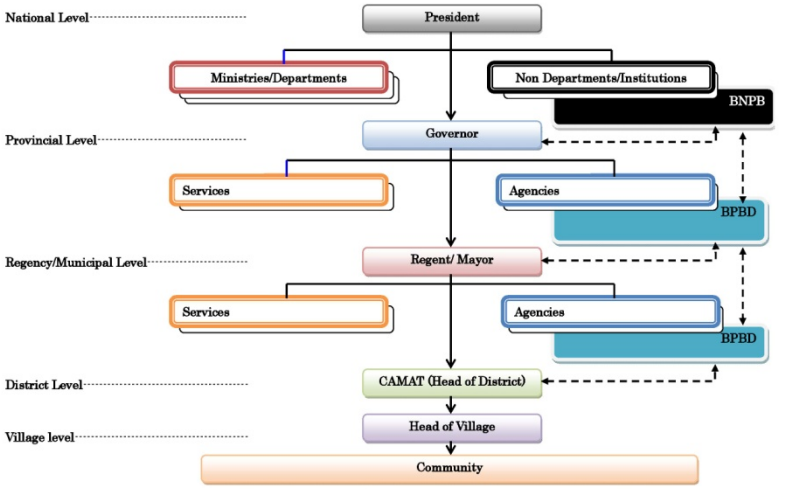
National Flag

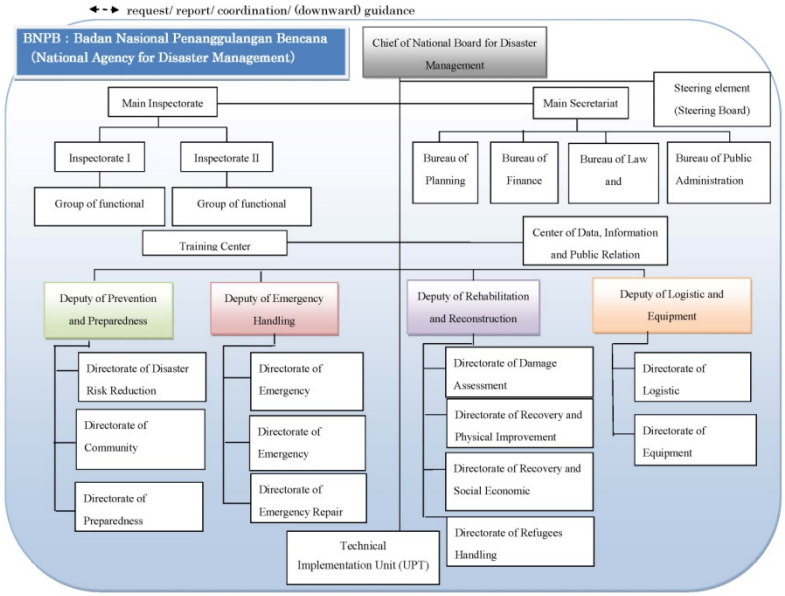
Capital	Jakarta
Ethnic Groups	Mostly Malays (there are about 300 ethnic groups including Java and Sunda)
Languages	Indonesian
Religions	Islam 88.1%, Christianity 9.3%(Protestant 6.1%, Catholic 3.2%), Hinduism 1.8%, Buddhism 0.6%, Confucianism 0.1%, Others 0.1%
Area (km^2)	Total: 1,904,570 Land: 1,811,570 Inland Water:93,000

Population	246,864,191	**Economic growth rate (annual %)**	6.2
Population density(people/ km^2 of land area)	136	**GNI per capita, PPP (current international $)**	4,730
Population growth (annual %)	1.2	**Agriculture, value added (% of GDP)**	14
Urban population (% of total)	51	**Industry, value added (% of GDP)**	47
GDP (current US$) (billion)	878	**Services, etc., value added (% of GDP)**	39

Features of Disasters

The various types of disasters such as flooding, earthquake, mass movement-wet, and volcanic eruption occurred in Indonesia. Earthquake and flood disrupted 88% of the total number of affected people. On the other hand, earthquake caused the highest number of death and significant economic losses. This is mainly due to the Sumatra Earthquake in 2004 and Java Earthquake in 2006. Flooding and earthquake will be the two major disasters that have great impact in Indonesia.





Sources: (Above) Dr. Syamsul Maarif, Msi (date unknown) *Disaster Management in Indonesia*, (Presentation Slide), p.11.
(Below) http://www.bnpb.go.id/website/asp/content.asp?id=4 [Accessed: June 3, 2012] (BNPB's organogram was provisionally translated in English by the JICA Study Team)

Sources; Map and Flag: CIA(Central Intelligence Agency) website (2014) (https://www.cia.gov)

Capital, Ethnic Groups, Languages and Religions: Ministry of Foreign Affairs website (2013) (http://www.mofa.go.jp)

Area, Population, Population density, Population growth, Urban population, GDP, Economic growth rate, GNI per capita, PPP, Agriculture, value added, Industry, value added and Services, etc., value added: The World Bank Data Bank website (2012) (http://data.worldbank.org)

Chapter 3 Natural Disaster Risk

3.1 Flood

(1) Risk

Summary of flood disaster

There is a high frequency of floods in this country. Java Island has the highest frequency, followed by Sumatra Island and Sulawesi Island, but Kalimantan Island has a low frequency. Many floods have occurred due to the east-west monsoons in the rainy season (January to February). Heavy rainfalls in the mountainous region cause floods in the plain and extensive damage in swamps and coastal low-lying areas. Urban areas become inundated because of an insufficient drainage system and poor maintenance work. Land subsidence is common in coastal towns due to groundwater use by industries, etc., and due to an increase in ponding.

Notable floods and disasters in recent years

1. Storm rainfalls on February 5, 2007 and January 15-25, 2013 caused flood damage.
2. Storm rainfall on February 5, 2007 caused flood disasters leaving 60 dead and affecting 220,000. Economic losses totaled approximately USD 1 billion in Jakarta, Bakasi, and the surrounding area, according to the EM-DAT (The International Disaster Database).
3. The flood on March 27, 2009 was caused by very strong rainfall. The Si tu Gintung Dam at Tengerang in Banten Province collapsed and the sudden flood affected 2,000 people and left 100 dead or missing from Cirendeu downstream, according to the Emergency Situation Report of the United Nations issued on March 20.
4. The flood on January 15, 2013 caused by prolonged storm rainfall lasting one week affected 40,000 people and left 40 dead in Jakarta and the surrounding area.

The human losses and economic losses are shown in Figures 3.1.1 and 3.1.2 respectively.

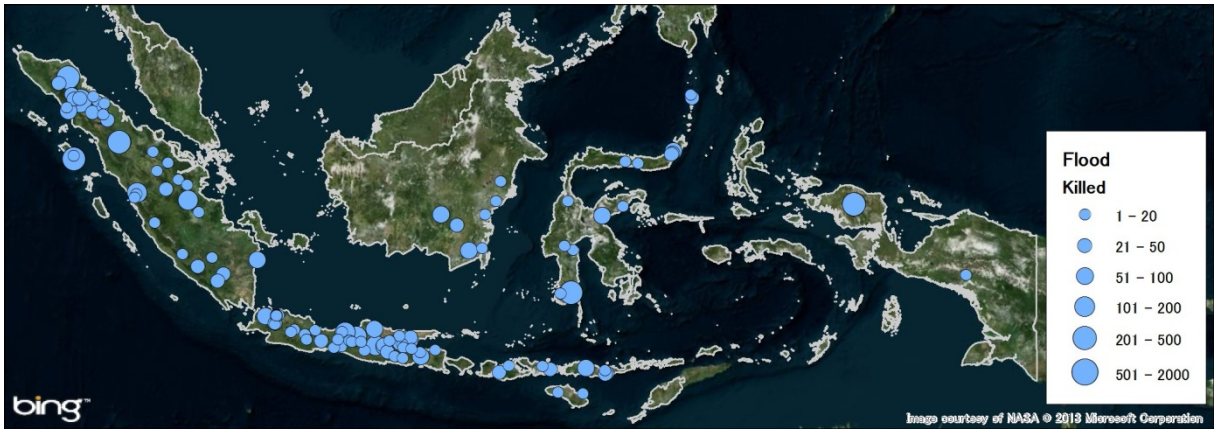


Figure 3.1.1 Flood Damage: Human Losses

Figure 3.1.2 Flood Damage: Economic Losses (% of GDP)

(2) Background

Characteristics of floods

Floods caused by storm rainfalls occur from January to February in the rainy season. Heavy rainfalls in the mountain area cause floods in the plains downstream.

Notable examples of flood disasters

- The flood on February 5, 2007 caused by rainfall in the amount of over 150 mm beginning January 23 in the southern part of Jakarta caused damages including 60 fatalities. Approximately 220,000 people in Jakarta, Tangeran, and Bakasi were affected. It also caused damage to Japanese-owned businesses in Jakarta.
- The flash flood on March 27, 2009 was caused by the collapse of the Situ Gintung Dam, where the water level was raised by prolonged rainfalls. A flash flood occurred before dawn on March 27, causing severe damages in the settlements of Cirendeu and Ciputat downstream, leaving 100 people dead or missing.
- The flood on January 15, 2013 was caused by storm rainfalls and lasted until January 25 due to intermittent storm rainfalls, causing damage in Jakarta and its surrounding area. The flood waters were deeper than 2 meters in the coastal area, which paralyzed transportation, blocked infrastructure, and greatly impacted the livelihood of citizens. The damages included 40 fatalities, and 40,000 people affected. The Jakarta Industrial Estate Pulogadung in east Jakarta was submerged, with operations stopped due to the stoppage of the electric power supply. At the industrial estate in west Java, some auto industries suspended operations as the disruption of the supply chain stopped the supply of parts.

Frequently flooded areas

- Java Island: Banten Province, Jakarta Special Capital Region, West Java Province, Central Java Province, East Java Province
- Sumatra island: Ache Province, North Sumatra Province

Figure 3.1.3 Hotspots of Flood Disaster: Human Loss

Figure 3.1.4 Hotspots of Flood Disaster: Economic Loss

(3) Efforts by the central government, local governments, and disaster management organizations

✓ National Disaster Management Agency (BNPB); http://www.bnpb.go.id/

- Established in 2008 to coordinate the implementation of comprehensive disaster management measures.
- Chief of BNPB, Management & Operation Committee, Policy Implementation Agency

✓ Management and Operational Committee

- This organization makes recommendation regarding disaster management to the chief of BNPB.
- Staff from ten (10) government organizations: Ministry of Home Affairs, Ministry of Ministry for Energy and Mineral Resources, Social Affairs, Ministry of Public Works, Ministry of Health, Ministry of Finance, Department of Transportation, police and National Army. Nine (9) experts comprise the committee.

✓ Policy Implementation Agency

- The agency conducts for pre-disaster, emergency response, and post-disaster measures
- Primary members of the Agency are the Prime Secretary, four (4) Directors (Prevention and Preparedness, Emergency Response, Rehabilitation & Reconstruction, Logistic & Equipment), and the Inspector.

✓ Regional Disaster Management Agency (BPBD)

- As a local disaster management agency, it coordinates the formulation of disaster management policy of the provinces, regencies, (Kabupaten), and cities (Kota) with the national policy of BNPB.

(4) Hazard and risk information sources

Disaster risk reduction organizations

Table 3.1.1 List of Organizations of Disaster Risk Reduction

Organization	Post	Web Address
Badan Nasional Penanggulangan Bencana, National Disaster Management Agency (BNPB)		http://www.bnpb.go.id/
The Management and Operational Committee		
The Policy Implementation Agency		
Regional Disaster Management Agency(BPBD) DKI Jakarta		http://bpbd.jakarta.go.id/
Regional Disaster Management Agency(BPBD) Java Tengah		http://bpbdjateng.info/
Regional Disaster Management Agency (BPBD) Java Barat		http://bpbd.jabarprov.go.id/
Badan Meteorologi, Klimatologi, dan Geofisika (BMKG)		http://www.bmkg.go.id/BMKG_Pusat/Depan.bmkg
Lembaga Ilmu Pengetahuan Indonesia (LIPI, Indonesian Institute of Sciences)		http://www.lipi.go.id/www.cgi?depan&&&&&eng
Institut Teknologi Bandung (ITB)		http://www.itb.ac.id/en/
ASEAN Coordinating Centre for Humanitarian Assistance on Disaster Management(AHA centre)		http://www.ahacentre.org/

Reports

Table 3.1.2 List of Reference Reports for Risk Analysis

Organization	Post	Title/ Web Address	Form
Asia Development Bank	Asian Water Development Outlook	Asian Water Development Outlook 2013: Asia-Pacific Water Forum	Report
		http://www.adb.org/publications/asian-water-development-outlook-2013	
World Bank	ASEAN Disaster Risk Management Initiative	Synthesis Report on Ten Asian Countries Disaster Risks Assessment; December 2012	Report
		http://www.unisdr.org/files/18872_asean.pdf	
The Nature Conservancy	ASEAN Disaster Risk Management Initiative	Wolrd Risk Report 2012: October 2012	Report
		http://www.ehs.unu.edu/article/read/worldriskreport-2012	

World Bank	Framework and Options for Implementation	Advancing Disaster Risk Financing and Insurance in ASEAN Countries: April 2012	Report
		https://openknowledge.worldbank.org/bitstream/handle/10986/12628/714530v20ESW0W0AN0appendices0June12.pdf?sequence=1	
International Development Research Centre	Economy and Environment Program for Southeast Asia (EEPSA)	Climate Change Vulnerability Mapping for Southeast Asia: January 2009	Report
		http://web.idrc.ca/uploads/user-S/12324196651Mapping_Report.pdf	
UNEP,GRID,UNISDR		Global Risk Data Platform	Web Map
		http://preview.grid.unep.ch/index.php?preview=map&lang=eng	
UNISDR,GAR		Desinventar Disaster Information Management System	Web Map
		http://www.desinventar.net/	

Abbreviations

BNPB	National Disaster Management Agency
BPBD	Regional Disaster Management Agency
BMKG	Agency for Meteorology, Climatology and Geophysics (Badan Meteorologi, kilimatologi, dan Geofisika)
LIPI	Indonesian Institute of Science
ITB	Institute Technology Bandung

References :

1) Ministry of Foreign Affairs of Japan (2013): “Information on Indonesia in Japanese”, 06 2013
2) ADRC: “Countries: Indonesia”, Information on Disaster Risk Reduction of the Member
3) ADRC: “Indonesia, Flood, 2007/02/03”
4) BBC NEWS (2007b): “Disease fears amid Jakarta floods,” 5 February 2007
5) BBC NEWS (2007a): “Jakarta floods death toll rises”, 4 February 2007
6) Relief Web, OCHA (2007d): “ACT Rapid Response for floods in Jakarta, Indonesia,” Rapid Response Payment No.03/2007,09 Feb 2007
7) Relief Web, OCHA (2007e): “Indonesia: Jakarta flood victims could face more rain, illness,” Report from Caritas, 16 Feb 2007
8) Relief Web, OCHA (2007f): “Major Natural Disaster in Indonesia During 2007,” Map from UN Office for the Coordination of Humanitarian Affairs, 31 Dec 2007.
9) BBC NEWS (2007): “In pictures: Jakarta flooding,” Sunday, 4 February 2007
10) Relief Web, OCHA (2007c): “Jakarta, Indonesia, Area affected by Flooding,” Map from UN Office for the Coordination of Humanitarian Affairs, as of 13 Feb 2007
11) Relief Web, OCHA (2007a): “DKI Jakarta Province, Indonesia, Location of Persons Displaced by Flooding,” Map from UN Office for the Coordination of Humanitarian Affairs, as of 7 Feb 2007
12) Relief Web, OCHA (2007b): “Indonesia, Flood Information Product - Jakarta Overview Derived from Radarsat-1,” Map from MDA Geospatial Services, 7 Feb 2007
13) ADRC (2009): “Indonesia, Flash Flood, 2009/03/27”, Details of Disaster Information

14) CNN NEWS (2009): "Suburban 'tsunami' kills 98 in Jakarta," March 29, 2009
15) Global Voices: Indonesia: ""Mini-Tsunami" hits village as dam collapses Posted," 30 March 2009
16) ADRC: "Indonesia, Flood, 2013/01/15," Details of Disaster Information
17) Relief Web, OCHA (2013c): Report from UN Office for the Coordination of Humanitarian Affairs, 22 Jan 2013
18) Relief Web, OCHA (2013b): "Assistance to Jakarta flood victims delayed floods in Jakarta and its greater area - Situation Report No. 03," Report from IRIN, 21 Jan 2013
19) Relief Web, OCHA (2013d): "Indonesia, Floods in Jakarta and its greater area," Situation Report No. 04/2013, as of 25 January 2013
20) Relief Web, OCHA (2013a): "Indonesia: Jakarta Flood," Map from UN Office for the Coordination of Humanitarian Affairs, 17 Jan 2013

3.2 Earthquakes

(1) Risk

Since 1797, 24 earthquakes with magnitude of 8 or more have been recorded in and around Indonesia. The 2004 Indian Ocean Earthquake (M9.1) was the largest.

More than 1,000 people were killed in 7 of those earthquake. Additionally, 10,000 people were killed by the earthquakes that occurred in 1815 and 1917 in Bali.

The earthquakes that greatly impacted the Indonesian economy were the 2004 Indian Ocean Earthquake (M9.1), the 2006 Central Java Earthquake, and the 2009 Sumatra Earthquake (M7.5).

Total losses caused by the 2004 Indian Ocean Earthquake (M9.1) were USD 10 billion (1.5% of GDP). The 2006 Central Java Earthquake (M6.3) was not so large in magnitude, but more than 5 thousand people were killed, with loss totaling USD 3.1 billion (0.40% of GDP). The 2009 Sumatra Earthquake (M7.5) caused the deaths of more than 1,000 people and USD2.2 billion in losses (0.23% of GDP).

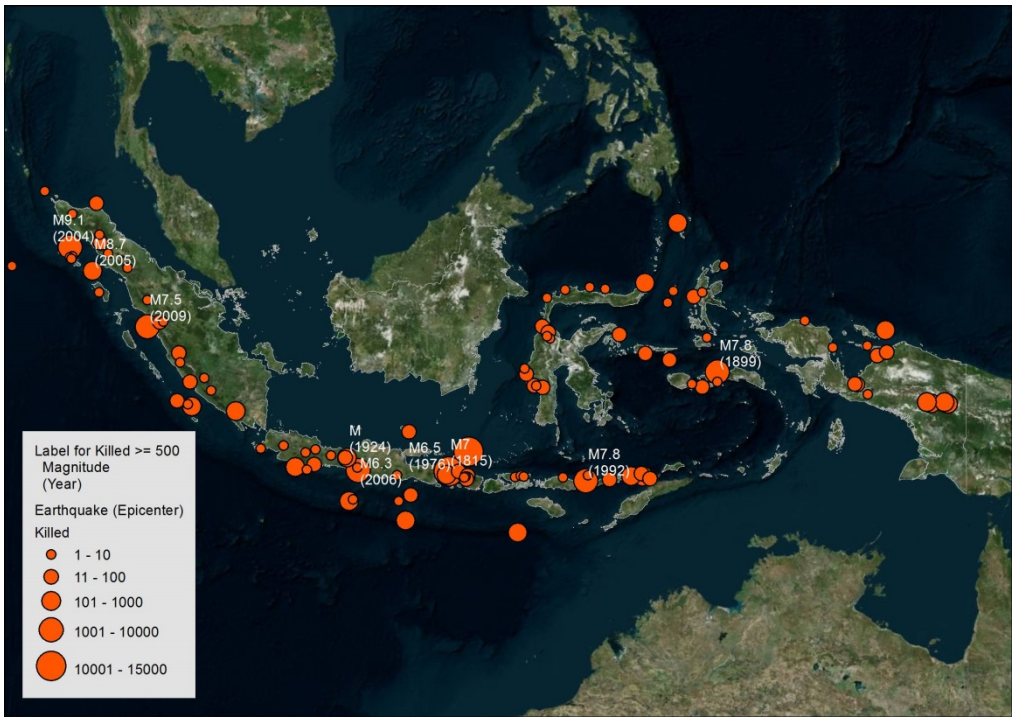


Figure 3.2.1 Earthquake Disasters: Human Losses

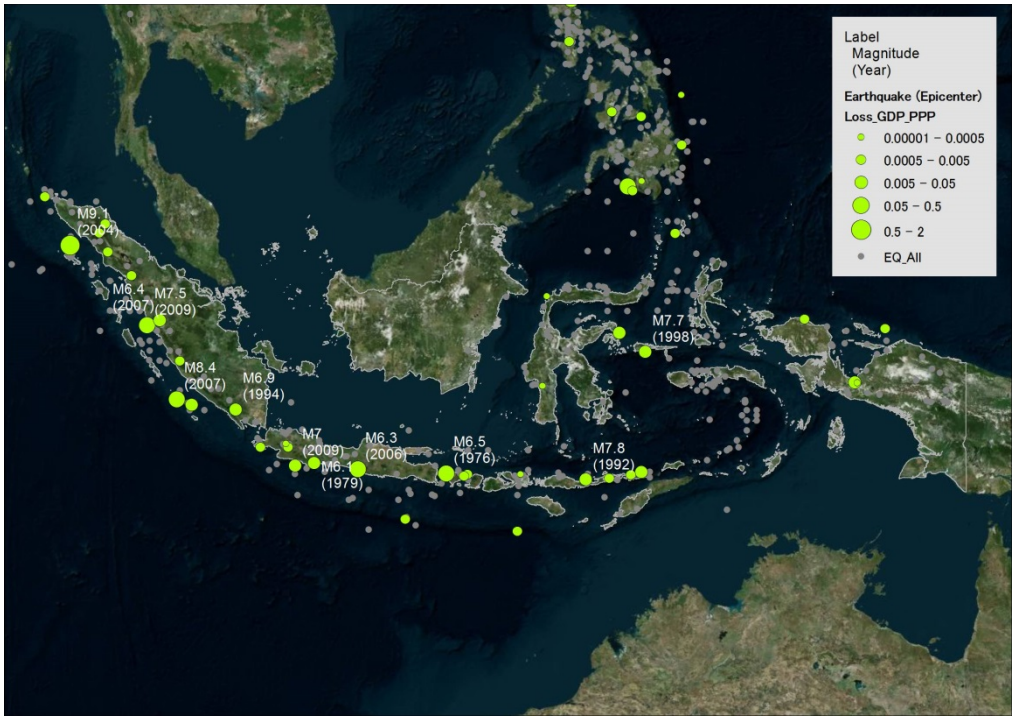


Figure 3.2.2 Earthquake Disasters: Economic Losses (% of GDP)

(2) Background

The south end of the Eurasian Plate where the Indonesian Archipelago is located forms complex plate boundaries with the subducting Indo-Australian Plate and the surging Pacific Plate and Philippine Sea Plate (See Figure 3.2.3). This causes many earthquakes around the area.

Many large earthquakes occur along the Sunda (Java) Trench where the Indo-Australian Plate subducts under the Indonesian Archipelago, as seen in the 2004 Indian Ocean Earthquake (M9.1) (See Figure 3.2.1).

Figure-3.2.4 is the Earthquake Risk Map developed by the insurance company, PT. Asuransi MAIPARK Indonesia. The map illustrates that the Sunda Trench sides of Sumatra and Java and the Pacific Ocean sides of New Guinea and Sulawesi have a high earthquake risk. On the other hand, the Java Sea and the Banda Sea sides have a low earthquake risk. The earthquake risk of Kalimantan is especially lower than other areas.

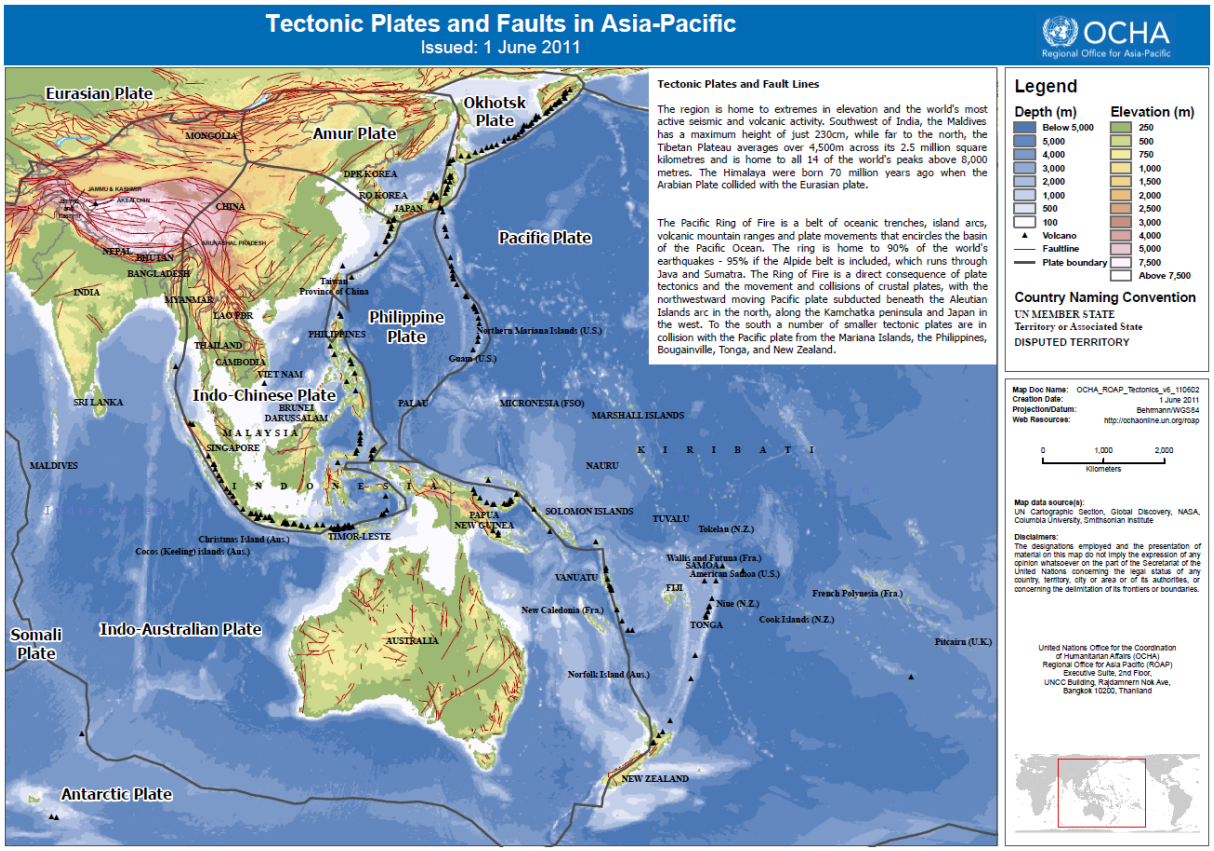
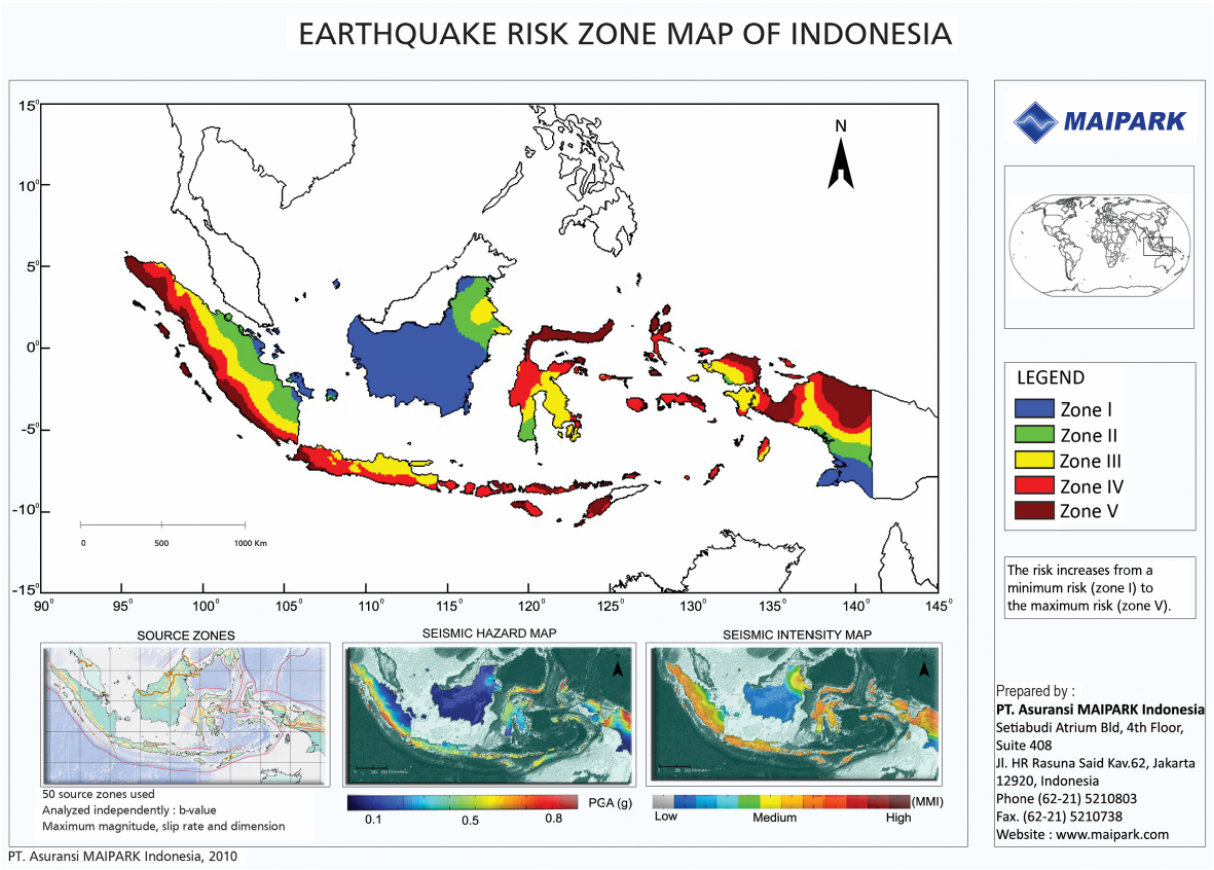


Figure 3.2.3 Tectonic Plates and Faults in Asia-Pacific



Source: http://www.maipark.com/download/File/other/MAIPARK%20EQ%20Zone%202010.pdf

Figure 3.2.4 Earthquake Risk Zone Map of Indonesia (MAIPARK 2010)

(3) Efforts by the central government, local governments, and disaster management organizations

Disaster Management Information

The Geology Research Development Centre (GRDC) has developed active fault maps for Mt. Merapi and Mt. Krakatoa, and a seismotectonic map of Manado.

For Aceh Province, TDMRC (Tsunami & Disaster Mitigation Research Center, Syiah Kuala University) has developed risk maps.

The National Agency for Disaster Management (BNPB) has developed two databases called GEOSPASIAL and DIBI (Data dan Informasi Bencana Indonesia), which are posted on their website. GEOSPASIAL is a Web-GIS database system that displays: (1) disaster/damage information caused by disasters occurring within 30 days, (2) various types of hazard maps, and (3) administrative boundaries on maps. DIBI is a database that stores information on historical disaster events in Indonesia. After a disaster has occurred, BNPB collects disaster information from the national government, local governments, NGOs, universities, etc., and enters the information into the database. The DIBI has accumulated data on disasters since 1815.

Early Warning and Information Transmission

The Meteorological, Climatological and Geophysical Agency (BMKG) prepares Seismic Intensity Maps in measured in Modified Mercalli Intensity after earthquakes and posts them on their website.

BMKG also operates the InaTEWS (Indonesia Tsunami Early Warning System), which manages the observation, analysis, evaluation, and transmission of information for earthquakes and tsunamis. Data is transmitted to the InaTEWS from more than 300 BMKG seismographs, GPS and tide-gauges from the Geospatial Information Agency (BIG), and tsunami buoys of Agency for the Assessment and Application of Technology (BPPT).

(4) Hazard and risk information sources

Badan Nasional Penanggulangan Bencana (BNPB) **National Agency for Disaster Management**
http://www.bnpb.go.id/
GEOSPASIAL
http://geospasial.bnpb.go.id/
Data dan Informasi Bencana Indonesia (DIBI) **Indonesian Disaster Information and Data**
http://dibi.bnpb.go.id/DesInventar/dashboard.jsp?lang=ID
Badan Meteorologi, Klimatologi, dan Geofisika (BMKG) **Meteorological, Climatological and Geophysical Agency**
http://www.bmkg.go.id/BMKG_Pusat/Depan.bmkg
Indonesia Tsunami Early Warning System (InaTEWS)
http://inatews.bmkg.go.id/new/
Badan Informasi Geospasial (BIG) **Geospatial Information Agency**
http://www.bakosurtanal.go.id/
Badan Penanggulangan Bencana Aceh (BPBA) **Aceh Disaster Management Agency**
http://bpba.acehprov.go.id/
Tsunami and Disaster Mitigation Research Center (TDMRC), Syiah Kuala University
http://www.tdmrc.org/en/
Badan Geologi
http://www.bgl.esdm.go.id/
Pusat Vulkanologi dan Mitigasi Bencana Geologi (PVMBG) **Center for Volcanology and Geological Hazard Mitigation**
http://www.vsi.esdm.go.id/static_content.php?id_kategori=1

References:

1) EM-DAT: The OFDA/CRED International Disaster Database – www.emdat.be – Université Catholique de Louvain – Brussels – Belgium.

2) United Nations Office for the Coordination of Humanitarian Affairs (OCHA), Regional Office for Asia Pacific (ROAP) (2011): "Tectonic Plates and Faults in Asia-Pacific", Downloaded from http://reliefweb.int/sites/reliefweb.int/files/resources/OCHA_ROAP_Tectonics_v6_110602.pdf
3) Japan International Cooperation Agency (JICA) (2012): "Data Collection Survey on ASEAN Regional Collaboration in Disaster Management"

3.3 Tsunami

(1) Risk

The 2004 Indian Ocean Earthquake (M9.1) and its tsunami affected 500,000 people, with 170,000 dead or missing, and USD 4.45 billion in losses (0.68% of GDP). The 2006 Java Earthquake (M7.7) caused 800 deaths and USD 55 million in losses (0.007% of GDP).

More than 1,000 people were also killed by the 1674 Seram Earthquake (M6.8), the 1815 Bali Earthquake (M7.0), the 1861 Sumatra Earthquake (M8.5), the 1899 Seram Earthquake (M7.8), and the 1992 Flores Earthquake (M7.8). Moreover, the volcanic eruption of Mt. Krakatoa in 1883 caused a tsunami that killed more 30,000 people.

In Indonesia, which is surrounded by ocean and experiences many earthquakes, tsunami is one of the most catastrophic risks and attention should be paid to it.

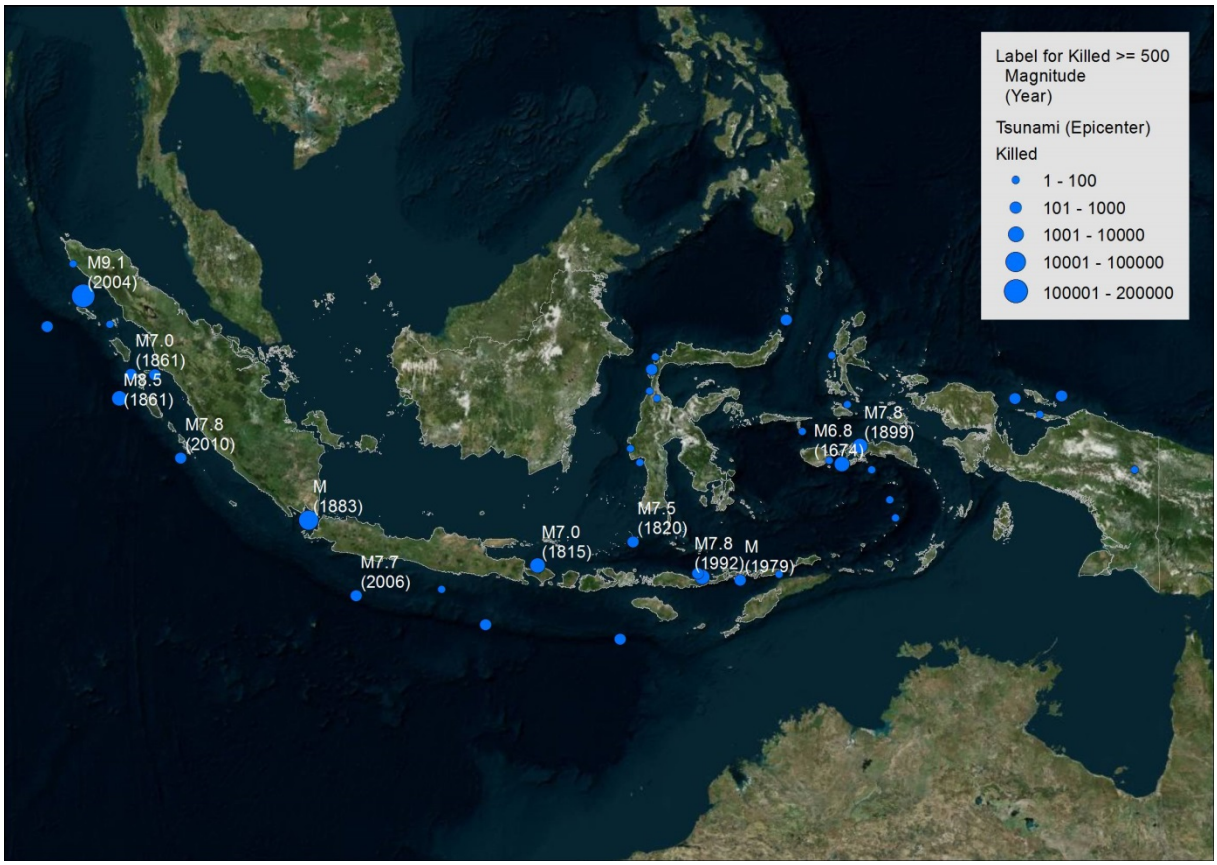


Figure 3.3.1 Tsunami Disasters: Human Losses

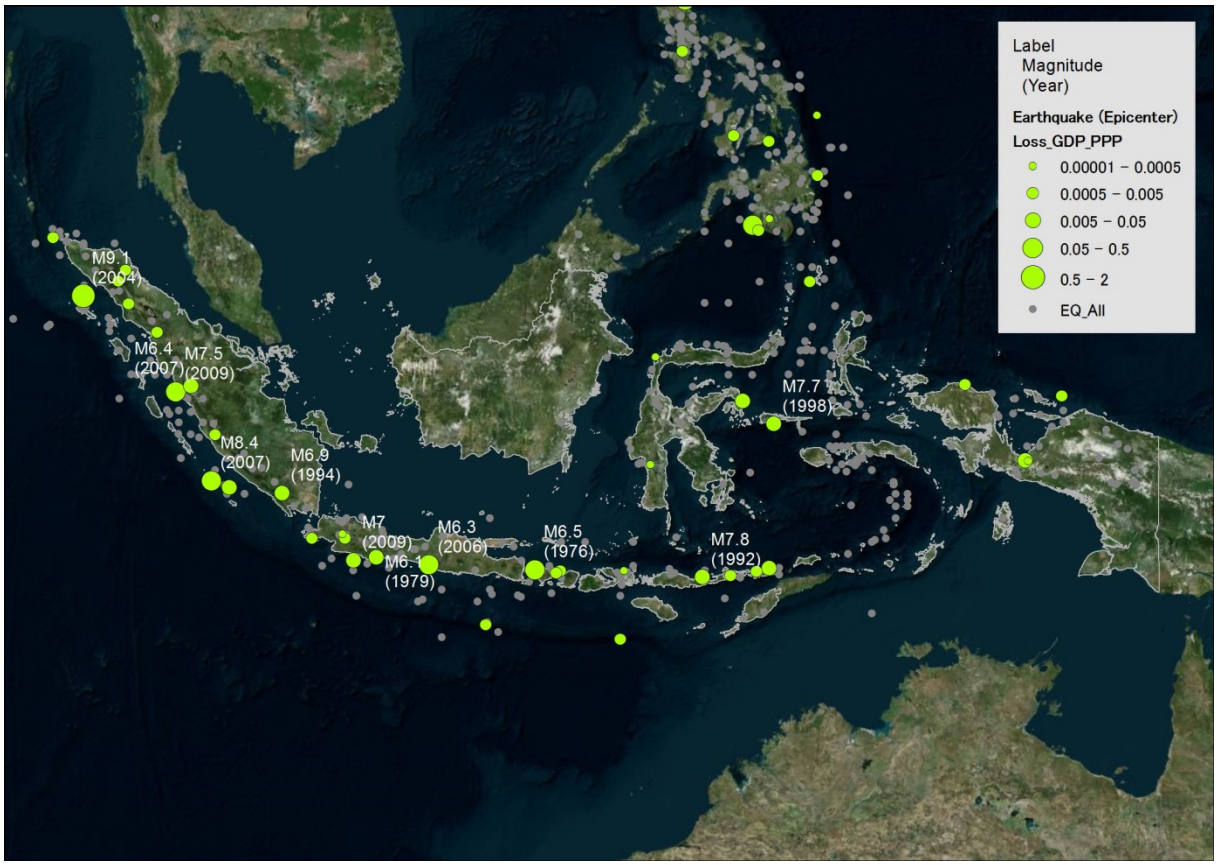


Figure 3.3.2 Tsunami Disasters: Economic Losses (% of GDP)

(2) Background

It is well known that tsunamis are generated by sea floor earthquakes. However, an undersea volcanic eruption, an undersea landslide, or other disturbances above or below water can also generate a tsunami.

Figure 3.3.3 is the Tsunami Disaster Risk Map of Indonesia developed by the National Agency for Disaster Management (BNPB). It illustrates that the coasts of Sumatra and Java along the Sunda Trench, the coasts of Lesser Sunda, Sulawesi, and Moluccas, and the east coast of Kalimantan have tsunami risk.

Moreover, the Tsunami Hazard Map, developed by the Volcanic Tsunami Working Group (called "Firewaves"), shows that the coast of Sumatra along the Sunda Trench, the coast along the Cenderawasih Bay of New Guinea and the coast of Seram along the Banda Sea have especially high tsunami risk. (See Figure 3.3.4)

Figure 3.3.3 Threat of Tsunami Disaster in Indonesia by BNPB

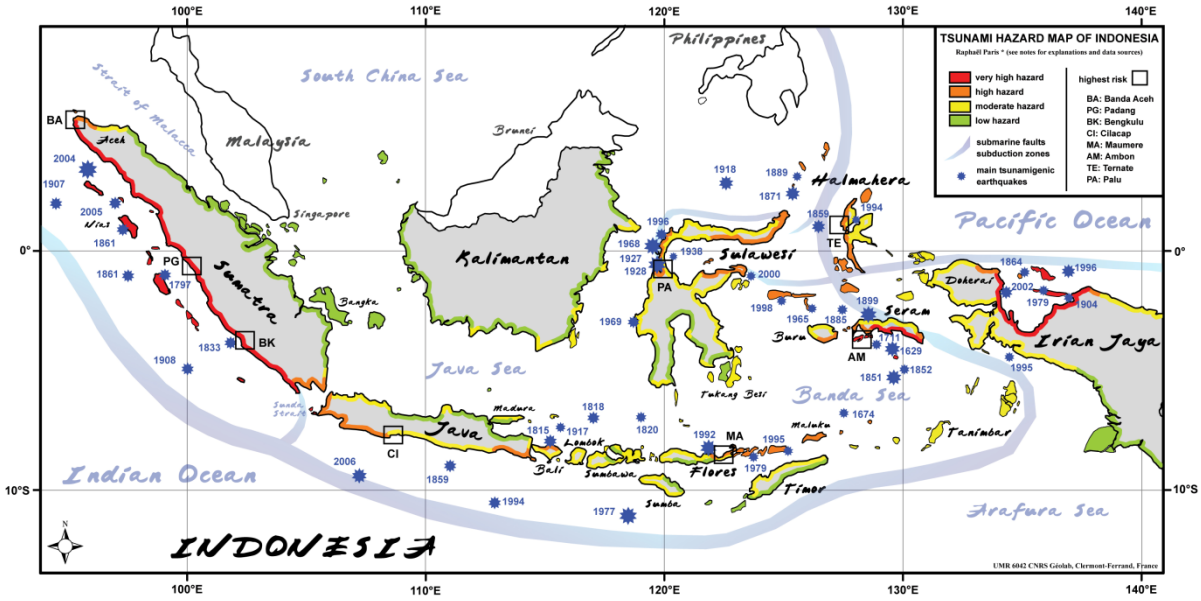


Figure 3.3.4 Tsunami Hazard Map of Indonesia

(3) Efforts by the central government, local governments, and disaster management organizations

Disaster Management Information

Geospatial Information Agency (BIG) developed multi-hazard maps for flooding and tsunami, which are posted on their website.

Geology Research Development Centre (GRDC) developed tsunami hazard maps of Sulawesi, Barat, Gorontalo, and Aceh in 2012, and is currently developing tsunami hazard maps of Sulawesi Utara and Sulawesi Selatan.

The National Agency for Disaster Management (BNPB) has set up two database systems named "GEOSPASIAL" and "DIBI," which are posted on their website. GEOSPASIAL is a Web-GIS database system that displays: (1) disaster/damage information caused by disasters occurring within 30 days, (2) various types of hazard maps, and (3) administrative boundaries on maps. DIBI is a database that stores information on historical disasters in Indonesia after 1815 collected by the national government, local governments, NGOs, universities, etc.

Early Warning and Transmitting Information

The Meteorological, Climatological and Geophysical Agency (BMKG) operates the InaTEWS (Indonesia Tsunami Early Warning System), which is an integrated system composed of seismic and tsunami observations, analysis, evaluation, and dissemination. All data recoded by more than 300 seismometers managed by BMKG, GPS and tide gauges managed by BIG, and tsunami buoys managed by Agency for the Assessment and Application of Technology (BPPT) are transmitted to InaTEWS.

The tsunami early warning consists of the following 3 ranks, "Red (Major Warning): Tsunami height > 3 meters", "Orange (Warning): Tsunami height 0.5-3 meters", and "Yellow (Advisory): Tsunami height < 0.5 meters." The InaTEWS provides early warning on tsunami that may impact Indonesia to disaster management agencies, local governments, mass media, etc. within 5 minutes after an earthquake occurs.

Early warning to the public is disseminated through sirens, television, radio, SMS, FM Radio Data System (FMRDS) alerts receiver, speakers, police sirens, social media (Facebook, Twitter), etc. Twenty-four (24) tsunami sirens are installed in six provinces.

Preparedness and Education

For Aceh Province, the Tsunami & Disaster Mitigation Research Center (TDMRC) of Syiah Kuala University has developed many kinds of risk maps. TDMRC has also published educational materials on tsunami disaster prevention. The database, called DIBA (Data dan Informasi Bencana Aceh), includes all of the disasters that have occurred in Aceh Province and is posted on their website. The Aceh Tsunami Museum can be used as a tsunami evacuation

building. The four evacuation buildings constructed by a grant aid project in Aceh Province can accommodate 6,000 people.

The Ministry of National Education of Indonesia has established a curriculum for primary and secondary school students regarding disaster management for six major hazards: earthquake, tsunami, volcano, flood, landslide and typhoon/cyclone.

(4) Hazard and risk information sources

Badan Nasional Penanggulangan Bencana (BNPB) **National Agency for Disaster Management**
http://www.bnpb.go.id/
GEOSPASIAL
http://geospasial.bnpb.go.id/
Data dan Informasi Bencana Indonesia (DIBI) **Indonesian Disaster Information and Data**
http://dibi.bnpb.go.id/DesInventar/dashboard.jsp?lang=ID
Badan Meteorologi, Klimatologi, dan Geofisika (BMKG) **Meteorological, Climatological and Geophysical Agency**
http://www.bmkg.go.id/BMKG_Pusat/Depan.bmkg
Indonesia Tsunami Early Warning System (InaTEWS)
http://inatews.bmkg.go.id/new/
Badan Informasi Geospasial (BIG) **Geospatial Information Agency**
http://www.bakosurtanal.go.id/
Badan Penanggulangan Bencana Aceh (BPBA) **Aceh Disaster Management Agency**
http://bpba.acehprov.go.id/
Tsunami and Disaster Mitigation Research Center (TDMRC), Syiah Kuala University
http://www.tdmrc.org/en/
Badan Geologi
http://www.bgl.esdm.go.id/
Pusat Vulkanologi dan Mitigasi Bencana Geologi (PVMBG) **Center for Volcanology and Geological Hazard Mitigation**
http://www.vsi.esdm.go.id/static_content.php?id_kategori=1

References:

1) EM-DAT: The OFDA/CRED International Disaster Database – www.emdat.be – Université Catholique de Louvain – Brussels – Belgium.
2) Volcanic Tsunami Working Group, Firewaves: "Tsunami Hazard map of Indonesia", Downloaded from "http://raphael.paris.pagesperso-orange.fr/database/indonesia_tsunami.jpg"
3) Japan International Cooperation Agency (JICA) (2012): "Data Collection Survey on ASEAN Regional Collaboration in Disaster Management"

3.4 Volcanoes

(1) Risk

The volcanic eruption of Mt. Tambora in 1815 was the largest eruption in the history of Indonesia caused more than 10,000 deaths. The eruption of Mt. Krakatoa in 1883 was the second largest eruption in history inducing a large landslide, which in turn caused a devastating tsunami.

There are many volcanoes including Mt. Merapi, Mt. Kelute, Mt. Awe and Mt. Sumeru, which had erupted many times in throughout history and are still active. Mt. Merapi is especially active and has erupted five times in the past 20 years (1994, 1997, 1998, 2006, and 2010). 322 people were killed by the eruption in 2010. The eruptions of Mt. Kelute in 1586, 1909, 1919, and 1966 caused several thousands of deaths and the latest eruption in 1990 also caused 10~20 deaths.

In terms of economic impact, the following losses caused by the eruptions were recorded: USD 160 million (0.12% of GDP) with the eruption of Mt. Galunggung in 1982, USD 150 million (0.10% of GDP) with the eruption of Mt. Gamalama in 1983, and USD 25 million (0.02% of GDP) with the eruption of Mt. Colo in 1983.

Figure 3.4.1 Volcanic Disasters: Human Losses

Figure 3.4.2 Volcanic Disasters: Economic Losses (% of GDP)

(2) Background

There are about 150 volcanoes in Indonesia and 80 of them are active volcanoes. Historical records show up to 1,200 eruptions. Figure 3.4.3 shows volcanoes that erupted after 1900 A.D. Most of the volcanoes are located in Sumatra, Java, Lesser Sunda, the north part of Sulawesi and Moluccas.

Figure 3.4.4 shows the volcanoes in Asia-Pacific region that have erupted during the Holocene. The Holocene is a geological epoch from 10,000 years ago to the present. The map indicates that Indonesia is one of the areas where volcanoes have erupted most actively.

Figure 3.4.3 Major Volcanoes of Indonesia

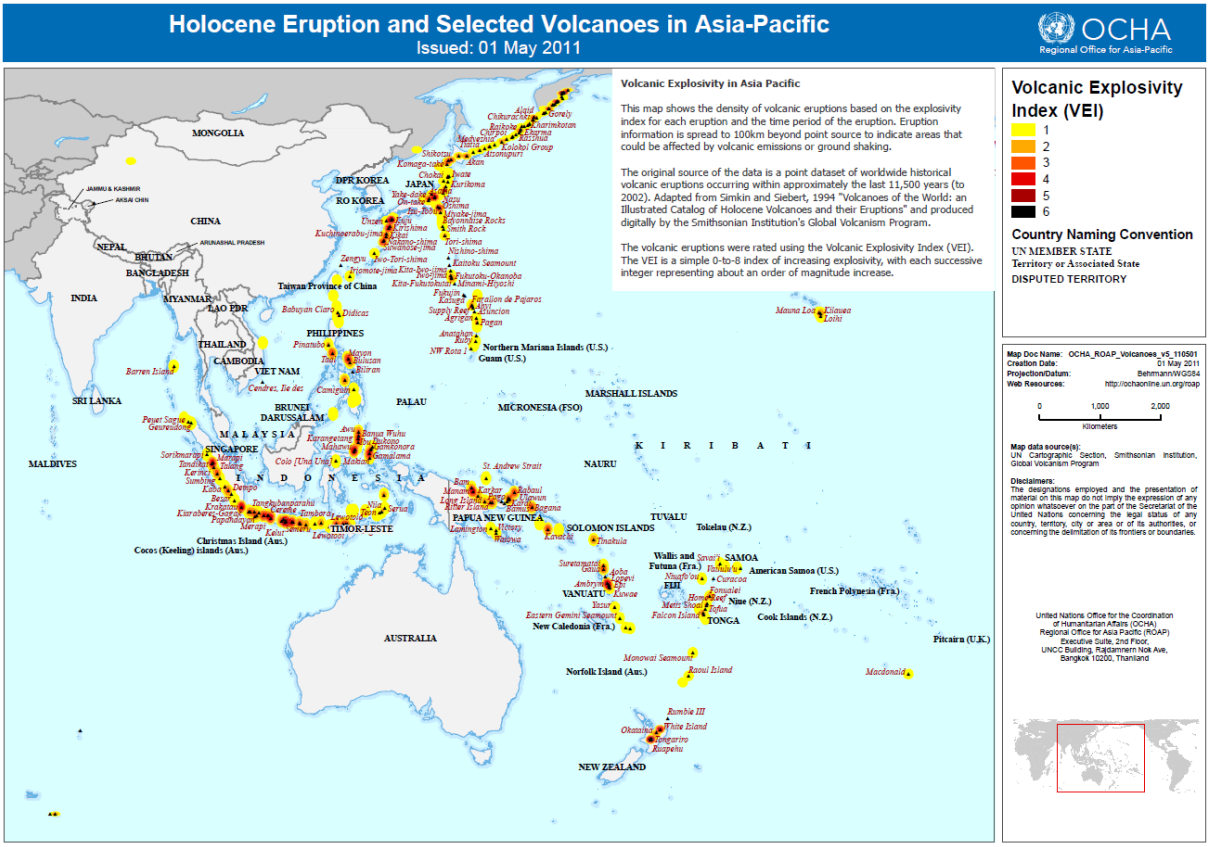


Figure 3.4.4 Holocene Eruption and Selected Volcanoes in Asia-Pacific

(3) Efforts by the central government, local governments, and disaster management organizations

Disaster Management Information

The National Agency for Disaster Management (BNPB) has set up two database systems named "GEOSPASIAL" and "DIBI," which are posted on their website. GEOSPASIAL is a Web-GIS database system that displays: (1) disaster/damage information caused by disasters occurring within 30 days, (2) various types of hazard maps, and (3) administrative boundaries on maps. DIBI is a database that stores information on historical disasters in Indonesia after 1815 collected by the national government, local governments, NGOs, universities, etc.

Early Warning and Transmitting Information

Survey and monitoring activities of active volcanoes, such as creating geological maps, seismic observations, ground deformations, magnetic and gravity surveys, and geochemical surveys, etc., are conducted by the Center for Volcanology and Geological Hazard Mitigation (CVGHM).

The CVGHM has developed 80 hazard maps for volcanoes. On the maps, the volcanic hazardous areas are classified into the following 3 categories: "Region I: Affected by secondary risk from eruption (lahars, ash clouds)", "Region II: Affected by material eruption by climatic condition," and "Region III: Directly affected by material eruption (pyroclastic flow, debris, gasses)."

The early warning system for volcanic eruption is by the CVGHM. The warning levels for volcanic eruption are classified into the following 4 categories: "Level I: Normal, Volcanic activity stays in normal without any difference from its background levels", "Level II: Alert, Volcanic activity begins to increase and has passed over its background levels", "Level III: Stand by, Volcanic activity shows its precursor before eruption," and "Level IV: Danger, Started with volcanic ash eruption, and then approaching the main eruption."

Preparedness and Education

Relocation of communities from hazardous areas has been conducted in the rehabilitation and reconstruction program of Merapi.

(4) Sources of hazard and risk information

Badan Nasional Penanggulangan Bencana (BNPB) **National Agency for Disaster Management**
http://www.bnpb.go.id/
GEOSPASIAL
http://geospasial.bnpb.go.id/
Data dan Informasi Bencana Indonesia (DIBI) **Indonesian Disaster Information and Data**
http://dibi.bnpb.go.id/DesInventar/dashboard.jsp?lang=ID
Pusat Vulkanologi dan Mitigasi Bencana Geologi (PVMBG) **Center for Volcanology and Geological Hazard Mitigation**
http://www.vsi.esdm.go.id/static_content.php?id_kategori=1
Badan Informasi Geospasial (BIG) **Geospatial Information Agency**
http://www.bakosurtanal.go.id/
Badan Geologi
http://www.bgl.esdm.go.id/
Badan Penanggulangan Bencana Aceh (BPBA) **Aceh Disaster Management Agency**
http://bpba.acehprov.go.id/
Tsunami and Disaster Mitigation Research Center (TDMRC), Syiah Kuala University
http://www.tdmrc.org/en/

References:

1) Lee Siebert, Tom Simkin, and Paul Kimberly (2011): "Volcanoes of the World - Third Edition", Smithsonian Institute/University of California Press
2) EM-DAT: The OFDA/CRED International Disaster Database – www.emdat.be – Université Catholique de Louvain – Brussels – Belgium.
3) USGS/CVO (2001), "Map, Major Volcanoes of Indonesia with eruptions since 1900 A.D.", Downloaded from http://vulcan.wr.usgs.gov/Volcanoes/Indonesia/Maps/map_indonesia_volcanoes.html
4) United Nations Office for the Coordination of Humanitarian Affairs (OCHA), Regional Office for Asia Pacific (ROAP) (2011): "Holocene Eruption and Selected Volcanoes in Asia-Pacific", Downloaded from http://reliefweb.int/sites/reliefweb.int/files/resources/map_619.pdf
5) Japan International Cooperation Agency (JICA) (2012): "Data Collection Survey on ASEAN Regional Collaboration in Disaster Management"

3.5 Cyclones (Meteorological) Hazards

(1) Risk

Indonesia is located between latitudes 6° to the north and 11° to the south and longitudes 95° and 141° to the east. As it is located near the equator, it has a tropical climate characterized by high temperatures, heavy rainfall, and high humidity.

The southeastern part of Sumatra Island, Java Island, and the Lesser Sunda Islands located in the southern hemisphere away from the equator have two seasons. There is much rain during the rainy season (summer in the southern hemisphere) from October to March and less rain during the dry season (winter in the southern hemisphere) from April to September in these regions. On the other hand, there are two maximum occurrences of rain in a year in the Moluccas Malay Peninsula close to the equator, Sumatra, Borneo, and Celebes, as the rainfall increases during the alternation of monsoon winds there. Annual rainfall in most areas of the country exceeds 2,000 mm. Rainfall is less than 1,000 mm in parts of the Lesser Sunda Islands and the eastern part of Java.

As Indonesia is located in the subtropical region on the equator, it is not usually affected by tropical cyclones. Five storm disasters due to tropical cyclones have occurred in the country according to 1980 - 2012 records.

Table 3.5.1 Tropical Cyclone (Storm) Disasters in Indonesia (1980 - 2012)

Date	Cause	Killed	Total Affected
February 1980	Tropical Cyclone	-	800
January 1982	Tropical Cyclone	2	123
February 1985	Storm	-	10000
February 2004	Storm	4	2400
March 2004	Tropical Cyclone	-	1315

The major meteorological disaster which occurs in Indonesia is flood. In addition to flood hazards, Indonesia is also affected by landslides, forest fires, droughts, and storm disasters. Extreme weather phenomena such as droughts and heavy rains related to El Niño may result to significant impacts on agriculture. Serious damage brought about by droughts and heavy rains due to El Niño have been reported in 1982, 1991, 1997 and 1998. The most severe of these occurrences was the drought of 1997, which resulted in the death of 672 people and affected over one (1) million others. The Indonesian regions most prone to drought are the western Sumatra and Java Islands.

Table 3.5.2 Natural Disasters in Indonesia (EMDAT: 1984 ~ 2013)

Disaster	No. of Events	Killed	Total Affected	Damage (Millions U.S.$)
Drought	5	986	1,083,000	89
Flood (including Flash Flood)	125	4,789	6,818,901	5,749
Landslide	42	1,558	381,873	122
Storm	5	25	24,265	1
Forest Fire	9	300	3,034,478	9,329

(2) Background

As Indonesia is located on the equator, the country's climate is heavily influenced by the ITCZ (Intertropical Convergence Zone) and monsoons. While the ITCZ lies near the equator, the easterly wind blows into the convergence zones in both the northern and southern hemispheres. Then, when the convergence zone is displaced to higher latitudes along with the movement of the sun, a narrow westerly region appears between the equator and the ITCZ called the equatorial westerlies. Therefore, in areas where the position of the convergence zone is displaced significantly from summer to winter as is in Southeast Asia, the direction of the prevailing wind moves to the opposite side, depending on the season, and, as such, monsoon phenomenon occurs. As Indonesia is located in the subtropical region on the equator, it is not usually affected by tropical cyclones. However, East Java and the Lesser Sunda Islands are located in the southern hemisphere and may be subject to indirect effects of tropical cyclones.

The most deaths due to natural disasters are caused by floods. Severe thunderstorms often bring sudden floods, which bring more damage by causing landslides including volcanic and mud flows. In addition, droughts and storms have also been experienced by the country. Forest fires may occur due to severe thunderstorms during the inter-monsoon period.

Torrential rain hit northern Sumatra in December of 2006. 360,000 people evacuated from Aceh province. The tropical convergence zone usually stagnates near Central Sumatra in December. As a result of the northeastern wind which blows into northern Sumatra, rainfall in the area increases. When cold air flows there from the mid-latitudes during this period, the northeastern wind is intensified and convective activity becomes more active in Southeast Asia.

Droughts, floods, and many more extreme weather events are likely to occur because Indonesia is impacted by El Niño. Areas with a high risk of flooding are spread all throughout Indonesia, especially on the east coast of the northern part of Sumatra, the northern coasts of the western part of Java Island, the western and southern parts of Kalimantan Island, the southern part of Sulawesi Island, and the southern parts of Papua. Direct damage of tropical cyclones is not that significant, but cyclones (tropical depressions) may affect Java and the Lesser Sunda Islands, which are located in the eastern part of Indonesia located in the southern hemisphere. Tidal waves, tornadoes, and storm surges in the area may also cause damage. In addition, the northern states of Sulawesi and the coastal areas of Marc Islands in the northern hemisphere may be subject to damage due to storm surges and high waves, which may have resulted from the effects of typhoons in Philippine waters. Additionally, many tornadoes that occurred in Java and Bali were due to the cumulonimbus clouds associated with Cyclone Iggy in January of 2012.

Climate change vulnerability and impact on Indonesia are follows.

- For tropical cyclone frequency, more models suggest a decreasing trend in tropical storm frequency over the 21st century than an increasing trend in the western North Pacific.

- For tropical cyclone intensity, most of the studies projected an increase in tropical cyclone intensity over the western North Pacific.
- The annual mean temperature in Indonesia has been increasing by around 0.3 °C since 1990, occurring in all seasons of the year. This is relatively consistent with, if not slightly lower than the expectation of the warming trend due to climate change.
- It has been projected that mean temperature will increase over 20 years from somewhere between 0.36 to 0.47 °C by 2020 with the highest temperatures potentially occurring in the islands of Kalimantan and the southeastern part of the Moluccas (DFID, 2007).
- An increase in annual precipitation is predicted across the majority of the Indonesian islands, except in southern Indonesia, where it is projected to decline by up to 15%.
- There could also be change in the seasonality of precipitation. Parts of Sumatra and Borneo may become 10 to 30% wetter by the 2080s during December-February. Jakarta is projected to become 5 to 15% drier during June-August.

Indonesia is sensitive to climate change. The country may experience prolonged droughts, increased flooding, and more frequent and severe storms as a consequence of climate change. Indonesia is currently experiencing a sea level increase of 1-3 mm/year in coastal areas, and this is projected to increase at a rate of about 5 mm per year over the next century. In addition, the impact of the increased frequency and severity of El Niño events may cause several coastal regions to become susceptible to damage.

(3) Efforts by the central government, local governments, and disaster management organizations

As part of the implementation of Law Number 24 Year 2007 on Disaster Management, particularly Article 36, the government and local governments are required to prepare a Disaster Management Plan in line with their authority. These preparations will be coordinated by the Agency.

Meteorological Service in Indonesia are under the responsibility of the BMKG (Badan Meteorologi, Klimatologi, Dan Geofisika). It consists of four technical sections: meteorology, climatology, geophysical, and instrument/calibration/network.

The Indonesian region is not directly affected by tropical cyclones. However, the occurrence of tropical cyclones in nearby regions influences Indonesian weather, resulting in extreme weather disasters, floods, and landslides.

Indonesia has been a member of the RA-V Tropical Cyclone Committee since it was established by RA V-IX in 1986. BMG (BMKG) operates the Jakarta TCWC (Tropical Cyclone Warning Centre) covering the sea area of latitudes from the equator to 10° to the south and longitudes 90° and 125° to the east. The BKMG monitors the tendencies of tropical cyclones and conducts forecasts in its area of responsibility. The Jakarta TCWC issues TC outlooks, extreme weather warnings, high wave warnings, coastal zone warnings, and aviation advisories.

The BKMG has been authorized to perform the following tasks:

- To prepare for national policy, public policy, and technical policy;
- To do maintenance work for observation instruments, data and information processing;
- To provide information related to climate change to stakeholders and relevant institutions;
- To issue early warning information to the public and relevant agencies;
- To promote research, assessment, and development;
- To implement and educate with regards to the calibration of observation equipment and the communication network; and
- To implement of projects in cooperation with international actors.

Table 3.5.3 Authorities from the Indonesian Meteorological Service

Institution	Contact information
Indonesia Weather, Climate, Geophysical Agency (BMKG) (Badan Meteorologi, Klimatologi, Dan Geofisika) http://www.bmkg.go.id/BMKG_Pusat/Depan.bmkg /	Tel : +62-21-4246321

(4) Hazard and risk information sources

Hazard risk assessment results related to tropical cyclones (meteorological) disasters are as follows.

Table 3.5.4 Source of Information on Tropical Cyclones (Meteorological Disasters)

Institution	Literature name
UNDP (2007)	Climate Variability and Climate Changes, and Their Implication Government http://www.undp.or.id/pubs/docs/Final% 20Country% 20Report% 20 -% 20Climate% 20Change.pdf
UNISDR (2010)	Synthesis Report on Ten ASEAN Countries Disaster Risks Assessment http://www.unisdr.org/files/18872_asean.pdf
OCHA Regional Office for Asia Pacific (2011)	Indonesia: Natural Hazard Risks http://reliefweb.int/sites/reliefweb.int/files/resources/map_1297.pdf

Abbreviations

IPCC	Intergovernmental Panel on Climate Change
ITCZ	Intertropical Convergence Zone
BMKG	Badan Meteorologi, Klimatologi, Dan Geofisika
WMO	World Meteorological Organization
TCWC	Tropical Cyclone Warning Centre

Explanation of terms

ITCZ: This is a low-pressure (convergence) zone formed near the equator. In the lower levels (near the surface), the northeastern trade wind blows into the northern area from the ITCZ and the southeastern trade wind blows into the southern area from the ITCZ.

References:

1) IPCC Fourth Assessment Report: Climate Change 2007
2) National Disaster Management Plan 2010-2014
3) UNDP (2007): Climate Variability and Climate Changes, and Their Implication Government
4) BMKG (Website): http://www.bmkg.go.id/BMKG_Pusat/Depan.bmkg

3.6 Landslides

(1) Risk

There is a record of tragic mudflow from the eruption of Kelut Volcano in 1911. The disaster killed more than 5,000 people. 144 landslides have been recorded since 1950. There are 7 records of landslides (3 of them are after 2000) that killed more than 100 people.

Thus, the country frequently suffers from landslides, most of which are distributed around Java and Sumatra Islands. Relatively fewer landslides are recorded in the islands of Sulawesi and Irian Jaya.

Landslides in the country are deeply related to the distribution of volcanos. Vulnerable and steep geological formations from volcanic activity form predisposing factors, while heavy rain and earthquakes form contributing factors.

Most types of landslides are caused by land collapse and flash floods. In particular, flash floods called “Banjir-Bandang” are being studied as a combination disaster of flooding and debris flow.

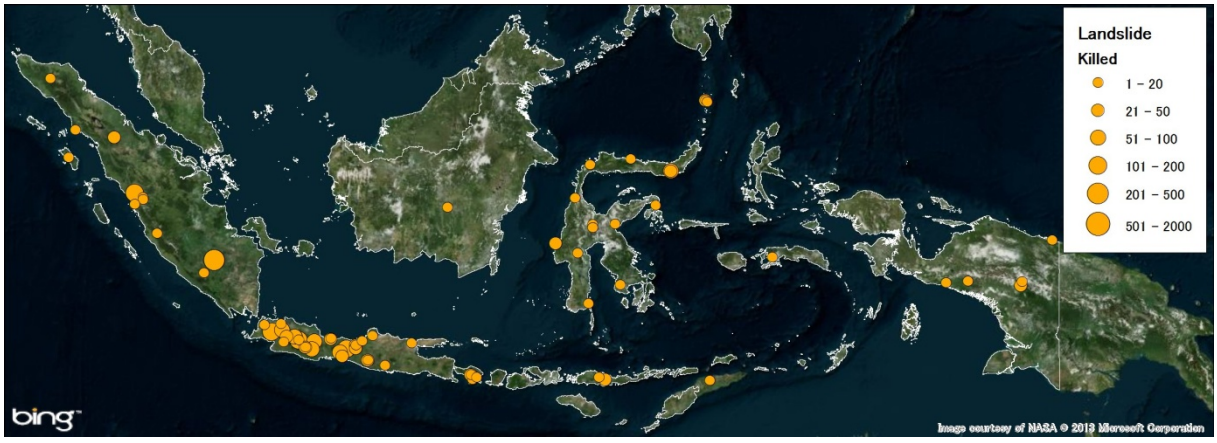


Figure 3.6.1 Landslide Damage: Human Losses

Figure 3.6.2 Landslide Damage: Economic Losses (% of GDP)

(2) Background

Notable example of landslides

The landslides that occurred in Central and West Java such as Cipinas (2001), Bandung (2005), and Sijeruk (2006) recorded more than 100 fatalities. In those disasters, slopes collapsed during heavy rains and flowed down along valley topography, hitting settlements in the basin and causing serious damage.

Landslides in the country feared as "Banjir-Bandang" are so called flash flood caused by landslide dam failure. They have recently occurred at Langkat (North Sumatra), Sinjai (South Sulawesi), and Jember (East Java) on a massive scale.

These landslides occur mainly on slopes in volcanic mountain areas, especially on Sumatra and Java, which are densely populated regions, increasing the amount of damage. Since volcanoes are distributed on every island of the country, flash floods should be expected in the lower reaches of these volcanoes.

Landslide exposure related to climate change has been widely confirmed at mountain slopes in Sulawesi Island and Irian Jaya Island, in addition to Sumatra and the volcanic area of Java.

Some areas of large cities such as Jakarta, Bandung, and Semarang are experiencing rapid land subsidence.

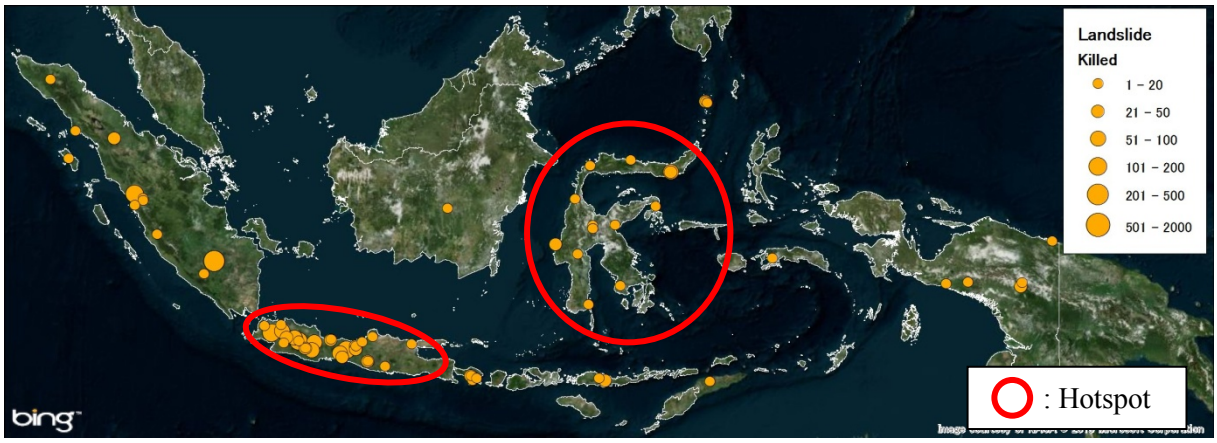


Figure 3.6.3 Hotspots of Human Losses

Figure 3.6.4 Hotspots of Economic Losses

(3) Efforts by the central government, local governments, and disaster management organizations

An early warning system for landslides is not operated in the country.

Observation of landslides by GPS, hyetometer, and extensometer are conducted by the Center of Volcanology and Geological Hazard Mitigation (CVGHM), which issues alerts for landslides.

✓ National Disaster Management Agency (BNPB: Badan Nasional Penanggulangan Bencan); http://www.bnpb.go.id/

- Established in 2008, manages general disaster countermeasures
- Consists of the president of the BNPB, the Management and Operational Committee, and the Policy Implementation Agency

✓ Management and Operational Committee

- In charge of advisory and consultation with BNPB's president

- Composed of ten ministries (Ministry of Interior, Ministry of Social Affairs, Ministry of Public Works, Ministry of Health, Ministry of Finance, Ministry of Transportation, Ministry of Energy and Mineral Resources, Police, and Armed Forces) and nine other experts

✓ The Management and Operational Committee

- In charge of increasing preparedness, emergency response, and relief and reconstruction
- Composed of the Prime Secretary, four Directors (Prevention and Preparedness, Emergency Response, Rehabilitation & Reconstruction, Logistic & Equipment) and an Inspector

✓ Regional Disaster Management Agency (BPBD); http://bpbd.jakarta.go.id/

- As a local disaster management agency, it coordinates the formulation of disaster management policy of the provinces, regencies, (Kabupaten), and cities (Kota) with the national policy of BNPB.

(4) Hazard and risk information sources

CVGHM publishes hazard maps of landslides on 33 states and small scale provincial hazard maps.

Reports

✓ Synthesis Report on Ten Asian Countries Disaster Risks Assessment; December 2012
ASEAN Disaster Risk Management Initiative, World Bank
http://www.unisdr.org/

- Summarizing natural hazard and risks in 10 ASEAN countries.
- World Bank reported risks with respect to countries and categories of disaster.
- Although the data is only available to 2009, the report is well assembled.

✓ World Risk Report 2012; October 2012, Alliance Development Works, The Nature Conservancy
http://www.nature.org/

- Natural disaster risks in 173 countries in the world are ranked in this report.
- Intended period is from 2002 to 2011.
- Vulnerabilities are assessed with respect to categories.
- The report is effective for comparing countries.

✓ Advancing Disaster Risk Financing and Insurance in ASEAN Countries: April 2012, Framework and Options for Implementation, Volume 2: Appendix 1
https://www.gfdrr.org/

- Summarizing natural hazard and risks in 10 ASEAN countries.
- Intended period is from 1970 to 2011.

- Summary of countries are well assembled.

✓ Climate Change Vulnerability Mapping for Southeast Asia: January 2009, Economy and Environment Program for Southeast Asia (EEPSA)
http://www.idrc.ca/

- Natural disaster risks in Southeast Asia are mapped in the report.
- The report contains information on risks in states/provinces.

Risk Map

✓ Global Risk Data Platform; UNEP (United Nations Environment Programme)/GRID, UNISDR (United Nations Office for Disaster Risk Reduction)
http://preview.grid.unep.ch/

- Disaster sites from all over the world are mapped.
- The map shows disaster hotspots.

✓ Desinventar Disaster Information Management System; UNISDR, GAR
http://www.desinventar.net/

- Risk map of states or provinces
- Indonesia, Vietnam, and Lao PDR are included from Southeast Asia

References:

1) Economy and Environment Program for Southeast Asia (EEPSEA) (2009): "Climate Change Vulnerability Mapping for Southeast Asia", p. 19

3.7 Predominant Natural Hazards

The records of natural disasters that have affected the country are classified based on the impacts and frequency of occurrence. The results have been plotted on the impacts - frequency matrix and the most prevailing hazards studied.

3.7.1 Employed Data

The disaster records compiled in Appendix A3 are employed in this study. The records for the last 30 years, namely from 1983 to 2012, are used because the number of events included in the database before 1980 is significantly less than after 1980. The records of large disasters through earthquakes, tsunamis and volcano eruptions before 1983 are also used because the frequencies of occurrence for these hazards are significantly lower than floods, cyclones and landslides.

3.7.2 Study Method

The "Damage Amount / GDP" and 'Number of Deaths" are used as the indices to show the impacts of the disasters considered and 6 natural hazards will be studied and compared. At the beginning of the study, only the "Damage Amount / GDP" was used as an index because the results can be used for Area BCP planning. However, the scarcity of information related to damage amounts became clear as the study progressed. As the information on the "Number of Deaths" is substantial compared to the damage amount, the "Number of Deaths" has been added as an index of impact.

The process of the study is as follows;

1) Based on the Damage Amount / GDP or Number of Death, each disaster is classified according to the ranking system outlined in Table 3.7.1.,
2) The number of disaster events for each country is added by type of hazard and disaster rank, and then classified into Table 3.7.2 below,
3) The above information is then plotted on the impacts - frequency matrix by country,
4) As for earthquakes, tsunamis and volcanic hazards, if an event occurred before 1983 that was of the same (or higher) disaster rank as the maximum disaster rank recorded between 1983 to 2012, a point is plotted on the matrix which corresponds to the relevant disaster and frequency rank (=1).

Table 3.7.1 Disaster Rank and Damage

Disaster Rank	Damage Amount / GDP[1]	Number of Death
5	1.0% -	10,001 -
4	0.1% - 1.0%	1,001 - 10,000
3	0.01% - 0.1%	101 - 1,000
2	0.001% - 0.01%	11 - 100
1	- 0.001%	- 10

Table 3.7.2 Frequency Rank and Number of Events

Frequency Rank	Number of Events from 1983 to 2012	Average Frequency (Events / Year)
5	7 or more	1/5 -
4	4 to 6	1/10 - 1/5
3	2 to 3	1/15 - 1/10
2	1	1/30
1	Large Events occurred before 1983	-

[1] Gross domestic product based on purchasing-power-parity (PPP) valuation of country GDP, International Monetary Fund, World Economic Outlook Database, October 2012

3.7.3 Study Results

The following results are based on the available existing information. Not all information relating to the impacts of disasters was collected. Furthermore, the purpose of this study is not intended to evaluate the precise damage amounts or number of deaths. The purpose of this study is to rank 6 natural hazards according to their impacts.

As with the Philippines, all 6 types of disasters have been recorded. Tsunamis caused the largest impact in terms of the number of deaths. The largest amount of damage was caused by the 2004 Indian Ocean Tsunami. In addition, a further 7 tsunamis have caused more than 1000 deaths since the 17th century. The number of deaths caused by the earthquakes is less than that of tsunamis but they occur frequently. 7 earthquakes caused more than 1000 deaths after the 19th century. The number of deaths from one flood is less than tsunamis or earthquakes, but they occur more frequently. The amount of damage caused by floods is larger than that of earthquakes in cases of events that occur every several years. The impacts of volcanoes and cyclones have been small in the last 30 years but events with more than 1000 deaths were recorded before 1983.

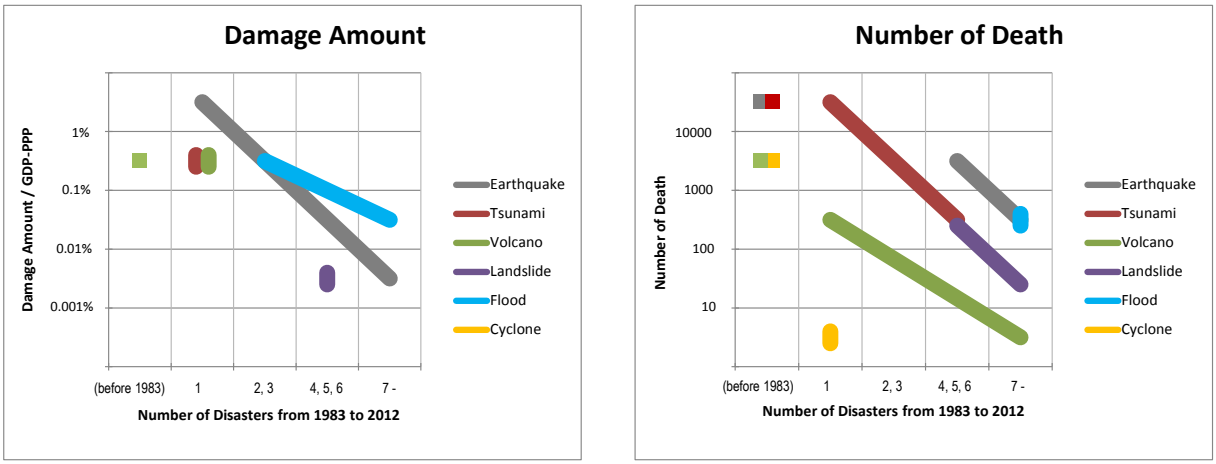


Figure 3.7.1 Impact of hazards in Indonesia

3.8 Existing Investigations and Studies

3.8.1 Methods and Scope of the Survey

This section reviews studies and research that have been conducted in the ASEAN region with a focus on natural hazards, risks, and vulnerability assessments. The target hazards are: floods, earthquakes, volcanoes, tsunamis, cyclones (typhoons)/meteorological disasters, and landslides. Information and study reports were reviewed from those that are available for the public and on the internet. The purpose of this section is to first gain an overview of the existing study results regarding hazard trends, encountering risks, and degrees of vulnerability throughout the entire ASEAN region as well as in each ASEAN member state. Another purpose it to produce a

compilation of assessment reports of the region, which will be accessible as a reference for those who wish to plan an Area BCP.

Table 3.8.1 Methodology of Information Collection and Scope of Survey

Information Collected	Methodology	Scope of Survey
Existing studies and research	To collect existing studies and reports from public sources including the internet.	To summarize the studied hazards, areas, contents of hazard and risk analysis, vulnerability assessment of existing studies, and other research.

3.8.2 Outline of Collected Information and Data

Table 3.8.2 shows the outline of collected information and data. Summaries of existing studies and reports are compiled as data sheets in Appendix A4.

Table 3.8.2 Outline of the Collected Information and Data

Appendix A4 Subsection	Hazards	Outline
A4.1	Flood	Flood hazard, risk assessments, hazard maps, and vulnerability assessment have been conducted in ASEAN countries using data on rainfall, inundation areas, affected population, and monetary assessment. Hazard maps were produced with GIS tools. The usage of GIS tools for assessments is widely recognized and its usage has been explored to produce hazard maps. Some runoff analyses were conducted for selected areas. Limited information and data available for Brunei Darussalam.
A4.2	Earthquake	Many of the earthquake hazard studies in the area are probabilistic seismic hazard analyses (PSHA), not scenario earthquake studies. This is to quantify the probability of exceeding a specific ground-motion level at a site given all possible earthquakes. This methodology is descended from the Global Seismic Hazard Assessment Program (GSHAP). GSHAP was launched in 1992 by the International Lithosphere Program (ILP) with the support of the International Council of Scientific Unions (ICSU), and endorsed as a demonstration program in the framework of the United Nations International Decade for Natural Disaster Reduction (UN/IDNDR). Earthquakes are not equally distributed around the globe because of the generating mechanism. In the ASEAN region, many earthquakes are observed in and around Indonesia and Philippines, which are located in the convergent boundary (subduction) zone and fewer earthquakes are observed in and around Myanmar, which is in the transform boundary zone. There are fewer or no earthquakes observed in other regions. However, some regions are sometimes affected by the earthquakes which occur in neighboring countries. The northern regions of ASEAN countries are sometimes affected by the earthquakes that occur in the Yunnan province of China. A number of investigations and studies reflect this trend.
A4.3	Tsunami	There are only few investigations and studies about tsunami hazard or risk in the region, and most of them are compilations of past disasters. There is no probabilistic

		study as there is for earthquakes. There is a hazard map that encompasses several tsunami scenarios. There are studies targeting the Asia-Pacific area because tsunamis propagate in the sea. Large-sized tsunamis are caused by major earthquakes in the ocean. This is the reason that tsunamis are also not equally distributed around the globe. However, tsunamis affect a wider area than the ground-motion of earthquakes, as seen in the tsunami caused by the Sumatra earthquake on December 26th in 2004. Thus, tsunamis are sometimes studied in countries with few or no earthquakes.
A4.4	Volcano	Most volcanoes are also located along the convergent boundary (subduction) zone. This is the reason why volcanoes are also not equally distributed around the globe. Disasters caused by volcanic eruptions are lava flow, pyroclastic flow, lahar, and ash fall. Ash is scattered widely via the prevailing westerlies, but the other disaster types do not have an extensive reach. Regarding volcanic hazard, many investigations and studies are a compilation of areas affected by lava flow, pyroclastic flow, lahar, and ash fall from past volcanic eruptions for each volcano.
A4.5	Cyclone	Research on cyclone and meteorological hazard, and risk assessments have been conducted in ASEAN countries using data on tracks, damaged areas, and storm rainfall. The impact of climate change is also included in this research. Limited information and data available for Brunei Darussalam and Singapore.

3.8.3 Summary of Survey

(1) Floods

Some useful studies on flood hazard, risk, and vulnerability are publicly available presenting assessment results, case studies of countermeasures, as well as different methodological approaches. There are a few types of methodologies to assess risks and vulnerability including, for example, risks involving exposure to flooding events and population density. Vulnerability can be defined as a function of exposure, adaptive or coping capacity, and land-use etc. There are slightly different combinations of these factors with different studies for use. Therefore, these concepts must be defined in advance to plan a methodology for an assessment, in terms of which definitions are to be used in a certain analysis.

A summary of existing studies and reports is shown in Table 3.8.3 by country. A list of collected existing studies and reports is shown in Table 3.8.4.

Table 3.8.3 Summary of Existing Studies and Reports by Country: Flood

Country/Region	Summary of Existing Studies and Reports
ASEAN	There are a few reports that study natural disasters for ASEAN and the Pacific regions at large in recent years. Disaster risks are assessed by scenario, exposure, vulnerability, damage, and loss. An assessment framework is also sought to give an overview of risks, hazard and vulnerability.
Indonesia	The analytical work for Indonesia leans toward the Jakarta region. Both highly technical analysis using hydrologic models as well as community interview methods have been used to assess hazards and risks.

Table 3.8.4 Existing Studies and Research: Flood

No	Country	Province/ City	Coordinates		Risk Assessment		Vulnera-bility Assess-ment	Organiza tion Produced	Document No. in Appendix A4.1
			Latitude	Longitude	Area	Popu-lation			
1	ASEAN	-	-	-	○	○	×	UNISDR/ WB	FL_001
2	Indonesia	Surakarta	-7.55889	110.8159	○	○	×	ADB	FL_002
3	Indonesia	Palembang	-2.97733	104.7566	○	○	×	ADB	FL_002
4	Indonesia	Pekalongan	-6.87632	109.6692	○	○	×	ADB	FL_002
5	Indonesia	Tegal	-6.86303	109.1333	○	○	×	ADB	FL_002
6	Indonesia	Samarang	-6.95165	110.4152	○	○	×	ADB	FL_002

Note: ○ indicates the existence of information. × indicates that information was not found in public resources.

(2) Earthquakes

Useful information and studies on earthquake hazard, risk, and vulnerability were collected from resources available in the public domain including websites. The information and studies include methodologies with analysis and assessment.

There is no standardized or authorized methodology for risk and vulnerability assessment. Therefore, the methodology should be selected or updated in accordance with the purpose when risk and vulnerability assessments are required.

A summary of existing studies and reports is shown in Table 3.8.5 by country. A list of collected existing studies and reports is shown in Table 3.8.6.

Table 3.8.5 Summary of Existing Studies and Reports by Country: Earthquake

Country/Region	Summary of Existing Studies and Reports
ASEAN	There are natural hazard assessment reports for ASEAN region created by international organizations like World Bank etc. They summarize frequency, vulnerability, loss, and others

	subject for each disaster. Some reports describe the methodology and assessment points/items.
Indonesia	Many organizations executed earthquake hazard-related investigations and studies for Indonesia. There is a zoning map for earthquake insurance in this country. BNPB publishes seismic intensity maps and related damage information for the earthquakes that have occurred since 2009. However, descriptions are written in Indonesian, limiting users.

Table 3.8.6 Existing Studies and Research: Earthquake

No	Country	Province/ City	Hazard Assessment			Risk Assessment		Vulnera-bility Assess-ment	Organi-zation Produced	Document No. in Appendix A4.2
			Scena rio	Probabi listic	Method ology	Human Loss	Econom ic Loss			
1	Worldwide	-	×	○	×	○	○	○	UNISDR	EQ_001
2	ASEAN	-	×	○	×	×	×	×	GSHAP, USGS	EQ_002
3	Indonesia	-	×	○	×	○	×	×	OCHA-ROAP	EQ_003
4	Indonesia	-	×	○	×	×	×	×	MAIPARK	EQ_004
5	Indonesia	-	×	○	×	○	×	×	USGS	EQ_005
6	Indonesia	-	×	○	○	×	×	×	USGS	EQ_006
7	Indonesia	Yogyakarta, Central Java	×	×	×	○	○	×	ADB	EQ_007
8	Indonesia	-	×	○	×	×	×	×	USGS, GSHAP	EQ_008
9	Indonesia	-	○	×	×	×	×	×	BNPB	EQ_009

(3) Tsunamis

Useful information and studies on tsunami hazard, risk, and vulnerability were collected from resources available in the public domain including websites. The information and studies include methodologies with analysis and assessment.

There is no standardized or authorized methodology for risk and vulnerability assessment. Therefore, methodology should be selected or updated in accordance with the purpose when risk and vulnerability assessment are required.

A summary of existing studies and reports is shown in Table 3.8.7 by country. A list of collected existing studies and reports is shown in Table 3.8.8.

Table 3.8.7 Summary of Existing Studies and Reports by Country: Tsunami

Country/Region	Summary of Existing Studies and Reports
ASEAN	Tsunami induced by the Sumatra earthquake on December 26, 2004 caused major damage to ASEAN countries. The disaster is summarized by organizations like ADB.
Indonesia	There are some materials summarizing tsunami hazards. There is a report of tsunami disaster on May 27, 2006 that affected Jogjakarta and the surrounding area. BNPB publishes damage information for tsunamis caused by earthquakes that have occurred since 2010. However, descriptions are made in Indonesian, limiting users.

Table 3.8.8 Existing Studies and Research: Tsunami

No	Country	Province/ City	Hazard Assessment			Risk Assessment		Vulnera-bility Assess-ment	Organi-zation Produced	Document No. in Appendix A4.3
			track record	Scena rio	Metho dology	Human Loss	Economic Loss			
1	Indonesia, Sri Lanka and India	-	○	×	×	×	×	×	DFO	TN_001
2	ASEAN	-	○	×	×	○	○	×	ADB	TN_002
3	Indonesia	-	×	○	×	×	×	×	Firewaves	TN_003
4	Indonesia	Yogyakarta and Central Java	○	×	×	○	○	×	ADB	TN_004
5	Indonesia	Sumatra – Aceh Province	○	×	×	×	×	×	DFO	TN_005
6	Indonesia	-	○	×	×	○	×	×	BNPB	TN_006

(4) Volcanoes

Useful information and studies on volcanic hazard, risk, and vulnerability were collected from resources available in the public domain including websites. The information and studies include methodologies for analysis and assessment.

There is no standardized or authorized methodology for risk and vulnerability assessment. Therefore, methodology should be selected or updated in accordance with the purpose when risk and vulnerability assessment are required.

A summary of existing studies and reports is shown in Table 3.8.9 by country. A list of collected existing studies and reports is shown in Table 3.8.10.

Table 3.8.9 Summary of Existing Studies and Reports by Country: Volcano

Country/Region	Summary of Existing Studies and Reports
ASEAN	UNOCHA summarized the scale of the explosion of volcanoes around the Asia-Pacific region using the Volcanic Explosivity Index (VEI).
Indonesia	The governmental organization BNPB publishes volcanic hazard maps on its website. Some maps use satellite images.

Table 3.8.10 Existing Studies and Research: Volcano

No	Country	Province/ City	Hazard Assessment			Risk Assessment		Vulnera-bility Assess-ment	Organi-zation Produced	Document No. in Appendix A4.4
			Track record	Scena rio	Metho dology	Human Loss	Economic Loss			
1	ASEAN Asia-Pacific	-	○	×	×	×	×	×	OCHA -ROAP	VE_001
2	Indonesia	Each volcano	○	×	×	×	×	×	BNPB	VE_002

(5) Cyclone (Typhoon) and Meteorological Hazard

"Cyclone" is a term to describe many types of of low pressure systems, of which tropical cyclones/typhoons are the main types creating disasters in the ASEAN region. Under the framework of WMO, leading countries implement monitoring/detection of tropical cyclones on a regional basis. Table 3.8.11 indicates the responsible territory allocated to ASEAN members and its leading country.

Table 3.8.11 Members of WMO Tropical Cyclone Committee

	Warning Zones	Members（ASEAN）	Leading Country
Western North Pacific Ocean and South China Sea	0° - 60°(N) 0° - 100°(E)	Cambodia, Lao PDR, Malaysia, Philippines, Singapore, Thailand, Vietnam	Japan
Bay of Bengal and the Arabian Sea	5°S - 45°(N) 30°E - 90°(E)	Myanmar, Thailand	India
South Pacific and South-East Indian Ocean	0°-50°(S) 90° - 170°(E)	Indonesia	Fiji

The dates and information utilized in this report have been acquired from various reports on the studies and research conducted on tropical cyclones and meteorological hazards published on the internet. Collected documents include evaluation results of hazards/risks, as well as their evaluation methods. With regard to tropical cyclones/typhoons, a meteorological organization of each country compiles a summary on the damage situation, including the number of casualties or loss of human lives, and the estimated amount of damage, etc.

A summary of existing studies and reports is shown in Table 3.8.12 by country. A list of collected existing studies and reports is shown in Table 3.8.13.

Table 3.8.12 Summary of Existing Studies and Reports by Country: Cyclone and Meteorological Hazard

Country/Region	Summary of Existing Studies and Reports
ASEAN	Study reports on natural disasters in the whole ASEAN region are available.
Indonesia	There is no indication of tropical cyclones/typhoons as Indonesia is located on the equator. Heavy rain can continue for several days due to El Nino. A down-scaling forecast experiment in tropical meteorology using a high resolution regional NWP model has been implemented.

Table 3.8.13 Existing Studies and Research: Cyclone and Meteorological Hazard

No	Country	Province/ City	Coordinates		Risk Assessment		Vulnera-bility Assess-ment	Organiza tion Produced	Document No. in Appendix A4.5
			Latitude	Longitude	Area	Popu-lation			
1	Indonesia							ADPC	CM_001
2	Indonesia							ADB	CM_002
3	Indonesia							UNDP	CM_003

(6) Landslides

A summary of existing studies and reports is shown in Table 3.8.14 by country. A list of collected existing studies and reports is shown in Table 3.8.15.

Table 3.8.14 Summary of Existing Studies and Reports by Country: Landslide

Country/Region	Summary of Existing Studies and Reports
ASEAN	There have been a few reports that study landslides for ASEAN and the Pacific region at large in recent years. Disaster risks are assessed by scenario, exposure, vulnerability, damage, and loss. An assessment framework is also sought to give an overview of risks, hazard, and vulnerability.
Indonesia	High levels of hazard are distributed near volcanic areas, which are concentrated on the Indian Ocean side of the archipelago, and some parts of Celebes and West Papua New Guinea. There is no hazard on the Java Sea side where the metropolis is located. Exposure distribution is similar to hazard, with the number of landslides per year and deaths per year at highest level in ASEAN. The vulnerability index shows the country is ranked second in terms of deaths per year per million people, and its average annual economic loss ranked first. Statistics from 2003-2005 indicated in LS-004 show the amount of events, number of deaths, amount of damaged farmlands, and roads that are most vulnerable in the east Java region. The second highest number of landslides occurs is the central Java region and the number of deaths is highest in the north Sumatra region. There have been many landslide disasters in the past, and some disaster studies and risk assessment projects were conducted by Japan, Australia and the World Bank. LS-016 reports a study on flash floods (Bansir-Pandang), which contains assessment methodology using the relationship with landslides and the hazard map of some areas. Improvement projects for landslides are conducted mainly by BNPB. Hazard maps are prepared for the entire country, even though some are not of a large enough scale. SATLAKPB has been organized as the main body of disaster emergency command. The conditions for which have been reported in terms of framework, responsibility, and their role in some pilot provinces (LS-017). Significant subsidence of

	the ground in metropolises (such as Jakarta, Bandon, Semarang) shall be assessed as a disaster of soils.

Table 3.8.15 Existing Studies and Research: Landslide

No	Country	Province/ City	Coordinate		Risk Assessment		Vulnera-bility Assess-ment	Organization Produced	Document No. in Appendix A4.6
			Latitude	Longitude	Area	Popu-lation			
1	ASEAN				○	○	X	UNISDR/World Bank	LS-006
2	ASEAN				○	○	X	EEPSEA	LS-013
4	Indonesia	Entire Country	-6.199	106.848	○	X	X	BAKOSURTANAL	LS-003
5	Indonesia	Entire Country	-6.199	106.848	○	X	X	MEMR	LS-004
6	Indonesia	Entire Country	-6.199	106.848	X	○	X	JICA	LS-014
7	Indonesia	Entire Country	-6.199	106.848	X	○	○	BNPB/AIFDR/GFDRR	LS-015
8	Indonesia	Entire Country	-6.199	106.848	X	○	X	JICA	LS-016
9	Indonesia	Jemberka bupaten	-8.103	113.692	○	○	X	JICA	LS-017
10	Indonesia	Pariaman kabupaten	-0.624	100.119	○	○	X	JICA	LS-017
11	Indonesia	Preaman City	-0.624	100.119	○	○	X	JICA	LS-017
12	Indonesia,	Entire Country	-6.199	106.848	X	X	○	UNISDR	LS-008
			Indicates Capital						

References:

Flood

1) Arief Anshory Yusuf & Herminia Francisco (2009). Climate Change Vulnerability Mapping for Southeast Asia, Singapore: EEPSEA
2) Asian Disaster Preparedness Center (2011) Program for Hydro-Meteorological Disaster Mitigation in Secondary Cities in Asia (PROMISE) 2005 to 2010: Bangkok
3) Brinkman, JanJaap et al (2009) Jakarta Flood Hazard Mapping Framework: Jakarta
4) Velasquez, Jerry et al (ed.) (2012). Reducing vulnerability and exposure to disasters: Asia-Pacific disaster report 2012, ESCAP/UNISDR AP

5) World Bank (2011). Advancing Disaster Risk Financing and Insurance in ASEAN Countries: Framework and Options for Implementation, Washington: Global Facility for Disaster Reduction and Recovery
6) World Bank, UNISDR (2010). Synthesis Report on Ten ASEAN Countries Disaster Risks Assessment.

Earthquake

1) BAPPENAS, the Provincial and Local Governments of D.I.Yogyakarta, the Provincial and Local Governments of Central Java, and international partners, (2006). Preliminary Damage and Loss Assessment: Yogyakarta and Central Java Natural Disaster: The 15th Meeting of The Consultative Group on Indonesia Jakarta, June 14, 2006
2) Mark Petersen et al. (2007). , Documentation for the Southeast Asia Seismic Hazard Maps, USGS
3) OCHA-ROAP (2011). Indonesia: Natural Hazard Risks
4) PT. Asuransi MAIPARK (2010). Earthquake Risk Zone Map of Indonesia
5) USGS (2009). Seismic Hazard of Western Indonesia

Tsunami

1) ADB (2005). From Disaster to Reconstruction: A Report on ADB's Response to the Asian Tsunami
2) BAPPENAS, the Provincial and Local Governments of D.I.Yogyakarta, the Provincial and Local Governments of Central Java, and international partners, (2006). Preliminary Damage and Loss Assessment: Yogyakarta and Central Java Natural Disaster: The 15th Meeting of The Consultative Group on Indonesia Jakarta, June 14, 2006

Volcano

1) OCHA -ROAP (2011). Holocene Eruption and Selected Volcanoes in Asia-Pacific

Cyclone (Typhoon) and Meteorological Hazard

1) ESCAP/WMO Typhoon Committee. (http://www.typhooncommittee.org/)
2) JMA/WMO Workshop on Quality Management in Surface, Climate and Upper-air Observations in RA II (Asia) 2011
3) WMO National Meteorological or Hydrometeorological Services of Members (http://www.wmo.int/pages/members/members_en.html)
4) WMO (2010). First Meeting of the Task Team on "Meteorological, Hydrological and Climate Services for Improved Humanitarian Planning and Response", WMO Headquarters, Geneva, Switzerland (31 August - 2 September, 2010)

Landslide

1) World Bank, UNISDR (2010). Synthesis Report on Ten ASEAN Countries Disaster Risks Assessment

2) World Bank, UNISDR (2011). Disaster Risk Management Programs for Priority Countries- 2nd edition

Figure 3.8.1 Existing Study on Natural Hazards in Indonesia

Chapter 4 Industrial Agglomerated Areas and Investment Risk

4.1 Historical Evolution of Industrial Agglomerated Areas

Industrial estates in Indonesia started to develop in the early 1970s as part of government effort to promote inbound FDI. Initially, most industrial estates were established and owned by the government. In 1973, the government established the country's first industrial estate, Pulo Gadung Industrial Estate. This was followed by the establishment of Surabaya Rungkut Industrial Estate in 1974. Several industrial estates were subsequently developed. In 1986, the government established the Nusantara Bonded Zone, which increased the facilities available to exporters, in a further effort to attract FDI.

In 1989, the government issued Presidential Decree 53/1989, which opened the industrial estate development business to private companies. The decree also established the legal and technical requirements for the development and operation of estates. The decree was replaced in 1996 by Presidential Decree 41/1996, which set new guidelines for industrial estates in Indonesia. The decree defines an industrial estate as "a center for industrial activities with provisions of infrastructure and supporting facilities, which is developed and operated by a licensed industrial estate company". Since then, industrial estates run by private sector firms have shown significant growth.

During the 1990s, the strong development of manufacturing industries in Indonesia further contributed to the development of industrial estates, until the 1997 Asian Financial Crisis. The Crisis saw many investors leave industrial estates, resulting in low occupancy rates and multiple estate closures. The development of new estates also slowed significantly. Indeed, several areas set aside for estates prior to 1997 have yet to be developed. As Indonesia's economic growth has recovered, industrial estate development has improved, but generally remains slower than in the early 1990s. Estate development slowed in 2005 and 2006 due to the fuel price increases, but has increased since 2007. Part of this improvement was due to a law passed in 2006 requiring new manufacturing companies to locate their operations in industrial estates, driving estate development. (Existing factories outside industrial estates are required to move into industrial estates when their land use right end.)

According to Industrial Park Association (HKI) data, as of June 2012, the total industrial land in Indonesia reached 27,320.6 ha. Industrial estates are concentrated on Java Island, where the vast majority of commercial businesses are based and the best infrastructure is located.

4.2 Recent Trends and Japanese Investment

Japanese investors have been present in Indonesian industrial estates since the 1970s, attracted by relatively low costs. However, Japanese investment increased significantly in the late 1980s, following the appreciation of the Yen and the opening of industrial estate development to private firms. Since then, Japanese companies have established various industrial estates in the area between

Jakarta and Cikampek in West Java Province. The growth of Japanese-affiliated industrial estates attracted further Japanese investment, especially in West Java province or the nearby Jakarta Special Area. Until 2003, 75% of Japanese investment was concentrated in these two provinces, with 8% located in Riau province. While some Japanese firms have extended into other areas, this general pattern of Japanese investment is still present today.

4.3 Observations from Data Collection

While the level of development of industrial estates in Indonesia varies, most are relatively well managed, and maintain their own websites and marketing teams. Estates in Java and Riau are generally equipped to communicate with and support foreign investors, given their significant experience with foreign tenants. Most websites have English language content. Marketing teams generally have English-speaking staff that are helpful and responsive to inquiries, though specific kinds of information, such as details on tenant firms, is often considered confidential and not publicly available.

4.4 General Investment Risk

(1) Political Risk

Indonesia is a republic headed by a president who is both head of state and commander-in-chief of the armed forces. President Susilo Bambang Yudhoyono, a former Army general, was re-elected for his second and final five-year term in July 2009. Yudhoyono heads the Partai Demokrat (PD), which has the most seats - 148 out of 560 - in the legislature, the People's Representative Council. The PD is in coalition with four of the largest Islamic political parties. The other main parties are Golkar, which has 106 seats and is in the coalition, and the Indonesian Democratic Party-Struggle (PDI-P) with 94 seats. Golkar was the dominant political party under President Suharto, while former President Megawati Sukarnoputri heads the PDI-P. These three main parties do not differ substantially in their political platforms and will tend to favor populist policies ahead of elections, including raising subsidies.

President Yudhoyono relies heavily on businessman-turned-politician Abu Rizal Bakrie, who is the head of Golkar, to push through politically sensitive laws. His support was instrumental in pushing through the partial removal of oil subsidies earlier this year as well as encouraging lower barriers for foreign investment. This is likely to continue despite Bakrie's falling public popularity because of financial irregularities in his family business as he retains the support of his party.

The military played a prominent role in politics under President Suharto. Since 1999, its role in governing the country has decreased, formally ending in 2004. The military's marginal political role makes a military coup unlikely.

The next presidential and parliamentary elections are scheduled for 2014. The ruling PD has done poorly in opinion polls; due partly to President Yudhoyono's declining popularity and multiple

corruption scandals. The current president Yudhoyono is constitutionally banned from seeking a third consecutive term and will therefore stand aside ahead of the 2014 poll. There is no clear successor for Yudhoyono within his party and the prospects of the ruling party are marginal at best. Meanwhile, the PD's coalition partners, Golkar and the Indonesian Democratic Party of Struggle (Partai Demokrasi Indonesia Perjuangan: PDI-P), have seen their support levels rising in tandem with the reigning party's downfall. It is likely that one of these big secular parties, which have the required wealth and regional connections, will be forming the next coalition government. Golkar has particular advantages in terms of wealth and political networks. Gerindra, the largest newcomer to Indonesia's political scene, is also a potential player in the making.

As a result of popular fear that domestic firms and workers will lose out to foreign competition, Indonesian politicians have passed multiple populist indigenization policies as elections have drawn near. These policies narrow the operating space for foreign firms and increase local ownership requirements. Since 2011, such policies have been passed in the retail, banking, mining and oil and gas sectors. If Golkar comes to power in 2014, the enforcement of such policies is likely to be softened, and new indigenization measures are less likely. Should PDI-P or Gerindra come to power, this trend is likely to continue, if not accelerate.

(2) Economic Risk

Domestic demand propelled Indonesia to 15-year growth peak in 2011 and will remain the key driver of the economy in the near term. On the back of strong consumer and business confidence, household spending and investment should continue to grow at a brisk pace despite persistent global headwinds. Thanks to robust domestic demand, Indonesia's economy should clock in growth of 6.1% in 2013, following last year's 6.2% expansion. Both private consumption and investment continue to grow at a fast clip owing to rising incomes and inflows of foreign direct investment as foreign firms seek to capitalize on the country's favorable demographics and natural resources. Domestic demand is at some risk from the government’s implementation of fuel subsidy cuts from 22 June 2013 on, although we do not currently expect this to dramatically weaken demand it will certainly limit upside surprises.

The Indonesian rupiah (IDR) has been the worst performing emerging market Asian currency in 2012. To help bolster the rupiah's value, the central bank (BI), in August 2012, reduced terms for foreign exchange hedging contracts to one month from three months and raised the floor for money market rates to 4% from 3.75% to absorb excess rupiah liquidity. These measures combined with the extra liquidity from the US Federal Reserve's quantitative easing that began in September 2012, helped the IDR to appreciate slightly against the dollar. Despite this, by December 2012, the IDR had depreciated to around 9,650 to the dollar, or by about 6.5% for 2012. However, a currency crisis is unlikely in the next year largely because foreign exchange reserves totaled USD 110 billion in November 2012, covering around seven months of imports. Moreover, at end-2011 domestic and external debt combined stood at 25% of GDP. These favorable figures are probably underlying BI's

tolerance of a declining rupiah. For 2013, the government projects growth of around 6.6%, accounting for weaker demand from European and the US.

BI has not introduced any capital controls recently, having put several measures in place between 2008 and 2010. However, further capital controls would be likely if external economic conditions were to again deteriorate. In late 2008, BI reacted to possible currency speculation by requiring Indonesian nationals or firms purchasing over USD 100,000 in foreign currency to provide evidence of the transactions underlying the exchange. Foreign nationals and firms were limited to making currency purchases over USD 100,000 only through spot transactions. In June 2010, the government introduced further measures to make investors commit funds for longer durations, stipulating that investors in the bank's debt paper must hold the bills for at least 28 days. Bank Indonesia also widened spreads on its overnight deposit and lending rates and began selling longer-dated SBIs.

Financing investment initiatives has become easier and less costly in the wake of Indonesia's return to investment-grade sovereign credit rating status. Direct investment inflows have been hitting record highs in 2011–2012, bearing witness to Indonesia's growing appeal as an investment destination. These positive trends reflect progress made in the past decade in improving the business environment and reducing debt. The government has lowered corporate tax rates, modestly reduced rampant tax evasion, eased red tape, introduced critical new legislation, and taken concrete steps to clarify the regulatory environment. As a result, Indonesia has been improving its standing in global competitiveness rankings. However, prevalent corruption and infrastructure limitations remain key restrictions on foreign investment. Foreign investors are often compelled to pay bribes or risk facing delays and other impediments to their investments on both a national and a local level.

(3) Legal Risk

Indonesia's regulatory and legal environment can be opaque, incoherent, and time-consuming. Laws are subject to inconsistent interpretation and enforcement, and many foreign investors see the unreliable legal environment as the main challenge to starting a business in Indonesia.

The legal system is based on a combination of Roman-Dutch law, indigenous customary law, and Islamic law. Since the country's independence in 1945, government rhetoric has long promoted the continuing rationalization and modernization of laws and regulations. Following the restoration of political stability and the accession to power of Indonesia's first democratically elected government in 2004, there have been moves to revise significant portions of the legal framework. These attempts are highlighted by four major amendments to Indonesia's Constitution every year from 1999 to 2002, dealing with issues such as the decentralization of authority from the central government to provincial and regional governments, human rights provisions, and the creation of additional constitutional bodies such as the House of Regional Representatives and the Constitutional Court.

Despite promises of legal reform, the judiciary remains weak and corrupt, and the introduction of deregulation under the 2001 Autonomy Law has added further layers of complicated rules and regulations for foreign investors to deal with. Provinces have taken over responsibility for various

regional-level legislation, including tax and the handling of revenue from the extraction of natural resources. The central government remains in charge of legislation in such areas as foreign policy, security, defense, justice, and monetary/fiscal matters. The current government of President Yudhoyono has prioritized the modernization of the legal system. It will, however, take some time before the ramifications of these enhancements are felt and the complex legal system is turned into a more efficient one. Entrenched corrupt business practices and deficiencies in law enforcement are also likely to be much harder to remedy than weaknesses in the legal system.

(4) Tax Risk

The Indonesian tax system is in the process of continuous reform, but progress has been slow. The main sources of revenue, besides oil and gas, are income taxes – personal and corporate. Indonesia has a high personal income tax rate and a moderate corporate tax rate by regional standards. The corporate income-tax reduction was concluded in January 2010. The system relies heavily on withholding taxes, reflecting the difficulties in revenue collection. Tax evasion is a major problem in Indonesia where the tax system works on a self-assessment basis and taxpayers are trusted to register, calculate their income generated and the tax payable, and report to the tax office. The government therefore urgently needs to widen the tax base. The decentralization process that commenced in 2001, allowing for more regional autonomy, has resulted in a greater risk that additional taxes are levied at provincial level. Improved budget allocation along with better public financial management systems would lead to substantial efficiency gains on a regional level, while, on the national level, efforts to improve tax administration and spending efficiency are a priority. Currently, there is, however, little supervision of the tax office's activities and corruption is perceived as rife in the Indonesian tax system.

(5) War Risk

Indonesia and Malaysia have a number of disputed maritime borders. The most significant of these is the Ambalat maritime dispute. This surfaced in 2005 after oil reserves were found in Ambalat, and both countries deployed naval forces to guard the area. In 2008, Indonesia's Parliament lodged a protest against alleged territorial violations by Malaysian troops in the area. Malaysia refers to oil blocks in the area as ND6 and ND7, which are both partially within the disputed territory. Both countries have awarded exploration rights to companies there. Malaysia awarded Shell Oil and PETRONAS Carigali Sdn Bhd joint exploration rights in 2005, while Indonesia awarded the Italian energy company ENI similar rights.

Despite this, military conflict between Indonesia and Malaysia over the Ambalat dispute is unlikely, as economic and diplomatic relations have improved. In 2002, a previous maritime dispute between the two countries concerning the Sipadan and Ligitan Islands was resolved by the International Court of Justice in Malaysia's favor. It is likely that the dispute will also be diplomatically resolved. Until then, protests by the respective navies over encroachment by their counterparts across the disputed boundary are probable. In 2010, Indonesia was considering the possibility of managing the territory

with Malaysia, with joint naval patrols. But this has not been acted upon since. There is a moderate risk of naval skirmishes involving ramming, but commercial vessels in the area are unlikely to be harassed.

Interstate conflict with East Timor is unlikely. Relations between Indonesia and East Timor have improved significantly since the latter won independence, despite accusations by East Timor that East Timorese rebels had crossed into Indonesia to seek refuge in 2006. While Indonesia has admitted that a lack of military capacity means it is unable to monitor rebel movements across the common border effectively, it has initiated joint patrols with East Timorese troops, particularly around East Nusa Tenggara. Indonesia investment is also increasing in East Timor. In December 2012, Indonesian state-owned PT Waskita Karya said that it will expand its operations in East Timor in 2013.

(6) Terrorism Risk

There have been multiple large-scale Islamist militant attacks in Indonesia against commercial properties that have resulted in significant property damage and loss of life. Several of these attacks have targeted Western assets, including the 2002 and 2005 Bali bombings. There have been subsequent attacks on Western targets including the 2009 Ritz-Carlton and Marriott attacks in Jakarta. Counterterrorist police have since succeeded in disrupting various cells and killing or capturing key militants. Further, we assess the new generation of militants will probably change this pattern.

Cells are now more dominated by new recruits that are less experienced and more locally focused. These recruits have backgrounds in vigilante groups and are unlikely to have trained in Afghanistan or the Philippines, reducing their capability to crude IEDs. As they are less connected to the global jihadist movement, they are less likely to follow the traditional jihadist target pattern, i.e. Western diplomatic and commercial interests. Rather, target sets will probably include 'un-Islamic' assets (including alcohol and music stores, bars and nightclubs), security forces, local government assets and central and local government officials perceived to be opposed to an Islamic state. Overall, this reduces the risk to commercial assets such as hotels and shopping malls, which fall outside the target set of most cells. Areas likely to be targeted include Cirebon, Poso, Ambon, Makassar and the urban areas of Java. Groups which do target Western diplomatic assets lack the capability, unity and organization to successfully carry out attacks.

Separately, in Papua, there is a low-intensity separatist conflict headed by the Free Papua Movement (OPM) which is likely to target the US-based mining firm Freeport-McMoRan's Grasberg mine. OPM militants are likely to mount road ambushes targeting migrant workers. In September 2012, suspected OPM militants fired at Freeport Indonesia buses carrying mine employees on two occasions, but injured no one. Since February 2012, the military has been providing support in securing the Grasberg mine area, mitigating the risk posed by separatists slightly.

(7) Civil Unrest Risk

Protests in Indonesia occur frequently and are driven by a wide range of issues. Land-related protests are likely to increase after President Yudhoyono implemented regulations forcing landowners to sell for infrastructure construction in August 2012. Infrastructure projects have stalled over land disputes and experience protests once they are completed. In December 2012, a few dozen farmers protested against the government in Pahlawan, Central Java, after they were forced to leave their land to make way for the Logung dam in kudus Regency. Palm oil and biofuel cultivation are a probable source of land-related protests. Biofuel production increased to 1.52 billion from 781 million liters in 2011 year-on-year. This is expected to reach 2.2 billion liters in 2013. Thousands in East Kalimantan in June 2012 protested against a palm oil company's plans to clear their land to make way for a plantation.

Mining-related protests are likely to increase and become more violent as a surge in illegal mining and mining permits awarded without the consent of locals becomes politicized in the 122 local elections taking place in 2013. In December 2012, the police identified 900 likely hotspots for conflict between miners and locals across the country. Mine protests are likely in Sumbawa, Papua, Sulawesi and North Sumatra.

Protests against perceived insults to Islam are also probable. Although these are normally peaceful, they become violent occasionally and pose an elevated risk of property damage. In September 2012 protesters in Jakarta threw bricks and Molotov cocktails at the US embassy after the release of an US-made anti-Islamic video. In Medan, protesters forcibly closed McDonalds and KFC branches. There is also an elevated risk of communal unrest based on religious differences. Such events are exacerbated by the Blasphemy Laws that protesters perceive validate their actions. In August 2012, 1,000 people attacked homes belonging to members of a minority Muslim sect in Sukabumi. Such unrest is unlikely to affect commercial assets.

Volatility in the price of commodities is likely to trigger protests. The police, in March 2012, deployed around 14,000 personnel to control thousands of protesters marching on the Presidential Palace in Jakarta after a fuel price increase was announced. Protesters also occupied Polonia International Airport for five hours, disrupting flights. The protests remained peaceful throughout, but further protests over fuel prices have the potential to turn violent.

Generally, national level, industry-wide strikes are unlikely, but reform to labor laws, likely after 2014 elections, is likely to lead to protests lasting a day or two in multiple cities. More often, there are day-to-day contract negotiations, strikes and protests at the factory or work-site level. These normally involve local grievances ranging from the availability of free cigarettes to workers to unpaid wages. The number of strikes has gradually increased since the end of the Suharto era in 1998, but the right under the law to fire striking workers gives employers an advantage during industrial action. Further, while the number of employees in some sectors is large (e.g. 200,000 employed in the timber sector in Kalimantan alone), the low-skilled nature of their occupations leaves them little

bargaining power. And so although strikes may be more frequent, wide-scale industrial action is rare due to workers' dependence on daily wages and their weaker bargaining position, reducing business disruption risks.

(8) Infrastructure Risk

A lack of investment in infrastructure since the Asian Financial Crisis means that infrastructure limitations are increasingly undermining Indonesia's competitiveness and ability to attract foreign investment. Despite strong recent economic growth, there are significant factors that will hinder a sector-wide turnaround in the infrastructure sector in the next five years. Public opposition to hikes in fares is likely to constrain the government's options for privatizing key rail, marine and aviation facilities and utilities operators ahead of elections in 2014. Further, allowing utilities providers to set their own tariffs would be a major indicator of political will to reform the power sector; however, the decision not to raise electricity rates in 2011 suggests that this is also unlikely prior to 2014.

Another factor contributing regulatory uncertainty is that while new legislation, such as the Railway Law and Electricity Law, is aimed at dismantling underperforming state infrastructure monopolies, this has yet to be accompanied by clear implementing regulations and procedures which facilitate the entry of private investors. The government intends to draw USD 47.3 billion from public private partnerships up to 2014, but the formula is still largely untested. In the last decade, only USD 2 billion has been realized in new investments from these projects. The outlook for change is therefore likely to be characterized by sustained but gradual improvements in infrastructural performance and national/international connectivity, as poorly-managed and inadequately funded state-owned enterprises dominate the infrastructure sector up to 2014. Other key issues that are likely to derail or at least slow down the implementation of projects include land acquisition disputes and delays caused by communal protests.

Roads: The existing road infrastructure compares unfavorably with neighboring countries, particularly in rural areas. Travel by road is the primary means of passenger and cargo transportation in Indonesia, but Indonesia's road density is lower than its regional peers, including the Philippines, Malaysia, Thailand and Vietnam, at just over 0.2 km per km². Furthermore, of the country's 437,759 km of roads, just under 60% are paved (against 99% in Thailand and 81% in Malaysia). Road development has been outstripped by vehicle sales, which numbered roughly 1 million cars and 3.5 million motorcycles per year over the last decade. This has led to increasing stress on the quality of roads and bottlenecks across the country. Costs to business are significant due to additional maintenance, accidents and time constraints incurred. As a result, goods transportation is on the whole inefficient and costly when compared to other Asian countries. Given that approximately 70% of freight is transported by trucks, Indonesia's road infrastructure is an impediment to trade and investment, with implications for a number of sectors. Local disputes over land rights constrain efforts to improve road infrastructure.

Rail: Indonesia's rail network is among the worst performing networks in the region. Indonesia has 5,824 km of railway tracks, making it the longest network in Southeast Asia. With only 4,337 km in operation, however, the sector has been severely neglected. Annual growth of rail has been only 4% for the last 25 years. As a result, performance is low due to poor and dated facilities. Tracks, signals and telecommunications systems are old and in bad shape, which also contribute to a high accident rate. Delays are frequent due to the poor quality of infrastructure, which needs continual attention. Locomotive upgrades and repairs take 30 days on average to complete, in comparison to modern standards which take 7-10 days. As such, rail shoulders only a modest part of the burden placed on overland transport, accounting for 17% and just 0.6% of passenger and freight transport respectively. By far the greatest application of rail passenger transport is in Java, where two long-distance routes link Jakarta with Surabaya and Yogyakarta and shorter routes link the capital with Bandung and Cirebon.

Ports: Indonesia has some 111 commercial ports (with 25 major commercial ports), 614 non-commercial ports and about 1,000 private ports that deal with specialized cargo such as specific commodities. The commercial ports are managed by the state-owned port operator PT Pelabuhan Indonesia (Pelindo), which is divided into four separate jurisdictions across the country. These Indonesian Port Corporations (IPCs) have long maintained a national monopoly over port authority and the provision of services. Private management is limited to a handful of foreign companies involved in joint-ventures with the regional state-run operators (known as Pelindos). Privatization is a slow process, and any major restructuring of port operations will likely increase the risk of strikes and protests by port unions. Despite their importance, Indonesia's public ports suffer from a significant shortfall in capacity, and are slow and expensive to use compared to other Asian economies. Congestion is a major concern, with ships running through Indonesia's main ports facing long waiting times, spending less than half of their turnaround time actually working. Also, the cost of shipping a 40 foot container from Padang (West Sumatra) to Jakarta is estimated at USD 600, whereas the cost of transporting the same container over the greater distance between Jakarta and Singapore costs USD 185. These expenses are compounded by poor transport logistics around ports and limited dry port infrastructure which inhibit the movement of cargo in and out of ports. Logistically, a major constraint is the centralization of shipping around a small number of container ports, meaning that cargo in and out of remote islands has to be transshipped through a central hub, typically a port in Java.

Airports: Despite public private partnership initiatives, most airports have not seen major investments in decades and are struggling to keep up with increasing demand. There are presently 210 airports in Indonesia, of which some are overseen by state-owned PT Angkasa Pura. Some smaller airports are operated separately through local governments or the Ministry of Transportation. There are some PPPs underway, but overall private uptake in airport projects has been limited. Freight transportation by air is relatively underdeveloped, and consists mostly of the shipment of perishable goods, much of which is trans-shipped via Singapore. On the other hand, between 2002 and 2006, passenger transport increased five-fold.

Power: Indonesia has an installed electricity generation capacity of around 44.5 GW. Some 57% of this is owned by the state-owned provider Perusahaan Listrik Negara (PLN), which, until the government passed its electricity law in 2009, was the sole provider of power in the country. The remaining share is accounted for by the 10,000 or so industrial and manufacturing units that see to their own power supply. Electricity production is heavily dependent on non-renewable feedstock, which is vulnerable to external price shocks (as in the case of diesel fuel) or entails an opportunity cost in terms of the non-export of domestic resources (as with natural gas). Indonesia's electricity sector is beset by inadequate capacity and inefficient transmission and distribution infrastructure. Electrification rates are lower than elsewhere in Southeast Asia, with large disparities by province. Having not seen substantial investment in decades, most power plants, the majority of which are located in Java, are inefficient, meaning that actual production falls far short of PLN's generating capacity. However, in areas where electricity is more readily available (e.g. Jakarta), subsidization encourages increased consumption by domestic and industrial consumers, and electricity demand has increased by roughly 7% annually over the last few years. Many businesses already regard poor electricity supply as a major hindrance to their operations.

Water: Water supply is increasingly compromised by pollution, poor management and the low level of state and private investment in the sector. The use of water in the agricultural sector accounts for 58.5% of consumption, and this, along with rising industrial and domestic consumption is putting significant pressure on supply. Water use was calculated at 591 billion liters/day in 2005 and is forecast to rise to 1,131 billion liters by 2015. Demand in Jakarta is growing, with the city needing an additional 13% supply by 2012. Piped water is available to just 24% of the population, but even in Jakarta some 35% of residents are reliant on other sources such as ground water, which may be contaminated, or bottled water, which comes at a considerable cost. The outlook for supply is deteriorating, as rising sea levels threaten coastlines and pose the risk of fresh water salinization. Similarly, water degradation is an increasingly acute problem as industry and the population expand, resulting in rivers effectively ending up as disposal grounds for industrial and household waste.

4.5 Industrial Agglomerated Areas and Natural Disaster Risk

Several distribution maps are shown overlaying natural disaster risk as follows. List of industrial agglomerated areas are attached at the end of this report.

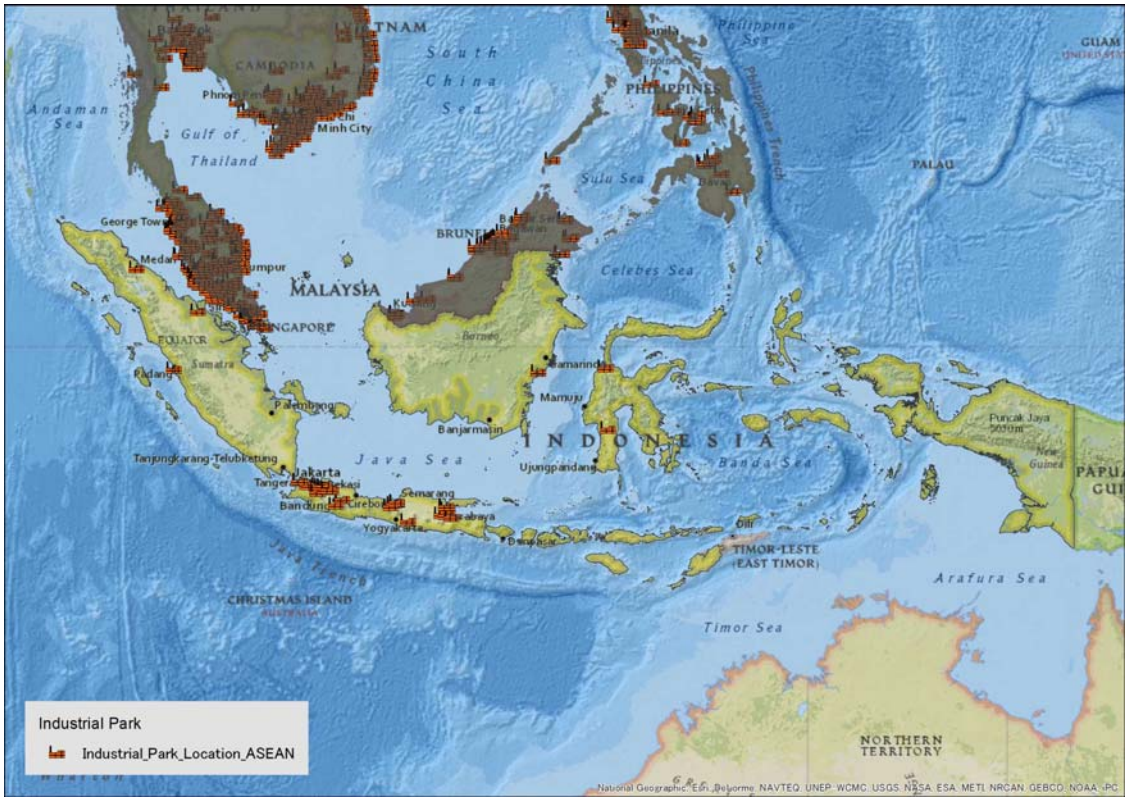


Figure 4.5.1 Distribution of Industrial Park in Indonesia

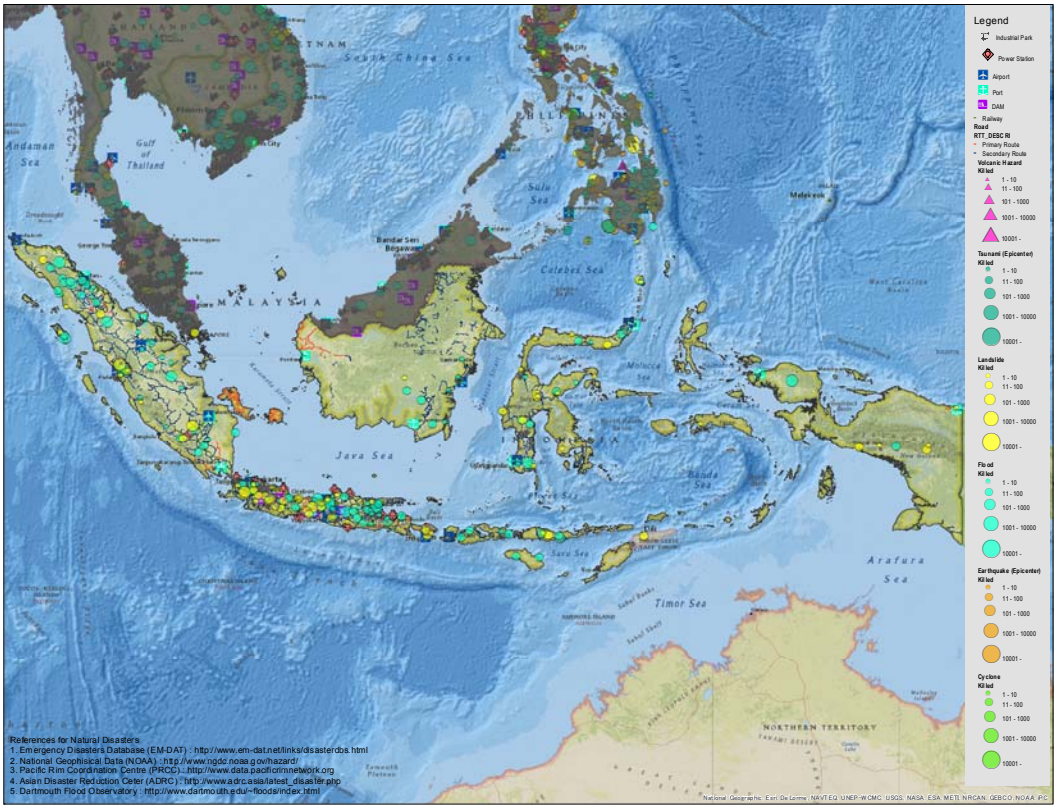


Figure 4.5.2 Distribution of Industrial Park, Major Infrastructures and Natural Hazards on number of killed in Indonesia

Figure 4.5.3 Distribution of Industrial Park, Major Infrastructures and Natural Hazards on number of killed in Java Island

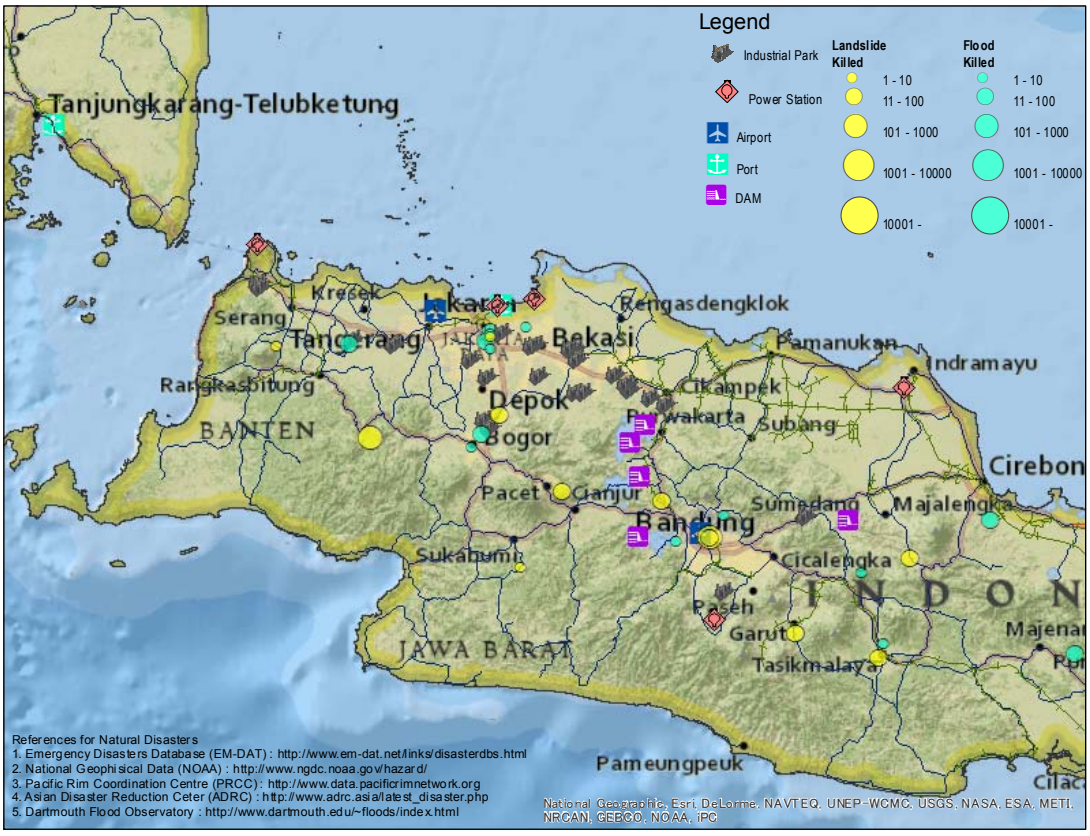


Figure 4.5.4 Distribution of Industrial Park, Major Infrastructures and Natural Hazards on number of killed in Metropolitan area

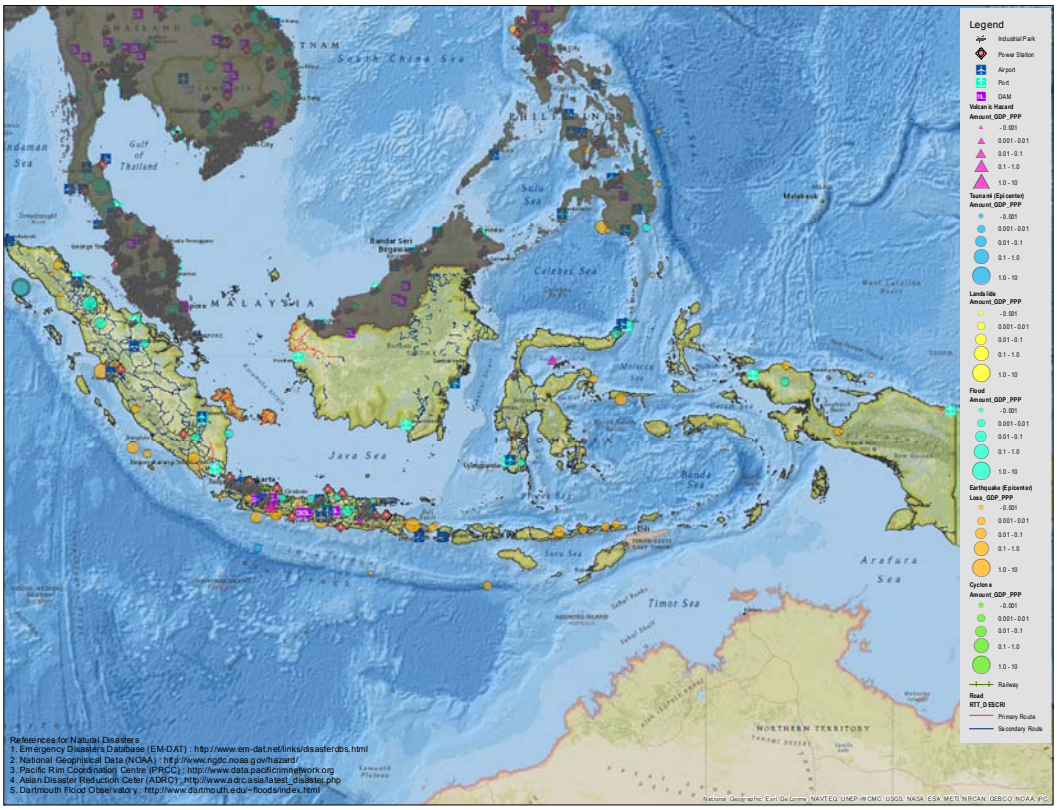


Figure 4.5.5 Distribution of Industrial Park, Major Infrastructures and Natural Hazards on loss rate to GDP in Indonesia

Figure 4.5.6 Distribution of Industrial Park, Major Infrastructures and Natural Hazards on loss rate to GDP in Java Island

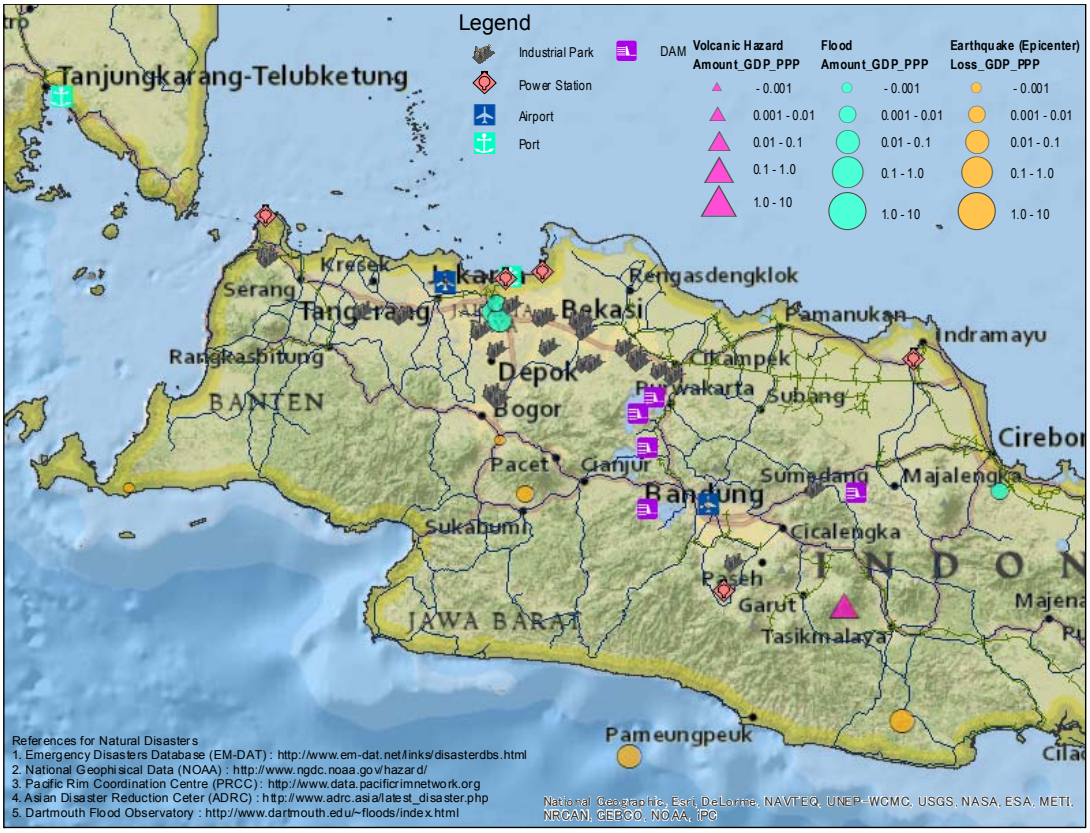


Figure 4.5.7 Distribution of Industrial Park, Major Infrastructures and Natural Hazards on loss rate to GDP in Metropolitan area

Chapter 5 Relevant Infrastructure and Natural Disaster Issues

5.1 Infrastructure Conditions

5.1.1 Roads

The total length of road in Indonesia is about 497,000 km: 39,000 km of national road, 54,000 km of provincial road, and 404,000 km of regency road.

Not all of the national roads are paved, and there are more unpaved roads in other categories. It can also be said that the pavement maintenance is insufficient.

Table 5.1.1 Total Length of Roads in Indonesia (km)

Year	National Road	Provincial Road	Regency and City Road	Total
2009	38,570	52,957	384,846	476,373
2010	38,570	53,291	395,453	487,314
2011	38,570	53,642	404,395	496,607

Source: Statistics Indonesia 2012

Table 5.1.2 Pavement Type (km) 2008

Surface	National Road	Provincial Road	Regency and City Road	Total
Asphalt	32,964	32,622	193,158	258,744
Gravel	1,664	4,311	66,958	72,933
Earth and sand	0	3,012	88,432	91,444
Others	0	180	14,458	14,638
Total	34,628	40,125	363,006	437,759

Source: Ministry of Economy, Trade and Industry, Indonesia Sunda Cross-strait Large Bridge, Regional Development Plan and Survey Report 2012

In Indonesia, there are two (2) Asian Highways: one is the road (AH25) which travels north-south through Sumatra, and the other is the road (AH2) which travels west-east through Java.

Table 5.1.3 Current Condition of Asian Highway in Indonesia

Route	Total Extension (km)	Paved Road		Un-paved road	Ferry
		2 lines	1 line		
AH2	1,545	1,537	-	-	8
Ah25	2,570	2,209	201	134	26
Total	4,115	3,746	201	134	34
Ratio %	100	91.0	4.9	3.3	0.8

Source: Ministry of Land, Infrastructure, Transport and Tourism, Asian Highway Database

5.1.2 Ports

Indonesia consists of approximately 17,000 islands. Therefore, the maritime transport that connects these islands plays an important role. The management and operation of ports are conducted by the four (4) national port companies (PT. Pelabuhan Indonesia I~IV: PELINDO).

In Indonesia there are 300 public ports, of which 43 are international ports and 14 are designated ports of ASEAN. There are four (4) major ports (Tanjung Priok, Tanjung Perak, Belawan, and Makassar), of which the largest is Tanjung Priok. This port is located in northern Jakarta and handles half of the entire container throughput of Indonesia.

Table 5.1.4 14 Designated Ports by ASEAN in Indonesia

Island	Port
Sumatra	Belawan, Dumai, Tanjung Pelapas, Palembang, Pajang
Java	Tanjung Priok, Tanjung Emas, Tanjung Perak
Kalimantan	Pontianak, Bajarmashin, Balikpapan
Sulawesi	Makassar, Bitung
New Guinea	Sorong, Jayapura

Source: ERIA, ASEAN Strategic Transport Plan 2011-2015

They are 540 million tons of cargo throughputs in Indonesia. Even if cargo throughputs differ, the numbers of import and export containers are similar.

Table 5.1.5 Cargo Throughput in all ports of Indonesia

	International			Domestic	Total
	Import	Export	Total		
Cargo (kilo tons)	100,958	442,457	543,415	424,946	968,361
Container(kilo TEUs)	3,066	3,034	6,100	2,722	8,822

Source: OECD, Indonesia Regulatory and Competition Issues in Ports, Rail and Shipping

5.1.3 Railways

Although Indonesia has a 6,720-km train line, the length of route actually used is 4,600 km. The railroad has not been connected in many areas. There are three routes in Java, with one route in Sumatra. The length of the train line is 3,300 km in Java and 1,300 km in Sumatra.

- The gauge of the track is 1,067 mm, which is the same narrow gauge used Japan.
- The railroad of Indonesia is managed by PT Kereta Api (PTKA).
- There have been 200 million railway passengers, 98% of whom are from within Java and 93% of whom are from the Jakarta metropolitan area. The rail freight tonnage is 20 million tons per year.

5.1.4 Airports

There are 187 airports for civil aviation use in Indonesia, of which 16 are international airports. These airports are mostly only equipped with short runways less than 1,000 m. There are only seven airports that have runways over 3,000 m.

Table 5.1.6 Flight, Passenger and Air Cargo by Airline Companies in Indonesia 2011

	Domestic	International	Total
Regular flights	460,924	61,755	522,679
Passengers	55,336,102	8,152,133	63,488,235
Air cargo (ton)	681,925	72,060	753,985

Source: Statistik Indonesia 2012

The passengers and air cargo in five (5) main international airports in Indonesia are as follows.

Table 5.1.7 Passenger and Freight Traffic in 5 Main International Airports in Indonesia 2011

Airport		Domestic	International	Total
Polonia-Medan				
	Passenger (thousands)	2,862	686	3,548
	Freight (tons)	17,143	3,346	20,489
Soekarno Hatta-Jakarta				
	Passenger(thousands)	17,705	5,295	23,000
	Freight (tons)	201,429	112,095	313,524
Juanda-Surabaya				
	Passenger (thousands)	5,710	641	6,351
	Freight (tons)	39,091	8,671	47,762
Ngurah Rai-Denpasar				
	Passenger (thousands)	3,243	3,088	6,331
	Freight (tons)	8,016	24,459	32,475
Hasanuddin-Makassar				
	Passenger (thousands)	2,777	39	2,816
	Freight (tons)	21,256	828	22,084

Source: Statistik Indonesia 2012

5.2 Public Services

5.2.1 Electricity

In Indonesia, Perusahaan Listrik Negara (PLN) is engaged in electric power generation and power transmission. Although PLN is the only entity conducting power transmission, an Independent Power Producer (IPP) may enter the electric power generation business.

The total power generation in 2011 was about 183,400 million kWh, and the electric power generating capacity was 29,268 MW. In addition, the national electrification rate was 72.95% as of 2011, although the electrification rates were low in Sulawesi, New Guinea, and especially Pulau Timor.

The sources of energy are largely dependent on fossil fuels such as coal, natural gas, and oil produced at home.

Table 5.2.1 Rate of Produced Energy Source of Indonesia 2010

Source of Power Generation Energy	Produced Electricity (1 million kWh)	Share (%)
Coal	68,040.5	41.1
Natural Gas	51,977.8	31.4
Oil / Diesel	19,104.4	11.5
Hydro	17,031.9	10.3
Geo Thermal	9,305.2	5.6
Biomass	87.5	0.1
Sunlight / Wind	0.5	0.0
Gross Total	165,547.9	100.0

Source: JBIC, Indonesia Investment Environment 2012.4

The demand for electric power shows that the rate of increase is around 10%, after a temporary decline in 2009. Although the largest electric power consumption in Indonesia is home consumption, the second largest is industry consumption.

Table 5.2.2 Rate according to the Field of Power Consumption of Indonesia 2010

Power Consumption Section	Power Consumption (1 million kWh)	Share (%)
Industry	50,985	34.6
Commerce	27,157	18.4
Public	9,330	6.3
Home	59,825	40.6
Gross Total	147,297	100.0

Source: JBIC, Indonesia Investment Environment 2012.4

5.2.2 Water

(1) Water Supply

In Indonesia, BPPSPAM and Cipta Karya, which are under the Ministry of Public Works, have jurisdiction over the national water supply. Under this, PDAMs, which are wholly financed by local governments, perform operation and maintenance work for the water supply system.

- The number of PDMAs is not clear because of different numbers in statistical data.

- The water supply system should be reviewed because the rate of non-revenue water is as high as 30%. The access rate to safe water is 82% for the whole country.

Table 5.2.3 Outline of Waterworks in Indonesia

Description	Figures
Domestic Access Number of Houses (as of June 2010)	8,741,297
Domestic Diffusion Rate (2009)	14.6%
Number of PDAM	410
Gross-product Capability	160,654 L/sec
Water Rates	1,673 Rp/m^3
Total Number of Employees	50,840

Source: Ministry of Health, Labor and Welfare; International Water Promotion Report 2012.3

Table 5.2.4 Outline of PDMA 2011

Item	Figures
Number of Water Company	532
Volume of Produced Clean Water (10^6 m^3)	3,167
Volume of Distributed Clean Water (10^6 m^3)	2,499

Source: Statistik Indonesia 2012

(2) Sewerage

In Indonesia, the sewerage coverage ratio is about 1%, which is remarkably low, even compared with the neighboring countries. Generally, septic tanks are popularly used (62%) in urban areas, but discharging into rivers without treatment is a cause of river water pollution. Only 4% of septic tanks discharge their waste water after treatment. The industrial estates in east Jakarta have installed sewerage treatment plants within their lots in order to avoid discharging polluted waters.

The waste water treatment technologies applied by the industrial estates are widely varied from the most simple aerated lagoon process to oxidation treatment with long aeration, membrane separation and filtration methods.

5.2.3 Communications

(1) Internet and broadband

204 companies have obtained licenses to provide internet access service as of 2011. Moreover, there are 2.74 million broadband subscribers with a yearly upward trend.

(2) Mobiles phone

The main companies in the mobile phone business are Telkomset, Indosat, and XL Axiata. This market also shows rapid growth and a one mobile phone per person distribution.

(3) Fixed-line phones

Six (6) companies provide local telephone service. Indonesia holds a satellite and provides satellite communications services.

(4) Radio broadcasting

There are about 800 broadcasting stations in the country including RRI (public broadcasting), commercial broadcasting, university broadcast, army broadcast, and community broadcasting.

(5) Broadcasting

After TVRI started broadcasting in 1962, commercial broadcasting was started from 1989 with 11 companies performing broader-based broadcasting. The satellite broadcasting company Indovision started broadcasting in 1994, and about 650,000 people have now subscribed. For cable TV, there are two main companies, but the number of subscribers remains low at about 160,000, with only people in the metropolitan area being able access the channels. The government is aiming to convert to digital broadcasting completely by 2018.

5.2.4 Waste

In Indonesia, waste is defined as "invaluable organic and/or inorganic solid or semi-solid residue from a business and/or other activities" by the Environment Management Act, etc. Waste is divided into the two (2) categories: domestic waste and dangerous/harmful waste, officially called B3 waste.

The amount of waste production is estimated to be about 2 - 3 liters per person per day or 440 million liters per day in the country. This calculates to 80.3 million tons or 154 billion liters per year. The average composition rate of waste is estimated based on the composition of waste of each urban area.

Table 5.2.5 Composition Percentages of City Garbage

Waste	Average (%)
Food	59.47
Paper	11.17
Corrugated Paper	1.68
Plastic, Rubber	10.71
Metal	1.77
Glass	1.33
Fiber	0.81

Leaves	6.92
Particulates	6.21
Rate of the organic waste accounts for the whole waste	79.16
Rate of the non-organic waste accounts for the whole waste	20.87

Source: IDE-JETRO, The Industrial Waste and Recycling Policy information Dissemination Business Report in Asian Countries

Although 55.5% of all waste is carried to the final disposal site by the waste disposal system of Indonesia, only 40% of all waste is treated. Landfills using an open dumping system are common, and the controlled landfill system has been adopted at only one site in Jakarta.

5.3 Natural Disaster Issues

Indonesia is an archipelago state which consists of about 17,000 islands. There are 5,500 or more rivers in the whole country and since most rivers have not been improved, several big floods occur during the monsoon every year.

There is a high frequency of floods in this country. Java Island has the highest frequency, followed by Sumatra Island and Sulawesi Island, but Kalimantan Island has a low frequency. Many floods have occurred due to the east-west monsoons in the rainy season (November to March). Heavy rainfalls in the mountainous region cause floods in the plain and extensive damage in swamps and coastal low-lying areas. Urban areas become inundated because of an insufficient drainage system and poor maintenance work.

Sumatra, Java, Bali, Nusa Tenggara, Irian Jaya, and Sulawesi, etc. have earthquake belts running through all the places throughout the country, and many earthquakes exceeding M5.0 have occurred.

The earthquake of Sumatra that occurred in 2004 was of a huge scale at M9.1. The Java Trench was generated by a gap between plate boundaries and in its vicinity, earthquakes exceeding M7.0 occur frequently.

There are 129 active volcanoes in Indonesia and it is thought that 70 of them are dangerous. Because of the eruptions of Mount Merapi in 2006 and 2010, there is a suspected correlation with the Great Sumatra Earthquake. Since the north side of Java is far from the Java Trench, the impact of an earthquake is quite small. However, it is an area prone to flooding due to its heavy rains.

Since Indonesia is near the equator, it is not affected by trade winds. Therefore, cyclones and typhoons affect only a portion of the country. However, the heavy rain in the rainy season caused by the monsoon is intense, causing floods and landslides. Even though the industrial estates are built on high ground, the impact for these disasters on roads, railroads, power lines, lifelines, etc. cannot be avoided. Attention should also be paid to ash fall from volcanic eruptions in central Java.

Although the seashore zone needs to be protected from tsunamis caused earthquakes in the southern areas of Sumatra or Java, it can be said that the north side is not greatly affected by tsunami. However, the generation of high tides by low pressure is possible.

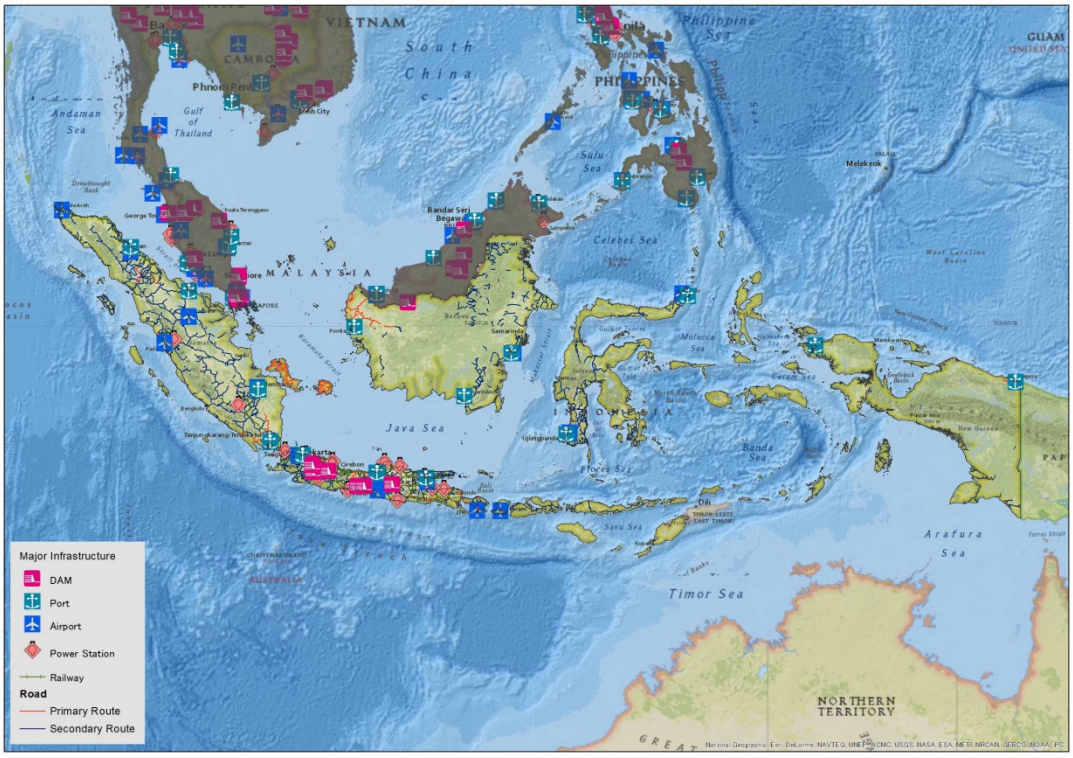


Figure 5.3.1 Major Infrastructures in Indonesia

Chapter 6 Economy, Industry, and Trade

In this survey, the general outline of economy and trade in Indonesia and the cases in which disaster impact analyses were conducted are examined. The purpose is to estimate the impact of a disaster on the economy of the nation and surrounding regions in the event that an industrial agglomerated area in Indonesia is hit by a disaster.

The following topics were explored using existing data and information from sources such as the internet, research papers, reports, and other materials.

- Overview of the economy and industry in Indonesia
- Overview of trade in Indonesia

In order to understand the conditions of the economy and trade in Indonesia, relevant information was gathered/organized based on a review of reference materials listed below.

No.	Reference	Remarks
1	ASEAN-JAPAN CENTRE website http://www.asean.or.jp/	Statistical data on economy, industry and trade of ASEAN
2	JETRO 2009, "ASEAN Economic Community" (in Japanese)	Regional corporation framework in East Asia
3	ASEAN Stats database http://aseanstats.asean.org/	Trade values of ASEAN by commodity and partner country, etc.
4	ASEAN website (2013), "Key basic ASEAN indicators in 2011, Last update 14 January 2013"	Key basic indicators of ASEAN
5	International Monetary Fund, World Economic Outlook Database	Macroeconomic indicators of ASEAN
6	Industrial agglomerated areas in ASEAN, IHS	Detailed information on industrial agglomerated areas in ASEAN
7	Ministry of Foreign Affairs of Japan http://www.mofa.go.jp/index.html	Information on regional affairs etc.

6.1 Overview of the economy

The GDP of Indonesia is 878.2 billion USD (2012), ranked sixteenth largest in the world. On the other hand, the country's GDP per capita is 3,592 USD (2012 (estimated figure)), ranking at 113th globally. The country maintained a high economic growth rate of not less than 10% beginning in2000, and with the exception of 2001, 2004 and 2009. Although the growth rate has been decreasing since 2011, it is expected that the Indonesian economy will continue to grow at a rate of around 10%.

The GDP per capita of Indonesia is close to the average of ASEAN, which is 3,745 USD (2012 (estimated figure)). The country's economic growth rate, which is 19.3% (2011), is also close to the average of ASEAN (15.7% (2011)). It is expected that this trend will continue, and we can thus regard Indonesia as typical of the ASEAN countries. On the other hand, foreign direct investment in Indonesia accounts for only 17% of total foreign direct investment in ASEAN (2010). This shows

that the size of investment is small, compared to its population ratio, which accounts for 40% of the total population in ASEAN.

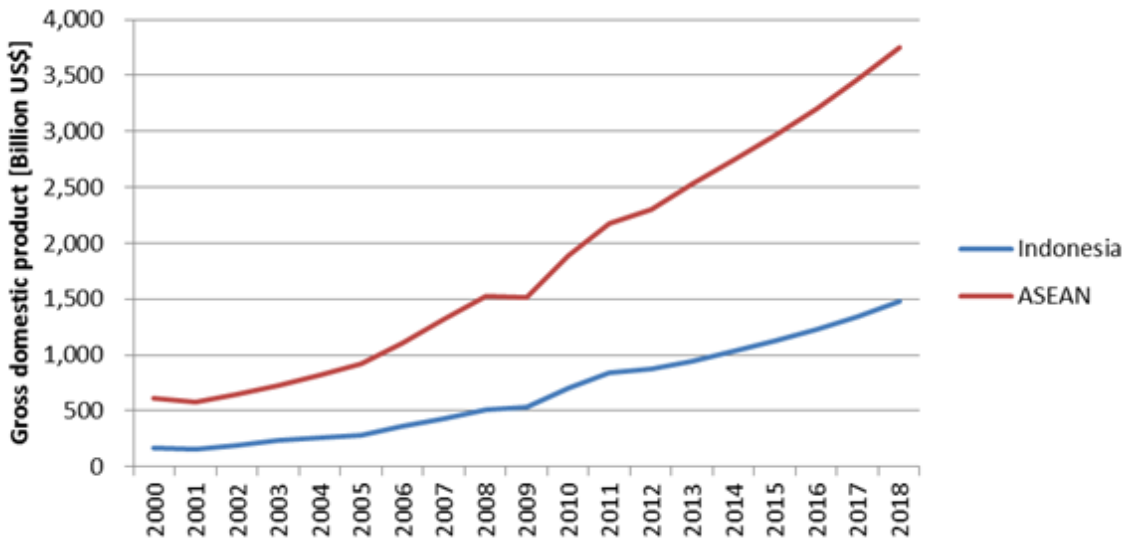
Also, while the unemployment rate was as high as 10% or more in some years, the rate has declined since its peak in 2005. It is estimated that the unemployment rate will decrease to about 5% by 2018. (Cf. The unemployment rate in Japan as of 2012 is 4.4 %.)

As for component ratio of GDP by industry, the manufacturing sector, especially the transport equipment industry (e.g. motorcycles) and food industry, represents the largest share. The agriculture, forestry, and fisheries sectors are also active, and the country has a large production of palm oil, rubber, and rice. The mining sector constitutes a little over 10% of the GDP. The country is engaged in mining nickel and tin, as well as in the development of fossil fuels such as LNG, coal, and oil.

Major industrial parks in Indonesia, in which many Japanese companies are operating, are summarized in the table below.

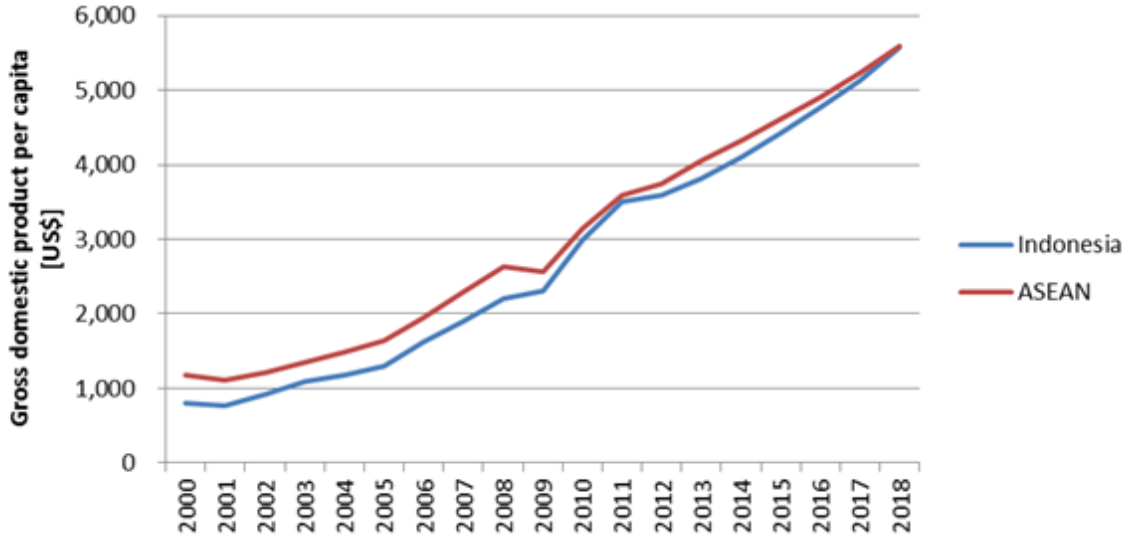
Name of Industrial Park	Number of Japanese companies operating	Features
Batamindo Industrial Park (BATAMINDO)	39	Located in Batam Island, 20 km from Singapore. Majority of the companies located here are engaged in the production of batteries and electronic parts, metal parts and medical equipment.
Jababeka Industrial Park	43	Located 30 km east of Jakarta. Majority of the companies located here are engaged in the production of fat, resin and rubber.
MM2100 Industrial Town	63 (116)	Located 30 km east of Jakarta. Majority of the companies located here are engaged in the production of iron and steel, electrical and electronic equipment and foods.
East Jakarta Industrial Park (EJIP)	72 (96)	Located 40 km east of Jakarta. 70% of the companies are involved in the electronic business and 20% of the companies are involved in the automobile industry (2008). 90% of the companies operating in this industrial park are Japanese.
Karawang International Industrial City (KIIC)	45 (71)	Located 50 km east of Jakarta. Majority of the companies located here are involved in the automobile industry.
Kota Bukit Indah Industrial Park	27 (51)	Located 65 km east of Jakarta. Majority of the companies located here are involved in electric or automobile industry.
Suryacipta City of Industry	12 (18)	Located 55 km east of Jakarta. Majority of the companies located here are engaged in the automobile or electronics industry.
Greenland International Industrial Center	>18	Located 37 km east of Jakarta. Most companies are Japanese.

Reference: The table was created based on information from ASEAN-Japan Centre (https://www.asean.or.jp/)
Note) Numbers shown in parentheses were obtained from resources provided by IHS.



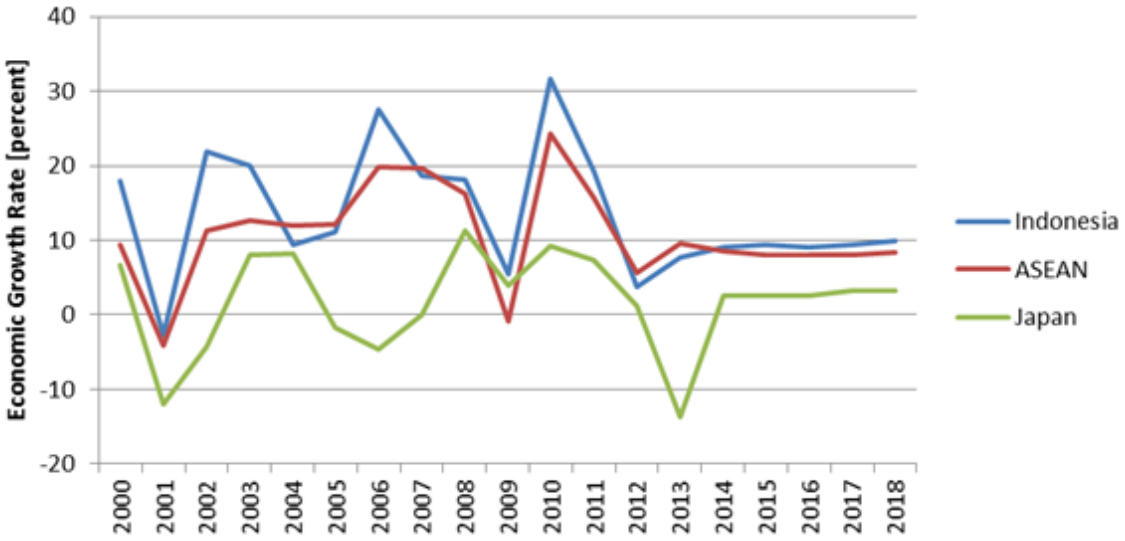
Source: International Monetary Fund, World Economic Outlook Database, April 2013

Figure 6.1.1 Gross Domestic Product in Indonesia, ASEAN countries and Japan (2000-2018), current prices (Estimation in Indonesia starting from 2013; in ASEAN starting from 2012)



Source: International Monetary Fund, World Economic Outlook Database, April 2013

Figure 6.1.2 Gross Domestic Product per capita in Indonesia, ASEAN countries and Japan (2000-2018), current prices (Estimation in Indonesia starting from 2011; in ASEAN starting from 2007)



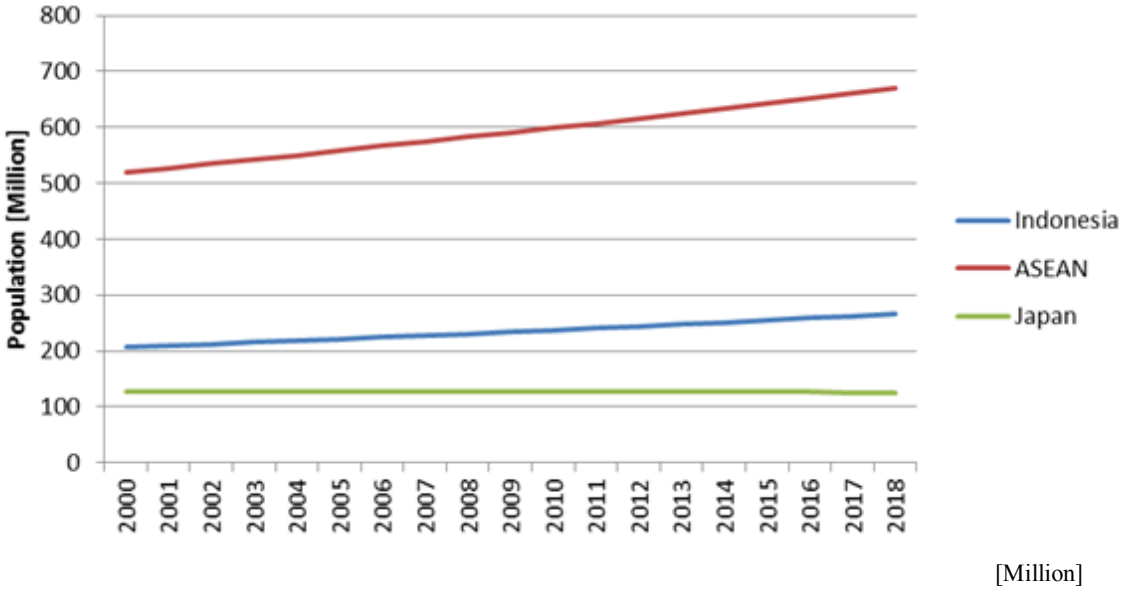
Source: International Monetary Fund, World Economic Outlook Database, April 2013

Figure 6.1.3 Economic Growth Rate in Indonesia, ASEAN countries and Japan (2000-2018), current prices (Estimation in Indonesia and Japan starting from 2013; in ASEAN starting from 2012)

Table 6.1.1 Average growth rate in Indonesia, ASEAN countries and Japan (2013-2017)

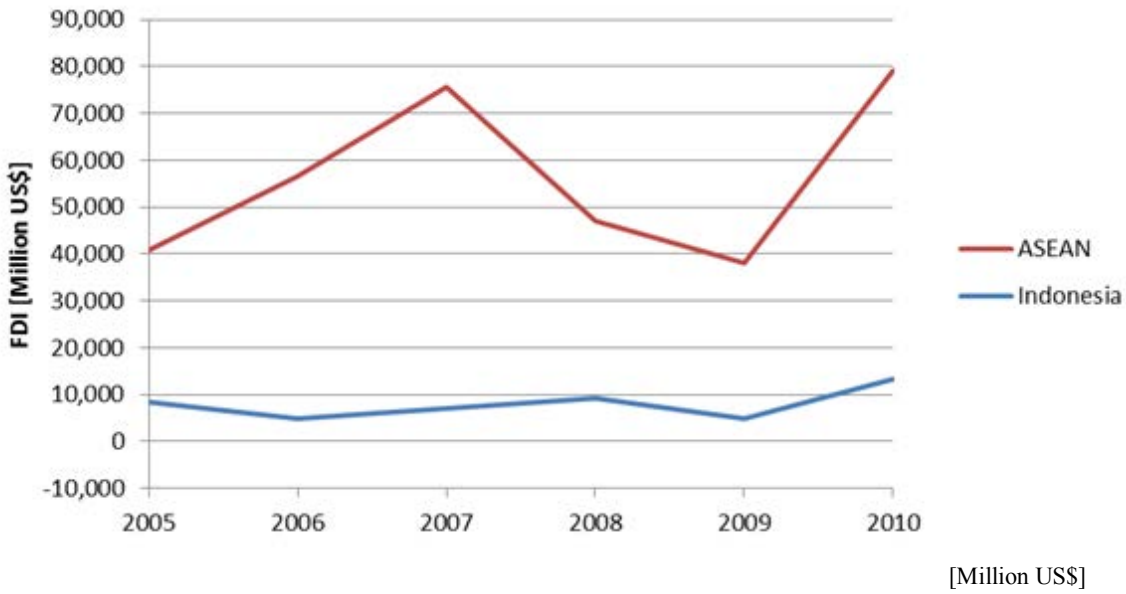
	Indonesia	ASEAN	Japan
Average growth rate (2013-2017) (%)	8.9	8.5	-0.53

Source: International Monetary Fund, World Economic Outlook Database, April 2013, calculated by MRI



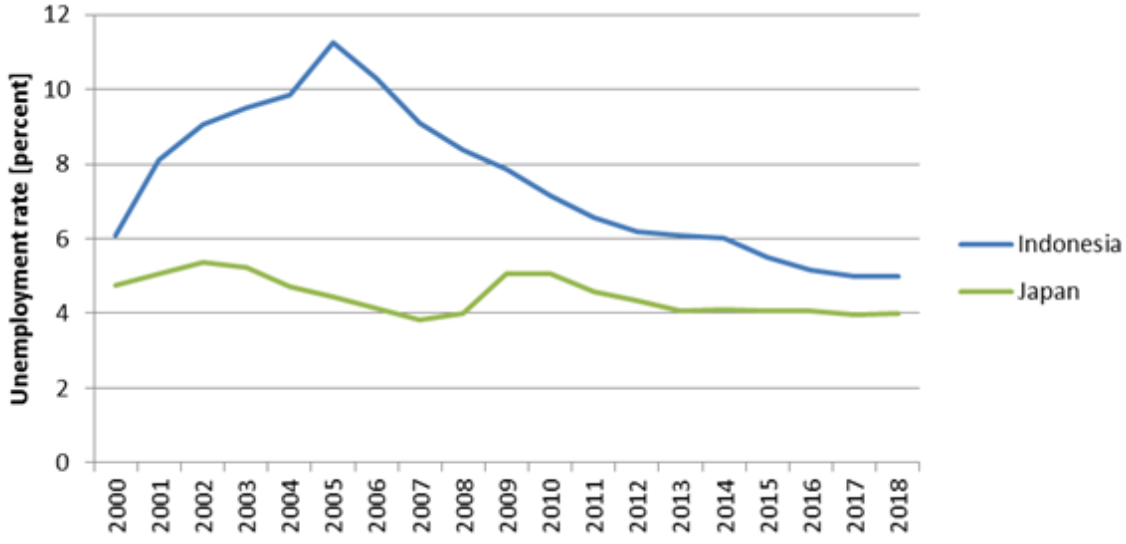
Source: International Monetary Fund, World Economic Outlook Database, April 2013

Figure 6.1.4 Population (2000-2018) (Estimation in Indonesia starting from 2011; ASEAN starting from 2007; in Japan starting from 2013)



Source: ASEAN-Japan Centre website

Figure 6.1.5 Foreign Direct Investment (2005-2010)



Source: International Monetary Fund, World Economic Outlook Database, April 2013

Figure 6.1.6 Unemployment rate in Indonesia and Japan (2000-2018)
(Estimation in Indonesia starting from 2012; in Japan starting from 2013)

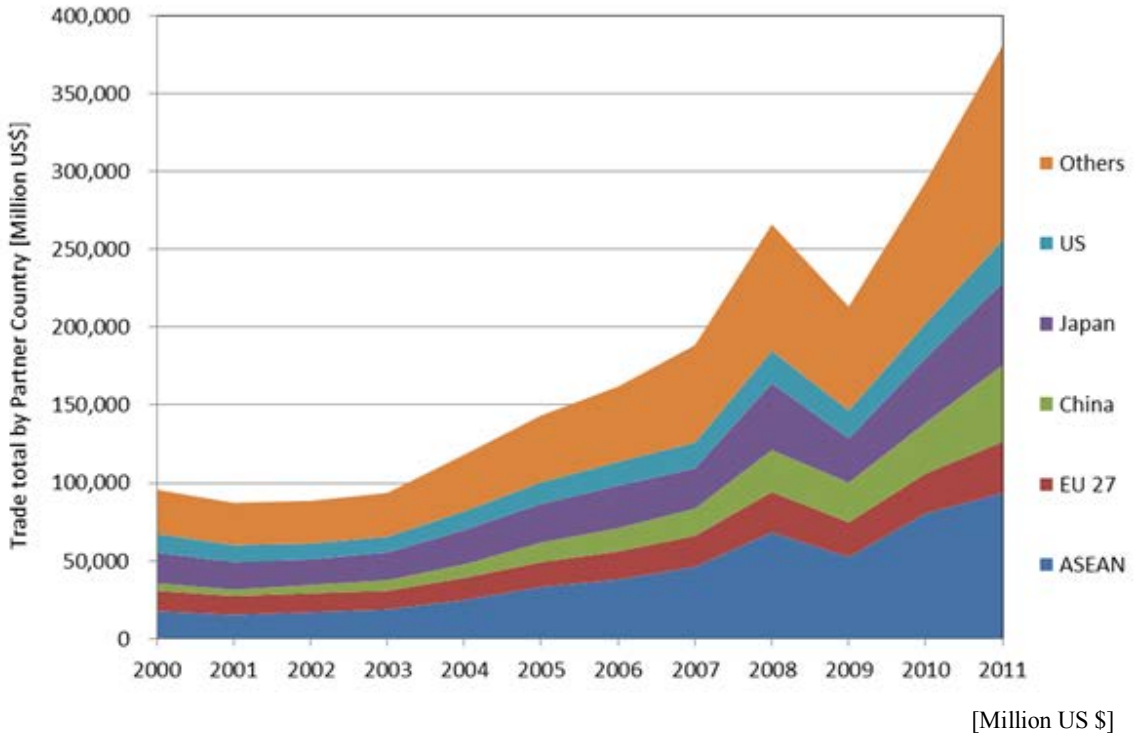
6.2 Overview of trade

(1) Amount of foreign trade/major trading partners

Trends in Indonesia's foreign trade by partner countries (2000 – 2011) are illustrated in the figure below. Indonesia's foreign trade has been growing steadily since 2000. Although foreign trade dropped in year 2009 after the collapse of Lehman Brothers in the fall of 2008, all regions recovered quickly from the crisis.

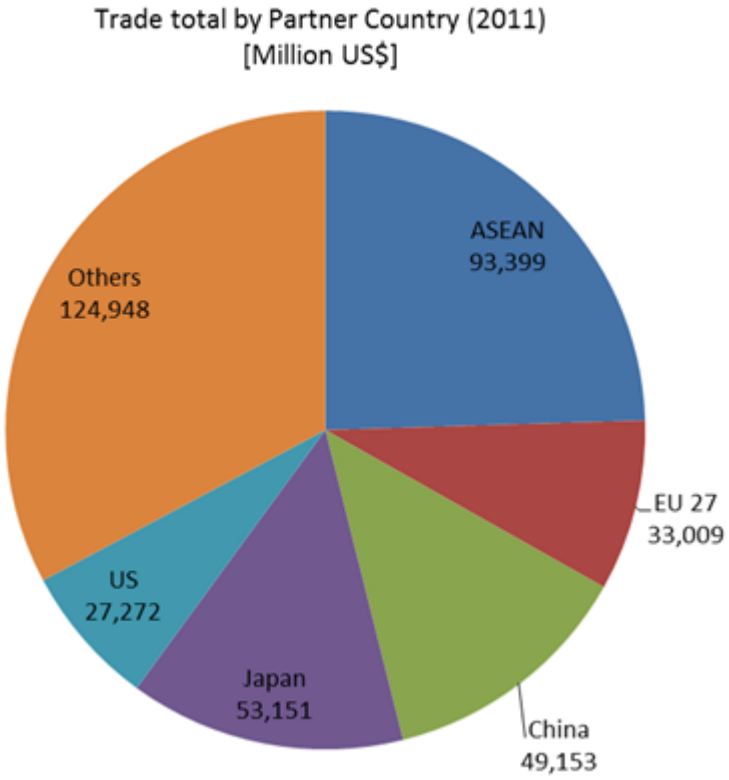
As of 2011, the largest trading partner of Indonesia is other ASEAN countries, with 25% of the total trade being associated with the countries in this region. The second largest trading partner is Japan, accounting for 14% of the total trade. China comes next, with 13%, followed by the EU and USA with 9% and 7% share, respectively.

Looking at the trend in recent years, it is observed that while Indonesia's foreign trade is increasing with all trading partners, the growth rate of trade with the ASEAN countries and China is higher than the growth rate of trade with developed countries such as Japan, the EU, and the USA.



Source: ASEAN Stats database (http://aseanstats.asean.org/)

Figure 6.2.1 External Trade Value by Partner - Total (2000-2011)



[Million US $]

Source: ASEAN Stats database (http://aseanstats.asean.org/)

Figure 6.2.2 External Trade Value by Partner - Total (2011)

(2) Categories of major trading commodities

Export values of Indonesia by commodity (2011) are shown in the table below.

Examining the export values by major export commodities, it can be observed that the largest group of products exported from Indonesia is mineral fuels, which accounts for 37% of the total export value (68,912 million USD). Manufactured goods comes next, accounting for 14% of the total exports (25,486 million USD).

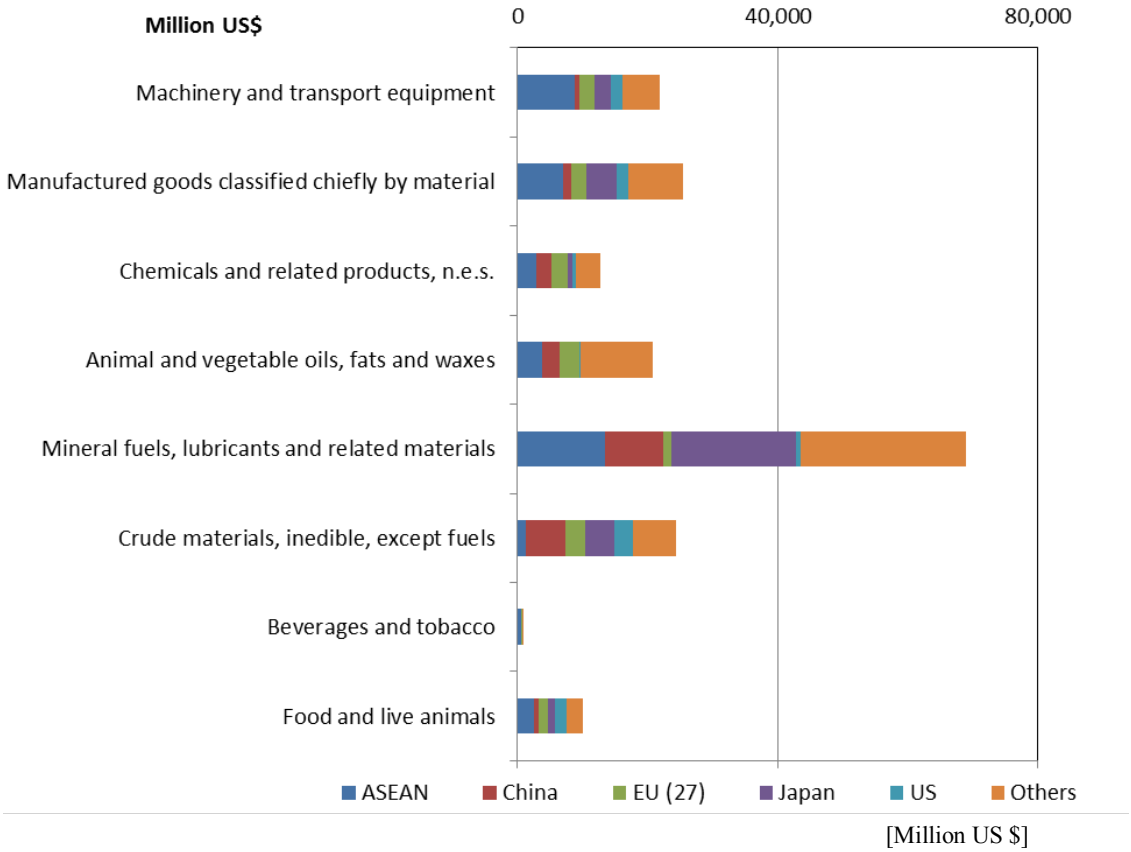
The largest export destination for mineral fuel is Japan, buying 19,145 million USD. This is followed by ASEAN and China, with export values of 13,429 million USD and 8,916 million USD, respectively.

Table 6.2.1 Trade values (exports) of Indonesia by commodity and partner country (2011)

[Million US $]

Category	ASEAN	China	EU (27)	Japan	US	Others	WORLD
Food and live animals	2,510	729	1,391	1,089	1,827	2,568	10,115
Beverages and tobacco	593	5	87	4	21	98	808
Crude materials, inedible, except fuels	1,255	6,105	3,040	4,454	2,955	6,466	24,275
Mineral fuels, lubricants and related materials	13,429	8,916	1,229	19,145	827	25,367	68,912
Animal and vegetable oils, fats and waxes	3,767	2,737	2,973	43	203	10,981	20,704
Chemicals and related products, n.e.s.	2,882	2,391	2,466	760	497	3,761	12,757
Manufactured goods classified chiefly by material	7,064	1,131	2,377	4,598	1,888	8,427	25,486
Machinery and transport equipment	8,768	687	2,370	2,464	1,825	5,654	21,768

Source: ASEAN Stats database (http://aseanstats.asean.org/)



Source: ASEAN Stats database (http://aseanstats.asean.org/)

Figure 6.2.3 Trade values (exports) of Indonesia by commodity and partner country (2011)

Next, import values of Indonesia by commodity (2011) are shown in the table below.

Examining the import values by major import commodities, it can be observed that the largest group of products imported by Indonesia is machinery and transport equipment, which accounts for 33% of the total import value (55,991million USD). Mineral fuels comes next, accounting for 24% of the total imports (40,821million USD).

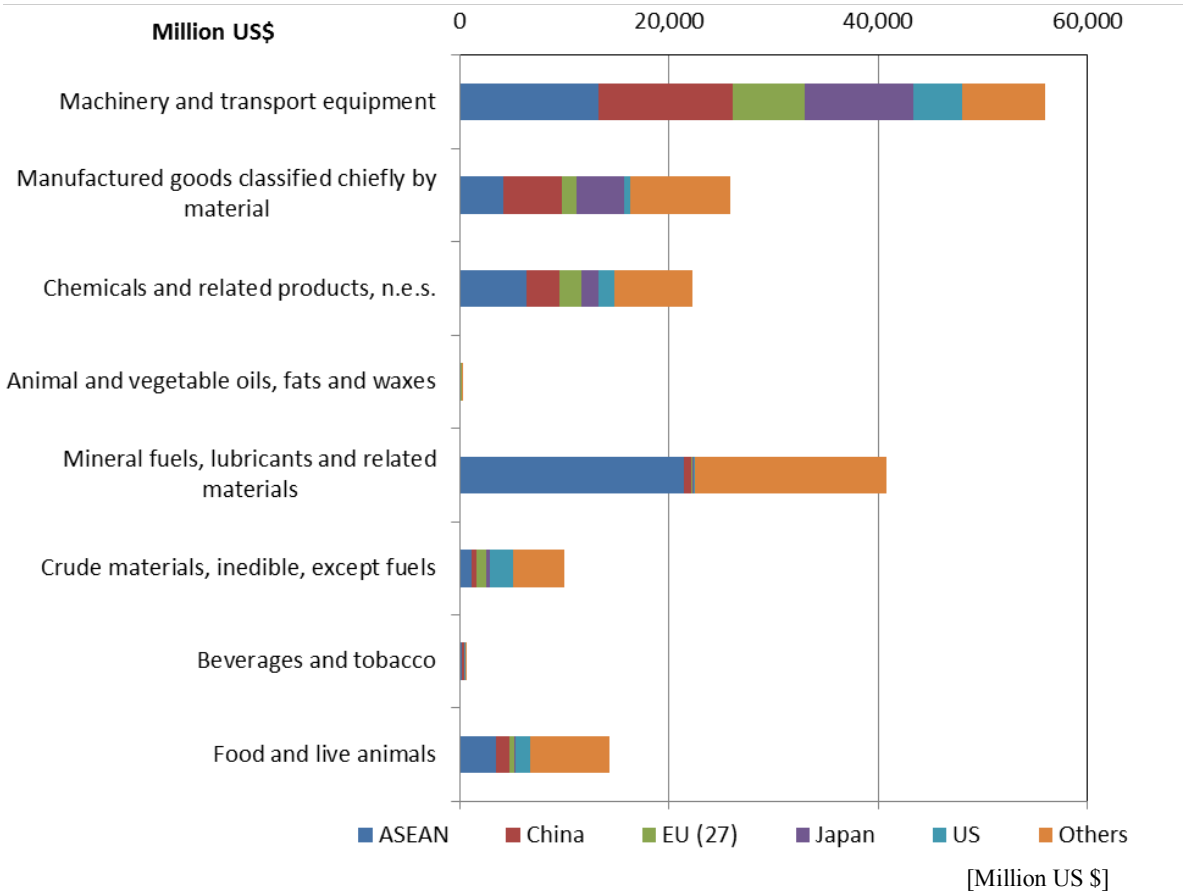
The largest exporter of machinery and transport equipment to Indonesia is ASEAN, exporting a total of 13,210 million USD. This is followed by China and Japan, with the import value of 12,889 million USD and 10,331million USD, respectively.

Table 6.2.2 Trade values (imports) of Indonesia by commodity and partner country (2011)

[Million US $]

Category	ASEAN	China	EU (27)	Japan	US	Others	WORLD
Food and live animals	3,479	1,232	527	51	1,424	7,623	14,335
Beverages and tobacco	172	247	37	0	31	169	657
Crude materials, inedible, except fuels	1,130	468	950	364	2,203	4,880	9,994
Mineral fuels, lubricants and related materials	21,374	771	83	120	119	18,354	40,821
Animal and vegetable oils, fats and waxes	122	5	15	4.39998	4	36	187
Chemicals and related products, n.e.s.	6,374	3,170	2,084	1,661	1,433	7,517	22,238
Manufactured goods classified chiefly by material	4,198	5,596	1,410	4,537	529	9,596	25,865
Machinery and transport equipment	13,210	12,889	6,906	10,331	4,698	7,957	55,991

Source: ASEAN Stats database (http://aseanstats.asean.org/)



Source: ASEAN Stats database (http://aseanstats.asean.org/)

Figure 6.2.4 Trade values (imports) of Indonesia by commodity and partner country (2011)

Chapter 7 Physical Distribution Network

The themes of this survey are divided into three categories as follows: 1) Understanding of Supply Chain Circumstances in ASEAN Countries, 2) Understanding of Circumstances on Physical Distribution Network, and 3) Organizing the framework of vulnerability analysis for natural disasters on the ASEAN Logistics Network.

7.1 Understanding of Supply Chain Circumstances in Indonesia

(1) Relation to Logistics Performance Index on International Physical Distribution

Table 7.1.1 International LPI (Logistics Performance Index)[*1] Ranking 2012

Rank	Country	LPI	Customs	Infrastructure	International Shipment	Logistics Competence	Tracing & Tracking	Timeliness
75	**Indonesia**	**2.76**	**2.43**	**2.54**	**2.82**	**2.47**	**2.77**	**3.46**

Source: World Bank Connecting to Compete 2012 Trade Logistics in the Global Economy

(2) Features of Physical Distribution in Relation to Main Industries in Industrial Parks

The lists of ASEAN-JAPAN CENTER (AJC) web-site[*2] have no specific time of investigation by year/month, but it is considered that the general current status of industry agglomeration at the time of the investigation can be obtained.

The industries in industrial parks are classified into the following 13 categories:

1) Fishery/Foodstuff, 2) Textile/Apparel, 3) Pulp/Paper, 4) Chemicals, Oil, Rubber/Ceramic, 5) Steel/Nonferrous metal, 6) Transport machines (Cars), 7) Electrical/Electronics/Precision apparatus, 8) Other industries, 9) Commerce (wholesale, retail), 10) Real estate, 11) Logistics/Warehouse, 12) Finance/Insurance/Other services, and 13) Information/Telecommunication.

The objective industrial parks are selected based on the criterion such as: 1) Degree of geographic accumulation, 2) Having sufficient operational experiences, 3) The size and number of Japanese companies, 4) Located in the pilot area in case of Vietnam, the Philippines and Indonesia.

Based on the industrial classifications above, the characteristics of distributions of the products from industrial parks are estimated.

At first it is necessary to limit objective regions. Accordingly, it is considered reasonable that the objective region shall be district between Jakarta and Cikampek, West Jawa State in Jawa Island which has 60% of the national total population.

In the selected region, outline of physical distribution will be inferred from types of industries and kinds of goods manufactured in two major industrial parks, that is, Karawang International Industrial City (KIIC) and East Jakarta Industrial Park (EJIP) in Bekasi.

Since Toyota Motor and other major auto-manufacturer's assembly plants is in operation in KIIC, diversified intermediate products such as car parts of textile, chemicals, electric devices and precision

instrument and so on are manufactured. It is considered that these intermediate products are distributed with each other in KIIC.

Consumer goods by Meiji, Fuji oil, KAWAI will be distributed to such big cities as Jakarta, Bandon, and also exported to Japan and other foreign countries.

Refrigerator, television, lighting goods are manufactured in EJIP. These items will be both for domestic use and for export by the applicable foreign specifications.

Top three items of import goods are oil, gas and machine, while top three items of export goods are crude oil, natural gas and coal (Ministry of Foreign Affairs of Japan, country and regional situations, Indonesia, Economy).

Oil and gas are transported by line pipe, tank lorry and coastal tankers for domestic transport; therefore, the distribution mode differs from that of general cargo.

Beside final product of cars, the breakdown of machinery goods/products is supposed to be mother machine, dices, and manufacturing equipment of various parts for use within the industrial parks.

In Jakarta Metropolitan area, distribution of the above goods except for bulk cargo, is in a way of which cargos are shipped and unloaded at Tanjung Priok Port, and transported by road to Jakarta City and/or each industrial park.

It will be necessary to investigate location and arrangement of warehouses, distribution centers on the route between the Port and industrial parks, so that actual mode of distribution can be sought, as situation requires.

(3) Supply Chain Circumstances

Physical distribution is evolving by the stages of Physical Distribution Development Phasing (PDDP) as follows:

1) Physical distribution control: Company's own sphere of materials/ products distribution (PDC).
2) Logistics management: Company's own distribution management by the market-in strategy (LGM).
3) Supply chain management: Integrated distribution management from company's own to systemized one by the collaboration with other logistics operator resources (SCM)

Other criteria can be considered applicable, so that the development phase may be justified, based on industrial categories and their products' varieties and volumes in the selected industrial parks/ SEZ.

1) Kinds and diversity of products (intermediate or final products).
2) Whether production of high valued goods like cars, electrical/ electronic/ precision devices or not, and the levels.
3) Correspondence of export/import major items of goods to, classification of intermediate/ final products
4) Existence of a regional head office of a company which power is vested from the headquarter, and the power strength in management term.

5) Existence of logistics operator as a 3PL and maturity of the business
6) Inter dependency of industrial parks/ SEZ with megalopolises in the vicinity.

The result of assessment is shown in the table below which is made by LPI of the World Bank and by supply chain circumstances determined by above mentioned industries in the industrial park as well as major export/import items in the light of the above three stages of PDDP. The evaluation is shown by relative evaluation of five levels among ASEAN countries. Since there are no distinction time and contents wise in PDDP, the level of development is indicated as a continuous line in the table below.

Table 7.1.2 Physical Distribution Development Phasing

LPI	Country	PDDP								
					Criteria					
		PDC	LGM	SCM	Products diversified	High valued goods	Export/ Import	Regional head office	Logistics operator	Products diversified
2.76	**Indonesia**				**3**	**3**	**3**	**3**	**3**	**3**

Source: JICA Study Team

7.2 Current Status and Trends of Indonesia Logistics Network

(1) Domestic Physical Distribution Network

For the industrial parks located between Jakarta and Cikampek, highway which runs through industrial parks and Tanjung Priok port are the key distribution infrastructure to ASEAN and outside of ASEAN region.

The implementation of the countermeasures to ease the heavy congestion of access road and cargo handling facilities in Tanjung Priok port have been a challenge for many years.

(2) Intra-ASEAN Physical Distribution Network

According to ASEAN Strategic Transport Plan 2011-2015, intra-ASEAN trade of Indonesia is reported to be about 40% of the total trade amount, and of that share, main intra-ASEAN trade partner is in the order of Singapore of 70%, Malaysia and Thailand of 12%, and Brunei of 4%.

(3) Extra-ASEAN Physical Distribution Network

The most commonly-used means of transportation to and from ASEAN are marine transportation both on both weight and value basis. In the marine transport, containerized cargo is a typical form of transport among the general cargo.

According to ASEAN Strategic Transport Plan 2011-2015**,** the container annual cargo traffics are shared by Tanjung Priok Port of about 55% of total containerized cargo in TEU and followed by Tanjung Perak of 15%.

Main trade partners are China, Japan and Singapore. From above situation being overviewed, it is considered that most of extra-ASEAN logistics cargo flows other than those handled at Tanjung Priok Port are to be transshipped at Port of Singapore.

7.3 Analysis Frame on Physical Distribution Network

This section studies frame for assessment of the vulnerability of logistics network against natural disasters in consideration of the actual situation of supply chain, as a preparedness of formulation of area BCP. The vulnerability itself is to be assessed after the further survey.

Table 7.3.1 Natural Disaster Prevention Related Matters in relation to vulnerability of Physical Distribution Facilities

Industrial Park Name represented	Karawang International Industrial City (KIIC)
Features	Place:Karawang, For features , refer to Survey Report 2 "Chapter 3 Industrial Agglomerated Areas"
Vulnerability Assessment Frame for Each Industrial Park (IPK)	
Natural Disaster Risk(NDR): Extract from Survey Report 1 "Chapter 5 Existing Investigations and Studies"	
■ Flooding	Flood hazard possibility is the highest among ASEAN countries.
■ Seismic intensity/ Tsunami	The Global Seismic Hazard Assessment Program (GSHAP) shows 3.2~4.0 m/sec^2 zone. Indonesia is one of the countries with highest tsunami hazard level in ASEAN countries.
■ Volcano	Indonesia is one of the countries with highest volcanic hazard level in ASEAN countries. After the 14th century, about 200 volcanic disasters are recoded in the database.
■ Cyclone, Meteorological Disaster, Landslide	The impact of cyclone hazard on whole the country is low. Landslide: There is no hazard in the Java Sea side region where metropolis locates.
Brief Descriptions on Counter-measures (CMS) for NDR	
***1) Private sector facilities* :** To follow further Survey	
Land, In-park Roads:	
Plant facilities: Lessons learned and disaster prevention measures drawn from the Jakarta flood disaster in January 2013 are followings. ● Flooding had impact on commuting and operation hours, so ensuring commuting route from employees and securing stockpile parts in accordance with production activities of the company are necessary. ● The disruption of operation and power supply can be avoided by storing fuels and securing back-up power source. ● Freight transport volume to Tanjong Priok was reduced to 50% of normal, so alternative port shall be decided. ● Transportation and delivery activities of daily sales of general merchandise were also reduced 40-60%, so additional emergency food stock shall get ready.	
Physical Distribution Facilities:	
Others, if any:	
2) Infrastructures	
Road: (Interviews from 2nd investigation: JETRO Mr. Aizawa) • Development of access roads to ease the traffic congestion to the Tanjung Priok port. • Development of new alternative highway to existing Cikampek highway. • Raising road surfaces or elevating road structure at the flood prone section of city streets in Jakarta and open road.	
Railway: MRT connecting central Jakarta and the south suburbs is at implementation stage. It is expected to ease road traffics.	
Port: (Interviews from 2nd investigation: JETRO Mr. Aizawa) • Improvement of cargo handling capacity of the Tanjung Priok port • Promote development of Chiramaya port as an alternative to Tanjung Priok port.	
Airport:	
Electric power/Fuel: • Development of power generation capacity and transmission line. • Proper placement of the fuel oil storage and supply facilities.	

Water-supply: (Interviews from 2nd investigation: JASA TITRA II PUBLIC CORPORATION (PJT II Mr. Herman Idrus ,President Director of PJT II) • Strengthening capacity of flood disaster prevention for Dams in Citarum river and canals .
Sewage: Development of storm water drainage facilities
Solid waste:
Telecommunication:

Note:

*1 The summary of "Logistics Performance Index" by the World Bank is as follows.

(1) LPI score and category wise score is indicated by each country

(2) Score is ranked from one to five

(3) LPI of international logistics is scored based on the interviewing following six items to major importers and logistics companies in the neighboring countries (total of over 1000 companies).

1) Efficiency of the clearance process i.e. Speed, simplicity and predictability of formalities by border control agencies, including Customs
2) Quality of trade and transport related infrastructure e.g. Ports, railroads, roads, information technology
3) Ease of arranging competitively priced shipments
4) Competence and quality of logistics services e.g. transport operators, customs brokers
5) Ability to track and trace consignments)
6) Timeliness of shipments in reaching destination within the scheduled or expected delivery time.

*2 http://www.asean.or.jp/ja/invest/about/country_info/brunei/invest_info/industrialestate/

*3 http://www.mofa.go.jp/mofaj/area/brunei/data.html#04

References :

1) ASEAN-JAPAN CENTER, Lists of Industrial Parks/Estate/SEZ by Member Country (in Japanese)
2) World Bank Connecting to Compete 2012 Trade Logistics in the Global Economy
3) Shinya Nakata (2012), Introduction to Logistics, NIKKEI Newspapers in Japan (in Japanese)
4) JETRO (2008), ASEAN Physical Distribution Network 2008 (in Japanese)
5) ERIA: ASEAN Strategic Transport Plan 2011-2015.
6) ASEAN Secretariat, ASEAN Statistics on Intra and Extra_ ASEAN trade 2011

Chapter 8 Legislative Systems

A survey on the legislative systems concerned with disaster management, business continuity, environmental pollution, and development in Indonesia is conducted in this chapter.

The survey of Indonesia is mostly based on research through the websites of ministries and agencies of Indonesia, and also several leading international institutes that contributed to disaster research such as the Asia Disaster Reduction Center. Information from the websites of standardization agencies in Indonesia is also indicated here. Laws, regulations, national implementation plans, and statutes are referred to within the scope of the survey.

The table below shows the methodology for collecting information.

Information Collected	Methodology	Scope of Survey
Legislative Systems for Disaster Management	To collect information from the internet, which is published by international agencies such as ADRC and disaster management institutes in Indonesia. And to refer to the report by the JICA research team.	Laws and regulations on disaster management. National action plans for disaster risk reduction.
Regulations and Standards for BCM / BCP	To collect information from the websites of financial authorities regulating the BCM/BCP.	Regulations indicating development of the BCP.
Legislative Systems for Environment and Pollution	To collect information from the websites of ministries and agencies responsible for environment management.	Laws and regulations for environmental management. Regulations and decrees for environmental management and pollution control
Legislative Systems for Development including Land Use, River and Building Regulations	To collect information from the websites of ministries and agencies related to land use.	Laws and regulations for land use, rivers, and forest. No official building standards exist in Indonesia.

The laws, regulations, decrees, and guidelines regulating the target fields defined above are compiled in this survey. The results of the survey in Indonesia are summarized below.

Scope	Information
Legislative Systems for Disaster Management in Indonesia	[Strategies and Plans] "Law of the Republic of Indonesia concerning disaster management, 2007". [Regulations, Standards and Guidelines] "National Disaster Management Plan 2010-2014", "National Action Plan for Disaster Risk Reduction 2010-2012", "Regional governments' action plans".
Regulations and Standards for BCM / BCP in Indonesia	"Regulation No.9/15/PBI/2007", "Regulation No.6/8/PBI/2004", "Indonesia BCP", "Manual: business continuity planning, 2011".

Legislative Systems for Environment and Pollution in Indonesia	[Laws for Environment] "Environmental Basic Law, No.04, 1982", "Environmental Management Act, No.23, 1997" "Environmental Protection and Management Act, No.32, 2009". [Laws and Regulations for Environmental Pollution Control] "Law on Water Resources, No.7, 2004", "Government Regulation No.82/2001 (Water Quality Management and Waste Water Control)", "Ministerial Decree No.51/MENLH/10/1995 (Effluent Standard for Industry)", "Government Regulation No.41, 1999 (Air Pollution Management)", "Ministerial Decree No.48/MENLH/11/1996 (Noise Standards)", "Ministerial Decree No.49/MENLH/11/1996 (Vibration Standards)", "Government Regulation No.74/2001", "Government Regulation No.18 and No.85 (Hazardous Waste Management)", "Government Regulation No.27, 1999 (Environmental Impact Assessment (EIA))", "Ministry of Environment Decree No.11, 2006".
Legislative Systems for Development including Land Use, Rivers, and Building Regulations in Indonesia	"Law No.5, 1960 concerning Basic Agrarian Law", "Presidential Decree No.36, 2005", "Presidential Decree No.65, 2006", "Forestry Act, 1999", "River Act, 1991".

The available results on the survey about the laws and regulations for disaster management, BCP/BCM, environmental conservation, and provisions for development in Indonesia are summarized below.

8.1 Legislative systems for disaster management

(1) Disaster management laws

Table 8.1.1 Laws and Regulations of Disaster Management in Indonesia

	Laws / Regulations	Supervisory Authority	Matter
Law	Law of the Republic of Indonesia concerning disaster management, (Law No.24), 2007	National Disaster Management Agency (BNPB)	Disaster Management

The Law on Disaster Management (No. 24) was enacted in 2007. Ancillary regulations for this law were also enacted in 2008: 1) Regulation No. 22 on Disaster Aid Financing and Management, 2) Regulation No.23 on Participation of International Institutions and Foreign Non-Governmental Organizations in Disaster Management, and 3) Regulation No.8 on National Agency Disaster Management. Disaster mitigation aspects are reflected in nearly all of the ministries' policy frameworks.

(2) Disaster management strategies and plans

Table 8.1.2 Strategies and Plan for Disaster Management in Indonesia

	Laws / Regulations	Supervisory Authority	Matter
Plan	National Disaster Management Plan 2010-2014	BNPB	General Disasters
Plan	National Action Plan for Disaster Risk Reduction 2010-2012	BNPB	General Disasters
Plan	Regional governments' action plans	BPBD	General Disasters

As stipulated by the Disaster Management Law (No.24), the "National Action Plan for Disaster Risk Reduction 2010-2012" was formulated as an action plan for the implementation of disaster

management in Indonesia in 2010. The annual action plan of each ministry and local governments' action plans are formulated based on this action plan. As of March 2012, maintenance of an action plan has been completed in all the 33 states. In regencies and cities where BPBD is established, the same action plan is to be formulated.

8.2 Regulations and standards for business continuity management

Table 8.2.1 Regulations, Standards or Guidelines for BCM/BCP in Indonesia

	Laws / Regulations	Supervisory Authority	Matter
Regulation	Regulation No. 9/15/PBI/2007	Bank of Indonesia	BCM
Regulation	Regulation No. 6/8/PBI/2004	Bank of Indonesia	BCM
Regulation	Indonesia BCP	Bank Indonesia (Central Bank)	BCM
Guideline	Manual: business continuity planning, 2011	International Labour Organization	BCM

Regulation No. 9/15/PBI/2007 prescribes the regulations for implementing risk management using IT systems in banking. In this regulation, data recovery centers are defined as back-up facilities that will function in time of disaster.

In Regulation No. 6/8/PBI/2004, the establishment of BCP and disaster recovery plans for banking is described.

The Manual on Business Continuity Planning indicates the importance of business continuity planning efforts and its guideline for development have been published. However, this document is only available in the Indonesian language.

8.3 Legislative systems for the environment and pollution control

(1) Environmental law and regulations

Table 8.3.1 Laws and Regulations regarding the Environment in Indonesia

	Law / Regulations	Supervisory Authority	Matter
Law	Environmental Basic Law, No.04, 1982	Ministry of Environment	Environment
Law	Environmental Management Act, No.23, 1997	Ministry of Environment	Environment
Law	Environmental Protection and Management Act, No.32, 2009	Ministry of Environment	Environmental Assessment

The legal system for managing the environment in Indonesia is stipulated in the Environmental Basic Law, No.04 and the Environmental Management Act, No.23. In addition, the environmental assessments is regulated in the Environmental Protection and Management Act, No.32.

(2) Pollution control laws and regulations

Table 8.3.2 Laws and Regulations for Environmental Pollution Control in Indonesia

	Laws / Regulations	Supervisory Authority	Matter
Law	Law on Water Resources, No.7, 2004	Ministry of Environment	Water Pollution
Regulation	Government Regulation No.82/2001 (Water Quality	Ministry of Environment	Water Pollution

	Management and Waste Water Control)		
Decree	Ministerial Decree No.51/MENLH/10/1995 (Effluent Standard for Industry)	Ministry of Environment	Industrial Effluent
Regulation	Government Regulation No.41, 1999 (Air Pollution Management)	Ministry of Environment	Air Pollution
Decree	Ministerial Decree No.48/MENLH/11/1996 (Noise Standards)	Ministry of Environment	Noise
Decree	Ministerial Decree No.49/MENLH/11/1996 (Vibration Standards)	Ministry of Environment	Vibration
Regulation	Government Regulation No.74/2001	Ministry of Environment	Hazardous Waste
Decree	Government Regulation No.18 and No.85 (Hazardous Waste Management)	Ministry of Environment	Hazardous Waste
Regulation	Government Regulation No.27, 1999 (Environmental Impact Assessment (EIA))	Ministry of Environment	Environmental Assessment
Decree	Ministry of Environment Decree No.11, 2006	Ministry of Environment	Environmental Assessment

Legal rules for environmental pollution control in Indonesia are defined by several decrees and regulations. The decrees and regulations related to industrial activities are listed above. These regulations cover water, industrial effluent, air pollution, noise, vibration, hazardous waste, and environmental assessments.

8.4 Legislative systems for development including land use, rivers and building codes

Table 8.4.1 Laws and Regulations for Land, Rivers, and Building Code in Indonesia

	Laws / Regulations	Supervisory Authority	Matter
Law	Law No.5, 1960 concerning Basic Agrarian Law	under survey	Land Use
Decree	Presidential Decree No.36, 2005	under survey	Land Acquisition
Decree	Presidential Decree No.65, 2006	under survey	Land Acquisition
Law	Forestry Act, 1999	under survey	Forestry
Law	River Act, 1991	under survey	River

Law No.5, 1960 concerning Basic Agrarian Law pertains to the use of land in Indonesia. Moreover, acquisition of land is prescribed by the Presidential Decree No.36, 2005 and the Presidential Decree No.65, 2006.

In addition, although regulations about the fundamental use and development of forests and rivers are defined by the Forestry Act and River Act, a direct statement about urgent disaster response measures and disaster recovery/restoration cannot be found.

Moreover, no regulations on construction standards could be confirmed in this investigation.

Chapter 9 Implementation of BCP

9.1 Major natural disasters and disaster management awareness

Earthquakes, volcanic disaster, floods, and storms are regarded as probable natural disasters for which preparations should be made in Java, Indonesia. Although risk management for these natural disasters has already been considered by private enterprises and civil organizations, disaster management plans are not yet well prepared. Moreover, most business people are not very familiar with the concept of BCP, nor is the necessity of BCP for corporate disaster risk management commonly recognized.

Through private institutes such as the Chamber of Commerce and Industry (KADIN), enterprises seem to put more weight on developing business activities than the management of disaster risk reduction, and most SMEs in Indonesia are not very concerned about corporate disaster risk.

9.2 Current state of BCP implementation

9.2.1 Implementation of BCP in Enterprises

Private or public companies dealing with any hazardous material such as oil or gas are obligated by laws on public safety and environmental conservation to establish a risk management system for the environment or crisis situations. The implementation of disaster risk management should be also furthered by general enterprises.

As electric utility companies are also required to prepare for crisis management, they develop Standard Operating Procedures. Although response during emergencies is also defined in this procedure, disaster management and contingency plans have not been established. Furthermore, at water utility agencies, there is no well-structured disaster risk management currently being conducted.

At other utility companies or agencies such as water resources, telecommunications, and road networks, no instance of developed BCP could be found. Most companies have not even established plans or manuals such as contingency or disaster recovery plans, nor have they considered the risks of a large-scale disaster.

9.2.2 Implementation of BCP in foreign capital companies and Japanese companies

It is assumed that some foreign capital companies including major manufacturers and commercial firms have prepared a BCP. In industrial parks accommodating the main factories of foreign capital companies, utility redundancy is ensured since water distribution systems and electric transmission systems are basically independent from the surrounding area. In addition, some individual companies and industrial parks have electric power facilities for emergencies. Thus, preparedness in terms of utilities has been established.

Enterprises consider labor demonstrations, accidents, and traffic congestion as business risks more important than the risks from natural disasters. Because foreign capital companies commonly devote their resources to these problems, the implementation of disaster risk management seems to have a relatively low priority.

9.2.3 Implementation of BCP in foreign capital companies and Japanese companies

Some major manufacturers or commercial firms in foreign capital companies are inferred to prepare their BCP. In an industrial park which main factories of foreign capital companies are located, since water distribution systems and electric transmission systems are basically independent from surrounding area, the utility redundancy is ensured. In addition, some individual companies or industrial parks have the electric power facility for emergency. The preparedness of utility is established.

Enterprises consider a labor demonstration, accidents, traffic congestion and others as a considerable business risk more than a natural disaster risk. Because foreign capital companies also commonly devote their resources to these problems, it is seemed that to implement management of disaster risk has the relatively low priority.

9.3 Efforts on furthering BCP implementation

9.3.1 Regulations and guidelines for BCP implementation

National strategies for disaster risk management and action plans have been developed. Enterprises are required to implement risk management in accordance with these strategies and master plans developed at the regional level.

At the central and local level, governmental authorities related to disaster risk management such as the National Disaster Management Agency (BNPB) and Regional Disaster Management Agency (BPBD) are in charge of the establishment and coordination of disaster management schemes. However, no laws that compel enterprises to develop disaster management plans are currently established. The implementation of contingency plans or BCP has not advanced sufficiently at either private or government-owned enterprises.

9.3.2 Efforts on disseminating and increasing awareness of BCP by the private sector

Efforts for the implementation of BCP by enterprises attempted by the private sector have been determined. For efforts on improving corporate management for disaster risk, no actions to support enterprises in the establishment of disaster risk management systems or in conducting disaster risk assessments have been verified.

However a function of KADIN is to support business growth in SMEs. This is done through periodic business seminars and symposiums. However, the issues of business continuity and disaster

management have never been covered as a main topic. KADIN also believes interest in implementing BCP will increase in the near future.

9.4 BCP implementation problems

To implement the BCP, it is essential to improve utility infrastructure. The failure to construct infrastructure in Indonesia is one problem for BCP diffusion. Road network problems seem to be the main bottleneck, with the continuous traffic congestion around Jakarta causing a severe impact on logistics. In addition, the improvement of infrastructure such as roads and drain facilities is an urgent issue considering flood vulnerability. Private enterprises including foreign capital companies are concerned by these weaknesses in social infrastructure.

The lack of knowledge and know-how in developing BCM/BCP is also regarded as a reason for not proceeding with implementation of BCP in the private sector.

List of Agglomerated Areas

ID	Short List	LongList	COUNTRY	PROVINCE	PARK NAME	ADDRESS
ID0001			Indonesia	North Sumatera	Medan Industrial Area	Jalan Perdana Kota Medan 20231
ID0002			Indonesia	North Sumatera	Medanstar Industrial Estate	NO ADRESS
ID0003			Indonesia	North Sumatera	Pulahan Seruai Industrial Estate	NO ADRESS
ID0004			Indonesia	West Sumatera	Padang Industrial Park	Jalan Mohammad Yamin Sh,Kota Padang
ID0005			Indonesia	Riau	industrial park Dumai	Jendral Sudirman Kota Dumai 28826
ID0006			Indonesia	Riau	industrial park Tanjung Buton	NO ADRESS（Sumatera）
ID0007		**XXID01**	Indonesia	Batam	Batamindo Industrial Park	Jalan Gaharu-Batamindo Indurty Park Kota Batam 29433
ID0008		**XXID04**	Indonesia	Batam	Bintang Industrial Park	Near Harris resort (Julan Brigien Katamso Tanjang Vncang Batang)
ID0009		**XXID08**	Indonesia	Batam	Kabil Integrated Industrial Estate	Jalan Pattimura Kota Batam 29467
ID0010		**XXID19**	Indonesia	Batam	Panbil Industrial Estate	Jalan Ahmad Yani-Komplek Panbil Industri Kota Batam 29433
ID0011			Indonesia	Batam	Puri Industrial Park 2000	Jalan Raya Puri 61363
ID0012		**XXID25**	Indonesia	Batam	Tunas Industrial Park	Jalan Mekar Sari 3 Kota Bekasi 17112
ID0013			Indonesia	Batam	Union Industrial Park	Unnamed Rd Kota Batam 29444
ID0014			Indonesia	Batam	West Point Maritime Industrial Park	Jalan Jend. A. Yani Kota Batam 29433
ID0015		**XXID03**	Indonesia	Bintan	Bintan Industrial Estate	Bintan Island Riau Archipelago, Indonesia
ID0016			Indonesia	Jakarta	CilandakCommercial Estate	Jalan Sekolah Duta 5 22 Kota Jakarta Selatan 12310
ID0017			Indonesia	Jakarta	Pulogadung IndustrialArea	Pulo Asem Utara 10 11 Kota Jakarta Timur 13220
ID0018		**XXID18**	Indonesia	Jakarta	Nusantara Bonded Zone	Nusantara Kota Depok 16451
ID0019			Indonesia	Banten - Cilegon	Cilegon IndustrialArea	Jalan Kyai Haji Tubagus Ismail Kota Cilegon 42418
ID0020			Indonesia	Banten - Cilegon	Jababeka Industrial Estate	Jalan Kh. Ahmad Dahlan 23 Kota Cilegon 42441
ID0021			Indonesia	Banten - Cilegon	MGM Cikande Integrated IndustrialPark	Jalan Kh. Ahmad Dahlan 23 Kota Cilegon 42441
ID0022		**XXID17**	Indonesia	Banten - Cilegon	Modern Cikande Industrial Estate	KM. 68 Bakung Cikande Banten, Indonesia
ID0023			Indonesia	Banten - Tangerang	Cikupamas Industrial Area & Warehousing	Jalan Ki Samaun 28 Kota Tangerang 15118
ID0024		**XXID14**	Indonesia	Banten - Tangerang	MilleniumIndustrial Estate	Jalan Millenium Raya III, Blok H1, Millenium Industrial Estate, Desa Peusar,, Panongan, Banten 15710
ID0025			Indonesia	Banten - Tangerang	Bumi Serpong Damai Techno Park	Jalan Ki Samaun 28 Kota Tangerang 15118
ID0026			Indonesia	West Java - Bogor	Cibinong CenterIndustrial Estate	Jalan Kampung Cikempong 2 Cibinong 16915
ID0027			Indonesia	West Java - Bogor	Sentul IndustrialArea	Jalan Lan Bau 25 16810
ID0028			Indonesia	West Java – Sumedang	Rancaekek IndustrialArea	Cibalong Satu 45355
ID0029			Indonesia	West Java – Karawang	BukitIndah Industrial Park	Jalan Benda Sari I 147 Karawang Timur 41371
ID0030	**XXID11**	**XXID11**	Indonesia	West Java – Karawang	Kujang IndustrialArea	Near Jalan Teluk Jambe Indonesia
ID0031			Indonesia	West Java – Karawang	International Industrial City Area	Jalan Benda Sari I 147 Karawang Timur 41371
ID0032	**XXID15**	**XXID15**	Indonesia	West Java – Karawang	Mitrakarawang IndustrialArea	Jalan Ms Al-Koriah, Setu, Bekasi, Jawa Barat 17320

ID	Short List	LongList	COUNTRY	PROVINCE	PARK NAME	ADDRESS
ID0033	**XXID21**	**XXID21**	Indonesia	West Java – Karawang	Suryacipta City ofIndustry	Jalan Peruri, Ciampel, Karawang 41363
ID0034			Indonesia	West Java – Karawang	Daya Kencanasia Industrial Park	Pair Huni 40379
ID0035			Indonesia	Central Java	Candi Industrial Area	Jalan Satria Utara 2 Kota Semarang 50257
ID0036			Indonesia	Central Java	TuguWijaya Kusuma IndustrialArea	Kandangan Rowo Senen 56281
ID0037		**XXID23**	Indonesia	Central Java	Terboyo Semarang IndustrialArea	Semarang, Central Jawa, Indonesia
ID0038			Indonesia	Central Java	Wonogiri IndustrialArea	Parkit Wonogiri 57611
ID0039			Indonesia	Central Java	Bugangan Baru Semarang Small Industry Community	Jalan Musi Kota Semarang 50126
ID0040			Indonesia	Central Java	Bukit Semarang Baru Industrial Park	Kandangan Rowo Senen 56281
ID0041			Indonesia	Central Java	Tanjung Emas Export Processing Zone	Jalan Pemuda Rembang 59217
ID0042			Indonesia	West Java - Purwakarta	Lion Industrial Area	Cimaung Purwakarta 41116
ID0043	**XXID27**	**XXID27**	Indonesia	West Java - Purwakarta	Kawasan Industrial Indotaisei Kota Bukit Indah	Purwakarta, West Jawa
ID0044	**XXID09**	**XXID09**	Indonesia	West Java - Purwakarta	Kota BukitIndah Industrial City	Near Kota Bukit Indah Plaza Hotel Blok L, Kota Bukit Indah, Purwakarta, Jawa Barat 41181, Indonesia
ID0045	**XXID02**	**XXID02**	Indonesia	West Java Bekasi	Bekasi International Industrial Estate	Stasiun Bekasi Kota Bekasi 17143
ID0046	**XXID05**	**XXID05**	Indonesia	West Java Bekasi	EastJakarta Industrial Estate	Kompl Industry Ejip Plot 7L Lemhbng Cikrang Barat Kabupaten Bekasi Jawa Barat, Indonesia
ID0047	**XXID06**	**XXID06**	Indonesia	West Java Bekasi	Greenland International Industrial Centre	Jalan Perjuangan Raya 15 Kota Bekasi 17143
ID0048	**XXID07**	**XXID07**	Indonesia	West Java Bekasi	Jababeka Industrial Estate	Jalan Industry Pasir Gonbong, Indonesia
ID0049			Indonesia	West Java Bekasi	Gobel IndustrialArea	Jalan Perjuangan Raya 15 Kota Bekasi 17143
ID0050			Indonesia	West Java Bekasi	Indonesia China Integrated Industrial Area	Jalan Perjuangan Raya 15 Kota Bekasi 17143
ID0051	**XXID12**	**XXID12**	Indonesia	West Java Bekasi	Lippo Cikarang Industrial Park	Jalan Perjuangan Raya 15 Kota Bekasi 17143
ID0052			Indonesia	West Java Bekasi	MarundaCenter	Jalan Perjuangan Raya 15 Kota Bekasi 17143
ID0053			Indonesia	West Java Bekasi	MM2100 Industrial Town – BFIE	Jalan Perjuangan Raya 15 Kota Bekasi 17143
ID0054	**XXID16**	**XXID16**	Indonesia	West Java Bekasi	MM2100 Industrial Town – MMID	Jalan Kampung Rawa Lele Timur No.45, Cibitung, Bekasi, Jawa Barat 17520
ID0055			Indonesia	West Java Bekasi	PatriaManunggal Industrial Estate	Jalan Perjuangan Raya 15 Kota Bekasi 17143
ID0056			Indonesia	East Java	Gresik Industrial Area	Jalan Harun Tohir Jalan Harun Tohir Gresik 61113
ID0057			Indonesia	East Java	Ngoro Industrial Park	Jalur Gempol - Mojokerto Ngoro 61385
ID0058			Indonesia	East Java	Surabaya Industrial Estate Rungkut	Siak Kota Surabaya 60241
ID0059			Indonesia	East Kalimantan	KaltimIndustrial Estate	NO ADRESS (Kalimatan Timur)
ID0060			Indonesia	East Kalimantan	Kariangau IndustrialArea	Jalan Soekarno Hatta Kota Balikpapan 76127
ID0061		**XXID13**	Indonesia	South Sulawesi	MakasarIndustrial Area	Jalan Gamba Puang 91712
ID0062			Indonesia	Central Sulawesi	Palu Industrial Area	Jalan Mangga Kota Palu 94111
ID0063		**XXID22**	Indonesia	Batam	Taiwan International Industrial Estate	Jalan Jend. A. Yani Kota Batam 29433
ID0064		**XXID10**	Indonesia	Banten - Cilegon	Krakatau Industrial Estate	Jalan Kh. Ahmad Dahlan 23 Kota Cilegon 42441

ID	Short List	LongList	COUNTRY	PROVINCE	PARK NAME	ADDRESS
ID0065		**XXID20**	Indonesia	East Java	Pasuruan Industrial Estate Rembang	Jalan Kyai Haji Wachid Hasyim Kota Pasuruan 67116
ID0066		**XXID24**	Indonesia	East Java	Tuban Industrial Estate	PT Kawasan Industri Gresik, Jl. Tridharma 03 Gresik, East Java,Indonesia
ID0067	**XXID26**	**XXID26**	Indonesia	West Java - Karawang	Karawang International Industrial City	Industri KIIC Karawang 41361, West Java, Indonesia

LAO PDR

Table of Contents

Chapter 1 Introduction

The report is a draft version of the Country Report for Lao PDR, which will be a reference document for organizations of the private and public sectors wishing to prepare an Area Business Continuity Plan (Area BCP) and develop an Area Business Continuity Management System (Area BCM System).

The country report contains information on natural disaster risks, industrial parks and investment risk, key infrastructure and lifeline systems, as well as issues to consider during natural disasters. It also presents an outline of economy and trade, an outline of physical distribution, and current practices for implementing business continuity management (BCM) in the country.

The draft report will be refined and finalized at the end of the Project.

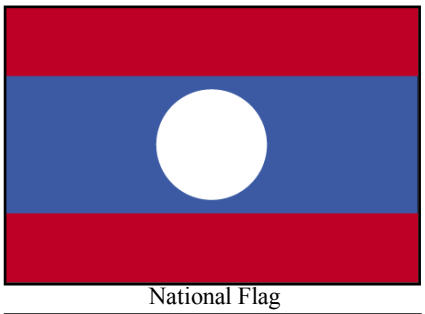
Chapter 2 Overview of the Country

Laos is located on the Indochina Peninsula, and bordered by China to the north, Myanmar to the west, Vietnam to the east, and Cambodia and Thailand to the south. It is the only landlocked country in ASEAN. The Mekong River runs north-south across Laos. The country is also characterized by its large mountainous regions.

Laos became a member of ASEAN on July 23, 1997, together with Myanmar. Unlike other ASEAN countries, Laos does not have a large metropolis, and the country is thinly populated.

Laos is a People's Democratic Republic, and Choummaly Sayasone is the President and the head of state of Laos. The central government also controls local level administration. The country has no local assembly.

Basic Information of Lao PDR



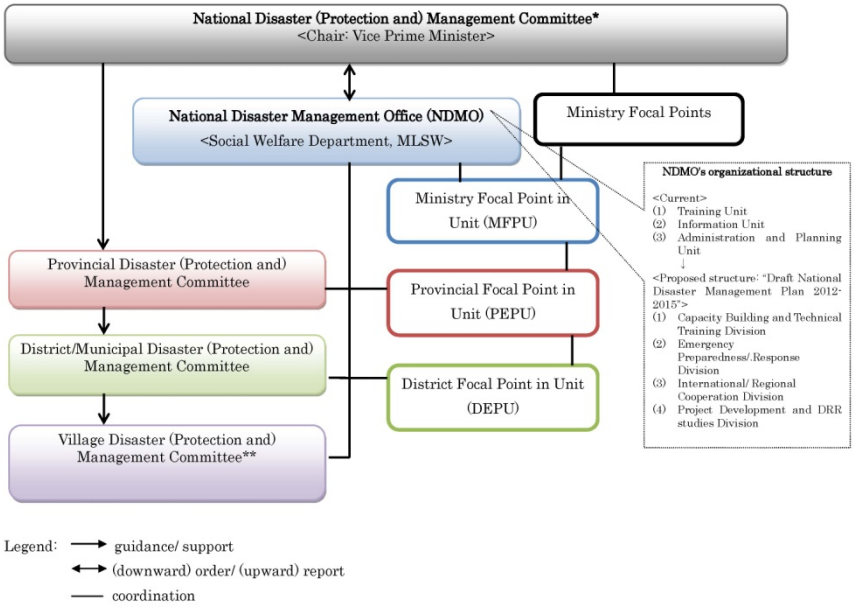
National Flag

Capital	Vientiane
Ethnic Groups	Cambodian (Khmer) 90%
Languages	Lao
Religions	Buddhism
Area (km^2)	Total: 236,800 Land: 230,800 Inland Water: 6,000

Population	664,5827
Population density(people/ km^2 of land area)	29
Population growth (annual %)	1.9
Urban population (% of total)	35
GDP (current US$) (billion)	9.4
Economic growth rate (annual %)	8.2
GNI per capita, PPP (current international $)	2,690
Agriculture, value added (% of GDP)	28
Industry, value added (% of GDP)	36
Services, etc., value added (% of GDP)	36

Features of Disasters

The major natural disasters in Lao People's Democratic Republic (PDR) are flooding, storm, and drought in terms of number of disaster, and total number of affected people. On the other hand, deaths due to disasters were attributed to flooding and storm. Estimated damage costs were caused by storm (95%) and flood (5%). The number of deaths was reported due to drought. It may be considered that people are affected mainly by flood (water) whereas economic losses are mainly caused by storms (considered from its strong winds).



Source: Draft National Disaster Management Plan 2012- 2015, p.26. <Partly added by JICA Study Team>

Note: *NDMC is renamed by the draft decree on National Disaster Protection and Management (Provisional English Translation by the JICA Study Team). Differences are bracketed off. ** Committee at the village level is established especially where there is high risk. It is currently called the Village Disaster Protection Unit (VDPU) in the draft National Disaster Management Plan 2012- 2015.

Sources; Map and Flag: CIA(Central Intelligence Agency) website (2014) (https://www.cia.gov)

Capital, Ethnic Groups, Languages and Religions: Ministry of Foreign Affairs website (2013) (http://www.mofa.go.jp)

Area, Population, Population density, Population growth, Urban population, GDP, Economic growth rate, GNI per capita, PPP, Agriculture, value added, Industry, value added and Services, etc., value added: The World Bank Data Bank website (2012) (http://data.worldbank.org)

Chapter 3 Natural Disaster Risk

3.1 Floods

(1) Risk

Summary of flood disaster

Floods in the Lao People's Democratic Republic (PDR) occur in the central to north regions affected by tropical monsoons in the rainy season (from June to November). September to October coincides with the typhoon season, and typhoons that land cause flood damage in the plains and basin areas.

Notable floods and damage in recent years

Recent notable floods were caused by storm rainfalls accompanying monsoons in August 2008 and on July 27, 2011.

1. Storm rainfall from August 6 to August 14, 2008 caused flood and inundation damage at the middle reaches of the Mekong River. According to the EM-DAT (The International Disaster Database) the flood caused the deaths of about 10 people and affected about 200,000.
2. The flood on July 29, 2011 caused by the typhoon brought flood damage leaving 30 dead and affecting approximately 430,000 people.

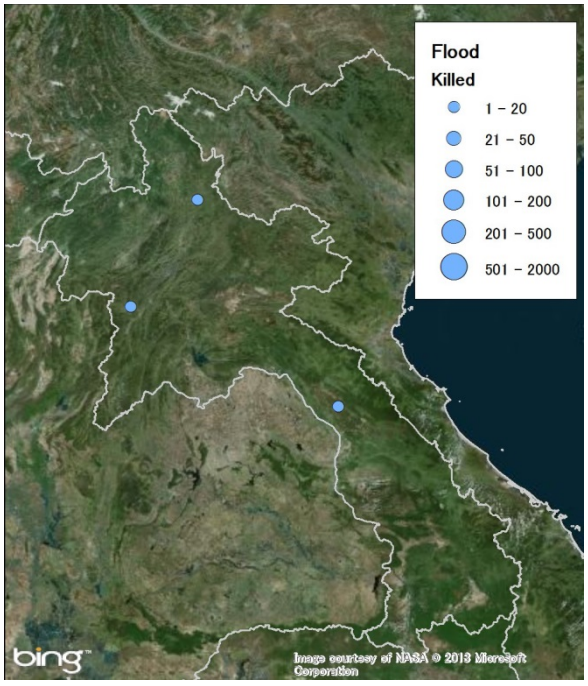


Figure 3.1.1 Flood Disaster: Human Losses

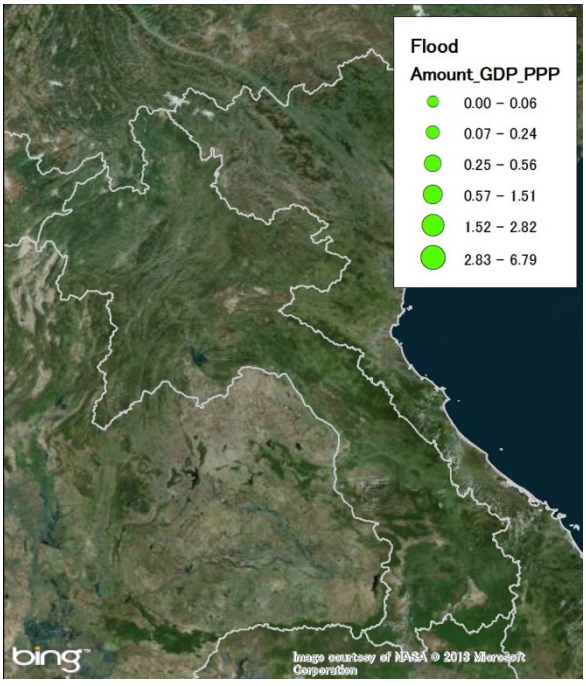


Figure 3.1.2 Flood Disaster: Economic Losses (% of GDP)

(2) Background

Characteristics of floods

Floods in Lao PDR are caused by storm rainfalls and typhoons in the rainy season and occur from July to October, similar to Viet Nam.

Notable examples of flood disasters

1. The flood of August 2008 was caused by the storm rainfalls of August 4 to 14, which were brought by the tropical cyclone "Kamuri" or Typhoon No.8. The flood caused severe damage in Louangprabang, Vientiane, Khammouane, Bolikhamsai, and Savannakhet along the middle reach of the Mekong River. The storm rainfalls also caused landslides at various sites in the central and northern mountainous regions, and 382.8 mm of rain was observed at the rainfall station Houei Sai, which belongs to the Department of Meteorology and Hydrology (DMH).
2. The flood on July 29, 2011 was caused by storm rainfall brought by Typhoon Nock-ten. It caused severe damage, including damage to agricultural crops in Khammouane and Savannakhet, which are located in the southern region.

Frequently flood areas

- Middle reach of the Mekong River

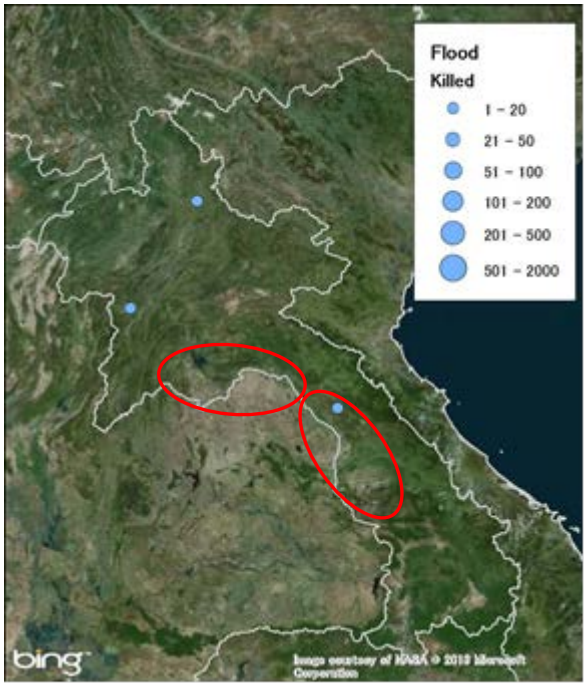


Figure 3.1.3 Hotspots of Human Loss

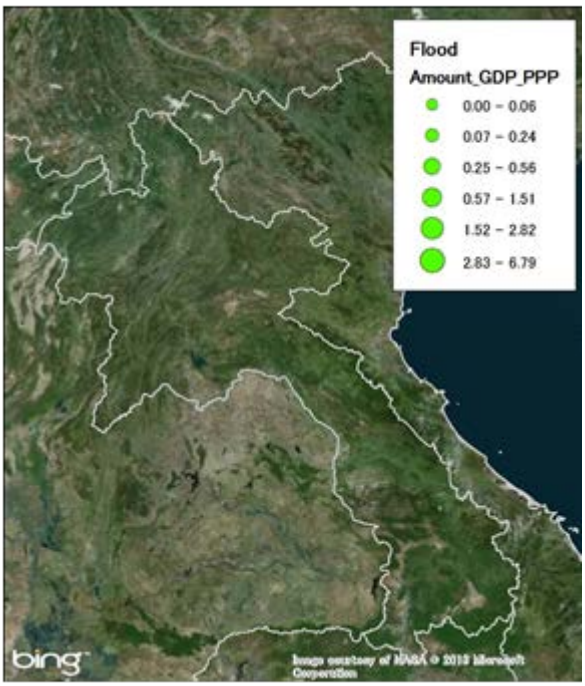


Figure 3.1.4 Hotspots of Economic Loss

(3) Efforts by the central government, local governments, and disaster management organizations

✓ National Disaster Management Committee (NDMC)

- Coordinates national disaster protection and prevention activities and others activities.
- The committee is comprised of major ministries, agencies, and representatives from provinces.
- Coordinates between ministries and agencies on policy on the prevention and management of natural disasters and promotes the disaster management activities of provincial citizens.

✓ National Disaster Management Office (NDOM)

- NDOM is the implementing organization for disaster management policy and belongs to the Ministry of Labor and Social Welfare (MLSW).
- Secretariat NDMC is set at NDOM.

✓ Disaster Management Committees at province (khoueng), district (muang), village (ban) levels

- Establishes committees at local governments.

(4) Hazard and risk information sources

Disaster risk reduction organizations

Table 3.1.1 List of Organizations for Disaster Risk Reduction

Organization	Post	Web Address
National Disaster Management Committee (NDMC)		
National Disaster Management Office (NDMO)		http://ndmo.laopdr.org/ndmo.htm
Province & District Disaster Management Committee (DMC)		
Water Resources and Environment Agency (WREA)		http://www.monre.gov.la/wrea/en.html
National Agriculture and Forestry Research Institute (NAFRI)		http://www.nafri.org.la/
United Nations in Lao PDR		http://www.unlao.org/
National University of Laos (NUOL)		http://www.nuol.edu.la/

Reports

Table 3.1.2 List of Reference Reports for Risk Analysis

Organization	Post	Title/ Web Address	Form
Asia Development Bank	Asian Water Development Outlook	Asian Water Development Outlook 2013;Asia-Pacific Water Forum	Report
		http://www.adb.org/publications/asian-water-development-outlook-2013	
World Bank	ASEAN Disaster Risk Management Initiative	Synthesis Report on Ten Asian Countries Disaster Risks Assessment ; December 2012	Report
		http://www.unisdr.org/files/18872_asean.pdf	
The Nature Conservancy	ASEAN Disaster Risk Management Initiative	World Risk Report 2012 ; October 2012	Report
		http://www.ehs.unu.edu/article/read/worldriskreport	

		-2012	
World Bank	Framework and Options for Implementation	Advancing Disaster Risk Financing and Insurance in ASEAN Countries: April 2012	Report
		https://openknowledge.worldbank.org/bitstream/handle/10986/12628/714530v20ESW0W0AN0appendices0June12.pdf?sequence=1	
International Development Research Centre	Economy and Environment Program for Southeast Asia (EEPSA)	Climate Change Vulnerability Mapping for Southeast Asia: January 2009	Report
		http://web.idrc.ca/uploads/user-S/12324196651Mapping_Report.pdf	
UNEP, GRID, UNISDR		Global Risk Data Platform	Web Map
		http://preview.grid.unep.ch/index.php?preview=map&lang=eng	
UNISDR, GAR		Desinventar Disaster Information Management System	Web Map
		http://www.desinventar.net/	

Abbreviations

DMC	Province & District Disaster Management Committee,
NAFRI	National Agriculture and Forestry Research Institute,
NDMC	National Disaster Management Committee,
NDMO	National Disaster Management Office,
NUOL	National University of Laos,
WREA	Water Resources and Environment Agency,

References：

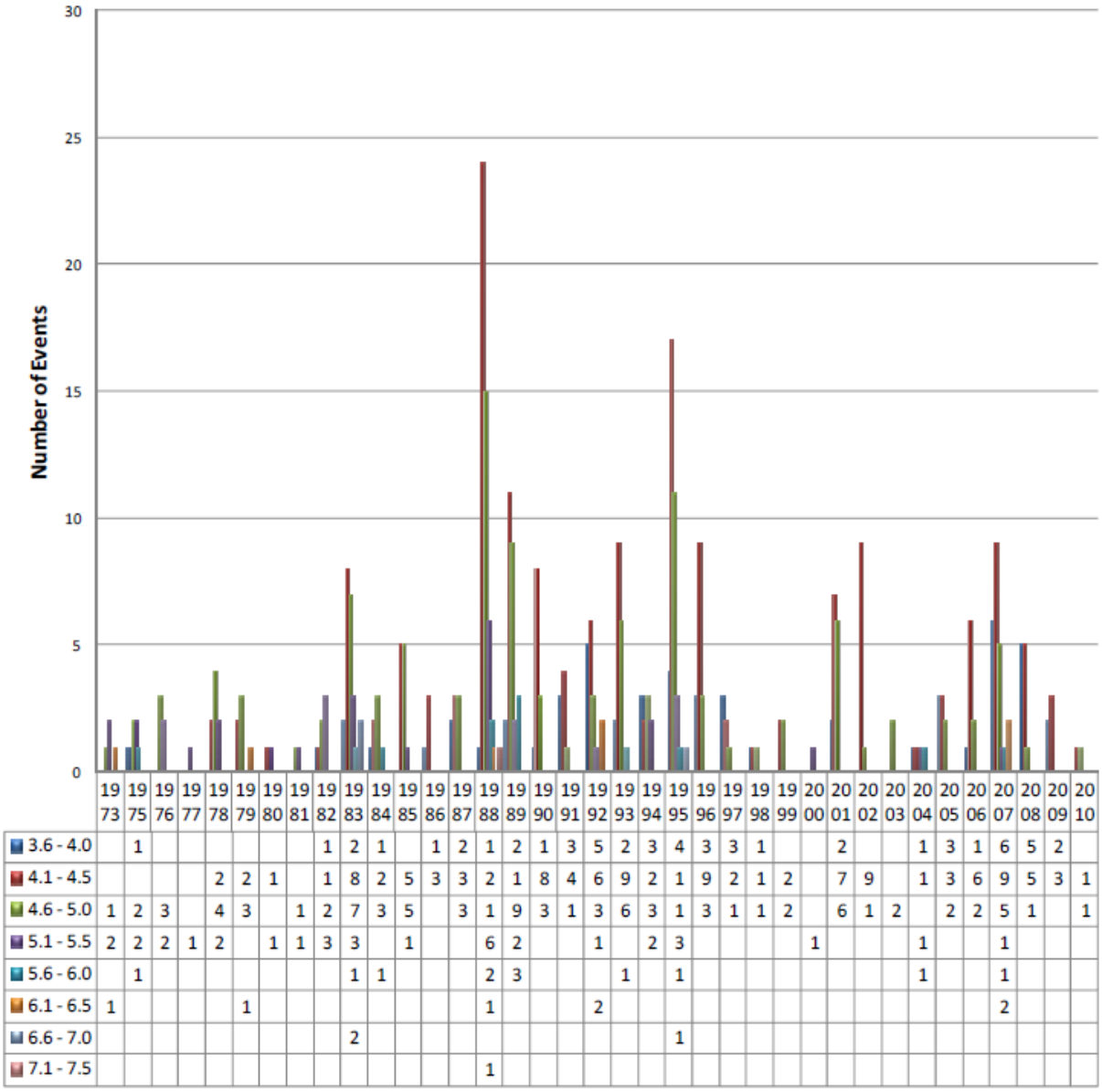
1) Ministry of Foreign Affairs of Japan (2013): “Information on Laos in Japanese”, 06 2013
2) ADRC: “Countries; Lao PDR”, Information on Disaster Risk Reduction of the Member
3) ADRC: “Lao People's Democratic Republic, Flood, 2008/08/14”, Details of Disaster Information
4) China View (2008): “Vientiane on high alert for flooding”, 2008-08-14
5) Association of Japanese Residents in Lao PDR: “Disasters in Laos by the tropical cyclone “Kammuri” on August, 2008 in Japanese”
6) ADRC (2011): “Lao People's Democratic Republic、Tropical Storm, 2011/07/29”
7) Relief Web, OCHA (2011): “Floods DREF Operation No MDRLA002 Update No 1”, Report from IFRC, 19 Aug 2011
8) The International Federation of Red Cross and Red Crescent (IFRC) (2011): “Lao PDR, Floods”, 19 August 2011

3.2 Earthquakes

(1) Risk

Lao PDR is prone to moderate to negligible earthquakes. The country has witnessed several small and moderate scale earthquakes in the past in northern and western parts of the country. Only one

earthquake of more than M7 has been reported in the past. Also, no significant disasters were recorded in the past. The details of earthquake events for the last 38 years are plotted in Figure 3.2.1.



	1973	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
3.6 - 4.0		1							1	2	1		1	2	1	2	1	3	5	2	3	4	3	3	1			2			1	3	1	6	5	2	
4.1 - 4.5					2	2	1		1	8	2	5	3	3	2	1	8	4	6	9	2	1	9	2	1	2		7	9		1	3	6	9	5	3	1
4.6 - 5.0	1	2	3		4	3		1	2	7	3	5		3	1	9	3	1	3	6	3	1	3	1	1	2		6	1	2		2	2	5	1		1
5.1 - 5.5	2	2	2	1	2		1	1	3	3		1			6	2			1		2	3					1				1			1			
5.6 - 6.0		1								1	1				2	3				1		1									1			1			
6.1 - 6.5	1					1									1				2															2			
6.6 - 7.0										2												1															
7.1 - 7.5															1																						

Figure 3.2.1 Earthquake events in Lao PDR (based on USGS catalogue)

(2) Background

Figure 3.2.2 shows earthquake risk in Lao PDR. The zones indicate where there is a probability of 20% that degrees of intensity shown on the map will be exceeded in 50 years. This probability figure varies with time; i.e., it is lower for shorter periods and higher for longer periods.

As per the map, Phongsaly, Namtha, Bokeo, Oudomxay, northern half part of Sayabouri, western half part of Luang Prabang, and a northern smaller portion of Vientiane are exposed to earthquakes, with intensity VII or less expected. Eastern half part of Luang Prabang, Houaphanh, Xiang Khohang, Vientiane 1 & 2, southern half part of Sayabouri and the northwest of Vientiane are

exposed to earthquake, with intensity VI or less expected. Remaining regions fall under low seismic risk.

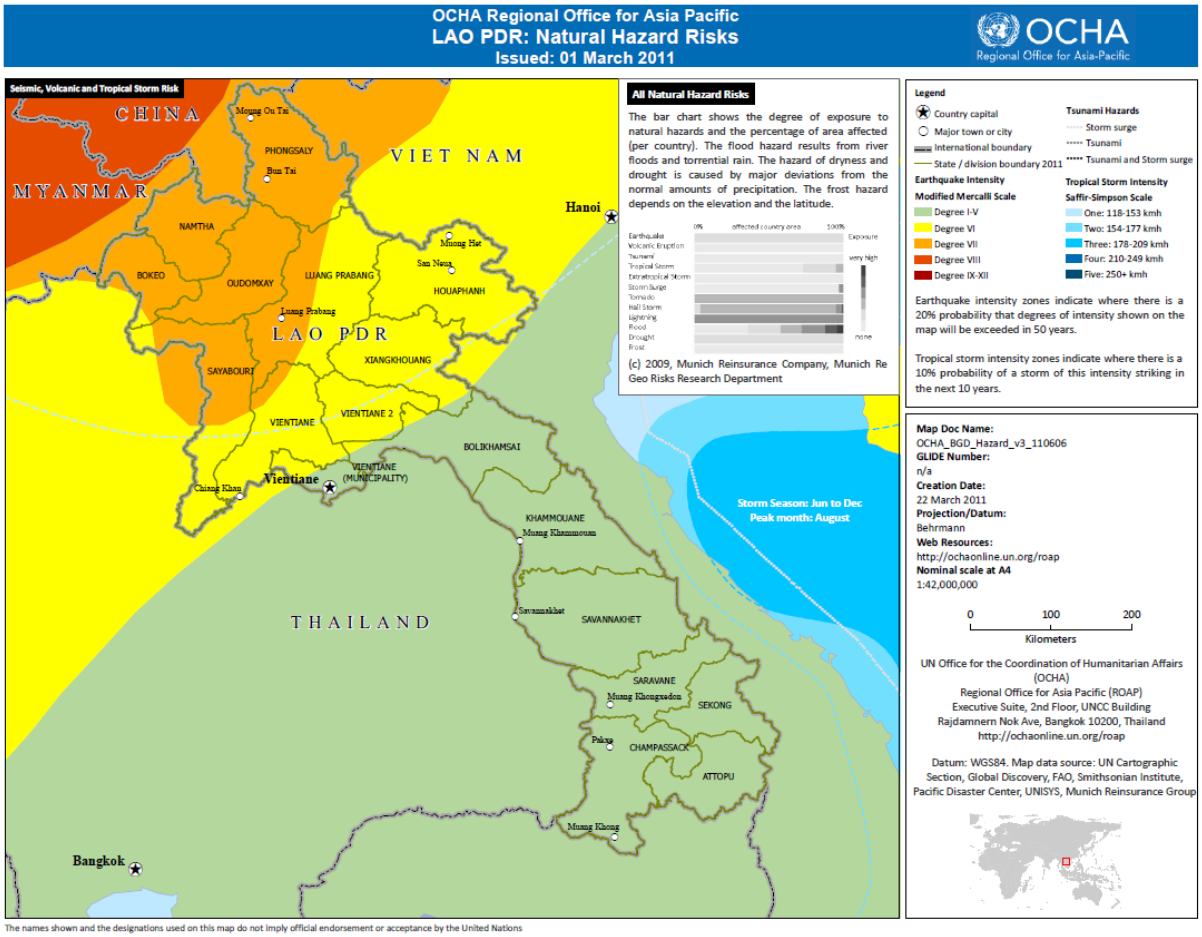


Figure 3.2.2 Natural Hazard Risk of Lao PDR (Seismic, Volcanic and Tropical Storm Risk)

(3) Efforts by the central government, local governments, and disaster management organizations

The Department of Meteorology and Hydrology (DMH) installed broadband seismographs and strong motion accelerometers at Luang Prabang and Laksao in 2008 with assistance from the China Earthquake Administration (CEA). The DMH has been observing earthquakes since 2009 and observed 34 earthquakes in 2009.

The DMH is conducting hypocenter determination by collecting the data in surrounding countries such as China, Vietnam, and Thailand through the internet because it does not have much of its own data. Therefore, it takes one hour for the hypocenter to be determined after the earthquakes occur.

Meteorological and hydrological monitoring, and early warning systems (severe weather, typhoon, heavy rainfall, very hot weather, flood, and flash flood) are operated by the DMH. Earthquakes are outside of their scope.

(4) Hazard and risk information sources

Department of Meteorology and Hydrology (DMH)
http://dmhlao.etllao.com/

References :

1) Asian Disaster Preparedness Center (ADPC), in collaboration with Public Work and Transport Institute (PTI) and National Disaster Management Office (NDMO), with the support of UNDP Lao PDR Country Office (2010), "DEVELOPING A NATIONAL RISK PROFILE OF LAO PDR"
2) EM-DAT: The OFDA/CRED International Disaster Database – www.emdat.be – Université Catholique de Louvain – Brussels – Belgium.
3) United Nations Office for the Coordination of Humanitarian Affairs (OCHA), Regional Office for Asia Pacific (ROAP) (2011): "LAO PDR: Natural Hazard Risks", Downloaded from "http://img.static.reliefweb.int/sites/reliefweb.int/files/styles/attachment-large/public/resources-pdf-previews/116605-OCHA_LAO_Hazard_v3_110606.png"
4) Japan International Cooperation Agency (JICA) (2012): "Data Collection Survey on ASEAN Regional Collaboration in Disaster Management"

3.3 Tsunami

(1) Risk

It is well known that tsunamis are generated by sea floor earthquakes. However, an undersea volcanic eruption, an undersea landslide, or other disturbances above or below water can also generate a tsunami. However, Lao PDR is an inland country and there is no tsunami risk caused by sea floor earthquakes.

(2) Efforts by the central government, local governments, and disaster management organizations

There are no special measures focusing on tsunami disaster.

References :

1) EM-DAT: The OFDA/CRED International Disaster Database – www.emdat.be – Université Catholique de Louvain – Brussels – Belgium.
2) Japan International Cooperation Agency (JICA) (2012): "Data Collection Survey on ASEAN Regional Collaboration in Disaster Management"

3.4 Volcanoes

(1) Risk

There are no volcanoes in Lao PDR and no record of significant disaster caused by volcanic eruption in its history.

Major hazards caused by volcanic eruption are lava flow, pyroclastic flow, "Lahar" (volcanic mud flow) and volcanic ash fall. Lava flow is a flow of melted rock along the slope. Pyroclastic flow is the flow of a mixture of hot dry masses of fragmented volcanic materials and volcanic gas along the slope. "Lahar" is originally an Indonesian term and is also called volcanic mud flow. It is the flow of a mixture of volcanic materials and water along the slope. These flows cause enormous damage to the side and foot of the volcano but generally do not have an extended reach. However, volcanic ash fall often spreads widely via the trade winds or the westerlies, causing damage over an extensive area. Therefore, there is a possibility that a volcanic eruption in neighboring countries might wreak a volcanic ash fall on Lao PDR.

Figure 3.4.1 shows the volcanoes in the Asia-Pacific region which erupted during the Holocene. The Holocene is a geological epoch from 10,000 years ago to the present. The map indicates that many volcanic eruptions have occurred in Indonesia, Philippines, and other neighboring countries.

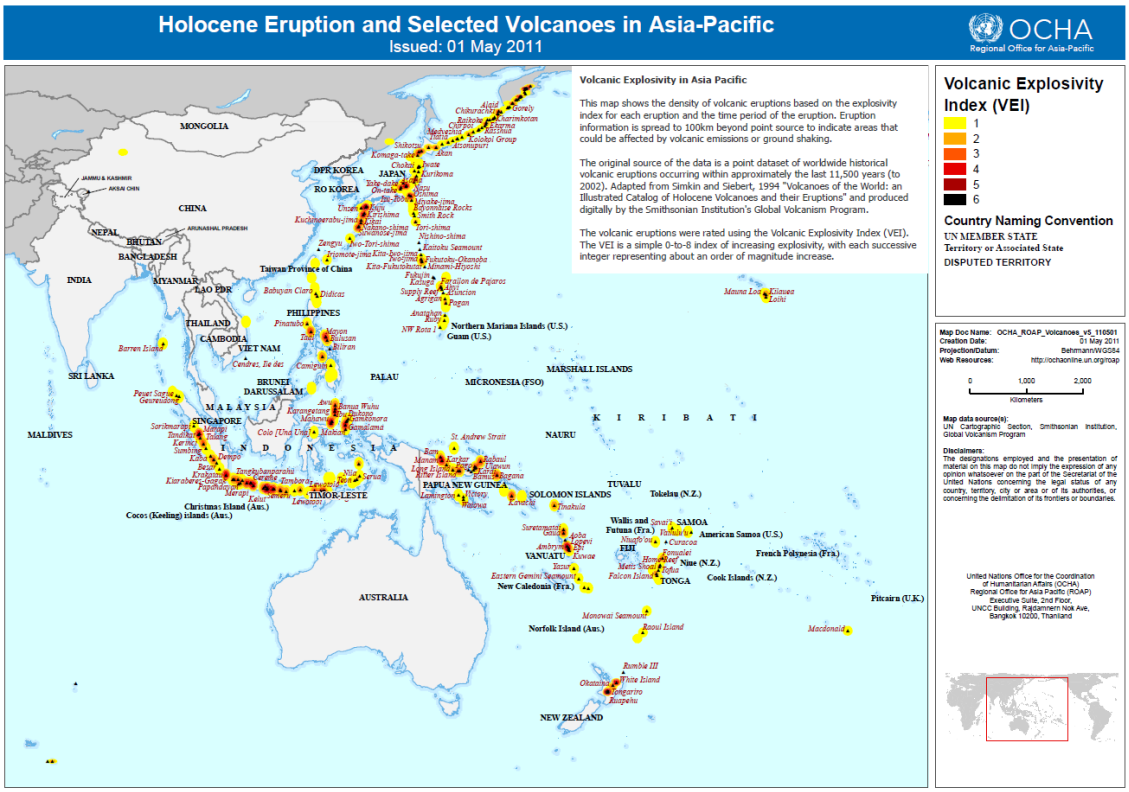


Figure 3.4.1 Holocene Eruption and Selected Volcanoes in Asia-Pacific

(2) Efforts by the central government, local governments, and disaster management organizations

Meteorological and hydrological monitoring, and early warning systems (severe weather, typhoon, heavy rainfall, very hot weather, flood, and flash flood) are operated by the Department of Meteorology and Hydrology (DMH). However, volcanic hazard is outside of their scope.

References :

1) Lee Siebert, Tom Simkin, and Paul Kimberly (2011): "Volcanoes of the World - Third Edition", Smithsonian Institute/University of California Press
2) EM-DAT: The OFDA/CRED International Disaster Database – www.emdat.be – Université Catholique de Louvain – Brussels – Belgium.
3) Japan International Cooperation Agency (JICA) (2012): "Data Collection Survey on ASEAN Regional Collaboration in Disaster Management"
4) United Nations Office for the Coordination of Humanitarian Affairs (OCHA), Regional Office for Asia Pacific (ROAP) (2011): "Holocene Eruption and Selected Volcanoes in Asia-Pacific", Downloaded from "http://reliefweb.int/sites/reliefweb.int/files/resources/map_619.pdf"

3.5 Cyclone (Meteorological) Hazards

(1) Risk

Lao PDR is located between latitudes 20° and 22° to the north and longitude 100° and 108° to the east. This country has a tropical monsoon climate. Affected by the southwest monsoon, it has two seasons with heavy and frequent rains from mid-May to mid-October (rainy season) and a cold dry season from November to February. The inter-monsoon period from March to April becomes dry and hot. Annual rainfall ranges from 900 mm to 3,500 mm. In particular, rainfall on the windward side of the mountain area is very high.

The country suffers from flooding caused by monsoons and typhoons (tropical cyclones). Floods occur almost every year in the Mekong River basin in the central and southern parts of this country. As a general condition, floods are experienced from September to October. Accounting for more than half of the country, areas susceptible to flood damage are major agricultural areas of rice cultivation. The northern and eastern parts of the country are often affected by landslides and flash floods triggered by heavy rains. Typhoons (tropical cyclones) which are generated around the Philippines sometimes affect Lao PDR after making landfall in Vietnam.

Table 3.5.1 Tropical Cyclone Disasters in Terms of Number of Deaths (1980- 2011)

Year (Month)	Typhoon, Cyclone (name)	Deaths	Total Affected
1991	Storm	-	38,315
July, 1992	Tropical Cyclone	22	268,877

July, 1993	Storm	8	120
August, 1995	Tropical Cyclone	26	1,000,000
October, 2009	Tropical Cyclone (Ketsana)	16	128,887

Floods are considered to be the most frequent and damaging disaster to occur in Lao PDR. They are brought about by rainfall with tropical cyclones and the southwest monsoon. In particular, floods occur in four main areas: Vientiane plain, Kamumuan Province (Takeku), Savannakhet Province, and Champasak Province (Pakse).

There are two causes of heavy rains in Lao PDR: the enhanced southwest monsoon caused by typhoons (tropical cyclones) close to the Philippines and Vietnam and the lasting southwest monsoon accompanied by the stagnation of tropical cyclones in neighboring Vietnam.

Table 3.5.2 shows meteorological disasters in Lao PDR (1984~2013).

Table 3.5.2 Meteorological Disasters in Lao PDR (EMDAT: 1984 ~ 2013)

Cause	No. of events	Killed	Total Affected	Damage (millions U.S.$)
Drought	4	-	750,000	1.0
Flood (including flash flood)	14	135	3,259,740	22.8
Storm	5	72	1,436,199	406.0

(2) Background

The climate of Lao PDR is under the influence of seasonal monsoon winds (i.e. the southwest monsoon and the northeast monsoon). The southwest monsoon brings a stream of warm moist air causing abundant rain over the country, especially during September and October. Rainfall during this period is not only caused by the southwest monsoon, but also by tropical cyclones which produce a large amount of rainfall.

In average, two tropical cyclones affect the country in a year. Tropical cyclones approaching Lao PDR after it has rained abundantly tend to cause magnified disaster damage.

Tropical cyclone Ketsana entered the southern part of Lao PDR on 29 September 2009, causing extensive damage to personal properties, social and physical infrastructure, and to the area's productive capacity. Savannakhet and Pakse were worst affected since they were directly in the path of the typhoon and are directly on the Mekong River. Attapeu Province was the worst hit with nearly 90% of the province affected. Before Ketsana, Typhoon Moracot in August 2009 had already brought significant damage to several provinces and the Kammuri flooding of August 2008 had affected about 200,000 people and damaged 50,000 ha of arable land.

More than 180,000 persons were directly affected and 28 storm-related deaths were caused by Ketsana. Affected regions were 5 provinces and 26 districts, 18 of which were seriously damaged.

Table 3.5.3 Affected 26 Districts in the 5 Provinces by Typhoon Ketsana

Attapeu 5 districts	Salavan 8 districts	Xekong 4 districts	Savannakhet 6 districts	Champasak 3 districts
1. Xaysetha 2. Sanxay 3. Phouvong 4. Sanamxay 5. Samakkhixay	6. Ta Oi 7. Samuoi 8. Salavan 9. Vapy 10. Toomlarn 11. Khongxedone 12. Kaakhonepheng 13. Lao Ngram	14. Lamarm 15. Thateng 16. Dakcheung 17. Kaleum	18. Sepone 19. Nong 20. Phine 21. Xonbuly 22. Thapangthong 23. Songkhone	24. Champasak 25. Pathoomphone 26. Moonlapamok

Source: The Typhoon Ketsana in the Lao People's Democratic Republic

Between 24 and 26 June 2011, Typhoon Haima No. 4 hit the northern and central provinces of Lao PDR, passing through the Houaphan, Xiengkhouang, Xayaboury, Vientiane, Bolikhamxay, and Khammouane provinces with wind speeds of 10 km per hour. On 26 June 2011, torrential rains due to Typhoon Haima caused widespread flooding in 4 provinces: Bolikhamxay, Xayaboury, Vientiane and Xiengkhouang.

The floods caused extensive damage to people's livelihoods, property, and to social and physical infrastructure along the major river banks.

Table 3.5.4 Affected Areas by Typhoon Haima

Province	Affected					
	District	Village	Family	Population	Death	Injured
Xayaboury	9	78	6490	32816	2	
Bolikhamxay	4	39	4414	28395	2	
Xiengkhouang	8	236	3082	11385	8	1
Vientiane	11		2613	10464	5	
Khammouane	4	62	845	4233		
Houaphan		7			1	

The Southwest Monsoon influenced the Mekong River Basin from mid-May onwards. Strong to intensive activity occurred from early June and the monsoon was almost stationary until mid-July. This was one of the main causes of isolated heavy rain in the middle and lower reaches of the Lower Mekong Basin early in the flood season. Tropical Low Pressure (TLP) systems and Inter-Tropical Convergence Zones (ITCZ) appeared periodically from early June to the end of August, with an average duration of 3-7 days. For most of September, continued ITCZ activity had a significant influence on and resulted in continuous intensive heavy rain with water levels rising in the middle and lower reaches of the Mekong River, particularly in the tributaries in the middle reach of the Lower Mekong Basin. In addition, during the flood period, six tropical cyclones were affected.

Climate change vulnerability and impact in Lao PDR are as follows.

- Increases in annual mean temperatures may be around 0.1-0.3 °C per decade; annual dry seasons may be longer; the country may experience more intensive rainfall events; and, more frequent and severe droughts and flooding events.

- Chapter 4 of the 4th IPCC report (2007) indicates that the Mekong basin may witness increasing maximum monthly flows of 35-41% and decreasing minimum monthly flows of 17-24% over the course of this century, which will substantially increase flooding risks during the wet season and cause water scarcity during the dry season.

(3) Measures of the National and Local governments and Disaster Prevention Institutions

The National Disaster Management Committee (NDMC) is responsible for coordinating disaster prevention and protection activities and efforts in the country. It promotes the disaster reduction activities of the existing Line Ministries and Provinces on natural disaster management and protection, which consists of representatives of key ministries, institutions, and provinces. The National Disaster Management Office is a policy implementation organization under the Ministry of Labour and Social Welfare (MLSW). There are local level committees at the provincial, district, and village levels.

Meteorological service in Lao PDR is the responsibility of the DMH (Department of Meteorology and Hydrology) under the Ministry of Natural Resources and Environment (MONRE).

The NDMC has overall responsibility for hydrometeorology early warning information services countrywide which includes the following.

- Observe hazard situations and generate meteorological and geophysical data.
- Analyse data for issuing forecasts and warnings for aviation, agriculture, transport, etc.
- Issue forecasts and warnings for any approaching events that might cause damage and loss to life and property.
- Disseminate warning about hazards to relevant users through speedy communication.
- Scrutinize, compare, and publish data for appraisal of long term weather trends and earthquakes.
- Analyse extreme events observed in the past and their future trends, e.g. climate change, weather modification, land-ocean-atmosphere interaction and seasonal weather prediction.

The DMH issues the following products and provides various services.

(a) Daily forecast
(b) Three-day city forecast
(c) Weekly forecast
(d) One month forecast
(e) Three-month forecast
(f) Warnings on severe weather
(g) Warnings on tropical cyclones and typhoons
(h) Warnings on heavy rain, flooding, flash flooding, related to extreme high temperatures

Table 3.5.5 Authorities of Laos Meteorological Service

Institution	Contact Information
DMH (Department of Meteorology and Hydrology) http://dmhlao.etllao.com/index.html	Tel: E-mail :

(4) Hazard and risk information sources

Hazard risk assessment results related to tropical cyclones (meteorological disasters) are as follows.

Table 3.5.6 Source of Information on Tropical Cyclones (Meteorological Disasters)

Institution	Literature name
Economy and Environment Program for Southeast Asia (2010)	Climate Change Vulnerability Mapping for Southeast Asia http://css.escwa.org.lb/sdpd/1338/d2-5a.pdf
UNISDR (2010)	Synthesis Report on Ten ASEAN Countries Disaster Risks Assessment http://www.unisdr.org/files/18872_asean.pdf
UNDP (2010)	Developing a National Risk Profile of LAO PDR Part.1 Hazard Assessment
UNDP (2010)	Developing a National Risk Profile of LAO PDR Part.2 Hazard Assessment

Abbreviations

ITCZ	Intertropical Convergence Zone
NDMO	National Disaster Management Office
NDMC	National Disaster Management Committee
DMH	Department of Meteorological and Hydrology

Explanation of terms

ITCZ: A relatively narrow zone where the trade winds from both the Northern and the Southern Hemisphere merge.

References:

1) Mekong River Commission (2011): “Flood Situation Report 2011”, MRC Technical Report Paper No.36 2011, pp.25-27, pp.5-11
2) Asian Disaster Preparedness Center: “Overview of Early Warning Systems for Hydrometeorological Hazards in selected countries in Southeast Asia”, pp.38-42.
3) Earl James Goodyear, Ph.D. (2011): “Draft National Disaster Management Plan 2012 – 2015”
4) Lao PDR (2009): “The Typhoon Ketsana in the Lao Peoples Democratic Republic's”
5) Lao PDR (2011): “Typhoon Haima in the Lao Peoples Democratic Republic's”
6) DMH (Website): http://dmhlao.etllao.com/

3.6 Landslides

(1) Risk

No records of landslides were found in the EM-DAT (http://www.emdat.be/) or any other available disaster database. However, a landslide with fatalities occurred in 2011.

The abundance of flash floods in the northern area indicates a possibility of landslides in those mountain areas.

(2) Background

During the typhoon in 2011, landslides and slope collapse occurred repeatedly. A large-scale landslide accompanied by fatalities blocked National Highway 13 along with more than 300 m of road.

Exposure related to climate change is distributed in the mountain areas of northern part of the capital and southern border area.[1)]

(3) Efforts by the central government, local governments, and disaster management organizations

Road rehabilitation for landslides has been conducted by the Department of Road (DoR) belonging to the Ministry of Public Works and Transport (MPWT) and Department of Public Works and Transportation (DPWT) in every province.

- ✓ National Disaster Management Committee（NDMC）
  - Coordinates national disaster protection and prevention activities and others activities.
  - The committee is comprised of major ministries, agencies, and representatives from provinces.
  - Coordinate between the ministries and agencies on policy for the prevention and management of natural disasters, and promotes the disaster management activities of provincial citizens.
- ✓ National Disaster Management Office (NDOM); http://ndmo.laopdr.org/ndmo.htm
  - NDOM is the implementing organization for disaster management policy and belongs to the Ministry of Labor and Social Welfare (MLSW).
  - Secretariat NDMC is set at NDOM.
- ✓ Disaster Management Committees at province (khoueng), district (muang), village (ban) levels
  - Establishes committees at local governments.

(4) Hazard and risk information sources

Reports

- ✓ Synthesis Report on Ten Asian Countries Disaster Risks Assessment; December 2012
  ASEAN Disaster Risk Management Initiative, World Bank
  http://worldbank.org/
  - Summarizing natural hazard and risks in 10 ASEAN countries.
  - World Bank reported risks with respect to countries and categories of disaster.
  - Although the data is only available up to 2009, the report is well assembled.
- ✓ World Risk Report 2012; October 2012, Alliance Development Works, The Nature Conservancy
  http://www.nature.org/
  - Natural disaster risks in 173 countries in the world are ranked in this report.
  - Intended period is from 2002 to 2011.
  - Vulnerabilities are assessed with respect to categories.
  - The report is effective for comparing countries.
- ✓ Advancing Disaster Risk Financing and Insurance in ASEAN Countries: April 2012, Framework and Options for Implementation, Volume 2: Appendix 1
  https://www.gfdrr.org/
  - Summarizing natural hazard and risks in 10 ASEAN countries.
  - Intended period is from 1970 to 2011.
  - Summary of countries is well assembled.
- ✓ Climate Change Vulnerability Mapping for Southeast Asia: January 2009, Economy and Environment Program for Southeast Asia (EEPSA)
  http://www.idrc.ca/
  - Natural disaster risks in Southeast Asia are mapped in the report.
  - The report contains information on risks in states/provinces.

Risk maps

- ✓ Global Risk Data Platform; UNEP (United Nations Environment Program)/GRID, UNISDR (United Nations Office for Disaster Risk Reduction)
  http://preview.grid.unep.ch/
  - Disaster site from all over the world are mapped.
  - The map shows disaster hotspots.

- ✓ Desinventar Disaster Information Management System; UNISDR, GAR http://www.desinventar.net/
  - Risk map of states or provinces
  - Indonesia, Vietnam, and Lao PDR are included from Southeast Asia

References:

1) Economy and Environment Program for Southeast Asia (EEPSEA) (2009): "Climate Change Vulnerability Mapping for Southeast Asia", p. 19

3.7 Predominant Natural Hazards

The records of natural disasters that have affected the country are classified based on the impacts and frequency of occurrence. The results have been plotted on the impacts - frequency matrix and the most prevailing hazards studied.

3.7.1 Employed Data

The disaster records compiled in Appendix A3 are employed in this study. The records for the last 30 years, namely from 1983 to 2012, are used because the number of events included in the database before 1980 is significantly less than after 1980. The records of large disasters through earthquakes, tsunamis and volcano eruptions before 1983 are also used because the frequencies of occurrence for these hazards are significantly lower than floods, cyclones and landslides.

3.7.2 Study Method

The “Damage Amount / GDP” and ‘Number of Deaths” are used as indices to show the impacts of the disasters considered 6 natural hazards will be studied and compared. At the beginning of the study, only the “Damage Amount / GDP” was used as an index because the results can be used for Area BCP planning. However, the scarcity of information related to damage amounts became clear as the study progressed. As the information on “Number of Deaths” is substantial compared to the damage amount, the “Number of Deaths” has been added as an index of impact.

The process of the study is as follows;

1) Based on the Damage Amount / GDP or Number of Death, each disaster is classified according to the ranking system outlined in Table 3.7.1.
2) The number of disaster events for each country is added by type of hazard and disaster rank, and then classified into Table 3.7.2,
3) The above information is then plotted on the impacts - frequency matrix by country,
4) As for earthquakes, tsunamis and volcanic hazards, if an event occurred before 1983 that was of the same (or higher) disaster rank as the maximum disaster rank recorded between 1983 to 2012,

a point is plotted on the matrix which corresponds to the relevant disaster and frequency rank (=1).

Table 3.7.1 Disaster Rank and Damage

Disaster Rank	Damage Amount / GDP[1]	Number of Death
5	1.0% -	10,001 -
4	0.1% - 1.0%	1,001 - 10,000
3	0.01% - 0.1%	101 - 1,000
2	0.001% - 0.01%	11 - 100
1	- 0.001%	- 10

Table 3.7.2 Frequency Rank and Number of Events

Frequency Rank	Number of Events from 1983 to 2012	Average Frequency (Events / Year)
5	7 or more	1/5 -
4	4 to 6	1/10 - 1/5
3	2 to 3	1/15 - 1/10
2	1	1/30
1	Large Events occurred before 1983	-

3.7.3 Study Results

The following results are based on the available existing information. Not all information relating to the impacts of disasters was collected. Furthermore, the purpose of this study is not intended to evaluate the precise damage amounts or number of deaths. The purpose of this study is to rank 6 natural hazards according to their impacts.

Flood and cyclone disasters have been recorded. The impacts of floods and cyclones, in terms of the number of deaths, are the same but floods occur more frequently.

[1] Gross domestic product based on purchasing-power-parity (PPP) valuation of country GDP, International Monetary Fund, World Economic Outlook Database, October 2012

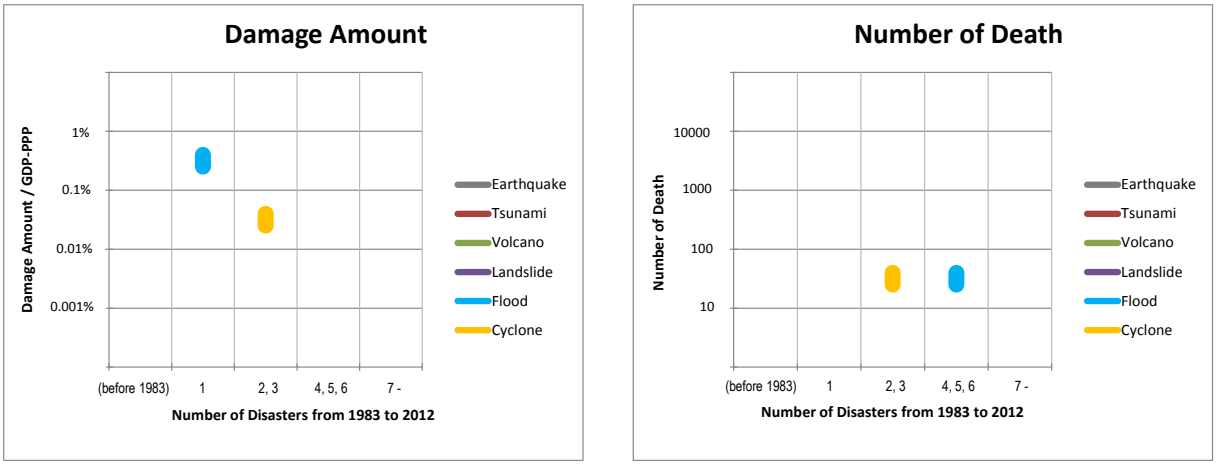


Figure 3.7.1 Impact of hazards in Lao PDR

3.8 Existing Investigations and Studies

3.8.1 Methods and Scope of the Survey

This section reviews studies and research that have been conducted in the ASEAN region with a focus on natural hazards, risks, and vulnerability assessments. The target hazards are: floods, earthquakes, volcanoes, tsunamis, cyclones (typhoons)/meteorological disasters, and landslides. Information and study reports were reviewed from those that are available for the public and on the internet. The purpose of this section is to first gain an overview of the existing study results regarding hazard trends, encountering risks, and degrees of vulnerability throughout the entire ASEAN region as well as in each ASEAN member state. Another purpose it to produce a compilation of assessment reports of the region, which will be accessible as a reference for those who wish to plan an Area BCP.

Table 3.8.1 Methodology of Information Collection and Scope of Survey

Information Collected	Methodology	Scope of Survey
Existing studies and research	To collect existing studies and reports from public sources including the internet.	To summarize the studied hazards, areas, contents of hazard and risk analysis, vulnerability assessment of existing studies, and other research.

3.8.2 Outline of Collected Information and Data

Table 3.8.2 shows the outline of collected information and data. Summaries of existing studies and reports are compiled as data sheets in Appendix A4.

Table 3.8.2 Outline of the Collected Information and Data

Appendix A4 Subsection	Hazards	Outline
A4.1	Flood	Flood hazard, risk assessments, hazard maps, and vulnerability assessment have been conducted in ASEAN countries using data on rainfall, inundation areas, affected population, and monetary assessment. Hazard maps were produced with GIS tools. The usage of GIS tools for assessments is widely recognized and its usage has been explored to produce hazard maps. Some runoff analyses were conducted for selected areas. Limited information and data available for Brunei Darussalam.
A4.2	Earthquake	Many of the earthquake hazard studies in the area are probabilistic seismic hazard analyses (PSHA), not scenario earthquake studies. This is to quantify the probability of exceeding a specific ground-motion level at a site given all possible earthquakes. This methodology is descended from the Global Seismic Hazard Assessment Program (GSHAP). GSHAP was launched in 1992 by the International Lithosphere Program (ILP) with the support of the International Council of Scientific Unions (ICSU), and endorsed as a demonstration program in the framework of the United Nations International Decade for Natural Disaster Reduction (UN/IDNDR). Earthquakes are not equally distributed around the globe because of the generating mechanism. In the ASEAN region, many earthquakes are observed in and around Indonesia and Philippines, which are located in the convergent boundary (subduction) zone and fewer earthquakes are observed in and around Myanmar, which is in the transform boundary zone. There are fewer or no earthquakes observed in other regions. However, some regions are sometimes affected by the earthquakes which occur in neighboring countries. The northern regions of ASEAN countries are sometimes affected by the earthquakes that occur in the Yunnan province of China. A number of investigations and studies reflect this trend.
A4.3	Tsunami	There are only few investigations and studies about tsunami hazard or risk in the region, and most of them are compilations of past disasters. There is no probabilistic study as there is for earthquakes. There is a hazard map that encompasses several tsunami scenarios. There are studies targeting the Asia-Pacific area because tsunamis propagate in the sea. Large-sized tsunamis are caused by major earthquakes in the ocean. This is the reason that tsunamis are also not equally distributed around the globe. However, tsunamis affect a wider area than the ground-motion of earthquakes, as seen in the tsunami caused by the Sumatra earthquake on December 26th in 2004. Thus, tsunamis are sometimes studied in countries with few or no earthquakes.
A4.4	Volcano	Most volcanoes are also located along the convergent boundary (subduction) zone. This is the reason why volcanoes are also not equally distributed around the globe. Disasters caused by volcanic eruptions are lava flow, pyroclastic flow, lahar, and ash fall. Ash is scattered widely via the prevailing westerlies, but the other disaster types do

		not have an extensive reach. Regarding volcanic hazard, many investigations and studies are a compilation of areas affected by lava flow, pyroclastic flow, lahar, and ash fall from past volcanic eruptions for each volcano.
A4.5	Cyclone	Research on cyclone and meteorological hazard, and risk assessments have been conducted in ASEAN countries using data on tracks, damaged areas, and storm rainfall. The impact of climate change is also included in this research. Limited information and data available for Brunei Darussalam and Singapore.

3.8.3 Summary of Survey

(1) Floods

Some useful studies on flood hazard, risk, and vulnerability are publicly available presenting assessment results, case studies of countermeasures, as well as different methodological approaches. There are a few types of methodologies to assess risks and vulnerability including, for example, risks involving exposure to flooding events and population density. Vulnerability can be defined as a function of exposure, adaptive or coping capacity, and land-use etc. There are slightly different combinations of these factors with different studies for use. Therefore, these concepts must be defined in advance to plan a methodology for an assessment, in terms of which definitions are to be used in a certain analysis.

A summary of existing studies and reports is shown in Table 3.8.3 by country. A list of collected existing studies and reports is shown in Table 3.8.4.

Table 3.8.3 Summary of Existing Studies and Reports by Country: Flood

Country/Region	Summary of Existing Studies and Reports
ASEAN	There are a few reports that study natural disasters for ASEAN and the Pacific regions at large in recent years. Disaster risks are assessed by scenario, exposure, vulnerability, damage, and loss. An assessment framework is also sought to give an overview of risks, hazard and vulnerability.
Lao PDR	There are comprehensive disaster hazard, risk, and vulnerability assessments primarily using existing secondary data and information. Regarding flooding, 8 major river inundation areas are focused upon for assessment. Scenario development and mapping are also included.

Table 3.8.4 Existing Studies and Research: Flood

No	Country	Province/ City	Coordinates		Risk Assessment		Vulnera-bility Assess-ment	Organiza tion Produced	Document No. in Appendix A4.1
			Latitude	Longitude	Area	Popu-lation			
1	ASEAN	-	-	-	○	○	×	UNISDR/ WB	FL_001
2	Lao PDR	Attapeu	15.79225	106.7798	×	○	×	UNDP/ ADPC	FL_024
3	Lao PDR	Borikhamxai	18.56816	104.4791	×	○	×	UNDP/ ADPC	FL_024
4	Lao PDR	Champassack	15.32657	105.813	×	○	×	UNDP/ ADPC	FL_024
5	Lao PDR	Khammouane	17.77484	105.2261	×	○	×	UNDP/ ADPC	FL_024
6	Lao PDR	LouangPhrabang	19.88717	102.1411	×	○	×	UNDP/ ADPC	FL_024
7	Lao PDR	Phongsaly	21.69827	102.2488	×	○	×	UNDP/ ADPC	FL_024
8	Lao PDR	Saravane	15.7184	106.4168	×	○	×	UNDP/ ADPC	FL_024
9	Lao PDR	Savannakhet	16.57302	105.5864	×	○	×	UNDP/ ADPC	FL_024
10	Lao PDR	Vientiane	17.97024	102.6171	×	○	×	UNDP/ ADPC	FL_024
11	Lao PDR	XaisombounSr	21.22794	101.358	×	○	×	UNDP/ ADPC	FL_024
12	Lao PDR	Xekong	15.6442	106.9981	×	○	×	UNDP/ ADPC	FL_024

Note: ○ indicates the existence of information. × indicates that information was not found in public resources.

(2) Earthquakes

Useful information and studies on earthquake hazard, risk, and vulnerability were collected from resources available in the public domain including websites. The information and studies include methodologies with analysis and assessment.

There is no standardized or authorized methodology for risk and vulnerability assessment. Therefore, the methodology should be selected or updated in accordance with the purpose when risk and vulnerability assessments are required.

A summary of existing studies and reports is shown in Table 3.8.5 by country. A list of collected existing studies and reports is shown in Table 3.8.6.

Table 3.8.5 Summary of Existing Studies and Reports by Country: Earthquake

Country/Region	Summary of Existing Studies and Reports
ASEAN	There are natural hazard assessment reports for ASEAN region created by international organizations like World Bank etc. They summarize frequency, vulnerability, loss, and others

	subject for each disaster. Some reports describe the methodology and assessment points/items.
Lao PDR	There are few records of earthquake disaster in Lao PDR, but the UNDP prepared a multi-hazard risk profile for 18 provinces. Multi-hazard profiles include earthquakes, floods, landslides, epidemics, unexploded ordinances (UXOs), droughts, and storms.

Table 3.8.6 Existing Studies and Research: Earthquake

No	Country	Province/ City	Hazard Assessment			Risk Assessment		Vulnera-bility Assess-ment	Organi-zation Produced	Document No. in Appendix A4.2
			Scena rio	Probabi listic	Method ology	Human Loss	Econom ic Loss			
1	Worldwide	-	×	○	×	○	○	○	UNISDR	EQ_001
2	ASEAN	-	×	○	×	×	×	×	GSHAP, USGS	EQ_002
3	Lao PDR	-	×	○	×	○	×	×	OCHA-ROAP	EQ_010
4	Lao PDR	18 Provinces	×	○	×	○	○	○	UNDP, GRIP	EQ_011

(3) Tsunamis

Useful information and studies on tsunami hazard, risk, and vulnerability were collected from resources available in the public domain including websites. The information and studies include methodologies with analysis and assessment.

There is no standardized or authorized methodology for risk and vulnerability assessment. Therefore, methodology should be selected or updated in accordance with the purpose when risk and vulnerability assessment are required.

A summary of existing studies and reports is shown in Table 3.8.7 by country. A list of collected existing studies and reports is shown in Table 3.8.8.

Table 3.8.7 Summary of Existing Studies and Reports by Country: Tsunami

Country/Region	Summary of Existing Studies and Reports
ASEAN	Tsunami induced by the Sumatra earthquake on December 26, 2004 caused major damage to ASEAN countries. The disaster is summarized by organizations like ADB.
Lao PDR	There is no record of tsunami disaster in Lao PDR and no investigations or studies limited to this country and its regions were found.

Table 3.8.8 Existing Studies and Research: Tsunami

No	Country	Province/ City	Hazard Assessment			Risk Assessment		Vulnera-bility Assess-ment	Organi-zation Produced	Document No. in Appendix A4.3
			track record	Scena rio	Metho dology	Human Loss	Economic Loss			
1	ASEAN	-	○	×	×	○	○	×	ADB	TN_002

(4) Volcanoes

Useful information and studies on volcanic hazard, risk, and vulnerability were collected from resources available in the public domain including websites. The information and studies include methodologies for analysis and assessment.

There is no standardized or authorized methodology for risk and vulnerability assessment. Therefore, methodology should be selected or updated in accordance with the purpose when risk and vulnerability assessment are required.

A summary of existing studies and reports is shown in Table 3.8.9 by country. A list of collected existing studies and reports is shown in Table 3.8.10.

Table 3.8.9 Summary of Existing Studies and Reports by Country: Volcano

Country/Region	Summary of Existing Studies and Reports
ASEAN	UNOCHA summarized the scale of the explosion of volcanoes around the Asia-Pacific region using the Volcanic Explosivity Index (VEI).
Lao PDR	There is no record of volcanic disaster in Lao PDR and no investigations or studies limited to this country and its regions were found.

Table 3.8.10 Existing Studies and Research: Volcano

No	Country	Province/ City	Hazard Assessment			Risk Assessment		Vulnera-bility Assess-ment	Organi-zation Produced	Document No. in Appendix A4.4
			Track record	Scena rio	Metho dology	Human Loss	Economic Loss			
1	ASEAN Asia-Pacific	-	○	×	×	×	×	×	OCHA -ROAP	VE_001

(5) Cyclone (Typhoon) and Meteorological Hazard

"Cyclone" is a term to describe many types of of low pressure systems, of which tropical cyclones/typhoons are the main types creating disasters in the ASEAN region. Under the framework of WMO, leading countries implement monitoring/detection of tropical cyclones on a regional basis. Table 3.8.11 indicates the responsible territory allocated to ASEAN members and its leading country.

Table 3.8.11 Members of WMO Tropical Cyclone Committee

	Warning Zones	Members（ASEAN）	Leading Country
Western North Pacific Ocean and South China Sea	0° - 60°(N) 0° - 100°(E)	Cambodia, Lao PDR, Malaysia, Philippines, Singapore, Thailand, Vietnam	Japan

Bay of Bengal and the Arabian Sea	5°S - 45°(N) 30°E - 90°(E)	Myanmar, Thailand	India
South Pacific and South-East Indian Ocean	0°-50°(S) 90° - 170°(E)	Indonesia	Fiji

The dates and information utilized in this report have been acquired from various reports on the studies and research conducted on tropical cyclones and meteorological hazards published on the internet. Collected documents include evaluation results of hazards/risks, as well as their evaluation methods. With regard to tropical cyclones/typhoons, a meteorological organization of each country compiles a summary on the damage situation, including the number of casualties or loss of human lives, and the estimated amount of damage, etc.

A summary of existing studies and reports is shown in Table 3.8.12 by country. A list of collected existing studies and reports is shown in Table 3.8.13.

Table 3.8.12 Summary of Existing Studies and Reports by Country: Cyclone and Meteorological Hazard

Country/Region	Summary of Existing Studies and Reports
ASEAN	Study reports on natural disasters in the whole ASEAN region are available.
Lao PDR	Typhoons generated around the Philippines sometimes affect Laos after landing in Vietnam. 87,403 people in 362 villages located in 36 regions of Vientiane, Bolikhamsai, Xiengkhouang, and Xayaboury Provinces were directly affected by Typhoon Haima in June 2012.

Table 3.8.13 Existing Studies and Research: Cyclone and Meteorological Hazard

No	Country	Province/ City	Coordinates		Risk Assessment		Vulnera-bility Assess-ment	Organiza tion Produced	Document No. in Appendix A4.5
			Latitude	Longitude	Area	Popu-lation			
1	Lao PDR							ADPC	CM_001
2	Lao PDR	Borikhamxai	18.56816	104.4791	×	×	×	GFDRR/ WB	CM_004
3	Lao PDR	Vientiane	17.97024	102.6171	×	×	×	GFDRR/ WB	CM_004
4	Lao PDR	Khammouane	17.77484	105.2261	×	×	×	GFDRR/ WB	CM_004
5	Lao PDR	Xayaboury			×	×	×	GFDRR/ WB	CM_004

(6) Landslides

A summary of existing studies and reports is shown in Table 3.8.14 by country. A list of collected existing studies and reports is shown in Table 3.8.15.

Table 3.8.14 Summary of Existing Studies and Reports by Country: Landslide

Country/Region	Summary of Existing Studies and Reports
ASEAN	There have been a few reports that study landslides for ASEAN and the Pacific region at large in recent years. Disaster risks are assessed by scenario, exposure, vulnerability, damage, and loss. An assessment framework is also sought to give an overview of risks, hazard, and vulnerability.
Lao PDR	The hazard area covers the entire country consisting mainly of hills and mountains, with the exception of the Mekong River lowland where the capital of Vientiane is located. According to the result of a nationwide hazard and vulnerability assessment by UNDP (LS-008), flash floods in the northern mountainous region are common and those areas are susceptible to landslide. Some exposure is distributed around mountain areas north of the capital and the south part of the country near the border. Laws and governmental organizations are not yet developed. The project for an early warning system is ongoing.

Table 3.8.15 Existing Studies and Research: Landslide

No	Country	Province/ City	Coordinate		Risk Assessment		Vulnera-bility Assess-ment	Organization Produced	Document No. in Appendix A4.6
			Latitude	Longitude	Area	Popu-lation			
1	ASEAN				○	○	×	UNISDR/World Bank	LS-006
2	ASEAN				○	○	×	EEPSEA	LS-013
3	Lao PDR	Entire Country	17.970	102.616	○	×	×	UNDP	LS-002
4	Lao PDR	Entire Country	17.970	102.616	×	×	○	JICA	LS-008

Indicates Capital

References:

Flood

1) ADPC (2010) Developing a National Risk Profile of Lao PDR, Part1: Hazard Assessment, Vientiane, UNDP
2) ADPC (2010) Developing a National Risk Profile of Lao PDR, Part2: Exposure, Vulnerability and Risk Assessment, Vientiane, UNDP
3) Arief Anshory Yusuf & Herminia Francisco (2009). Climate Change Vulnerability Mapping for Southeast Asia, Singapore: EEPSEA
4) Velasquez, Jerry et al (ed.) (2012). Reducing vulnerability and exposure to disasters: Asia-Pacific disaster report 2012, ESCAP/UNISDR AP
5) World Bank (2011). Advancing Disaster Risk Financing and Insurance in ASEAN Countries: Framework and Options for Implementation, Washington: Global Facility for Disaster Reduction and Recovery
6) World Bank, UNISDR (2010). Synthesis Report on Ten ASEAN Countries Disaster Risks Assessment.

Earthquake

1) ADPC, PTI, (NDMO, UNDP (2010). DEVELOPING A NATIONAL RISK PROFILE OF LAO PDR
2) OCHA-ROAP (2011). LAO PDR: Natural Hazard Risks
3) UNISDR (2009). Global assessment report on disaster risk reduction, Risk and poverty in a changing climate

Tsunami

1) ADB (2005). From Disaster to Reconstruction: A Report on ADB's Response to the Asian Tsunami

Volcano

1) OCHA -ROAP (2011). Holocene Eruption and Selected Volcanoes in Asia-Pacific

Cyclone (Typhoon) and Meteorological Hazard

1) ESCAP/WMO Typhoon Committee. (http://www.typhooncommittee.org/)
2) JMA/WMO Workshop on Quality Management in Surface, Climate and Upper-air Observations in RA II (Asia) 2011
3) WMO National Meteorological or Hydrometeorological Services of Members (http://www.wmo.int/pages/members/members_en.html)
4) WMO (2010). First Meeting of the Task Team on "Meteorological, Hydrological and Climate Services for Improved Humanitarian Planning and Response", WMO Headquarters, Geneva, Switzerland (31 August - 2 September, 2010)

Landslide

1) World Bank, UNISDR (2010). Synthesis Report on Ten ASEAN Countries Disaster Risks Assessment
2) World Bank, UNISDR (2011). Disaster Risk Management Programs for Priority Countries- 2nd edition

Figure 3.8.1 Existing Study on Natural Hazards in Lao PDR

Chapter 4 Industrial Agglomerated Areas and Investment Risk

4.1 Historical Evolution of Industrial Agglomerated Areas

Industrial parks in Laos that offer incentives to foreign investors are all classified as specific economic zones or special economic zones. The development of such zones in Laos began rather recently. It corresponded with the rapid growth of the industrial sector, urbanization, and large-scale investment in transportation connections (domestically and regionally) that Laos experienced in the first decade of the 2000s. Economic zone development commenced with the signing of Prime Ministerial Decree Number 148, which established the Savan-Seno SEZ, in 2003.

The National Committee for Special Economic Zones (NCSEZ) is responsible for economic zone development. Chaired by the deputy prime minister, its members include the ministers of Finance, Public Works and Transport, Planning and Investment, and Industry and Commerce. In 2010, the Secretariat of the NCSEZ (SNSEZ) was established under the Ministry of Planning and Investment with the mandate to promote, administer and facilitate the development of economic zones. SNSEZ manages two types of economic zones: specific economic zones and special economic zones. Specific economic zones can be 100% government-owned, public-private partnerships, or 100% private-owned. By contrast, special economic zones are either 100% government-owned or public-private partnerships. Special economic zones, which can contain several specific economic zones, must cover at least 1000 hectares. Currently, there are 10 approved specific and special economic zones in Laos.

The first SEZs to be established were the Savan-Seno SEZ in Savannakhet (2003), Boten SEZ in Luangnamtha (2003), and the Golden Triangle SEZ in Bokeo (2007). Savan-Seno was chosen for its favorable location in central Savannakhet province, at the center of the East-West Economic Corridor and adjacent to the Second Lao-Thai friendship bridge. While progress was initially slow, this changed with the establishment of Savan Park in 2008 through a contract with Malaysian developer Pacifica Streams Development Company. Savan-Seno SEZ has since experienced rapid development. Boten SEZ and the Golden Triangle SEZ, established on the Lao-Chinese and Lao-Thai borders respectively, both attracted Chinese investment in casinos and entertainment establishments. Following security concerns, Boten's concession agreement was amended in 2011 and the zone made casino-free as the Laotian government announced that its focus should turn to commerce.

Since the late 2000s, seven more SEZs have been established. Five of these are located in and around the capital Vientiane, namely VITA Park (2011), Saysetha Development SEZ (2010), That Luang SEZ (2011), Long Thanh SEZ (2012), and Dongphosey SEZ (2012). The government originally planned for SEZ development to start around Vientiane in 1995, but this was delayed by a lack of resources for infrastructure development and a government decision that as Vientiane was able to attract investment, SEZs should begin in other areas. VITA Park, in Vientiane's Xaythany district,

was thus the first SEZ to be established in the capital when it was approved in 2009. This was followed by the establishment of Saysetha Development Zone in 2010, also in Xaythany district. Set up in 2011, That Luang Lake Specific Economic Zone is being developed by Chinese developer, Wan Feng Shanghai Real Estate Company. The firm has announced that it aims to spend 15-20 years on the USD 1.6 billion project. In 2012, Long Thanh Specific Economic Zone and Dongphosy Specific Economic Zone were established through domestic investment. Another two recently established projects are located in central Khammuane province: Phoukyo SEZ (2010), and Thakhek SEZ (2012).

The number of approved economic zones is set to expand rapidly. In December 2012, the Laotian government announced its plan to set up 41 economic zones, 25 of which are to be established by 2022. The majority of these are to be established in border and rural areas, in order to create jobs further from urban centers. The government has announced that it will need FDI of USD 3 billion for infrastructure development to establish these zones over the next decade, excluding investment by companies operating in the SEZs. Plans for obtaining these funds remain unclear.

4.2 Recent Trends and Japanese Investment

Two economic zones in Laos have Japanese investment. In Savan-Seno SEZ, five out of a total of 41 companies investing in the zone are Japanese. Savan-Seno SEZ is split into four sites, A, B, C, and D. The B zone, which is under development, targets Japanese investment. Japanese company Logitem started operations in Site B in 2008, occupying 3 ha out of a total of 20 ha. Development of Site B was initially slow however, as Japanese companies generally preferred Vientiane to Savan-Seno SEZ, probably due to Savan-Seno SEZ's poorer infrastructure links to Vietnam and China when compared to Vientiane. Recently, this has changed. In March 2013, Japanese multinational Nikon started construction of a USD 8 million factory, scheduled to become operational by October 2013. In April 2013, Savan-Seno announced that negotiations are underway with a Japanese investor for a 20% stake of the USD 30 million B-zone project. In December 2012, a joint venture to build a production plant in the C-zone, to be completed during spring 2013, was announced by Japanese toy manufacturer Bureau Company Ltd (65%), KP Company Ltd (Laos), (30 %), and KP Nissei Mizuki Lao Company Ltd (5%); the registration fund is USD 1 million and the investment fund is estimated at USD 2 million.

According to estimates in January 2012, Japan is the biggest investor in VITA Park, with total investments at USD 10 billion. This makes VITA Park one of the chief targets for Japanese investment in Laos. Out of seven foreign companies that have developed production facilities in VITA Park, two are Japanese.

4.3 Observations from Data Collection

To a large extent, the government has used SEZs in Laos to pursue political development goals. This is clear in the decision to initially establish SEZs outside of Vientiane, even though the capital would

have been most favorable to foreign investors. To some extent, this will be true of future SEZs in Laos, with SNCSEZ plans to establish several SEZs in rural areas to drive job creation outside of urban areas. Nonetheless, some of the present and future SEZs are likely to be in locations suitable to foreign investors. It is worth noting that even for fully private specific economic zones, the government is likely to be actively involved in the zone's operations. For example, there have been concerns over security in Boten Specific Economic Zone. As a result, in 2011 the government stepped in and amended the existing concession agreement, banning casinos and allowing Lao authorities to take charge of security issues. This resulted in losses for some Chinese investors in the zone.

The level of development of Laos' ten economic zones varies significantly, and only a few are equipped to communicate with and support foreign investors. Only Vita Park and Savan-Seno Site C run their own websites. Most economic zones did not have staff that spoke foreign languages, do not have marketing teams, and were very unwilling to provide information about their parks. Some information in English is available on the SNCSEZ website on location, land tenure, developer, land leasing fees, electricity and water fees, and investment projects for most SEZs. However, through our conversations with park operators it became clear that much of the information available online is inaccurate. For instance, descriptions of park infrastructure often list infrastructure that is planned as if it already exists, even though there is no clear funding or timeline for this infrastructure to be built. Our research suggests that only VITA Park and Savan-Seno SEZ can presently provide quality service and support to foreign investors.

4.4 General Investment Risk

(1) Political Risk

Laos is politically stable due to the long-term dominance of the Lao People's Revolutionary Party (LPRP) and the absence of an organized opposition. As such, business continuity is unlikely to be impacted as a result of political instability. The LPRP is the only legitimate party in the country. It seized power in 1975 following the end of the Vietnam War. The LPRP enjoys full control of the country. The party dominates every aspect of Lao political life, co-opting the entire administrative class. Its mass organizations also provide the ruling elite with a power base among the population at large. As a traditional communist state, real power lies within the party's central organs, mainly the Politburo. Factional divides within the LPRP do not threaten political stability. After the National Congress of the LPRP endorsed the key leadership changes and confirmed the continuity of one-party rule in Laos, there is little to suggest any prospect for a party split over major policy issues or that any other major political changes will take place over the near-to-medium term. The military plays a prominent role in politics and holds around half of all the posts in the Politburo. Under its current leadership, Laos is likely to continue on a course of cautious economic reform and gradual liberalization, with the LPRP simultaneously attempting to perpetuate its exclusive political control.

(2) Economic Risk

Reflecting decades of centralized control, Laos' economic base comprises a combination of subsistence agriculture and defunct state-owned enterprise, with growth sectors largely restricted to hydropower, mining, textiles, and tourism. Domestic demand is also driving some growth in services, construction, and manufacturing. Reform of the inefficient state sector to galvanize growth in the private sector stands as a key policy challenge. The state-dominated financial system is shallow with high levels of non-performing loans, frustrating a more efficient allocation of resources to the private sector while imprudent credit growth remains a risk to monetary stability.

Other risks to Laos's economy derive from its expansionary growth strategy built around country's significant hydropower and mineral resources. While more than a dozen hydro-projects under way are seen to turn Laos into a "regional battery," fostering growth and development in the long term, they also threaten to create unsustainable external imbalances in the near term. Heavy importation of capital machinery with no sufficient counterbalance from the export side until major projects come fully online will widen the current-account deficit, while extensive external borrowing to finance this gap will increase debt levels, putting significant pressure on the balance of payments and pulling resources from domestic sectors. Increased transfers, predominantly from bilateral and multilateral donors, will be required to boost the foreign-reserve position and support balance-of-payments stability.

High dependence on commodity prices in both the hydropower and mining sectors are also making the economy more vulnerable to external shocks, particularly over the short term, given the highly uncertain global mineral demand and price outlook. Over the medium-to-long term, Laos's recent accession to the World Trade Organization should help diversify the country's exports and capital inflows, partially mitigating this risk. On a more structural note, weak financial and private sectors, endemic corruption, lack of an adequate legal framework, and other inefficiencies fostered by the central planning will keep weighing on Laos's ability to attract foreign investment and its overall economic progress.

(3) Legal Risk

The legal system is based on French legal practices coupled with Lao customary law, traditions and socialist practices. There are no safeguards in place to protect the judiciary's independence meaning that the legal guarantees offered ultimately rely on the ruling the LPRP. In recent years, Laos has made some progress putting in place investor-friendly laws as part of the government's effort to enhance the country competitiveness and gain accession to the WTO. Since 2000, Laos has endorsed more than 90 new or improved laws, decrees and regulations relating to trade.

Among recently revised laws is the main law governing the registration of commercial activities, the Law on Enterprise. The New Enterprise Law was passed in 2006, taking effect in 2007. The act theoretically simplified registration procedures for business, made business registration information available to the public, and created a single access point, the Enterprise Registration Office, for

businesses in Vientiane in 2008. Efficient implementation, however, remains problematic. Despite the government's efforts to simplify registration procedures for business, starting a business in Laos is still a time-consuming and unpredictable process taking 92 days on average. The enterprise law does not differentiate between foreign and domestic companies in terms of registration requirements. Several types of business entity are possible: a sole trader private company; a partnership; a limited liability company; a public company; and a joint venture/private-state mixed enterprise, in which the state must hold at least 51% of shares. The new Investment Promotion Law was promulgated in March 2010, and has seen a similar lack of enforcement. The law theoretically merges the laws on domestic and foreign investors, and provides a more streamlined, standardized and harmonized framework for business requirements, procedures and incentives. In reality, most of these benefits have yet to be realized.

(4) Tax Risk

Laos' tax system is undergoing reform. The government is making positive efforts to align the tax regime with international practices and lower the tax burden for investors by reducing the corporate income tax rate. The reforms are part of Laos' drive to enhance its business environment and international competiveness by leveling the playing field for domestic and foreign companies. Under the new amended 2011 Tax Law, Laos is expected to eliminate the Business Turnover Tax with the 10% value-added tax and reduce the maximum corporate income tax rate (Profit tax) from 28% to 24%, for domestic and foreign investors. Despite these upcoming reforms, challenges remain. Even after the reduction from 28% to 24%, the profit–tax rate is still well above the East Asia and Pacific average of 16.8%. In addition, there is a significant need for the government to strengthen the tax authorities' capacity to monitor and implement new legislation.

(5) War Risk

There is a low-level anti-government insurgency by guerrillas from the Hmong ethnic minority. Violence in urban areas is no longer a threat, especially compared to the late 1990s, when a series of small explosions occurred in Vientiane, including occasional roadside ambushes and grenade attacks. Between 1999 and 2004, Hmong guerrillas conducted a series of hit-and-run attacks in remote locations on government outposts and buses.

Intensified fighting with the Laos military in 2004 resulted in the surrender of many Hmong guerrillas in return for an amnesty. Since 2004, a consensual, albeit only verbal, ceasefire has largely held in rural areas, although small bombings and attacks on government officials have since occurred infrequently. Dissidents in northern and central Laos have agreed to participate in peace talks with local officials. The ceasefire has largely arisen out of the erosion of the Hmong's will to fight, and its lack of food and medical supplies. Also, by resorting to violence, the Hmong insurgents have lost local support. In July 2007, Lao authorities arrested five Hmong allegedly plotting to attack seven targets, including the city hall, a hospital, the airport and a radio station in northwestern Bokeo province. The plot did not seem well developed or credible. Since then, there have been no

indications of further plots aimed at public or commercial targets. Still, within Laos, infrequent low-intensity fighting is likely to continue between the Hmong and security forces, particularly in the northern rural areas where there are no commercial assets. Government officials and security forces are the primary targets.

Given this, we do not view the insurgency as posing risks significant risks to commercial operations and their business continuity.

Laos does not have any border disputes with its neighbors: Cambodia, China, Myanmar, Thailand and Vietnam. Since 2000, Thailand has prevented the Hmong from using its territory as a base for insurgency attacks, improving its relations with Laos.

(6) Terrorism Risk

Criminal gangs pose a moderate risk to life and property, especially in the Golden Triangle Area, which covers parts of Myanmar, Thailand and northwest Laos. The area produces vast amounts of heroin, which is traded and exported illegally by the gangs. These gangs pose a moderate risk to cargo in Laos, including cargo being transported on the Mekong River. Gangs are likely to steal and resell the cargo or extort crewmembers. In October 2011, criminal gangs attacked two Chinese cargo vessels on the Mekong River, killing 13 Chinese nationals. In response Laos has started joint patrols on the Mekong with forces from China, Myanmar and Thailand. These patrols are likely to continue as river-borne traffic, especially involving Chinese vessels, is likely to increase in the three-year outlook due primarily to increasing trade links between these countries. Attacks, however, remain a risk. In January 2012, gunmen fired shots at the Chinese ship 'Shengtai-11' on the Mekong River; there were no reported injuries. Vessels are generally undamaged, the gangs seeking primarily to loot the cargo.

(7) Civil Unrest Risk

Labor unrest is rare, but we expect the risk of industrial action to increase as employment shifts from the agricultural sector to industry. Strikes are likely to be met with severe government force, including military and police intervention, as the government does not tolerate any civil disobedience. This reduces risks of business disruption. Figures from 2010 showed that roughly three out of five workers are employed in the agriculture sector. The small size of the industrial sector's workforce is a key factor underlying the virtual absence of labor unrest in the country. Moreover, as the communist government controls commodity prices, traditional triggers for industrial unrest like inflation and rising living costs are much less applicable to Laos.

Protests are similarly not tolerated by the government. It is likely that some anti-government groups do exist, though this is very difficult to corroborate, as the government is quick to limit their capability and influence. These groups, therefore, are unlikely to stage protests. There is some evidence of small-scale protests over local issues, involving a few hundred people. In September 2012, around 200 people protested against the government's plans to demolish their shops to make

way for a mall in Talat Sao, Vientiane. However, this protest lasted for only an hour before the crowd was dispersed and the plans for the construction of the mall continued. Such protests are exceptions. Land use for hydroelectric and mining projects has not resulted in substantial protests or demonstrations, likely because the areas affected are relatively sparsely populated.

Looking ahead, as the economy transitions from an agricultural-based to an industrial one, the risk of civil unrest will increase, as has been the case in neighboring countries like Cambodia, China and Vietnam. However, this transition is still in its very early stages in Laos and consequently the risk of protests will be low for at least the next five years.

4.5 Industrial Agglomerated Areas and Natural Disaster Risk

Several distribution maps are shown overlaying natural disaster risk as follows. List of industrial agglomerated areas are attached at the end of this report.

Figure 4.5.1 Distribution of Industrial Park in Lao PDR

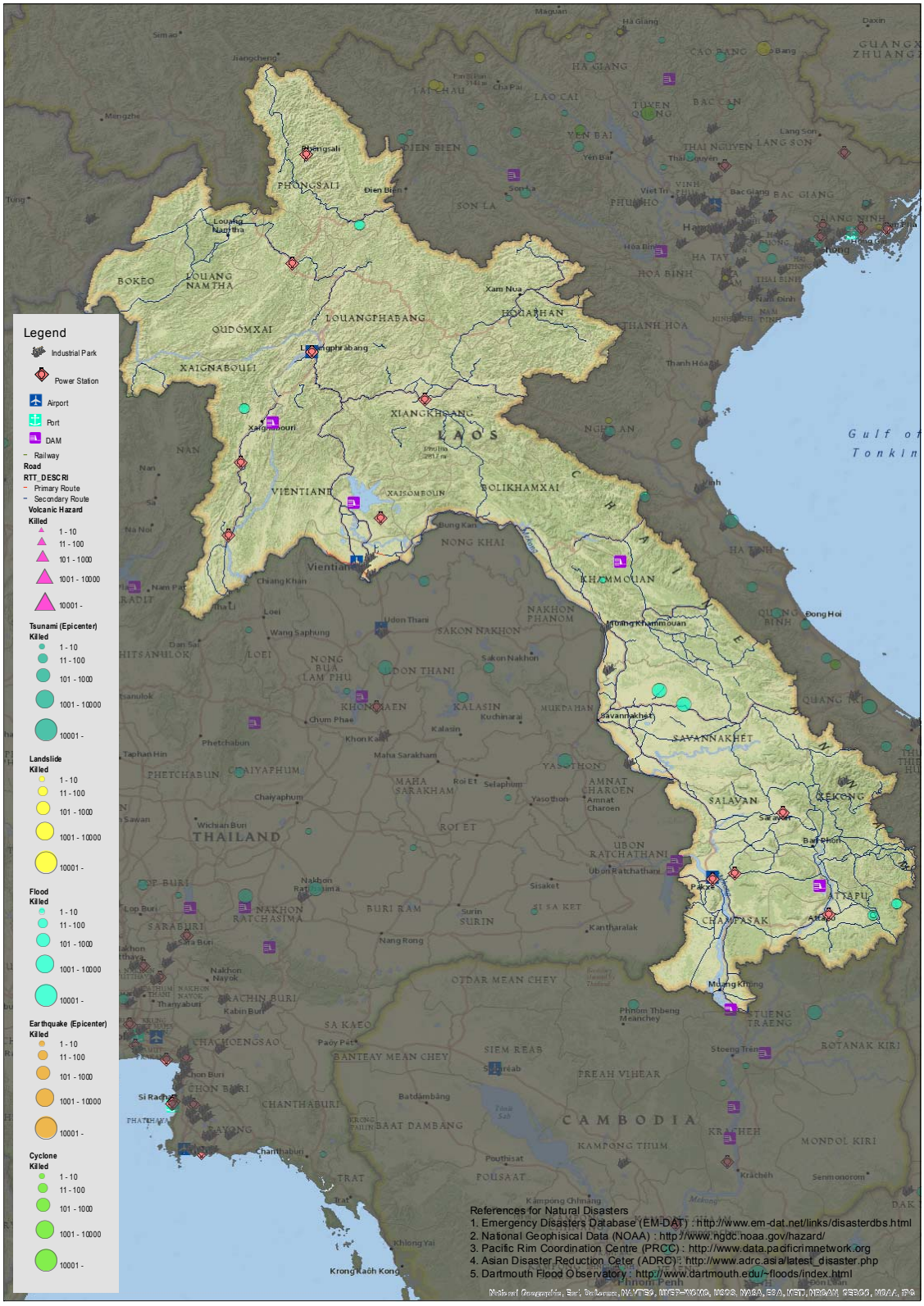


Figure 4.5.2 Distribution of Industrial Park, Major Infrastructures and Natural Hazards on number of killed in Lao PDR

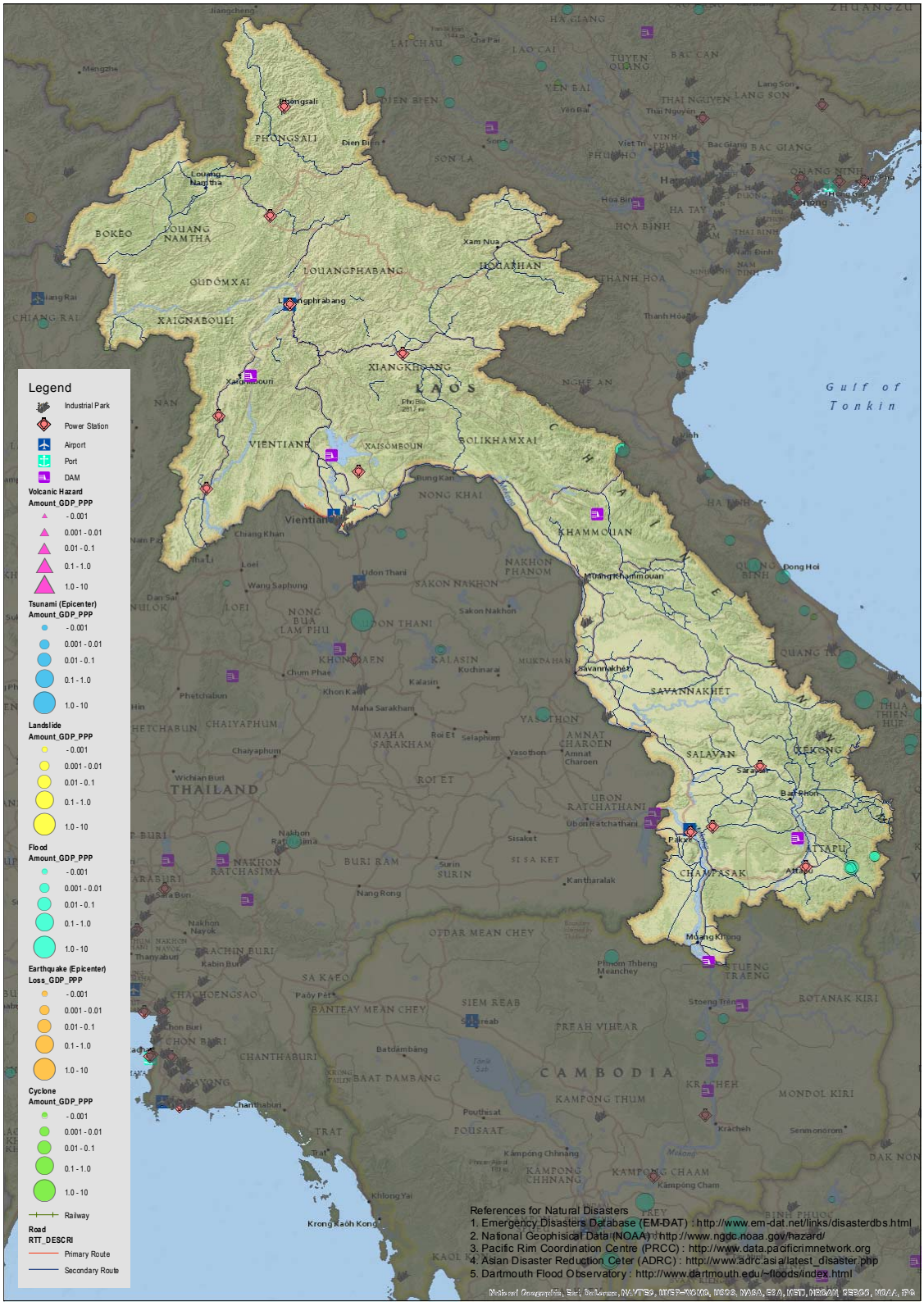


Figure 4.5.3 Distribution of Industrial Park, Major Infrastructures and Natural Hazards on loss rate to GDP in Lao PDR

Chapter 5 Relevant Infrastructure and Natural Disaster Issues

5.1 Infrastructure Conditions

5.1.1 Roads

In the Lao People's Democratic Republic (Lao PDR), the traffic network, especially the road network, is a significantly important means of transportation between the neighboring countries since it is landlocked country. Currently, there are national roads from route No.1 to route No.20, and the main parts of them make up the Asian Highway. Their total length is 7,200 km. A large portion of road is unpaved and made of sand and gravel or earth (Paved: 55%).

Major road networks are AH11 and AH12, which run north-south, and AH13 and AH16. AH refers to the Asian Highway. All extend to neighboring countries, meaning that Laos is a connection hub for transportation.

Table 5.1.1 Asian Highway in Laos

Route No.	National Road No.	Length (km)	Criteria of Selection
AH3	No. 3	244	Industrial Estate / Agriculture
AH11	No. 13	823	Connection between Capitals / Industrial Estate / Agriculture
AH12	No. 13	684	Connection between Capitals / Industrial Estate / Agriculture
AH13	No. 2w	166	Industrial Estate / Agriculture
AH15	No. 8	133	Industrial Estate / Agriculture
AH16	No. 9E	241	Industrial Estate /Agriculture / Major Port
	Total (6	2,290	

Source: Ministry of Land, Infrastructure, Transport and Tourism, Asian Highway Database 2005

Table 5.1.2 Status of Roads as of 2011 (Unit: km)

Type	Asphalt Pavement	Gravel Pavement	Dirt Road	Total
National Road	4,433	2,191	611	7,235
Prefectural Road	697	4,165	3,101	7,963
Country Road	183	2,633	2,313	5,129
Rural Road	85	3,666	12,689	16,440
City Road	575	895	445	1,915
Particular Road	143	324	437	904
Total	6,116	13,874	19,596	39,586
Ratio	15.4%	35.0%	49.5%	100.0%

Source: JETRO, Lao PDR Infrastructure Map

5.1.2 Ports

The total length of the waterways of the Lao PDR is 4,600 km. The primary component of this system is the Mekong River and its tributaries. Vessels up to 400 DWT can operate on this waterway. There are 21 river port facilities. Since Lao PDR is a landlocked country, the Gulf of Thailand and Vietnam are used for marine transportation.

5.1.3 Railways

In Laos, there is only one railway. The 35 km track links Thailand to Laos. The sections are non-electrified with 1,000 mm narrow gauge. In October 2010, the government planned to build a 420 km railway from China.

5.1.4 Airports

There are 42 airports, including 3 international airports, of which 9 have paved runways. In July 2013, a new terminal opened in the Luang Prabang International Airport.

Table 5.1.3 International Airports in Laos

Airport Name	Type	Administrator	Location	Runway
Wattay	Military/Public	Military of Laos	Vientiane	3,000m×45m
Luang Prabang	Public	Government	Luang Prabang	2,200m×45m
Savannakhet	Public	Government	Savannakhet	1,633m×38m

Source: Wikipedia, List of airports in Laos

5.2 Public Services

5.2.1 Electricity

Electric du Laos (EDL) is the state corporation of Lao PDR that owns and operates the country's electricity generation, electricity transmission, and electricity distribution business. In addition, an Independent Power Producer (IPP) and local governments manage small-scale power generation.

Their total generating capacity is 684.1MW as of 2005, of which hydroelectric power generation makes up 679.49 MW (98.7%).

Table 5.2.1 Generation Capacity in the Lao PDR as of 2005

Ownership	Type	Capacity (MW)	Generation (Million kWh)
Edl	Hydroelectric	307.5	1,715.0
IPP	Hydroelectric	362.1	1,794.4
Local Government	Hydroelectric	5.2	N.A.
	Diesel, Solar	9.2	N.A.
Total		684.1	3,509.4

Source: Chubu Electric Power, Japan, Survey Report of Electrification Work which Utilized the Biomass in an Un-electrified Area 2008.3

Demand for electricity by year is shown as follows. A sharp increase of around 20% is seen, which is caused by the growth of commercial and service sectors.

Table 5.2.2 Demand for Electricity in the Lao PDR

Items	2006	2007	2008	2009
Rate of Increase (%)	10.02	16.72	21.52	20.50
Domestic Sales Amount (GWh)	1,112.40	1,298.41	1,577.86	1,901.29

Source: Laos Stock Dotcom, Laos Electric Sector

5.2.2 Water

(1) Water supply

In 1999, the Management and Development Plan of the Water Supply Sector was formulated. It set a goal to supply safe piped water to 80% of the urban population. Currently, 77% of the urban population has attained access to safe water and gradually, the effects of the improvement plan have been revealed. However, the water service rate remains low at 26.7%, and the rate of non-revenue water is still high at 29%. Installed water supply pipes have a total length of 2,500 km.

In 2010, there was a problem with insufficient water supply resulting from a drop in water pressure. The shortage of waterworks engineers is also a severe problem. Basically, the water supply in the country is divided into the urban water supply and the rural water supply. The rural water supply is managed by the Ministry of Health while the urban water supply is managed by 26 business entities (as of 2004) under the jurisdiction of the Water Supply Authority (WASA) which was established in 2000.

(2) Sewerage

In Lao PDR, sewage facilities have not yet been installed. All urban waste water and industrial waste water is discharged without being treated into the wetlands behind Vientiane city. This causes a severe environmental pollution. In rural areas, the wastewater situation is the same as the urban area. The government has planned to promote the spread of temporary toilets, but almost all of them are infiltration type toilets. In large buildings such as public buildings, hospitals, and hotels, septic tanks have been installed.

In 2009, the National Environmental Standard was promulgated, and a strict effluent standard has been enforced that will require water quality monitoring and on-the-spot inspections. In the future, wastewater management will be strengthened.

However, there is a possibility that water quality will continue to deteriorate due to the expansion of urban areas and the corresponding increase in untreated wastewater.

5.2.3 Communications

(1) Internet

Internet services are not widely used since access fees remain high, despite a declining trend in fees since 2009. ADSL is the main service type used, but users have been limited to business corporations and government organizations.

In 2005, Planet Online started wireless internet services, and Sky Telecom installed the first broadband connection with ADSL in 2006.

(2) Mobile phones

There are four service providers in the mobile phone market: Lao Telecommunication Company Limited: LTC (26.6%), Enterprise of Telecommunications Lao: ETL (24.3%), Beeline Lao (10.0%), and Unitel (39.2%). They have built a proprietary infrastructure. Unitel started W-CDMA-type 3G services in October 2009. The number of subscribers to the service has been increasing sharply, and it is anticipated that the number of subscribers will reach 5.481 million, which is equivalent to an 87.2% diffusion rate.

(3) Fixed-line phones

Fixed-line phone services are provided mainly by two companies: LTC (81%) and ETL (19%). The number of subscribers is 108,000, which is only a 1.7% diffusion rate as of the end of 2011. The insufficient infrastructure in rural areas keeps the number of subscribers low.

(4) Terrestrial broadcasting

LNTV provides terrestrial analog broadcasting service. China Central Television (CCTV) has opened a new office in LNTV, and it provides services in both English and Chinese.

LNTV developed its facilities with the aid of China in 2009, which enables it to deliver high quality broadcasts.

5.2.4 Waste

(1) General

According to the study report by WHO, the amount of daily domestic waste per capita as of 2001 is 750g. In Vientiane, the total amount of waste is about 638 tons as of 2011, which explains the recent sharp increase. The waste amounts of Luang Prabang and Sayabouri are 68 tons and 35 tons respectively. (Cf. The waste amount in Vientiane is estimated as 300-400 tons.)

The waste collection ratio of Vientiane is less than 20%, and the ratios of Luang Prabang and Savannakhet are about 60% and 40% respectively. The uncollected waste is generally piled up or burned in open fields, which have caused insects and offensive odors in the past. This uncollected

waste is due to inefficient methods of waste collection and transmission, and the use of dump tracks instead of waste collection vehicles.

(2) Final disposal site in Lao PDR

At the KM 32 final waste disposal site in Lao PDR, open dumping of waste is conducted, separating out only hospital waste. The total area is 62 ha, of which 14 ha is being used.

In Lao PDR, the amount of waste is estimated as 300- 400 tons per day, but the disposal capacity of the final disposal site is 150-200 tons. The excess waste is disposed of without treatment. In the shallow uncontrolled landfill, about 40-50% seems to be organic waste. Uncontrolled landfill is seen in other cities such as Sayaburi. This is subject to penalties, for which Traffic Police are responsible.

Currently, JICA assists and leads its implementation of controlled landfill. Moreover, some CDM projects have also started.

5.3 Natural Disaster Issues

Floods in the country occur in the central to the north regions affected by tropical monsoons in the rainy season (from June to November). September to October coincides with the typhoon season, and typhoons that land cause flood damage in the plain and basin areas.

The most severe natural disaster in the Lao PDR is drought, followed by floods. In the storm rainfall in 1995, the number of affected people was estimated to be one (1) million. Considering the frequency and the extent of damage, flooding is the most alarming natural disasters. In August 2008, a typhoon coming from the South China Sea brought torrential rain in the upper basin area of the Mekong. As a result, inundation occurred in Luang Prabang, and the flow reached Vientiane. Water levels continued to rise and reached 12.5 m, which is a dangerous level.

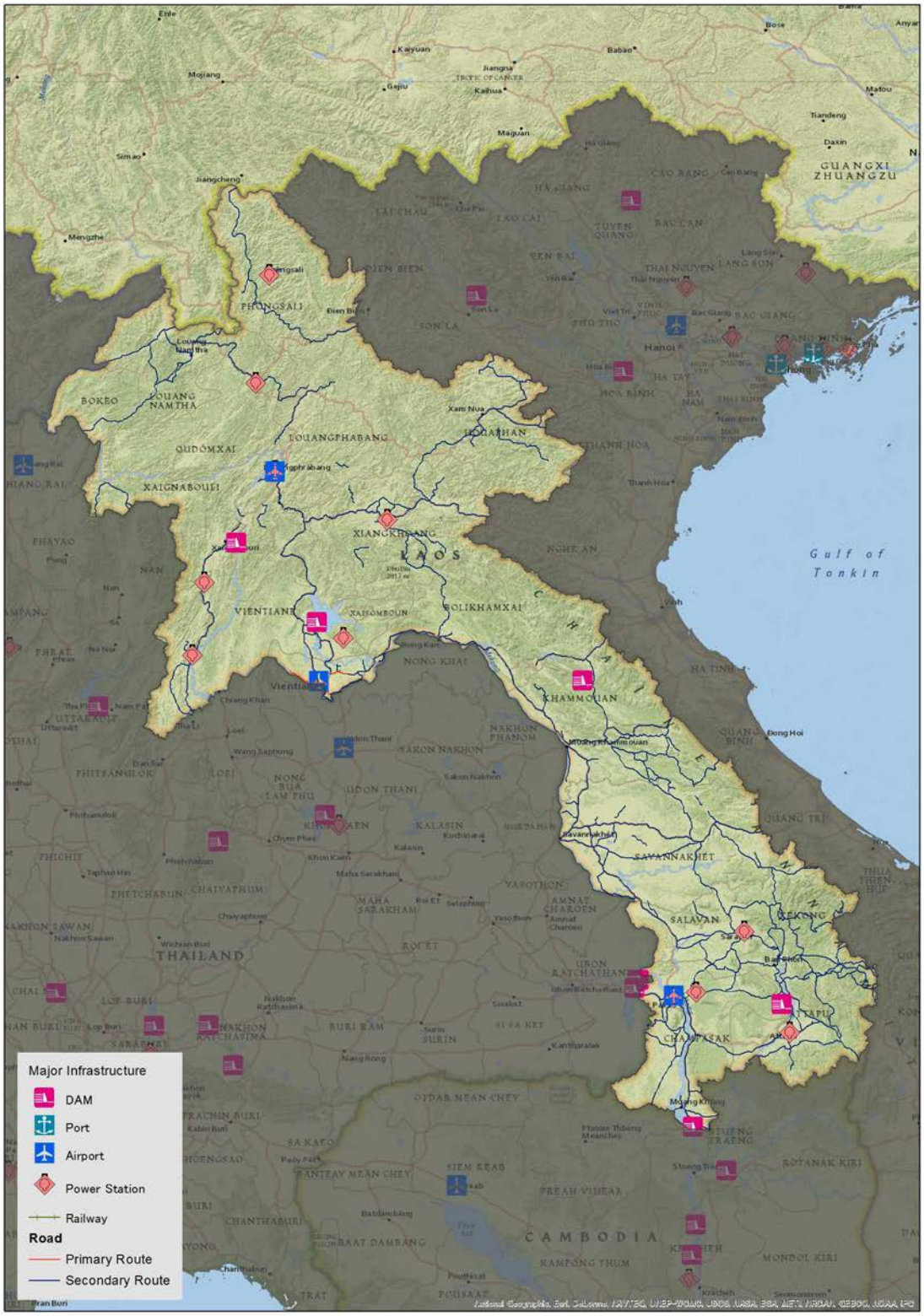


Figure 5.3.1 Major Infrastructures in Lao PDR

Chapter 6 Economy, Industry, and Trade

In this survey, the general outline of economy and trade in Lao People's Democratic Republic and the cases in which disaster impact analyses were conducted are examined. The purpose is to estimate the impact of a disaster on the economy of the nation and surrounding regions in the event that an industrial agglomerated area in Laos is hit by a disaster.

The following topics were explored using existing data and information from sources such as the internet, research papers, reports, and other materials.

- Overview of the economy and industry in Laos
- Overview of trade in Laos

In order to understand the conditions of the economy and trade in Laos, relevant information was gathered/organized based on a review of reference materials listed below

No.	Reference	Remarks
1	ASEAN-JAPAN CENTRE website http://www.asean.or.jp/	Statistical data on economy, industry and trade of ASEAN
2	JETRO 2009, "ASEAN Economic Community (in Japanese)"	Regional corporation framework in East Asia
3	ASEAN Stats database http://aseanstats.asean.org/	Trade values of ASEAN by commodity and partner country, etc.
4	ASEAN website (2013), "Key basic ASEAN indicators in 2011, Last update 14 January 2013"	Key basic indicators of ASEAN
5	International Monetary Fund, World Economic Outlook Database	Macroeconomic indicators of ASEAN
6	Industrial agglomerated areas in ASEAN, IHS	Detailed information on industrial agglomerated areas in ASEAN
7	Ministry of Foreign Affairs of Japan http://www.mofa.go.jp/index.html	Information on regional affairs etc.

6.1 Overview of the economy

The GDP of Laos is 8.3 billion USD (2011) which is the lowest in ASEAN. The GDP per capita is 1,320 USD (2011), which is the third lowest in ASEAN.

However, the country's economic growth rate is 21.1%, which is higher than the average of ASEAN (15.7% (2011)). It is expected that the economy of Laos will continue to grow at a rate slightly faster than the growth rate of ASEAN. Foreign direct investment in Laos accounts for 0.4% (2010) of total foreign direct investment in ASEAN.

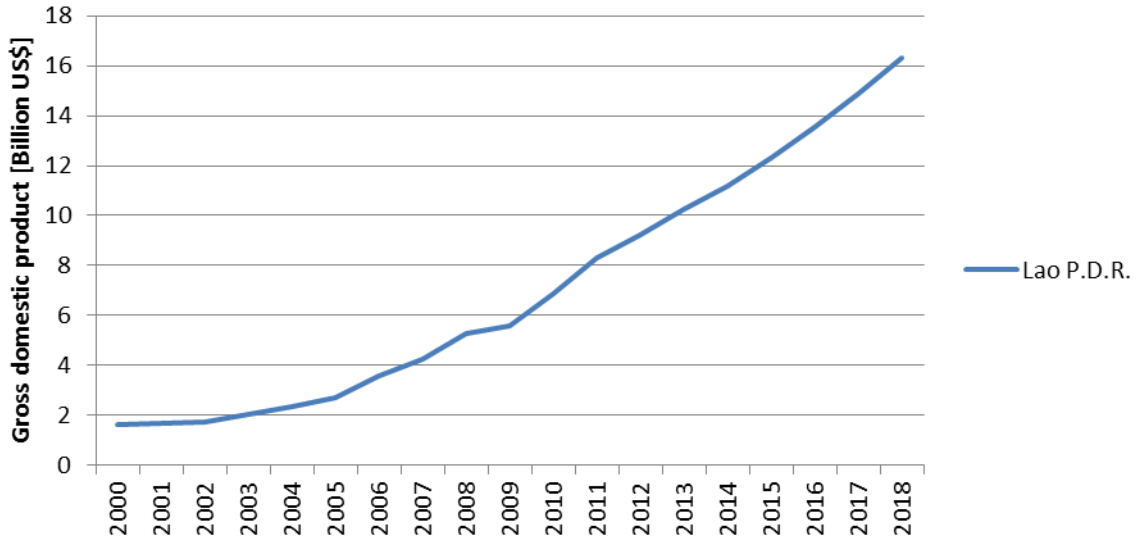
As for industrial composition of the GDP, the service sector is the largest, accounting for 38%, Tourism around the World Heritage Site makes a major contribution to the sector. Agriculture (approx. 28%) and the manufacturing industry (approx. 27%) are also active in Laos. In addition, the

country is actively engaged in the hydroelectric power generation business by making effective use of its geographical conditions. Laos obtains foreign currency by selling this electricity to Thailand.

Major industrial parks in Laos, in which many Japanese companies are operating, are summarized in the table below.

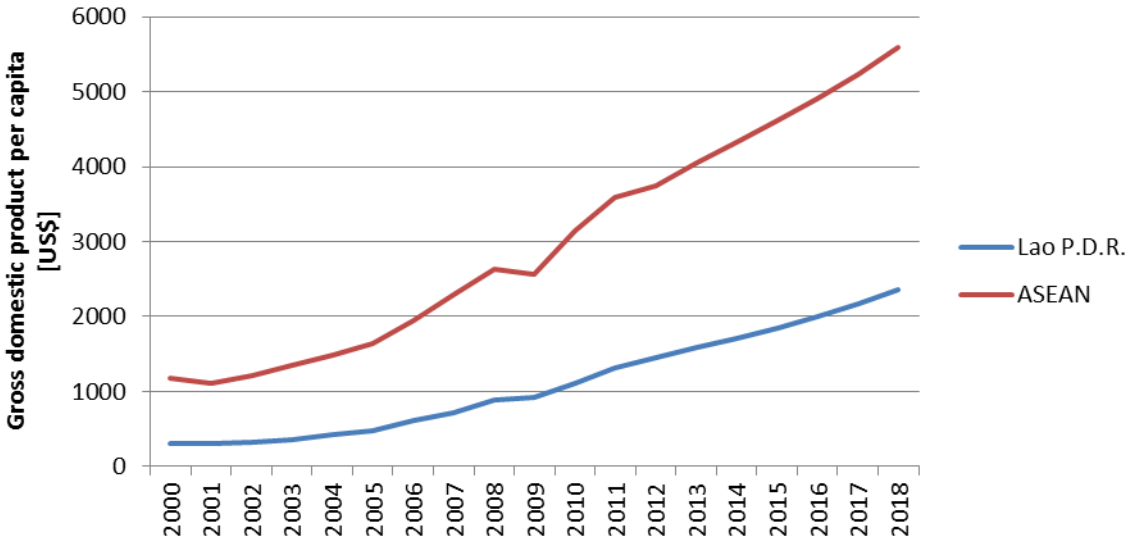
Name of Industrial Park	Number of Japanese companies operating	Description
Savan-Seno	1 (5)	Located near where Indochina East-West Corridor and Lao Highway Route 13 intersect. Companies engaged in international freight transportation business and bonded warehouses are operating in this industrial park.
VITA Park	- (2)	Located 22 km from Vientiane and 25 km from Wattay International Airport. Japan is the largest investor in the industrial park.

Reference: The table was created based on information from ASEAN-Japan Centre (https://www.asean.or.jp/)
Note) Numbers shown in parentheses were obtained from resources provided by IHS.



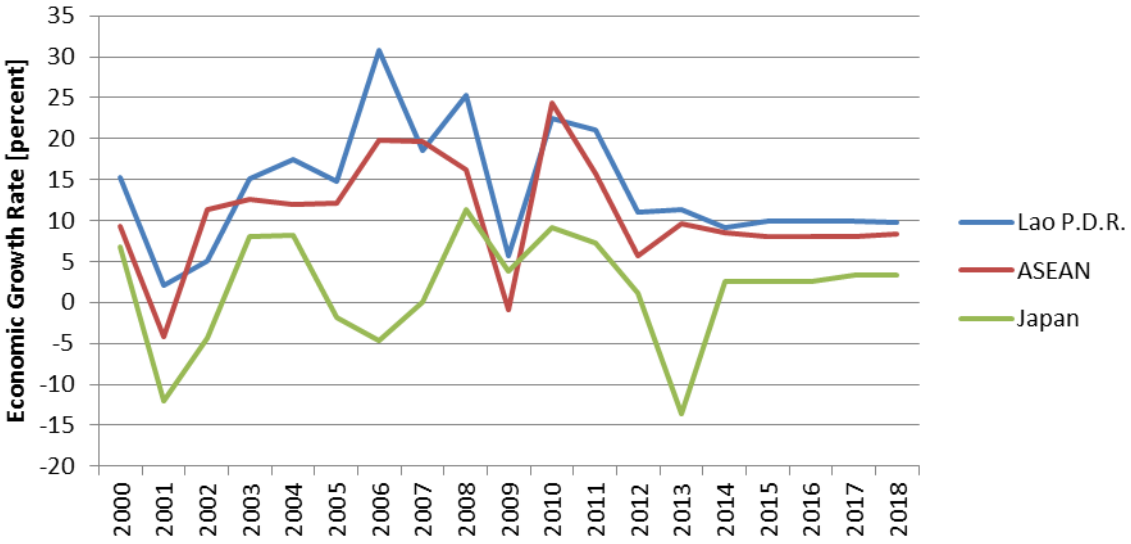
Source: International Monetary Fund, World Economic Outlook Database, April 2013

Figure 6.1.1 Gross Domestic Product in Laos, ASEAN countries and Japan (2000-2018), current prices (Estimation starting from 2012)



Source: International Monetary Fund, World Economic Outlook Database, April 2013

Figure 6.1.2 Gross Domestic Product per capita in Laos, ASEAN countries and Japan (2000-2018), current prices (Estimation in Laos starting from 2012; in ASEAN starting from 2007)



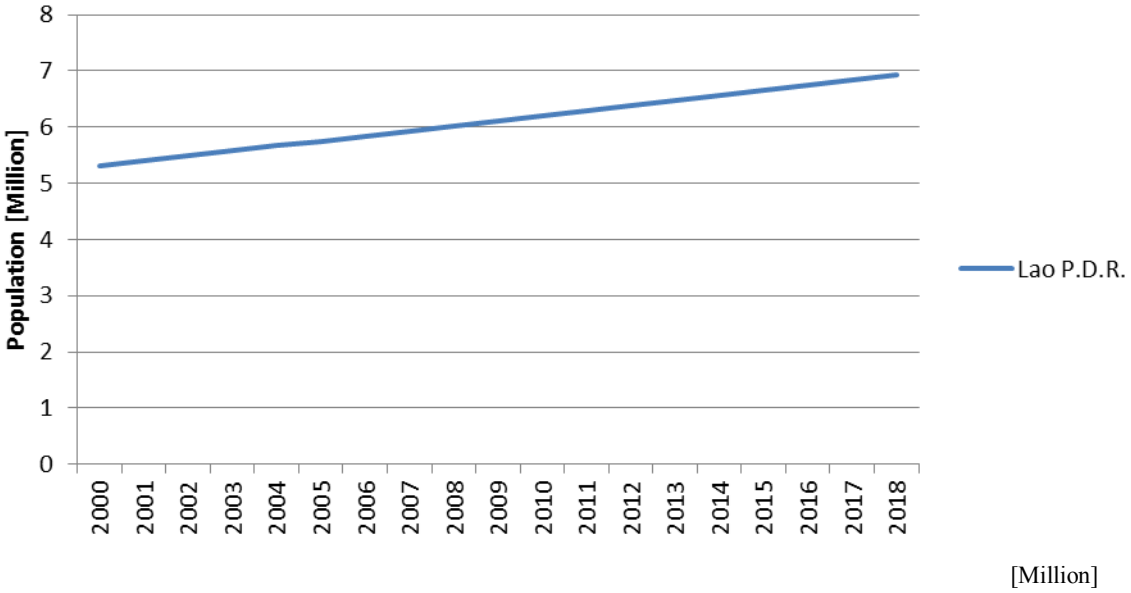
Source: International Monetary Fund, World Economic Outlook Database, April 2013

Figure 6.1.3 Economic Growth Rate in Laos, ASEAN countries and Japan (2000-2018), current prices (Estimation in Laos and ASEAN starting from 2012; in Japan starting from 2013)

Table 6.1.1 Average growth rate in Laos, ASEAN countries and Japan (2013-2017)

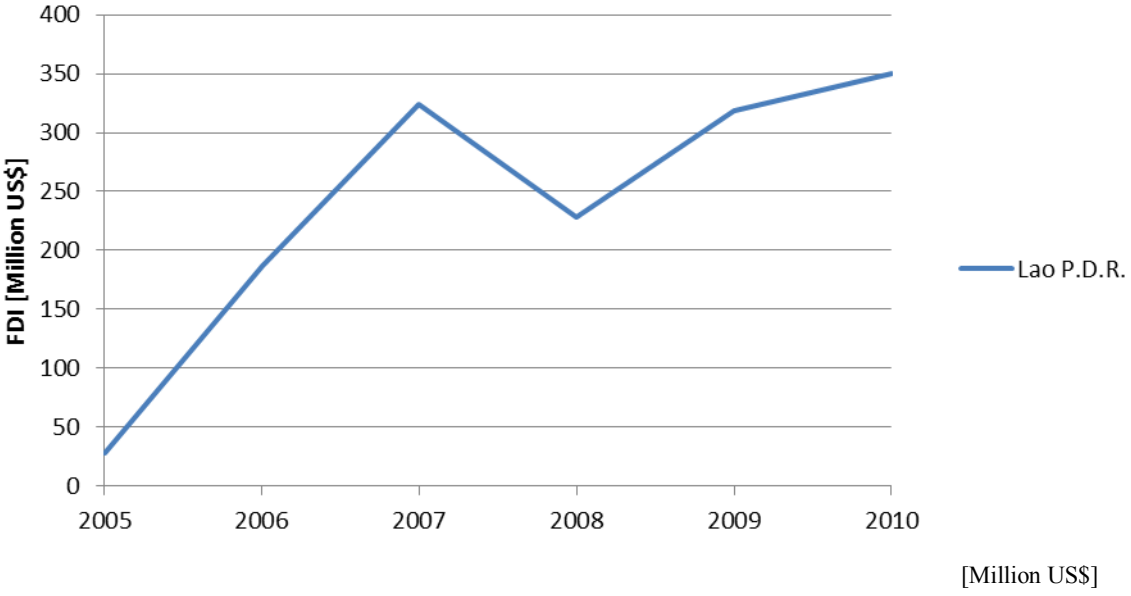
	Lao PDR	ASEAN	Japan
Average growth rate (2013-2017) (%)	10.0	8.5	-0.53

Source: International Monetary Fund, World Economic Outlook Database, April 2013, calculated by MRI



Source: International Monetary Fund, World Economic Outlook Database, April 2013

Figure 6.1.4 Population (2000-2018) (Estimation starting from 2012)



Source: ASEAN-Japan Centre website

Figure 6.1.5 Foreign Direct Investment to Laos and ASEAN (2005-2010)

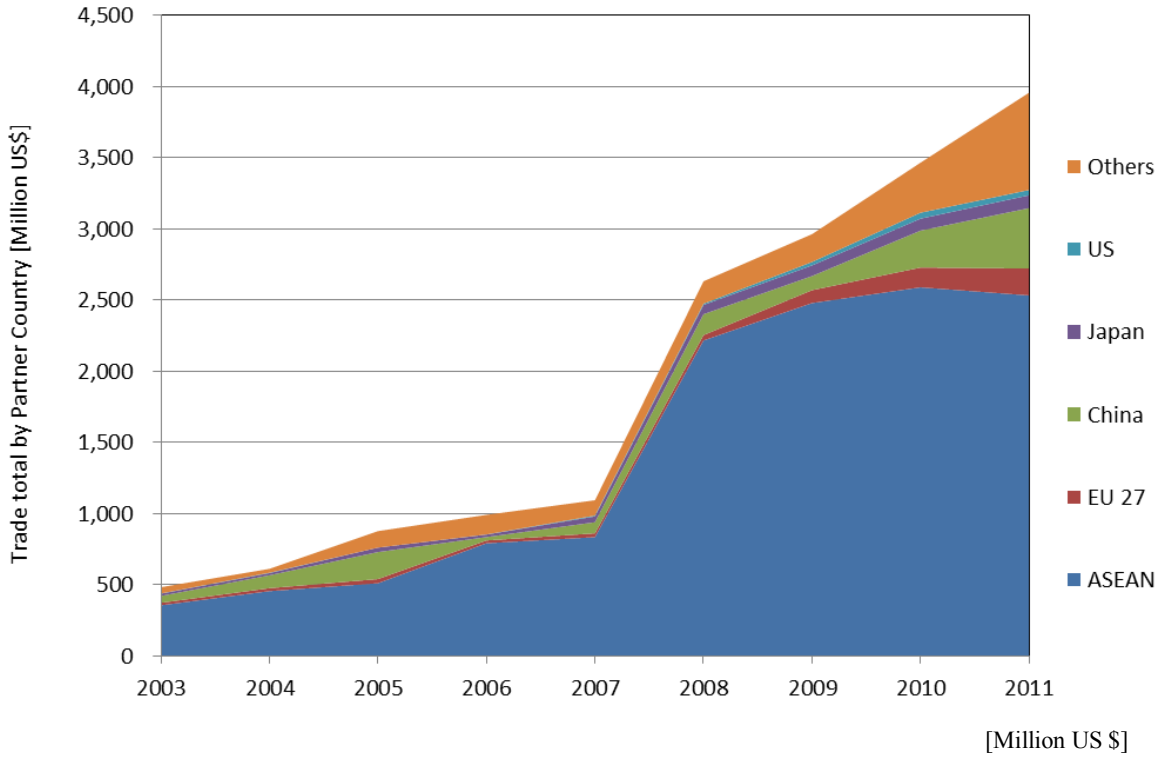
6.2 Overview of trade

(1) Amount of foreign trade/major trading partners

Trends in Laos' foreign trade by partner countries (2004 – 2011) are illustrated in the figure below. It can be seen that while the external trade value has been growing steadily since 2000 in Laos, the value rose sharply in 2008. The impact of the collapse of Lehman Brothers during that year was not as significant in Laos, and the country's trade value has continued to grow steadily since then.

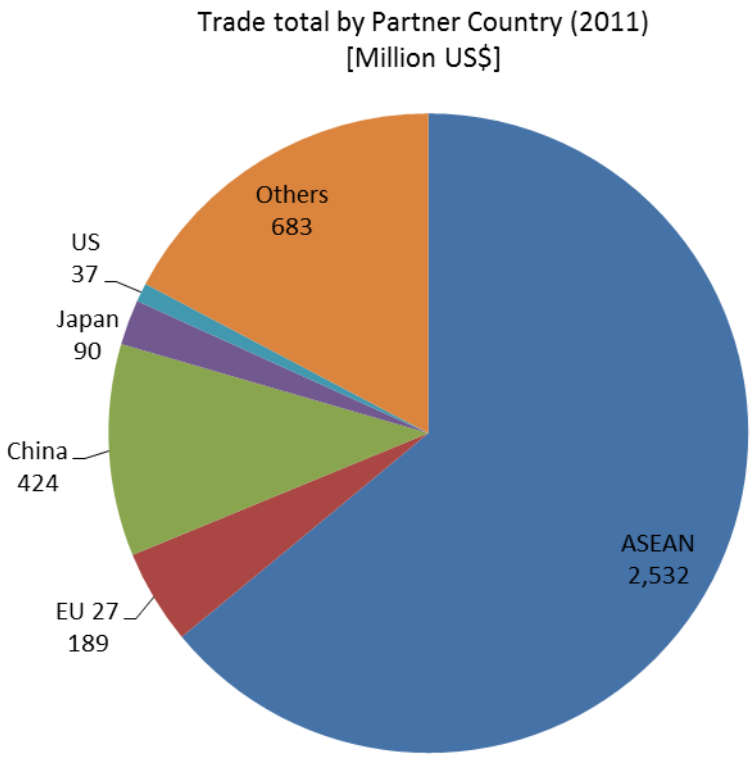
As of 2011, the largest trading partner of Laos is ASEAN countries, accounting for 64% of the total trade. The second largest trading partner is China, accounting for 11%. The EU comes next, with 5%, followed by Japan and the USA, accounting for 2% and 1%, respectively.

Looking at trends in recent years, it is observed that while Laos' foreign trade with other ASEAN countries is maintained at the same level, trades with countries in other regions is increasing. It can be observed that the increase of trade between the EU and China is especially large.



Source: ASEAN Stats database (http://aseanstats.asean.org/)

Figure 6.2.1 External Trade Value by Partner - Total (2000-2011)



[Million US $]

Source: ASEAN Stats database (http://aseanstats.asean.org/)

Figure 6.2.2 External Trade Value by Partner - Total (2011)

(2) Categories of major trading commodities

Export values of Laos by commodity (2011) are shown in the table below.

Examining the export values by major export commodities, it can be observed that the largest group of products exported from Laos is manufactured goods, which accounts for 49% of the total export value (722 million USD). Crude materials, etc. (except fuels) comes next, accounting for 34% of the total exports (502 million USD).

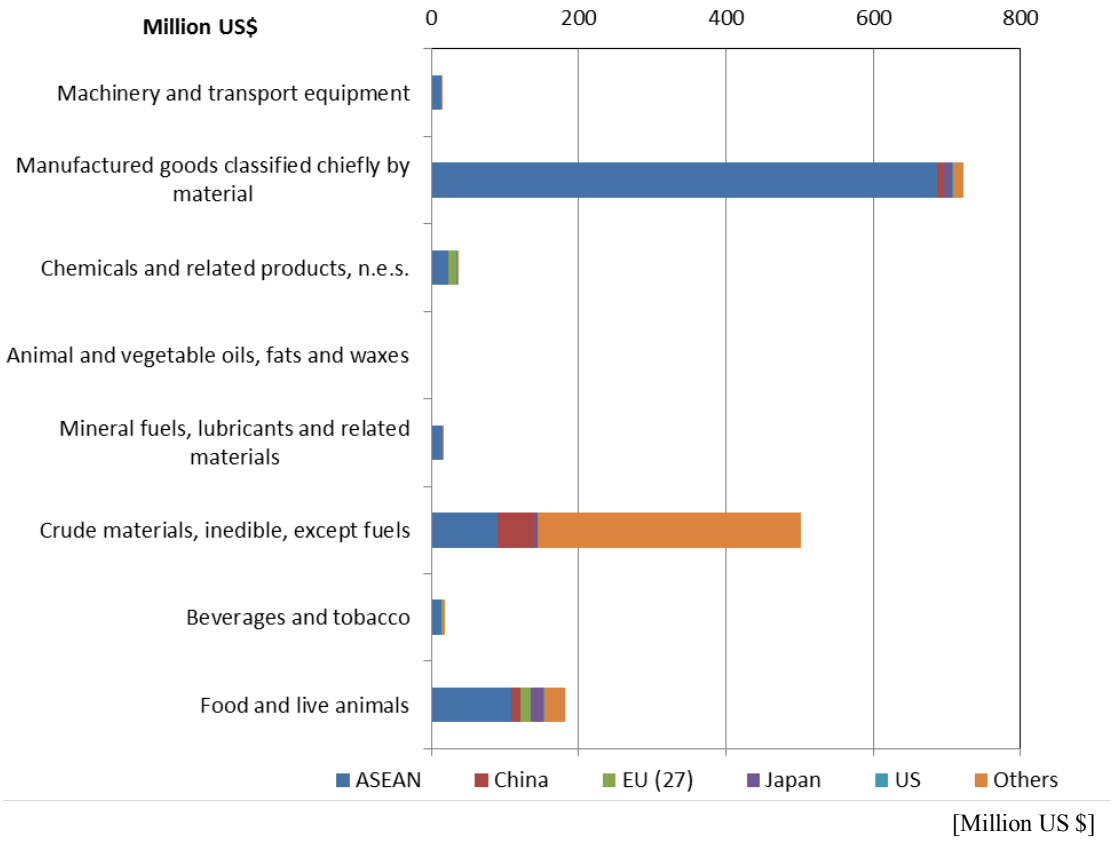
The largest export destination for manufactured goods is ASEAN countries, buying 687 million USD. This is followed by Japan and China, with export values of 12 million USD and 7.1 million USD, respectively.

Table 6.2.1 Trade values (exports) of Laos by commodity and partner country (2011)

[Million US $]

Category	ASEAN	China	EU (27)	Japan	US	Others	WORLD
Food and live animals	108	12	15	17	1	27	181
Beverages and tobacco	14	0	0	0	0	3	17
Crude materials, inedible, except fuels	90	49	1	4	0	359	502
Mineral fuels, lubricants and related materials	14	0	0	0	0	0	15
Animal and vegetable oils, fats and waxes	0	0	0	0	0	0	0
Chemicals and related products, n.e.s.	23	0	11	0	1	1	37
Manufactured goods classified chiefly by material	687	7	1	12	1	14	722
Machinery and transport equipment	13	0	0	0	0	0	14

Source: ASEAN Stats database (http://aseanstats.asean.org/)



[Million US $]

Source: ASEAN Stats database (http://aseanstats.asean.org/)

Figure 6.2.3 Trade values (exports) of Laos by commodity and partner country (2011)

Import values of Laos by commodity (2011) are shown in the table below.

Examining the import values by major import commodities, it can be observed that the largest group of products imported by Laos is machinery and transport equipment, which accounts for 43% of the total import value (899 million USD). Manufactured goods comes next, accounting for 22% of the total imports (461 million USD).

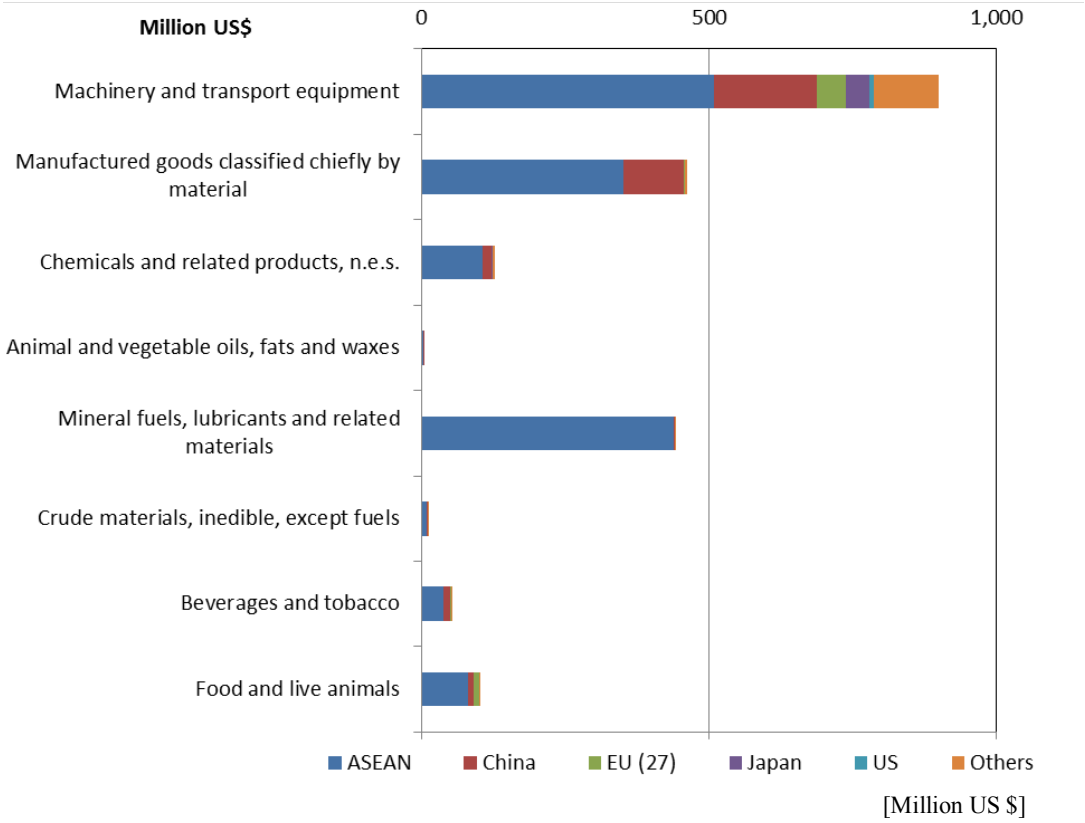
The largest exporter of manufactured goods to Laos is ASEAN, exporting a total of 509 million USD. This is followed by China and the EU, with import values of 178 million USD and 50 million USD, respectively. Imports from Japan were 42 million USD.

Table 6.2.2 Trade values (imports) of Laos by commodity and partner country (2011)

[Million US $]

Category	ASEAN	China	EU (27)	Japan	US	Others	WORLD
Food and live animals	81	10	9	0	0	0	100
Beverages and tobacco	39	12	1	0	0	1	52
Crude materials, inedible, except fuels	8	3	0	0	0	0	12
Mineral fuels, lubricants and related materials	438	2	0	0	0	0	441
Animal and vegetable oils, fats and waxes	3	0	0	0	0	0	3
Chemicals and related products, n.e.s.	106	15	1	1	0	4	128
Manufactured goods classified chiefly by material	351	106	1	0	2	2	461
Machinery and transport equipment	509	178	50	42	6	113	899

Source: ASEAN Stats database (http://aseanstats.asean.org/)



Source: ASEAN Stats database (http://aseanstats.asean.org/)

Figure 6.2.4 Trade values (imports) of Laos by commodity and partner country (2011)

Chapter 7 Physical Distribution Network

The themes of this survey are divided into three categories as follows: 1) Understanding of Supply Chain Circumstances in ASEAN Countries, 2) Understanding of Circumstances on Physical Distribution Network, and 3) Organizing the framework of vulnerability analysis for natural disasters on the ASEAN Logistics Network.

7.1 Understanding of Supply Chain Circumstances in Lao PDR

(1) Relation to Logistics Performance Index on International Physical Distribution

Table 7.1.1 International LPI (Logistics Performance Index) *[1] Ranking 2012

Rank	Country	LPI	Customs	Infrastructure	International Shipment	Logistics Competence	Tracing & Tracking	Timeliness
118	**Lao PDR**	**2.46**	**2.17**	**1.95**	**2.7**	**2.14**	**2.45**	**3.23**

Source: World Bank Connecting to Compete 2012 Trade Logistics in the Global Economy

(2) Features of Physical Distribution in Relation to Main Industries in Industrial Parks

The lists of ASEAN-JAPAN CENTER (AJC) web-site[*2] have no specific time of investigation by year/month, but it is considered that the general current status of industry agglomeration at the time of the investigation can be obtained.

The industries in industrial parks are classified into the following 13 categories:

1) Fishery/Foodstuff, 2) Textile/Apparel, 3) Pulp/Paper, 4) Chemicals, Oil, Rubber/Ceramic, 5) Steel/Nonferrous metal, 6) Transport machines (Cars), 7) Electrical/Electronics/Precision apparatus, 8) Other industries, 9) Commerce (wholesale, retail), 10) Real estate, 11) Logistics/Warehouse, 12) Finance/Insurance/Other services, and 13) Information/Telecommunication.

The objective industrial parks are selected based on the criterion such as: 1) Degree of geographic accumulation, 2) Having sufficient operational experiences, 3) The size and number of Japanese companies, 4) Located in the pilot area in case of Vietnam, the Philippines and Indonesia.

Based on the industrial classifications above, the characteristics of distributions of the products from industrial parks are estimated.

The following three industrial parks are provided in the AJC list; that is, Savan-Seno, Phoukhyo Specific Economic Zone), and VITA Park

Lao PDR is promoting to construct Savan-Seno SEZ in Savannakhet Province at the junction of east-west corridor road, which passes from Vietnam to Myanmar through Thailand, with national road No.13 through north-south, which crosses over Laos, near to border of Thailand.

At the time of investigation, how far this SEZ development proceeds is not known. However, it is remarked that the affiliated company with Japan logistics Systems Co. has operated a bonded warehouse and a truck terminal at this important place of transport.

Final industrial products are limited to higher degree in Laos, because industrial park development has not yet advanced, therefore, physical distribution in Laos is surely by truck only within the country and to/from neighbor countries.

As a recent movement, Nikon Company has decided to transfer the factory in Thailand to Laos, from this factory final and intermediate products will be transported back to Thailand and Intra /Extra ASEAN markets; resulting in a new supply chain being established.

Top three share of the major export/import items of Laos are as follows (Ministry of Foreign Affairs of Japan, country and regional situation, Lao PDR, Economy)[*3]:

- Export：Mineral&Agricultural products, Needle work products, Electricity
- Import：Vechile Parts, Electric appliances, Construction materials

From the data above, Physical distribution of Lao PDR shows characteristics of exporting primary goods and importing finished and value added products. Although it is not directly related to the distribution network, it is worthwhile mentioning that electricity has a major share of the export item in Lao PDR.

(3) Supply Chain Circumstances in ASEAN Countries

Physical distribution is evolving by the stages of Physical Distribution Development Phasing (PDDP) as follows:

1) Physical distribution control: Company's own sphere of materials/ products distribution (PDC).
2) Logistics management: Company's own distribution management by the market-in strategy (LGM).
3) Supply chain management: Integrated distribution management from company's own to systemized one by the collaboration with other logistics operator resources (SCM)

Other criteria can be considered applicable, so that the development phase may be justified, based on industrial categories and their products' varieties and volumes in the selected industrial parks/ SEZ.

1) Kinds and diversity of products (intermediate or final products).
2) Whether production of high valued goods like cars, electrical/ electronic/ precision devices or not, and the levels.
3) Correspondence of export/import major items of goods to, classification of intermediate/ final products
4) Existence of a regional head office of a company which power is vested from the headquarter, and the power strength in management term.
5) Existence of logistics operator as a 3PL and maturity of the business
6) Inter dependency of industrial parks/ SEZ with megalopolises in the vicinity.

The result of assessment is shown in the table below which is made by LPI of the World Bank and by supply chain circumstances determined by above mentioned industries in the industrial park as well as major export/import items in the light of the above three stages of PDDP. The evaluation is shown by relative evaluation of five levels among ASEAN countries. Since there are no distinction time and contents

wise in PDDP, the level of development is indicated as a continuous line in the table below.

Table 7.1.2 Physical Distribution Development Phasing

LPI	Country	PDDP								
					Criteria					
		PDC	LGM	SCM	Products diversified	High valued goods	Export/ Import	Regional head office	Logistics operator	Products diversified
2.46	**Lao PDR**	[redacted]			**2**	**2**	**2**	**1**	**1**	**1**

Source: JICA Study Team

7.2 Current Status and Trends of Brunei Logistics Network

(1) Domestic Physical Distribution Network

Lao situates at the strategic position in the international supply chain such as the East-West and North-South Corridors of GMS.

According to the improvement of international supply chain with Thailand, Vietnam and Cambodia, the economic role of the capital city Vientiane will increase and as a result the flow of consumer goods will also become active.

The time distance between Vientiane and major cities such as Bangkok, Hanoi, Phnom Penh and Kunming etc. is only about an hour to one hour and half by flight. This presages the great potential for Lao PDR's future development.

(2) Intra-ASEAN Physical Distribution Network

Laos positions junctions of East-West and North-South Corridors as aforementioned. By this geographical logistics feature, main intra-ASEAN trade partners are neighbor countries of Thailand and Vietnam. In terms of trade amount share, Thailand is overwhelming, and that with Vietnam is only less than 1/10 of that with Thailand.

(3) Extra-ASEAN Physical Distribution Network

Most of extra-ASEAN logistics of Laos is by means of truck transport to Thailand and/or Vietnam, and then shipped to trade partner countries.

Trade with China has been steadily increasing by truck on North-South Corridor.

7.3 Analysis Frame on ASEAN Physical Distribution Network

This section studies frame for assessment of the vulnerability of logistics network against natural disasters in consideration of the actual situation of supply chain, as a preparedness of formulation of area BCP.

The vulnerability itself is to be assessed after the further survey.

Table 7.3.1 Natural Disaster Prevention Related Matters in relation to vulnerability of Physical Distribution Facilities

Industrial Park Name represented	Not designated yet
Features	Place: Operation commenced in: Nos of Operating Enterprises : Total IPK Annual Turn-over (Mill.US$):
Vulnerability Assessment Frame for Each Industrial Park (IPK)	
Natural Disaster Risk(NDR): Extract from Survey Report 1: "Chapter 5 Existing Investigations and Studies"	
■ Flooding	Flood hazard possibility is generally not high.
■ Seismic intensity/ Tsunami	Earthquake hazard level in Lao PDR is low in general. However, northern region near Yunnan Province of China is higher in the earthquake hazard level. Lao PDR is inland state and no effect of tsunami.
■ Volcano	Volcano hazard level of Lao PDR is low. No volcanic disaster is recorded in the database.
■ Cyclone, Meteorological Disaster, Landslide	The impact of cyclone hazard on whole the country is not so high. Typhoons generated around the Philippines sometimes affect Lao PDR after landing on Vietnam. According to 1980-2012 records, five storm disasters have occurred. For landslide, hazard possible area covers all over the country consisted mainly hills and mountains without Mekong River low land where Capital Vientiane stands.
Brief Descriptions on Counter-measures (CMS) for NDR	
1) Private sector facilities: To follow further Survey	
Land, In-park Roads:	
Plant facilities:	
Physical Distribution Facilities:	
Others, if any:	
2) Infrastructures	
Road: • Pavement ratio of roads in Laos is low with only 1.3%, and 244 km of length of Asian-highway is comparatively short and all the sections are in level of Class Two (2) with two traffic lanes in both directions. • This under-developed condition of roads being considered, improvement of the roads is required to be as a matter of urgency. • The third international friendship bridge completed in November 2011. Furthermore, successive completion of the fourth bridge completion which date seems unforeseeable will help reduce vulnerability of logistics network infrastructure against natural disasters connecting Vietnam, Laos, Thailand, and Chine.	
Railway: • It is made public that 417 km of railway construction will be commenced in 2013. • This railway completion will contribute a lot to development between GMS logistics and China.	
Port:	
Airport:	
Electric power/Fuel: • It contradicts the fact that Lao PDR is exporting electricity but power supply is substantially as insufficient as a few times of blackout of power a week occurring that is now an ordinary state in Laos. • The Government has placed importance on hydro-electric power development. • The improvement of this situation needs to be solved swiftly.	
Water-supply:	
Sewage:	
Solid waste:	
Telecommunication:	

Note:

*1 The summary of "Logistics Performance Index" by the World Bank is as follows.

(1) LPI score and category wise score is indicated by each country

(2) Score is ranked from one to five

(3) LPI of international logistics is scored based on the interviewing following six items to major importers and logistics

companies in the neighboring countries (total of over 1000 companies).

1) Efficiency of the clearance process i.e. Speed, simplicity and predictability of formalities by border control agencies, including Customs
2) Quality of trade and transport related infrastructure e.g. Ports, railroads, roads, information technology
3) Ease of arranging competitively priced shipments
4) Competence and quality of logistics services e.g. transport operators, customs brokers
5) Ability to track and trace consignments)
6) Timeliness of shipments in reaching destination within the scheduled or expected delivery time.

*2 http://www.asean.or.jp/ja/invest/about/country_info/brunei/invest_info/industrialestate/

*3 http://www.mofa.go.jp/mofaj/area/brunei/data.html#04

References :

1) ASEAN-JAPAN CENTER, Lists of Industrial Parks/Estate/SEZ by Member Country (in Japanese)
2) World Bank Connecting to Compete 2012 Trade Logistics in the Global Economy
3) Shinya Nakata (2012), Introduction to Logistics, NIKKEI Newspapers in Japan (in Japanese)
4) JETRO (2008), ASEAN Physical Distribution Network 2008 (in Japanese)
5) ERIA: ASEAN Strategic Transport Plan 2011-2015.
6) ASEAN Secretariat, ASEAN Statistics on Intra and Extra_ ASEAN trade 2011

Chapter 8 Legislative Systems

A survey on the legislative systems concerned with disaster management, business continuity, environmental pollution, and development in Lao PDR is conducted in this chapter.

The survey of Lao PDR is mostly based on research through the websites of several leading international institutes that contributed to disaster research such as the Asia Disaster Reduction Center. Some information about Lao PDR's legislative systems comes from UN-related web pages. Laws, regulations, national implementation plans, and statutes are referred to within the scope of the survey.

The table below shows the methodology for collecting information.

Information Collected	Methodology	Scope of Survey
Legislative Systems for Disaster Management	To collect information from the internet, which is published by international agencies such as ADRC and disaster management institutes in Lao PDR. And to refer to the report by the JICA research team.	Governmental decrees for disaster management. National action plans and management plan for disaster risk reduction.
Regulations and Standards for BCM / BCP	To collect information from the internet. No official institutes regulating the BCM/BCP exist in Lao PDR.	Standards or regulations related to BCM. No standards or policies are found in Lao PDR.
Legislative Systems for Environment and Pollution	To collect information from the internet. Few websites of governmental agencies in Lao PDR are found.	Laws for environmental protection.
Legislative Systems for Development including Land Use, River and Building Regulations	To collect information from the internet. Few websites of governmental agencies in Lao PDR are found.	Laws for land, forest and water. No official building standards exist in Lao PDR.

The laws, regulations, decrees, and guidelines regulating the target fields defined above are compiled in this survey. The results of the survey in Lao PDR are summarized below.

Scope	Information
Legislative Systems for Disaster Management in Lao PDR	[Strategies and Plans] "The Prime Minister's Decree No.158, 1999", "NDMC Decree No.097, 2000". [Regulations, Standard and Guidelines] "Strategic Plan on Disaster Risk Management in Lao 2020, 2010 and Action Plan", "National Disaster Management Plan 2012-2015", "National adaptation plan for action - NAPA (2009)".
Regulations and Standards for BCM / BCP in Lao PDR	No regulations, standards or guidelines for business continuity management in time of disaster have been identified in Lao PDR.
Legislative Systems for Environment and Pollution in Lao PDR	[Laws for Environment] "Environmental Protection Law, 1999"
Legislative Systems for Development including Land use, River and Building Regulations in Lao PDR	"Land Act", "Forest Act,1996", "Water Act"

The available results on the survey about the laws and regulations for disaster management, BCP/BCM, environmental conservation and provisions for development in Lao PDR are summarized below.

According to a survey on legislative systems in Lao PDR, no regulations, standards, or guidelines defining Business Continuity Management have been determinably established.

8.1 Legislative systems for disaster management

(1) Disaster management laws

Table 8.1.1 Laws and Regulations of Disaster Management in Lao PDR

	Laws / Regulations	Supervisory Authority	Subject
Decree	The Prime Minister's Decree No.158, 1999	under survey	Disaster Management
Decree	NDMC Decree No.097, 2000	National Disaster Management Committee	Disaster Management

It is expected that the Prime Minister's Decree to order the preparation of a Disaster Management Law will be issued by around October 2012. If the decree is issued as assumed, preparation will be started for the law to be enacted in 2013.

The functions and responsibilities of each sections in NDMC are defined in the "NDMC Decree No. 097".

(2) Disaster management strategies and plans

Table 8.1.2 Strategies and Plan for Disaster Management in Lao PDR

	Laws / Regulations	Supervisory Authority	Subject
Plan	Strategic Plan on Disaster Risk Management in Lao 2020, 2010 and Action Plan (2003-2005)	Ministry of Labour and Social Welfare	General Disasters
Plan	National Disaster Management Plan 2012-2015	under survey	General Disasters
Plan	National adaptation plan for action - NAPA (2009)	under survey	General Disasters

The Strategic Plan on Disaster Risk Management in Lao 2020, 2010 was issued in the form of Decree No.158 by the Ministry of Labour and Social Welfare (MLSW) in 2003. The plan lists long-term aims up to 2020 and goals for the medium-term until 2005 and 2010. In 2011, the National Disaster Management Plan 2012-2015 was drafted and reviewed. A decree from the Prime Minister is necessary for the above new plan to be implemented even after it is finalized.

In its 2009 report "Disaster Risk Management Programs for Priority Countries," the Global Facility for Disaster Reduction and Recovery (GFDRR) highlights Lao PDR as one of the priority countries the World Bank will continue to support in 2010-2012.

8.2 Regulations and standards for business continuity management

No regulations, standards or guidelines for business continuity management in time of disaster have been identified in Lao PDR.

8.3 Legislative systems for the environment and pollution control

(1) Environmental laws and regulation

Table 8.3.1 Laws and Regulations regarding the Environment in Lao PDR

	Laws / Regulations	Supervisory Authority	Subject
Law	Environmental Protection Law, 1999	Science, Technology and Environment Agency	Environment, Environmental Assessment

As the basic law on environmental management in Lao PDR, the Environmental Protection Law was enacted in 1999. The Environmental Protection Law prescribes regulations for disaster management, and the function of NDMC in a time of disaster is defined as organizing disaster related agencies.

(2) Pollution control laws and regulations

Due to the absence of published documents for the legal system on environmental pollution control in Lao PDR, it is difficult to obtain specific information about the regulations.

8.4 Legislative systems for development including land use, rivers, and building codes

Table 8.4.1 Laws and Regulations for Land, River and Building Code in Lao PDR

	Laws / Regulations	Supervisory Authority	Subject
Law	Land Act	under survey	Land Use
Law	Forest Act,1996	under survey	Forestry
Law	Water Act	under survey	River

Due to the absence of published documents about the legal system in Lao PDR, it is difficult to obtain specific information about regulations.

There are several basic laws on the sectors related to disaster management. The Land Act was developed and stipulates land use. The development and usage of river systems is regulated by the Water Act. In addition, there is a Forest Act for the protection of forestry land.

In our research, a specific building codes enacted in Lao PDR could not be verified.

Chapter 9 Situation of Implementation of BCP

9.1 Major natural disasters and disaster management awareness

Flood disaster caused by heavy rain and landslides in mountainous area are expected to be the main natural disasters in Lao PDR. In recent years, a severe flood in 2008 caused major damage in Vientiane and other provinces. In addition, the risk of landslides is also considered high in mountainous areas; however, since principal roads for logistics are limited in those areas, there will be less of an impact on the economy.

Because Laos has a lack of experience with disasters that cause extensive damage in urban areas, the awareness of disaster risk has not been increased. Enterprises in Laos consider international influences such as political uncertainty and economic fluctuations, especially in Thailand, as business risks that have more weight than natural disasters.

9.2 Current state of BCP implementation

Since the risk of natural disaster is considered relatively low in Laos, most enterprises recognize that disaster risk management is not urgently required and are not well-prepared for disasters. The concept of BCP is completely unknown among general enterprises, and there are few enterprises that are able to implement BCP. Furthermore, only a few enterprises have prepared disaster risk mitigation plans. They are also unable to conduct risk assessment and contingency management for disasters.

Japanese enterprises in Laos have not implemented BCP either. The lower disaster risk is one of the advantages of moving into Laos. Therefore, most enterprises do not regard disaster risk management as necessary for their business situation.

9.3 Efforts on furthering BCP implementation

Governmental policy on disasters in Laos attaches a high value to the mitigation of human damage, but not to the economy or business conditions. The Lao government does not proactively promote disaster risk mitigation for the non-governmental sector.

The SMEs Promotion Law defines the governmental policy for supporting SMEs and schemes for SME activities in Laos. There is a comprehensive policy for national disaster risk management, but no specific management systems for individual companies have been considered in the policy. Agencies aiming to support SMEs such as the Chamber of Commerce and Industry cannot provide any assistance for implementing BCP or disaster management in enterprises.

9.4 BCP implementation problems

One of the main issues for BCP implementation in Laos is that recognition of BCP by governmental agencies or enterprises has not been sufficiently promoted. In addition, due to the shaky understanding of disaster risk, disaster management for business is not common among general enterprises.

In urban regions, the improvement of utility systems and social infrastructures such as power, water supply, and roads is being promoted. The main social infrastructure, which is regarded as the framework of corporate disaster risk management in cities, is being refined gradually.

List of Agglomerated Areas

ID	Short List	LongList	COUNTRY	PROVINCE	PARK NAME	ADDRESS
LA0001	**XXLA04**	**XXLA04**	Laos		Savan-Seno Special Economic Zone	Savannakhet District
LA0002	**XXLA05**	**XXLA05**	Laos		VITA Park	Nonthong Village, Saithany District, Lao PDR
LA0003			Laos		Thatluang Lake Specific Economic Zone	Thatluang-Hongkae Vientiane, Laos
LA0004		**XXLA01**	Laos		Boten Beautiful Land Specific Economic Zone	Luang Namtha
LA0005			Laos		Saysetha Development Zone	Boulevard Kamphengmeuang Vientiane, Laos
LA0006			Laos		LongThanh Vientiane Specific Economic Zone	Rue Samsenthai Vientiane, Laos
LA0007			Laos		Thakhek Specific Economic Zone	13 Thakhèk, Laos
LA0008		**XXLA02**	Laos		Golden Triangle Special Economic Zone	Tonpheung District, Bokeo Province, Laos
LA0009		**XXLA03**	Laos		Phoukyo Specific Economic Zone	Kaysone Phomvihane (Thakhek District Khammuane Province)
LA0010			Laos		Dongphosy Specific Economic Zone	Wat Dongphosy Thanaleng, Laos
LA0011			Laos		Vientiane Industrial and Trade Area (VITA)	Rue Samsenthai Vientiane, Laos

MALAYSIA

Table of Contents

Chapter 1 Introduction

The report is a draft version of the Country Report for Malaysia, which will be a reference document for organizations of the private and public sectors wishing to prepare an Area Business Continuity Plan (Area BCP) and develop an Area Business Continuity Management System (Area BCM System).

The country report contains information on natural disaster risks, industrial parks and investment risk, key infrastructure and lifeline systems, as well as issues to consider during natural disasters. It also presents an outline of economy and trade, an outline of physical distribution, and current practices for implementing business continuity management (BCM) in the country.

The draft report will be refined and finalized at the end of the Project.

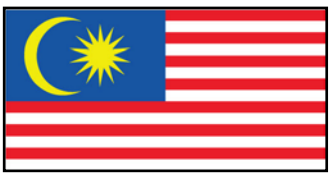
Chapter 2 Overview of the Country

The territory of Malaysia consists of two parts, which are the southern end of the Malay Peninsula and northern Borneo. The country shares borders with Thailand, Brunei, and Indonesia, and its territory on the southern edge of the Malay Peninsula is close to Singapore.

Malaysia is one of the founding members of ASEAN (founded on August 8, 1967). Strengthening collaboration with ASEAN countries is one of the basic foreign policies of the country.

Malaysia is a constitutional monarchy (adopts parliamentary democracy). Prime Minister Najib Razak is focusing on interethnic collaboration and administrative reform, and on economic reform with the aim of being on par with the developed countries. The country also adopts a policy to strengthen collaboration with Muslim countries as a basic direction for diplomacy.

Basic Information of Malaysia



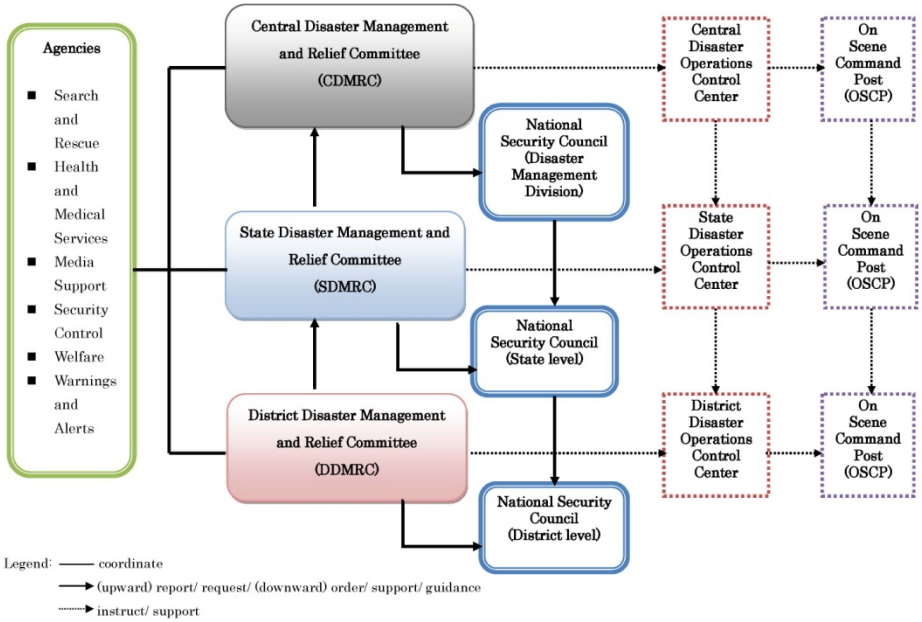
National Flag

Capital	Kuala Lumpur
Ethnic Groups	Malay (approx. 67%); Chinese (approx. 25%); Indian (approx.7%)
Languages	Malay (official language); Chinese; Tamil; English
Religions	Islam (61%); Buddhism (20%); Christianity (9.0%); Hinduism (6.0%); Confucianism/Daoism (1.0%)
Area (km^2)	Total: 330,800 Land: 328,550 Inland Water: 2,250

Population	29,239,927	**Economic growth rate (annual %)**	5.6
Population density(people/ km^2 of land area)	89	**GNI per capita, PPP (current international $)**	16,270
Population growth (annual %)	1.7	**Agriculture, value added (% of GDP)**	10
Urban population (% of total)	73	**Industry, value added (% of GDP)**	41
GDP (current US$) (billion)	305	**Services, etc., value added (% of GDP)**	49

Features of Disasters

71% of the total number of disasters was caused by floods followed by storm (14%) which affected 90% and 8% number of people, respectively. On the other hand, people were killed not only by floods (27%) and storm (38%) but also due to mass movement (wet and dry) (24%) and earthquake (11%) that attributed to 35% of the total death due to disasters. Flooding (65%) and earthquake (32%) are the two major causes of estimated damage cost. Though flooding, storm, and earthquake will be the major three disasters, mass movement (-wet, -dry) is also a noteworthy disaster that affects human life.



Source: A. Fakhru'l-Razi (date unknown) *Disaster Management in Malaysia* (PPT Slide), p.36.

Sources; Map and Flag: CIA(Central Intelligence Agency) website (2014) (https://www.cia.gov)

Capital, Ethnic Groups, Languages and Religions: Ministry of Foreign Affairs website (2013) (http://www.mofa.go.jp)

Area, Population, Population density, Population growth, Urban population, GDP, Economic growth rate, GNI per capita, PPP, Agriculture, value added, Industry, value added and Services, etc., value added: The World Bank Data Bank website (2012) (http://data.worldbank.org)

Chapter 3 Natural Disaster Risk

3.1 Floods

(1) Risk

Summary of flood disaster

Floods are caused by storm rainfalls brought by both the southwest and northeast monsoons. Floods are the dominant risk in Malaysia, but there is almost no impact from typhoons, because the country is located outside of the course of typhoons. In urban areas, flood disasters have decreased due to the improvement of rivers and drainage systems.

Notable floods and disasters in recent years

Recent notable floods were caused by the storm rainfalls of December 2006, January 11, 2007 and February 1, 2011.

1. The flood in December 2006 triggered by storm rainfall caused 6 fatalities affected about 100,000 persons, according to the EM-DAT (The International Disaster Database).
2. There is a record of two floods in 2007. The flood on January 11 caused 17 fatalities and affected about 140,000 persons. The flood on December 7 caused 17 persons fatalities and affected about 30,000 persons.
3. The flood on February 1 triggered by storm rainfall caused 2 fatalities affected about 20,000 persons at the southernmost tip of the peninsula.

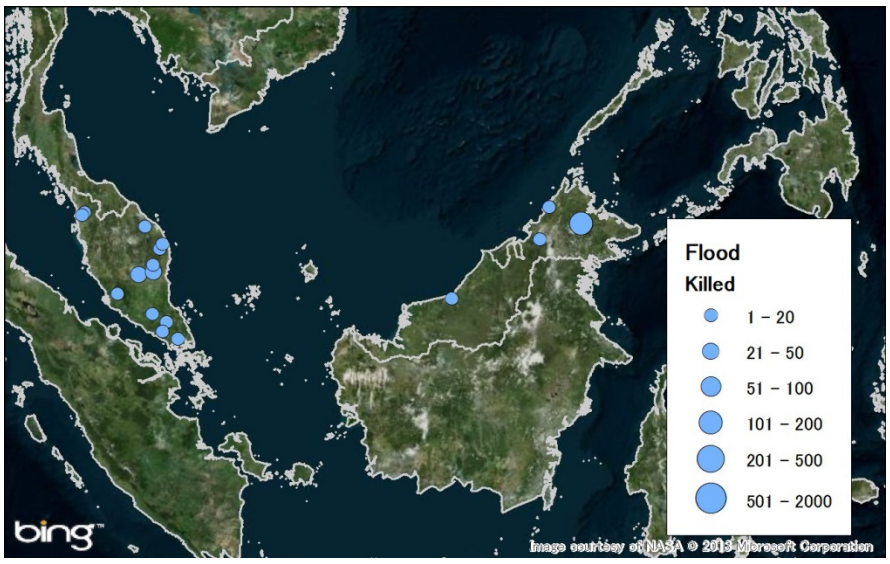


Figure 3.1.1 Flood Disaster: Human Losses (The deaths)

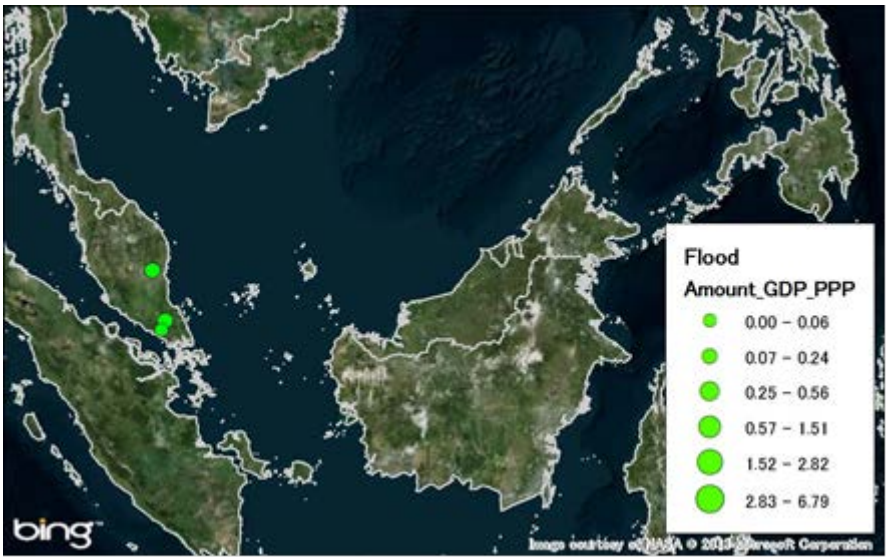


Figure 3.1.2 Flood Disaster: Economic Losses (% of GDP)

(2) Background

Characteristics of floods

The western part of the Malay Peninsula is mostly affected by the southwest monsoons, which has comparatively less rainfall amounts and experiences less flood damage. The eastern part of the Malay Peninsula and Malaysian Borneo (East Malaysia) are affected by the northeast monsoons, which carry high humidity in the rainy season. Floods are caused by storm rainfalls in the rainy season from October to May. In Sabah and Sarawaku in Malaysian Borneo of East Malaysia, floods caused damage in low-lying coastal areas. In Salawaku, the rainfall amount is larger and damage greater.

Notable examples of flood disasters

- The flood on December 2006 was the largest in 40 years, and caused disturbances like looting due to food shortages.
- In 2007, two (2) floods occurred. The flood of January 11 in the southern part of Malaysia caused economic losses of USD 600 million.
- The flood of December 7 in the central and the northeast part of Malaysia caused economic losses of USD 360 million.
- The flood of February 1, 2011 was caused by storm rainfall at the southernmost tip of the peninsula near Johor and its surroundings.

Frequently flooded areas

- East part of the Malay Peninsula
- Malaysian Borneo (East Malaysia), Sarawak of East Malaysia

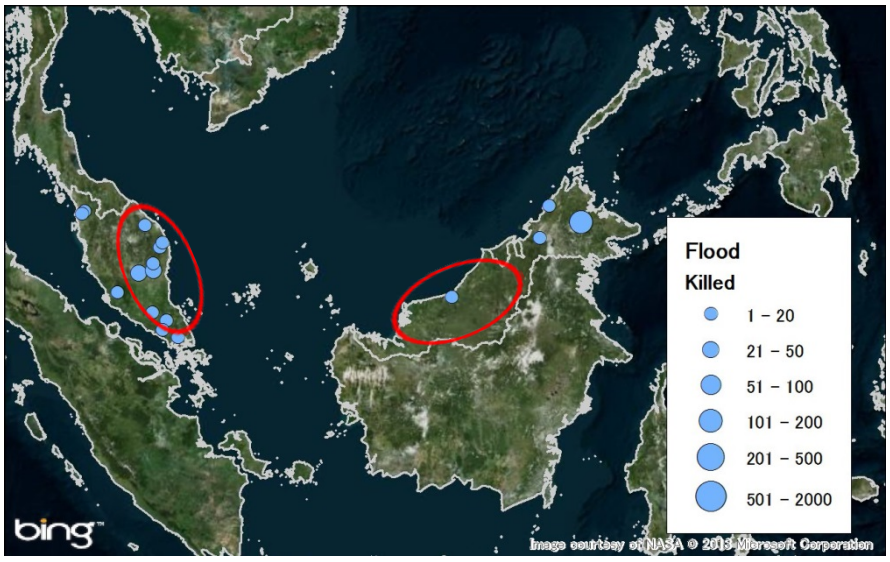


Figure 3.1.3 Hotspots of Human Loss

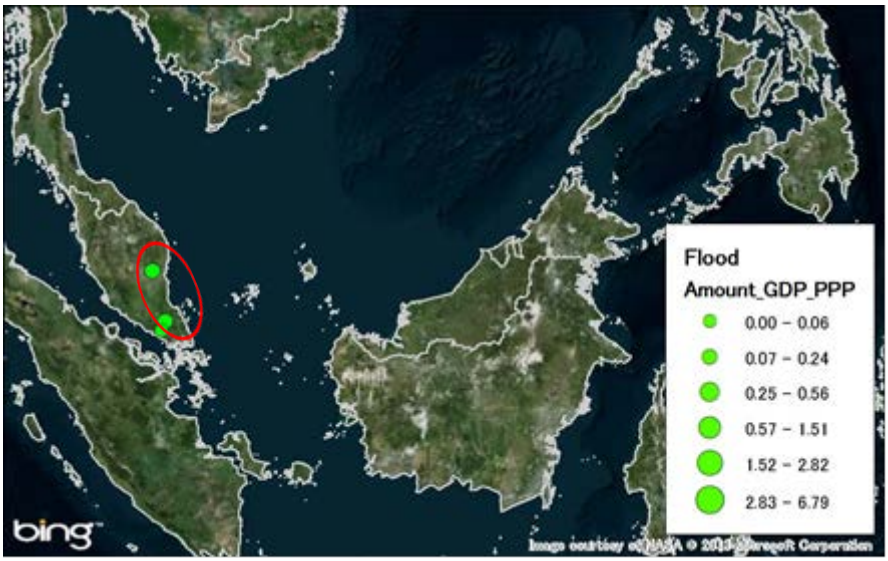


Figure 3.1.4 Hotspots of Economic Loss

(3) Efforts by the central government, local governments, and disaster management organizations

✓ National Security Division（NSD）

- NSD belongs to the office of Prime Minister.
- NSD coordinates all activities related to disasters.

✓ Disaster Management and Relief Committee（DMRC）

- DMRC acts as the secretariat of NSD.
- NSD fulfills the duties of the NSD when it coordinates relevant activities for disaster management.

- DMRC is set up at three levels: Federal Government, State Government, and District Government.
- DMRC on the federal government level formulates national policies and strategies for the relevant agencies for preparedness and prevention of disasters.

(4) Hazard and risk information sources

Disaster risk reduction organizations

Table 3.1.1 List of Organizations for Disaster Risk Reduction

Organization	Post	Web Address
National Security Council for Prime Minister's Department	Disaster Management	http://www.mkn.gov.my/mkn/default/article_e.php?mod=4&fokus=17
National Security Division (NSD)		
Disaster Management And Relief Committee (DMRC)		
Malaysian Meteorology Department (MMD)		http://www.met.gov.my/index.php?option=com_frontpage&Itemid=1
Malaysian Agricultural Research and Development Institute (MARDI)		http://www.mardi.gov.my/
University of Science-Malaysia (USM)		http://www.usm.my/
University of Malaya (UM)		http://www.um.edu.my/

Reports

Table 3.1.2 List of Reference Reports for Risk Analysis

Organization	Post	Title/ Web Address	Form
Asia Development Bank	Asian Water Development Outlook	Asian Water Development Outlook 2013;Asia-Pacific Water Forum	Report
		http://www.adb.org/publications/asian-water-development-outlook-2013	
World Bank	ASEAN Disaster Risk Management Initiative	Synthesis Report on Ten Asian Countries Disaster Risks Assessment; December 2012	Report
		http://www.unisdr.org/files/18872_asean.pdf	
The Nature Conservancy	ASEAN Disaster Risk Management Initiative	World Risk Report 2012;October 2012	Report
		http://www.ehs.unu.edu/article/read/worldriskreport-2012	
World Bank	Framework and Options for Implementation	Advancing Disaster Risk Financing and Insurance in ASEAN Countries: April 2012	Report
		https://openknowledge.worldbank.org/bitstream/handle/10986/12628/714530v20ESW0W0AN0appendices0June12.pdf?sequence=1	
International Development Research Centre	Economy and Environment Program for Southeast Asia (EEPSA)	Climate Change Vulnerability Mapping for Southeast Asia: January 2009	Report
		http://web.idrc.ca/uploads/user-S/12324196651Mapping_Report.pdf	
UNEP, GRID, UNISDR		Global Risk Data Platform	Web Map
		http://preview.grid.unep.ch/index.php?preview=map&lang=eng	

Abbreviations

DMRC	Disaster Management and Relief Committee
NSC	National Security Council for Prime Minister's Department
NSD	National Security Division
MARDI	Malaysian Agricultural Research and Development Institute
MMD	Malaysian Meteorology Department
UM	University of Malaysia
USM	University of Science –Malaysia

References:

1) Ministry of Foreign Affairs of Japan (2013): *"Information on Malaysia in Japanese", 04 2013.*
2) ADRC: *"Countries; Malaysia", Information on Disaster Risk Reduction of the Member*
3) ADRC: *"Malaysia, Flood,2006/12/23"*
4) AFP BB NEWS (2006): *"Expand of the Flood Damage in the Country, Malaysia in Japanese", December 27, 2006*
5) ADRC: *"Malaysia, Flood, 2007/01/14"*
6) BBC NEWS (2007): *"Floods force Malaysia evacuation", 14 January 2007*
7) ADRC: *"Malaysia, Flood, 2011/01/31"*
8) Relief Web; OCHA (2011):*"Malaysia, Help at hand for Johor flood evacuees" ,Report from IFRC,10 Feb 2011*

3.2 Earthquakes

(1) Risk

Earthquake disaster is not common in Malaysia. In recent decades, there have been two earthquakes recorded in the northeast area of the Borneo Island. They were earthquakes with a magnitude of 6.2 in 1976 and magnitude 4.5 in 1991. The earthquake in 1991 caused some casualties.

Figure 3.2.1 shows earthquake risk in the Asia-Pacific region. The zones indicate where there is a probability of 20% that degrees of intensity shown on the map will be exceeded in 50 years. This probability figure varies with time; i.e., it is lower for shorter periods and higher for longer periods. Most of Malaysia is categorized as I to V on the Modified Mercalli Scale and VI for northeast area of Borneo Island.

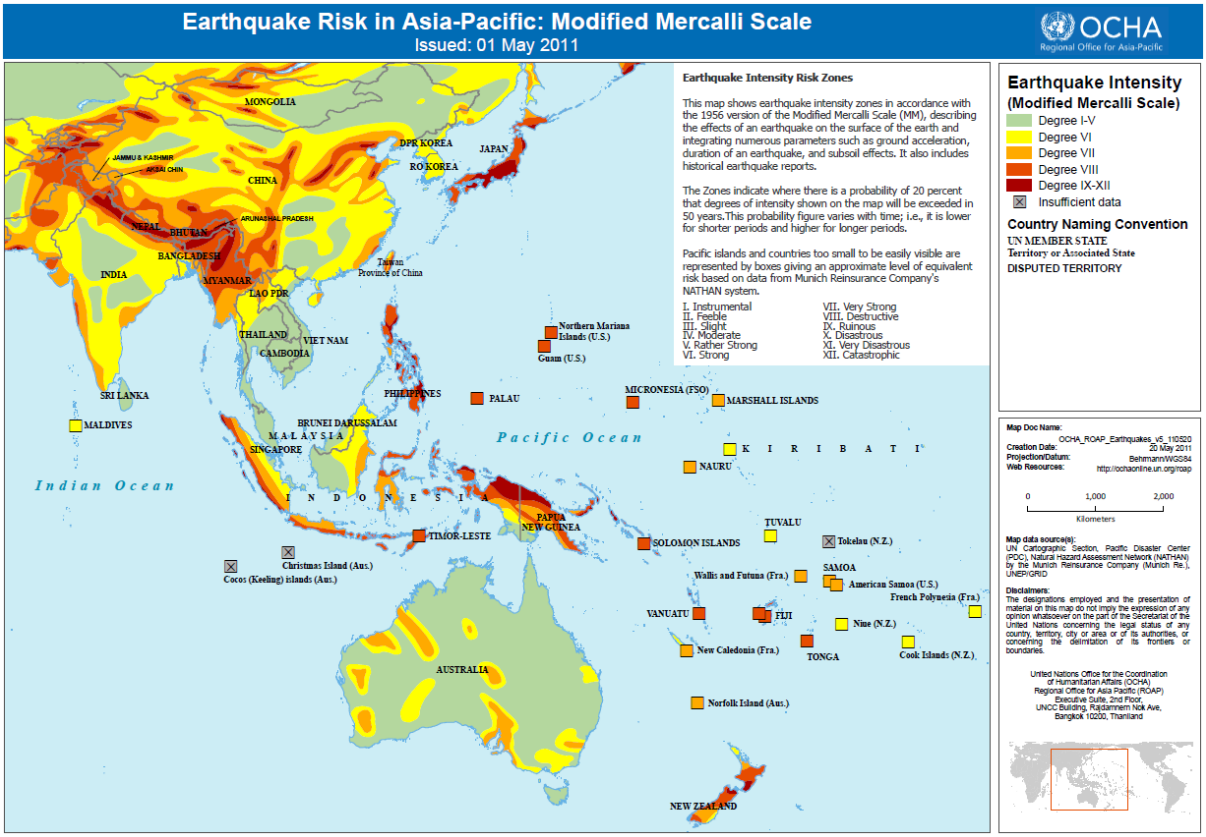


Figure 3.2.1 Earthquake Risk in Asia-Pacific

(2) Efforts by the central government, local governments, and disaster management organizations

The Malaysian Meteorological Department (MMD) is responsible for monitoring the occurrence of earthquakes and tsunamis in the country.

(3) Hazard and risk information sources

Malaysian Meteorological Department (MMD)
http://www.met.gov.my/index.php?lang=english

References:

1) EM-DAT: The OFDA/CRED International Disaster Database – www.emdat.be – Université Catholique de Louvain – Brussels – Belgium.
2) United Nations Office for the Coordination of Humanitarian Affairs (OCHA), Regional Office for Asia Pacific (ROAP) (2011): "Earthquake Risk in Asia-Pacific: Modified Mercalli Scale", Downloaded from http://reliefweb.int/sites/reliefweb.int/files/resources/map_613.pdf
3) Japan International Cooperation Agency (JICA) (2012): "Data Collection Survey on ASEAN Regional Collaboration in Disaster Management"

3.3 Tsunami

(1) Risk

Earthquake disaster is not common in Malaysia; however, the potential of a tsunami hitting Saba Sarawak has been considered.

The tsunami induced by the 2004 Sumatra Earthquake (M 9.1) caused around 80 missing or dead in Malaysia. It also caused USD 500 million in losses, corresponding to 0.18% of the GDP at that time.

Tsunami disaster is not frequent in Malaysia, but it is one of the major disasters.

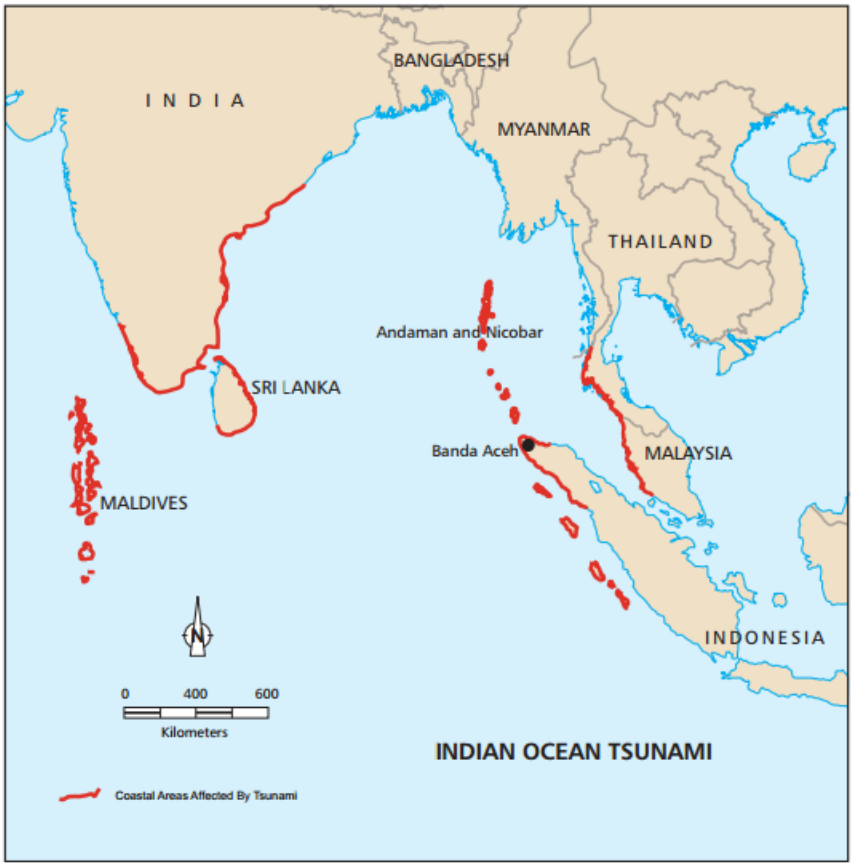


Figure 3.3.1 Coastal Areas Affected By Tsunami by 2004 Sumatra Earthquake

(2) Efforts by the central government, local governments, and disaster management organizations

<u>Disaster Management Information</u>

The Malaysian Meteorological Department (MMD) has developed a tsunami database. They have conducted seismic profiling and collected historical tsunami events around the Indian Ocean, South China Sea, and the western Pacific Ocean. MMD also simulated tsunami based on numerous source points (about 1,800 source points), and made a database of tsunami.

Early Warning and Transmitting Information

MMD is responsible for monitoring the occurrence of earthquakes and tsunamis in the country. For tsunami monitoring, modern equipment and a warning system have been installed in the Tsunami Monitoring Center at Kuala Lumpur. Recently, this center is focused on a possible tsunami disaster in Sarawak area should a strong earthquake occur along the Philippine Islands and the Celebes Sea. A Tsunami Monitoring Center has been constructed and manages warning siren towers in Sarawak.

MMD has established the Malaysian National Tsunami Early Warning Center (MNTEWC) to ensure the efficient dissemination of earthquake information and tsunami warnings over the Indian Ocean, South China Sea, and the Pacific Ocean.

A seismograph network, tsunami monitoring, and an early warning system have already been established (MNTEWS). Seventeen broadband seismographs, 191 GPS, 3 buoys, 23 sirens and other facilities have already been installed. MMD has already obtained simulation results of tsunami that may be generated in the Manila Trench.

Early warnings are disseminated through sirens, SMS, hotlines (between MNTEWC and national television), fixed lines (whenever necessary), telefax, websites, mass media broadcasting systems (mini studio at MNTEWC), and public announcements. ICT is also utilized to promote awareness and to disseminate early warnings to the public via Fixed-Line Disaster Alert System (FLAS). A separate system known as the Government Integrated Radio Network (GIRN) provides radio communication between responders during emergency or disaster. Disaster reporting is now more efficient with the centralized Malaysia Emergency Response System (MERS) emergency hotline.

(3) Hazard and risk information sources

Malaysian Meteorological Department (MMD)
http://www.met.gov.my/index.php?lang=english
Malaysian National Tsunami Early Warning Center (MNTEWC)

References:

1) EM-DAT: The OFDA/CRED International Disaster Database – www.emdat.be – Université Catholique de Louvain – Brussels – Belgium
2) Asian Development Bank (2005): “From Disaster to Reconstruction: A Report on ADB's Response to the Asian Tsunami”
3) Japan International Cooperation Agency (JICA) (2012): “Data Collection Survey on ASEAN Regional Collaboration in Disaster Management”

3.4 Volcanoes

(1) Risk

There are no volcanoes in Malaysia and no record of significant disaster caused by volcanic eruption in its history.

Major hazards caused by volcanic eruption are lava flow, pyroclastic flow, "Lahar" (volcanic mud flow), and volcanic ash fall. Lava flow is a flow of melted rock along the slope. Pyroclastic flow the flow of a mixture of hot dry masses of fragmented volcanic materials and volcanic gas along the slope. "Lahar" is originally an Indonesian term and is also called volcanic mud flow. It is the flow of a mixture of volcanic materials and water along the slope. These flows cause enormous damage to the side and foot of the volcano, but generally do not have an extended reach. However, volcanic ash fall often spreads widely via the trade winds or the westerlies, causing damage over an extensive area. Therefore, there is a possibility that a volcanic eruption in neighboring countries might wreak a volcanic ash fall in Malaysia.

Figure 3.4.1 shows the volcanoes in the Asia-Pacific region which erupted during the Holocene. The Holocene is a geological epoch from 10,000 years ago to the present. The map indicates that many volcanic eruptions have occurred in Indonesia, Philippines and other neighboring countries.

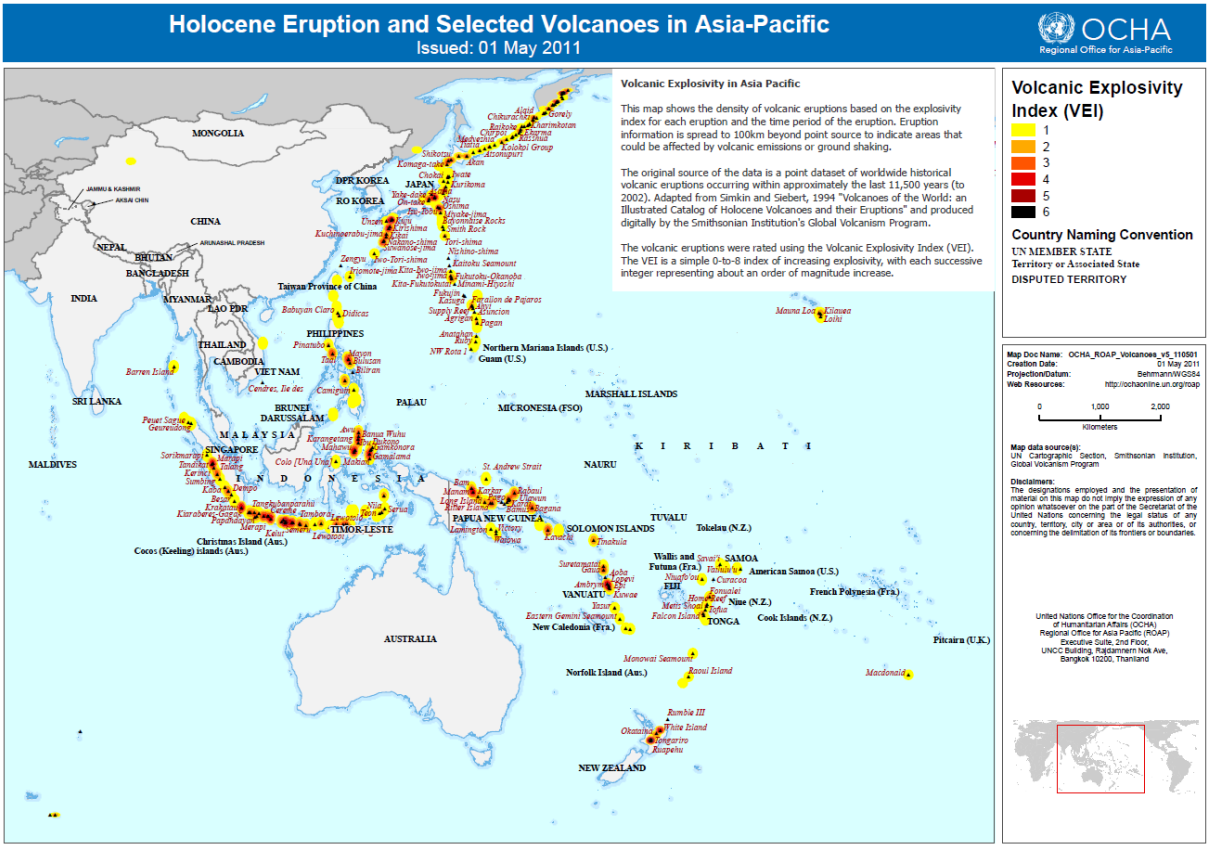


Figure 3.4.1 Holocene Eruption and Selected Volcanoes in Asia-Pacific

(2) Efforts by the central government, local governments, and disaster management organizations

There are no special measures focusing on volcanic disaster.

References:

1) Lee Siebert, Tom Simkin, and Paul Kimberly (2011): "Volcanoes of the World - Third Edition", Smithsonian Institute/University of California Press
2) EM-DAT: The OFDA/CRED International Disaster Database – www.emdat.be – Université Catholique de Louvain – Brussels – Belgium.
3) Japan International Cooperation Agency (JICA) (2012): "Data Collection Survey on ASEAN Regional Collaboration in Disaster Management"
4) United Nations Office for the Coordination of Humanitarian Affairs (OCHA), Regional Office for Asia Pacific (ROAP) (2011): "Holocene Eruption and Selected Volcanoes in Asia-Pacific", Downloaded from http://reliefweb.int/sites/reliefweb.int/files/resources/map_619.pdf

3.5 Typhoon (Meteorological) Disasters

(1) Risk

Malaysia is located between latitudes 2° and 7° to the north and belongs to a subtropical climate zone. Malaysia consists of west Malaysia in the southern part of the Malay Peninsula, Sabah in the northern part of Borneo Island, and east Malaysia including Sarawak. Malaysia is strongly influenced by the ITCZ (Intertropical Convergence Zone) and the monsoon with its climate divided into two seasons: the southwest monsoon season and the northeast monsoon season.

In addition to this, Malaysia is characterized by high levels of temperature and humidity. The amount of precipitation is also very high because the country faces the Indian Ocean and the South China Sea. The annual rainfall is from 2,000 to 3,000 mm in a large part of western Malaysia and nearly 4,000 mm in the northwest coastal area of Borneo Island.

As Malaysia is not frequently affected by tropical cyclones, only seven cases are found in its cyclone disaster records. Once in a few years, a tropical cyclone formed in the South China Sea passes over northern Malaysia and southern Thailand before going into the Bay of Bengal. Despite this, direct losses in the region have been very limited. On the other hand, near northern Borneo Island (Sabah province), torrential rain sometimes causes landslide disasters when a cyclone passes over or makes landfall in the area. This, however, is a very rare case.

Table 3.5.1 Tropical Cyclone (Storm) Disasters in Malaysia (1980~2012)

Year/Month	Cause	Killed	Total Affected
December 1996	Tropical Cyclone (Greg)	270	4,176
August 1997	Tropical Cyclone (Sita)	2	2,115
September 2000	Storm	-	500
March 2002	Local Storm	2	155
November 2004	Storm	-	1,000
November 2004	Storm	1	40,000

In Malaysia, the main meteorological disaster is flooding, while other disasters occur less frequently.

Table 3.5.2 Natural Disasters in Malaysia (EMDAT: 1984 ~ 2013)

Disaster	No. of Event	Killed	Total Affected	Damage (millions of U.S. $)
Drought	1	-	5,000	-
Flood (including flash flood)	31	186	551,058	1012.5
Landslide	5	168	291	0
Storm	6	275	47,946	53
Forest fires	4	-	3,000	302

(2) Background

The southern part of the Malay Peninsula is the downwind region of Sumatra, where the southwest monsoon is prevailing. Therefore, the southwest monsoon is much weaker in the southern part of the Peninsula. The country is not often directly affected by typhoons due to its location. Although in very rare cases, tropical cyclones may pass over or make landfall in the country.

In 1996, the Sabah province was heavily damaged by floods and landslide disasters induced by tropical storm Greg. Northern Borneo Island, where the Sabah province is located, can be impacted by typhoons or tropical storms. The province has both rainforests and low-lying areas as it is divided by the Crocker mountain range. Figure 3.5.1 shows the track of tropical storm Greg in December 1996. Tropical storm Greg made landfall at Keningau in the Sabah province, leaving 270 people dead. As a slow-moving tropical storm, Greg brought long-lasting rainfall and created favorable conditions for the continuous development of rain clouds in the mountainous regions through an orographic effect. It was speculated that a landslide may have occurred there.

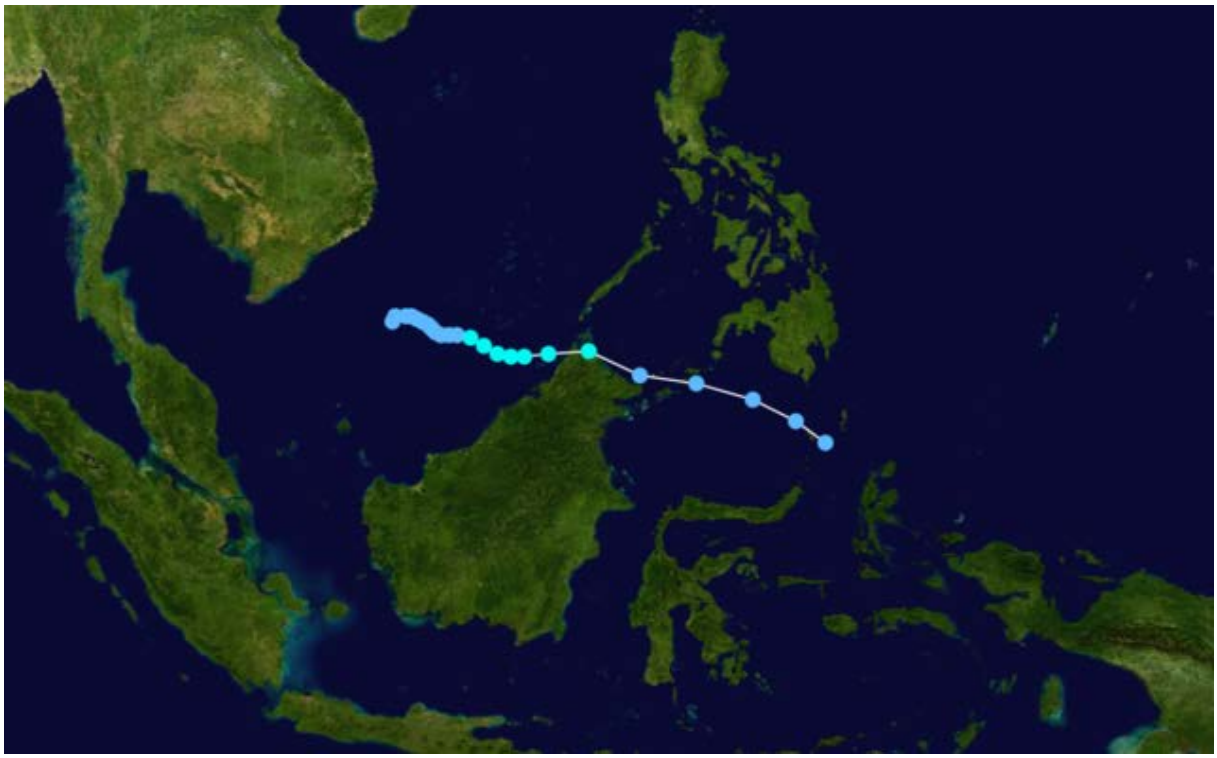


Figure 3.5.1 Track of Tropical Storm Greg (December 1996)

Meanwhile, the country is strongly impacted by the monsoon in the Malay Peninsula. The wind usually blows from the north or northeast between December and early March and from the south or southwest between June and September. Periods between them are called monsoon transition periods, which migrate slowly over the course of about two months.

(a) Northeast monsoon season (December to early March)
(b) Inter-monsoon period 1 (Late March to May)
(c) Southwest monsoon season (June to September)
(d) Inter-monsoon period 2 (October to November)

In December, when the ITCZ is located around the southern part of Malaysia, precipitation reaches its peak. In February and March, when the ITCZ moves southward around Java, there is relatively less precipitation. During the southwest monsoon season, heavy thunderstorms called "Sumatra Squalls" persist for about two hours.

The two major causes of floods in the Malay Peninsula are:

(a) Long-lasting rainfall with medium intensity in a relatively wide area; and
(b) Localized, short-lasting but very heavy rainfall.

Climate change vulnerability and impact on Malaysia are as follows.

- In the next 60 years, the average temperature in Malaysia is expected to rise by 0.6 to 3.4°C.
- In the next 60 years, the variation of precipitation is expected to range from -0.1 to +32%.
- In the next 100 years, sea level is anticipated to rise by 13 to 94 cm.

(3) Efforts by the central government, local governments, and disaster management organizations

The National Security Division (NSD) in the Prime Minister's Department is responsible for the coordination of all activities related to disasters.

The Disaster Management and Relief Committee (DMRC) carries out the responsibilities of the NSD in coordinating all activities related to disaster management. The DMRC is established at three different levels, i.e., at the federal, state, and district levels, whereby the NSD serves as the Secretariat. At the federal level, the DMRC is responsible for the formulation of national polices and strategies regarding the alertness and the preparation of various agencies involved in disaster management.

Meteorological service in Malaysia is the responsibility of the Malaysian Meteorological Department (MMD) under the Ministry of Science, Technology and Innovation (MOSTI). The Central Forecast Office (CFO) was established in the Headquarters Office in 1997. The CFO issues a comprehensive range of forecasting services to the general public and the mass media.

Table 3.5.3 Authorities of Malaysian Meteorological Service

Institution	Contact information
Malaysian Meteorological Department (MMD) http://www.met.gov.my/index.php?lang=english	TEL: +603 7967-8000 +603 7955-0964 E-mail : mmd@met.gov.my

The severe weather warnings issued by the CFO can be divided into the following types:

(a) Thunderstorm warnings; and,
(b) Heavy rainfall and strong wind warnings over land areas.

The CFO issues the following products.

Weather information	Content
Weather Warning	Strong Winds and Rough Seas Warning Severe Weather Warning Tropical Cyclone and Storm Warnings
Weather Forecast	General Weather Forecast State Weather Forecast District Weather Forecast Weather Forecast for Major Towns / Tourist Destinations
Marine Meteorological Forecast	Forecast for Fishermen Seven-day Weather, Wind, Wave Seven-day Tide Forecast Wave Model (WAM) Products
Seasonal and Long-Range Weather Outlook	Current El-Nino Condition Long-Range Weather Outlook
Aviation Meteorology	Weather Forecast Kiosk Aviation Briefing Terminal
Meteorological Observations	Satellite Picture Radar Image Surface Observation

Weather information	Content
Earthquake & Tsunami	Earthquake Information / Tsunami Warning Map of Latest Earthquake List of Recent Earthquakes
Weather Modification	Cloud Seeding Operations
Environmental Studies	Solar UV Index Particulate Matter (PM-10) Multigas Oxidant and Particle Photochemical Processes (OP3) Project
Climate	Malaysian Fire Danger Rating System Southeast Asia Fire Danger Rating System Monthly Rainfall Review
Agromet	10-day Agromet Bulletin Agroclimatic Analysis & Outlook Crop Zonation and Agroclimatic Classifications Plant Phenology Selected Crops

(4) Hazard and risk information sources

Hazard risk assessment results related to tropical cyclones (meteorological disasters) are as follows.

Table 3.5.4 Source of Information on Tropical Cyclones (Meteorological Disasters)

Institution	Literature name
Economy and Environment Program for Southeast Asia (2010)	Climate Change Vulnerability Mapping for Southeast Asia http://css.escwa.org.lb/sdpd/1338/d2-5a.pdf
UNISDR (2010)	Synthesis Report on Ten ASEAN Countries Disaster Risks Assessment http://www.unisdr.org/files/18872_asean.pdf

Abbreviation

ITCZ	Intertropical Convergence Zone
NSD	National Security Division
DMRC	Disaster Management and Relief Committee
MMD	Malaysian Meteorological Department
MOSTI	Ministry of Science, Technology and Inundation
CFO	Central Forecast Office

Explanation of terms

ITCZ: This is a low-pressure zone formed near the equator. In the lower levels (near the surface), the northeastern trade wind blows into the northern area from the ITCZ and the southeastern trade wind blows into the southern area from the ITCZ.

References:

1) Edwin ST Lai (2013): "Overview of Member's Summary of Reports 2012, TC-45 Appendix VI - AWG Working Reports Members, WMO, pp.12-13
2) Abustan etc. “The Vulnerability of Malaysia in Facing Flood Experiences” http://project-wre.eng.chula.ac.th/watercu_eng/sites/default/files/conference_14-150255/IA% 20Bangkok% 20Seminar% 2014% 20Feb% 202012.pdf

3) Malaysia Meteorological Department (Website):
http://www.met.gov.my/index.php?option=com_frontpage&Itemid=1

3.6 Landslides

(1) Risk

According to the EM-DAT database (http://www.emdat.be/), dozens of landslides have occurred with 26 recorded fatalities, 4 of which are after 2000.

Sites of landslides are distributed near Kuala Lumpur, the capital of the country, and some parts of Borneo Island are shown in the Figure below.

The recorded landslides are mud flow accompanied with slope collapse and building collapse caused by slope creep and rock slope movement.

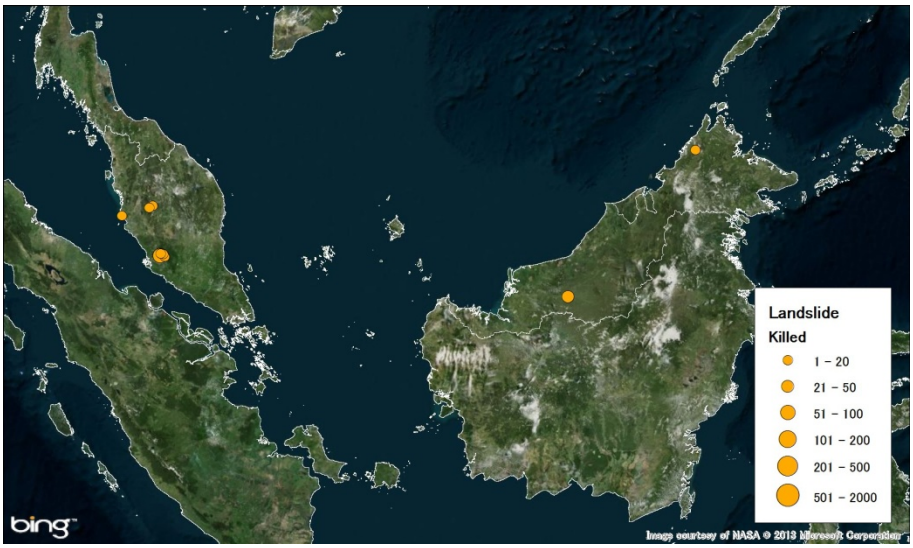


Figure 3.6.1 Landslide Damage: Human Losses

(2) Background

Notable example of landslides

A landslide occurred in Keninga, Sabah province Borneo Island with a 302 recorded fatalities. This landslide occurred during the heavy rain caused by a tropical storm, and the mud from collapse of a slope flowed along the river.

In December 1993, a landslide called the Highland Tower Disaster occurred in a concentrated urban and involved some buildings. There were 13 recorded landslides in those area from 1993 to 2008.[1)]

Frequent Landslide Areas

The areas affected by mud flow with large-scale slope collapse are distributed in the steep slopes of the mountains in Borneo Island. Land creep collapse occurs in populated hills near Kuala Lumpur. Rock slope movement is distributed along mountain roads.

Exposure related to climate change is distributed mainly the north part of Borneo island[1)].

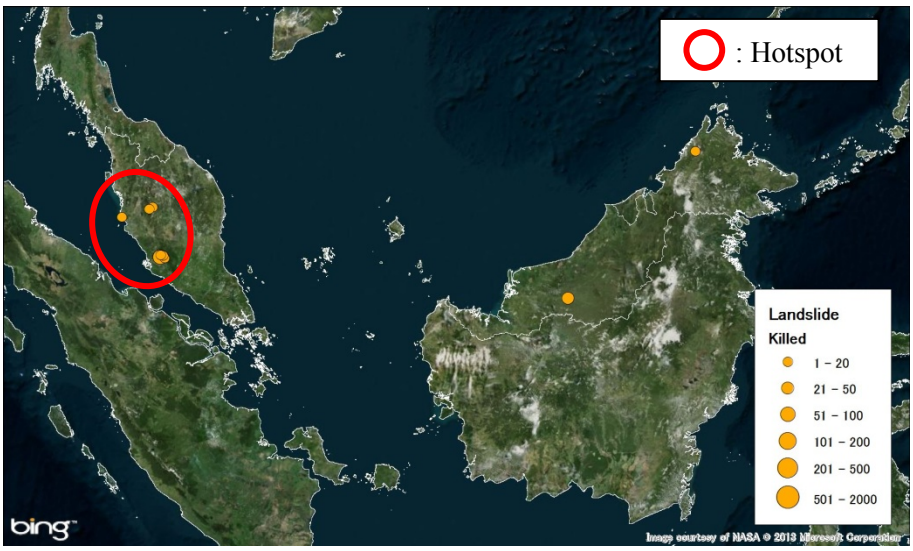


Figure 3.6.2 Hotspots of Human Losses

(3) Efforts by the central government, local governments, and disaster management organizations

✓ National Security Division (NSD)

- The NSD belongs to the office of Prime Minister.
- The NSD coordinates all activities related to disasters.

✓ Disaster Management and Relief Committee (DMRC)

- DMRC acts as the secretariat of NSD.
- NSD fulfills the duties of the NSD when it coordinates all relevant activities for disaster management.
- DMRC is set up at three levels: Federal Government, State Government, and District Government
- DMRC on the federal government level formulates national policies and strategies for the relevant agencies for preparedness and prevention of disasters

(4) Hazard and risk information sources

Jabatan Kerja Raya (JKR) operates the ISIS system, which is an integrated management system for landslides. This system has evaluated 3000 slopes in Sarawaku province, 300 slopes in Sabah province and 1000 slopes in the Malay Peninsula.

Reports

✓ Synthesis Report on Ten Asian Countries Disaster Risks Assessment; December 2012
ASEAN Disaster Risk Management Initiative, World Bank
http://worldbank.org/

- Summarizing natural hazard and risks in 10 ASEAN countries.
- World Bank reported risks with respect to countries and categories of disaster.
- Although the data is only available up to 2009, the report is well assembled.

✓ World Risk Report 2012; October 2012, Alliance Development Works, The Nature Conservancy
http://www.nature.org/

- Natural disaster risks in 173 countries in the world are ranked in this report.
- Intended period is from 2002 to 2011.
- Vulnerabilities are assessed with respect to categories.
- The report is effective for comparing countries.

✓ Advancing Disaster Risk Financing and Insurance in ASEAN Countries: April 2012, Framework and Options for Implementation, Volume 2: Appendix 1
https://www.gfdrr.org/

- Summarizing natural hazard and risks in 10 ASEAN countries.
- Intended period is from 1970 to 2011.
- Vulnerabilities are assessed with respect to categories.
- Summary of countries is well assembled.

✓ Climate Change Vulnerability Mapping for Southeast Asia: January 2009, Economy and Environment Program for Southeast Asia (EEPSA)
http://www.idrc.ca/

- Natural disaster risks in Southeast Asia are mapped in the report.
- The report contains information on risks in states/provinces.

Risk Map

✓ Global Risk Data Platform; UNEP (United Nations Environment Program)/GRID, UNISDR (United Nations Office for Disaster Risk Reduction)
http://preview.grid.unep.ch/

- Disaster sites of from all over the world are mapped.
- The map shows disaster hotspots.

References:

1) Low Tian Huat, Faisal Ali (2012): "Slope Hazard Assessment in Urbanized Area", The Electronic Journal of Geotechnical Engineering, Vol. 17, pp. 341 –352
2) Economy and Environment Program for Southeast Asia (EEPSEA) (2009): "Climate Change Vulnerability Mapping for Southeast Asia", p. 19

3.7 Predominant Natural Hazards

The records of natural disasters that have affected the country are classified based on the impacts and frequency of occurrence. The results have been plotted on the impacts - frequency matrix and the most prevailing hazards studied.

3.7.1 Employed Data

The disaster records compiled in Appendix A3 are employed in this study. The records for the last 30 years, namely from 1983 to 2012, are used because the number of events included in the database before 1980 is significantly less than after 1980. The records of large disasters through earthquakes, tsunamis and volcano eruptions before 1983 are also used because the frequencies of occurrence for these hazards are significantly lower than floods, cyclones and landslides.

3.7.2 Study Method

The "Damage Amount / GDP" and 'Number of Deaths" are used as indices to show the impacts of the disasters considered and 6 natural hazards will be studied and compared. At the beginning of the study, only the "Damage Amount / GDP" was used asan index because the results can be used for Area BCP planning. However, the scarcity of information related to damage amounts became clear as the study progressed. As the information on the "Number of Deaths" is substantial compared to the damage amount, the "Number of Deaths" has been added as anindex of impact.

The process of the study is as follows;

1) Based on the Damage Amount / GDP or Number of Death, each disaster is classified according to the ranking system outlined in Table 3.7.1,
2) The number of disaster events for each country is added by type of hazard and disaster rank, and then classified into Table 3.7.2 below,
3) The above information is then plotted on the impacts - frequency matrix by country,
4) As for earthquakes, tsunamis and volcanic hazards, if an event occurred before 1983 that was of the same (or higher) disaster rank as the maximum disaster rank recorded between 1983 to 2012, a point is plotted on the matrix which corresponds to the relevant disaster and frequency rank (=1).

Table 3.7.1 Disaster Rank and Damage

Disaster Rank	Damage Amount / GDP[1]	Number of Death
5	1.0% -	10,001 -
4	0.1% - 1.0%	1,001 - 10,000
3	0.01% - 0.1%	101 - 1,000
2	0.001% - 0.01%	11 - 100
1	- 0.001%	- 10

Table 3.7.2 Frequency Rank and Number of Events

Frequency Rank	Number of Events from 1983 to 2012	Average Frequency (Events / Year)
5	7 or more	1/5 -
4	4 to 6	1/10 - 1/5
3	2 to 3	1/15 - 1/10
2	1	1/30
1	Large Events occurred before 1983	-

3.7.3 Study Results

The following results are based on the available existing information. Not all the information relating the impacts by the disaster was collected, and the purpose of this study is not intended to evaluate the precise damage amount or number of death. The purpose of this study is to show the order of impacts by 6 natural hazards.

The impacts by landslide and flood are same in the view of death. The maximum number of death by cyclone is same order to landslide and flood, but frequency is low. The damage by tsunami was caused by 2004 Indian Ocean Tsunami and no older events are recorded.

[1] Gross domestic product based on purchasing-power-parity (PPP) valuation of country GDP, International Monetary Fund, World Economic Outlook Database, October 2012

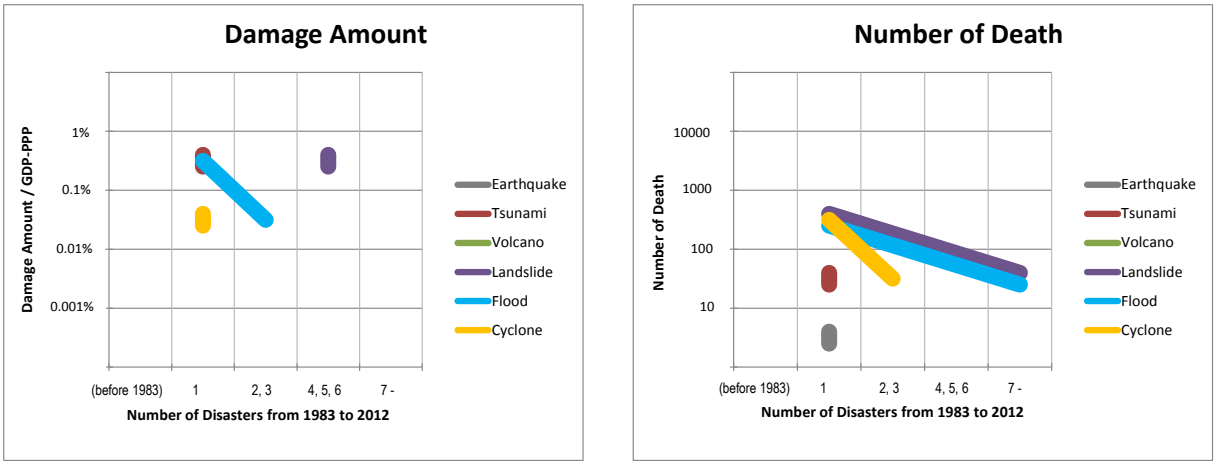


Figure 3.7.1 Impact of hazards in Malaysia

3.8 Existing Investigations and Studies

3.8.1 Methods and Scope of the Survey

This section reviews studies and research that have been conducted in the ASEAN region with a focus on natural hazards, risks, and vulnerability assessments. The target hazards are: floods, earthquakes, volcanoes, tsunamis, cyclones (typhoons)/meteorological disasters, and landslides. Information and study reports were reviewed from those that are available for the public and on the internet. The purpose of this section is to first gain an overview of the existing study results regarding hazard trends, encountering risks, and degrees of vulnerability throughout the entire ASEAN region as well as in each ASEAN member state. Another purpose it to produce a compilation of assessment reports of the region, which will be accessible as a reference for those who wish to plan an Area BCP.

Table 3.8.1 Methodology of Information Collection and Scope of Survey

Information Collected	Methodology	Scope of Survey
Existing studies and research	To collect existing studies and reports from public sources including the internet.	To summarize the studied hazards, areas, contents of hazard and risk analysis, vulnerability assessment of existing studies, and other research.

3.8.2 Outline of Collected Information and Data

Table 3.8.2 shows the outline of collected information and data. Summaries of existing studies and reports are compiled as data sheets in Appendix A4.

Table 3.8.2 Outline of the Collected Information and Data

Appendix A4 Subsection	Hazards	Outline
A4.1	Flood	Flood hazard, risk assessments, hazard maps, and vulnerability assessment have been conducted in ASEAN countries using data on rainfall, inundation areas, affected population, and monetary assessment. Hazard maps were produced with GIS tools. The

		usage of GIS tools for assessments is widely recognized and its usage has been explored to produce hazard maps. Some runoff analyses were conducted for selected areas. Limited information and data available for Brunei Darussalam.
A4.2	Earthquake	Many of the earthquake hazard studies in the area are probabilistic seismic hazard analyses (PSHA), not scenario earthquake studies. This is to quantify the probability of exceeding a specific ground-motion level at a site given all possible earthquakes. This methodology is descended from the Global Seismic Hazard Assessment Program (GSHAP). GSHAP was launched in 1992 by the International Lithosphere Program (ILP) with the support of the International Council of Scientific Unions (ICSU), and endorsed as a demonstration program in the framework of the United Nations International Decade for Natural Disaster Reduction (UN/IDNDR). Earthquakes are not equally distributed around the globe because of the generating mechanism. In the ASEAN region, many earthquakes are observed in and around Indonesia and Philippines, which are located in the convergent boundary (subduction) zone and fewer earthquakes are observed in and around Myanmar, which is in the transform boundary zone. There are fewer or no earthquakes observed in other regions. However, some regions are sometimes affected by the earthquakes which occur in neighboring countries. The northern regions of ASEAN countries are sometimes affected by the earthquakes that occur in the Yunnan province of China. A number of investigations and studies reflect this trend.
A4.3	Tsunami	There are only few investigations and studies about tsunami hazard or risk in the region, and most of them are compilations of past disasters. There is no probabilistic study as there is for earthquakes. There is a hazard map that encompasses several tsunami scenarios. There are studies targeting the Asia-Pacific area because tsunamis propagate in the sea. Large-sized tsunamis are caused by major earthquakes in the ocean. This is the reason that tsunamis are also not equally distributed around the globe. However, tsunamis affect a wider area than the ground-motion of earthquakes, as seen in the tsunami caused by the Sumatra earthquake on December 26th in 2004. Thus, tsunamis are sometimes studied in countries with few or no earthquakes.
A4.4	Volcano	Most volcanoes are also located along the convergent boundary (subduction) zone. This is the reason why volcanoes are also not equally distributed around the globe. Disasters caused by volcanic eruptions are lava flow, pyroclastic flow, lahar, and ash fall. Ash is scattered widely via the prevailing westerlies, but the other disaster types do not have an extensive reach. Regarding volcanic hazard, many investigations and studies are a compilation of areas affected by lava flow, pyroclastic flow, lahar, and ash fall from past volcanic eruptions for each volcano.
A4.5	Cyclone	Research on cyclone and meteorological hazard, and risk assessments have been

		conducted in ASEAN countries using data on tracks, damaged areas, and storm rainfall. The impact of climate change is also included in this research. Limited information and data available for Brunei Darussalam and Singapore.

3.8.3 Summary of Survey

(1) Floods

Some useful studies on flood hazard, risk, and vulnerability are publicly available presenting assessment results, case studies of countermeasures, as well as different methodological approaches. There are a few types of methodologies to assess risks and vulnerability including, for example, risks involving exposure to flooding events and population density. Vulnerability can be defined as a function of exposure, adaptive or coping capacity, and land-use etc. There are slightly different combinations of these factors with different studies for use. Therefore, these concepts must be defined in advance to plan a methodology for an assessment, in terms of which definitions are to be used in a certain analysis.

A summary of existing studies and reports is shown in Table 3.8.3 by country. A list of collected existing studies and reports is shown in Table 3.8.4.

Table 3.8.3 Summary of Existing Studies and Reports by Country: Flood

Country/Region	Summary of Existing Studies and Reports
ASEAN	There are a few reports that study natural disasters for ASEAN and the Pacific regions at large in recent years. Disaster risks are assessed by scenario, exposure, vulnerability, damage, and loss. An assessment framework is also sought to give an overview of risks, hazard and vulnerability.
Malaysia	The Ministry of Natural Resources and Environment is taking initiative on flood management. The hazard significance of flood is high in terms of population affected, extent of area, duration, and socioeconomic damage. The assessments are conducted with data which include monetary damage, flood frequency, and magnitude. Flood management includes structural and non-structural measures.

Table 3.8.4 Existing Studies and Research: Flood

No	Country	Province/ City	Coordinates		Risk Assessment		Vulnera-bility Assess-ment	Organiza tion Produced	Document No. in Appendix A4.1
			Latitude	Longitude	Area	Popu-lation			
1	ASEAN	-	-	-	○	○	×	UNISDR/ WB	FL_001
2	Malaysia	Georgetown	5.364588	100.3109	○	○	×	ADB	FL_002

Note: ○ indicates the existence of information. × indicates that information was not found in public resources.

(2) Earthquakes

Useful information and studies on earthquake hazard, risk, and vulnerability were collected from resources available in the public domain including websites. The information and studies include methodologies with analysis and assessment.

There is no standardized or authorized methodology for risk and vulnerability assessment. Therefore, the methodology should be selected or updated in accordance with the purpose when risk and vulnerability assessments are required.

A summary of existing studies and reports is shown in Table 3.8.5 by country. A list of collected existing studies and reports is shown in

Table 3.8.6.

Table 3.8.5 Summary of Existing Studies and Reports by Country: Earthquake

Country/Region	Summary of Existing Studies and Reports
ASEAN	There are natural hazard assessment reports for ASEAN region created by international organizations like World Bank etc. They summarize frequency, vulnerability, loss, and others subject for each disaster. Some reports describe the methodology and assessment points/items.
Malaysia	There is no record of earthquake disaster in Malaysia and no investigations or study limited to this country and its regions was found.

Table 3.8.6 Existing Studies and Research: Earthquake

No	Country	Province/ City	Hazard Assessment			Risk Assessment		Vulnera-bility Assess-ment	Organi-zation Produced	Document No. in Appendix A4.2
			Scena rio	Probabi listic	Method ology	Human Loss	Econom ic Loss			
1	Worldwide	-	×	○	×	○	○	○	UNISDR	EQ_001
2	ASEAN	-	×	○	×	×	×	×	GSHAP, USGS	EQ_002

(3) Tsunamis

Useful information and studies on tsunami hazard, risk, and vulnerability were collected from resources available in the public domain including websites. The information and studies include methodologies with analysis and assessment.

There is no standardized or authorized methodology for risk and vulnerability assessment. Therefore, methodology should be selected or updated in accordance with the purpose when risk and vulnerability assessment are required.

A summary of existing studies and reports is shown in Table 3.8.7 by country. A list of collected existing studies and reports is shown in Table 3.8.8.

Table 3.8.7 Summary of Existing Studies and Reports by Country: Tsunami

Country/Region	Summary of Existing Studies and Reports
ASEAN	Tsunami induced by the Sumatra earthquake on December 26, 2004 caused major damage to ASEAN countries. The disaster is summarized by organizations like ADB.
Malaysia	There is no record of tsunami disaster in Malaysia and no investigations or studies limited to this country and its regions were found.

Table 3.8.8 Existing Studies and Research: Tsunami

No	Country	Province/ City	Hazard Assessment			Risk Assessment		Vulnera-bility Assess-ment	Organi-zation Produced	Document No. in Appendix A4.3
			track record	Scena rio	Metho dology	Human Loss	Economic Loss			
1	ASEAN	-	○	×	×	○	○	×	ADB	TN_002

(4) Volcanoes

Useful information and studies on volcanic hazard, risk, and vulnerability were collected from resources available in the public domain including websites. The information and studies include methodologies for analysis and assessment.

There is no standardized or authorized methodology for risk and vulnerability assessment. Therefore, methodology should be selected or updated in accordance with the purpose when risk and vulnerability assessment are required.

A summary of existing studies and reports is shown in Table 3.8.9 by country. A list of collected existing studies and reports is shown in Table 3.8.10.

Table 3.8.9 Summary of Existing Studies and Reports by Country: Volcano

Country/Region	Summary of Existing Studies and Reports
ASEAN	UNOCHA summarized the scale of the explosion of volcanoes around the Asia-Pacific region using the Volcanic Explosivity Index (VEI).
Malaysia	There is no record of volcanic disaster in Malaysia and no investigations or studies limited to this country and its regions were found.

Table 3.8.10 Existing Studies and Research: Volcano

No	Country	Province/ City	Hazard Assessment			Risk Assessment		Vulnera-bility Assess-ment	Organi-zation Produced	Document No. in Appendix A4.4
			Track record	Scena rio	Metho dology	Human Loss	Economic Loss			
1	ASEAN Asia-Pacific	-	○	×	×	×	×	×	OCHA -ROAP	VE_001

(5) Cyclone (Typhoon) and Meteorological Hazard

"Cyclone" is a term to describe many types of of low pressure systems, of which tropical cyclones/typhoons are the main types creating disasters in the ASEAN region. Under the framework of WMO, leading countries implement monitoring/detection of tropical cyclones on a regional basis. Table 3.8.11 indicates the responsible territory allocated to ASEAN members and its leading country.

Table 3.8.11 Members of WMO Tropical Cyclone Committee

	Warning Zones	Members（ASEAN）	Leading Country
Western North Pacific Ocean and South China Sea	0° - 60°(N) 0° - 100°(E)	Cambodia, Lao PDR, Malaysia, Philippines, Singapore, Thailand, Vietnam	Japan
Bay of Bengal and the Arabian Sea	5°S - 45°(N) 30°E - 90°(E)	Myanmar, Thailand	India
South Pacific and South-East Indian Ocean	0°-50°(S) 90° - 170°(E)	Indonesia	Fiji

The dates and information utilized in this report have been acquired from various reports on the studies and research conducted on tropical cyclones and meteorological hazards published on the internet. Collected documents include evaluation results of hazards/risks, as well as their evaluation methods. With regard to tropical cyclones/typhoons, a meteorological organization of each country compiles a summary on the damage situation, including the number of casualties or loss of human lives, and the estimated amount of damage, etc.

A summary of existing studies and reports is shown in Table 3.8.12 by country. A list of collected existing studies and reports is shown in Table 3.8.13.

Table 3.8.12 Summary of Existing Studies and Reports by Country: Cyclone and Meteorological Hazard

Country/Region	Summary of Existing Studies and Reports
ASEAN	Study reports on natural disasters in the whole ASEAN region are available.
Malaysia	Malaysia is not directly affected by tropical cyclones. However, storms associated with typhoons generated in the Western Pacific and the South China Sea occur in the northern area of Malaysia. In the tropical region, convective activity is intensified at approximately ten-day intervals, which sometimes bring a large amount of precipitation.

Table 3.8.13 Existing Studies and Research: Cyclone and Meteorological Hazard

No	Country	Province/ City	Coordinates		Risk Assessment		Vulnera-bility Assess-ment	Organiza tion Produced	Document No. in Appendix A4.5
			Latitude	Longitude	Area	Popu-lation			
	No data								

(6) Landslides

A summary of existing studies and reports is shown in Table 3.8.14 by country. A list of collected existing studies and reports is shown in Table 3.8.15.

Table 3.8.14 Summary of Existing Studies and Reports by Country: Landslide

Country/Region	Summary of Existing Studies and Reports
ASEAN	There have been a few reports that study landslides for ASEAN and the Pacific region at large in recent years. Disaster risks are assessed by scenario, exposure, vulnerability, damage, and loss. An assessment framework is also sought to give an overview of risks, hazard, and vulnerability.
Malaysia	Hazard areas are distributed in the center of the peninsula, which includes the suburbs of the capital Kuala Lumpur. The number of landslide per year and total number of deaths are high, with deaths per year being third in ASEAN. Economic loss data is unconfirmed. The amount of damage caused by the Selangor disaster in November 2003 recorded losses of 836 million RM (almost 13.7 billion yen). Exposure is distributed in the northeastern part of the peninsula and eastern part of Borneo. As a large-scale hazard map has been prepared, awareness of landslides is relatively high. Preparation of an early warning system is ongoing, although its main target is flooding.

Table 3.8.15 Existing Studies and Research: Landslide

No	Country	Province/ City	Coordinate		Risk Assessment		Vulnera-bility Assess-ment	Organization Produced	Document No. in Appendix A4.6
			Latitude	Longitude	Area	Popu-lation			
1	ASEAN				○	○	×	UNISDR/World Bank	LS-006
2	ASEAN				○	○	×	EEPSEA	LS-013
3	Malaysia	Entire Country	3.148	101.689	○	○	×	JICA	LS-018
4	World				○	○	○	WB	LS-007

Indicates Capital

References:

Flood

1) Arief Anshory Yusuf & Herminia Francisco (2009). Climate Change Vulnerability Mapping for Southeast Asia, Singapore: EEPSEA

2) Ministry of Natural Resources & Environment, (2007) Flood and Drought Management in Malaysia: Ministry of Natural Resources & Environment: Kuala Lumpur
3) Ministry of Natural Resources & Environment, (2010) Flood Management – Programme and Activities: Ministry of Natural Resources & Environment: Kuala Lumpur
4) Mohd. SafieMohd. et al, (2009) GIS Analysis for flood Mapping: Case Study; Segamt, Johor West Malaysia University, Indonesia, Jakarta . (Unpublished)
5) Velasquez, Jerry et al (ed.) (2012). Reducing vulnerability and exposure to disasters: Asia-Pacific disaster report 2012, ESCAP/UNISDR AP
6) World Bank (2011). Advancing Disaster Risk Financing and Insurance in ASEAN Countries: Framework and Options for Implementation, Washington: Global Facility for Disaster Reduction and Recovery
7) World Bank, UNISDR (2010). Synthesis Report on Ten ASEAN Countries Disaster Risks Assessment.

Earthquake

1) Mark Petersen et al. (2007). , Documentation for the Southeast Asia Seismic Hazard Maps, USGS
2) UNISDR (2009). Global assessment report on disaster risk reduction, Risk and poverty in a changing climate

Tsunami

1) ADB (2005). From Disaster to Reconstruction: A Report on ADB's Response to the Asian Tsunami

Volcano

1) OCHA -ROAP (2011). Holocene Eruption and Selected Volcanoes in Asia-Pacific

Cyclone (Typhoon) and Meteorological Hazard

1) ESCAP/WMO Typhoon Committee. (http://www.typhooncommittee.org/)
2) WMO National Meteorological or Hydrometeorological Services of Members (http://www.wmo.int/pages/members/members_en.html)
3) WMO (2010). First Meeting of the Task Team on “Meteorological, Hydrological and Climate Services for Improved Humanitarian Planning and Response”, WMO Headquarters, Geneva, Switzerland (31 August - 2 September, 2010)

Landslide

1) World Bank, UNISDR (2010). Synthesis Report on Ten ASEAN Countries Disaster Risks Assessment

Figure 3.8.1 Existing Study on Natural Hazards in Malaysia

Chapter 4 Industrial Agglomerated Areas and Investment Risk

4.1 Historical Evolution of Industrial Agglomerated Areas

Malaysia's economy recorded rapid growth from 1970 to 1997. With the exception of a brief recession in the mid-1980s, it achieved high rates of sustained growth until it succumbed to the Asian Crisis in 1997. This notable economic expansion was largely led by manufacturing and industry. The first industrial estate was developed in Petaling Jaya, Selangor near Kuala Lumpur in 1954 to initiate the process of industrialization. This process continued in the1960s, when Malaysia's policy makers realized the importance of developing industrial clusters and made plans to do so. By 1970, a further nine industrial estates had been created on the west coast of peninsular Malaysia. The number increased to 70 in 1980 and exceeded 100 by 1983.

In an effort to emulate the manufacturing success of Singapore, Hong Kong, and of the Export Processing Zone (EPZ) in Taiwan, Penang state leaders pushed hard to set up Free Trade Zones (FTZ) in the country. In 1971, Malaysia promulgated a law on FTZs, which called for the development of such zones to be managed by the state governments. The Penang Development Corporation was established in 1971 and subsequently founded the Bayan Lepas FTZ, still one of the most important FTZs in the country. Thereafter, two other state development corporations (SDCs) also established FTZs and industrial enclaves. These were: Selangor, which established Sungai Way, Ulu Kelang, and Telok Panglima FTZs in 1972, 1973, and 1975, respectively; and Malacca, which established the Batu Berendam and Tanjung Keling FTZs in 1973 and 1975. These FTZs were successful from the start due to strong infrastructure and a favorable business environment, which supported Malaysia's emergence as an exporter of semiconductors and electronic components.

Currently, Malaysia has over 300 industrial parks developed by both private developers and government agencies, mainly the SDCs, Regional Development Authorities, and port authorities. Most of the industrial parks built over the past 10 years in the Klang Valley and its surroundings have been developed by the Selangor State Development Corporation (PKNS). Selangor has the largest concentration of industrial parks in the country, and attracts the largest number of approved investments. From January to September 2012, Selangor industrial parks attracted investments worth RM 7.7 billion.

Malaysia plans to become an industrialized, high-income nation by 2020. The manufacturing sector, particularly the production of high value-added products in hi-tech industries, has been identified as the catalyst for the industrial growth needed to realize this plan. As such, the development of high-end industrial parks forms an essential part of this effort and the development of parks is set to continue.

4.2 Recent Trends and Japanese Investment

Economic relations between Japan and Malaysia have steadily grown over time. Malaysia has relied heavily on Japan, not only for trade, but also for investment, technology transfer, services, aid, and even education. Japan replaced Europe's as Malaysia's principal trade partner in the 1970s and its trade surplus has substantially grown since the 1988 yen appreciation, as Japanese corporations shifted production plants to Southeast Asia to cut production costs. Malaysia's political stability, business-friendly regulations, and access to Southeast Asian markets were all attractive to Japanese firms, and remain so today. However, Japanese investments have shifted from focusing on raw materials to labor-intensive industries to take advantage of Malaysia's export orientation policy and skilled but relatively low-cost labor.

Since the 1970s, the government has offered incentives to encourage firms to invest in the country's poorest regions. Despite this, some 80% of Japanese manufacturing companies operating in Malaysia are located in the three most developed states. Roughly 25% of Japanese manufacturing firms operate in FTZs, while the rest are based in industrial estates. Most Japanese investment is located in the western states of peninsular Malaysia, with the greatest concentration in Selangor, where some 50% of Japanese manufacturing firms are located. Most firms have established their plants in the Petaling and Hulu Langat districts. Johor state is the second most important destination for Japanese firms, where some 20%, of Japanese manufacturers are based. Penang is home to about 10% of Japanese manufacturing firms. Negri Sembilan hosts around 5% of Japanese manufacturers, and Malacca some 4%. Larger firms are concentrated in Selangor (with a per capita GDP 63% higher than the Malaysian average) and Penang, as infrastructure in these areas is most developed and skilled labor more available.

4.3 Observations from Data Collection

Data collection and industrial park research in Malaysia proved to be among the most challenging for all countries covered in this report. There is very little public information available on mature parks established in the 1950s to mid-1990s. Most of these have been full for decades and are run by SDCs that have no desire to provide information to potential investors, as they have no need to attract investment. Indeed, the SDCs actively discourage seeking information on such parks. These parks do not have websites or marketing material and are not generally labeled on Google Earth. Given that over 200 parks were founded in this timeframe, this means that there is little to no public information available on the majority of parks in Malaysia. Beyond limited information on location and, in some cases, a few established tenants, information on these parks is scarce, especially details about infrastructure and facilities. Industrial lots in these parks are largely privately owned rather than rented, hence park operators do not have financial information, facilities detail, availability data, contact details or other information about tenant firms. Further, most operators of these parks are unwilling to share information. A few Malaysian real-estate websites provide listings of available lots or vacancies within these parks, but most of this information is out of date and only in Malay.

More recently established industrial parks, generally those founded in the mid-1990s to the present, are more prepared to engage with foreign investors and provide information about these parks. These parks typically have fairly well-maintained websites and marketing material that provides details on park infrastructure and facilities. Some of these park operators or their marketing teams have agents appointed to address inquiries from foreign investors, many of whom speak English.

The Malaysian Investment Development Authority (MIDA) provides effective and prompt attention to information requests regarding industrial parks, both through email and telephone. MIDA maintains regional offices that have information on state-specific incentives available foreign investors. Nonetheless, MIDA is focused on promoting the latest industrial parks, both those that have been recently built and those that are under construction. As such, they have little information to offer regarding mature industrial parks.

The level of development of Laos' ten economic zones varies significantly, and only a few are equipped to communicate with and support foreign investors. Only Vita Park and Savan-Seno Site C run their own websites. Most economic zones did not have staff that spoke foreign languages, do not have marketing teams, and were very unwilling to provide information about their parks. Some information in English is available on the SNCSEZ website on location, land tenure, developer, land leasing fees, electricity and water fees, and investment projects for most SEZs. However, through our conversations with park operators it became clear that much of the information available online is inaccurate. For instance, descriptions of park infrastructure often list infrastructure that is planned as if it already exists, even though there is no clear funding or timeline for this infrastructure to be built. Our research suggests that only VITA Park and Savan-Seno SEZ can presently provide quality service and support to foreign investors.

4.4 General Investment Risk

(1) Political Risk

Malaysia has historically enjoyed a high degree of political stability under the Barisan Nasional (BN) coalition, which has ruled the country since independence. However, since the end of 2007, the BN has faced the challenge of addressing growing ethnic tension in the political sphere amid popular discontent over the country's pro-Malay policies. The government of former Prime Minister Abdullah Ahmad Badawi saw his stance weakened amid concerns over government corruption, marginalization of ethnic minorities, and inflation in 2007 and 2008. This culminated in the BN losing its two-thirds majority in parliament in the 2008 general election for the first time.

Following a subsequent leadership change, the BN has been led by current Prime Minister Najib Razak. Although the BN was able to hold onto power in the general election held on 5 May 2013, it failed to win the popular vote for the first time in 44 years, exposing sharpening divisions within the country. The main challenge now for the three-party opposition alliance - the People's Alliance (Pakatan Rakyat, PR), led by Anwar Ibrahim and consisting of Anwar's Parti Keadilan Rakyat, the

ethnic Malaysian-Chinese Democratic Action Party (DAP), and the conservative Parti Islam SeMalaysia (PAS) - is to maintain its gained momentum. The opposition parties cater to widely differing constituencies are united mainly by their shared desire to remove the BN.

The poll outcome is likely to lead to intensifying disagreement within the BN's leading party, the United Malays National Organization (UMNO), over how to respond to its reduced mandate based on voters' approval rather than seats held, and particularly the growing disillusionment among ethnic Chinese Malaysians. Widespread anger over perceived marginalization of ethnic minorities, existing economic disparities, and government corruption are some of the issues that took votes away from the BN. During its next five-year term, the BN is likely to continue on the same economic and development path and push for creation of 3.3 million jobs by 2018, lower private and corporate income tax, and improve public transportation. Given this, the political outlook is stable over the next five years, but beyond that timeframe foreign investors need to be prepared for potential changes in government and investment policies.

(2) Economic Risk

Malaysia is one of Southeast Asia's most successful economies, with per-capita income now above USD 10,000. The Asia crisis, to which authorities responded in a non-conformist fashion (capital controls and expansionary fiscal policies), briefly interrupted a decade of 9%-plus annual growth. Since then, the financial sector has been greatly strengthened, the investment environment gradually liberalized, the fixed exchange rate abandoned, and most capital controls eliminated. Growth has remained steady, although it downshifted to 5.6% annually during 1999–2008. Good infrastructure, rule of law, political stability and a well-educated labor force are notable assets. To preserve the country's competitiveness, the government has announced a 10-year investment plan that aims to mobilize USD 444 billion in investment. From a more fundamental perspective, deeper deregulation and a more open and flexible labor market are required to strengthen the investment climate, promote innovation, and foster entrepreneurship for long-lasting growth.

Robust investment growth, driven by a combination of private-sector capacity expansion and government-financed infrastructure investment, and strong private consumption anchored in stable incomes and low inflation are two main pillars of the Malaysian economy. Net exports, whose contribution to growth has been traditionally large, have lost luster in recent quarters amid sluggish external demand and do not look poised for a meaningful recovery in the near term. Nonetheless, real GDP growth of almost 5.0% in 2013 is widely anticipated.

In the private sector, risks of expropriation are very low and government interference in foreign contracts is generally unlikely. Malaysia is particularly keen to attract foreign investment in high-value export-oriented industries such as electronics, machine manufacturing and medical devices. Moreover, it is intent on developing information technology and other research-intensive sectors for the development of the Multimedia Super Corridor, as well as the country's business processing and back office operations. Investment in these priority sectors is incentivized by faster

provision, approval and renewal of the necessary licenses. Corruption remains a risk, but is most prevalent in government contracts for infrastructure projects and defense.

(3) Legal Risk

Malaysia's legal system is based on English Common Law, and is pro-business in its outlook. Although there have been accusations of political influence being brought to bear in some sensitive criminal and civil legal cases, the local judiciary and legal profession are generally considered to be independent. Foreign investors can be confident that commercial cases will by and large be handled independently, and that redress to a higher court is effective.

The principal entities available in Malaysia to foreign investors are sole proprietorships, partnerships, locally incorporated company, and a foreign company registered under the Companies Act 1965. Any two or more persons may incorporate a company and three types of company may be formed. The most popular is a company limited by shares, where the personal liability of members is limited to the amount, if any, unpaid on their shares. A company may be private or public. A foreign company may operate a branch in Malaysia instead of forming a local company. Prior approval of the Ministry of International Trade and Industry must be obtained, after which the branch must register itself with the Register of Companies before commencing business in Malaysia. The Ministry encourages foreign companies doing business in Malaysia to incorporate local subsidiaries. As such, the Ministry does not permit companies to register branches in Malaysia unless these companies have been awarded government or quasi-governmental contracts. It is a fairly easy process to establish a business in Malaysia, taking an average of three procedures and six days.

(4) Tax Risk

Malaysia's tax system is relatively well developed and represents a transparent framework that contributes to a positive environment for businesses. The system is based on the UK and Australian models. The corporate tax rate is 25% and was last changed in 2009 when it was decreased by 1%. Given that tax revenue increased by 12% in 2012, the government has scope to reduce corporate taxes, a move Prime Minister Najib is considering. The government is unlikely to impose windfall taxes. Any tax changes are likely to be motivated by regional competitiveness, such as the proposal in July 2012 to increase shipping quotas for tax free palm oil by two million tonnes, announced after Indonesian palm oil had out-sold Malaysian oil. Incentives are an integral part of the tax system and the existence of a wide range of tax holiday schemes and reductions, particularly at export-oriented high-tech industries, serve to make the country more competitive. Malaysia also has a wide tax treaty network of over 70 treaties, meaning possible further reductions to tax rates.

(5) War Risk

War risks in Malaysia are low, and generally unlikely to impact business continuity. Malaysia has a number of disputed maritime borders with Indonesia. The most significant is Ambalat, which began in 1979 when Malaysia published a map showing a large portion of the area within its territory. The

dispute escalated in 2005 after oil reserves were found in Ambalat. Both countries subsequently deployed naval forces to guard the area. In 2008, Indonesia's Parliament lodged a protest against alleged territorial violations by Malaysian troops in the area. Both countries have awarded exploration rights to companies there. Despite this, military conflict over Ambalat is unlikely, and commercial vessels in the disputed area are unlikely to be harassed by naval vessels. In 2002, a previous maritime dispute between the two countries concerning the Sipadan and Ligitan Islands was resolved by the International Court of Justice in Malaysia's favor. It is likely that the Ambalat dispute will also be diplomatically resolved.

Another maritime dispute primarily between Malaysia, the Philippines, Vietnam and China concerns the Spratly Islands. Malaysia is likely to work towards a diplomatic reconciliation of this dispute. During past flare ups of the dispute, Malaysia avoided escalating rhetoric or military posturing, although it has the highest number of oil and gas wells in the disputed area of all the competing claimant nations.

Another issue is occasional disputes with Singapore, including over water provision. These are usually resolved at the prime ministerial level, and over the past three years there has been continued improvement in bilateral relations, making any military confrontation unlikely.

(6) Terrorism Risk

There is currently no evidence of active militant groups operating in Malaysia, primarily as authorities have been proactive in countering the threat posed from Islamic fundamentalism. This includes close monitoring of regional terrorists, arrests and increased scrutiny for those travelling from the Middle East, North Africa and the Asian subcontinent. The Islamist militant group Jemaah Islamiyah (JI), which is based in Indonesia, remains Malaysia's principal militant threat. We assess that a JI attack on Malaysian soil is unlikely given the group's reduced capability and its focus on targeting Indonesia. However, urban and tourist areas of Kuala Lumpur are probable aspirational targets.

Some Thai separatists, fighting an insurgency in southern Thailand, are based in areas bordering Malaysia. However, these groups are very unlikely to target Malaysia itself as they share cultural, religious and linguistic similarities with the country. The ties are such that the Thai government uses the Malaysian government to mediate discussions with the insurgents.

Individuals in the eastern Malaysian states of Sabah and Sarawak are targeted for kidnap by the Philippines-based Abu Sayyaf militant group. Following the ongoing peace negotiations between the Philippine government and the Moro Islamic Liberation Front in Mindanao, Abu Sayyaf is likely to increase domestic attacks to get a peace deal for themselves. Abu Sayyaf militants are likely to increasingly target locals and foreigners in Basilan and the waters bordering northern Borneo Island and South Mindanao in the next year to finance their intensified attacks.

There is a moderate risk of piracy in Malaysian waters. Pirates operate in groups of up to six people, sometimes buying information about cargo and routes from corrupt port officials. To counter this, the Malaysian Maritime Enforcement Agency places undercover agents at ports and on ships to gather intelligence on pirates. Traditionally, the Malacca Strait has been a hotspot for piracy, but attacks have decreased over the past few years because of improved maritime security cooperation between Indonesia, Malaysia and Singapore. While hijackings are unlikely, there is an elevated risk of robbery of stores, equipment and crew possessions anchored vessels. Robberies are normally opportunistic and carried out by assailants armed with knives, but it is uncommon for crew members to be killed or injured.

(7) Civil Unrest Risk

Malaysia's population predominantly consists of ethnic Malays and large ethnic Indian and Chinese minorities. Since independence, the government has implemented policies favoring Malays. The government is likely to gradually scale back these policies, which means there is an elevated risk of protests from the Malays. There is also an elevated risk that ethnic Indians groups, primarily the Hindu Rights Action Force (HINDRAF), will protest against perceived discrimination. Such protests are likely in Kuala Lumpur near Independence Square (Dataran Merdeka), Merdeka Stadium, the National Mosque and the Petronas Twin Towers. They are also likely in Putrajaya, the administrative capital, outside the prime minister's residence (Seri Perdana), the Prime Minister's Office (Perdana Putra) and the Home Ministry. Protests over race policies will probably involve hundreds of people but are unlikely to cause damage to commercial property. Such protests are likely to be contained forcibly by the police.

Political rallies are also likely. In January 2013, 2,000 people gathered for an opposition rally in the Merkeda Stadium in Kuala Lumpur. Such protests are unlikely to become violent until the police intervene and use water cannons, tear-gas and beatings to disperse the crowds. The election reform rally in April 2012 was peaceful until a barrier was breached and police used tear gas and water cannons to disperse the group. Any violence is likely to consist of fighting between protesters and police, including the use of tear gas and water cannons. Collateral damage to commercial assets is likely to be superficial.

Strikes are generally rare and are unlikely to significantly undermine business continuity. Unions in Malaysia are strong and have significant lobbying power. This allows them to address worker grievances, such as wage disputes and working hours, before the need for industrial action arises. Moreover, the government does not tolerate any industrial unrest that could negatively affect Malaysia's reputation as a business friendly destination. The government is therefore likely to try and resolve the situation to avert strikes, particularly in the IT, manufacturing and transport sectors. If strikes do occur, we expect the government to use force in ending the strikes as soon as possible, including the use of teargas and rubber bullets. Violent strikes will pose a moderate risk of collateral damage to commercial property. When strikes occur in the transport sector, delays are likely last for only a few days. In May 2012 haulage workers at Port Klang went on strike for three days.

4.5 Industrial Agglomerated Areas and Natural Disaster Risk

Several distribution maps are shown overlaying natural disaster risk as follows. List of industrial agglomerated areas are attached at the end of this report.

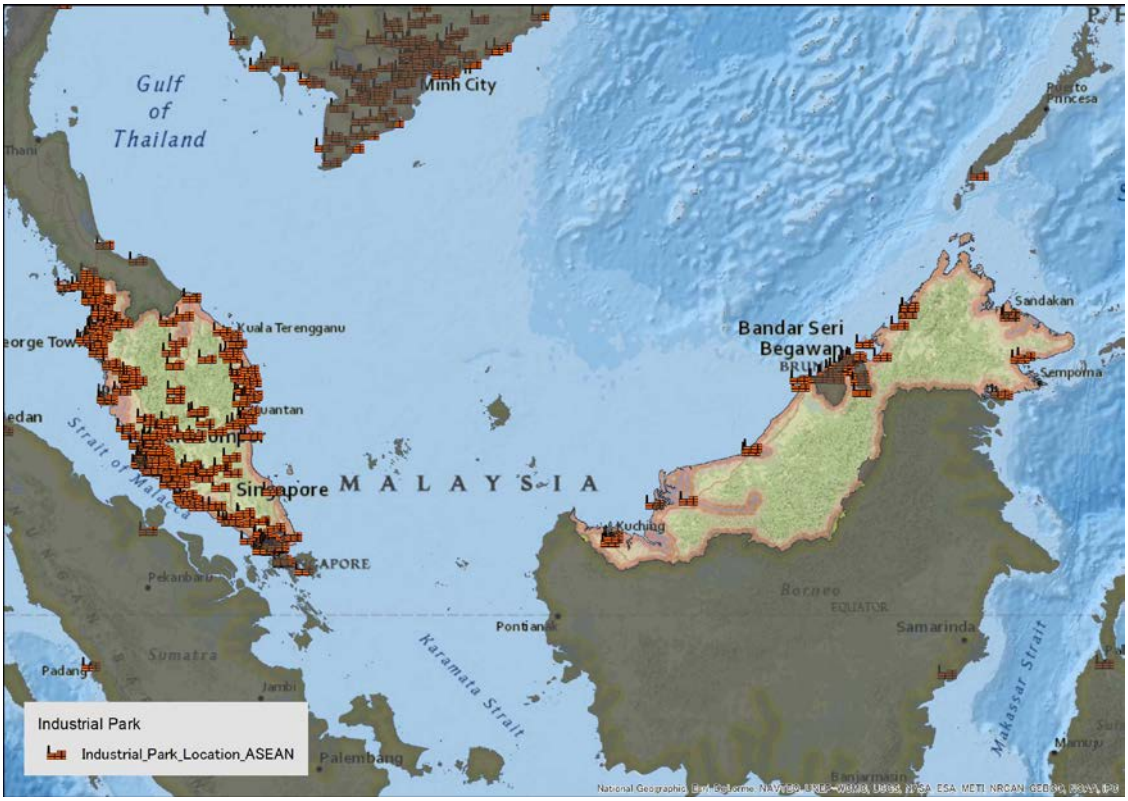


Figure 4.5.1 Distribution of Industrial Park

Figure 4.5.2 Distribution of Industrial Park, Major Infrastructures and Natural Hazards on number of killed in Malaysia

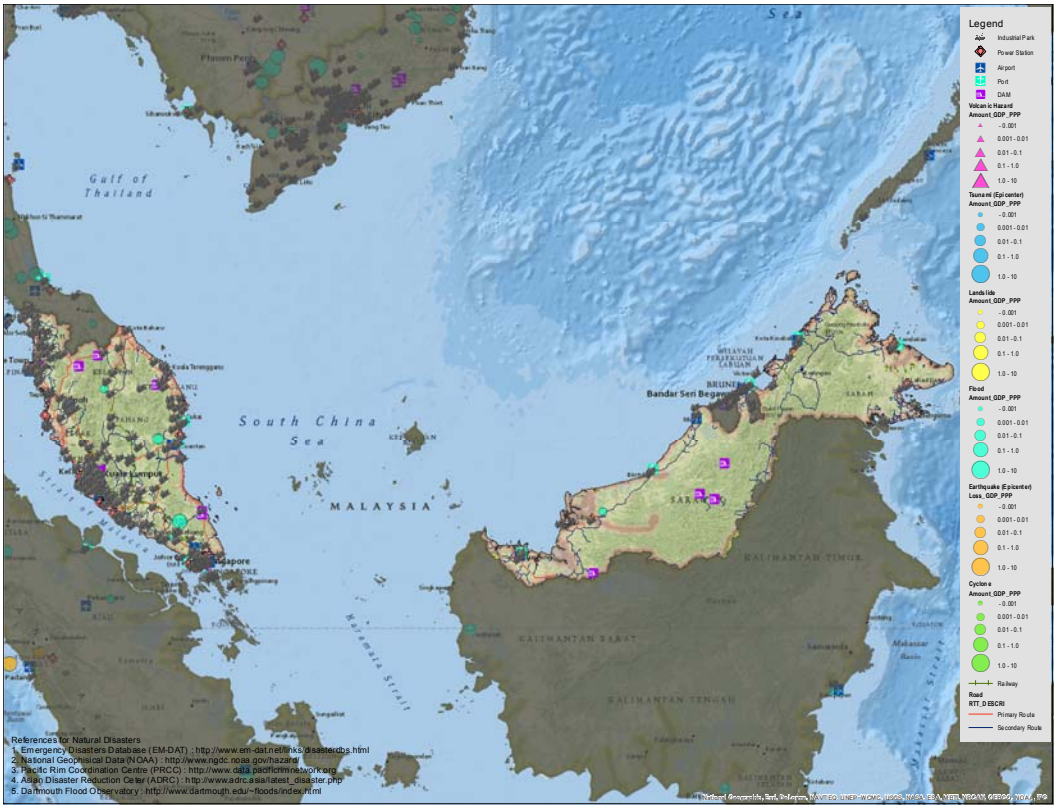


Figure 4.5.3 Distribution of Industrial Park, Major Infrastructures and Natural Hazards on loss rate to GDP in Malaysia

Chapter 5 Relevant Infrastructure and Natural Disaster Issues

5.1 Infrastructure Conditions

5.1.1 Roads

(1) Outline

There are 3 types of road in Malaysia, not including small local roads. They are expressways, federal road, and state road. Expressway is defined as a high speed route with at least a four-lane road (with two-lanes in each direction). There are 29 expressways in total from E1 to E29, 5 federal roads, and 2 state roads. The operation and maintenance of the expressways is conducted by private sector companies.

National roads are called federal roads. They are under the administration of the Ministry of Works. The Department of Public Works (JKR) is responsible for their construction and maintenance.

Table 5.1.1 Federal Roads and Route Number

Sample Number	Information	Number digits
5, 24, 222	Main federal route numbers	001-249
276, 423	Institutional facilities federal road	250-479
EXI 1, EXIT 226	Federal road exit numbers	EXIT 1- EXIT 99 EXIT 201-EXIT 299
1, 1-15, 3	Main federal route numbers (Sarawak)	1-1 – 1-59 3-1 – 3-99
A1, A3, A22	Main federal route numbers (Sabah; old numbering system)	A01-A99
700, 701, 702	Main federal route numbers (Labuan)	700-799
1123, 2486	FELDA/FELCRA federal route numbers	1000-1999 2000-2999
3214	Industrial federal route numbers	3000-3999

Source: Wikipedia, Malaysian Federal Roads System

The Asian Highway has two routes which run north-south and east-west in the Malay Peninsula.

Table 5.1.2 Asian Highway in Malaysia

Route Number	Total Extension (km)	Pavement, number of lanes	Basis of Selection
AH2	821	Paved, 2 lanes or more	Connection between capitals, Industrial estates / Agricultural area connection
AH18 (Federal road 3)	774	Paved, 2 lanes or more	Industrial estate/ Agricultural area connection Major ports connection
Total	1,595		

Source: Ministry of Land, Infrastructure, Transport and Tourism, Asian Highway Database

(2) Urban transport

Automotive traffic has been increasing year by year as a result of economic development. When the average speed falls below 10 km/h during rush hour, traffic congestion worsens. The use of multi-modal transport through the improvement of the traffic system has been promoted in the Klang

Valley district of the metropolitan area. In order to integrate private cars, buses, and the rail transport, preparations are being made to improve parking lots and bus services at nearby stations.

The number of registered cars has been growing for all types of vehicles yearly. In the Klang Valley district of the metropolitan area, 17 bus companies are operating about 2,200 buses in total with 500,000 passengers per day. Intra Kota is used as the bus system for regular routes, which the major bus company operates in Kuala Lumpur City.

There are two types of buses: large-sized buses with a 75-person capacity and midi-buses with a 44-person capacity. The minibus was eliminated in 1998.

5.1.2 Ports

(1) Outline

The ports in Malaysia are managed by the three levels of government, not including fishing ports. They are as follows.

1) Direct control under the Federal Governments: Klang Port, Johor Port, Penang Port, Kuantan Port, Bintulu Port
2) Under management of the State Governments: Kota Kinabalu Port, Sandakan Port, Kuching Port, etc.
3) Under management of the Marine Department, Ministry of Transport: Langlawi Port, Kota Bharu Port, etc.

(Management of Marine Department Peninsular Malaysia, Saba Marine Department, and Sarawak Marine Department)

Among these ports, there are 10 ASEAN designated ports: Klang Port, Johor Port, Penang Port, Kuantan Port, Bintulu Port, Kota Kinabalu Port, Sandakan Port, Kuching Port, Tanjung Pelepas Port, and Kemaman Port.

(2) Container throughput

The ten (10) international ports mentioned above handle 90% or more of the exports from Malaysia. Klang Port, which is the largest, handled about 150 million tons (40% share) of the throughput and there were about 8 million TEU (50%) container throughputs in 2008.

In world port rankings for container handling volume in 2005, Klang Port was placed 14th. Together with Tunjung Pelepas, which is the 2nd highest, they are positioned higher that all the ports in the world.

(3) Railways

The railway networks in the Peninsular Malay were constructed from the end of the 19th century to the beginning of the 20th century, and the present network is complete.

There are eight (8) companies which engage in rail operations, and the specifications of each railway are shown in Table 5.1.3 as follows.

Table 5.1.3 Railway Enterprises and Companies

Name of Companies	Management Subject	Operating Distance (km)	Number of Stations	Operating Speed (km/h)	Power
KTM Intercity	KTMB	1,699 (All 2,262)	92	120	Diesel
KTM Commuter	KTMB	153	42	120	25kV AC
ERL	ERL	57	5	160	25kV AC
LRT (KLJ Line)	Rapid KL	29	24	80	750V DC
LRT (AMP Line)	Rapid KL	27	25	80	750V DC
KL Monorail	Rapid KL	7.9	11	80	750V DC
Santrex2000		3.5	5	25	415V AC
TTS	MAB	1.3	2	10.6	600V AC

Source: Ministry of Land, Infrastructure, Transport and Tourism Japan, Transportation Situation 2007

The number of passengers in 2006 was 4,084,000 people.

5.1.3 Airports

(1) Outline

There are five (5) international airports (Kuala Lumpur, Penang, Langkawi, Kota Kinabalu, and Kuching) and 19 main domestic airports.

(2) Passengers, commercial aircraft movement

The usage numbers for international airports are as follows.

Table 5.1.4 Number of passengers

	International Airport Name	State	Passenger Traffic (thousands)			Aircraft Movements
			2010	2011	2012	2010
1	Kuala Lumpur	Selangor	34,088	37,705	29,888	244,179
2	Kota Kinabalu	Sabah	5,223	5,809	5,848	55,089
3	Penang	Penang	4,167	4,600	4,767	44,753
4	Kutching	Sarawak	3,685	4,287	4,187	42,940
5	Langkawi	Kedah	1,375	1,505	1,594	13,274

Source: Wikipedia, List of the busiest airports in Malaysia

5.2 Public Services

5.2.1 Electricity

(1) Outline

Tenaga Nasional Berhad (TNB) supplies electric power in the Malaysia peninsula, Sabah Electricity Sdn. Berhad (SESB) conducts operations in Sabah, and Sarawak Energy Berhad (SEB) conducts operations in the State of Sarawak.

TNB covers all of Malaysia for electrical power services.

(2) Electricity supply and demand

The supply capacity for the electric power supply of Malaysia increased 20% in 2009 from 2000. Therefore, even if an increase in demand occurs, it is possible to continue supplying electric power without increasing the supply capacity for the time being.

However, improvements in supply capacity are planned through the introduction of renewable energy sources, etc. as the government furthers action.

Table 5.2.1 Amount of Supply and Supply Capacity of Each National Power Corporation

Power Corporation		Tenaga National Berhad (2010)	Sabah Electricity Sdn. Berhad (2010)	Sarawak Energy Berhad (2009)
Maximum Demand (MW)		15,072	760	1,036
Supply Capacity (MW)		21,817	866	1,230
Power Supply Composition Rate	Natural gas	54.0%	-	53.0%
	Coal	40.0%	31.0%	34.0%
	Oil	-	57.0%	-
	Hydro	5.2%	9.0%	8.0%
	Diesel	-	-	5.0%
	Renewable Energy	0.8%	3.0%	

Source: Ministry of Economy, Trade and industry, Malaysia Photovoltaic Project Survey Report 2012.2

5.2.2 Water

(1) Water supply

The Malaysia constitution was revised at the beginning of 2005, and the waterworks in Malaysia and its service operations are performed jointly by the federal government and the state government. It is possible to receive water at all hours of the day, and water quality is also good in Malaysia.

The diffusion rate of water service has gradually improved by the spread of water services in rural areas. The whole country shows a high rate at 95.5%. However, the State of Sabah and Sarawak are not included in this number.

The actual diffusion rate for the whole country will be slightly lower.

Table 5.2.2 Diffusion Rate of Water Supply 2010

	Diffusion Rate of Urban Areas (%)	Diffusion Rae of Rural Area (%)	State Average Water Service Diffusion Rate (%)
Malaysia Peninsula	96.4	94.7	95.3

Source: Japan Water Research Center, Malaysia, Outline of 2010 Water-Project Statistics 2010

The design capability of the water-purifying facility is larger than scale of actual waterworks, and the stable supply is possible.

Table 5.2.3 Water Supply Connection Numbers 2010

	Operating Water Purification Plant	Design Capacity of Water Purification Capacity (10^3m^3/day)	Water-Purifying Power (10^3m^3/day)	Allowance Ratio of Water Purification Capacity (%)
Malaysia Peninsula	323	14,386	12,079	16.0

Source: Japan Water Research Center, Malaysia, Outline of 2010 Water-Project Statistics 2010

(2) Sewerage

The sewerage of Malaysia is managed by the Indah Water Konsortium (IWK). 8.3 million people have sewer connections and 4.1 million people use septic tanks. 30% of the population has drain pipes for sewage to be processed at the centralized processing facility. The diffusion rate of septic tanks is 50%.

There is no sewerage in Malacca, a tourist resort, and preparations in Johor, Pinang, etc. are also insufficient. The roles of the sewer enterprises in Malaysia are shown below.

- Department of Water Sector Policy: manufacturing business.
- Department of Sewerage Services: planning and implementation.
- National Water Service Commission (SPAN): established business.
- Sewer company: operation and maintenance.

Much wastewater is discharged to rivers, etc. However, the resurgent water-use rate of treated water is not high, with only about 15% of treated water used in some disposal plants in Kuala Lumpur as the water for washing and landscaping.

Sludge treatment in Malaysia is divided roughly into two methods: a mechanical dehydration-of-oil method and a solar drying floor.

Dewatering cakes are used for the dehydration of oil and disposed in landfills at a rate of 100%.

Sludge quantity has reached 4.3 million m^3 per year, and the construction of a new disposal facility is called for.

5.2.3 Communications

(1) Internet and broadband

A maximum transmission speed of 256 bps or more is classified as broadband.

For broadband internet, ADSL service was started from 2001, and Telekom Malaysia started offering FTTH service in the metropolitan area.

There were 2.14 million broadband subscribers 2011, and its diffusion rate was 74%.

(2) Mobile phones

As of June, 2011, three companies: Maxis Mobile, Tizi Telekom, and Celcom Axiata, form 90% of the market. There were 36.661 million subscribers to mobile phone services in 2011, and the diffusion rate is 127.0%. This far exceeds one mobile phone per one person.

(3) Fixed-line phones

Local communication was liberalized in May 1994. There are four (4) main companies: Telekom Malaysia, Maxis, TIME 5-6otcom Bhd. And Tizi Telekom. The old state company, Telekom Malaysia, is dominant.

The number of landline subscribers is decreasing due to the spread of mobile phones.

There were 4.243 million subscribers to landlines phones in 2011, and the diffusion rate has stayed low at 14.7%.

(4) Terrestrial broadcasting

For terrestrial broadcasting, after RTM started its service in 1963, various commercial broadcasting companies have entered the market.

5.2.4 Waste

Estimates from a survey to reduce solid waste conducted in cooperation with JICA show that 22,941 tons of waste is generated per day with 8.7 million tons every year.

The waste generated from homes is 6.5 million tons and the waste from companies is 2.65 million tons. The quantity of waste which is recycled is presumed to be 1,025 tons per day. The Solid Waste and Public Cleansing Corporation (PPSPPA) was established in 2007 to promote waste management, optimal processing, and transport using a uniform national standard, not including some states.

Malaysia is divided into three areas and the waste disposal for each area is entrusted to private enterprises, while the central government manages the system. Moreover, 3R activities are promoted to reduce waste. It is system for recyclable trash called the Buy Back system, which other countries do not have.

5.3 Natural Disasters Issues

Disasters in Malaysia include floods, tsunami due to earthquakes, flood damage due to storms, landslides and slope collapse, and forest fires. However, since it is geographically separated from the Pacific Rim of Fire, there are comparatively few serious disasters such as earthquakes, a typhoons, and a volcanic eruptions.

The primary disasters are floods and landslides caused by the monsoon (tropical cyclone: rainstorm). Caution is necessary as typhoons and cyclone sometimes land in northern areas (Tropical Cyclone

Greg of December 1996 landing at Sabah), but they do not occur for the most part in other areas of Malaysia. 270 people were killed in Tropical Cyclone Greg.

Damages, including the deaths of 80 people, were caused by the tsunami triggered by the M9.1 earthquake of December 26, 2004 in northwest Sumatra in Indonesia.

Moreover, 33 people were killed by the flood due to the heavy rain in the northeast part Kelantan State and the central part of Bahan State in December 2007. At that time, there were 158,000 disaster victims.

Examination of these damage examples and other damage examples shows that the factors with the greatest impact are firstly, rainstorms accompanied by floods, and secondly, tsunamis triggered by earthquakes.

Even if an industrial estate is built on raised ground, large floods may cause damage to roads, buildings, power transmission lines, and other lifelines in the surrounding area, and necessary countermeasures have to be examined.

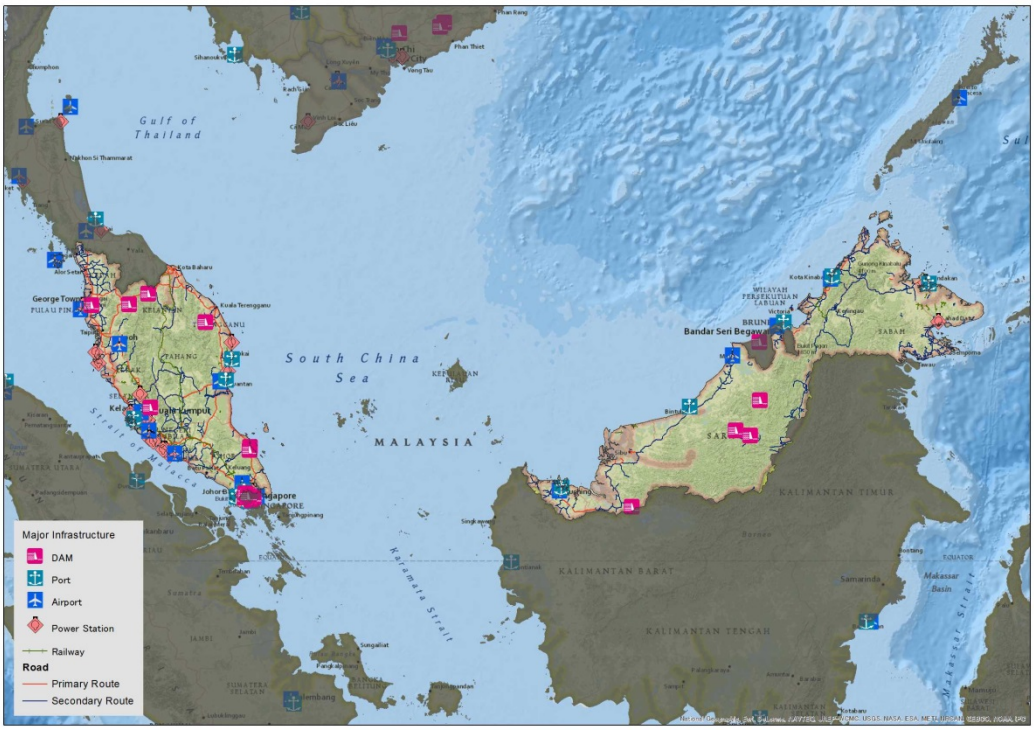


Figure 5.3.1 Major Infrastructures in Malaysia

Chapter 6 Economy, Industry, and Trade

In this survey, the general outline of economy and trade in Malaysia and the cases in which disaster impact analyses were conducted are examined. The purpose is to estimate the impact of a disaster on the economy of the nation and surrounding regions in the event that an industrial agglomerated area in Malaysia is hit by a disaster.

The following topics were explored using existing data and information from sources such as the internet, research papers, reports and other materials.

- Overview of the economy and industry of Malaysia
- Overview of trade in Malaysia

In order to understand the conditions of the economy and trade in Malaysia, relevant information was gathered/organized based on a review of reference materials listed below.

No.	Reference	Remarks
1	ASEAN-JAPAN CENTRE website http://www.asean.or.jp/	Statistical data on economy, industry and trade of ASEAN
2	JETRO 2009, "ASEAN Economic Community (in Japanese)"	Regional corporation framework in East Asia
3	ASEAN Stats database http://aseanstats.asean.org/	Trade values of ASEAN by commodity and partner country, etc.
4	ASEAN website (2013), "Key basic ASEAN indicators in 2011, Last update 14 January 2013"	Key basic indicators of ASEAN
5	International Monetary Fund, World Economic Outlook Database	Macroeconomic indicators of ASEAN
6	Industrial agglomerated areas in ASEAN, IHS	Detailed information on industrial agglomerated areas in ASEAN
7	Ministry of Foreign Affairs of Japan http://www.mofa.go.jp/index.html	Information on regional affairs etc.

6.1 Overview of the economy

The GDP of Malaysia is 303.5 billion USD (2012) and the GDP per capita is 10,304 USD (2012). Malaysia ranks third in ASEAN in terms of both GDP and GDP per capita.

The economic growth rate is 16.7% (2011), which is almost the same as the average of ASEAN (15.7% (2011)). By looking at past trends, it can be observed that the economic growth rate of Malaysia is moving in line with the average level of ASEAN. However, the drop in the economic growth rate in 2009 was greater than the average of ASEAN countries, and it shows that the country suffered a greater impact from the collapse of Lehman Brothers. Foreign direct investment in Malaysia accounts for 12% (2010) of total foreign direct investment in ASEAN. Although Malaysia experienced a drop in 2009, it managed to recover in 2010.

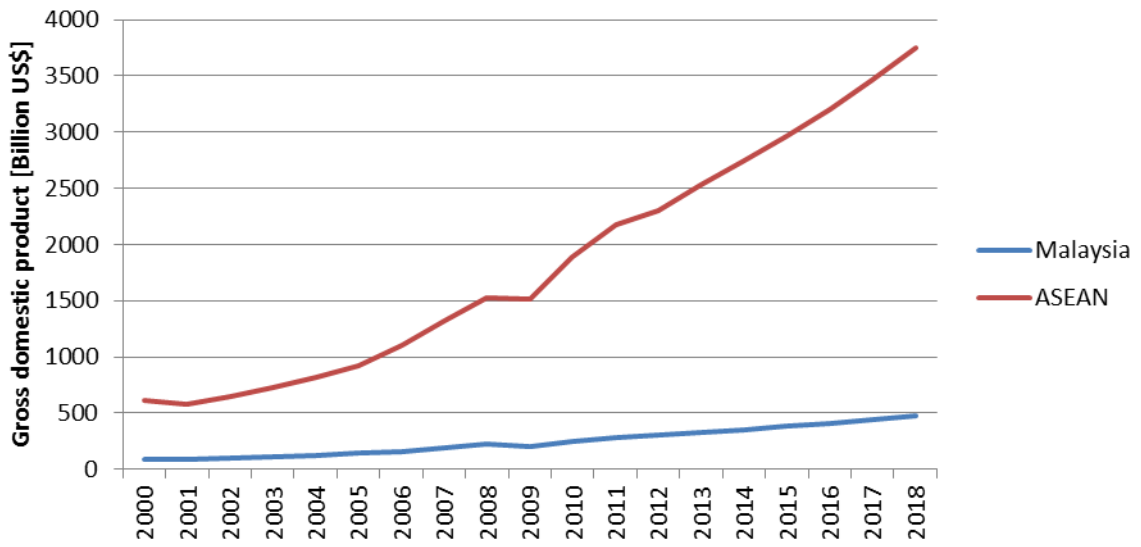
The country has maintained a low unemployment rate since 2000, and it is expected that the unemployment rate will continue to remain in the low 3% range. (Cf. The unemployment rate in Japan as of 2012 is 4.4%).

As for industrial composition of the GDP, the manufacturing sector producing electric equipment, the agriculture sector producing natural rubber, palm oil and wood, and the mining sector producing tin, crude oil, and LNG are the main contributors.

Major industrial parks in Malaysia, in which many Japanese companies are operating, are summarized in the table below.

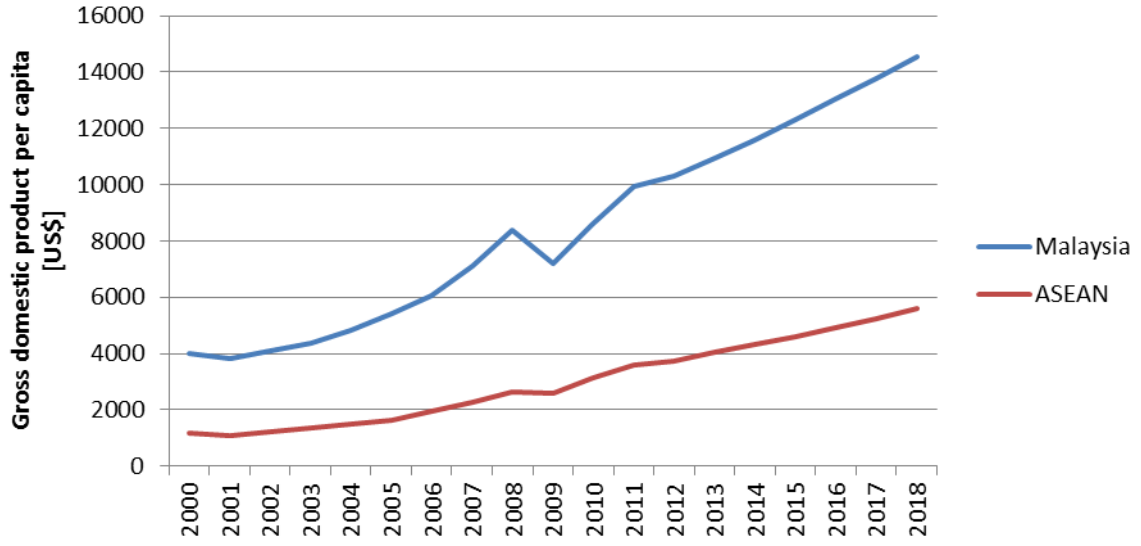
Name of Industrial Park	Number of Japanese companies operating	Description
Pasir Gudang Industrial Estate	32 (>35)	Located 36 km from Johor Bahru. Mainly comprised of petrochemical companies.
Kawasan Perindustrian Senai	12	Located 32km from Johor Bahru.
Kawasan Perindustrian Tebrau	15	Located 11-16 km from Johor Bahru.
Bakar Arang	12	Located 75 km from Lor Setar, Kedah.
Batu Berendam Free Zone	10 (>11)	Located 5 km from Malacca. Mainly comprised of companies handling IT, semiconductors, and electronic devices.
Nilai	13	Located 26 km from Seremban. Companies engaged in metal-processing are operating in this industrial park.
New Senawang Industrial Park	15	Located 70 km from Kuala Lumpur. Mainly comprised of plastics manufacturing companies.
Prai Wharf Free Industrial Zone	50	Located in Penang. Comprised mainly of companies engaged in metal-processing, electrical and electronic equipment manufacturing, and petrochemical manufacturing.
Bayan Lepas Industrial Estate	18	Located 14 km from Georgetown. Comprised mainly by electrical and electronic equipment manufacturing companies.
Shah Alam Section	37	Located 4 km from Klang. Comprised mainly of electrical and electronic equipment manufacturing companies.
Subang Hi-Tech Industrial Park	10	Located 20 km from Kuala Lumpur. Mainly comprised of information communication companies.
Hicom Industrial Valley	47	Located 7 km from Shah Alam.
Bangi IV-Bandar Baru Bangi	23	Located 6 km from Kajang. Electrical and electronic equipment manufacturing companies including Hitachi and Sony operate in this industrial park.
Sungai Way FZ	12	Located 12 km from Kuala Lumpur. Electrical and electronic equipment manufacturing companies operate in this industrial park.

Reference: The table was created based on information from ASEAN-Japan Centre (https://www.asean.or.jp/)
Note) Numbers shown in parentheses were obtained from resources provided by IHS.



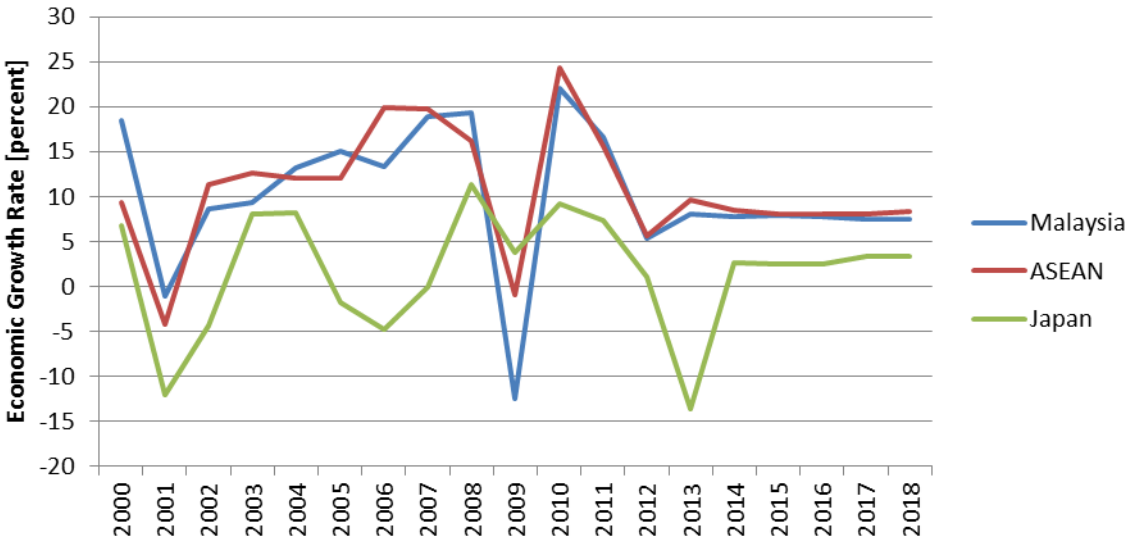
Source: International Monetary Fund, World Economic Outlook Database, April 2013

Figure 6.1.1 Gross Domestic Product in Malaysia, ASEAN countries and Japan (2000-2018), current prices (Estimation in Malaysia starting from 2013; in ASEAN starting from 2012)



Source: International Monetary Fund, World Economic Outlook Database, April 2013

Figure 6.1.2 Gross Domestic Product per capita in Malaysia, ASEAN countries and Japan (2000-2018), current prices (Estimation in Malaysia starting from 2013; in ASEAN starting from 2007)



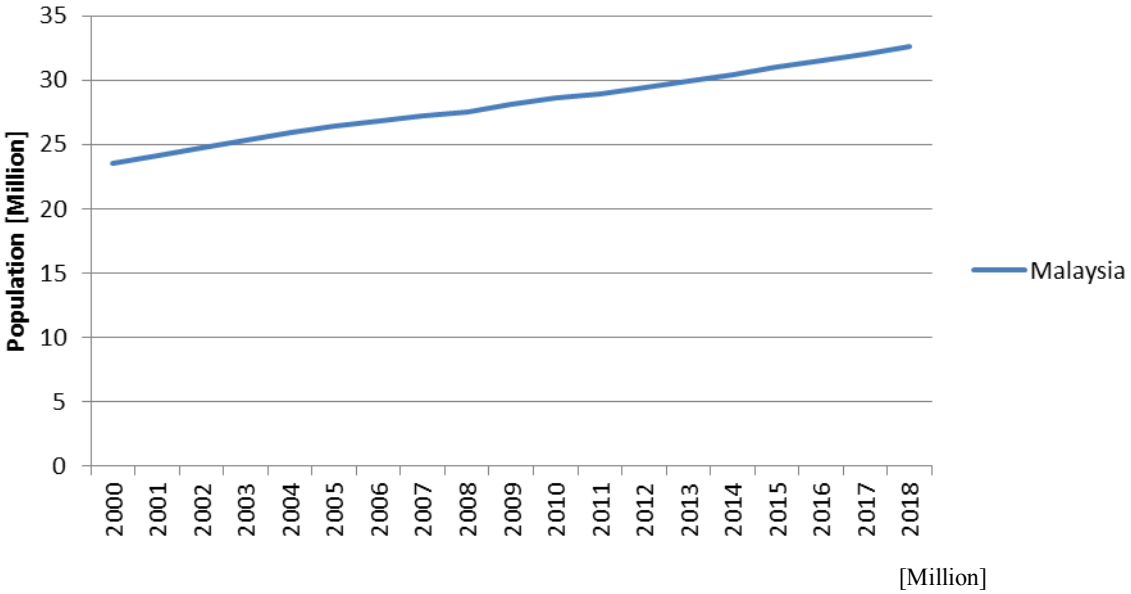
Source: International Monetary Fund, World Economic Outlook Database, April 2013

Figure 6.1.3 Economic Growth Rate in Malaysia, ASEAN countries and Japan (2000-2018), current prices (Estimation in Malaysia and Japan starting from 2013; in ASEAN starting from 2012)

Table 6.1.1 Average growth rate in Malaysia, ASEAN countries and Japan (2013-2017)

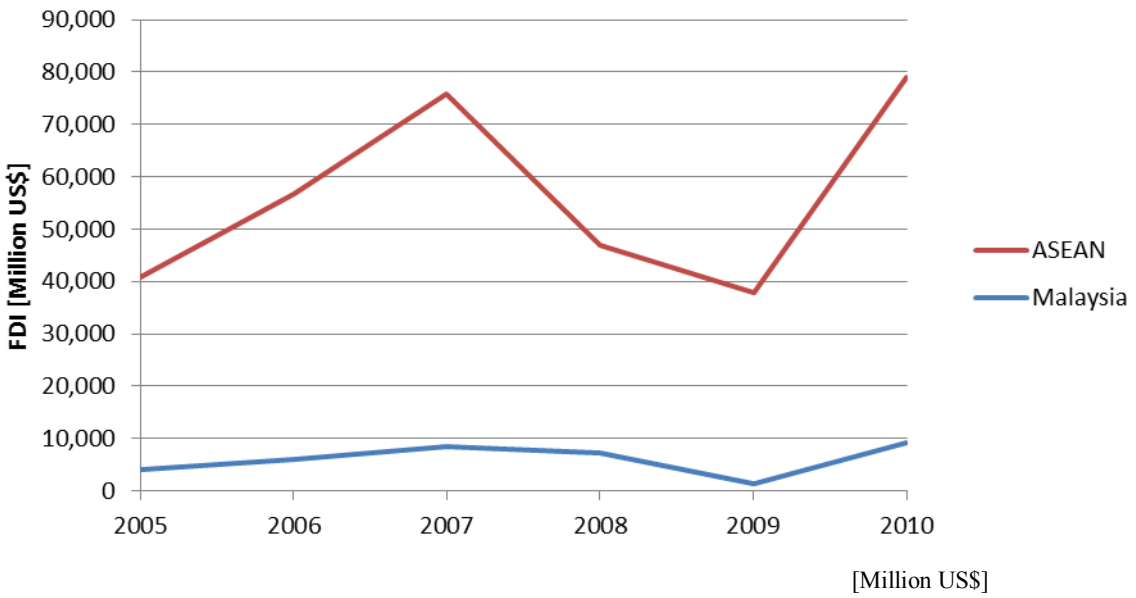
	Malaysia	ASEAN	Japan
Average growth rate (2013-2017) (%)	7.8	8.5	-0.53

Source: International Monetary Fund, World Economic Outlook Database, April 2013, calculated by MRI



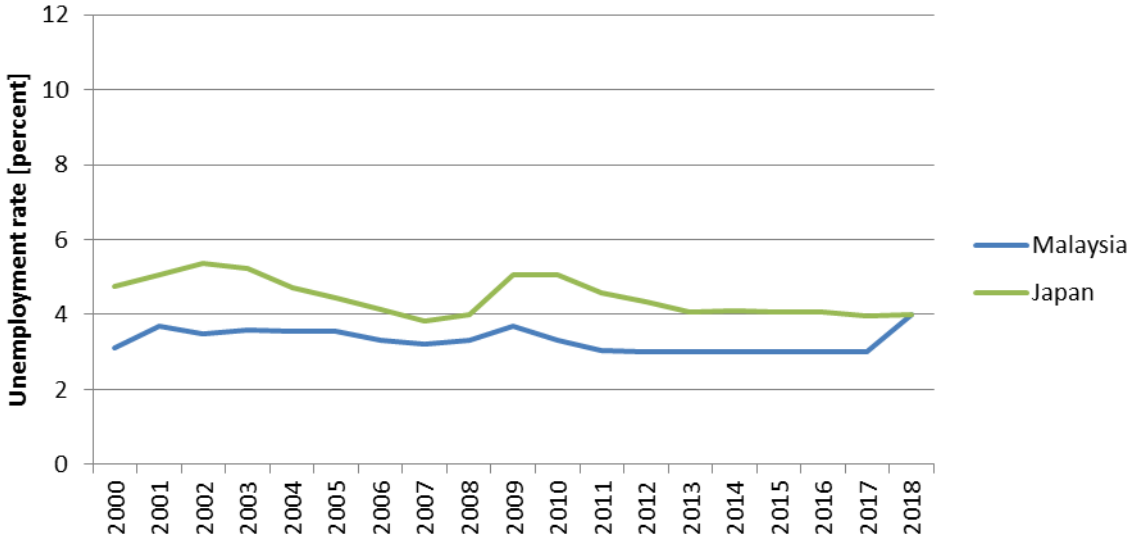
Source: International Monetary Fund, World Economic Outlook Database, April 2013

Figure 6.1.4 Population (2000-2018) (Estimation starting from 2013)



Source: ASEAN-Japan Centre website

Figure 6.1.5 Foreign Direct Investment to Malaysia and ASEAN (2005-2010)



Source: International Monetary Fund, World Economic Outlook Database, April 2013

Figure 6.1.6 Unemployment rate in Malaysia and Japan (2000-2018) (Estimation starting from 2013)

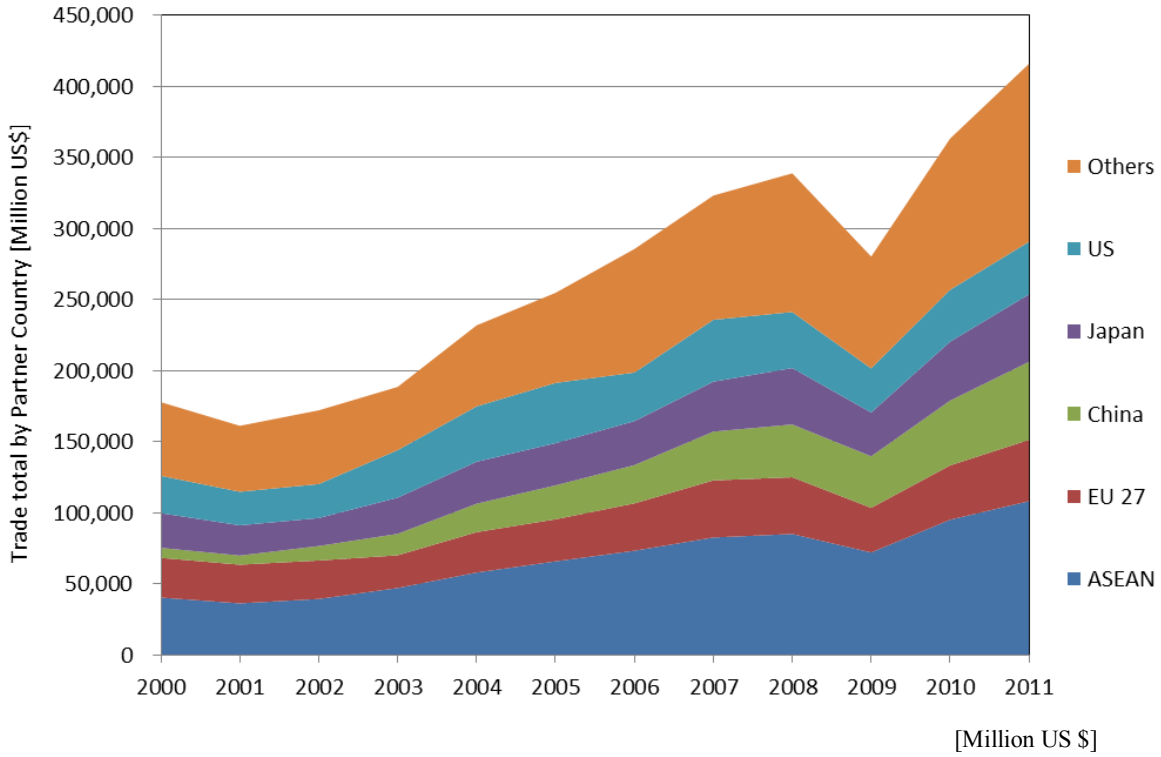
6.2 Overview of trade

(1) Amount of foreign trade/major trading partners

Trends in Malaysia's foreign trade by partner countries (2004 – 2011) are illustrated in the figure below. Malaysia's foreign trade has been growing steadily since 2000. Although foreign trade dropped in 2009 after the collapse of Lehman Brothers in the fall of 2008, all regions recovered quickly from the crisis.

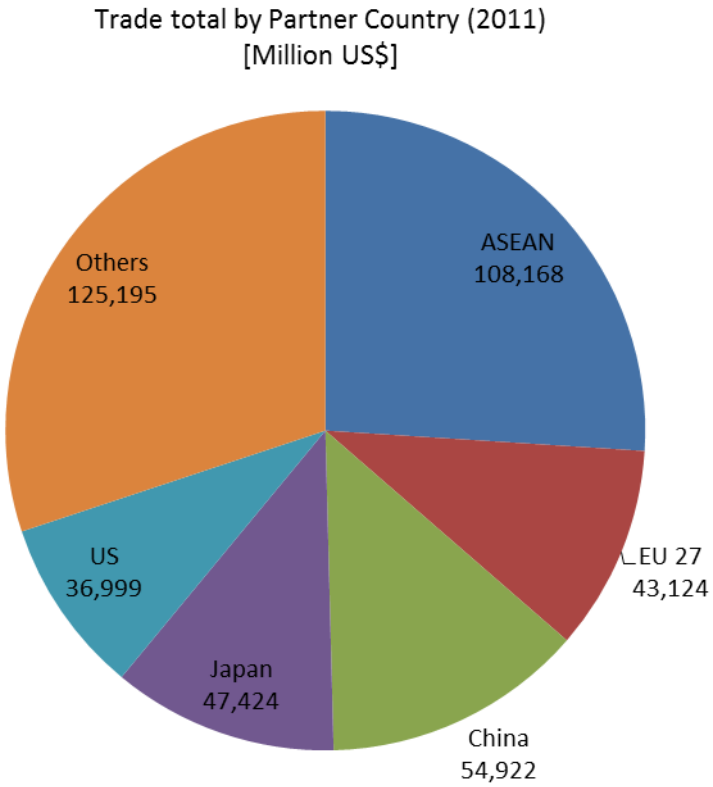
As of 2011, the largest trading partner of Malaysia is other ASEAN countries, with 26% of the total trade being associated with the countries in this region. The second largest trading partner is China, accounting for 13% of the total trade. Japan comes next with 11%, followed by the EU and the USA with 10% and 9% shares, respectively.

Looking at trends in recent years, it is observed that while Malaysia's foreign trade is increasing with all trading partners, the growth rate of trade with the ASEAN countries and with China are higher, compared to the growth rate of trade with developed countries such as Japan, the EU, and the USA.



Source: ASEAN Stats database (http://aseanstats.asean.org/)

Figure 6.2.1 External Trade Value by Partner - Total (2000-2011)



[Million US $]

Source: ASEAN Stats database (http://aseanstats.asean.org/)

Figure 6.2.2 External Trade Value by Partner - Total (2011)

(2) Categories of major trading commodities

Export values of Malaysia by commodity (2011) are shown in the table below.

Examining the export values by major export commodities, it can be observed that the largest group of products exported from Malaysia is machinery and transport equipment, which accounts for 43% of the total export value (89,254 million USD). Mineral fuels comes next, accounting for 20% of the total exports (40,222 million USD).

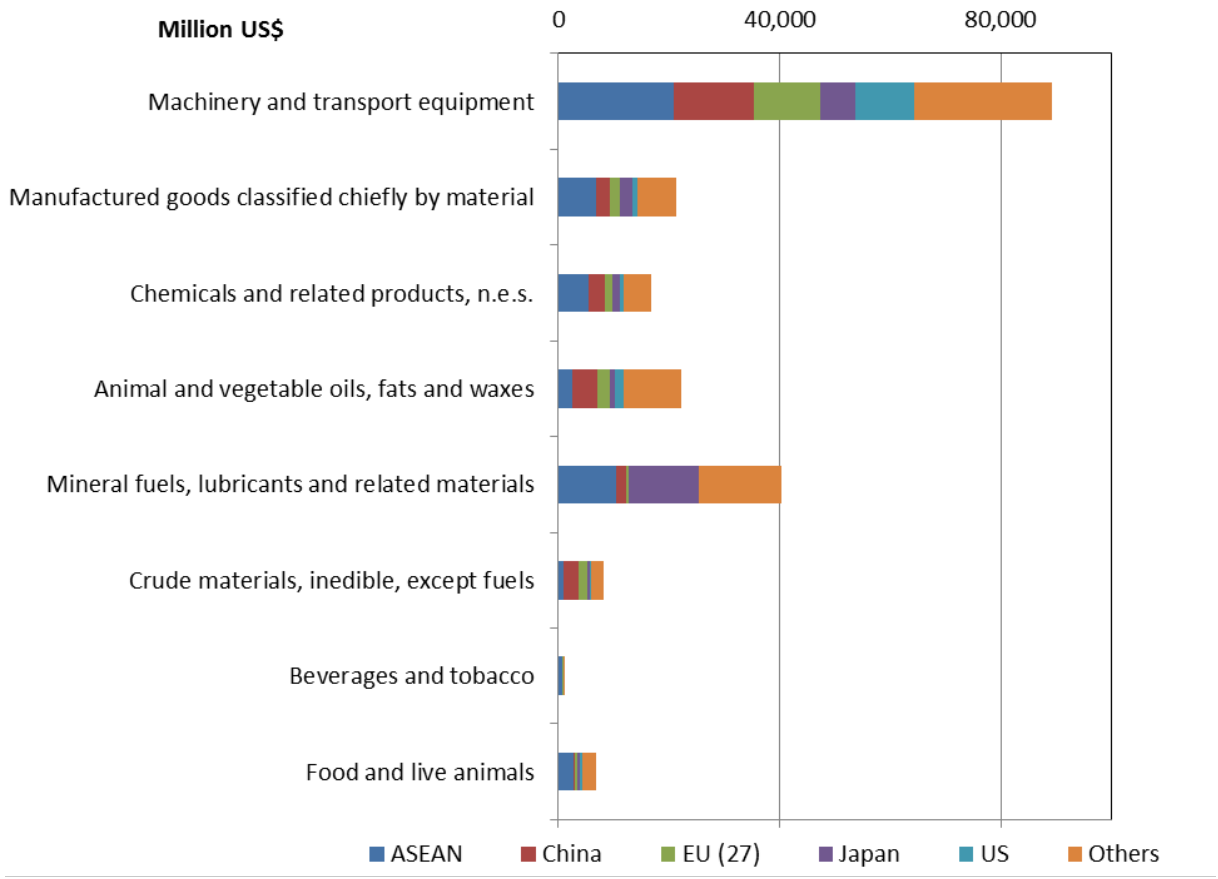
The largest export destination for machinery and transport equipment is ASEAN countries, buying 20,792 million USD. This is followed by China and the EU, with export values of 14,573 million USD and 12,075 million USD, respectively. Exports to Japan were 6,220 million USD.

Table 6.2.1 Trade values (exports) of Malaysia by commodity and partner country (2011)

[Million US $]

Category	ASEAN	China	EU (27)	Japan	US	Others	WORLD
Food and live animals	2,706	332	432	361	587	2,301	6,718
Beverages and tobacco	789	20	13	18	8	177	1,024
Crude materials, inedible, except fuels	999	2,671	1,600	487	236	2,129	8,122
Mineral fuels, lubricants and related materials	10,488	1,869	294	12,643	82	14,847	40,222
Animal and vegetable oils, fats and waxes	2,433	4,623	2,283	849	1,534	10,581	22,302
Chemicals and related products, n.e.s.	5,533	2,767	1,428	1,370	600	5,056	16,753
Manufactured goods classified chiefly by material	6,767	2,556	1,764	2,199	919	7,121	21,326
Machinery and transport equipment	20,792	14,573	12,075	6,220	10,761	24,834	89,254

Source: ASEAN Stats database (http://aseanstats.asean.org/)



[Million US $]

Source: ASEAN Stats database (http://aseanstats.asean.org/)

Figure 6.2.3 Trade values (exports) of Malaysia by commodity and partner country (2011)

Import values of Malaysia by commodity (2011) are shown in the table below.

Examining the import values by major import commodities, it can be observed that the largest group of products imported by Malaysia is Machinery and transport equipment which accounts for 49% of the total import value (83,637 million USD). Manufactured goods comes next, accounting for 14% of the total imports (24,533 million USD).

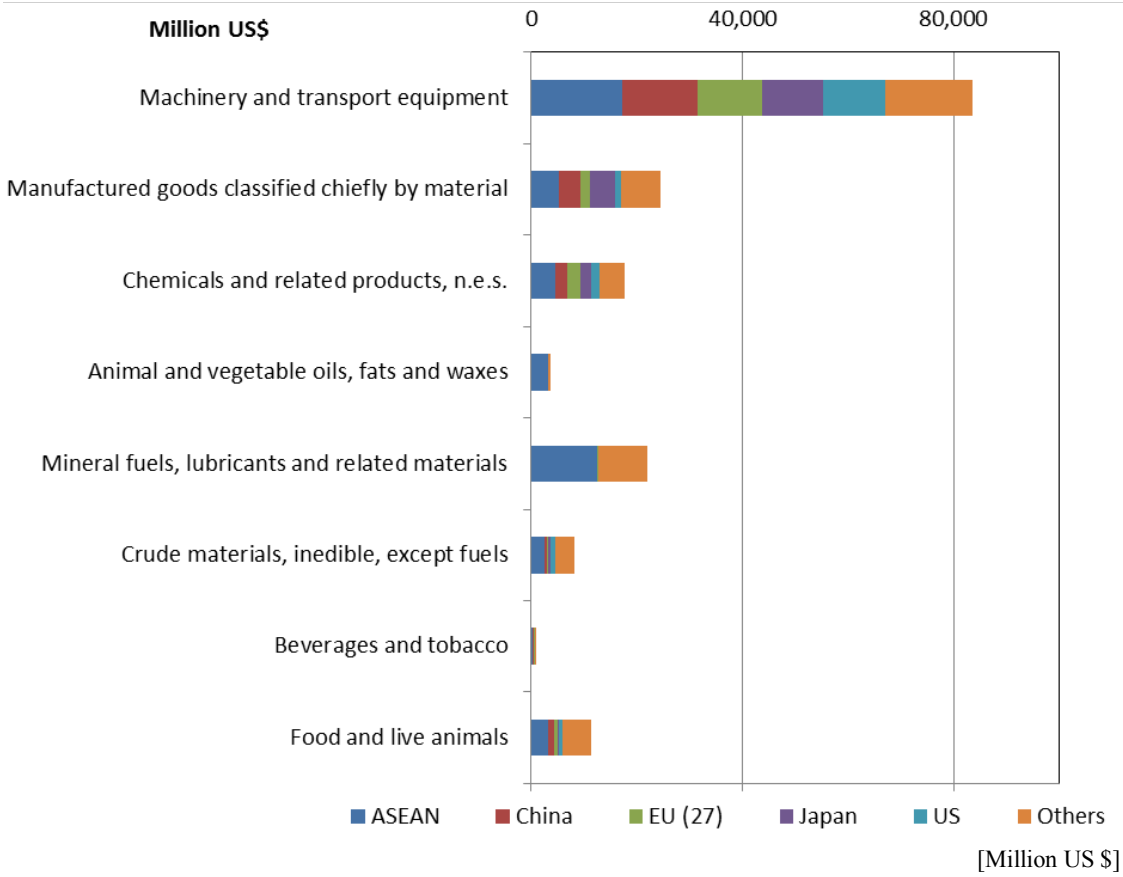
The largest exporter of manufactured goods to Malaysia is ASEAN, exporting a total of 17,198 million USD. This is followed by China and the EU, with import values of 14,396 million USD and 12,030 million USD, respectively. Imports from Japan were 11,550 million USD.

Table 6.2.2 Trade values (imports) of Malaysia by commodity and partner country (2011)

[Million US $]

Category	ASEAN	China	EU (27)	Japan	US	Others	WORLD
Food and live animals	3,194	1,199	683	68	713	5,413	11,270
Beverages and tobacco	311	56	358	10	49	227	1,010
Crude materials, inedible, except fuels	2,584	369	348	329	958	3,501	8,090
Mineral fuels, lubricants and related materials	12,423	91	80	52	144	9,263	22,053
Animal and vegetable oils, fats and waxes	3,177	14	25	5.032532	16	360	3,597
Chemicals and related products, n.e.s.	4,571	2,223	2,611	1,897	1,547	4,935	17,784
Manufactured goods classified chiefly by material	5,244	3,948	1,992	4,690	1,233	7,425	24,533
Machinery and transport equipment	17,198	14,396	12,030	11,550	11,852	16,612	83,637

Source: ASEAN Stats database (http://aseanstats.asean.org/)



Source: ASEAN Stats database (http://aseanstats.asean.org/)

Figure 6.2.4 Trade values (imports) of Malaysia by commodity and partner country (2011)

Chapter 7 Physical Distribution Network

The themes of this survey are divided into three categories as follows: 1) Understanding of Supply Chain Circumstances in ASEAN Countries, 2) Understanding of Circumstances on Physical Distribution Network, and 3) Organizing the framework of vulnerability analysis for natural disasters on the ASEAN Logistics Network.

7.1 Understanding of Supply Chain Circumstances in Malaysia

(1) Relation to Logistics Performance Index on International Physical Distribution

Table 7.1.1 International LPI (Logistics Performance Index) *[1] Ranking 2012

Rank	Country	LPI	Customs	Infrastructure	International Shipment	Logistics Competence	Tracing & Tracking	Timeliness
29	**Malaysia**	**3.44**	**3.11**	**3.5**	**3.5**	**3.34**	**3.32**	**3.86**

Source: World Bank Connecting to Compete 2012 Trade Logistics in the Global Economy

(2) Features of Physical Distribution in Relation to Main Industries in Industrial Parks

The lists of ASEAN-JAPAN CENTER (AJC) [*2] web-site have no specific time of investigation by year/month, but it is considered that the general current status of industry agglomeration at the time of the investigation can be obtained.

The industries in industrial parks are classified into the following 13 categories:

1) Fishery/Foodstuff, 2) Textile/Apparel, 3) Pulp/Paper, 4) Chemicals, Oil, Rubber/Ceramic, 5) Steel/Nonferrous metal, 6) Transport machines (Cars), 7) Electrical/Electronics/Precision apparatus, 8) Other industries, 9) Commerce (wholesale, retail), 10) Real estate, 11) Logistics/Warehouse, 12) Finance/Insurance/Other services, and 13) Information/Telecommunication.

The objective industrial parks are selected based on the criterion such as: 1) Degree of geographic accumulation, 2) Having sufficient operational experiences, 3) The size and number of Japanese companies, 4) Located in the pilot area in case of Vietnam, the Philippines and Indonesia.

Three industrial parks in Penang and Selangor provinces are investigated.

"Shah Alam Section 15, 15, 21, 22, 23", Hicom Industrial Valley, Shah Alam", and Prai Industrial Park are selected as representatives from Selangor and Penang States respectively.

Since cars makers, electric and precision devices makers have operated in the industrial parks in Malaysia, much diversified parts in the fields of chemicals, nonferrous metal, machinery, and other industries are manufactured.

Regional general management offices are also established in the above parks. These facts being overviewed, it is said that physical distribution has been developed well in areas of an intra-industrial park, domestic, intra and extra ASEAN regions.

Top three items of the major export/import are as follows (Ministry of Foreign Affairs of Japan, country and regional situation, Malaysia, Economy)[*3]:

- Export: Electric appliances, Palm oil, Chemical goods
- Import: Electric appliances, Manufacturing equipment, Chemical goods

When these items are looked into, it implies that physical distribution in Malaysia has already proceeded to a phase of international logistics management by which international horizontal specialization with main trade counterparts of China, Japan and Singapore can be expected.

(3) Supply Chain Circumstances

Physical distribution is evolving by the stages of Physical Distribution Development Phasing (PDDP) as follows:

1) Physical distribution control: Company's own sphere of materials/ products distribution (PDC).
2) Logistics management: Company's own distribution management by the market-in strategy (LGM).
3) Supply chain management: Integrated distribution management from company's own to systemized one by the collaboration with other logistics operator resources (SCM)

Other criteria can be considered applicable, so that the development phase may be justified, based on industrial categories and their products' varieties and volumes in the selected industrial parks/ SEZ.

1) Kinds and diversity of products (intermediate or final products).
2) Whether production of high valued goods like cars, electrical/ electronic/ precision devices or not, and the levels.
3) Correspondence of export/import major items of goods to, classification of intermediate/ final products
4) Existence of a regional head office of a company which power is vested from the headquarter, and the power strength in management term.
5) Existence of logistics operator as a 3PL and maturity of the business
6) Inter dependency of industrial parks/ SEZ with megalopolises in the vicinity.

The result of assessment is shown in the table below which is made by LPI of the World Bank and by supply chain circumstances determined by above mentioned industries in the industrial park as well as major export/import items in the light of the above three stages of PDDP. The evaluation is shown by relative evaluation of five levels among ASEAN countries. Since there are no distinction time and contents wise in PDDP, the level of development is indicated as a continuous line in the table below.

Table 7.1.2 Physical Distribution Development Phasing

LPI	Country	PDDP								
					Criteria					
		PDC	LGM	SCM	Products diversified	High valued goods	Export/ Import	Regional head office	Logistics operator	Products diversified
3.44	**Malaysia**				**4**	**4**	**4**	**4**	**4**	**3**

Source: JICA Study Team

7.2 Current Status and Trends of Malaysia Logistics Network

(1) Domestic Physical Distribution Network

Malaysia land is divided into Borneo Island and the peninsula. The main industries in Borneo are fertilizer manufacturing industry using natural energy resources and wood processing industry. The distribution bases for those products are Bintulu port and Kuching port.

The main distribution bases in the peninsula are; Penang Ply district in the northern part of west coast, Kuala Lumpur and Klang port district in the central, and Johor district in the south. Especially 1,000 IT companies are concentrated in the "Multimedia super corridor" developed by the government in the suburbs of the capital city Kuala Lumpur. Highway network connecting those distribution bases are well developed and it is categorized as the highest rank in the efficiency index (LPI) of the World Bank.

From Klang port, a hub port in Malaysia, it takes a day to Singapore, 3 days to Ho Chi Minh, 4 days to Chennai and 9 day to Japan by ship.

(2) Intra-ASEAN Physical Distribution Network

According to ASEAN Strategic Transport Plan 2011-2015, intra-ASEAN trade of Malaysia is reported to be about 40% of the total trade amount.

Of that share, main intra-ASEAN trade partner is well distributed as in the order of Singapore of 66%, Thailand of 16%, Indonesia of 11%, and Philippines of 5%.

Considerably large portion of cargo traffics to and from main ports in Malaysia are considered to be transshipped at Port of Singapore.

(3) Extra-ASEAN Physical Distribution Network

Physical distributions to and from ASEAN are either by sea and air. At present, marine transportation is the most commonly-used means of transportation on both weight and value basis.

In the marine transport, containerized cargo is a typical form of transport at this moment among the general cargo, except bulk cargo.

According to ASEAN Strategic Transport Plan 2011-2015, the container annual cargo traffics are shared by Port Klang of about 75% of total containerized cargo in TEU and followed by Penang Port of 9%. Main trade partners are China, Singapore and Japan.

From above situation being overviewed, it is considered that large portion of extra-ASEAN logistics cargo is to be transshipped at Port of Singapore.

Since Malaysia Government has recently placed weight on development and expansion of container terminals of Tajung Pelapas in Johor State, considering its closeness to Singapore, it will need to pay an attention to the trend of changes in extra-ASEAN logistic network

7.3 Analysis Frame on Physical Distribution Network

This section studies frame for assessment of the vulnerability of logistics network against natural disasters in consideration of the actual situation of supply chain, as a preparedness of formulation of area BCP. The vulnerability itself is to be assessed after the further survey.

Table 7.3.1 Natural Disaster Prevention Related Matters in relation to vulnerability of Physical Distribution Facilities

Industrial Park Name represented	Not designated yet
Features	Place: Operation commenced in: Nos of Operating Enterprises : Total IPK Annual Turn-over (Mill.US$):
Vulnerability Assessment Frame for Each Industrial Park (IPK)	
Natural Disaster Risk(NDR): Extract from Survey Report 1 "Chapter 5 Existing Investigations and Studies"	
■ Flooding	Malaysia has relatively high flood hazard possibility especially in the river basin of Pandaruan River that flows through the border with Brunei.
■ Seismic intensity/ Tsunami	Earthquake hazard level of the most of Malay Peninsula and Kalimantan Island is low. However, Sumatra Island side of Malay Peninsula is relatively higher in the earthquake hazard level. Few earthquake disasters are recorded in the database. The tsunami disaster caused by the Sumatra earthquake of December 26 in 2004 is reported. However, no other tsunami disaster is recorded in the database.
■ Volcano	Volcano hazard level of Malaysia is low. No volcanic disaster is recorded in the database.
■ Cyclone, Meteorological Disaster, Landslide	The impact of cyclone hazard on whole the country is low. According to 980-2012 records, seven storm disasters have occurred in the country. Hazard distributes in the center of the Malay Peninsula where contains the suburbs of Capital Kuala Lumpur.
Brief Descriptions on Counter-measures (CMS) for NDR	
1) Private sector facilities: To follow further Survey	
Land, In-park Roads:	
Plant facilities:	
Physical Distribution Facilities:	
Others, if any:	
2) Infrastructures	
Road：The level of highway network development in Malaysia is advanced after Singapore. To increase the efficiency of logistics further, bypass road at the congested section in the city center is required in the future.	
Railway Railway development is one of the highest priority along with the investment in power and road. The development plan of high-speed railway which links Singapore and Kuala Lumpur has a great significance to the development of both countries.	

Port: The expansion plan of Tanjung Pelepas port is being promoted to increase its container handling capacity to 10 million TEU. This plan contributes to increase capacity of alternative logistics by developing Tanjung Pelepas port as a southern base of Malay Peninsula, alongside Port Klang in the middle and Port Penag in the north.
Airport: Long term expansion plan of Kuala Lumpur international airport aims to develop 5 lanes of 4000m runway to increase air cargo throughput to 5 million ton per year. This plan propels the sophistication of industry and logistics network.
Electric power/Fuel: The power supply in Malaysia is stable in that the annual instant power outage total hours are the same level as in Tokyo. To maintain this level, investments in power sector is being promoted alongside investment in the road.
Water-supply:
Sewage:
Solid waste:
Telecommunication:

Note:

*1 The summary of "Logistics Performance Index" by the World Bank is as follows.

(1) LPI score and category wise score is indicated by each country

(2) Score is ranked from one to five

(3) LPI of international logistics is scored based on the interviewing following six items to major importers and logistics companies in the neighboring countries (total of over 1000 companies).

1) Efficiency of the clearance process i.e. Speed, simplicity and predictability of formalities by border control agencies, including Customs
2) Quality of trade and transport related infrastructure e.g. Ports, railroads, roads, information technology
3) Ease of arranging competitively priced shipments
4) Competence and quality of logistics services e.g. transport operators, customs brokers
5) Ability to track and trace consignments)
6) Timeliness of shipments in reaching destination within the scheduled or expected delivery time.

*2 http://www.asean.or.jp/ja/invest/about/country_info/brunei/invest_info/industrialestate/

*3 http://www.mofa.go.jp/mofaj/area/brunei/data.html#04

References :

1) ASEAN-JAPAN CENTER, Lists of Industrial Parks/Estate/SEZ by Member Country (in Japanese)
2) World Bank Connecting to Compete 2012 Trade Logistics in the Global Economy
3) Shinya Nakata (2012), Introduction to Logistics, NIKKEI Newspapers in Japan (in Japanese)
4) JETRO (2008), ASEAN Physical Distribution Network 2008 (in Japanese)
5) ERIA: ASEAN Strategic Transport Plan 2011-2015.
6) ASEAN Secretariat, ASEAN Statistics on Intra and Extra_ ASEAN trade 2011

Chapter 8 Legislative Systems

A survey on the legislative systems concerned with disaster management, business continuity, environmental pollution, and development in Malaysia is conducted in this chapter.

The survey of Malaysia is mostly based on research through the websites of ministries and agencies of Malaysia, several leading international institutes that contributed to disaster research such as the Asia Disaster Reduction Center, and information from the websites of financial authorities in Malaysia. Laws, regulations, national implementation plans, and statutes are referred to within the scope of the survey.

The table below shows the methodology for collecting information.

Information Collected	Methodology	Scope of Survey
Legislative Systems for Disaster Management	To collect information from the internet, which is published by international agencies such as ADRC and disaster management institutes in Malaysia. And to refer to the report by the JICA research team.	Policies for disaster management. Management plans and action plans for landslides, floods, and other disasters.
Regulations and Standards for BCM / BCP	To collect information from the websites of financial authorities regulating the BCM/BCP.	Standards and guidelines related to BCM and business contingency.
Legislative Systems for Environment and Pollution	To collect information from the websites of ministries and agencies responsible for environment management.	Laws and regulations for industry activities on environmental management and pollution control
Legislative Systems for Development including Land Use, River and Building Regulations	To collect information from the websites of governmental authorities related to land use, rivers, or development.	Laws and regulations describing town development and land use. Building control laws.

The laws, regulations, decrees, and guidelines regulating the target fields defined above are compiled in this survey. The results of the survey in Malaysia are summarized below.

Scope	Information
Legislative Systems for Disaster Management in Malaysia	[Strategies and Plans] "National Security Council Directive No.20" [Regulations, Standards, and Guidelines] "Climate Change Adaptation Policy", "National Slope Master Plan 2009-2023", "Integrated River Basin Management Plan", "Federal Haze Action Plan"
Regulations and Standards for BCM / BCP in Malaysia	"MS (Malaysia Standards) 1970, Business Continuity Management Framework, 2007", "Guidelines on Management of IT Environment, 2004, Bank Negara Malaysia", "Guidelines on Business Continuity Management, 2008, Bank Negara Malaysia"
Legislative Systems for Environment and Pollution in Malaysia	[Laws for Environment] "Environmental Quality Act, 2006" [Laws and Regulations for Environmental Pollution Control] "Environmental Quality (Clean Air) Regulations, 1978", "Environmental Quality (Industrial Effluent) Regulations, 1979", "Environmental Quality (Sewage and Industrial Effluents) Regulations, 1979", "Environmental Quality (Scheduled Wastes) Regulation, 1989"

Legislative Systems for Development including Land Use, Rivers, and Building Regulations in Malaysia	"Town and Country Planning Act, 2005", "Land Conservation Act", "National Forest Act, 1984", "Federal Forest Act", "Highland Slope Development Guidance", "Road, Drainage and Building Act, 2000"

The available results on the survey about the laws and regulations for disaster management, BCP/BCM, environmental conservation, and provisions for development in Malaysia are summarized below.

8.1 Legislative systems for disaster management

(1) Disaster management laws

Table 8.1.1 Laws and Regulations of Disaster Management in Malaysia

	Laws / Regulations	Supervisory Authority	Related Law
Government Orders	National Security Council Directive No.20	National Security Council	Disaster Management

Malaysia has no specific disaster management laws. However, it has a disaster management policy and mechanism known as the "National Security Council (NSC) Directive No.20," approved by the Prime Minister in 1997.

NSC Directive No.20 is in the process of being revised to shift its paradigm from emergency response to disaster prevention and mitigation, as agreed upon by ASEAN countries. This revised NSC No.20 is to be approved by the Prime Minister in March or April 2012. In our research for this report, however, this revision of directive could not be confirmed.

(2) Disaster management strategies and plans

Table 8.1.2 Strategies and Plan for Disaster Management in Malaysia

	Laws / Regulations	Supervisory Authority	Matter
Plans	Climate Change Adaptation Policy	under survey	Climate Change
Plans	National Slope Master Plan 2009-2023	Public Works Department	Landslide
Plans	Integrated River Basin Management Plan	Selangor Waters Management Authority	Flood
Plans	Federal Haze Action Plan	under survey	Haze

There is no specific disaster management plan, but the preparation of one is planned once the new NSC Directive No. 20 is approved.

The Several Disaster Management Plan has been developed for each hazard: climate change, landslides, floods, and haze. The strategy and action plan for reducing risk from landslides on slopes nationwide is defined by the "National Slope Master Plan 2009-2023." Other plans, however, are not found in published information. Thus, the content defined in these plan is not clear and requires additional research.

8.2 Regulations and standards for business continuity management

Table 8.2.1 Regulations, Standards, or Guidelines for BCM/BCP in Malaysia

	Laws / Regulations	Supervisory Authority	Related Law
Standard	MS (Malaysia Standards) 1970, Business Continuity Management Framework, 2007	Technical Committee on Business Continuity Management	BCM
Guideline	Guidelines on Management of IT Environment, 2004, Bank Negara Malaysia	Central Bank of Malaysia	Business Contingency
Guideline	Guidelines on Business Continuity Management, 2008, Bank Negara Malaysia	Central Bank of Malaysia	BCM

The "MS 1970, Business Continuity Management Framework" has been developed to provide policies for organizations to develop, implement, and maintain a BCP.

In the Guidelines on Management of IT Environment, which was developed to mitigate risks pertaining to the IT environment in banks, procedures for business resumption and contingency plans are also described.

The Guidelines on Business Continuity Management were developed for financial institutes in order to provide the principles and requirements of BCM for banks, and also to describe the methods of creating a BCP.

8.3 Legislative systems for the environment and pollution control

(1) Environmental laws and regulations

Table 8.3.1 Laws and Regulations regarding the Environment in Malaysia

	Laws / Regulations	Supervisory Authority	Matter
Law	Environmental Quality Act, 1974 (revised in 2006)	Ministry of Natural Resources and Environment, Department of Environment	Environment Management

The integrated law on environmental management in Malaysia is called the Environmental Quality Act, which was established in 1974. The act, revised in 2006, issues regulations for effluent, air pollutant emissions, disposal and management of hazardous waste, and provisions for environmental assessments, and so on.

(2) Pollution control laws and regulations

Table 8.3.2 Laws and Regulations for Environmental Pollution Control in Malaysia

	Laws / Regulations	Supervisory Authority	Matter
Regulation	Environmental Quality (Clean Air) Regulations, 1978	Department of Environment	Air Pollution
Regulation	Environmental Quality (Industrial Effluent) Regulations, 1979	Department of Environment	Industrial Effluent
Regulation	Environmental Quality (Sewage and Industrial Effluents) Regulations, 1979	Department of Environment	Industrial Effluent
Regulation	Environmental Quality (Scheduled Wastes) Regulation, 1989	Department of Environment	Industrial Waste

The regulations for environmental pollution control related to industrial activities are listed. These Environmental Quality Regulations are based on the Environmental Quality Act, revised in 1985.

8.4 Legislative systems for development including land use, rivers and building codes

Table 8.4.1 Laws and Regulations for Land, River, and Building Code in Malaysia

	Laws / Regulations	Supervisory Authority	Matter
Law	Town and Country Planning Act, 1976 (revised in 2005)	Ministry of Land and Cooperative Development	Development
Law	Land Conservation Act	under survey	Land Use
Law	National Forest Act, 1984	under survey	Forestry
Law	Federal Forest Act	under survey	Forestry
Regulation	Highland Slope Development Guidance	under survey	Development
Law	Road, Drainage and Building Act, 1974 (revised in 2000)	under survey	Building Standards

In Malaysia, laws pertaining to urban development, land use, and forest conservation have been developed. In these laws and regulations, however, no particular provisions related to emergency management or disaster rehabilitation management have been stipulated.

Regulations for construction of streets, drains, and buildings are enacted based on the Road, Drainage, and Building Act. In our research, no documents about specific Building Standards in Malaysia have been acquired.

Chapter 9 Situation of Implementation of BCP

Guidelines for the development of BCP among the banking companies are indicated by the central bank of Malaysia. Moreover, in the Malaysia Standards, the framework for development of BCP among general companies is published by the Malaysian BCM committee.

Information about the actual condition of development of BCP and effort to disperse the BCP among companies in Malaysia is not sufficiently disclosed in the internet. The on-site surveys and interviews of institutions concerned are required.

List of Agglomerated Areas

ID	Short List	LongList	COUNTRY	PROVINCE	PARK NAME	ADDRESS
MY0001	**XXMY20**	**XXMY20**	Malaysia	Johor	Pasir Gudang Industrial Estate	Kawasan Perindustrian Pasir Gudang, 81700 Pasir Gudang, Johor
MY0002		**XXMY31**	Malaysia	Johor	Tebrau Industrial Estate	Taman Mount Austin, 81100 Johor Bahru, Johor
MY0003			Malaysia	Johor	Pontian	82000 Pontian, Johor
MY0004			Malaysia	Johor	Petaling Larkin	Jalan Petaling Kawasan Perindustrian Dato Onn, 80350 Johor Bahru, Johor
MY0005			Malaysia	Johor	Pagoh Industrial Area	Jalan Muar Pagoh, 84600 Pagoh, Johor
MY0006			Malaysia	Johor	Mengkibol	J25 86000 Kluang, Johor
MY0007			Malaysia	Johor	Bukit Pasir	J141 84300 Bukit Pasir, Johor
MY0008			Malaysia	Johor	Bandar Penawar Industrial Estate	Jalan Dato Abdullah Bandar Penawar, 82200 Kota Tinggi, Johor
MY0009			Malaysia	Johor	Bandar Tenggara Industrial Estate	Jalan Tun Abdul Majid Bandar Tenggara, 81000 Kulai, Johor
MY0010			Malaysia	Johor	Tanjung Langsat Industrial Complex	N107 71300 Rembau, Negeri Sembilan
MY0011			Malaysia	Johor	Johor Technology Park	Pusat Pentadbiran Universiti Teknologi Malaysia Universiti Teknologi Malaysia, 81300 Johor Bahru, Johor
MY0012			Malaysia	Johor	Tanjung Agas	C100 Tanjung Agas, 26600 Pekan, Pahang
MY0013			Malaysia	Johor	Simpang Renggam	Jalan Besar Simpang Renggam, 86200 Simpang Renggam, Johor
MY0014			Malaysia	Johor	Mersing	Jalan Endau Mersing Kampung Mersing Kanan, 86800 Mersing, Johor
MY0015			Malaysia	Johor	Johor Port FZ	Padan Tengku Phang
MY0016			Malaysia	Johor	Jl. Hasil	Jalan Hasil Kawasan Perindustrian Tampoi Jaya, 81200 Johor Bahru, Johor
MY0017			Malaysia	Johor	Tongkang Pecah	Jalan Tongkang Pechah 83000 Batu Pahat, Johor
MY0018			Malaysia	Johor	Senai Industrial Estate	Exit Persimpangan Senai & Jalan Lapangan Terbang & E3 81400 Senai, Johor
MY0019			Malaysia	Johor	Segamat	85000 Segamat, Johor
MY0020			Malaysia	Johor	Parit Raja	Taman Bintang, 86400 Parit Raja, Johor
MY0021			Malaysia	Johor	Sri Gading	Jalan Kluang Sri Gading, 83300 Seri Gading, Johor
MY0022			Malaysia	Johor	Kota Tinggi	Jalan Kolam Air Kota Tinggi, 81900 Kota Tinggi, Johor
MY0023			Malaysia	Johor	Kluang	Jalan Idaman 2 Taman Idaman, 86000 Kluang, Johor
MY0024			Malaysia	Johor	Sedenak Industrial Estate	J25 Kampung Baru Sungai Sayong, 81000 Kulai, Johor
MY0025		**XXMY25**	Malaysia	Johor	Senai Hi-Tech Park	Exit Persimpangan Senai & Jalan Lapangan Terbang & E3 81400 Senai, Johor
MY0026			Malaysia	Johor	Bio-XCell	J25 Kampung Baru Sungai Sayong, 81000 Kulai, Johor
MY0027			Malaysia	Kedah	Bukit Kayu Hitam Industrial Estate	Utara - Selatan Hwy & E1 06050 Bukit Kayu Hitam, Kedah
MY0028			Malaysia	Kedah	Sg. Tiang	K127 06700 Pendang, Kedah
MY0029			Malaysia	Kedah	Jeniang	K10 Jeniang, 08210 Sik, Kedah
MY0030			Malaysia	Kedah	Baling	67 Kampung Teduh, 09100 Baling, Kedah
MY0031			Malaysia	Kedah	Naka	K8 Pendang, Kedah
MY0032			Malaysia	Kedah	Kisap	Jalan Ayer Hangat 07000 Langkawi, Kedah
MY0033			Malaysia	Kedah	Rendong	K149 06700 Pendang, Kedah
MY0034			Malaysia	Kedah	Pokok Sena	K8 06400 Pendang, Kedah

ID	Short List	LongList	COUNTRY	PROVINCE	PARK NAME	ADDRESS
MY0035			Malaysia	Kedah	Sik	K10 Pekan Sik, 08210 Sik, Kedah
MY0036			Malaysia	Kedah	Darulaman	Utara - Selatan Hwy 06000 Jitra, Kedah
MY0037			Malaysia	Kedah	Sri Tandop	Jalan Sri Mengkudu 2 Kampung Pengkalan Putat, 05400 Alor Setar, Kedah
MY0038			Malaysia	Kedah	Mergong	Jalan Putih 1/1 Taman Rakyat Mergong, 05150 Alor Setar, Kedah
MY0039			Malaysia	Kedah	Ria Jaya Park	Lorong Gamelan 3/2 Taman Ria Jaya, 08000 Sungai Petani, Kedah
MY0040			Malaysia	Kedah	Bakar Arang Light(Cergas Layar)	Jalan Baiduri 1/4 Taman Baiduri, 08000 Sungai Petani, Kedah
MY0041			Malaysia	Kedah	Bakar Arang Light(Keladi Maju)	Jalan Baiduri 1/4 Taman Baiduri, 08000 Sungai Petani, Kedah
MY0042			Malaysia	Kedah	Taman Makmur	K149 08300 Gurun, Kedah
MY0043			Malaysia	Kedah	Kempas Park	Utara - Selatan Hwy 06010 Bukit Kayu Hitam, Kedah
MY0044			Malaysia	Kedah	Bukit Selambau	K17 Bukit Selambau, 08010 Sungai Petani, Kedah
MY0045		**XXMY14**	Malaysia	Kedah	Kulim Hi Tech Park	K115 Taman Kulim Hi-tech, 09000 Kulim, Kedah
MY0046			Malaysia	Kedah	Darulaman Industrial Estate	K149 06700 Pendang, Kedah
MY0047			Malaysia	Kedah	Mergong Barrage	69 Jalan Timur 3 Kawasan Perusahaan Mergong 2b, 05150 Alor Setar, Kedah
MY0048			Malaysia	Kedah	Sg. Petani	Jalan Air Mendidih 08000 Sungai Petani, Kedah
MY0049			Malaysia	Kedah	Bakar Arang	Jalan Baiduri 1/4 Taman Baiduri, 08000 Sungai Petani, Kedah
MY0050			Malaysia	Kedah	Kuala Ketil	K723 09100 Baling, Kedah
MY0051		**XXMY33**	Malaysia	Kedah	Tikam Batu Industrial Estate	1 Tikam Batu, 08600 Sungai Petani, Kedah
MY0052			Malaysia	Kedah	Kulim	151-157 Jalan Kelang Lama Taman Kejora, 09000 Kulim, Kedah
MY0053			Malaysia	Kedah	Binjal	K109 06000 Jitra, Kedah
MY0054			Malaysia	Kelantan	Gua Musang	8 18300 Gua Musang, Kelantan
MY0055			Malaysia	Kelantan	Jeli	Jalan Sungai Sam - Dabong - Jeli Bandar Jeli, 17600 Jeli, Kelantan
MY0056			Malaysia	Kelantan	Tanah Merah	Jalan Tasek Tanah Merah, 17500 Tanah Merah, Kelantan
MY0057			Malaysia	Kelantan	MIEL Lundang	D29 18300 Gua Musang, Kelantan
MY0058			Malaysia	Kelantan	Pengkalan Chepa(Jalan Maktab)	Jalan Maktab Pengkalan Chepa, 16100 Kota Bharu, Kelantan
MY0059			Malaysia	Kelantan	Pengkalan Chepa(Jalan Padang Tembak)	Jalan Padang Tembak Pengkalan Chepa, 16100 Kota Bharu, Kelantan
MY0060			Malaysia	Kelantan	Kemubu	D233 18200 Dabong, Kelantan
MY0061			Malaysia	Kelantan	Pengkalan Kubor Free Zone	D29 18300 Gua Musang, Kelantan
MY0062			Malaysia	Kelantan	Gua Musang Industrial Estate	8 18300 Gua Musang, Kelantan
MY0063			Malaysia	Kelantan	Kelantan Halal Park	D29 18300 Gua Musang, Kelantan
MY0064			Malaysia	Malacca	Merlimau	Jalan Tanjung Terap Barat 1 Taman Panglima Pak, 77300 Merlimau, Melaka
MY0065			Malaysia	Malacca	Cheng Industrial Estate	Jalan Durian Daun Kampung Durian Daun Lama, 75400 Melaka
MY0066			Malaysia	Malacca	Krubong Industrial Estate	Jalan Durian Daun Kampung Durian Daun Lama, 75400 Melaka
MY0067		**XXMY03**	Malaysia	Malacca	Batu Berendam Free Zone	Jalan Batu Berendam 75350 Melaka
MY0068		**XXMY09**	Malaysia	Malacca	Bukit Rambai Industrial Estate	Jalan Gedung Lalang Kampung Gedung Lalang, 75250 Tanjung Kling, Melaka
MY0069			Malaysia	Malacca	Batu Berendam	Jalan Batu Berendam 75350 Melaka
MY0070			Malaysia	Malacca	Sungai Udang	5 Taman Peruna, 76300 Sungai Udang, Melaka

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MY0071			Malaysia	Malacca	Mawar Industrial Park	Jalan Merdeka Bandar Hilir, 75000 Melaka
MY0072			Malaysia	Malacca	Ossons Industrial Park	Jalan Durian Daun Kampung Durian Daun Lama, 75400 Melaka
MY0073			Malaysia	Malacca	Jasin Industrial Park	Jalan Bukit Katil 75450 Melaka
MY0074			Malaysia	Malacca	Krubong Techno Park	Jalan Durian Daun Kampung Durian Daun Lama, 75400 Melaka
MY0075		**XXMY01**	Malaysia	Malacca	Ayer Keroh	Leboh Ayer Keroh 75450 Melaka
MY0076			Malaysia	Malacca	Malaysia China Light Industrial Park	Jalan Durian Daun Kampung Durian Daun Lama, 75400 Melaka
MY0077			Malaysia	Malacca	Bandar Putra Melaka	Jalan Ayer Leleh Bukit Serindit, 75000 Melaka
MY0078			Malaysia	Malacca	Taman Tasik Utama	Jalan Tu 2 Taman Tasik Utama, 75350 Melaka
MY0079			Malaysia	Malacca	Merlimau Industrial Estate	Jalan Tanjung Terap Barat 1 Taman Panglima Pak, 77300 Merlimau, Melaka
MY0080			Malaysia	Malacca	Batu Berendam (Free Trade Zone)	Jalan Batu Berendam 75350 Melaka, Malaysia
MY0081			Malaysia	Malacca	Kawasan Periindustrian Tasik Utama Air Keroh	Jalan Durian Daun Kampung Durian Daun Lama, 75400 Melaka
MY0082			Malaysia	Malacca	Tangga Batu	Jalan Tangga Batu Tangga Batu, 76400 Tanjung Kling, Melaka
MY0083			Malaysia	Malacca	Alor Gajah	Jalan Pengkalan 78000 Alor Gajah, Melaka
MY0084			Malaysia	Malacca	Masjid Tanah	Jalan Masid Tanah / Sungai Udang 78300 Masjid Tanah, Melaka
MY0085			Malaysia	Malacca	Tanjung Kling Free Zone	Jalan Durian Daun Kampung Durian Daun Lama, 75400 Melaka
MY0086			Malaysia	Malacca	Telok Mas Industrial Estate	Jalan Durian Daun Kampung Durian Daun Lama, 75400 Melaka
MY0087			Malaysia	Malacca	HICOM Pegoh Industrial Park	Jalan Durian Daun Kampung Durian Daun Lama, 75400 Melaka
MY0088			Malaysia	Malacca	Zarina Industrial Park	Jalan Durian Daun Kampung Durian Daun Lama, 75400 Melaka
MY0089			Malaysia	Malacca	Melaka World Solar Valley	Jalan Durian Daun Kampung Durian Daun Lama, 75400 Melaka
MY0090			Malaysia	Malacca	Melaka Halal Hub	Jalan Durian Daun Kampung Durian Daun Lama, 75400 Melaka
MY0091			Malaysia	Negeri Sembilan	Chembong	Jalan Perusahaan 2/2 Kawasan Perindustrian Chembong, 71300 Rembau, Negeri Sembilan
MY0092		**XXMY19**	Malaysia	Negeri Sembilan	Nilai Industrial Estate	58 Persiaran Nilai Impian 2 Nilai Impian, 71800 Nilai, Negeri Sembilan
MY0093			Malaysia	Negeri Sembilan	Arab-Malaysian Industrial Park	Jalan Permata 1/2 Kawasan Perindustrian Nilai, 71800 Nilai, Negeri Sembilan
MY0094			Malaysia	Negeri Sembilan	New Senawang Industrial Park	N19 72200 Batu Kikir, Negeri Sembilan
MY0095			Malaysia	Negeri Sembilan	Lukut Light Industrial Area	Jalan Seremban Lukut, 71010 Port Dickson, Negeri Sembilan
MY0096			Malaysia	Negeri Sembilan	Seremban Light Industrial Area	Muzium Negeri Sembilan 70200 Seremban, Negeri Sembilan
MY0097			Malaysia	Negeri Sembilan	Sri Senawang Light Industrial Area	Seremban - Port Dickson Hwy Port Dickson, Negeri Sembilan
MY0098			Malaysia	Negeri Sembilan	Sungai Gadut Industrial Estate	N19 72200 Batu Kikir, Negeri Sembilan
MY0099			Malaysia	Negeri Sembilan	GKM Industrial Park	N19 72200 Batu Kikir, Negeri Sembilan
MY0100		**XXMY18**	Malaysia	Negeri Sembilan	Senawang	Jalan Senawang 70450 Seremban, Negeri Sembilan
MY0101			Malaysia	Negeri Sembilan	Nilai	58 Persiaran Nilai Impian 2 Nilai Impian, 71800 Nilai, Negeri Sembilan
MY0102			Malaysia	Negeri Sembilan	Nilai Mini	Jalan Semenyih 43000 Kajang, Selangor
MY0103			Malaysia	Negeri Sembilan	Kampung Dioh(Kuala Pilah)	N117 Dioh, 72000 Kuala Pilah, Negeri Sembilan
MY0104			Malaysia	Negeri Sembilan	Simpang Pertang(Jelebu)	9 72300 Simpang Pertang, Negeri Sembilan
MY0105			Malaysia	Negeri Sembilan	Oakland Industrial Park	N19 72200 Batu Kikir, Negeri Sembilan

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MY0106			Malaysia	Negeri Sembilan	Tuanku Jaafar Industrial Estate	N19 72200 Batu Kikir, Negeri Sembilan
MY0107			Malaysia	Negeri Sembilan	Tuanku Jaafar Industrial Park	Menengah Teknik Tuanku Jaafar 70450 Seremban, Negeri Sembilan
MY0108			Malaysia	Negeri Sembilan	Techpark@enstek	N19 72200 Batu Kikir, Negeri Sembilan
MY0109			Malaysia	Negeri Sembilan	Pedas Halal Park	N9 Kampung Pedas Hilir, 71400 Pedas, Negeri Sembilan
MY0110			Malaysia	Pahang	Bentong Industrial Estate I & II	Jalan Anuar Taman Ban Hua, 28700 Bentong, Pahang
MY0111			Malaysia	Pahang	Kuantan Port Industrial Land	Jalan Pelabuhan 3/4 Bukit Pengorak, 26080 Kuantan, Pahang
MY0112			Malaysia	Pahang	Bandar Pusat Jengka Industrial Estate	62 Bandar Jengka, 26400 Bandar Pusat Jengka, Pahang
MY0113			Malaysia	Pahang	Tun Abdul Razak	11 26900 Bandar Tun Abdul Razak, Pahang
MY0114			Malaysia	Pahang	Rompin	NO ADRESS
MY0115			Malaysia	Pahang	Temerloh Industrial Park	Jalan Industri 3/1 Kawasan Perindustrian Temerloh, 28400 Mentakab, Pahang
MY0116			Malaysia	Pahang	Raub Industrial Estate	Jalan Tun Razak 27600 Raub, Pahang
MY0117			Malaysia	Pahang	Lipis Industrial Estate	8 27100 Padang Tengku, Pahang
MY0118			Malaysia	Pahang	KG. Sempadan Furniture Village	C145 Kampung Pedah, 27150 Jerantut, Pahang
MY0119			Malaysia	Pahang	Gebeng I, II & III Industrial Estate	Jalan Pelabuhan 3/4 Bukit Pengorak, 26080 Kuantan, Pahang
MY0120			Malaysia	Pahang	Jerantut	Lorong 11 Taman Muhibbah, 27000 Jerantut, Pahang
MY0121			Malaysia	Pahang	Maran	2 26500 Maran, Pahang
MY0122			Malaysia	Pahang	Pekan-Peramu Automotive Industrial Park	3 26600 Pekan, Pahang
MY0123			Malaysia	Pahang	Semanbu	Jalan Pintasan Kuantan 26100 Balok, Pahang
MY0124			Malaysia	Pahang	Songsang	98 Kampung Songsang, 28020 Temerloh, Pahang
MY0125			Malaysia	Pahang	Jaya Gading	Jalan Gambang Gading Jaya, 25150 Kuantan, Pahang
MY0126			Malaysia	Pahang	Muadzam Shah	63 26700 Muadzam Shah, Pahan
MY0127			Malaysia	Pahang	Kuantan Industrial Park	Kelab Golf Diraja Pahang 25050 Kuantan, Pahang
MY0128			Malaysia	Pahang	Gambang Industrial Estate	Mec Hwy Kampung Melayu Gambang, 26300 Gambang, Pahang
MY0129			Malaysia	Pahang	Lanchang Industrial Estate	Pantai Timur Hwy Lanchang, Pahang
MY0130			Malaysia	Pahang	Tanjung Gelang Free Industrial Zone	C145 Kampung Pedah, 27150 Jerantut, Pahang
MY0131			Malaysia	Pahang	Tun Abdul Razak Industrial Estate	C145 Kampung Pedah, 27150 Jerantut, Pahang
MY0132			Malaysia	Pahang	Indera Makhota Industrial Estate	C145 Kampung Pedah, 27150 Jerantut, Pahang
MY0133			Malaysia	Pahang	Rompin Industrial Estate	5 k m from Rompin town
MY0134			Malaysia	Pahang	Tanjung Agas Oil & Gas and Logistics Industrial Park	C100 Tanjung Agas, 26600 Pekan, Pahang
MY0135			Malaysia	Pahang	Kuantan Industrial Park	Kelab Golf Diraja Pahang 25050 Kuantan, Pahang
MY0136		XXMY21	Malaysia	Penang	Prai Wharf Free Industrial Zone	51 Lorong Belibis 37 Taman Tangling Jaya, 14100 Simpang Ampat, Pulau Pinang
MY0137			Malaysia	Penang	Asas Industrial Park	Jalan Asas Murni Taman Amra, 14100 Bukit Mertajam, Pulau Pinang
MY0138			Malaysia	Penang	Permatang Tinggi Industrial Park	Jalan Pahlawan Permatang Tinggi, 14100 Bukit Mertajam, Pulau Pinang
MY0139			Malaysia	Penang	Handersons Industrial Park	51 Lorong Belibis 37 Taman Tangling Jaya, 14100 Simpang Ampat, Pulau Pinang
MY0140			Malaysia	Penang	Diamond Valley Light Industrial Park	51 Lorong Belibis 37 Taman Tangling Jaya, 14100 Simpang Ampat, Pulau Pinang

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MY0141			Malaysia	Penang	Adorna Light Industrial Complex	51 Lorong Belibis 37 Taman Tangling Jaya, 14100 Simpang Ampat, Pulau Pinang
MY0142			Malaysia	Penang	Penang Technoplex	51 Lorong Belibis 37 Taman Tangling Jaya, 14100 Simpang Ampat, Pulau Pinang
MY0143		**XXMY10**	Malaysia	Penang	Bukit Tengah	Jalan Perusahaan Bukit Tengah, 13600 Perai, Pulau Pinang
MY0144			Malaysia	Penang	Mak Mandin	Jalan Mak Mandin Kawasan Perindustrian Mak Mandin, 13400 Butterworth, Pulau Pinang
MY0145			Malaysia	Penang	Seberang Jaya	24 Lorong Siakap 10 Seberang Jaya, 13700 Perai, Pulau Pinang
MY0146	**XXMY05**	**XXMY05**	Malaysia	Penang	Bayan Lepas Industrial Estate	84-126 Jalan Sultan Azlan Shah Bandar Bayan Baru, 11900 Bayan Lepas, Pulau Pinang
MY0147		**XXMY06**	Malaysia	Penang	Bukit Minyak Industrial Park	Utara - Selatan Hwy 14100 Bukit Mertajam, Penang
MY0148		**XXMY07**	Malaysia	Penang	Bukit Panchor Industrial Park	P146 14300 Nibong Tebal, Pulau Pinang
MY0149			Malaysia	Penang	Raja Uda Light Industrial Park	51 Lorong Belibis 37 Taman Tangling Jaya, 14100 Simpang Ampat, Pulau Pinang
MY0150			Malaysia	Penang	Sungai Lokan Industrial Estate	Lorong Perusahaan Sungai Lokan 5 Kawasan Perusahaan Acku, 13400 Butterworth, Pulau Pinang
MY0151		**XXMY04**	Malaysia	Penang	Batu Kawan Industrial Estate	Jalan Batu Kawan 3 14100 Simpang Ampat, Pulau Pinang
MY0152			Malaysia	Penang	Penang Science Park	Jalan Kubang Menderung 13100 Penaga, Pulau Pinang
MY0153		**XXMY23**	Malaysia	Penang	Seberang Jaya Industrial Park	Jalan Sungai Air Putih 2/2 Botanica City Air Putih, 11000 Balik Pulau, Pulau Pinang
MY0154			Malaysia	Penang	Penang Technoplex	51 Lorong Belibis 37 Taman Tangling Jaya, 14100 Simpang Ampat, Pulau Pinang
MY0155		**XXMY17**	Malaysia	Penang	Mak Mandin Industrial Park	Lorong Cantek 18 Taman Cantek, 13400 Butterworth, Pulau Pinang
MY0156			Malaysia	Penang	Perai Industrial Park	Jalan Sungai Air Putih 2/2 Botanica City Air Putih, 11000 Balik Pulau, Pulau Pinang
MY0157			Malaysia	Perak	Silibin	Jalan Silibin 30100 Ipoh, Perak
MY0158			Malaysia	Perak	Tupai	Jalan Tupai Taman Jambu, 34000 Taiping, Perak
MY0159			Malaysia	Perak	Parit Buntar	Jalan Perusahaan 1 Kawasan Perusahaan Parit Buntar, 34200 Parit Buntar, Perak
MY0160			Malaysia	Perak	Slim River	Jalan Nilam Taman Sri Krishnan, 35800 Slim River, Perak
MY0161			Malaysia	Perak	Seri Manjong	Jalan Pasir Panjang Kampung Pasir Panjang Laut, 32000 Sitiawan, Perak
MY0162			Malaysia	Perak	Pengkalan Industries Park	Jalan Gopeng 31610 Gopeng, Perak
MY0163			Malaysia	Perak	Pharmaceutical Park(Seri Iskandar)	1 34850 Changkat Jering, Perak
MY0164			Malaysia	Perak	Bemban Industrial Estate	1 34850 Changkat Jering, Perak
MY0165			Malaysia	Perak	Pulai Jaya Industrial Park	Pulai Jaya 1 Taman Bersatu, 31300 Ipoh, Perak
MY0166			Malaysia	Perak	Paku Rimba Industrial Park	1 34850 Changkat Jering, Perak
MY0167			Malaysia	Perak	Gopeng Industrial Park	Jalan Industri 4/2 Kawasan Perindustrian Gopeng, 31350 Ipoh, Perak
MY0168			Malaysia	Perak	Jelapang	Pusat Perdagangan Jelapang 2 Jelapang, 30020 Ipoh, Perak
MY0169			Malaysia	Perak	IGB International Industrial Park	1 34850 Changkat Jering, Perak
MY0170		**XXMY15**	Malaysia	Perak	Lumut Port Industrial Park	100 32200 Lumut, Perak
MY0171			Malaysia	Perak	Zagrib Industrial Park	1 34850 Changkat Jering, Perak
MY0172			Malaysia	Perak	Thai Aik Industrial Park	1 34850 Changkat Jering, Perak
MY0173			Malaysia	Perak	Taman Teknologi Seri Iskandar	Regat Teknologi 1 Seri Iskandar, 32600 Bota, Perak
MY0174			Malaysia	Perak	Foundary Park	1 34850 Changkat Jering, Perak

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MY0175			Malaysia	Perak	Ceramic Industrial Park	1 34850 Changkat Jering, Perak
MY0176			Malaysia	Perak	Furniture Village	1 34850 Changkat Jering, Perak
MY0177			Malaysia	Perak	Jelapang FZ	Pusat Perdagangan Jelapang 2 Jelapang, 30020 Ipoh, Perak
MY0178			Malaysia	Perak	Kinta FZ	A181 31300 Ipoh, Perak
MY0179			Malaysia	Perak	Taman Meru	Jalan Bukit Meru 4 Taman Meru, 30020 Ipoh, Perak
MY0180			Malaysia	Perak	Perindustrian Bebas	Jalan Perak Taman Desa Wira, 42500 Telok Panglima Garang, Selangor
MY0181			Malaysia	Perak	Pengkalan	Jalan Tasek 33100 Pengkalan Hulu, Perak
MY0182			Malaysia	Perak	Kanthan	Persiaran Perindustrian Dti Dua Taman Perindustrian Khantan Dti, 31200 Chemor, Perak
MY0183			Malaysia	Perak	Tasek	Jalan Tasek 33100 Pengkalan Hulu, Perak
MY0184		**XXMY13**	Malaysia	Perak	Kuala Kangsar	Jalan Taiping 33000 Kuala Kangsar, Perak
MY0185		**XXMY12**	Malaysia	Perak	Kamunting	Kamunting Perak
MY0186			Malaysia	Perak	Kamunting Tambahan	Jalan Kamunting Lama Kampung Jana Baharu, 34600 Kamunting, Perak
MY0187			Malaysia	Perak	Kawasan Perindustrian Kg Acheh, Sitiawan	1 34850 Changkat Jering, Perak
MY0188			Malaysia	Perak	Proton City	Jalan Bunga Tanjung Proton City, 35900 Tanjong Malim, Perak
MY0189			Malaysia	Perak	Kawasan Perindustrian Jalan Sungkai Bidor	1 34850 Changkat Jering, Perak
MY0190			Malaysia	Perak	Kawasan Perindustrian Seramik	1 34850 Changkat Jering, Perak
MY0191			Malaysia	Perak	Kawasan Perindustrian Sungai Siput	1 34850 Changkat Jering, Perak
MY0192			Malaysia	Perak	Kawasan Perindustrian Jalan Lahat - Simpang Pulai Perak	1 34850 Changkat Jering, Perak
MY0193			Malaysia	Perak	Kawasan Perindustrian Bercham	Persiaran Industri Bercham 8 Taman Mujur, 31400 Ipoh, Perak
MY0194			Malaysia	Perak	Kawasan Perindustrian Bukit Merah	1 34850 Changkat Jering, Perak
MY0195			Malaysia	Perlis	Jejawi	Persiaran Jubli Emas Kampung Jejawi, 01000 Kangar, Perlis
MY0196			Malaysia	Perlis	Chuping	Jalan Chuping Chuping, 02500 Kangar, Perlis
MY0197			Malaysia	Perlis	Kuala Perlis Industrial Estate	Jalan Bukit Kubu 02000 Kuala Perlis, Perlis
MY0198			Malaysia	Perlis	Padang Besar Industrial Estate	7 02100 Padang Besar, Perlis
MY0199			Malaysia	Sabah	Likas	Sekolah Jenis Kebangsaan (Cina) Lok Yuk Likas 88400 Kota Kinabalu, Sabah
MY0200			Malaysia	Sabah	Kimanis	A2 Kimanis, 89600 Papar, Sabah
MY0201			Malaysia	Sabah	Sipitang	A2 89850 Sipitang, Sabah
MY0202			Malaysia	Sabah	Sandakan	Jalan Cecily 90000 Sandakan, Sabah
MY0203			Malaysia	Sabah	Lok Kawi	Jalan Pintas Penampang 89500 Penampang, Sabah
MY0204			Malaysia	Sabah	Tawau	Jalan Timur 91000 Tawau, Sabah
MY0205			Malaysia	Sabah	Silam	A5 91100 Lahad Datu, Sabah
MY0206			Malaysia	Sabah	Kastam Baru	Jalan Kastam Baru 91100 Lahad Datu, Sabah
MY0207			Malaysia	Sabah	Seguntor	Jalan Batu Sapi Batu Sapi, 90000 Sandakan, Sabah

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MY0208			Malaysia	Sabah	Batu Sapi	Jalan Batu Sapi Batu Sapi, 90000 Sandakan, Sabah
MY0209			Malaysia	Sabah	Sungei Imam	Jalan Kuhara 91000 Tawau, Sabah
MY0210			Malaysia	Sabah	Kota Kinabalu Industrial Park (KKIP) incl. Sabah Halal Park	Jalan Kilang Sedco Industrial Estate Kelombong, 88450 Kota Kinabalu, Sabah
MY0211			Malaysia	Sabah	Sipitang Oil and Gas Indsutrial Park (SOGIP)	A2 89850 Sipitang, Sabah
MY0212			Malaysia	Sabah	Palm Oil Industrial Cluster, Sandakan Sabah	NO ADRESS
MY0213			Malaysia	Sabah	Palm Oil Industrial Cluster, Lahad Datu	NO ADRESS
MY0214			Malaysia	Sarawak	Demak Laut Industrial Park	852 Jalan Demak Laut 7 Sejingkat Industrial Park, 93050 Kuching, Sarawak
MY0215			Malaysia	Sarawak	Kemena	Jalan Tun Razak 97000 Bintulu, Sarawak
MY0216			Malaysia	Sarawak	Tanjung Manis Halal Hub	Tanjung Manis Airport Belawai, Sarawak
MY0217			Malaysia	Sarawak	Kota Samarahan Industrial Estate	Jalan Datuk Mohammad Musa 93250 Kuching, Sarawak
MY0218			Malaysia	Sarawak	Pending	8276 Jalan Pending 93450 Kuching, Sarawak
MY0219			Malaysia	Sarawak	Upper Lanang	Jalan Upper Lanang 96000 Sibu, Sarawak
MY0220			Malaysia	Sarawak	Piasau	Jalan Taman Piasau Edar Piasau, 98000 Miri, Sarawak
MY0221			Malaysia	Sarawak	Limbang	NO ADRESS
MY0222			Malaysia	Sarawak	Kidurong	1 97000 Bintulu, Sarawak
MY0223			Malaysia	Sarawak	Kuala Baram	22 98000 Miri, Sarawak
MY0224			Malaysia	Sarawak	Sama Jaya Free Industrial Zone	1370 Persiaran Elektronik 1 Sama Jaya Free Industrial Zone, 93350 Kuching, Sarawak
MY0225			Malaysia	Sarawak	Palm Oil Industrial Cluster, Tanjung Manis	NO ADRESS
MY0226			Malaysia	Sarawak	Taman Perindustrian Samalajau	NO ADRESS
MY0227			Malaysia	Sarawak	Estet Perindustrian Rantau Panjang	NO ADRESS
MY0228			Malaysia	Sarawak	Kawasan Perindustrian Sibu	NO ADRESS
MY0229			Malaysia	Selangor	Sungai Besar	Jalan Sungai Panjang Kampung Parit Empat, 45300 Sungai Besar, Selangor
MY0230			Malaysia	Selangor	Ampang Hulu Kelang	Jalan L.O 2 Laman Oakleaf, 68000 Ampang, Selangor
MY0231			Malaysia	Selangor	Rawang Batu 17	Jalan 1a Taman Jati, 48000 Rawang, Selangor
MY0232			Malaysia	Selangor	Telok Panglima Garang	2 Jalan Indah 4 Taman Indah Jaya, 42500 Telok Panglima Garang, Selangor
MY0233			Malaysia	Selangor	Banting	Jalan Gangsa Kawasan Perindustrian Banting, 42700 Banting, Selangor
MY0234			Malaysia	Selangor	Bangi (Section10,13(1&2), &16)	2 Jalan Seksyen 1/16 Taman Kajang Utama, 43000 Kajang, Selangor
MY0235			Malaysia	Selangor	Baranang	Lorong Dato Dagang Haji Tahir Kampung Sesapan Kelubi, 43700 Beranang, Selangor
MY0236			Malaysia	Selangor	Setapak	Jalan Tembaga Setapak, 53200 Kuala Lumpur, Wilayah Persekutuan Kuala Lumpur
MY0237			Malaysia	Selangor	Cheras Jaya	Jalan CJ 8 Taman Cheras Jaya, 43200 Seri Kembangan, Selangor
MY0238			Malaysia	Selangor	Salak Tinggi	Jalan Warisan Megah Kota Warisan, 43900 Sepang, Selangor
MY0239			Malaysia	Selangor	Olak Lempit	Jalan Olak Lempit 28/41 Taman Alam Megah, 40400 Shah Alam, Selangor

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MY0240			Malaysia	Selangor	Selat Kelang Utara	Selat Klang Hwy 42000 Port Klang, Selangor
MY0241			Malaysia	Selangor	Sekinchan	Jalan Gereja Sekinchan, 45400 Sekinchan, Selangor
MY0242			Malaysia	Selangor	Kuala Selangor	12 Jalan Pahlawan 4 Taman Pahlawan, 45000 Kuala Selangor, Selangor
MY0243			Malaysia	Selangor	Batu Arang	Jalan Albert Fenelum Taman Muhibbah, 48100 Batu Arang, Selangor
MY0244			Malaysia	Selangor	Bandar Baru Kuala Selangor	Jalan 2/3 Bandar Baru Kuala Selangor, 45000 Kuala Selangor, Selangor
MY0245			Malaysia	Selangor	Sugai Buloh	Jalan Kusta Sungai Buloh Kampung Melayu Batu 13 Sungai Buloh, 47000 Sungai Buloh, Selangor
MY0246			Malaysia	Selangor	Rawang Batu 20	Jalan 3/17 Bandar Tasik Puteri, 48000 Rawang, Selangor
MY0247			Malaysia	Selangor	Rasa	Jalan Damar 2 Kampung Chuang, 44200 Rasa, Selangor
MY0248			Malaysia	Selangor	Pulau Meranti	Jalan Pulau Meranti 47100 Puchong, Selangor
MY0249		**XXMY22**	Malaysia	Selangor	Pulau Indah	Persiaran Sultan Abdul Aziz Kampung Sungai Pinang, 42920 Pulau Lumut, Selango
MY0250			Malaysia	Selangor	Sugai Gumut Hulu Selangor	55 44000 Kuala Kubu Bahru, Selangor
MY0251			Malaysia	Selangor	Taiwan Industrial Park	Utara - Selatan Hwy Kuala Kubu Bharu, Selangor
MY0252			Malaysia	Selangor	Ladang Emmot, Kajang	Utara - Selatan Hwy Kuala Kubu Bharu, Selangor
MY0253		**XXMY27**	Malaysia	Selangor	Subang Hi-Tech Industrial Park, Subang Jaya	Jalan Delima 1/2 Subang Hi-tech Industrial Park, 40000 Subang Jaya, Selangor
MY0254			Malaysia	Selangor	Sungai Choh Rawang Industrial Park	Jalan Sungai Buaya Kawasan Industri Sungai Choh, 48200 Serendah, Selangor
MY0255			Malaysia	Selangor	Saujana Impian Township, Kajang	1-13 Jalan Impian Indah 3 Taman Impian Indah, 43000 Kajang, Selangor
MY0256			Malaysia	Selangor	Balakong Section 16 & 26	Jalan Balakong Jaya 17 Taman Balakong Jaya, 43300 Seri Kembangan, Selangor
MY0257			Malaysia	Selangor	Hicom Industrial Valley, Shah Alam	Utara - Selatan Hwy Kuala Kubu Bharu, Selangor
MY0258			Malaysia	Selangor	Bandar Bay Batang Kali, Mukim Hulu Yam	Utara - Selatan Hwy Kuala Kubu Bharu, Selangor
MY0259			Malaysia	Selangor	Hulu Yam Industrial Area	Utara - Selatan Hwy Kuala Kubu Bharu, Selangor
MY0260			Malaysia	Selangor	Tai Chong Industrial Park, Kelang	Utara - Selatan Hwy Kuala Kubu Bharu, Selangor
MY0261			Malaysia	Selangor	Puchong Industrial Park	9-21 Jalan TPP 1/13 Taman Perindustrian Puchong, 47100 Puchong, Selangor
MY0262			Malaysia	Selangor	Pandamaran	Jalan Sijangkang & Jalan Young Kawasan 10, 42000 Pelabuhan Klang, Selangor
MY0263			Malaysia	Selangor	Subang-Glenmarie, Subang	Jalan Lapangan Terbang Subang 40150 Shah Alam, Selangor
MY0264		**XXMY08**	Malaysia	Selangor	Bukit Raja Industrial Park, Shah Alam	Jalan Keluli 1 Taman Perindustrian Bukit Raja Selatan, 40000 Shah Alam, Selangor
MY0265			Malaysia	Selangor	Port Kelang Industrial Park	2-50 Lorong Seri Gambut 3 Taman Camellia, 41200 Klang, Selangor
MY0266			Malaysia	Selangor	Lion Industrial Park, Shah Alam	Utara - Selatan Hwy Kuala Kubu Bharu, Selangor
MY0267			Malaysia	Selangor	Labohan Dagang Industrial Area	Utara - Selatan Hwy Kuala Kubu Bharu, Selangor
MY0268		**XXMY29**	Malaysia	Selangor	Sugai Buloh Industrial Area	Puta Industrial Park Sungai,Buloh
MY0269			Malaysia	Selangor	Kimfals Holdings, Batu Caves	Jalan Sungai Buloh 40150 Shah Alam, Selangor
MY0270			Malaysia	Selangor	Lee Lan & Sons, Kepong	Jalan Sungai Buloh 40150 Shah Alam, Selangor
MY0271			Malaysia	Selangor	Hicom Heavy Industries, Shah Alam	Jalan Sungai Buloh 40150 Shah Alam, Selangor
MY0272		**XXMY28**	Malaysia	Selangor	Subang Jaya Industrial Estate	Jalan SS 13/3 Subang Jaya Industrial Estate, 47500 Subang Jaya, Selangor

ID	Short List	LongList	COUNTRY	PROVINCE	PARK NAME	ADDRESS
MY0273			Malaysia	Selangor	Bukit Raja	Persiaran Bukit Raja Bandar Baru Klang, 41150 Klang, Selangor
MY0274			Malaysia	Selangor	Sri Damansara Industrial Park	Persiaran Mahogani Kota Damansara, 47810 Petaling Jaya, Selangor,
MY0275			Malaysia	Selangor	Hicom Hong Leong, Shah Alam	Utara - Selatan Hwy Kuala Kubu Bharu, Selangor
MY0276			Malaysia	Selangor	Saleha Development, Kelang	Utara - Selatan Hwy Kuala Kubu Bharu, Selangor
MY0277			Malaysia	Selangor	Taman Cempakasari, Kelang	1-47 Lorong Sungei Puloh 7 Taman Cempaka Sari, 41200 Klang, Selangor
MY0278			Malaysia	Selangor	Bukit Beruntung Industrial Park	Jalan Iskandar Kampung Bukit Kapar, 42200 Kapar, Selangor
MY0279			Malaysia	Selangor	Hicom Industrial Estate Sector B, Shah Alam	Persiaran Hulu Selangor Taman Perindustrian Hicom, 40400 Shah Alam, Selangor
MY0280			Malaysia	Selangor	Sugain Lang Industrial Area	Utara - Selatan Hwy Kuala Kubu Bharu, Selangor
MY0281			Malaysia	Selangor	Bukit Sentosa Industrial Area	Jalan Iskandar Kampung Bukit Kapar, 42200 Kapar, Selangor
MY0282			Malaysia	Selangor	Meru Industrial Area	Persiaran Hamzah Alang Taman Perindustrian Meru, 42200 Kapar, Selangor
MY0283			Malaysia	Selangor	Mah Sing Integrated Industrial Area	Utara - Selatan Hwy Kuala Kubu Bharu, Selangor
MY0284	**XXMY26**	**XXMY26**	Malaysia	Selangor	Shah Alam Section 15,15,21,22,23	Jalan Utas A 15/A Seksyen 15, 40200 Shah Alam, Selangor
MY0285			Malaysia	Selangor	Kundang Industrial Area	Jalan Kuala Selangor 40160 Shah Alam, Selangor
MY0286			Malaysia	Selangor	Palm Green Industrial Area	Utara - Selatan Hwy Kuala Kubu Bharu, Selangor
MY0287			Malaysia	Selangor	Cosmoplex Salak Tinggi, Shah Alam Propoerties	Utara - Selatan Hwy Kuala Kubu Bharu, Selangor
MY0288			Malaysia	Selangor	Bolton Industrial Park, Batu Caves	Jalan Batu Caves Kawasan Industri Batu Caves, 68100 Batu Caves, Selangor
MY0289			Malaysia	Selangor	Kelang Central Industrial Park	Jalan Awan Mendung Taman United, 58200 Kuala Lumpur, Wilayah Persekutuan Kuala Lumpur
MY0290			Malaysia	Selangor	Subang Integrated Light Industrial Park	Sekolah Kebangsaan Seafield Usj 2, 47500 Subang Jaya, Selangor
MY0291			Malaysia	Selangor	Taman Perindustrian Selat Kelang	Sungai Perigi Nanas 42000 Selangor
MY0292	**XXMY02**	**XXMY02**	Malaysia	Selangor	Bangi IV - Bandar Baru Bangi	Jalan Mahkota 1 Taman Mahkota, 43000 Kajang, Selangor
MY0293			Malaysia	Selangor	Taman Baru Tanjung Sepat	Jalan Mat Raji Kampung Padang Jawa, 40200 Shah Alam, Selangor
MY0294			Malaysia	Selangor	Bukit Serdang Industrial Park - Section 4	2-48 Jalan PBS 14/10 Taman Perindustrian Bukit Serdang, 43300 Seri Kembangan, Selangor
MY0295			Malaysia	Selangor	Petaling Jaya Selatan	Exit Lebuhraya Baru Lembah Klang & E1 47810 Petaling Jaya, Selangor
MY0296			Malaysia	Selangor	Selaman Industrial Park, Ampang	Utara - Selatan Hwy Kuala Kubu Bharu, Selangor
MY0297			Malaysia	Selangor	Furniture Village, Banting	Utara - Selatan Hwy Kuala Kubu Bharu, Selangor
MY0298			Malaysia	Selangor	Foundry & Engineering Park, Sepang	Utara - Selatan Hwy Kuala Kubu Bharu, Selangor
MY0299			Malaysia	Selangor	Marine Industrial Park, Port Klang	1-97 Jalan Rengas Taman Selatan, 41200 Klang, Selangor
MY0300			Malaysia	Selangor	Taman Teknovasi Sg. Buloh	Utara - Selatan Hwy Kuala Kubu Bharu, Selangor
MY0301			Malaysia	Selangor	Taman Bumiputra Batu Caves	Utara - Selatan Hwy Kuala Kubu Bharu, Selangor
MY0302			Malaysia	Selangor	Kawasan Perindustrian Electronik Telukp Naglima Garang	Utara - Selatan Hwy Kuala Kubu Bharu, Selangor
MY0303			Malaysia	Selangor	Bukit Kemuning Electroplating Park, Shah Alam	Utara - Selatan Hwy Kuala Kubu Bharu, Selangor

ID	Short List	LongList	COUNTRY	PROVINCE	PARK NAME	ADDRESS
MY0304		**XXMY30**	Malaysia	Selangor	Sungai Way FZ	Petaling Jaya, 47300 Selanger
MY0305			Malaysia	Selangor	Ampang/ Hulu Klang FZ	Jalan Mamanda 11 Taman Dato Ahmad Razali, 68000 Ampang, Selangor
MY0306			Malaysia	Selangor	Petaling Jaya Section 51A & 52 & Kawasan Am Sungai Way	1-33 Jalan SS 5d/2 Kelana Jaya, 47301 Petaling Jaya, Selangor
MY0307			Malaysia	Selangor	Telok Panglima Garang FZ	2 Jalan Indah 4 Taman Indah Jaya, 42500 Telok Panglima Garang, Selangor
MY0308		**XXMY32**	Malaysia	Selangor	Temasya Industrial Park	Kelab Shah Alam Selangor Seksyen 13, 47000 Shah Alam, Selangor
MY0309			Malaysia	Selangor	Edaran Light Industrial Park	Utara - Selatan Hwy Kuala Kubu Bharu, Selangor
MY0310			Malaysia	Selangor	Shah Alam International Estate	Persiaran Kewajipan 47600 Subang Jaya, Selangor
MY0311			Malaysia	Selangor	Selesa Jaya Industrial Park	Persiaran Dewan Besar Universiti Putra Malaysia, 43400 Serdang, Sela
MY0312			Malaysia	Selangor	Kinarara Industrial Park	24-58 Jalan Tpk 1/8 Taman Perindustrian Kinrara, 47100 Puchong, Selangor
MY0313			Malaysia	Selangor	Rawang Integrated Industrial Park	Persiaran Rawang 1 Kawasan Industri Rawang Intergrated, 48000 Rawang, Selangor
MY0314			Malaysia	Selangor	Kawasan Perindustrian Miel	Jalan P10/10 Kawasan Perindustrian Miel, 43650 Bandar Baru Bangi, Selangor
MY0315			Malaysia	Selangor	Pandan Indah Industrial Park	Jalan Kampung Pandan Kawasan 1, 41000 Klang, Selangor
MY0316			Malaysia	Selangor	Seri Kembagan Industrial Area	Jalan Sri Serdang Selatan Taman Sri Serdang, 43300 Seri Kembangan, Selangor
MY0317			Malaysia	Selangor	Batu Caves	2-20 Jalan Sejati 1 Taman Selayang Sejati, 68100 Batu Caves, Selangor
MY0318			Malaysia	Selangor	Senawang Industrial Park	Kajang - Seremban Hwy 70200 Seremban, Negeri Sembilan
MY0319		**XXMY11**	Malaysia	Selangor	Hicom Glenmarie Industrial Park	5-9 Jalan Peguam U1/25 Hicom-glenmarie Industrial Park, 40150 Shah Alam, Selangor
MY0320			Malaysia	Selangor	Beranang Industrial Estate	1 Jalan Beranang 5 27/14e Taman Bunga Negara, 40400 Shah Alam, Selangor
MY0321			Malaysia	Selangor	Selangor Science Park	Persiaran Masjid Seksyen 7, 40100 Shah Alam, Selangor
MY0322		**XXMY24**	Malaysia	Selangor	Selangor Science Park 2, Cyberjaya	Persiaran Apec 63000 Cyberjaya, Selangor
MY0323			Malaysia	Selangor	Sementa Industrial Zone	Utara - Selatan Hwy Kuala Kubu Bharu, Selangor
MY0324			Malaysia	Selangor	Cyberjaya	Persiaran Apec Cyberjaya, 63000 Cyberjaya, Selangor
MY0325			Malaysia	Selangor	Bandar Baru Bangi Industrial Estate	Jalan Medan Pb 2b Seksyen 9, 43650 Bandar Baru Bangi, Selangor
MY0326			Malaysia	Selangor	Guthrie Aerospace & Technology Park	Utara - Selatan Hwy Kuala Kubu Bharu, Selangor
MY0327			Malaysia	Selangor	Bandar Sultan Sulaiman	28-50 Jalan Sultan Abdul Samad 23 Bandar Sultan Sulaiman, 42000 Pelabuhan Klang, Selangor
MY0328			Malaysia	Selangor	Port Klang Free Zone	2-16 Jalan Cengal Kawasan 12, 42000 Pelabuhan Klang, Selangor
MY0329			Malaysia	Selangor	Taman Perindustrian Subang/Sungai Penaga	Utara - Selatan Hwy Kuala Kubu Bharu, Selangor
MY0330			Malaysia	Selangor	Taman Perindustrian Marine, Kapar	Utara - Selatan Hwy Kuala Kubu Bharu, Selangor
MY0331			Malaysia	Selangor	Sungai Kapar Indah Industrial Park	9 Jalan Wawasan 2 Sungai Kapar Indah Industrial Park, 42200 Kapar, Selangor
MY0332			Malaysia	Selangor	Taman Perindustrian UEP, Subang Jaya	Jalan TP 5 Taman Perindustrian Sime Uep, 47600 Subang Jaya, Selangor
MY0333			Malaysia	Selangor	Ampang Ulu Klang Industrial Estate	Duta - Ulu Kelang Hwy 56000 Kuala Lumpur, Federal Territory of Kuala Lumpur
MY0334			Malaysia	Selangor	Kota Puteri Industrial Estate	Jalan Kuala Selangor 40160 Shah Alam, Selangor
MY0335			Malaysia	Selangor	Sepang Industrial Area	Jalan Gunggur 28/30 Taman Alam Megah, 40400 Shah Alam, Selangor

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MY0336			Malaysia	Selangor	Selangor Halal Hub	Utara - Selatan Hwy Kuala Kubu Bharu, Selangor
MY0337			Malaysia	Terengganu	Sungai Besar	T156 Tasik Kenyir, 21700 Kuala Berang, Terengganu
MY0338			Malaysia	Terengganu	Bukit Besi	Jalan Mutiara Taman Harmoni, 23200 Bukit Besi, Terengganu
MY0339			Malaysia	Terengganu	Batu Rakit	3685 Kampung Batu Rakit, 21020 Kuala Terengganu, Terengganu
MY0340			Malaysia	Terengganu	Paka	Jalan Jerangau - Jabor Penghantar 5 23100 Paka, Terengganu
MY0341			Malaysia	Terengganu	Wakaf Tapai	Jalan Jabor - Al Muktafi Billah Shah Kampung Wakaf Tapai, 21040 Kuala Terengganu
MY0342			Malaysia	Terengganu	Ajil	T117 Kampung Pengkalan Ajal, 21800 Ajil, Terengganu
MY0343			Malaysia	Terengganu	Teluk Kalong	3 24100 Kijal, Terengganu
MY0344			Malaysia	Terengganu	Kemaman Supply Base	T13 24000 Cukai, Terengganu
MY0345			Malaysia	Terengganu	Kertih	3 24300 Kerteh, Terengganu
MY0346			Malaysia	Terengganu	Pulau Serai	Jalan Rajawali Kampung Pulau Serai, 23000 Dungun, Terengganu
MY0347			Malaysia	Terengganu	Cenering	Jalan Batu Buruk 20400 Kuala Terengganu, Terengganu
MY0348			Malaysia	Terengganu	Gong Badak	Jalan Tengku Ampuan Intan Zaharah Kampung Gong Badak, 21300 Kuala Terengganu, Terengganu
MY0349			Malaysia	Terengganu	Seri Medang	Jalan Medang Kampung Baharu Mak Cili, 24000 Cukai, Terengganu
MY0350			Malaysia	Terengganu	Ceneh Baharu	Jalan Jabor - Al Muktafi Billah Shah Bandar Ceneh Baharu, 24000 Cukai, Terengganu
MY0351			Malaysia	Terengganu	Seri Bandi	Jalan Bunga Raya Bandar Seri Bandi, 24000 Cukai, Terengganu
MY0352			Malaysia	Terengganu	Ketengah Jaya	Jalan Jerangau - Jabor Penghantar 5 22300 Ketengah Jaya, Terengganu
MY0353			Malaysia	Terengganu	Al Muktafi Billah Shah (I & II)	Jalan Sultan Abdul Rahman Bandar Al Muktafi Billah Shah, 23400 Al Muktafi Billah Shah, Terengganu
MY0354			Malaysia	Terengganu	Kertih Polymer Park	T11 Kampung Tajin, 21700 Kuala Berang, Terengganu
MY0355			Malaysia	Terengganu	Kawasan Perindustrian Telok Kalong, Kemaman	T131 Desa Salehah, 24000 Cukai, Terengganu
MY0356			Malaysia	Terengganu	Al Muktafi Billah Shah (I & II)	Jalan Sultan Abdul Rahman Bandar Al Muktafi Billah Shah, 23400 Al Muktafi Billah Shah, Terengganu
MY0357			Malaysia	Terengganu	Kawasan Perindustrian Jakar, Kemaman	3 24000 Cukai, Terengganu
MY0358			Malaysia	Terengganu	Ceneh Baharu	Jalan Jabor - Al Muktafi Billah Shah Bandar Ceneh Baharu, 24000 Cukai, Terengganu
MY0359			Malaysia	Terengganu	Sungai Bari	T168 Kampung Bukit Putera, 21450 Chalok, Terengganu
MY0360			Malaysia	Terengganu	Seri Medang	Jalan Medang Kampung Baharu Mak Cili, 24000 Cukai, Terengganu
MY0361			Malaysia	Terengganu	Kemaman Boat Building & Repair Park	T13 24000 Cukai, Terengganu
MY0362			Malaysia	Terengganu	Kemaman Heavy Industrial Park	T13 24000 Cukai, Terengganu
MY0363			Malaysia	Terengganu	Kemaman Port Free Zone	T13 24000 Cukai, Terengganu
MY0364			Malaysia	Wilayah Persekutuan	Ranca-Ranca Industrial Estate	A7 89760 Menumbok, Sabah
MY0365			Malaysia	Wilayah Persekutuan	Bukit Jalil Teknology Park	8 27100 Padang Tengku, Pahang
MY0366			Malaysia	Wilayah Persekutuan	6 1/2 Mile Kepong Road	1-19 Jalan Kepong 52000 Kuala Lumpur, Wilayah Persekutuan Kuala Lumpur

ID	Short List	LongList	COUNTRY	PROVINCE	PARK NAME	ADDRESS
MY0367			Malaysia	Wilayah Persekutuan	BH Realty, Kapong Industrial Area	8 27100 Padang Tengku, Pahang
MY0368			Malaysia	Wilayah Persekutuan	Setapak & PKNS Industrial Area	8 27100 Padang Tengku, Pahang
MY0369		**XXMY16**	Malaysia	Selangor	Mahkota Industrial Park	Beranang, Selangor, Malaysia
MY0370		**XXMY34**	Malaysia	Selangor	UMW Land	Petaling Jaya, Selangor, Malaysia
MY0371		**XXMY35**	Malaysia	Selangor	Zurah Industrial Park	Utara Selatan Hwy, Kuala Kubu, Bahru, Selango

MYANMAR

Table of Contents

Chapter 1 Introduction

The report is a draft version of the Country Report for Myanmar, which will be a reference document for organizations of the private and public sectors wishing to prepare an Area Business Continuity Plan (Area BCP) and develop an Area Business Continuity Management System (Area BCM System).

The country report contains information on natural disaster risks, industrial parks and investment risk, key infrastructure and lifeline systems, as well as issues to consider during natural disasters. It also presents an outline of economy and trade, an outline of physical distribution, and current practices for implementing business continuity management (BCM) in the country.

The draft report will be refined and finalized at the end of the Project.

Chapter 2 Overview of the Country

Myanmar covers the western part of Indochina Peninsula, and the land area is about 1.8 times the size of Japan. Myanmar has a long territory stretching north to south, with the Irrawaddy River running through the heart of the country. While Burmese is the largest ethnic group in the country, the country has many ethnic minorities.

Myanmar joined ASEAN on July 23, 1997, together with Laos. Due to the isolationist policy adopted by the military government led by Ne Win which continued until 1988, the economic development of Myanmar fell far behind other ASEAN countries.

Today, Myanmar is a republic, and President Thein Sein is the head of state. Myanmar was a socialist country until 1988, but after the coup d'état, the military took control of the government. The current political system has been in place since 2011. Myanmar is expected to accelerate its economic development through democratization, which is being promoted under the current administration.

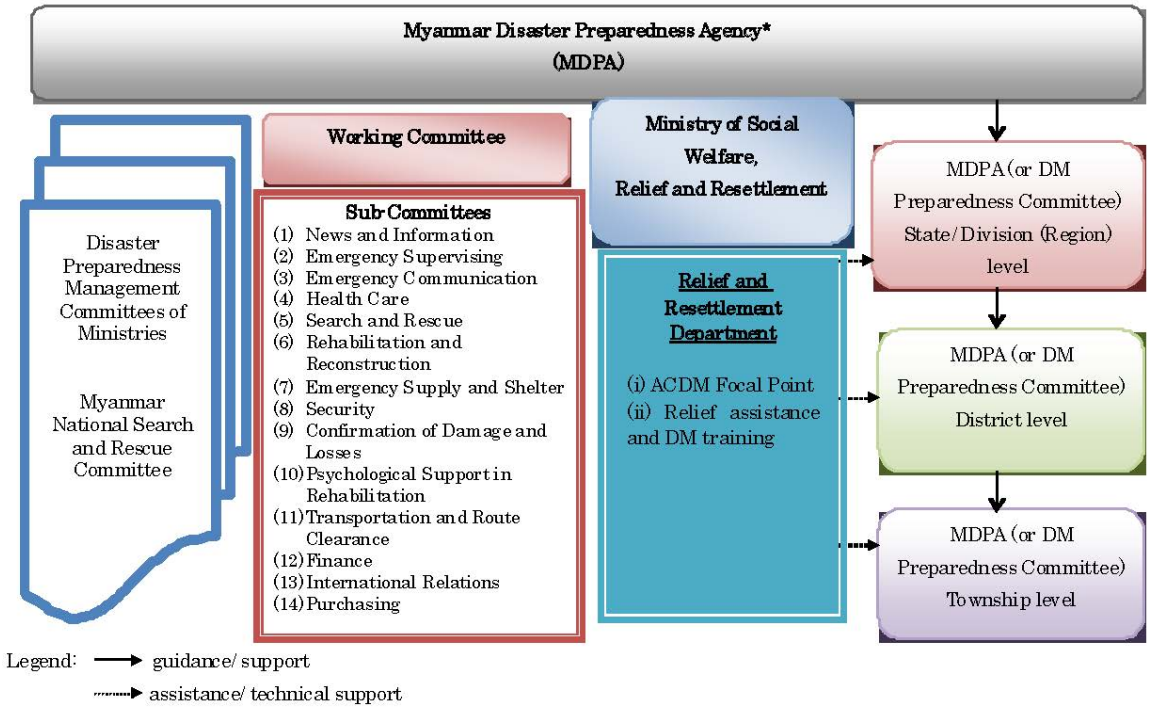
Basic Information of Myanmar

National Flag

Capital	Naypidaw
Ethnic Groups	Burmese (about 70%),many other ethnic groups
Languages	Myanmar
Religions	Buddhism (90%), Christianity, Islam, others
Area (km^2)	Total: 676,590 Land: 653,290 Inland Water: 23,300
Population	52,797,319
Population density(people/ km^2 of land area)	81
Population growth (annual %)	0.8
Urban population (% of total)	33
GDP (current US$) (billion)	54 (Estimate)
Economic growth rate (annual %)	5 (Estimate)
GNI per capita, PPP (current international $)	-
Agriculture, value added (% of GDP)	48(2004)
Industry, value added (% of GDP)	16(2004)
Services, etc., value added (% of GDP)	36(2004)

Features of Disasters

50% of the total number of disasters in Myanmar was related to floods followed by storm (23%), earthquake (15%), and mass movement-wet (12%), whereas 73% of the total affected people by disasters were due to storm followed by floods in 1980-2011. Similarly, storm is a major cause of disaster-related death and biggest estimated damage cost (86%). Earthquake (11%) and flood (3%) are next on the estimated damage cost. This pattern of disasters is due to Cyclone Nargis in 2008 t affected 2,400,000 people, left 138,000 fatalities and estimated damage cost of US$4,000,000 to Myanmar.



Source: JICA Study Team

Note: *New name "MDPA" is used here as it is mentioned among related government officers in Myanmar. As it is still under reform, names of organizations at the local level are indicated in both possible new names and current names.

Sources; Map and Flag: CIA(Central Intelligence Agency) website (2014) (https://www.cia.gov)

Capital, Ethnic Groups, Languages, Religions, GDP and Economic growth rate :Ministry of Foreign Affairs website (2013) (http://www.mofa.go.jp)

Area, Population, Population density, Population growth, Urban population and GNI per capita, PPP: The World Bank Data Bank website (2012) (http://data.worldbank.org), Agriculture, value added, Industry, value added and Services, etc., value added: The World Bank Data Bank website (2004) (http://data.worldbank.org)

Chapter 3 Natural Disaster Risk

3.1 Flood

(1) Risk

Summary of flood disaster

Floods occur due to the tropical monsoons in the rainy season from June to October and also due to typhoons which land in Vietnam from September to October.

Notable floods and damage in recent years

Recent notable floods occurred in October 2006, June 2010 and November 2011. They are described below.

1. The flood of October 2006 was triggered by storm rainfall and caused damage in the eastern part and the central part of the country. The flood caused 25 death and affected about 10,000 persons, according to the EM-DAT (The International Disaster Database).
2. The flood of June 2010 caused about 60 deaths and affected about 5,000 persons in Yakain and the surrounding area.
3. The flood of October 2011 caused about 150 deaths and affected about 36,000 persons in the central part of the country.

The Cyclone Nargis disaster in 2008 was categorized as the damage by storm surges and strong winds, but not floods.

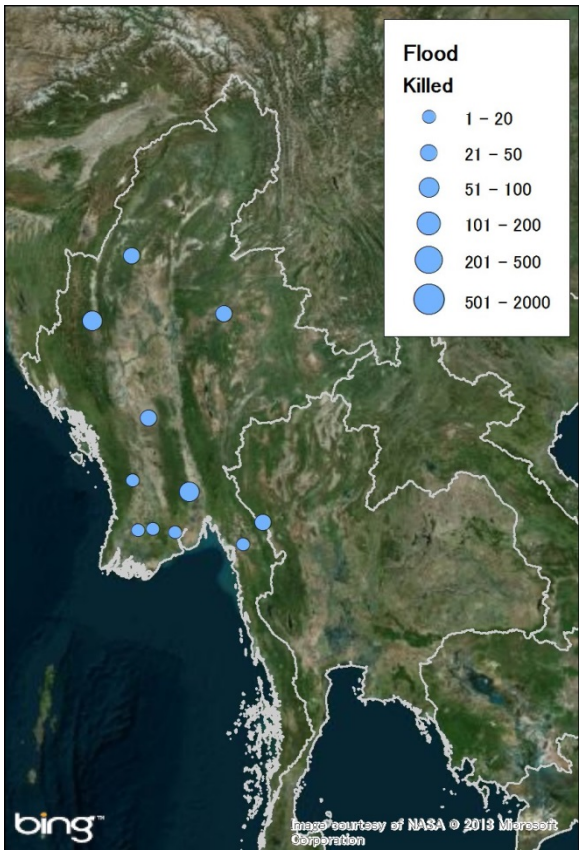


Figure 3.1.1 Flood Damages: Human Losses

(2) Background

Characteristics of floods

Many floods are caused by storm rainfalls from the southwest monsoons in July to October. The topography of the country is characterized by the central plain (delta), which is surrounded by steep mountains on the west side and highlands on the east side. Rainfall in the mountains and highlands causes flood damage in the central plain and coastal areas. Flooding spanned over the long term at the delta near the river mouth.

Notable examples of flood events

- The flood of October 2006, triggered by a large scale monsoon which hit Thailand and Myanmar, caused damage, including human losses and property losses in Mandalay, the eastern areas, and the central areas.
- The flood of June 15, 2010 was caused by storm rainfall, which was recorded at 340 mm/day in Rakhine in the western region.
- The flood of October 2011, which was triggered by a Cyclone, caused damages in Magway and Mandalay in the central areas and Sagain in the northern region. Flash floods hit Pakokku and collapsed a bridge.

Frequently flooded area

- Central regions: Mandalay and its surroundings
- Ayeyarwadi River delta

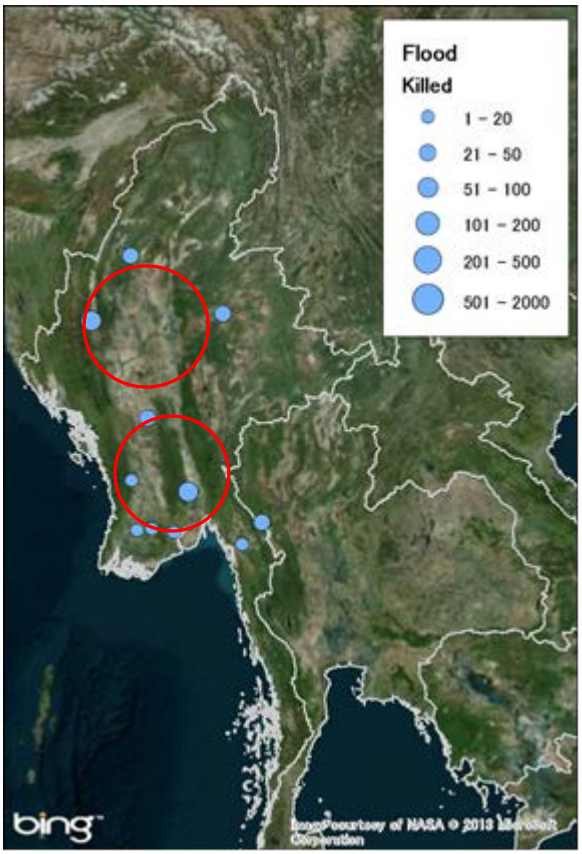


Figure 3.1.2 Hotspots of Human Loss

(3) Efforts by the central government, local governments, and disaster management organizations

✓ Central Committee on National Disaster Prevention

- Policy-making organization established in 2005, headed by the Prime Minister.
- Formulates disaster management policy and regulates budget and disaster management activities of the relevant organizations.
- Under the Ministry of Social Welfare, Relief, and Resettlement, the Fire Department is in charge of fire prevention measures, fire prevention, firefighting, training of firemen, rescue operations, and public education for fire and disaster.

(4) Hazard and risk information sources

Disaster risk reduction organizations

Table 3.1.1 List of Organizations for Disaster Risk Reduction

Organization	Post	Web Address
Central Committee on National Disaster Prevention (CCNDP)		
Relief and Resettlement Department (RRD)		http://www.clearcut-team.com/rrd/index.php?name=menu&m=1&id=3
Department of Meteorology and Hydrology Myanmar (DMH)		http://www.dmh.gov.mm/
Yangon University (YU)		
Yangon Technological University (YTU)		http://www.most.gov.mm/ytu/

Reports

Table 3.1.2 List of Reference Reports for Risk Analysis

Organization	Post	Title/ Web Address	Form
Asia Development Bank	Asian Water Development Outlook	Asian Water Development Outlook 2013;Asia-Pacific Water Forum	Report
		http://www.adb.org/publications/asian-water-development-outlook-2013	
World Bank	ASEAN Disaster Risk Management Initiative	Synthesis Report on Ten Asian Countries Disaster Risks Assessment; December 2012	Report
		http://www.unisdr.org/files/18872_asean.pdf	
The Nature Conservancy	ASEAN Disaster Risk Management Initiative	World Risk Report 2012;October 2012	Report
		http://www.ehs.unu.edu/article/read/worldriskreport-2012	
World Bank	Framework and Options for Implementation	Advancing Disaster Risk Financing and Insurance in ASEAN Countries: April 2012	Report
		https://openknowledge.worldbank.org/bitstream/handle/10986/12628/714530v20ESW0W0AN0appendices0June12.pdf?sequence=1	
International Development Research Centre	Economy and Environment Program for Southeast Asia(EEPSA)	Climate Change Vulnerability Mapping for Southeast Asia: January 2009	Report
		http://web.idrc.ca/uploads/user-S/12324196651Mapping_Report.pdf	
UNEP, GRID, UNISDR		Global Risk Data Platform	Web Map
		http://preview.grid.unep.ch/index.php?preview=map&lang=eng	

Abbreviations

CCNDP	Central Committee on National Disaster Prevention
DMH	Department of Meteorology and Hydrology Myanmar,
RRD	Relief and Resettlement Department
YTU	Yangon Technology University
YU	Yangon University

References:

1) Ministry of Foreign Affairs of Japan (2013): *"Information on Myanmar in Japanese",06 2013.*

2) ADRC: *"Countries; Myanmar", Information on Disaster Risk Reduction of the Member*

3) ADRC: *"Myanmar, Flood,2006/10/11"*
4) ADRC: *"Myanmar, Flood, 2010/06/16"*
5) Relief Web; OCHA (2010):*"Myanmar, Floods Situation Report # 5 - 28 June 2010",Report from UN Office for the Coordination of Humanitarian Affairs,28 Jun 2010*
6) Japan-Myanmar Interchange Association HP(2010/06):*"the dead: 63 persons by flood at Kayin State in Japanese"*
7) ADRC: *"Myanmar, Flood, 2011/10/20"*
8) Relief Web; OCHA (2011): *"Magway Floods DREF operation n° MDRMM005", Report from IFRC, 03 Nov 2011.*

3.2 Earthquakes

(1) Risk

Geographically, a large part of Myanmar lies in the southern part of the Himalayas and on the eastern side of the Indian Ocean. Myanmar is earthquake-prone as it lies in one of the two main earthquake belts of the world, known as the Alpine-Himalayan Belt. 16 earthquakes with magnitudes 7.0 and over have occurred over the last 170 years since 1839.

The earthquakes that caused many casualties were the earthquake that occurred in Innwa in 1839 and the earthquake that occurred in Near Khyan in 1930. They each caused several hundred deaths. The earthquakes not only caused casualties, but also an economic impact on society. One death and USD 1 million (0.006% of GDP) in losses were recorded for the earthquake that occurred in Bagan in 1975. About 70 deaths and USD 4 million (0.004% of GDP) in losses were recorded for the earthquake occurred that in Tachilek in 2011.

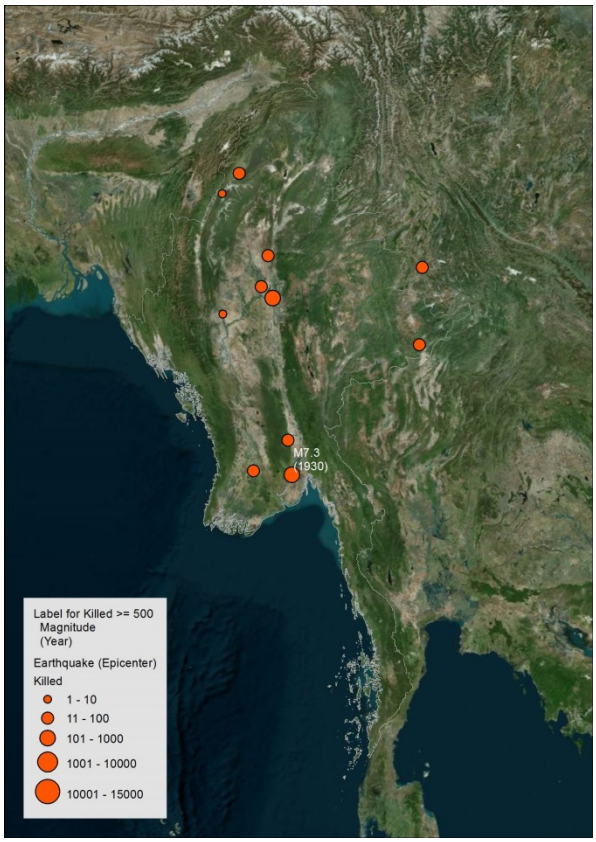


Figure 3.2.1 Earthquake Disasters: Human Losses

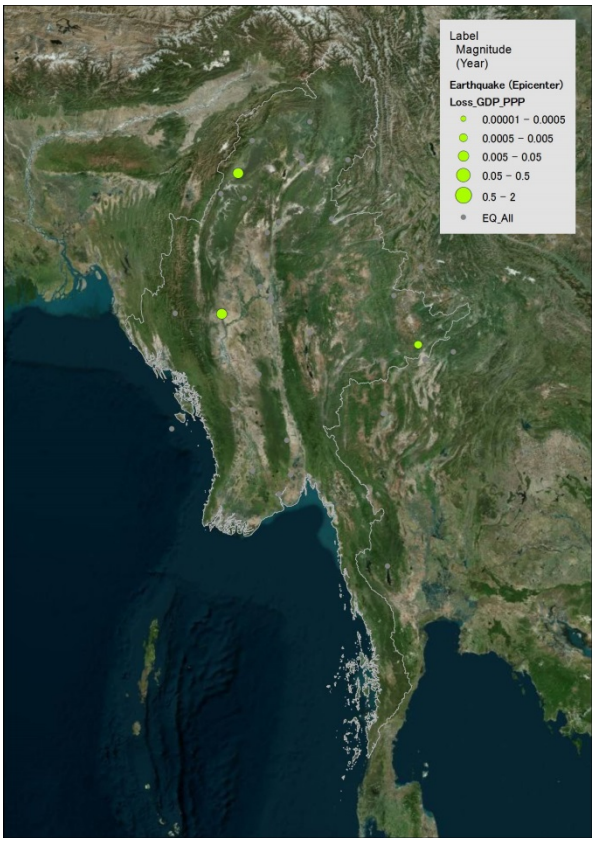


Figure 3.2.2 Earthquake Disasters: Economic Losses (% of GDP)

(2) Background

The seismotectonics of Myanmar are shown in Figure 3.2.3. Earthquakes in Myanmar have been mainly attributed to the following two plate activities:

- The continuous subduction of the northward-moving Indian Plate under the Burma Platelet, which is a part of the Eurasian Plate, and
- The northward movement of the Burma Platelet along the Sagain Fault from a spreading center in the Andaman Sea.

A seismic zone map of Myanmar is shown in Figure 3.2.4. This map is basically a probability map, but several zones were decided deterministically based on historical seismic intensity maps or peak ground acceleration values of some earthquakes.

The highest intensity zone designated for Myanmar is Zone V (Destructive: the probable maximum range of PGA is 0.4 – 0.5 g), which is equivalent to MMI Intensity IX. Four areas are designated to the Destructive Zone, namely, Bago-Phyu, Mandalay-Sagaing-Tagaung, Putao-Tanaing, and Kale-Homalin. Although the latter two have major earthquake hazards, their risk-level is low because they are sparsely populated. Important cities and towns in Zone IV (Severe: the probable maximum range of ground acceleration is 0.3 – 0.4 g) are Taungoo, Taungdwingyi, Bagan-Nyaung-U, Kyaukse, Pyin Oo Lwin, Shwebo, Wuntho, Hkamti, Haka, Myitkyina, Taunggyi,

and Kunglong. Yangon is located at the boundary between Zone II and Zone III. The old and new satellite towns in the eastern area are in Zone III, and the old City is in Zone II.

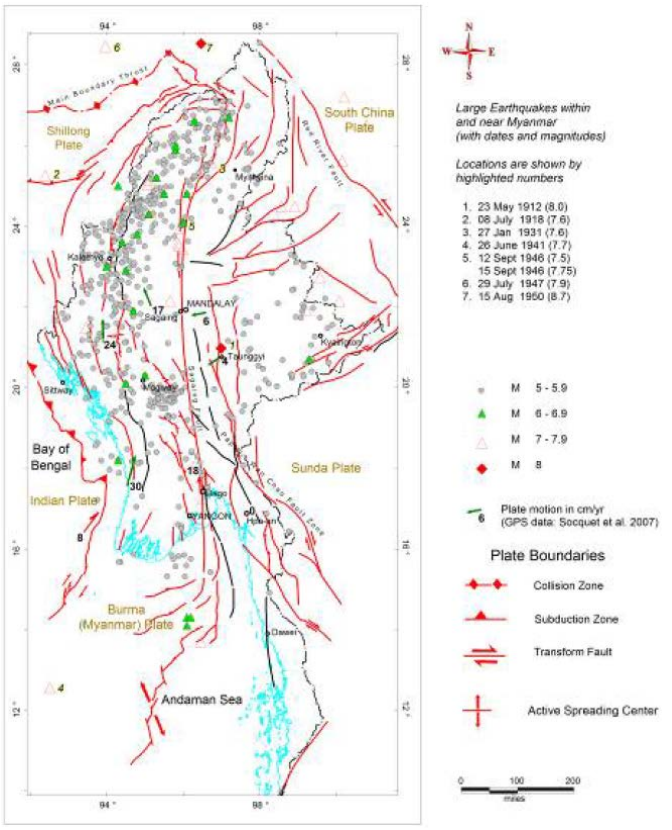


Figure 3.2.3 Seismotectonic map of Myanmar and surrounding regions

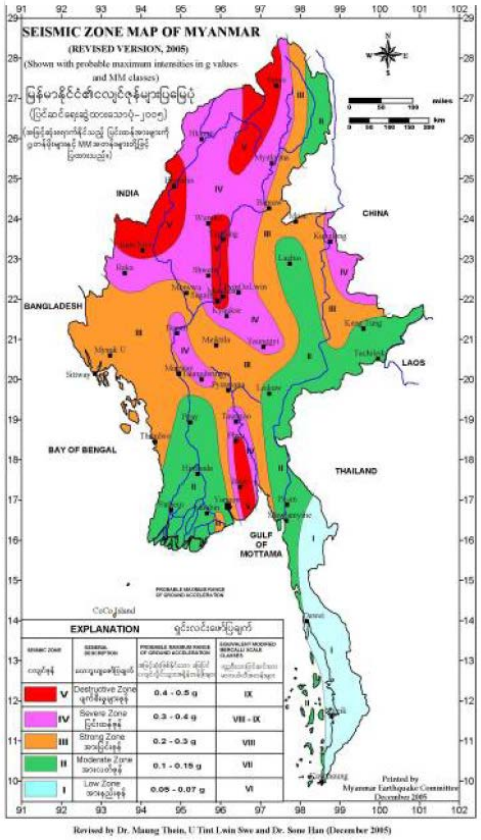


Figure 3.2.4 Seismic zone map of Myanmar

(3) Efforts by the central government, local governments, and disaster management organizations

Disaster Management Information

A small-scale nationwide seismotectonic map and seismic zone map were developed by the Myanmar Earthquake Committee (MEC) in 2004 and by the Myanmar Geosciences Society (MGS) in 2012. However, earthquake hazard maps available at community level have not been developed yet. On the other hand, the MEC developed seismic zoning maps for Mandalay-Amarapura, Bago-Oaktha, and Taunggyi until 2006. The earthquake hazard map of Mandalay was developed in collaboration with the Norwegian government. All other cities plan to develop their hazard maps.

Tokyo University and Kyoto University in Japan have studied historical seismic activity and conducted a trench survey along the Sagain Fault in collaboration with the MES.

Early Warning and Transmitting Information

Eight broadband seismographs have been installed by the Myanmar government, China Earthquake Administration (CEA), Yunnan Seismic Bureau (YSB), and Regional Integrated Multi-Hazard Early Warning System for Africa and Asia (RIMES). However, only two digital broadband seismographs installed by DMH and three analog seismographs installed by JICA are currently operating for seismic observation. The others are not in operation because of mechanical trouble.

Preparedness and Education

Reading material that contains information on eight types of disasters is available as a self-study booklet for Grade 5, 6, and 7 students. Reading cards on earthquakes, storms, and tsunami, and story books on how to be prepared are available for non-formal education. These materials cover what to do before, during, and after a disaster.

The Disaster Preparedness and Response Education (DPRE) Working Group, comprised of representatives from DEPT, MOE, UN Agencies, International NGOs, and NGOs was formed in August 2008. The DPRE Working Group collects relevant DRR education materials from various agencies and distributes them as resource packs to schools and teachers for their training.

The Department of Educational Planning and Training (DEPT) has developed Disaster Risk Reduction (DRR) training modules in accordance with the five priority areas of HFA, with the support of the DPRE Working Group. DEPT conducts training for township education officers, school principals, teachers in cyclone-affected areas, and teacher trainers at education colleges. The DRR training covers risk assessment, the formation of school disaster management committees and school disaster preparedness plans, mock drills, and psychological/social support.

In higher education, the Ministry of Science and Technology has initiated seminars and technical training on the topics of 'Utilization of Space-based Technologies for Disaster Risk Management' and 'Quality Control Assessment for Cyclone Shelter Construction.'

(4) Hazard and risk information sources

Myanmar Earthquake Committee (MEC)
http://eqmyanmar.org/?page_id=9
Department of Meteorology and Hydrology (DMH)
http://www.dmh.gov.mm/
Myanmar Engineering Society (MES)
http://www.mes.org.mm/
Myanmar Geosciences Society (MGS)
http://www.myanmargeosciences.org/
Myanmar Information Management Unit (MIMU)
http://www.themimu.info/

References:

1) EM-DAT: The OFDA/CRED International Disaster Database – www.emdat.be – Université Catholique de Louvain – Brussels – Belgium.
2) Japan International Cooperation Agency (JICA) (2012): "Data Collection Survey on ASEAN Regional Collaboration in Disaster Management"
3) Union of Myanmar consist of Department of Meteorology and Hydrology (DMH), Forest Department, Relief and Resettlement Department, Irrigation Department and Fire Services Department; Myanmar Engineering Society (MES), Myanmar Geosciences Society (MGS), Myanmar Information Management Unit (MIMU) and Asian Disaster Preparedness Center (ADPC); Supported by Department for International Development (DFID) of UK (2009): "Hazard Profile of Myanmar"

3.3 Tsunami

(1) Risk

The tsunami induced by the 2004 Sumatra Earthquake (M9.1) caused around 60 missing and dead in the delta area of southern Myanmar. It also caused USD 500 million in losses, corresponding to 1.25% of the GDP at that time. There are other records of tsunamis induced by earthquakes in 1750 and in 1930. The tsunami in 1930 affected around 500 victims in Myanmar.

It is probable that a large tsunami will cause severe damages along the west coast of Myanmar if a large earthquake occurs in the Indian Ocean.

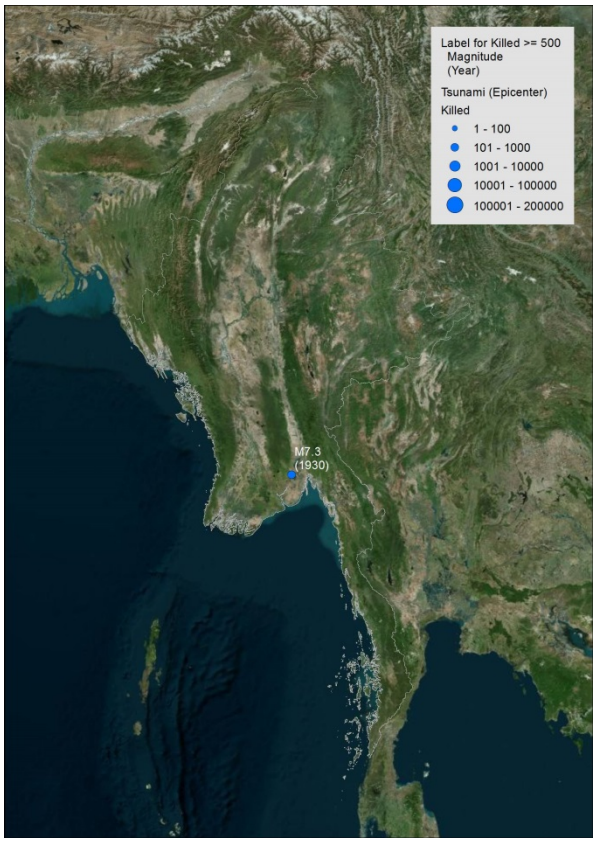


Figure 3.3.1 Tsunami Disasters: Human Losses

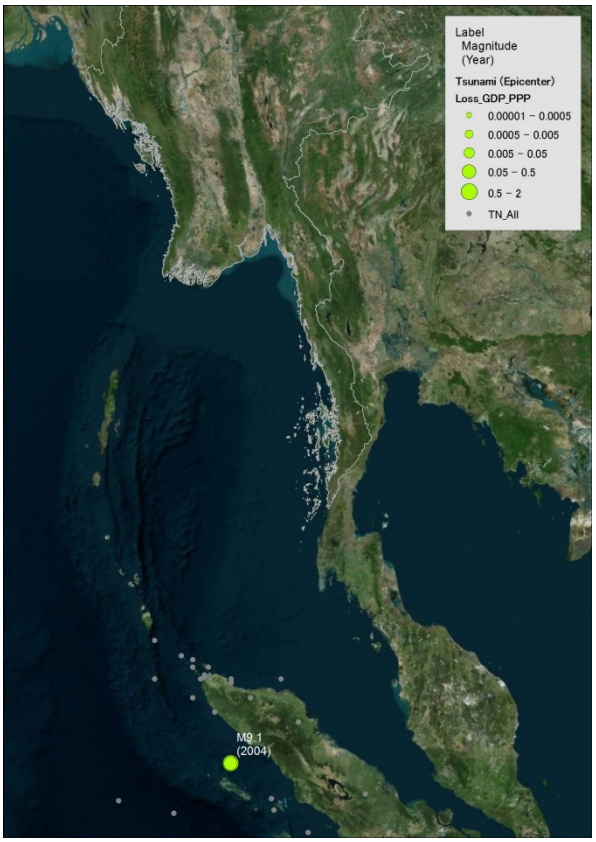


Figure 3.3.2 Tsunami Disasters: Economic Losses (% of GDP)

(2) Efforts by the central government, local governments, and disaster management organizations

In the delta area where the tsunami in 2004 caused damage and the area along the Bay of Bengal, evacuation routes have been planned and tsunami evacuation drills have been conducted using such routes. Preparedness for tsunami disaster prevention has been cooperatively addressed by the national and local governments.

There are two tide gauges installed in Myanmar by the Hawaii Sea Level Center. However, the Department of Meteorology and Hydrology (DMH) needs to access Hawaii University website to acquire data for tsunami observation. Under these circumstances, tsunami warnings are disseminated based on information from foreign observation agencies and international organizations through GTS, even though local tsunami occur near the coast. Therefore, there are concerns that warning information will not be issued early enough for the public to evacuate.

In the delta area where the tsunami in 2004 and Cyclone Nargis caused damage, tsunami evacuation shelters were built using funds donated from citizens and private companies. However, such tsunami shelters have not been built in coastal cities including Sittwe along the west coast; instead, a pagoda (temple) on a hill has been utilized as the evacuation facility. However, it is necessary to install evacuation sign boards showing evacuation routes and sites, and warning facilities such as sirens and loud speakers are required.

In the areas mentioned above, a tsunami evacuation drill in which many citizens participate was conducted by DMH and local government in October 2011.

The Myanmar government has promoted mangrove plantations as a measure to reduce tsunami damage along the front coast of the delta area.

(3) Hazard and risk information sources

Department of Meteorology and Hydrology (DMH)
http://www.dmh.gov.mm/

References:

1) EM-DAT: The OFDA/CRED International Disaster Database – www.emdat.be – Université Catholique de Louvain – Brussels – Belgium.
2) Japan International Cooperation Agency (JICA) (2012): "Data Collection Survey on ASEAN Regional Collaboration in Disaster Management"

3.4 Volcanoes

(1) Risk

Popa, Lower Chindwin, and the Singu Plateau are the known volcanoes in Myanmar. However, there is no record of significant disaster caused by volcanic eruption in its history.

Major hazards caused by volcanic eruption are lava flow, pyroclastic flow, "Lahar" (volcanic mud flow), and volcanic ash fall. Lava flow is a flow of melted rock along the slope. Pyroclastic flow is the flow of a mixture of hot dry masses of fragmented volcanic materials and volcanic gas along the slope. "Lahar" is originally an Indonesian term and is also called volcanic mud flow. It is the flow of a mixture of volcanic materials and water along the slope. These cause enormous damage to the side and foot of the volcano but generally do not have an extended reach. However, volcanic ash fall often spreads widely via the trade winds or the westerlies, causing damage over an extensive area. Therefore, there is a possibility that a volcanic eruption in the neighboring countries might wreak a volcanic ash fall in Myanmar.

Figure 3.4.1 shows the volcanoes in the Asia-Pacific region which erupted during the Holocene. The Holocene is a geological epoch from 10,000 years ago to the present. The map indicates that many volcanic eruptions have occurred in Indonesia, Philippines and other neighboring countries.

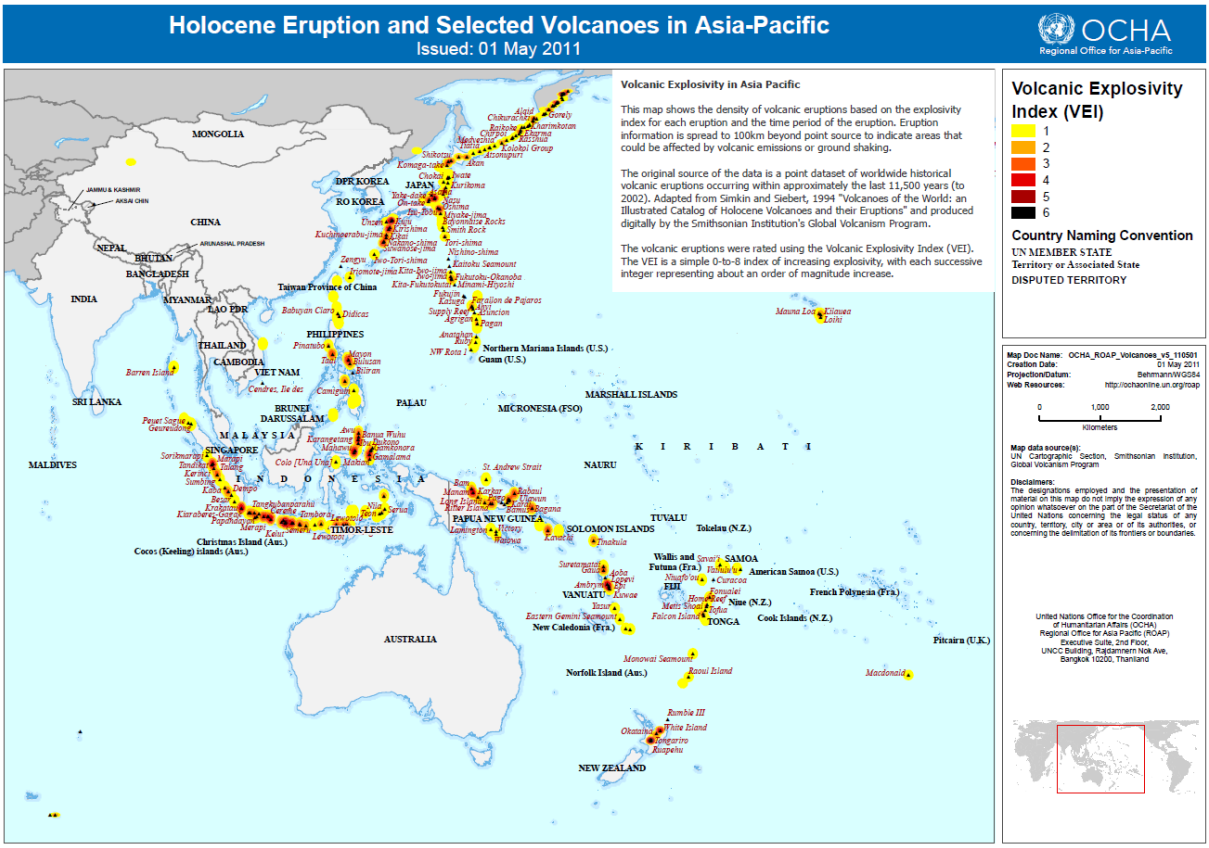


Figure 3.4.1 Holocene Eruption and Selected Volcanoes in Asia-Pacific

(2) Efforts by the central government, local governments, and disaster management organizations

There are no special measures focusing on volcanic disaster.

References:

1) Lee Siebert, Tom Simkin, and Paul Kimberly (2011): "Volcanoes of the World - Third Edition", Smithsonian Institute/University of California Press
2) EM-DAT: The OFDA/CRED International Disaster Database – www.emdat.be – Université Catholique de Louvain – Brussels – Belgium.
3) Japan International Cooperation Agency (JICA) (2012): "Data Collection Survey on ASEAN Regional Collaboration in Disaster Management"
4) United Nations Office for the Coordination of Humanitarian Affairs (OCHA), Regional Office for Asia Pacific (ROAP) (2011): "Holocene Eruption and Selected Volcanoes in Asia-Pacific", Downloaded from http://reliefweb.int/sites/reliefweb.int/files/resources/map_619.pdf

3.5 Cyclone (Meteorological) Hazards

(1) Risk

Myanmar is located on the western edge of the Indochina Peninsula between latitudes 10° and 28° to the north and longitudes 92° and 101° to the east. The central part of the country is covered predominantly by the Ayeyarwady River, which runs into the Bay of Bengal while the mouth lies in the Ayeyarwady Delta. Myanmar stretches for 1,930km from the north to the south. The climate of the country is mostly tropical. The southern coastal area is characterized by the tropical monsoon, the central part is a savanna, while the mountainous terrain in the north is a temperate zone. The country has three seasons, a hot season (from late February to early May), a rainy season (mid-May to mid-October), and a season (late October to mid-February).

Heavy rains with thunder usually occur in the coastal region during the afternoons and late nights of April and May. On the other hand, instead of rain, furious dust storms and occasionally, tornadoes occur inland. The monthly rainfall of July exceeds 1,000 mm while the annual rainfall is more than 5,000 mm on the slopes of the mountains and coastal areas in the western region. Myanmar is exposed to meteorological hazards which include cyclones, storm surges, floods, landslides, droughts, and forest fires.

The average annual frequency of tropical cyclones (cyclonic disturbances) in the Bay of Bengal is from five to nine. Normally, only two to four cyclones are formed. The monthly frequency of tropical cyclones in the Bay of Bengal peaks in November (the transition month between the southwest monsoon and the northeast monsoon).

Tropical cyclones developing during the monsoon months (July to September) are generally not so intense. Cyclones which make land fall in Myanmar has are most prevalent in two peaks periods: April to May and October to November.

In the last five decades, seven major cyclones have hit Myanmar.

Table 3.5.1 Cyclones which Caused Significant Damage in Myanmar

years	Location	Cyclone Name	Dead	Victims	Amount of Damage (U.S. $ Million)
October,2010	Kyaukpyu, Minbya, Munaug	Gili	45	260,049	57
May, 2008	Ngapadudaw, Labutta, Mawl	Nargis	138,373	2,420,000	4,000
April, 2006	Irrawaddy, Rakhine, Araka	Mara	37	60,106	-
May, 1994	Maungdaw, Buthidaung	Mandoryu	17	64,970	10
May, 1982	South West	Gaoua	11	36,000	-
May, 1975	-	Pathein	304	-	-
May, 1968	-	Shittawa	1,037	90,000	2.5

Cyclone Nargis, back in 2008, brought about unprecedented damage killing 138,371 people, affecting over 2.4 million people and dealing a total amount of damage estimated to be worth around 4 billion dollars. Typically, most of the cyclones are generated in the Bay of Bengal land in

Bangladesh or on the east coast of India. However, Cyclone Nargis continued to move eastward on the Bay of Bengal and hit Myanmar directly.

(2) Background

A tropical depression was formed southeast of the Bay of Bengal at 0300 UTC on 27 April 2008. It intensified into a cyclonic storm "Nargis" at 0000 UTC on 28 April and into a very severe cyclonic storm at 0300 UTC on 29 April. The system initially moved in a north-westerly direction and then re-curved north-eastwards and crossed the Myanmar coast near latitude 16.0 degrees to the north between 1200 and 1400 UTC on 2 May 2008.

Cyclone Nargis crossed the southern Deltaic area with near peak intensity and moved ashore in the Ayeyarwady Division starting from the evening of 2 May, and southern Yangon and Bago Divisions on midnight of that same day. On 3 May, it crossed the Mon and Kayin States and passed towards northern Thailand in the evening. The sea surface temperature recorded during the course of Cyclone Nargis was above 30°C, 0.2 ~ 0.6°C higher than normal.

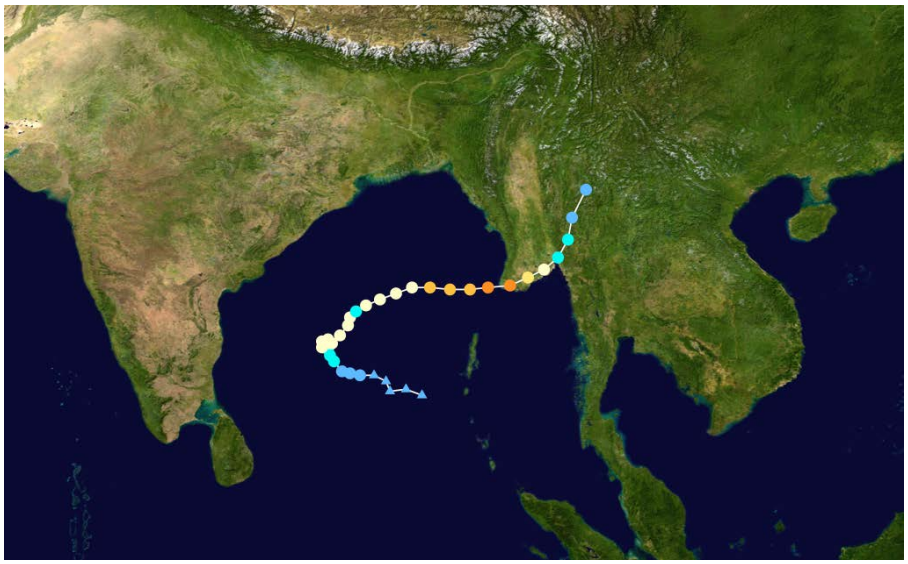


Figure 3.5.1 Path of Cyclone Nargis

Cyclone Nargis came ashore across the mouths of the Irrawaddy River and followed the coastline northeast. The shallow waters allowed the counter-clockwise circulation of onshore winds around Nargis to accumulate into a large storm surge to the right of the storm's track. The major cause of damage and loss of lives during Cyclone Nargis was from storm surges (up to 90% of losses).

The causes of storm surge damage are as follows (WMO Report).

(1) At its severe stage while crossing the southern Ayeyarwady;
(2) Moving straight eastwards along the coastline;
(3) During landfall, Nargis was almost stationary for about four hours;
(4) The system is phenomenal in the sense that the intensity and track of the Cyclone has never been experienced before in the Deltaic area.

(5) Very low-lying area;
(6) Most populous area of the country;
(7) Many tributaries in the Deltaic areas (seven river mouths);
(8) Absence of storm shelters and high ground;
(9) Hazard maps and risk assessment had not yet been made;
(10) No past experience and difficulties in convincing the local people to evacuate;
(11) Risk knowledge on the disaster and especially on storm surges is very low;
(12) Poor mobility as area is filled mostly with waterways to be navigated by boats;
(13) The non-linear interactions between the wind induced waves, and the topography and high tides of the area are extremely high;
(14) The cutting of mangrove trees.

Meteorological disasters in Myanmar are mainly due to floods during the rainy season from mid-May to October. Riverine floods are common in the river delta while flash floods and landslides are frequent in upper reaches of the river systems which are normally the mountainous areas. In cities and towns, localized floods occur from time to time. The dry zone of Myanmar is located in the central part of the country in Magway, Mandalay, and Sagaing Regions (lower part) across 54 townships in 13 districts and covers approximately 10 percent of the total area of the country.

Thunderstorms may occur during the inter-monsoon period (from April to May and from October to November). Downbursts are particularly strong downdrafts from thunderstorms. Downbursts are exceedingly dangerous to aircrafts which are taking off or landing due to the strong vertical wind shear caused by these events. Downbursts are also dangerous in the sea as they can cause extreme, sudden winds which can capsize ferry boats. Fatal accidents related to this have already been reported.

Climate change vulnerability and impact in Myanmar are as follows.

- According to the IPCC 2007, the probable temperature rise in Myanmar by 2100 could range between 1.8-4.0 °C, whereas, possible temperature rise by 2100 is predicted to be around 1.1-6.4°C.
- The IPCC 2007 also projected a probable rise in sea levels of 18-59 cm. Countries like Myanmar with a long coastline and densely settled low-lying land are particularly vulnerable to rising sea levels. Even diminutive vertical rises in sea levels can lead to enormous horizontal erosion in the country.

(3) Efforts by the central government, local governments, and disaster management organizations

The Myanmar National Disaster Preparedness Agency (MDPA) was created in 2011 under the Chairmanship of the Union Minister of Social Welfare, Relief and Resettlement. The MDPA is the

national focal point for planning, executing, facilitating, and coordinating disaster preparedness activities.

Meteorological service is under the responsibility of the DMH (Department of Meteorology and Hydrology) under the Ministry of Transport.

The DMH is responsible for the following:

1) To exchange information with other centers on weather, water and earthquakes;
2) To safeguard the people from losing their lives and property by issuing early warnings and bulletins for all weather, water and geological-related hazards;
3) To expand public awareness and education programs on natural disasters, natural hazards and environmental issues;
4) To monitor climate change, underground water resources, air and water quality of Myanmar;
5) To assist all authorities from Transport, Health, Agriculture, Construction and Tourism by providing meteorological, hydrological and seismological information; and,
6) To assist with all national projects.

The DMH issues the following products:

1) Daily Weather Forecast
2) 10-day and Monthly Weather Forecast
3) Sea Route Forecast
4) Aviation Forecast
5) Special Weather Forecast
6) Water-level Forecast
7) Lowest Water-level Forecast
8) Water-level Bulletin
9) General Forecast for Southwest Monsoon
10) Pre-, Mid- and Post-monsoon Weather Forecast

In accordance with meteorological law, the above forecasts and warnings are disseminated by the DMH to Government authorities, local authorities, UN Offices, NGOs and other relevant organizations, national media, and the general public through telephone, fax, mobile phone, Internet (website and e-mail), VHF, wireless port, AFTN (aviation), and Radio/TV and print media.

On the other hand, it is the responsibility of the RRD to transmit the information to the community.

Table 3.5.2 Authorities of Myanmar Meteorological Service

Institution	Contact information
Department of Meteorology and Hydrology (DMH) http://www.dmh.gov.mm/index.php?lang=en	Tel: +95-67-411031 E-mail: dg.dmh@ mptmail.net.mm

(4) Hazard and risk information sources

The hazard risk assessment results related to tropical cyclones (meteorological) disasters are as follows.

Table 3.5.3 Source of Information on Tropical Cyclones (Meteorological Disasters)

Institution	Literature name
Economy and Environment Program for Southeast Asia (2010)	Climate Change Vulnerability Mapping for Southeast Asia http://css.escwa.org.lb/sdpd/1338/d2-5a.pdf
UNISDR (2010)	Synthesis Report on Ten ASEAN Countries Disaster Risks Assessment http://www.unisdr.org/files/18872_asean.pdf

Abbreviations

IPCC	Intergovernmental Panel on Climate Change
MDPA	Myanmar Disaster Preparedness Agency
DMH	Department of Meteorology and Hydrology
RRD	Relief and Resettlement Department
WMO	World Meteorological Organization
RIMES	Regional Integrated Multi-Hazard Early Warning System

References:

1) Ministry of Social Welfare, Relief and Resettlement, Relief and Resettlement Department (2012): "Myanmar Action Plan on Disaster Risk Reduction (MAPDRR)" http://reliefweb.int/sites/reliefweb.int/files/resources/RRD_FILE_1340609699_MAPDRR_English_June% 202012.pdf
2) WMO (2009): WMO Fact-Finding Mission to Myanmar, Mission Report, pp.4-5
3) DMH (Website): http://www.dmh.gov.mm/index.php?lang=en

3.6 Landslides

(1) Risk

According to the EM-DAT database (http://www.emdat.be/), six (6) landslides have occurred since 2005, but there are no records before that. As the reported landslides occurred in combination with slope collapse and flash floods, the exact mechanism of landslide still remains unsolved.

Most of landslides are distributed along the borders with India, Bangladesh, and Thailand as shown in the figure below.

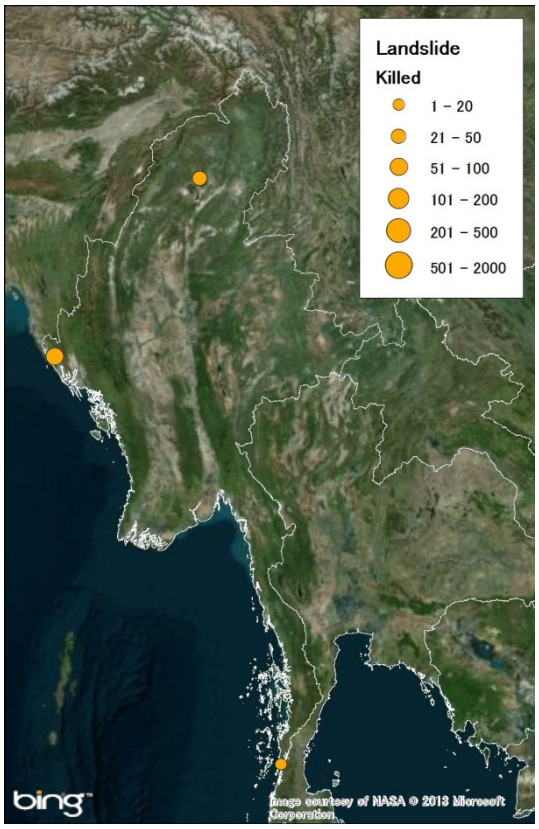


Figure 3.6.1 Landslide Damage: Human Losses

(2) Background

Notable example of landslides

A landslide occurred at several slopes in Maungdaw-Buthidaung, Arakan province on June 2010, causing 68 fatalities. This occurred during heavy rain and there was simultaneous flooding. The highway was blocked for a long time because of those disasters.

The occurrence of landslides seems to be limited to steep slope areas consisting of soft rocks, such as in the areas bordering India and Bangladesh.

The areas of exposure related to climate change are also distributed in the areas bordering India and Bangladesh.[1)]

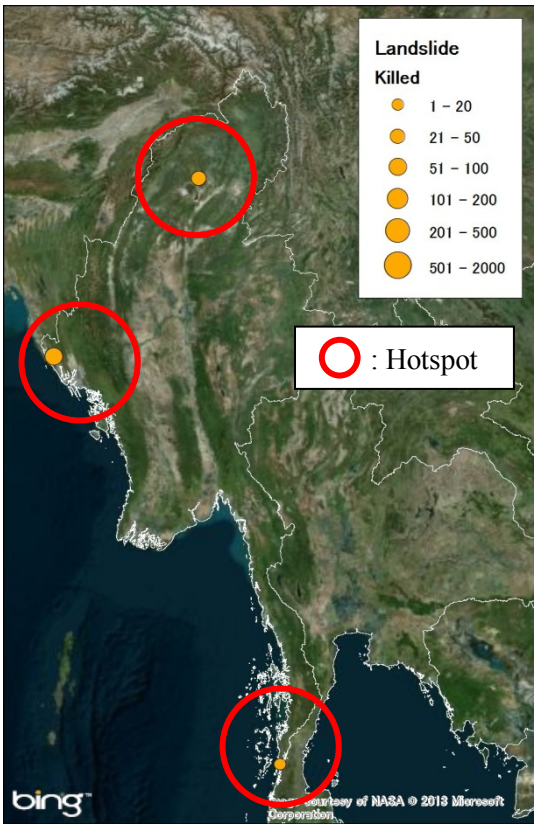


Figure 3.6.2 Hotspot of Human Losses

(3) Efforts by the central government, local governments, and disaster management organizations

✓ Central Committee on National Disaster Prevention

- Policy-making organization established in 2005, headed by the Prime Minister.
- Formulates disaster management policy and regulates budget and disaster management activities of the relevant organizations.
- Under the Ministry of Social Welfare, Relief and Resettlement, the Fire Department is in charge of fire prevention measures, fire prevention, firefighting, training of firemen, rescue operations, and public education for fire and disaster.

(4) Hazard and risk information sources

A small scale provincial hazard map of the landslide was created by Myanmar Geosciences Society (MGS) based on the geology and topography.

There are currently no countermeasures for soft components or physical infrastructure for landslides.

Reports

- ✓ Synthesis Report on Ten Asian Countries Disaster Risks Assessment; December 2012
  ASEAN Disaster Risk Management Initiative, World Bank
  http://worldbank.org/
  - Summarizing natural hazard and risks in 10 ASEAN countries.
  - World Bank reported risks with respect to countries and categories of disaster.
  - Although the data is only available up to 2009, the report is well assembled.
- ✓ World Risk Report 2012; October 2012, Alliance Development Works, The Nature Conservancy
  http://www.nature.org/
  - Natural disaster risks in 173 countries in the world are ranked in this report.
  - Intended period is from 2002 to 2011.
  - Vulnerabilities are assessed with respect to categories.
  - The report is effective for comparing countries.
- ✓ Advancing Disaster Risk Financing and Insurance in ASEAN Countries: April 2012, Framework and Options for Implementation, Volume 2: Appendix 1
  https://www.gfdrr.org/
  - Summarizing natural hazard and risks in 10 ASEAN countries.
  - Intended period is from 1970 to 2011.
  - Vulnerabilities are assessed with respect to categories.
  - Summary of countries is well assembled.
- ✓ Climate Change Vulnerability Mapping for Southeast Asia: January 2009, Economy and Environment Program for Southeast Asia (EEPSA)
  http://www.idrc.ca/
  - Natural disaster risks in Southeast Asia are mapped in the report.
  - The report contains information on risks in states/provinces.

Risk maps

- ✓ Global Risk Data Platform; UNEP (United Nations Environment Program)/GRID, UNISDR (United Nations Office for Disaster Risk Reduction)
  http://preview.grid.unep.ch/
  - Disaster site from all over the world are mapped.
  - The map shows disaster hotspots.

References:

1) Economy and Environment Program for Southeast Asia (EEPSEA) (2009): “Climate Change Vulnerability Mapping for Southeast Asia”, p. 19

3.7 Predominant Natural Hazards

The records of natural disasters that have affected the country are classified based on the impacts and frequency of occurrence. The results have been plotted on the impacts - frequency matrix and the most prevailing hazards studied.

3.7.1 Employed Data

The disaster records compiled in Appendix A3 are employed in this study. The records for the last 30 years, namely from 1983 to 2012, are used because the number of events included in the database before 1980 is significantly less than after 1980. The records of large disasters through earthquakes, tsunamis and volcano eruptions before 1983 are also used because the frequencies of occurrence for these hazards are significantly lower than floods, cyclones and landslides.

3.7.2 Study Method

The "Damage Amount / GDP" and 'Number of Deaths" are used asindices to show the impacts of the disasters considered and 6 natural hazards will be studied and compared. At the beginning of the study, only the "Damage Amount / GDP" was used as an the index because the results can be used for Area BCP planning. However, the scarcity of information related to damage amounts became clear as the study progressed. As the information on the "Number of Deaths" is substantial compared to the damage amount, the "Number of Deaths" has been added as an index of impact.

The process of the study is as follows;

1) Based on the Damage Amount / GDP or Number of Death, each disaster is classified according to the ranking system in Table 3.7.1,
2) The number of disaster events for each country is added by type of hazard and disaster rank, and then classified into Table 3.7.2 below,
3) The above information is then plotted on the impacts - frequency matrix by country,
4) As for earthquakes, tsunamis and volcanic hazards, if an event occurred before 1983 that was of the same (or higher) disaster rank as the maximum disaster rank recorded between 1983 to 2012, a point is plotted on the matrix which corresponds to the relevant disaster and frequency rank (=1).

Table 3.7.1 Disaster Rank and Damage

Disaster Rank	Damage Amount / GDP[1]	Number of Deaths
5	1.0% -	10,001 -
4	0.1% - 1.0%	1,001 - 10,000
3	0.01% - 0.1%	101 - 1,000
2	0.001% - 0.01%	11 - 100

[1] Gross domestic product based on the purchasing-power-parity (PPP) valuation of the country's GDP, according to the International Monetary Fund, World Economic Outlook Database, October 2012

1	- 0.001%	- 10

Table 3.7.2 Frequency Rank and Number of Events

Frequency Rank	Number of Events from 1983 to 2012	Average Frequency (Events / Year)
5	7 or more	1/5 -
4	4 to 6	1/10 - 1/5
3	2 to 3	1/15 - 1/10
2	1	1/30
1	Large Events that occurred before 1983	-

3.7.3 Study Results

The following results are based on the available existing information. Not all information relating to the impacts of disasters was collected. Furthermore, and the purpose of this study is not intended to evaluate the precise damage amounts or number of deaths. The purpose of this study is to rank 6 natural hazards according to their impacts.

The impact of Cyclone Nargis that occurred in 2008 far outranks other disasters in terms of the number of deaths (about 140 thousand). Additionally, another 3 cyclones have caused more than 1000 deaths in the 20th century. The numbers of deaths caused by floods are less than that of cyclones but they are more frequent. The amount of damage caused by the 2004 Indian Ocean Tsunami was large; however no tsunamis and earthquakes have been recorded that caused more than 1000 deaths.

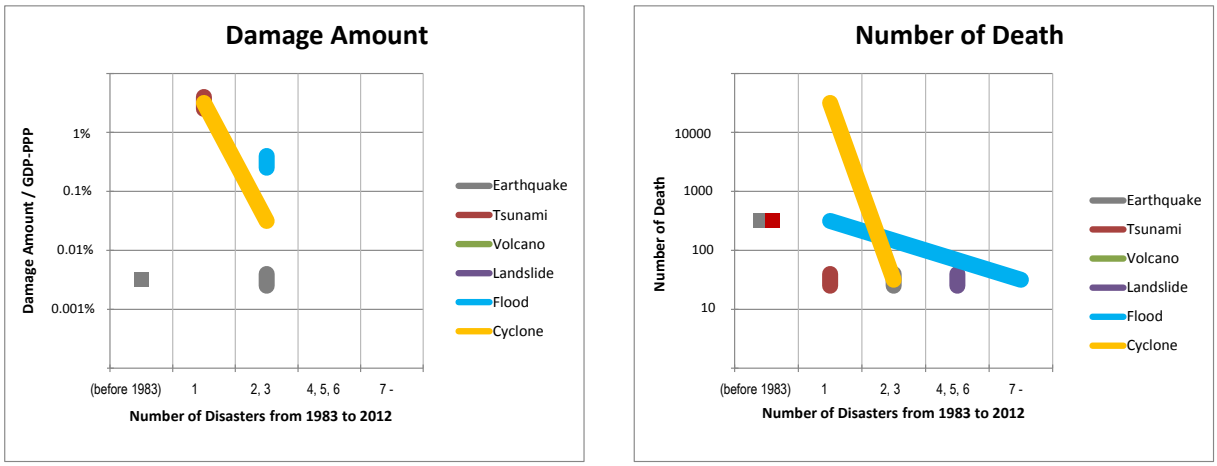


Figure 3.7.1 Impact of hazards in Myanmar

3.8 Existing Investigations and Studies

3.8.1 Methods and Scope of the Survey

This section reviews studies and research that have been conducted in the ASEAN region with a focus on natural hazards, risks, and vulnerability assessments. The target hazards are: floods, earthquakes, volcanoes, tsunamis, cyclones (typhoons)/meteorological disasters, and landslides. Information and study reports were reviewed from those that are available for the public and on the internet. The purpose of this section is to first gain an overview of the existing study results regarding hazard trends, encountering risks, and degrees of vulnerability throughout the entire ASEAN region as well as in each ASEAN member state. Another purpose it to produce a compilation of assessment reports of the region, which will be accessible as a reference for those who wish to plan an Area BCP.

Table 3.8.1 Methodology of Information Collection and Scope of Survey

Information Collected	Methodology	Scope of Survey
Existing studies and research	To collect existing studies and reports from public sources including the internet.	To summarize the studied hazards, areas, contents of hazard and risk analysis, vulnerability assessment of existing studies, and other research.

3.8.2 Outline of Collected Information and Data

Table 3.8.2 shows the outline of collected information and data. Summaries of existing studies and reports are compiled as data sheets in Appendix A4.

Table 3.8.2 Outline of the Collected Information and Data

Appendix A4 Subsection	Hazards	Outline
A4.1	Flood	Flood hazard, risk assessments, hazard maps, and vulnerability assessment have been conducted in ASEAN countries using data on rainfall, inundation areas, affected population, and monetary assessment. Hazard maps were produced with GIS tools. The usage of GIS tools for assessments is widely recognized and its usage has been explored to produce hazard maps. Some runoff analyses were conducted for selected areas. Limited information and data available for Brunei Darussalam.
A4.2	Earthquake	Many of the earthquake hazard studies in the area are probabilistic seismic hazard analyses (PSHA), not scenario earthquake studies. This is to quantify the probability of exceeding a specific ground-motion level at a site given all possible earthquakes. This methodology is descended from the Global Seismic Hazard Assessment Program (GSHAP). GSHAP was launched in 1992 by the International Lithosphere Program

		(ILP) with the support of the International Council of Scientific Unions (ICSU), and endorsed as a demonstration program in the framework of the United Nations International Decade for Natural Disaster Reduction (UN/IDNDR). Earthquakes are not equally distributed around the globe because of the generating mechanism. In the ASEAN region, many earthquakes are observed in and around Indonesia and Philippines, which are located in the convergent boundary (subduction) zone and fewer earthquakes are observed in and around Myanmar, which is in the transform boundary zone. There are fewer or no earthquakes observed in other regions. However, some regions are sometimes affected by the earthquakes which occur in neighboring countries. The northern regions of ASEAN countries are sometimes affected by the earthquakes that occur in the Yunnan province of China. A number of investigations and studies reflect this trend.
A4.3	Tsunami	There are only few investigations and studies about tsunami hazard or risk in the region, and most of them are compilations of past disasters. There is no probabilistic study as there is for earthquakes. There is a hazard map that encompasses several tsunami scenarios. There are studies targeting the Asia-Pacific area because tsunamis propagate in the sea. Large-sized tsunamis are caused by major earthquakes in the ocean. This is the reason that tsunamis are also not equally distributed around the globe. However, tsunamis affect a wider area than the ground-motion of earthquakes, as seen in the tsunami caused by the Sumatra earthquake on December 26th in 2004. Thus, tsunamis are sometimes studied in countries with few or no earthquakes.
A4.4	Volcano	Most volcanoes are also located along the convergent boundary (subduction) zone. This is the reason why volcanoes are also not equally distributed around the globe. Disasters caused by volcanic eruptions are lava flow, pyroclastic flow, lahar, and ash fall. Ash is scattered widely via the prevailing westerlies, but the other disaster types do not have an extensive reach. Regarding volcanic hazard, many investigations and studies are a compilation of areas affected by lava flow, pyroclastic flow, lahar, and ash fall from past volcanic eruptions for each volcano.
A4.5	Cyclone	Research on cyclone and meteorological hazard, and risk assessments have been conducted in ASEAN countries using data on tracks, damaged areas, and storm rainfall. The impact of climate change is also included in this research. Limited information and data available for Brunei Darussalam and Singapore.

3.8.3 Summary of Survey

(1) Floods

Some useful studies on flood hazard, risk, and vulnerability are publicly available presenting assessment results, case studies of countermeasures, as well as different methodological approaches. There are a few types of methodologies to assess risks and vulnerability including, for example, risks involving exposure to flooding events and population density. Vulnerability can be defined as a function of exposure, adaptive or coping capacity, and land-use etc. There are slightly different combinations of these factors with different studies for use. Therefore, these concepts must be defined in advance to plan a methodology for an assessment, in terms of which definitions are to be used in a certain analysis.

A summary of existing studies and reports is shown in Table 3.8.3 by country. A list of collected existing studies and reports is shown in Table 3.8.4.

Table 3.8.3 Summary of Existing Studies and Reports by Country: Flood

Country/Region	Summary of Existing Studies and Reports
ASEAN	There are a few reports that study natural disasters for ASEAN and the Pacific regions at large in recent years. Disaster risks are assessed by scenario, exposure, vulnerability, damage, and loss. An assessment framework is also sought to give an overview of risks, hazard and vulnerability.
Myanmar	Flood hazard maps are prepared for 50-year and 100-year return period scenarios by a project conducted by UNDP/ADPC for Rakhine State. 5 river basins are selected for analysis. Flood forecasting efforts are also implemented by the Department of Meteorology and Hydrology. Flood forecasting stations are installed at major rivers in Myanmar.

Table 3.8.4 Existing Studies and Research: Flood

No	Country	Province/ City	Coordinates		Risk Assessment		Vulnera-bility Assess-ment	Organiza tion Produced	Document No. in Appendix A4.1
			Latitude	Longitude	Area	Popu-lation			
1	ASEAN	-	-	-	○	○	×	UNISDR/ WB	FL_001
2	Myanmar	Mandalay	21.99017	96.08357	○	○	×	ADB	FL_002
3	Myanmar	Yangon	16.82163	96.14662	○	○	×	ADB	FL_002
4	Myanmar	Rakhine State	20.02497	93.96423	○	×	×	UNDP/ ADPC	FL_010

Note: ○ indicates the existence of information. × indicates that information was not found in public resources.

(2) Earthquakes

Useful information and studies on earthquake hazard, risk, and vulnerability were collected from resources available in the public domain including websites. The information and studies include methodologies with analysis and assessment.

There is no standardized or authorized methodology for risk and vulnerability assessment. Therefore, the methodology should be selected or updated in accordance with the purpose when risk and vulnerability assessments are required.

A summary of existing studies and reports is shown in Table 3.8.5 by country. A list of collected existing studies and reports is shown in Table 3.8.6.

Table 3.8.5 Summary of Existing Studies and Reports by Country: Earthquake

Country/Region	Summary of Existing Studies and Reports
ASEAN	There are natural hazard assessment reports for ASEAN region created by international organizations like World Bank etc. They summarize frequency, vulnerability, loss, and others subject for each disaster. Some reports describe the methodology and assessment points/items.
Myanmar	Many organizations executed earthquake hazard-related investigations and studies for Myanmar. The UNDP executed a multi-hazard risk assessment for Rakhine State and the 3 states of Ayeyarwady, Bago and Yangon State. Multi-hazard assessments includes earthquakes, tsunamis, floods, cyclones, storm surges, and climate change. Detailed methodologies are described in the reports.

Table 3.8.6 Existing Studies and Research: Earthquake

No	Country	Province/ City	Hazard Assessment			Risk Assessment		Vulnera-bility Assess-ment	Organi-zation Produced	Document No. in Appendix A4.2
			Scena rio	Probabi listic	Method ology	Human Loss	Econom ic Loss			
1	Worldwide	-	×	○	×	○	○	○	UNISDR	EQ_001
2	ASEAN	-	×	○	×	×	×	×	GSHAP, USGS	EQ_002
3	Myanmar	-	○	○	×	○	×	×	USGS	EQ_013
4	Myanmar	-	×	○	×	○	×	×	OCHA-ROAP	EQ_014
5	Myanmar	Rankin State	×	○	○	○	○	○	UNDP, GRIP	EQ_015
6	Myanmar	Ayeyarwady, Bago,Yangon State	×	○	○	○	○	○	UNDP, GRIP	EQ_016

(3) Tsunamis

Useful information and studies on tsunami hazard, risk, and vulnerability were collected from resources available in the public domain including websites. The information and studies include methodologies with analysis and assessment.

There is no standardized or authorized methodology for risk and vulnerability assessment. Therefore, methodology should be selected or updated in accordance with the purpose when risk and vulnerability assessment are required.

A summary of existing studies and reports is shown in Table 3.8.7 by country. A list of collected existing studies and reports is shown in Table 3.8.8.

Table 3.8.7 Summary of Existing Studies and Reports by Country: Tsunami

Country/Region	Summary of Existing Studies and Reports
ASEAN	Tsunami induced by the Sumatra earthquake on December 26, 2004 caused major damage to ASEAN countries. The disaster is summarized by organizations like ADB.
Myanmar	There are a few recorded tsunami disasters in Myanmar, and it is recognized as a damaging hazard in the country. UNDP executed a multi-hazard risk assessment for Rakhine State and the 3 states of Ayeyarwady, Bago, and Yangon State. The multi-hazard assessment includes earthquakes, tsunamis, floods, cyclones, storm surges, and climate change. Detailed methodologies are described in the reports.

Table 3.8.8 Existing Studies and Research: Tsunami

No	Country	Province/ City	Hazard Assessment			Risk Assessment		Vulnera-bility Assess-ment	Organi-zation Produced	Document No. in Appendix A4.3
			track record	Scena rio	Metho dology	Human Loss	Economic Loss			
1	ASEAN	-	○	×	×	○	○	×	ADB	TN_002
2	Myanmar	Rankin State	×	○	○	○	○	○	UNDP, GRIP	TN_007
3	Myanmar	Ayeyarwady, Bago,Yangon State	×	○	○	○	○	○	UNDP, GRIP	TN_008

(4) Volcanoes

Useful information and studies on volcanic hazard, risk, and vulnerability were collected from resources available in the public domain including websites. The information and studies include methodologies for analysis and assessment.

There is no standardized or authorized methodology for risk and vulnerability assessment. Therefore, methodology should be selected or updated in accordance with the purpose when risk and vulnerability assessment are required.

A summary of existing studies and reports is shown in Table 3.8.9 by country. A list of collected existing studies and reports is shown in Table 3.8.10.

Table 3.8.9 Summary of Existing Studies and Reports by Country: Volcano

Country/Region	Summary of Existing Studies and Reports
ASEAN	UNOCHA summarized the scale of the explosion of volcanoes around the Asia-Pacific region using the Volcanic Explosivity Index (VEI).
Myanmar	There is no record of volcanic disaster in Myanmar and no investigations or studies limited to this country and its regions were found.

Table 3.8.10 Existing Studies and Research: Volcano

No	Country	Province/ City	Hazard Assessment			Risk Assessment		Vulnera-bility Assess-ment	Organi-zation Produced	Document No. in Appendix A4.4
			Track record	Scena rio	Metho dology	Human Loss	Economic Loss			
1	ASEAN Asia-Pacific	-	○	×	×	×	×	×	OCHA -ROAP	VE_001

(5) Cyclone (Typhoon) and Meteorological Hazard

"Cyclone" is a term to describe many types of of low pressure systems, of which tropical cyclones/typhoons are the main types creating disasters in the ASEAN region. Under the framework of WMO, leading countries implement monitoring/detection of tropical cyclones on a regional basis. Table 3.8.11 indicates the responsible territory allocated to ASEAN members and its leading country.

Table 3.8.11 Members of WMO Tropical Cyclone Committee

	Warning Zones	Members（ASEAN）	Leading Country
Western North Pacific Ocean and South China Sea	0° - 60°(N) 0° - 100°(E)	Cambodia, Lao PDR, Malaysia, Philippines, Singapore, Thailand, Vietnam	Japan
Bay of Bengal and the Arabian Sea	5°S - 45°(N) 30°E - 90°(E)	Myanmar, Thailand	India
South Pacific and South-East Indian Ocean	0°-50°(S) 90° - 170°(E)	Indonesia	Fiji

The dates and information utilized in this report have been acquired from various reports on the studies and research conducted on tropical cyclones and meteorological hazards published on the internet. Collected documents include evaluation results of hazards/risks, as well as their evaluation methods. With regard to tropical cyclones/typhoons, a meteorological organization of each country

compiles a summary on the damage situation, including the number of casualties or loss of human lives, and the estimated amount of damage, etc.

A summary of existing studies and reports is shown in Table 3.8.12 by country. A list of collected existing studies and reports is shown in Table 3.8.13.

Table 3.8.12 Summary of Existing Studies and Reports by Country: Cyclone and Meteorological Hazard

Country/Region	Summary of Existing Studies and Reports
ASEAN	Study reports on natural disasters in the whole ASEAN region are available.
Myanmar	The enormous Cyclone Nargis brought about unprecedented damage that was more than had occurred in several decades.

Table 3.8.13 Existing Studies and Research: Cyclone and Meteorological Hazard

No	Country	Province/ City	Coordinates		Risk Assessment		Vulnera-bility Assess-ment	Organiza tion Produced	Document No. in Appendix A4.5
			Latitude	Longitude	Area	Popu-lation			
	No data								

(6) Landslides

A summary of existing studies and reports is shown in Table 3.8.14 by country. A list of collected existing studies and reports is shown in Table 3.8.15.

Table 3.8.14 Summary of Existing Studies and Reports by Country: Landslide

Country/Region	Summary of Existing Studies and Reports
ASEAN	There have been a few reports that study landslides for ASEAN and the Pacific region at large in recent years. Disaster risks are assessed by scenario, exposure, vulnerability, damage, and loss. An assessment framework is also sought to give an overview of risks, hazard, and vulnerability.
Myanmar	High levels of hazard are distributed in the border area with India and some hazard is distributed in the Andaman Sea coastal area. According to the LS-001 risk assessment of Rakhine state, a hazard map of landslide caused by rainfall and earthquake was analyzed and there is no hazard around townships. The number of landslide per year is at a high level, but the deaths per year and average annual economic losses are low. Exposure is distributed along the border with India at a high level and also along the border with Thailand. The vulnerability of buildings, households, and livelihoods in Rakhine state were studied. There are few laws and organizations regarding disaster. MGS prepared hazard maps. Experience and technical education are lacking because of poor organization.

Table 3.8.15 Existing Studies and Research: Landslide

No	Country	Province/ City	Coordinate		Risk Assessment		Vulnera-bility Assess-ment	Organization Produced	Document No. in Appendix A4.6
			Latitude	Longitude	Area	Popu-lation			
1	ASEAN				○	○	×	UNISDR/World Bank	LS-006
2	ASEAN				○	○	×	EEPSEA	LS-013
3	Myanmar	Rakhine State	20.025	94.010	○	○	○	UNDP	LS-001

Indicates Capital

References:

Flood

1) Department of Meteorology and Hydrology (2010). Flood Forecasting and Mitigation in Myanmar, Department of Meteorology and Hydrology
2) Shigenobu Tanaka et al (2010). Progress Report on Flood Hazard Mapping in Asian Countries. PWRI.
3) UNDP/ADPC (2011). Multi Hazard Risk Assessment in the Rakhine State of Myanmar.
4) Velasquez, Jerry et al (ed.) (2012). Reducing vulnerability and exposure to disasters: Asia-Pacific disaster report 2012, ESCAP/UNISDR AP
5) World Bank (2011). Advancing Disaster Risk Financing and Insurance in ASEAN Countries: Framework and Options for Implementation, Washington: Global Facility for Disaster Reduction and Recovery
6) World Bank, UNISDR (2010). Synthesis Report on Ten ASEAN Countries Disaster Risks Assessment.

Earthquake

1) OCHA-ROAP (2011). MYANMAR: Natural Hazard Risks
2) UNDP (2011). Multi-hazard Risk Assessment in the Rakhine State of Myanmar
3) UNDP (2012). Multi-hazard Risk Assessment in Nargis Affected Areas, Myanmar
4) UNISDR (2009). Global assessment report on disaster risk reduction, Risk and poverty in a changing climate
5) USGS (2012). Poster of the Burma Earthquake of 11 November 2012 - Magnitude 6.8

Tsunami

1) ADB (2005). From Disaster to Reconstruction: A Report on ADB's Response to the Asian Tsunami
2) UNDP (2011). Multi-hazard Risk Assessment in the Rakhine State of Myanmar
3) UNDP (2012). Multi-hazard Risk Assessment in Nargis Affected Areas, Myanmar

Volcano

1) OCHA -ROAP (2011). Holocene Eruption and Selected Volcanoes in Asia-Pacific

Cyclone (Typhoon) and Meteorological Hazard

1) ESCAP/WMO Typhoon Committee. (http://www.typhooncommittee.org/)
2) JMA/WMO Workshop on Quality Management in Surface, Climate and Upper-air Observations in RA II (Asia) 2011
3) WMO National Meteorological or Hydrometeorological Services of Members (http://www.wmo.int/pages/members/members_en.html)
4) WMO (2010). First Meeting of the Task Team on "Meteorological, Hydrological and Climate Services for Improved Humanitarian Planning and Response", WMO Headquarters, Geneva, Switzerland (31 August - 2 September, 2010)

Landslide

1) World Bank, UNISDR (2010). Synthesis Report on Ten ASEAN Countries Disaster Risks Assessment

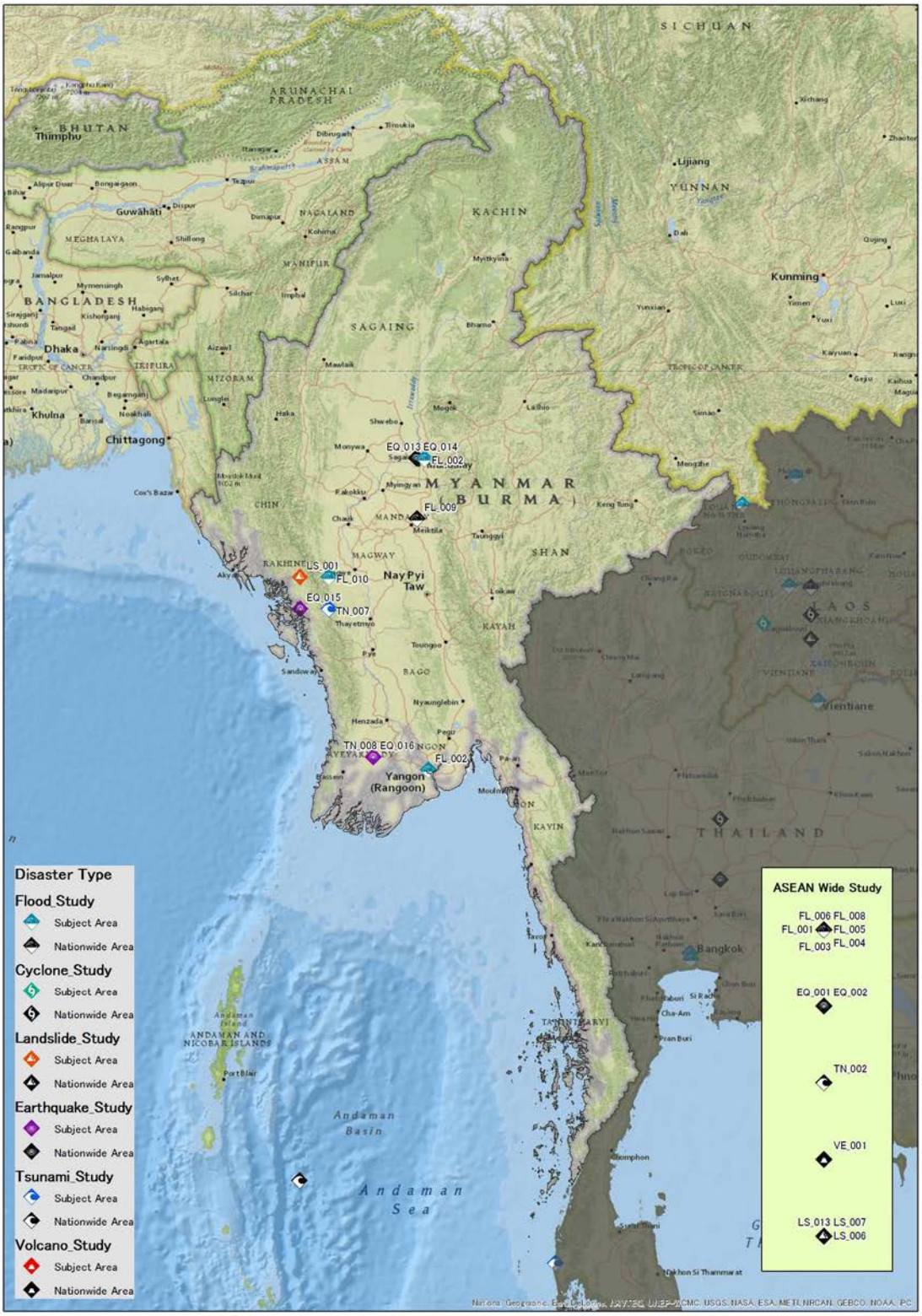


Figure 3.8.1 Existing Study on Natural Hazards in Myanmar

Chapter 4 Industrial Agglomerated Areas and Investment Risk

4.1 Historical Evolution of Industrial Agglomerated Areas

Myanmar first saw the development of industrial parks in the 1950s, primarily around Yangon, as part of foreign-financed reconstruction efforts following World War II. The development of these sites was fairly limited, and they were closed following the rise of Ne Win's socialist government through a coup in 1962. The development of industrial parks did not restart until the 1990s. The State Law and Order Restoration Council, the successor military junta to Ne Win's government, established industrial zones in the early 1990s under the auspices of the Department of Human Settlement and Housing Development (DHSHD), part of the Ministry of Construction.

These industrial zones were not initially intended to function as SEZs and promote export-oriented manufacturing; businesses operating in them were not granted relief from prevailing tax or labor laws. Rather, the zones were intended to serve as an example of urban land-use planning and to warehouse cottage industries. The establishment of industrial zones, along with the junta's attempts at opening the economy to the outside world, led to a garment-manufacturing boom by the mid-1990s. This boom was fueled by relatively low labor costs and the underutilized import quotas for Burmese goods in place in the EU and US. It saw the number of parks in the country rise to around 50, and saw the establishment of the first private parks. Most industrial parks catered only to domestic investors, focused on the garment industry and had fairly basic infrastructure and facilities. A couple of parks, especially the few private and joint-venture ones around Yangon, attracted foreign investment and offered somewhat better infrastructure, though this was generally still below regional standards.

Throughout the 1990s, garments accounted for the majority of Myanmar's manufactured exports. As the US had become the single largest market for Myanmar-produced garments by the late 1990s, the imposition of trade sanctions in 2003 resulted in a massive contraction of the garment industry. By 2005, output had contracted to 38% of what it had been in 1999. As a result, most foreign investors left, and many industrial parks closed or stagnated, with little invested in park development or infrastructure.

In the wake of political reforms since 2011 and the easing of international sanctions, foreign interest in Myanmar's industrial parks has returned. However, ongoing infrastructure and governance problems have to date limited new foreign manufacturing investment. Modern, heavy-industrial production is essentially impossible, given Myanmar's unreliable power grid, poor roads, and underdeveloped ports. Yangon is also experiencing a property bubble; rampant speculation has driven up the price of commercial real estate to a level that offset Myanmar's low-wage advantages. A 2012 investigation found that one acre of land in Yangon's Hlaing Thar Yar industrial zone cost roughly USD 500,000 – about ten times what an equivalent plot would cost in Orlando, Florida.

Land confiscation has also been an issue associated with industrial zone development in the past, which may lead to tenure issues for investors to contend with in the future.

In an attempt to jumpstart export production, the government has announced plans to develop three SEZs, in which foreign manufacturers will enjoy special tax benefits. The one that has attracted the most interest from foreign manufacturers to date is the Thilawa SEZ, located next to the closest deep-water port to Yangon. Japan's ODA agency has issued the Myanmar government with a USD 205 million loan to assist with infrastructure development in the Thilawa SEZ.

4.2 Recent Trends and Japanese Investment

Japan, which has never imposed trade sanctions on Myanmar, became the country's largest garment export market after the imposition of US sanctions in 2003. Japanese companies and organizations have subsequently done more to further Myanmar's industrial development than any other country. In 1998, a consortium spearheaded by Mitsui & Co. broke ground on what is to date the only international-standard industrial zone in the country - Mingaladon, located near Yangon International Airport. One of only a handful of joint-venture or private industrial parks in the country, it is also among the smallest at 184 acres. Of its nine tenants, five are Japanese: Ajinomoto (foodstuffs), Htet Pyae Phyo (electronics), and three garment manufacturers.

Aside from Mingaladon, Japanese foreign direct investment in the manufacturing sector has been limited. In 2012, a Japanese garment producer, Honey, set up a wholly Japanese financed factory in the Yangon Industrial Zone near Mingaladon, which is the first new investment of its type in Myanmar since 2002. Suzuki resumed production of small cars at its facility in Yangon's South Dagon industrial zone in May 2013, but the plant, which has never built more than 100 cars per month, is hampered by a lack of infrastructure.

Suzuki is set to build a much larger and more modern factory at Thilawa, the first firm commitment from a foreign company to develop a modern automobile plant in Myanmar. Other Japanese heavy industry firms have recently expressed interest in manufacturing construction equipment at Thilawa. It is likely that the vast majority of future manufacturers at Thilawa will be Japanese due to Tokyo's support for and promotion of the project.

4.3 Observations from Data Collection

Publicly available information on Myanmar's industrial zones is extremely hard to come by. Only Mingaladon, by far the country's best-run industrial zone, has any sort of online presence. The Directorate of Investment and Company Administration, a government agency tasked with aiding foreigners with investment questions, was unable to provide industrial park information for this project. Multiple government agencies told us that no official, comprehensive list of industrial parks in the country exists. The closest document that we were able to identify is an outdated list of parks in and around Yangon held by the Union of Myanmar Federation of Chambers of Commerce and

Industry (UMFCCI). Contact information for some industrial zones was provided by the Myanmar Industries Association (MIA), but it consisted of phone numbers only, most of which were disconnected. The MIA was unable to provide contact information for a number of industrial zones outside of Yangon. With the exception of Mingaladon, which is already fully occupied, and Thilawa SEZ, which is under construction, industrial parks in Myanmar appear to be wholly unprepared to engage with foreign investors.

Information on industrial zone ownership and capital contributions remains shrouded in secrecy. A Japanese company, FORVAL, has collected some data on the physical features of industrial parks in the Yangon area, however this information is proprietary and for internal company use only. FORVAL apparently attempted to obtain financial information for various industrial zones around Yangon, only to have their requests universally denied. A representative from FORVAL explained that local businesses intentionally obfuscate their investments in order to avoid taxation. This means that accurate figures for capital contributions and investment levels are, in general, impossible to procure. Corruption is likely to be another motivation for this lack of transparency – commercial real estate ownership is often used to launder money.

4.4 General Investment Risk

(1) Political Risk

In April 2011, a civilian government formed by the Union Solidarity and Development Party (USDP) took office after five decades of military rule. The military remains influential as the Constitution guarantees it 25% of parliamentary seats and three cabinet posts. The government, led by President Thein Sein, a former Army general, has initiated a political reform process, releasing hundreds of political prisoners and inviting opposition leader Aung San Suu Kyi, and her National League for Democracy (NLD) Party successfully to contest by-elections in April 2012.

As a result, Western sanctions have been largely suspended, with the exception of arms embargos and some US restrictions on doing business with military-owned firms or blacklisted individuals. The government is also opening the economy to foreign investment. There has been speculation of a backlash against reforms from military and political hardliners, but this is unlikely. Since most within the political elite do stand to benefit from the recent changes, large-scale upsets from within, such as a new military coup, are unlikely, as is a reversal to isolationist policies that were seen prior to 1988.

In addition to Thein Sein, other stakeholders are establishing rival centers of influence. Shwe Mann, the Speaker of Parliament and also an ex- general, is positioning himself as a successor to Thein Sein, who is unlikely to continue in office beyond 2015. Former army chief Than Shwe is also an important force behind the scenes, and a hardline group of MPs who are opposed to reform are also coalescing in parliament.

Suu Kyi has declared her intention to run for president after the November 2015 general elections in June 2013. A constitutional amendment allowing Suu Kyi to do so is likely. The military is interested in improving the image of the country and its history of military rule. Removing obstacles stopping Suu Kyi from becoming a presidential candidate would achieve this to a large extent. However, the military knows that the USDP is unlikely to lose an election. Even if it does, constitutionally, the military is guaranteed 25% of all parliamentary seats and three cabinet positions, meaning that its influence is certain in any government.

Beyond political instability, foreign investors face a range of political risks. There are 10-12 large local conglomerates owned by well-connected Myanmar elite that control a large portion of the economy and hold monopolistic positions over certain sectors. These companies include Htoo Trading, Max Myanmar and military-owned Myanmar Economic Corporation and Union of Myanmar Economic Holdings. The interests behind these companies could well interfere with foreign investments in their sectors. However, projects requiring foreign expertise, such as airport and other large infrastructure developments, are less likely to experience interference as the government hopes to establish Myanmar's credentials as an investment destination. Accordingly, outright expropriation is unlikely. Corruption is another significant risk. Bribery is accepted as a part of doing business in Myanmar and companies will probably be expected to pay bribes in order to secure business deals, permits or concessions from governmental agencies, politicians and the military.

(2) Economic Risk

Myanmar's economy has gone into reverse after decades of isolation and mismanagement under the rule of successive military regimes, compounded by the imposition of international sanctions. The reformist path recently taken by the new semi-civilian government has provided the country with a chance to jump-start its economy and lift the living standards of its 50 million people, over a quarter of which still live in poverty.

The economy holds considerable potential, given substantial natural resources and Myanmar's strategic location on the borders of India, China, and South-East Asia. Regional hunger for energy is likely to continue attracting foreign direct investment into Myanmar's hydrocarbon sector following the large investments already made by China and Thailand. Meanwhile, Western business interests have also risen significantly, following the re-established political dialogue of Myanmar’s administration with Western governments and the subsequent suspension of the economic sanctions. Nonetheless, the reform agenda is long, as nearly all aspects of Myanmar’s economy and business environment need to be transformed. The rudimentary infrastructure and financial system, inadequate legal framework, weak private sector, endemic corruption, and other inefficiencies bolstered by the central planning will have to be overcome if Myanmar is to realize its economic potential.

Economic activity will receive support from the ongoing reform momentum, with exports and foreign investment remaining the main drivers of growth. Following the removal of sanctions by Western governments, FDI into Myanmar is expected to rise, particularly into the energy sector. Meanwhile, exports will benefit from the removal of foreign-exchange restrictions, as well as rising demand from Asian neighbors, especially following the sharp rise in gas production in fiscal year (FY) 2013/14 (beginning 1 April), when the gas pipeline transporting gas from Daewoo International's offshore reserves in the Bay of Bengal to the Yunnan province in China comes on line (expected in second-quarter 2013) and later in 2014, when a twin oil pipeline also becomes operational. The hydrocarbon sector is likely to remain the mainstay of the economy in coming years. On the domestic front, the economy will benefit from rising demand and investment. Construction of new infrastructure projects will drive industrial production, while anticipated acceleration of credit growth and private-sector development will lead investment and services.

(3) Legal Risk

Myanmar retains the remnants of a British colonial-era legal system. Following nearly five decades of successive military regimes the new semi-civilian government that took power in March 2011 inherited a judicial system with a weak legal framework that lacks transparency, in which political overlay and interference remain pervasive, and where arbitrary decisions are common. With the coming into force of the 2008 constitution, Myanmar now has a rule of law that provides for a strengthened judiciary, and the government has made it one of its priorities to increase the fairness and efficiency of judicial proceedings. This includes the updating of a raft of antiquated laws, as well as new legislation, including a new foreign investment law. While the situation is slowly improving, the regulatory and legal situation remains unpredictable. It is often unclear what regulations are in place, which laws are still valid, and which legislation is applicable to specific processes. There are no standard processes in place for notifying new laws, or amendments to existing legislation, and developments often occur without advance or written notice. Excerpts of laws however, are increasingly published through state-run media.

In the event of a dispute, foreign companies have limited domestic or international legal recourse. Myanmar is not a member of the International Center for the Settlement of Investment Disputes or a signatory to The Convention on the Recognition of Foreign Arbitration Awards (New York Convention). All disputes must be settled under the country's own arbitration procedures. The 1944 Arbitration Act allows for international arbitration, but the government usually attempts to circumvent this and use local mechanisms, which it controls to a large extent. The lack of independence and impartiality of courts means that this often works to the distinct disadvantage in disputes between foreign businesses and the government, or entities with close connections to the government and/or the military.

On 5 November 2012, Myanmar's president approved the new Foreign Direct Investment Law 2012. The legislation establishes a framework for FDI, but is vague. The law will only be the guiding document for more detailed rules that will be drafted and published by the Myanmar Investment

Commission (MIC). This means that there is great potential for changes to FDI regulations that are not favorable to foreign investors. The forms of investments permissible under the FDI Law 2012 are a limited liability company that is 100% foreign owned if permitted by the MIC, or a joint venture between a foreigner and Myanmar citizens or government departments or organizations, for which the ceiling of foreign capital shall be agreed by both parties. Companies can also be established under the Companies Act 1914. Whether a company needs to be established under the FDI Law 2012 or the Companies Act 1914 appears to depend on the size and nature of the investment, although most substantial investments will likely be required to register under the FDI Law 2012. Firms established under the Companies Act 1914 are not entitled to tax incentives. According FDI Law 2012, foreign investors are required to apply for a permit from the Myanmar Investment Commission. After the obtaining of the permit, foreign investors are required to conclude a contract with the relevant government departments or organization.

(4) Tax Risk

Myanmar's tax system, like other regulatory frameworks, suffers from lack of transparency and consistent enforcement of regulations. As a result the risk of arbitrary or politically-motivated selective enforcement is high. Myanmar's tax base is also narrow, and tax-evasion levels are high. Confusion and inconsistent enforcement undermine the significant tax incentives that exist for investors. Tax reforms will probably be forthcoming as part of the broader reform moves undertaken by the government.

Myanmar's maximum corporate tax rate is 25%. Firms in the oil and gas sector are also liable for a tax on profits arising from asset transfers, ranging from 40% for profits up to USD 100 million to 50% for profits over USD 150 million. There is no withholding tax on dividends, but other payments are subject to withholding taxes ranging from 3.5% to 20%, depending on whether the payee is resident or non-resident. The new foreign investment law provides for a five-year tax holiday for companies if the investment is considered to be in the national interest. The new law also allows investors to apply to the MIC for waivers of import taxes and duties on parts and machinery during construction and on raw material imports for the first three years of a company's production operations. While the application is made to the MIC, it is the cabinet that grants the specific tax incentives.

Myanmar has three SEZs, all of which offer tax incentives for investors, including income tax exemptions for export sales for the first five years of production, and 50% income tax relief on export sales for the next five years of production. Further relief is available for the following five years if profits from exports are reinvested.

(5) War Risk

Since 2011 reforms began, Myanmar’s relations with other countries have improved, leaving Bangladesh as its most difficult international relationship. Myanmar and Bangladesh's long-standing

sea boundary dispute in the Bay of Bengal was resolved by the International Tribunal for the Law and Sea in March 2012. Myanmar accepted the decision and lost significant mineral resources. Contract awards made by the government in the disputed area were voided. Given this, conflict with Bangladesh is unlikely, but diplomatic relations are increasingly strained over communal unrest issues related to the Rohingya community.

Internally, Myanmar suffers from protracted ethnic insurgencies in its border areas. Several ethnic rebel groups, particularly in the eastern part of the country, demand federal autonomy in their regions. The most significant of these include the Karen National Union (KNU), the United Wa State Army (UWSA), the Shan State Army (SSA) and a splinter group of the Democratic Karen Buddhist Army (DKBA). These groups mostly use small-arms. Since November 2011, the government has signed ceasefire agreements with almost all the ethnic rebel groups.

The Kachin Independence Army (KIA), which is based in the northern state of Kachin, bordering China, has not signed a ceasefire with the government. In early 2013, the army attacked the KIA's de facto headquarters in Lajayang, Kachin, with ground troops supported by Mi-8 helicopters, artillery and fighter planes. Following a lull in fighting, the KIA and the government reached a seven-point agreement intended to reduce fighting. But importantly, the deal is not a ceasefire, and as such, sporadic gun battles are likely in Lajayang, Hpakant and Pan Wan. However, the army is less likely to initiate large operations with aerial support as it did earlier this year. Trade and infrastructure developments along the Myanmar-China border face risks of disruption and collateral damage during fighting. This would include sections of the Shwe pipeline from Myanmar's Rakhine state to China's Yunnan province that passes through Shan and Kachin state. Moreover, NGO workers, such as SwissAid employees in Kachin, will face collateral injury risks as result of the fighting.

(6) Terrorism Risk

The principle source of income for ethnic militias is protection money on cargo convoys from smugglers bringing in goods from Thailand and China. Any attempts by the military to take control of KIA-controlled smuggling routes would probably result in KIA attacks on infrastructure projects and power facilities in the area. Potential targets include the Shwe gas pipeline to Yunnan, (China National Petroleum Corporation) and the Taping Hydropower dam (China Datang Corporation).

Dissident militant groups, notably the Vigorous Burmese Student Warriors (VBSW) and the All Burma Democratic Front, also have the capability to stage crude IED attacks, primarily in Yangon. Though the risk of such attacks has declined since 2011, they would likely resume if the reform process were to stall. Probable targets include government facilities, hotels and restaurants. Past targets of dissident plots include City Hall (in September 2008), Insein Prison (to coincide with the visit of UN Secretary General Ban Ki Moon in August 2009), Traders Hotel, Panorama Hotel and the Zawgyi House restaurant. A notable vehicle-borne IED was detonated in Yangon during New Year celebrations in April 2010, injuring 60 people. In any such attacks, property damage is likely to be comparatively minor.

(7) Civil Unrest Risk

There has been an increase in protests over a variety of issues since the accession to power of the semi-civilian government in 2011. Myanmar's civil society is increasingly making use of recently relaxed laws on freedom of expression and assembly, including a law allowing peaceful protests that was passed in March 2012. Thus, while risks of large-scale political protests, such as those led by monks in 2007, have declined, protest frequency is likely to continue to increase. Urban protests are likely to be related to particular political policies, land confiscation, and infrastructure issues, such as power shortages.

The protests that pose the greatest risks to business continuity are likely to be environmental ones against large infrastructure and mining projects. In some cases, such protests are likely to lead to contract suspension, revision or cancelation. This has already occurred with the some dam and power plant projects, including the Myitsone Dam. In November 2012, protesters fought with security forces near the site of the Latpadaung copper mine in Sagaing region. A cross-section of groups, including Buddhist monks, have protested against the mine, which is a joint venture between the Union of Myanmar Economic Holdings and the Chinese Wanbao Group.

Strikes also pose risks of business disruption. In October 2011, the Labor Organization Law allowed the creation of labor unions. Protests over inflation and industrial disputes are increasingly likely, and are at risk of some low-level violence. In May 2013, workers in 41 factories in Yangon's Hlaing Tharyar Industrial Zone-3 went on a strike to demand higher wages. The government pre-emptively deployed hundreds of fully armed riot police in the area. It is very probable that that there will be further strikes, particularly in the garment sector, over inflation and poor working conditions

Another potential source of unrest and business disruption is communal unrest, especially due to religious disputes between Muslim and Buddhist communities. Communal violence between Rohingya Muslims and Buddhists resulted in a state of emergency being imposed in June 2012. The Rohyingya community is located only in Rakhine state, which has little onshore foreign investment. As such, this conflict is unlikely to spread or pose significant business disruption risks. However, other Muslim communities are located in major commercial cities, including Yangon. Since the start of 2013, there have been multiple examples of violent religious unrest leading to significant property damage in central Myanmar. If such unrest were to spread to major urban areas, there would be security, property damage and business disruption concerns for foreign investors operating there.

4.5 Industrial Agglomerated Areas and Natural Disaster Risk

Several distribution maps are shown overlaying natural disaster risk as follows. List of industrial agglomerated areas are attached at the end of this report.

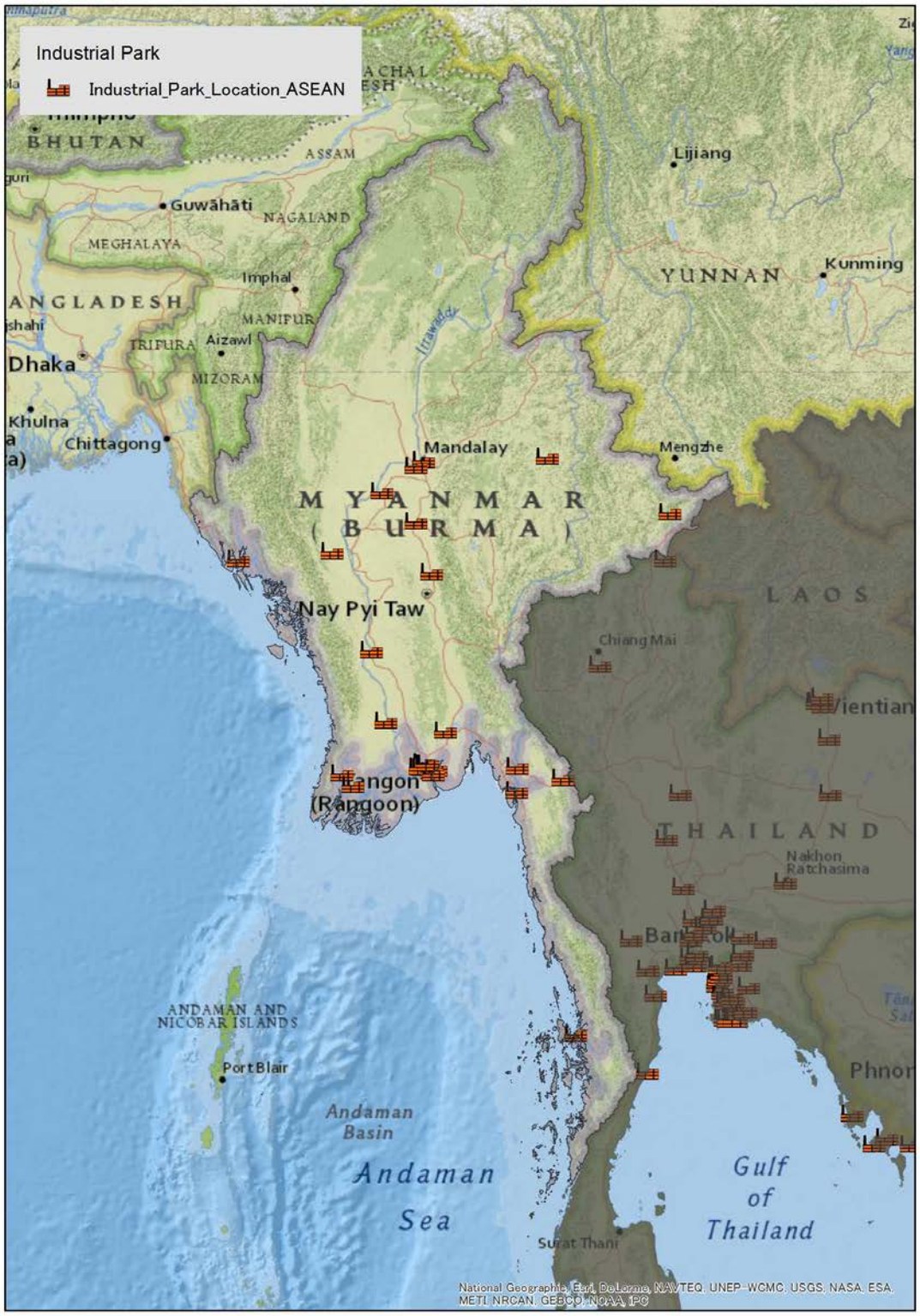


Figure 4.5.1 Distribution of Industrial Park in Myanmar

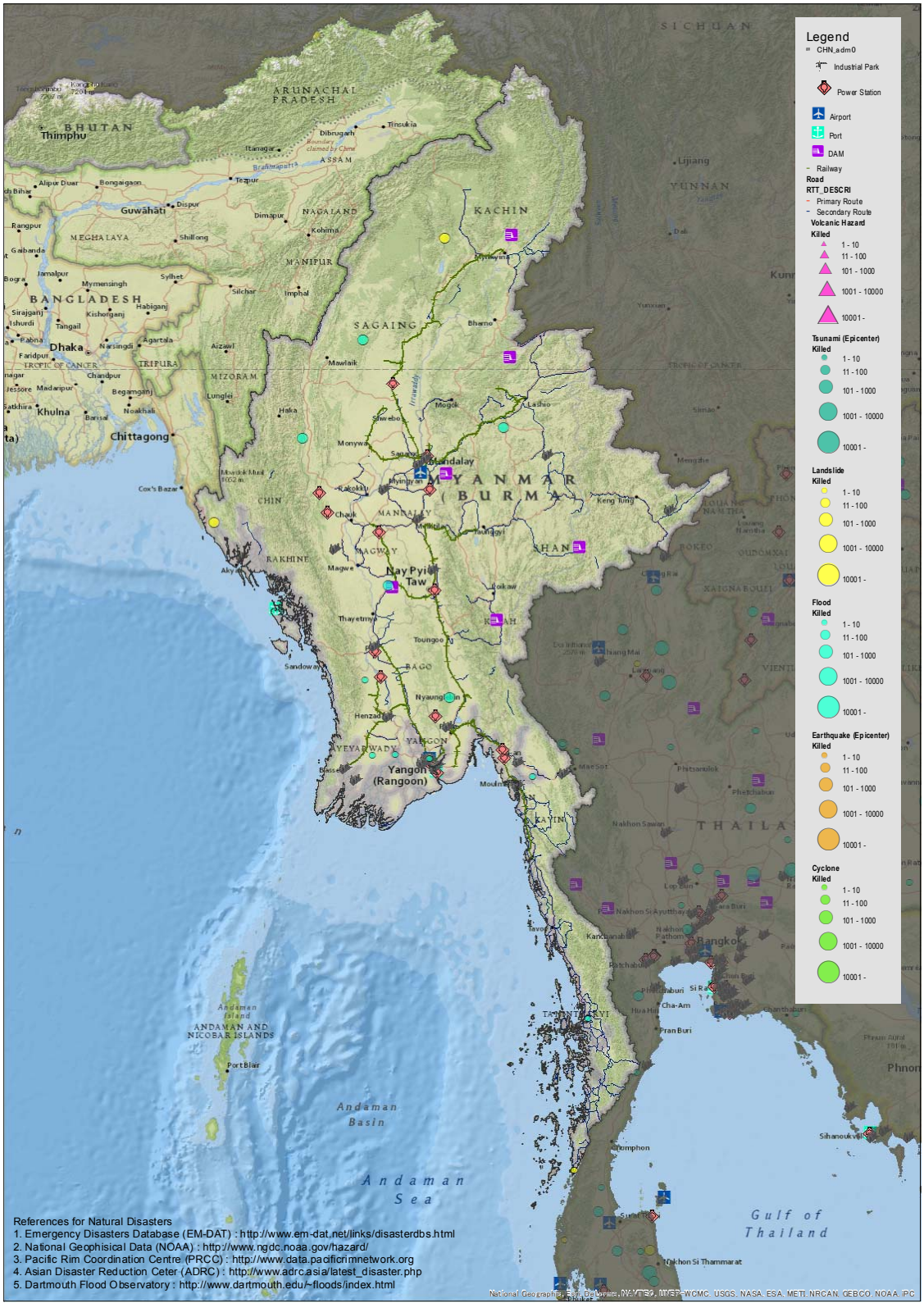


Figure 4.5.2 Distribution of Industrial Park, Major Infrastructures and Natural Hazards on number of killed in Myanmar

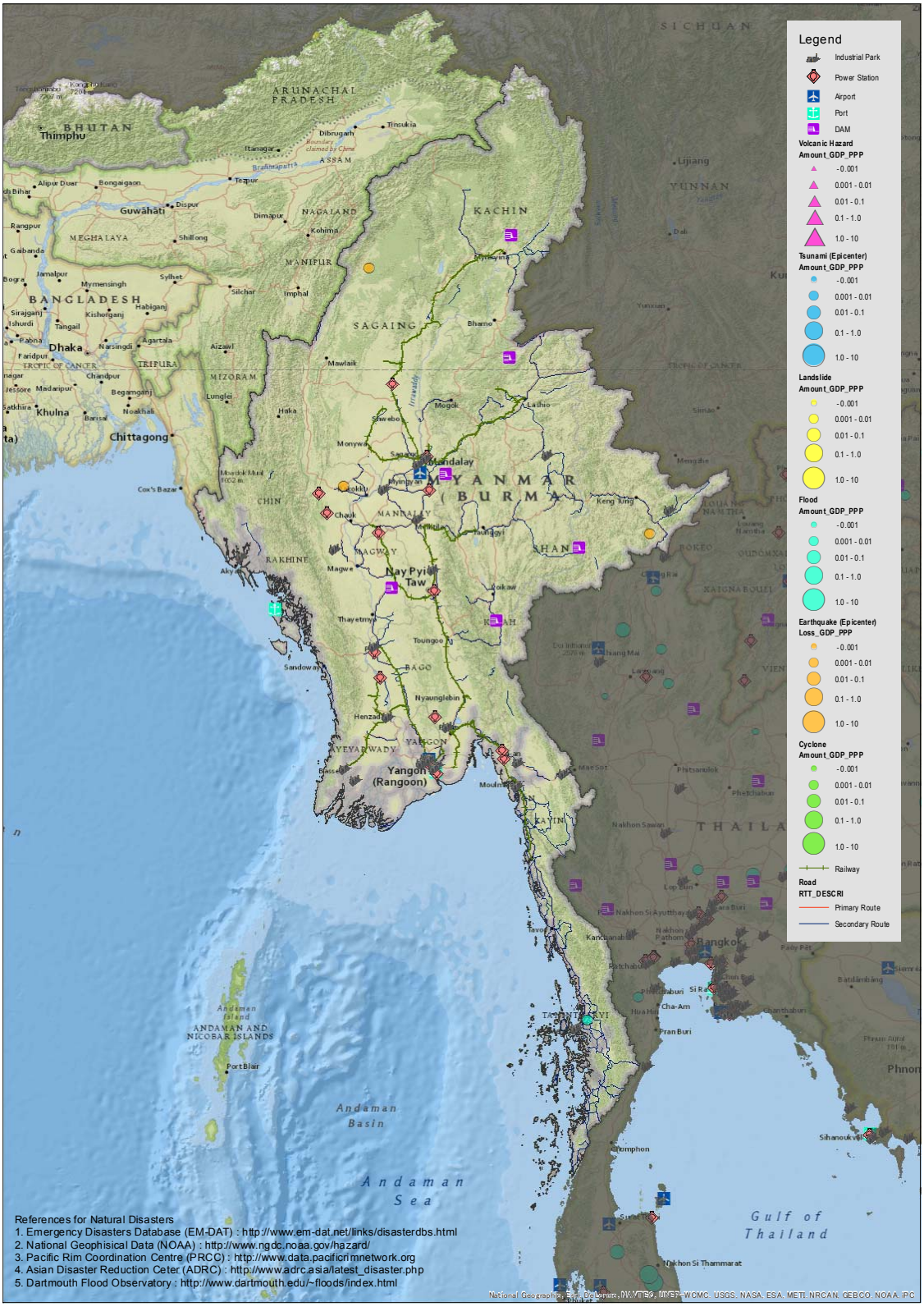


Figure 4.5.3 Distribution of Industrial Park, Major Infrastructures and Natural Hazards on loss rate to GDP in Myanmar

Chapter 5 Relevant Infrastructure and Natural Disaster Issues

5.1 Infrastructure Conditions

5.1.1 Roads

The domestic transportation network in Myanmar is based on a traffic system which flows in the direction of north to south, while the east to west route tends to be divided by rivers. No means of transportation have been developed in either the northern mountain area or border regions because of political restrictions.

In 2005, the capital was relocated from Yangon to Ney Pyi Taw. Improvement work for the road and railway networks has been furthered in order to improve access between the two areas. A highway between the two areas was opened for traffic in 2009.

Regarding the number of registered cars, most are passenger cars, followed by trucks. However, it is expected that the number of trucks will increase in the future.

Table 5.1.1 Number of Registered Automobiles (February 2008)

Vehicle Type	Inside of the Yangon District		Outside of the Yangon District	Total
	Inside of Yangon City	Outside of Yangon City		
Passenger Car	129,819	3,185	82,177	215,181
Light Truck	13,213	698	9,966	23,877
Heavy Truck	8,907	828	23,410	33,145
Bus	9,660	1,030	8,735	19,425
Other four-wheeled vehicles	8,761	244	3,825	12,830
Two-wheeled vehicle	1,108	1,929	852,653	655,690
Three-wheeled vehicle			5,653	5,653
Tractor	1,144	1,109	60,054	62,307
Total	172,612	9,023	846,473	1,028,108

Source: Ministry of Land, Infrastructure, Transport and Tourism, Japan, Transportation Situation of Myanmar 2009.11

5.1.2 Port

(1) Summary

In Myanmar, the ports are classified according to their roles into three types.

The Yangon Thilawa Port and the Kyaukphyu Port are listed in the 47 harbors designated by ASEAN.

Table 5.1.2 Classification of Ports

Classification	Ports
International port for export and import	Yangon Port
International Export port	Sittwe Port, Pathein Port, Mawlamyine Port, Myeik Port
Domestic coastal transportation port	Chaopyu Harbor, Sandoue Port, Dawei Port, Harbor Kotaun

Source: Ministry of Land, Infrastructure, Transport and Tourism, Transportation, Japan, Situation of Myanmar 2009.11

At the Yangon Port, the cargo throughput was 12,003,103 tons and the container throughput was 189,690 TEUs in 2008. Although there is some yearly fluctuation, there is a general upward trend.

(2) Port facilities

Yangon Port has 26 berths, of which 13 can accommodate containers. There are four (4) container terminals: Bo Aung Gyaw Terminal: MPA Management, Myanmar International Terminal Thilawa: MITT, Asia World Port Terminal (AWP), and Myanmar Industrial Port (MIP).

(3) Damage by Cyclone Nargis

In May 2008, Cyclone Nargis hit the Ayeyarwaddy District and the Yangon District, causing serious damage to Yangon Port. Because of the sinking of vessels, the throughput capability of Yangon Port fell to about 1/3, and among the 37 piers used for domestic distribution, 24 piers became unusable. As a result, the distribution of goods was greatly disrupted.

5.1.3 Railways

(1) Summary

In 1877, the 298 km of railway between Yangon- Pyay was built by the Irrawaddy State Railway. In 1886, the 623 km between Yangon-Mandalay was completed. These became the foundation of the railway of Myanmar. After that, construction of railway progressed slowly. However, in recent years, railway construction has been conducted more rapidly.

The present railway is 5,031 km in length, and there are 806 railway stations (2007). The railway company is under governmental jurisdiction, with no entry of private enterprise into railway operations. 1,000 mm gauge and 37 kg/m rail are used for the railway structure with wooden railway sleepers. However, these wooden sleepers are currently being replaced with concrete sleepers. The speed limits are 70 km/h for main lines and 35 km/h for branch lines.

(2) Number of vehicles and operation

The railway operates with an average of 412 trains per day in the whole country. The circle line of Yangon city operates 200 trains per day and transports 47.45 million people every year.

Table 5.1.3 Classification of Trains 2007

Classification	Number of Operations
Express	42
Mail Train	20
Normal Passenger Train	64
City circle train	200
Local train	72
Freight Train	15

Source Ministry of Land, Infrastructure, Transport and Tourism, Transportation Situation of Myanmar 2009.11

5.1.4 Airports

(1) Outline

In Myanmar, there are two (2) international airports: Yangon International Airport and Mandalay International Airport. They are managed by the Ministry of Transport and Department of Civil Aviation. The Myanmar government will also build the Hanthawaddy International Airport at Bago, for which a South Korean company was the successful bidder in August of this year.

There are 69 airports, which are classified as follows.

Table 5.1.4 Classification of Airports

Classification of Airports		Number
Class 1	(International Airport)	2
Class 2	(Domestic ai	24
Class 3	(Domesti	6
Class 4	(Local safety airport)	30
Class 5	(Military airport)	7
Total		69

Source: Ministry of Land, Infrastructure, Transport and Tourism, Transportation Situation of Myanmar 2009.11

(2) Yangon International Airport

The new international air terminal building opened formally in 2007. Runways are 3,414 m x 61 m.

(3) Mandalay International Airport

The airport was opened in 2000. The runway is 4,267 m x 61 m, which is longer than the runway of Yangon International Airport. However, in order to strengthen overseas travel, it was decided to repair the passenger terminal. Japanese companies have obtained negotiating rights for this.

5.2 Public Services

5.2.1 Electricity

In Myanmar, power failures occur frequently, even in big cities such as Yangon and Mandalay. Unless personal electricity generators are used, it is difficult to establish a satisfactory electric power environment. The shortage of electric power is a major issue in Myanmar.

Electricity in Myanmar is generated by hydro power (70%) and thermal power (24%). There is also a difference in electricity generation capacity of electricity between the rainy season (May to October) and the dry season (November to March). (almost half.)

Myanmar transmits electricity at 66, 33, 11 and 6.6 kV, and supplies electricity at 230V and 132V. The electric power supply at peak hours is 1,500 MW, of which about half is consumed in Yangon. However, even if the nominal voltage is stated as 230V, it may be distributed in voltages that are higher or lower, which home electrical appliances to malfunction.

Dam construction is difficult due to large problems involving location, time, distance, and the environment. Therefore, the construction of a natural gas power plant is planned. Additionally, Chubu Electric Power of Japan received an order to conduct a survey on improving the electric power supply networks of Myanmar in June this year. Various types of plans are expected to be formulated.

5.2.2 Water

(1) Water supply

The tap water service coverage rate is only 60% in Yangon city. The shortage is supplemented by using groundwater and low-speed filtrated water. Chemical disinfection and water-purification is not conducted. The total water volume supplied to Yangon is 524,000 m³/day, coming from the four (4) water-purification plants. About 40% of the water supply comes from the water supply pump station of the 1st phase water purification plant in Naunghnapin. Although there are four (4) sets of pumps installed, only two (2) sets of them are working because of malfunctions.

As for the water quality, two thirds (2/3) of the water supply is without water-purification and it has also suffered flood damage. The leakage rate is about 50% in Yangon City, and also 40% in some parts of Nay Pyi Taw City. Water supply pipes are deteriorated.

Mitsui Bussan, Toyo Engineering (TEC) and the Bureau of Waterworks of the Tokyo Metropolitan Government exchanged a memorandum in May of this year with the Yangon City Development Committee (YCDC) for a project to support the improvement of the water supply in Yangon city. TEC has received the order from JICA for a feasibility study to review the water supply improvement project for Yangon.

(2) Sewerage

In some parts of the city center in Yangon, the sewer facilities installed during British possession 120 years ago are still partly in use, but have become remarkably deteriorated. Although there is an area using septic tanks, supernatant fluid is discharged without treatment and contaminates groundwater. Moreover, domestic wastewater is discharged without any treatment into the Yangon River and contaminates the river.

Among the 28 industrial estates in Myanmar, only the Mingaladon Industrial Park (MIP) of Yangon, which was partly developed by Japanese companies, treat their industrial wastewater.

5.2.3 Communication

(1) Internet

Only two companies (Myanmar Posts and Telecommunications (MPT) and Yadanaporn Teleport (YT)) provide ISP services. Several companies borrow these lines and are performing communications services using optical fiber, radio broadband, Asymmetric Digital Subscriber Line (ADSL), Dialup, WiMAX, and an iPSTAR satellite.

There are 15,300 internet subscribers, with numbers remaining low.

(2) Mobile phones

MPT provides mobile communication services with many systems, such as CDMA and GSM. Interconnection between the systems is not performed. In August, 2012, Telecom Square (the Japanese mobile communication facility rental service company) started mobile phone rental services.

(3) Fixed-line phones

Although MPT offers fixed-line telephone services, infrastructure improvement of fixed-line phones is insufficient because of a shortage of funds. Diffusion rates are also low.

(4) Terrestrial broadcasting

Myanmar Radio and Television (MRTV) is a state-run television station that broadcasts news and dramas. There are 218 relay stations, which cover about 98% of the population.

5.2.4 Waste

In order to maintain Yangon city as a garden city, the Pollution Control and Cleansing Department (PCCD) was established. In 1999, the urban waste generated was 3,000 tons/day, and the basic unit of solid waste generation was 0.52 kg/person/day. The sources of solid waste are households (61.4%) and markets (14.8%).

Table 5.2.1 Present Condition of Garbage Collection of Yangon

Year	Waste generation (t/D)	Amount of Collection and Disposal (t/D)	Collection Rate (%)	Generating Basic Units (kg/capita/D)
2000	1,457	787	54	0.395
2003/4	1,435	1,150	80	0.312

Source: Tokyo Environmental Public Service Corporation

Although there were disposal sites located in Yangon, they were closed because they caused various environmental problems. Currently, the new Htein Pin disposal site located at 26 km west of the city is used.

5.3 Natural Disaster Issues

Floods occur due to tropical monsoons in the rainy season from June to October and also due to the typhoons which land in Vietnam from September to October. Cyclone Nargis, which landed in Myanmar from April to May 2008 caused the greatest disaster in Myanmar.

After the cyclone was generated in the center of the Bay of Bengal, it moved toward the east, and when crossing the lower swampy zone of the Irrawaddy delta, much damage was brought about. Cyclone Nargis was a very severe cyclonic storm with a central atmospheric pressure of 962 hPa and a maximum wind speed of 215 km/h.

There were 800,000 houses and buildings damaged, 600,000 ha of farmland inundated, and 138,000 persons dead and missing. Moreover, it is reported that 4,000 school buildings and 75% of hospitals and medical facilities were damaged or collapsed by the huge storm surge from the seashore. (ASEAN) The roads broke into pieces and many bridges were destroyed.

There are active faults in Myanmar, and many earthquakes have occurred. A tsunami may be triggered when an earthquake occurs in the offshore Sumatra areas. Floods and landslides, etc. have also occurred. Various natural disasters similar to those in Japan have occurred. However, the greatest damage is caused by cyclones, and infrastructure should be prepared for such.

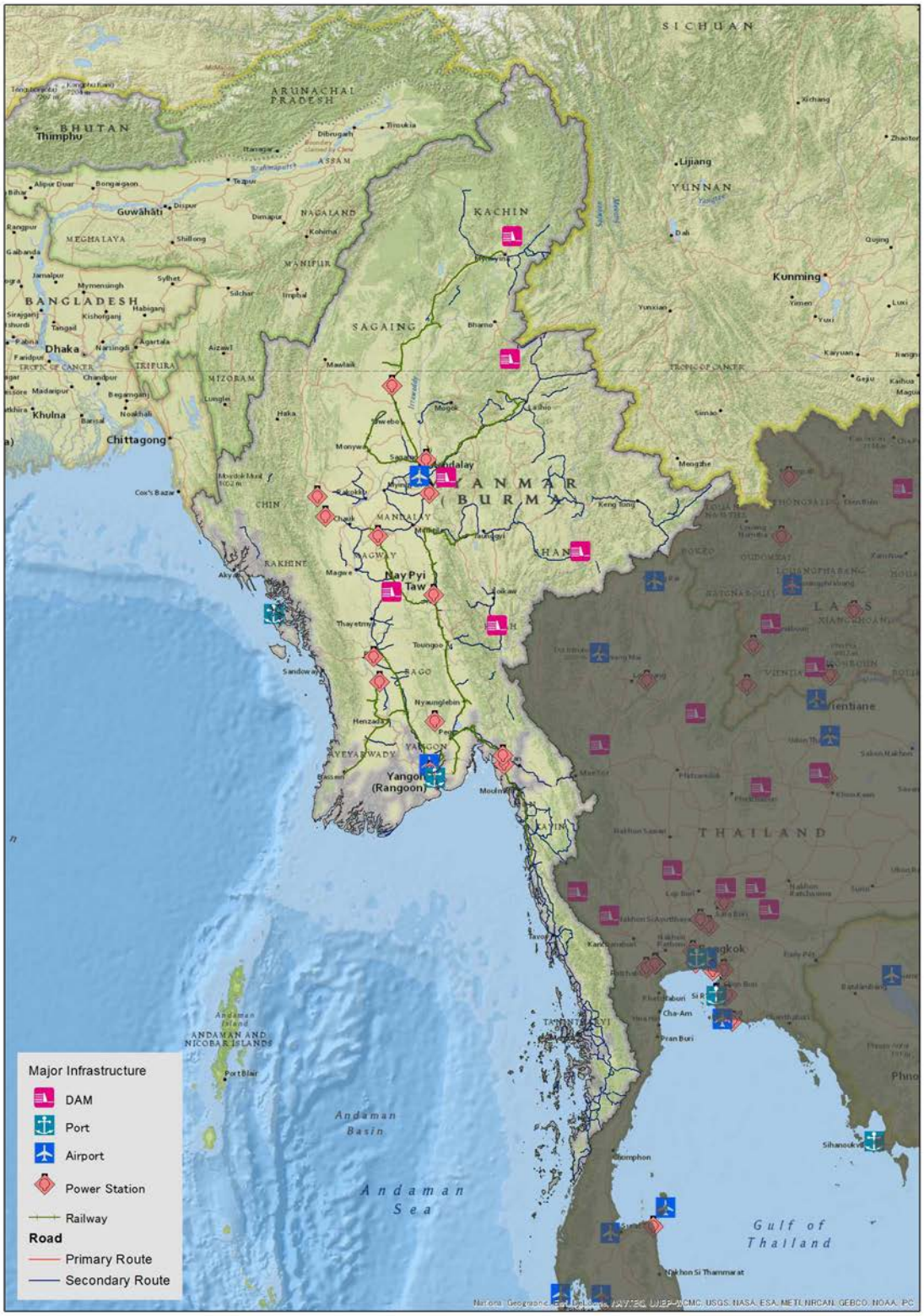


Figure 5.3.1 Major Infrastructures in Myanmar

Chapter 6 Economy, Industry, and Trade

In this survey, the general outline of economy and trade in Republic of the Union of Myanmar and the cases in which disaster impact analyses were conducted are examined. The purpose is to estimate the impact of a disaster on the economy of the nation and surrounding regions in the event that an industrial agglomerated area in Myanmar is hit by a disaster.

The following topics were explored using existing data and information from sources such as the internet, research papers, reports and other materials.

- Overview of the economy and industry in Myanmar
- Overview of trade in Myanmar

In order to understand the conditions of the economy and trade in Myanmar, relevant information was gathered/organized based on a review of reference materials listed below:

No.	Reference	Remarks
1	ASEAN-JAPAN CENTRE website http://www.asean.or.jp/	Statistical data on economy, industry and trade of ASEAN
2	JETRO 2009, "ASEAN Economic Community (in Japanese)"	Regional corporation framework in East Asia
3	ASEAN Stats database http://aseanstats.asean.org/	Trade values of ASEAN by commodity and partner country, etc.
4	ASEAN website (2013), "Key basic ASEAN indicators in 2011, Last update 14 January 2013"	Key basic indicators of ASEAN
5	International Monetary Fund, World Economic Outlook Database	Macroeconomic indicators of ASEAN
6	Industrial agglomerated areas in ASEAN, IHS	Detail information on industrial agglomerated areas in ASEAN
7	Ministry of Foreign Affairs of Japan http://www.mofa.go.jp/index.html	Information on regional affaires etc.

6.1 Overview of the economy

The GDP of Myanmar is 51.4 billion USD (2011), which is the fourth lowest in ASEAN. The GDP per capita is 824 USD (2011), which is the lowest in ASEAN.

The country's economic growth rate is 13.4% (2011), and it is almost the same as the average of ASEAN (15.7% (2011)). Although the figures may fluctuate from year to year, by looking at the past trends, it can be estimated that the economic growth rate of Myanmar will move in line with the ASEAN average in the future. While foreign direct investment in Myanmar is small at only 756 million USD (2010), it has been growing continuously, with the exception of 2009.

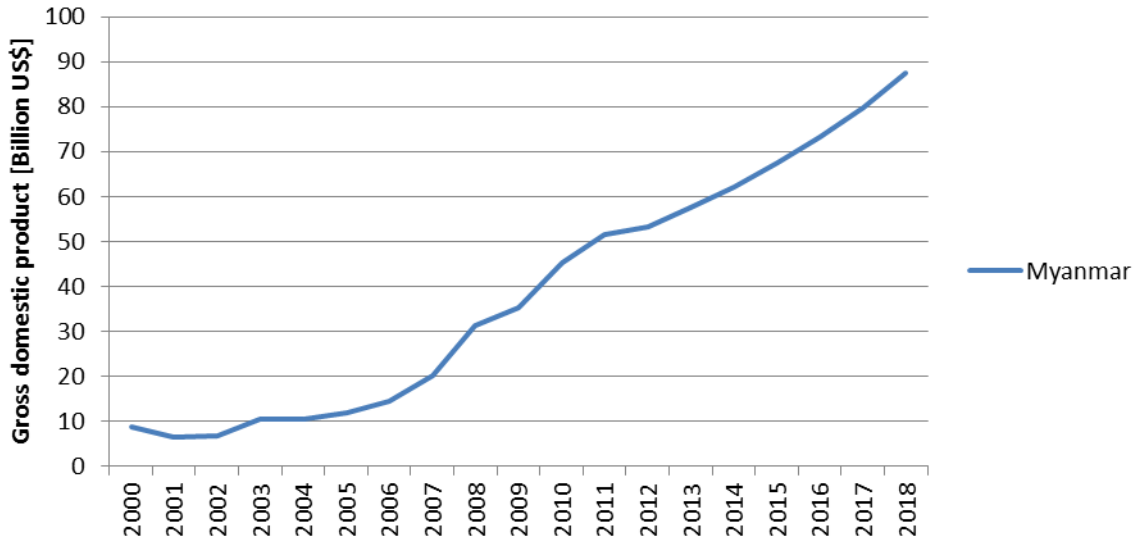
While statistics show that the unemployment rate of the country is held at nearly constant rate around 4%, it has been pointed out that the reliability of the information is unconfirmed. (Cf. The unemployment rate in Japan as of 2012 is 4.4%.)

As for industrial composition, agriculture is the largest sector. The country was late in industrialization, but since the current administration is pushing hard for economic reform, it is expected that part of the country's industrial sector will increase in the future.

Major industrial parks in Myanmar, in which many Japanese companies are operating, are summarized in the table below:

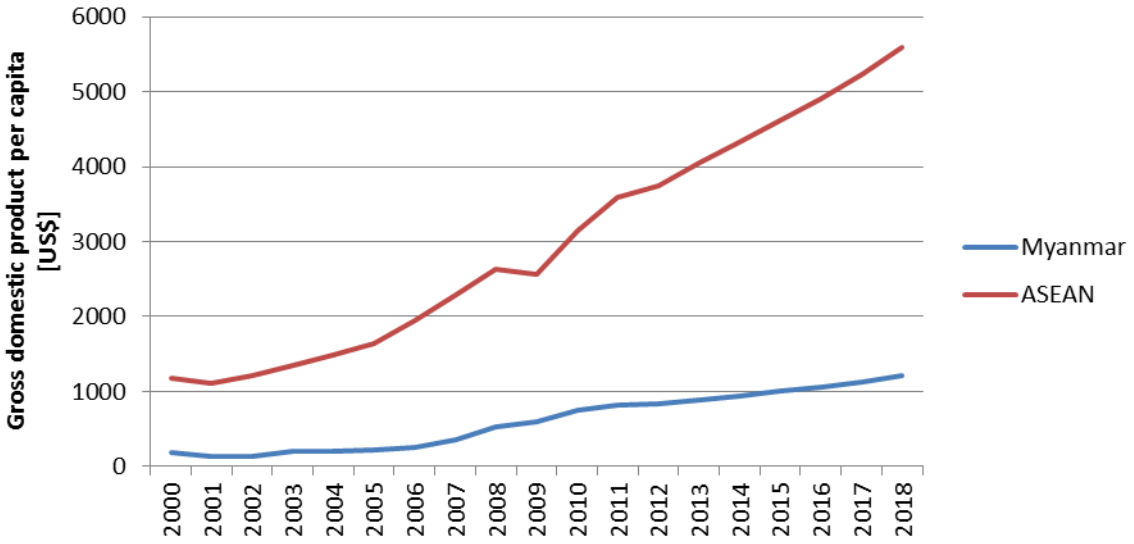
Name of Industrial Park	Number of Japanese companies operating	Description
Bago Industrial Zone (Intagaw)	(1)	Located 70 km north of Yangon. Companies handling medical equipment are operating in this industrial park.
Mingaladon Industrial Park	(several)	Located 23 km from Yangon, near Yangon International Airport. Food manufacturing companies operate in this industrial park.
Thilawa Special Economic Zone	(-)	Located 25 km south of Yangon. Construction will be completed in 2015. 49% of investments are from Japan.

Reference: The table was created based on information from ASEAN-Japan Centre (https://www.asean.or.jp/)
Note) Numbers shown in parentheses were obtained from resources provided by IHS.



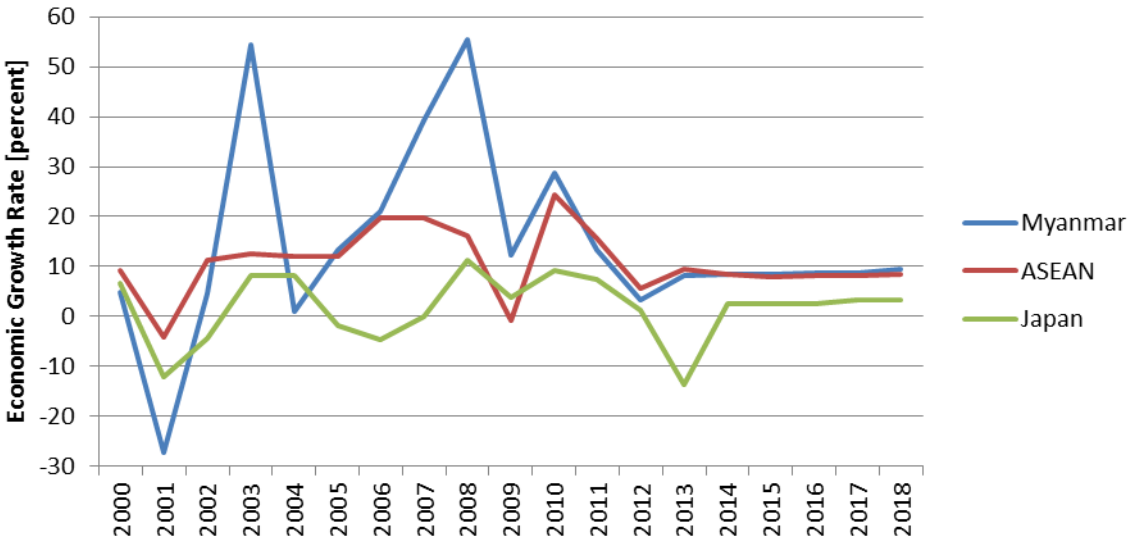
Source: International Monetary Fund, World Economic Outlook Database, April 2013

Figure 6.1.1 Gross Domestic Product in Myanmar, ASEAN countries and Japan (2000-2018), current prices (Estimation in Myanmar and ASEAN starting from 2012; in Japan starting from 2013)



Source: International Monetary Fund, World Economic Outlook Database, April 2013

Figure 6.1.2 Gross Domestic Product per capita in Myanmar, ASEAN countries and Japan (2000-2018), current prices (Estimation starting from 2007)



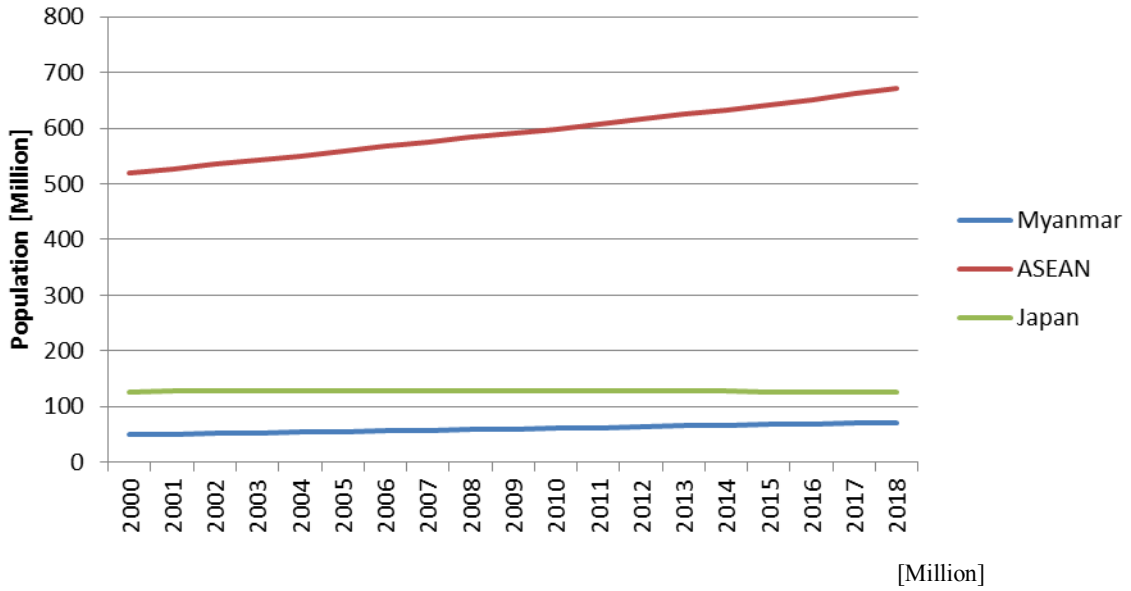
Source: International Monetary Fund, World Economic Outlook Database, April 2013

Figure 6.1.3 Economic Growth Rate in Myanmar, ASEAN countries and Japan (2000-2018), current prices (Estimation in Myanmar and ASEAN starting from 2012; in Japan starting from 2013)

Table 6.1.1 Average growth rate in Myanmar, ASEAN countries and Japan (2013-2017)

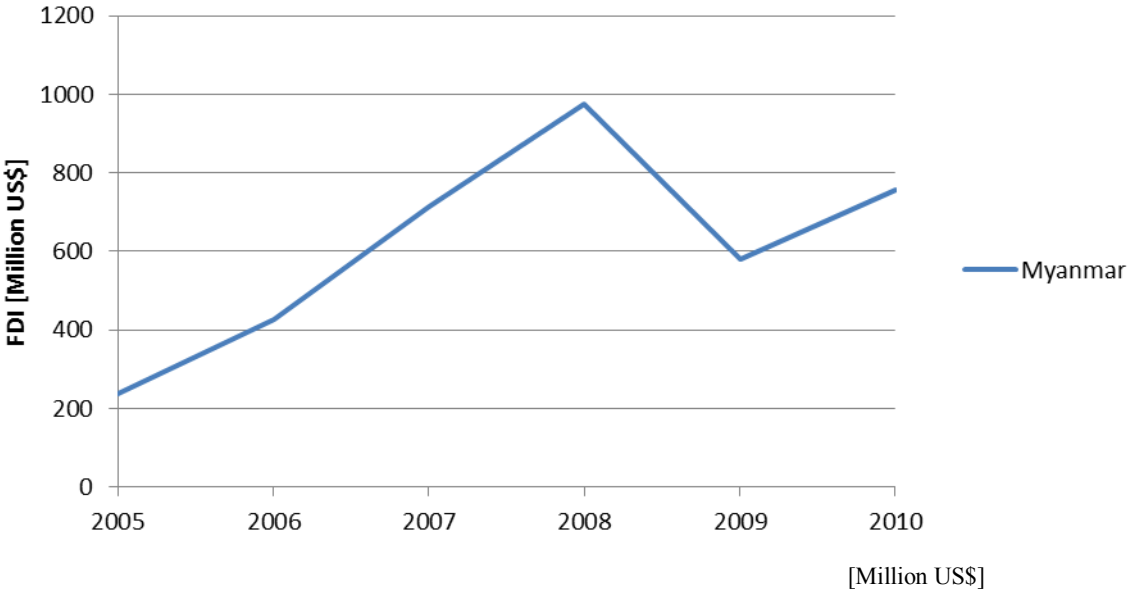
	Myanmar	ASEAN	Japan
Average growth rate (2013-2017) (%)	8.5	8.5	-0.53

Source: International Monetary Fund, World Economic Outlook Database, April 2013, calculated by MRI



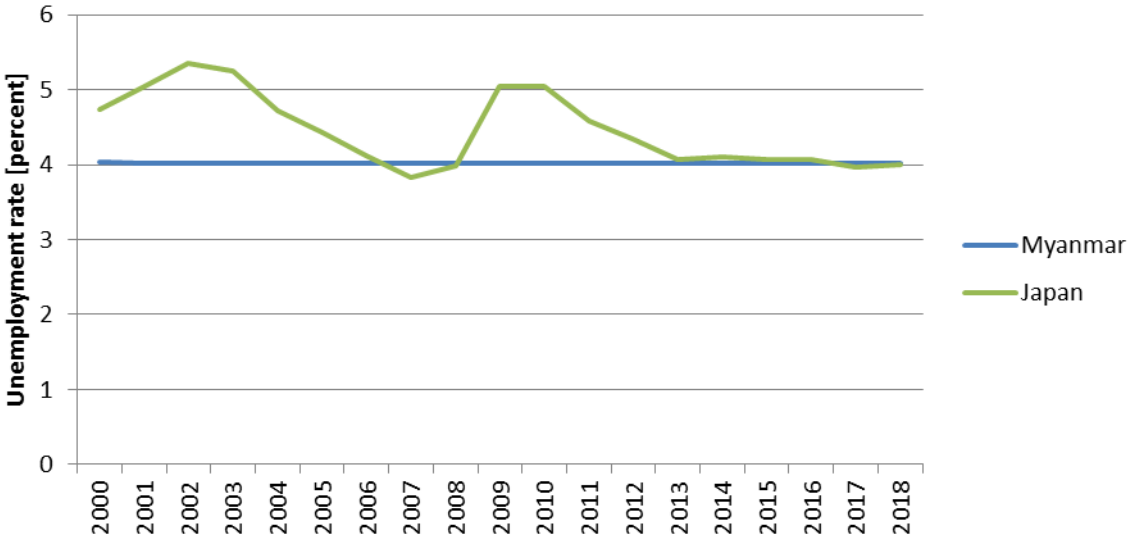
Source: International Monetary Fund, World Economic Outlook Database, April 2013

Figure 6.1.4 Population (2000-2018) (Estimation in Myanmar starting from 2007; ASEAN starting from 2007; in Japan starting from 2013)



Source: ASEAN-Japan Centre website

Figure 6.1.5 Foreign Direct Investment to Myanmar and ASEAN (2005-2010)



Source: International Monetary Fund, World Economic Outlook Database, April 2013

Figure 6.1.6 Unemployment rate in Myanmar and Japan (2000-2018)
(Estimation in Myanmar starting from 2010; in Japan starting from 2013)

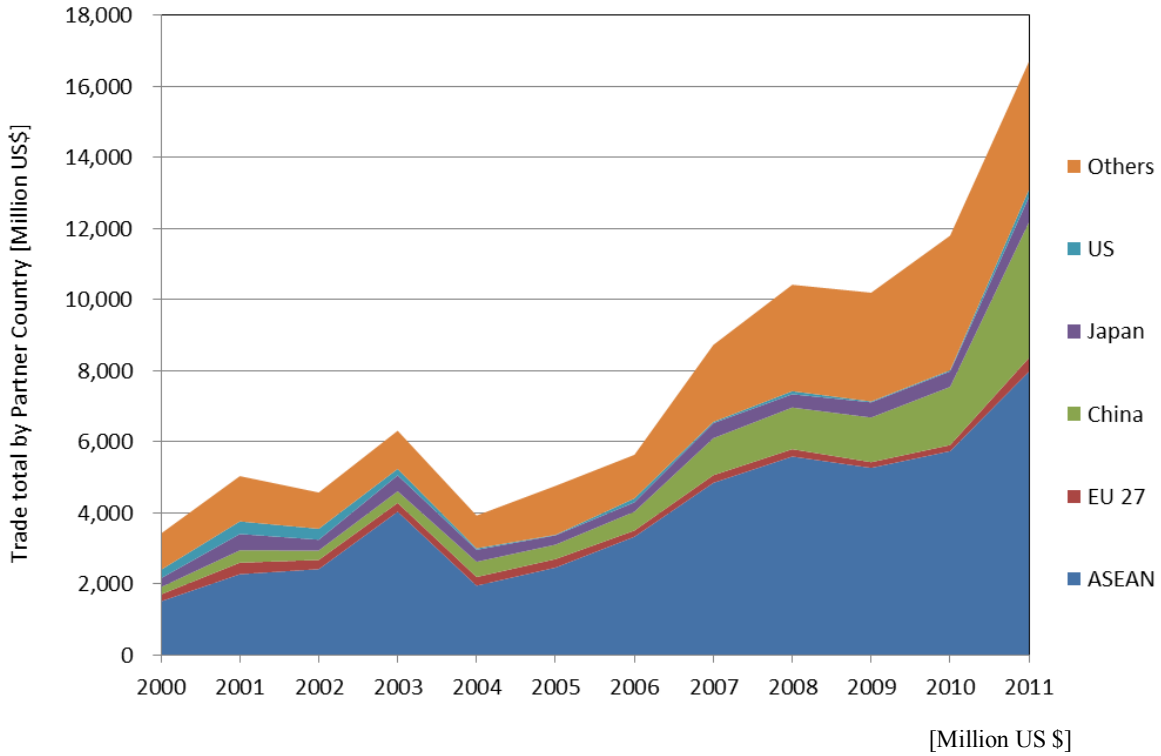
6.2 Overview of trade

(1) Amount of foreign trade/major trading partners

Trends in Myanmar's foreign trade by partner countries (2000 – 2011) are illustrated in the figure below. Myanmar's foreign trade has been growing steadily since 2000. Although foreign trade dropped largely in 2004, the country has been growing rapidly since then. The country suffered less impact from the crisis caused by the collapse of Lehman Brothers in the fall of 2008 than other countries.

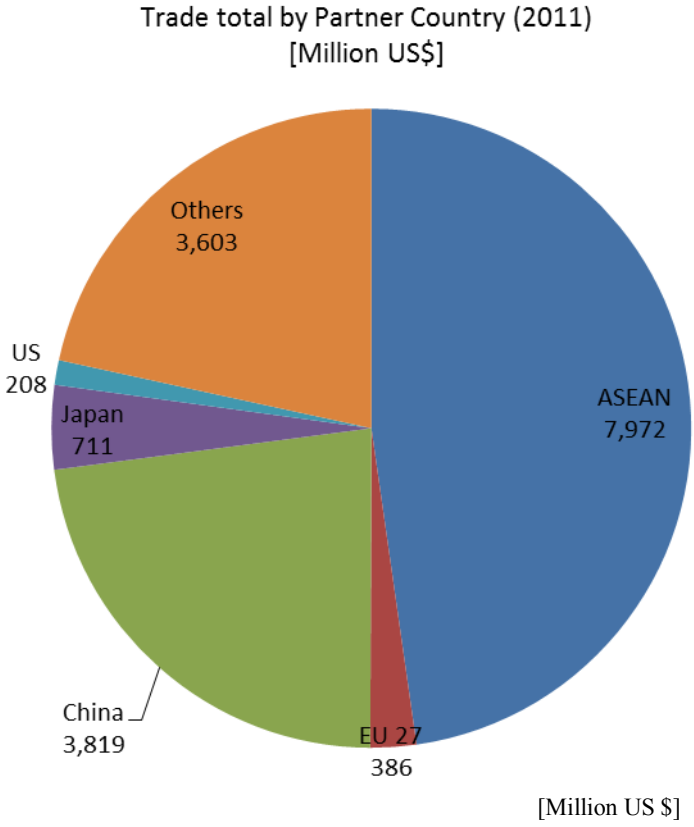
As of 2011, the largest trading partner of Myanmar is other ASEAN countries, with 48% of the total trade being associated with the countries in this region. The second largest trading partner is China, accounting for 23% of the total trade. Japan comes next, with 4%, followed by the EU and the USA with 2% and 1% shares, respectively.

Looking at trends in recent years, it is observed that while Myanmar's foreign trade is increasing with all trading partners, the growth rate of trade with ASEAN countries and with China are especially high.



Source: ASEAN Stats database (http://aseanstats.asean.org/)

Figure 6.2.1 External Trade Value by Partner - Total (2000-2011)



Source: ASEAN Stats database (http://aseanstats.asean.org/)

Figure 6.2.2 External Trade Value by Partner - Total (2011)

(2) Categories of major trading commodities

Export values of Myanmar by commodity (2011) are shown in the table below.

Examining the export values by major export commodities, it can be observed that the largest group of products exported from Myanmar is mineral fuels, which accounts for 39% of the total export value (2,919 million USD). Food comes next, accounting for 19% of the total exports (2,146 million USD).

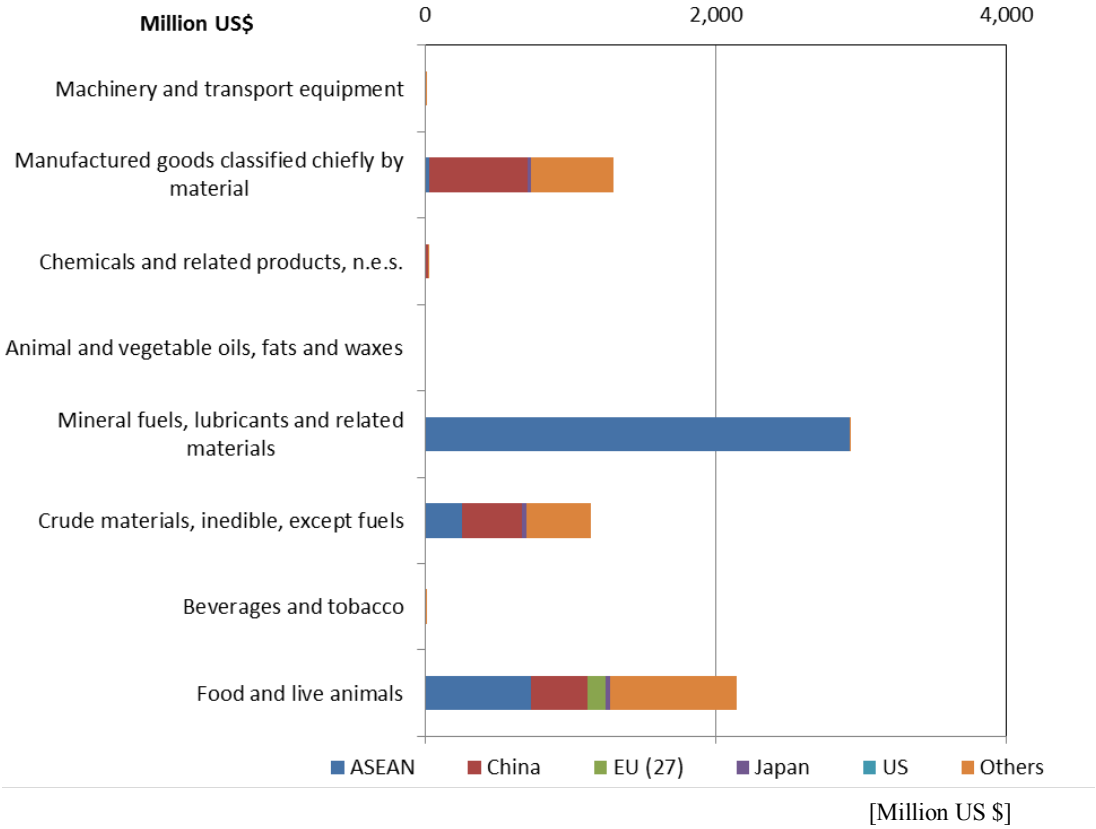
The export destination for mineral fuels is almost completely limited to ASEAN countries, and the total of the exports of mineral fuels is 2,919 million USD. Myanmar is not exporting mineral fuels to China, Japan, the EU, or the USA.

Table 6.2.1 Trade values (exports) of Myanmar by commodity and partner country (2011)

[Million US $]

Category	ASEAN	China	EU (27)	Japan	US	Others	WORLD
Food and live animals	728	387	124	33	3	871	2,147
Beverages and tobacco	2	0	0	0	0	1	2
Crude materials, inedible, except fuels	250	413	0	35	0	441	1,139
Mineral fuels, lubricants and related materials	2,919	0	0	0	0	0	2,919
Animal and vegetable oils, fats and waxes	0	1	0	0	0	0	1
Chemicals and related products, n.e.s.	5	12	0	0	0	1	18
Manufactured goods classified chiefly by material	30	678	0	18	0	569	1,296
Machinery and transport equipment	4	1	0	1	0	2	7

Source: ASEAN Stats database (http://aseanstats.asean.org/)



Source: ASEAN Stats database (http://aseanstats.asean.org/)

Figure 6.2.3 Trade values (exports) of Myanmar by commodity and partner country (2011)

Import values of Myanmar by commodity (2011) are shown in the table below.

Examining the import values by major import commodities, it can be observed that the largest group of products imported by Myanmar is machinery and transport equipment, which accounts for 32% of the total import value (2,621 million USD). Mineral fuels comes next, accounting for 26% of the total imports (2,127 million USD).

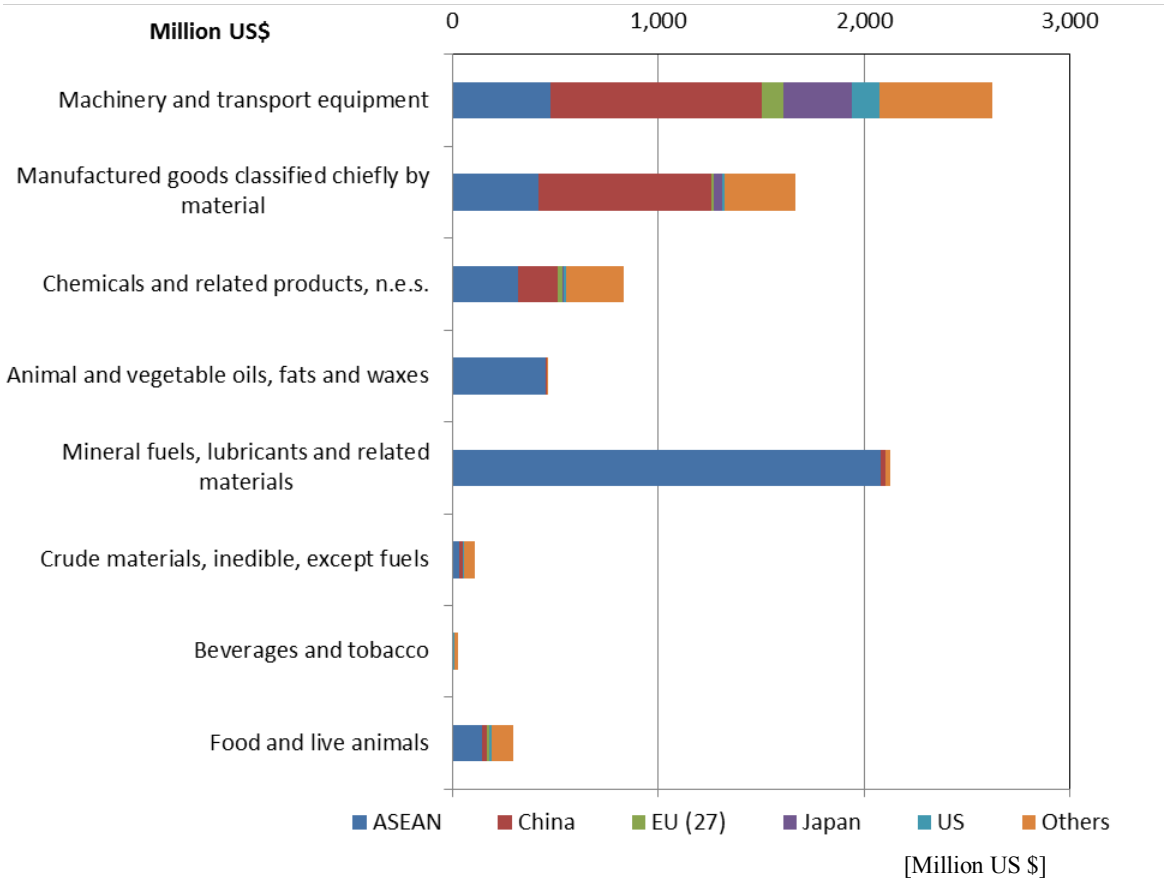
The largest exporter of machinery and transport equipment to Myanmar is China, exporting a total of 1,027 million USD. This is followed by ASEAN countries and Japan, with import values of 478 million USD and 332 million USD, respectively.

Table 6.2.2 Trade values (imports) of Myanmar by commodity and partner country (2011)

[Million US $]

Category	ASEAN	China	EU (27)	Japan	US	Others	WORLD
Food and live animals	145	22	9	0	12	106	294
Beverages and tobacco	4	0	2	1	0	19	26
Crude materials, inedible, except fuels	32	20	0	0	1	55	109
Mineral fuels, lubricants and related materials	2,079	22	2	0	0	24	2,127
Animal and vegetable oils, fats and waxes	454	2	0	0.002409	0	0	456
Chemicals and related products, n.e.s.	317	191	27	7	9	281	833
Manufactured goods classified chiefly by material	420	840	10	41	9	348	1,668
Machinery and transport equipment	478	1,027	101	332	135	548	2,621

Source: ASEAN Stats database (http://aseanstats.asean.org/)



Source: ASEAN Stats database (http://aseanstats.asean.org/)

Figure 6.2.4 Trade values (imports) of Myanmar by commodity and partner country (2011)

Chapter 7 Physical Distribution Network

The themes of this survey are divided into three categories as follows: 1) Understanding of Supply Chain Circumstances in ASEAN Countries, 2) Understanding of Circumstances on Physical Distribution Network, and 3) Organizing the framework of vulnerability analysis for natural disasters on the ASEAN Logistics Network.

7.1 Understanding of Supply Chain Circumstances in Myanmar

(1) Relation to Logistics Performance Index on International Physical Distribution

Table 7.1.1 International LPI (Logistics Performance Index) *[1] Ranking 2012

Rank	Country	LPI	Customs	Infrastructure	International Shipment	Logistics Competence	Tracing & Tracking	Timeliness
133	**Myanmar**	**2.33**	**1.94**	**1.92**	**2.37**	**2.01**	**2.36**	**3.29**

Source: World Bank Connecting to Compete 2012 Trade Logistics in the Global Economy

(2) Features of Physical Distribution in Relation to Main Industries in Industrial Parks

The lists of ASEAN-JAPAN CENTER (AJC) web-site*[2] have no specific time of investigation by year/month, but it is considered that the general current status of industry agglomeration at the time of the investigation can be obtained.

The industries in industrial parks are classified into the following 13 categories:

1) Fishery/Foodstuff, 2) Textile/Apparel, 3) Pulp/Paper, 4) Chemicals, Oil, Rubber/Ceramic, 5) Steel/Nonferrous metal, 6) Transport machines (Cars), 7) Electrical/Electronics/Precision apparatus, 8) Other industries, 9) Commerce (wholesale, retail), 10) Real estate, 11) Logistics/Warehouse, 12) Finance/Insurance/Other services, and 13) Information/Telecommunication.

The objective industrial parks are selected based on the criterion such as: 1) Degree of geographic accumulation, 2) Having sufficient operational experiences, 3) The size and number of Japanese companies, 4) Located in the pilot area in case of Vietnam, the Philippines and Indonesia.

Based on the industrial classifications above, the characteristics of distributions of the products from industrial parks are estimated.

In case of Myanmar, no industrial parks are listed in the AJC list.
Myanmar's economic relation with western countries has been almost nil until USA lifted the sanction in July 2012. Exceptionally, Dawei project started in 1993 by a joint venture with Singapore Company supported by the Thai government.

After the lift of sanction, development plans and project are on the rush as represented by Thilawa SEZ projects.

For the Thilawa project, MOU on SEZ development was signed between the both Governments of Japan and Myanmar in December 2012 and the consortium of public/private sectors from both countries was

established for the implementation in October 2013.

(3) Supply Chain Circumstances

Physical distribution is evolving by the stages of Physical Distribution Development Phasing (PDDP) as follows:

1) Physical distribution control: Company's own sphere of materials/ products distribution (PDC).
2) Logistics management: Company's own distribution management by the market-in strategy (LGM).
3) Supply chain management: Integrated distribution management from company's own to systemized one by the collaboration with other logistics operator resources (SCM)

Other criteria can be considered applicable, so that the development phase may be justified, based on industrial categories and their products' varieties and volumes in the selected industrial parks/ SEZ.

1) Kinds and diversity of products (intermediate or final products).
2) Whether production of high valued goods like cars, electrical/ electronic/ precision devices or not, and the levels.
3) Correspondence of export/import major items of goods to, classification of intermediate/ final products
4) Existence of a regional head office of a company which power is vested from the headquarter, and the power strength in management term.
5) Existence of logistics operator as a 3PL and maturity of the business
6) Inter dependency of industrial parks/ SEZ with megalopolises in the vicinity.

The result of assessment is shown in the table below which is made by LPI of the World Bank and by supply chain circumstances determined by above mentioned industries in the industrial park as well as major export/import items in the light of the above three stages of PDDP. The evaluation is shown by relative evaluation of five levels among ASEAN countries. Since there are no distinction time and contents wise in PDDP, the level of development is indicated as a continuous line in the table below.

Table 7.1.2 Physical Distribution Development Phasing

LPI	Country	PDDP								
					Criteria					
		PDC	LGM	SCM	Products diversified	High valued goods	Export/ Import	Regional head office	Logistics operator	Products diversified
2.33	**Myanmar**				**2**	**2**	**2**	**1**	**2**	**1**

Source: JICA Study Team

7.2 Current Status and Trends of Indonesia Logistics Network

(1) Domestic Physical Distribution Network

Current logistics of Myanmar is characterized as the high share of railway transportation which is handling about 35% and waterway transportation about 43% of the domestic cargo volume（JETRO ASEAN Logistics Network 2008 Appendices ）.

Geographically speaking, the greatest strength is that it is open to the Indian Ocean as a gateway from east-west and south-north economic corridors in GMS. This strength will be exerted in that it can be accessed by sea transport without having to bypass the Malay Peninsula to the emerging markets outside of ASEAN such as India, Middle East and African and so on, as well as European countries.

Once the large scale industrial park such as Thilawa and Dawei and modern deep-sea port facilities and access road are developed, it will greatly contributes to the economic development of Myanmar.

(2) Intra-ASEAN Physical Distribution Network

According to ASEAN Strategic Transport Plan 2011-2015, intra-ASEAN trade of Myanmar is reported to be about 50% of the total trade amount.

Of that share, main intra-ASEAN trade partner is as in the order of Singapore of 40%, Thailand of 40%, Indonesia of 10%, and Malaysia of 8%.

Considerably large portion of cargo traffics to and from Yangon/Thilawa Port is considered to be transshipped at Port of Singapore.

(3) Extra-ASEAN Physical Distribution Network

Regarding extra-ASEAN logistics of Myanmar, large quantity of cargo is transported by truck on roads with China; sea-borne cargo with other extra-ASEAN countries is to be transshipped at Port of Singapore, as said above.

7.3 Analysis Frame on Physical Distribution Network

This section studies frame for assessment of the vulnerability of logistics network against natural disasters in consideration of the actual situation of supply chain, as a preparedness of formulation of area BCP.

The vulnerability itself is to be assessed after the further survey.

Table 7.3.1 Natural Disaster Prevention Related Matters in relation to vulnerability of Physical Distribution Facilities

Industrial Park Name represented	Not designated yet
Features	Place: Operation commenced in: Nos of Operating Enterprises : Total IPK Annual Turn-over (Mill.US$):
Vulnerability Assessment Frame for Each Industrial Park (IPK)	
Natural Disaster Risk(NDR): Extract from Survey Report 1 "Chapter 5 Existing Investigations and Studies"	
■ Flooding	Flood hazard possibility is low in general. The higher possibility area is Ayeyarwady River basin in which Myitkyina city is situated.
■ Seismic intensity/ Tsunami	Myanmar is one of the countries with highest earthquake hazard level in ASEAN countries. A number of earthquake disasters are 3rd after Indonesia and Philippines. The earthquake hazard level of the northern region facing India and China is high. After the 18th century, 4 tsunami disasters are recorded in the database.
■ Volcano	Volcano hazard level of Myanmar is low. No volcanic disaster is recorded in the database.
■ Cyclone, Meteorological Disaster, Landslide	The impact of cyclone hazard in south western area in the country is a little high. According to 1980-2012 records, six storm disasters have occurred in the country. Cyclone Nargis, back in 2008, brought about unprecedented damage killing 138,371 people, affecting over 2.4 million people and dealing a total amount of damage estimated to be worth around 4 billion dollars. For landslides, high hazard possible area distributes in the border with India and some hazard distributes in the Andaman Sea coastal area.
Brief Descriptions on Counter-measures (CMS) for NDR	
1) Private sector facilities: To follow further Survey	
Land, In-park Roads:	
Plant facilities:	
Physical Distribution Facilities:	
Others, if any:	
2) Infrastructures	
Road： Myanmar has special geopolitical position bordering with Thailand which is an economic hub of south Asian countries , China, and India. In addition, Myanmar locates on the west side of Malay Peninsula, and has easy access to the market in India and Middle East. The distance between Dawei and Bangkok is 250km and Yangon and Bangkok is 900km. With the trailer it only takes 1 to 3days. Yangon to Singapore is 4,200km which takes 9 to 10days by road, and the difference is obvious compared to 20 to 30days by sea. In terms of international logistics efficiency and alternatives, improvement of underdeveloped road network is urgent issues.	
Railway ：The ratio of railway use in the logistics is higher than other ASEAN countries. China is promoting railway plan from Kunmin, to Singapore, Phnom Penh and Yangon. By complementing with road logistics, the realization of this plan brings great economic significance to the region.	
Port: Because there is no large scale port in Myanmar, products shipped from Yangon have to transship in Singapore. Under this circumstance, realization of Dawei development including large port construction plan is awaited for increasing transportation efficiency and alternative port for the GMS countries.	
Airport: Capacity expansion plan of airports are in the implementation phase: including Hantawadi International Airport in Yangon North Suburbs, Yangon international airport expansion and renovation of Mandalay International Airport renovation, etc.	
Electric power/Fuel: Power failure is constant due to insufficient power supply capacity. Therefore there are number of factories and commercial/service facilities having in-house power generation. Considering economic development and restoration measures in the event of a disaster, investment in power requires prompt action.	
Water-supply:	
Sewage:	
Solid waste:	
Telecommunication: It was determined between Myanmar and Japan Governments in May 2013 that advanced telecommunication infrastructure will be developed to connect among three main cities, Yangon, Naypydaw, and Mandalay as a matter of urgency. And mobile telecom companies from Norway and Qatar have subsequently got the operating permits in June.	

Note:

*1 The summary of "Logistics Performance Index" by the World Bank is as follows.

(1) LPI score and category wise score is indicated by each country

(2) Score is ranked from one to five

(3) LPI of international logistics is scored based on the interviewing following six items to major importers and logistics companies in the neighboring countries (total of over 1000 companies).

1) Efficiency of the clearance process i.e. Speed, simplicity and predictability of formalities by border control agencies, including Customs
2) Quality of trade and transport related infrastructure e.g. Ports, railroads, roads, information technology
3) Ease of arranging competitively priced shipments
4) Competence and quality of logistics services e.g. transport operators, customs brokers
5) Ability to track and trace consignments)
6) Timeliness of shipments in reaching destination within the scheduled or expected delivery time.

*2 http://www.asean.or.jp/ja/invest/about/country_info/brunei/invest_info/industrialestate/

*3 http://www.mofa.go.jp/mofaj/area/brunei/data.html#04

References :

1) ASEAN-JAPAN CENTER, Lists of Industrial Parks/Estate/SEZ by Member Country (in Japanese)
2) World Bank Connecting to Compete 2012 Trade Logistics in the Global Economy
3) Shinya Nakata (2012), Introduction to Logistics, NIKKEI Newspapers in Japan (in Japanese)
4) JETRO (2008), ASEAN Physical Distribution Network 2008 (in Japanese)
5) ERIA: ASEAN Strategic Transport Plan 2011-2015.
6) ASEAN Secretariat, ASEAN Statistics on Intra and Extra_ ASEAN trade 2011

Chapter 8 Legislative Systems

A survey on the legislative systems concerned with disaster management, business continuity, environmental pollutions and development in Myanmar is conducted in this chapter.

The survey of Myanmar is mostly based on research through the websites of several leading international institutes that contributed to disaster research such as the Asia Disaster Reduction Center. Some information about Myanmar's legislative systems comes from UN-related web pages. Laws, regulations, national implementation plans, and statutes are referred to within the scope of the survey.

The table below shows the methodology for collecting information.

Information Collected	Methodology	Scope of Survey
Legislative Systems for Disaster Management	To collect information from the internet, which is published by international agencies such as ADRC and disaster management institutes in Myanmar. And to refer to the report by the JICA research team.	Laws for disaster management and rehabilitation. National action plans and strategy for disaster risk reduction.
Regulations and Standards for BCM / BCP	To collect information from the internet. No official institutes regulating the BCM/BCP exist in Myanmar.	Standards or regulations related to BCM. No standards or policies are found in Myanmar.
Legislative Systems for Environment and Pollution	To collect information from the internet. Few websites of governmental agencies in Myanmar are found.	Laws and regulations for environmental management. Regulations for industrial activities on pollution control and water quality.
Legislative Systems for Development including Land Use, River and Building Regulations	To collect information from the internet. Few websites of governmental agencies in Myanmar are found.	Laws for nature conservation. No official building standards exist in Myanmar.

The laws, regulations, decrees, and guidelines regulating the target fields defined above are compiled in this survey. The results of the survey in Myanmar are summarized below.

Scope	Information
Legislative Systems for Disaster Management in Myanmar	[Strategies and Plans] "Disaster Management Bill", "Rehabilitation Board Act, 1950". [Regulations, Standard and Guidelines] "Standing Order, 2009", "Myanmar Action Plan on Disaster Risk Reduction 2009-2015", "Regional / State Flood Protection Plans".
Regulations and Standards for BCM / BCP in Myanmar	No regulations, standards or guidelines for business continuity management in time of disaster have been identified in Myanmar.
Legislative Systems for Environment and Pollution in Myanmar	[Laws for Environment] "National Environmental Conservation Law, 2012". [Laws and Regulations for Environmental Pollution Control] "Factory Act, 1951", "Conservation of Water Resources and Rivers Law, No.8/2006".
Legislative Systems for Development including Land use, River and Building Regulations in Myanmar	"Board of Development Affairs Act, 1993", "Forest Law, No.8/92", "Protection of Wildlife and Conservation of Natural Areas Law, No.6/94"

The available results on the survey about the laws and regulations for disaster management, BCP/BCM, environmental conservation and provisions for development in Myanmar are summarized below.

According to a survey on legislative systems in Myanmar, no regulations, standards, or guidelines defining Business Continuity Management have been determinably established.

8.1 Legislative systems for disaster management

(1) Disaster management laws

Table 8.1.1 Laws and Regulations of Disaster Management in Myanmar

	Laws / Regulations	Supervisory Authority	Subject
Law	Disaster Management Bill (to be enacted)	Myanmar Disaster Preparedness Agency (MDPA)	Disaster Management
Law	Rehabilitation Board Act, 1950	under survey	Disaster Rehabilitation

The Disaster Management Bill has been drafted and submitted to the Union Attorney-General for scrutiny. It is expected to be approved by June 2012. The Disaster Management Bill is expected to define the role and structure of the organizations and agencies engaged in disaster management clearly.

(2) Disaster management strategies and plans

Table 8.1.2 Strategies and Plan for Disaster Management in Myanmar

	Laws / Regulations	Supervisory Authority	Subject
Government Order	Standing Order, 2009	under survey	Disaster Management
Plan	Myanmar Action Plan on Disaster Risk Reduction (MAPDRR) 2009-2015	MDPA	Disaster Management
Plan	Regional / State Flood Protection Plans	under survey	Flood

The Myanmar Action Plan on Disaster Risk Reduction (MAPDRR) 2009-2015 has been prepared, but it requires endorsement from the national government to be a formal document.

Local governments or authorities do not have the official framework for integrated disaster management plans and implementation plans. Except for the Regional/State Flood Protection Plans, no disaster management plans have been established at the local level.

8.2 Regulations and standards for business continuity management

No regulations, standards or guidelines for business continuity management in time of disaster have been identified in Myanmar.

8.3 Legislative systems for the environment and pollution control

(1) Environmental laws and regulations

Table 8.3.1 Laws and Regulations regarding the Environment in Myanmar

	Laws / Regulations	Supervisory Authority	Subject
Law	National Environmental Conservation Law, 2012	General Environmental Conservation Department	Environment Management

Sufficient information about regulations of environment has not been published in Myanmar.

Laws and regulations related to environmental conservation in Myanmar are established based on the National Environmental Conservation Law, 2012.

(2) Pollution control laws and regulations

Table 8.3.2 Laws and Regulations for Environmental Pollution Control in Myanmar

	Laws / Regulations	Supervisory Authority	Related Law
Law	Factory Act, 1951	Factories and General Labour Laws Inspection Department	Industry
Law	Conservation of Water Resources and Rivers Law, No.8/2006	Ministry of Transport	Water Resources, River

Sufficient information about regulations of environmental pollution control has not been published in Myanmar.

As a law for environmental pollution control related to industrial activities, the Factory Act, 1951 was enacted. Furthermore, regulations for the conservation of water resources and rivers are regulated in the Conservation of Water Resources and Rivers Law, No.8/2006.

8.4 Legislative systems for development such as land use, rivers, and building codes

Table 8.4.1 Laws and Regulations for Land, River and Building Code in Myanmar

	Laws / Regulations	Supervisory Authority	Related Law
Law	Board of Development Affairs Act, 1993	under survey	Development
Law	Forest Law, No.8/92	Forest Department	Forestry
Law	Protection of Wildlife and Conservation of Natural Areas Law, No.6/94	Forest Department	Nature Conservation

Several laws for town development and forest use have been enacted in Myanmar.

However, although the policies for conservation of forests and natural areas are issued in the Forest Law and Protection of Wildlife and Conservation of Natural Areas Law, there are few direct provisions about the regulation of industrial activities.

In our research, specific building codes enacted in Myanmar could not be verified.

Chapter 9 Implementation of BCP

9.1 Major natural disasters and disaster management awareness

Flood disasters caused by cyclones or heavy rain, as well as earthquakes and tsunamis along the coastal area are probable natural hazards that may cause damage to the economy and business conditions in Myanmar. In 2008, major damage was incurred due to the large-scale flood disaster caused by a cyclone in southwestern region. Although landslide disasters often occur in mountainous areas, they are not extensive enough to inflict critical damage on the economy.

Yangon and Nay Pyi Taw have a less experience with natural disasters, and most enterprises and governmental agencies do not consider the prevention of disaster risks necessary. Enterprises in Myanmar generally consider business risks to be political and social unrest and economic uncertainty in neighboring countries.

9.2 Current state of BCP implementation

Because most companies in Myanmar are small to medium sized enterprises, it is more difficult for them to prepare for disaster management than a BCP. In a major city like Yangon, government agencies and enterprises tend to consider the risk of natural disasters in Myanmar to be quite low and that preparation of a plan is not highly necessary.

The concept of BCP is not known among people in the government or enterprises. There are no enterprises that have already prepared their own BCP.

Most Japanese companies in Myanmar have not attempted to prepare for disaster risk management. Only major companies have group policies for disaster mitigation.

9.3 Efforts on furthering BCP implementation

Governmental agencies or departments in charge of natural disaster have not yet been sufficiently improved. The establishment of an administrative system and development of a legislative system for national disaster management are necessary for the Myanmar government. Moreover, urban development in Yangon and other towns has continued in recent years, bringing environmental change that could have an impact on disaster risk. The establishment of regulations for environmental conservation has also become urgent, and the preparation of a comprehensive policy for disaster risk management is needed.

Governmentally and non-governmentally, disaster risk management systems are less developed in Myanmar. Such a management system is not regarded as an important issue at the present stage.

9.4 BCP implementation problems

National policy for disaster management by the government has not yet been significantly defined, and governmental agencies have not reached the stage of developing BCP implementation.

In Myanmar, since most enterprises are still small to medium sized, they cannot afford to invest in disaster risk management and need to further their businesses in terms of economic development and growth. Because understanding of BCP has not grown in the current situation, it is still very difficult to promote wide dissemination of BCP.

List of Agglomerated Areas

ID	Short List	LongList	COUNTRY	PROVINCE	PARK NAME	ADDRESS
MM0001			Myanmar	Ayeyarwady Division	Hinthada Industrial Zone	Manawhari Rd Hinthada 94, Burma
MM0002			Myanmar	Ayeyarwady Division	Pathein Industrial Zone	Cartman Rd Bassein, Burma
MM0003			Myanmar	Ayeyarwady Division	Myaungmya Industrial Zone	Office Rd Myaungmya, Burma
MM0004			Myanmar	Bago Division	Pyay Industrial Zone	N Saung Tan St Pye, Burma
MM0005			Myanmar	Kayin State	Hpa-An Industrial Zone	Main Rd Pa-an, Burma
MM0006			Myanmar	Kayin State	Thin Gan Nyi Naung Industrial Zone (Myawaddy)	Thin Gan Nyi Naung, Burma
MM0007			Myanmar	Kayin State	Payathonzu Industrial Zone (planned)	No Address
MM0008			Myanmar	Magwe Division	Ye Nan Chaung Industrial Zone	Seikphyu-Salin-Pwintbyu-Minbu Burma
MM0009		**XXMM05**	Myanmar	Mandalay Division	Mandalay Industrial Zone 1	31st St Mandalay, Burma
MM0010		**XXMM05**	Myanmar	Mandalay Division	Mandalay Industrial Zone 2	31st St Mandalay, Burma
MM0011			Myanmar	Mandalay Division	Yadanabon Industrial Zone (planned)	Planned
MM0012			Myanmar	Mandalay Division	Tatkon Industrial Zone (planned)	Yangon - Mandalay Rd Burma
MM0013			Myanmar	Mandalay Division	Meiktila Industrial Zone	Meiktila Industrial Zone Tha Phay Wa, Burma
MM0014			Myanmar	Mandalay Division	Myingyan Industrial Zone (planned)	2 Myingyan, Burma
MM0015			Myanmar	Mon State	Mawlamyine Industrial Zone (Myanmar-Thai Industrial Zone)	Taung Yoe Dan St Moulmein, Burma
MM0016			Myanmar	Rakhine State	Ponnagyun Industrial Zone (planned)	Aung Min Ga La Rd Ponnagyun, Burma
MM0017			Myanmar	Sagaing Division	Kalay Industrial Zone	7 Sagang, Burma
MM0018			Myanmar	Sagaing Division	Monywa Industrial Zone	7 Sagang, Burma
MM0019			Myanmar	Shan State	Aye Tha Ya Industrial Zone (Taunggyi)	442 Burma
MM0020			Myanmar	Shan State	Namoum Industrial Zone (planned)	442 Burma
MM0021			Myanmar	Tanintharyi Division	Myeik Industrial Zone	Kan Phyar Rd Myeik, Burma
MM0022			Myanmar	Yangon Division	Shwe Pyi Thar Industrial Zone (Insein) (Zone 1)	Shwedagon Pagoda Yangon, Myanmar
MM0023		**XXMM06**	Myanmar	Yangon Division	Shwe Pyi Thar Industrial Zone (Insein) (Zone 2-3)	Near Lower Mingaladon Rd. Yangon
MM0024		**XXMM06**	Myanmar	Yangon Division	Shwe Pyi Thar Industrial Zone (Insein) (Zone 4)	Near Lower Mingaladon Rd. Yangon
MM0025	**XXMM04**	**XXMM04**	Myanmar	Yangon Division	Mingaladon Industrial Zone	1Yangon, Burma
MM0026			Myanmar	Yangon Division	Pyinmabin Industrial Zone (Mingaladon)	Shwedagon Pagoda Yangon, Myanmar
MM0027		**XXMM03**	Myanmar	Yangon Division	Hlaing Thar Yar Industrial Zone (Zone 1)	near P Moe Nin Rd, Yangon
MM0028			Myanmar	Yangon Division	Hlaing Thar Yar Industrial Zone (Anawrahta) (Zone 2-3)	near P Moe Nin Rd, Yangon

ID	Short List	LongList	COUNTRY	PROVINCE	PARK NAME	ADDRESS
MM0029			Myanmar	Yangon Division	Hlaing Thar Yar Industrial Zone (Zone 4-5)	near P Moe Nin Rd, Yangon
MM0030			Myanmar	Yangon Division	Hlaing Thar Yar Industrial Zone (Zone 6)	near P Moe Nin Rd, Yangon
MM0031			Myanmar	Yangon Division	Hlaing Thar Yar Industrial Zone (Zone 7)	near P Moe Nin Rd, Yangon
MM0032		**XXMM07**	Myanmar	Yangon Division	Shwe Than Lwin Industrial Zone	near Pathein Rd, Yangon
MM0033			Myanmar	Yangon Division	Thardukan Industrial Zone	Shwedagon Pagoda Yangon, Myanmar
MM0034			Myanmar	Yangon Division	Wathaya Industrial Zone	Shwedagon Pagoda Yangon, Myanmar
MM0035			Myanmar	Yangon Division	Shwelinban Industrial Zone	Shwedagon Pagoda Yangon, Myanmar
MM0036			Myanmar	Yangon Division	Shwe Paukkan Industrial Zone	Shwedagon Pagoda Yangon, Myanmar
MM0037			Myanmar	Yangon Division	East Dagon Industrial Zone	Chin Dwin Rd Yangon, Burma
MM0038			Myanmar	Yangon Division	East Dagon Industrial Zone Extension	Shwedagon Pagoda Yangon, Myanmar
MM0039			Myanmar	Yangon Division	North Dagon Industrial Zone	Chin Dwin Rd Yangon, Burma
MM0040			Myanmar	Yangon Division	South Dagon Industrial Zone	Chin Dwin Rd Yangon, Burma
MM0041			Myanmar	Yangon Division	South Dagon Industrial Zone 2	Shwedagon Pagoda Yangon, Myanmar
MM0042		**XXMM02**	Myanmar	Yangon Division	Dagon Seikkan Industrial Zone	near Kanaung Minthagyi St. Yangon
MM0043			Myanmar	Yangon Division	North Okkalapa Industrial Zone	Chin Dwin Rd Yangon, Burma
MM0044			Myanmar	Yangon Division	South Okkalapa Industrial Zone	Chin Dwin Rd Yangon, Burma
MM0045			Myanmar	Yangon Division	Mya Sein Yaung Industrial Zone	Shwedagon Pagoda Yangon, Myanmar
MM0046			Myanmar	Yangon Division	Myaungdaga Industrial Zone	Shwedagon Pagoda Yangon, Myanmar
MM0047			Myanmar	Yangon Division	Thanlyin-Kyauktan Industrial Zone	Bogyoke Rd Syriam, Burma
MM0048		**XXMM08**	Myanmar	Yangon Division	Thaketa Industrial Zone	near Shukhinthar Rd Yangon
MM0049		**XXMM01**	Myanmar	Bago Division	Bago Industrial Zone (Intagaw)	Bago Industrial Zone (Intagaw) No. 1 Bago-Mandalay Highway, Industrial Zone, Bago
MM0050		**XXMM09**	Myanmar	Yangon Division	Thilawa Special Economic Zone	Thanlyin, Yangon (Adjcent to Thilawa Port)
MM0051		**XXMM10**	Myanmar	Yangon Division	Yadanabon Industrial Park	1, Khayay Ave., No. (3) Main Rd., Mingalardon Tsp. Yangon

PHILIPPINES

Table of Contents

Chapter 1 Introduction

The report is a draft version of the Country Report for the Philippines, which will be a reference document for organizations of the private and public sectors wishing to prepare an Area Business Continuity Plan (Area BCP) and develop an Area Business Continuity Management System (Area BCM System).

The country report contains information on natural disaster risks, industrial parks and investment risk, key infrastructure and lifeline systems, as well as issues to consider during natural disasters. It also presents an outline of economy and trade, an outline of physical distribution, and current practices for implementing business continuity management (BCM) in the country.

The draft report will be refined and finalized at the end of the Project.

Chapter 2 Overview of the Country

The Philippines is an archipelago comprising 7,107 islands; the region is prone to volcanic activity and earthquakes. The country is surrounded by water, with neighboring countries being Taiwan across the Luzon Strait, Malaysia to its southwest across the Sulu Sea, Indonesia to its south across the Celebes Sea, and Vietnam to its west across the South China Sea. The Philippines is characterized by its warm climate, and typhoons cross the country frequently.

The Philippines is one of the founding members of ASEAN (founded on August 8, 1967). The Philippines is the only Christian country in ASEAN.

The Philippines is a constitutional republic, and Benigno Aquino III is the current president. Emphasis is being placed on the eradication of bribery and corruption, as well as restoration of law and order. As in other ASEAN countries, the country is engaged in active economic diplomacy in order to acquire foreign currency and employment opportunities.

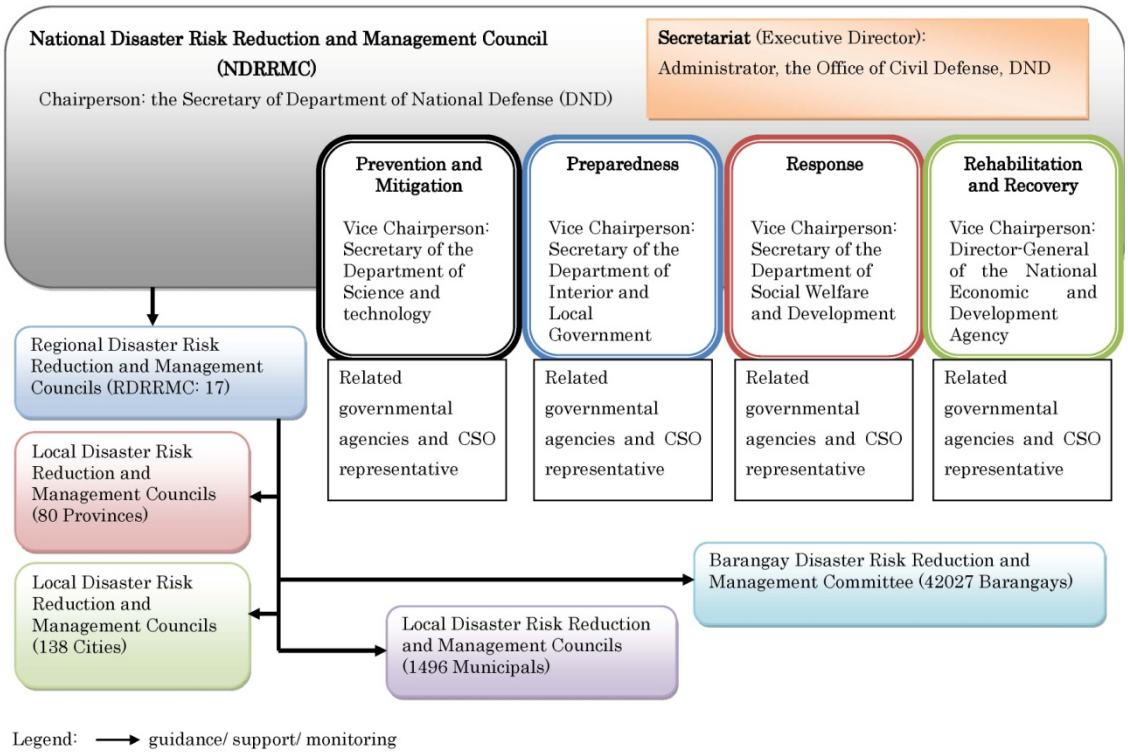
Basic Information of the Philippines

National Flag

Capital	Manila
Ethnic Groups	Malay (other ethnic groups include Chinese, Spanish, mixed origin between these ethnic groups, and ethnic minorities)
Languages	National language is Filipino, and the official languages are Filipino and English
Religions	Christianity (83% of the nation's entire population is Catholic, and 10% of the population belongs to other Christian denominations), Islam (5%)
Area (km^2)	Total: 300,000 Land: 298,170 Inland Water: 1,830
Population	96,706,764
Population density(people/ km^2 of land area)	324
Population growth (annual %)	1.7
Urban population (% of total)	49
GDP (current US$) (billion)	250
Economic growth rate (annual %)	6.8
GNI per capita, PPP (current international $)	4,380
Agriculture, value added (% of GDP)	12
Industry, value added (% of GDP)	31
Services, etc., value added (% of GDP)	57

Features of Disasters

Storm is the most frequent disaster occurring (55% of the total number of disasters) in Philippines causing 80% of total affected people, 76% of total death, and 76% of estimated cost (damage) followed by flood and earthquake. Mass movement caused a similar number of deaths as to the earthquake and flood though mass movement does not show a significant estimated cost (economic loss). This may be because mass movement occurred mainly in rural mountainous areas in the Philippines.



Source: JICA Study Team.

Note: Local level disaster risk reduction and management councils are supposed to be established as follows: (1) 17 RDRRMCs (Region) (2) LDRRMCs (80 provinces, 138 cities, 1496 municipalities, (3) BDRRMCs (42027 *Barangays*[1]. RDRRMCs are chaired by the OCD Regional Directors, while other respective level is chaired by the Local Chief Executives.

Sources; Map and Flag: CIA(Central Intelligence Agency) website (2014) (https://www.cia.gov)

Capital, Ethnic Groups, Languages and Religions: Ministry of Foreign Affairs website (2013) (http://www.mofa.go.jp)

Area, Population, Population density, Population growth, Urban population, GDP, Economic growth rate, GNI per capita, PPP, Agriculture, value added, Industry, value added and Services, etc., value added: The World Bank Data Bank website (2012) (http://data.worldbank.org)

Chapter 3 Natural Disaster Risk

3.1 Floods

(1) Risk

Summary of flood disaster

In the Philippines, floods are triggered by very strong rainfall caused by monsoons in the rainy season from June to November. In the typhoon season from September to October, big floods occur on the islands of Luzon, Cebu, and Mindanao, which are all located on the route of typhoons. Recently, even in November and December, floods have been caused by storm rainfall. The urban areas suffer from inundation because of the insufficient of installation and maintenance of the drainage system.

Notable floods and disasters in recent years

Recent notable floods causing damage in Luzon and other areas occurred on July 1, 2001, September 26, 2006 and September 26, 2009, which were caused by typhoons, and on August 6, 2012, caused by storm rainfall.

1. The flood of July 4, 2001 triggered by a typhoon caused about 170 fatalities and affected about 800,000 persons in Metro Manila and surroundings, according to the EM-DAT (The International Disaster Database).
2. The flood of September 27, 2006 triggered by a typhoon caused about 260 fatalities affected 250,000 persons.
3. The flood of September 25/26, 2009 triggered by storm rainfall brought by a typhoon caused about 460 fatalities and affected 4.7 million persons in Metro Manila and Rizar Province.
4. The flood of August 6, 2012 triggered by two weeks of storm rainfalls caused about 120 fatalities and affected 4.4 million persons in Metro Manila and its surroundings.

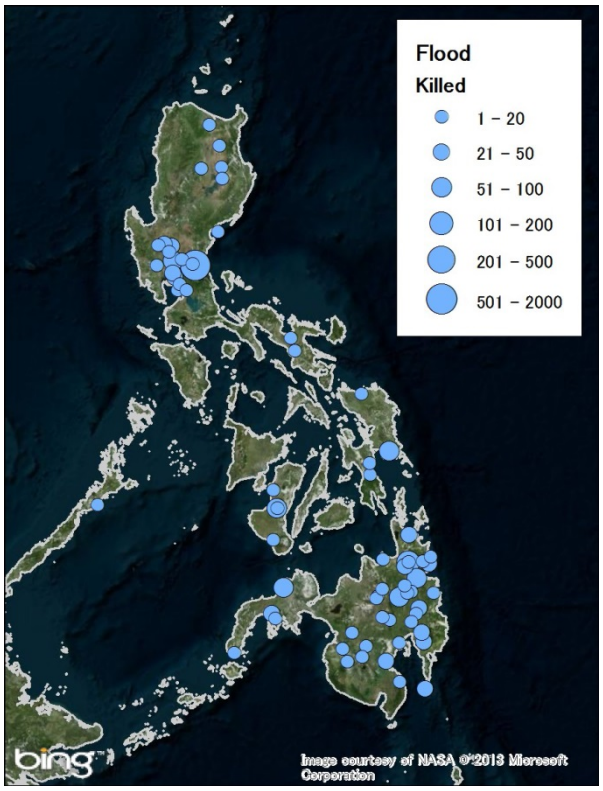


Figure 3.1.1 Flood Disaster: Human Losses

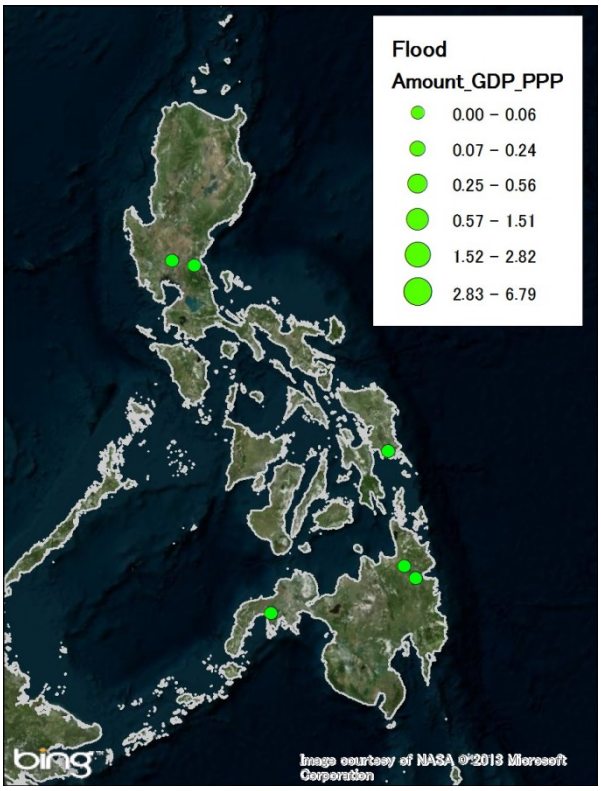


Figure 3.1.2 Flood Disaster: Economic Losses (% of GDP)

(2) Background

Characteristics of floods

Floods are frequently triggered by storm rainfalls brought by typhoons in the rainy season. Increases in water levels are comparatively rapid and drawdown takes a few days. The duration of the flooding is about a week at most.

Notable examples of flood events

- The flood of July 4, 2001 was caused by storm rainfalls brought by Typhoon No.16 (Utor), which landed in the northern part of Luzon from July 1 to 5 caused damage in metro Manila and its surroundings.
- The flood of September 27, 2006 caused by storm rainfall brought by a typhoon caused damage in metro Manila and its suburbs.
- From September to October, three (3) typhoons (No. 16, 17, and 18) passed over and caused serious damage due to floods and landslides in the central to northern part of Luzon. Especially the storm rainfall of the typhoon No.16 (ASEAN name: Ketsana, Philippines: Ondoy) caused severe damage to Metro Manila and Rizar Province and surroundings.
- Storm rainfall of August 5 to 6, 2012 cause water to overflow at several dams in Metro Manila and surroundings, causing flood damage and also inducing landslides.

Frequently flooded areas

- Luzon island: Metro Manila, Calabarzon (Calamba, Laguna; Rehiyon IV-A), Cagayan Valley (Tuguegarao; Rehiyon II)
- Mindanao island: Caraga (Butuan; Rehiyon VIII)

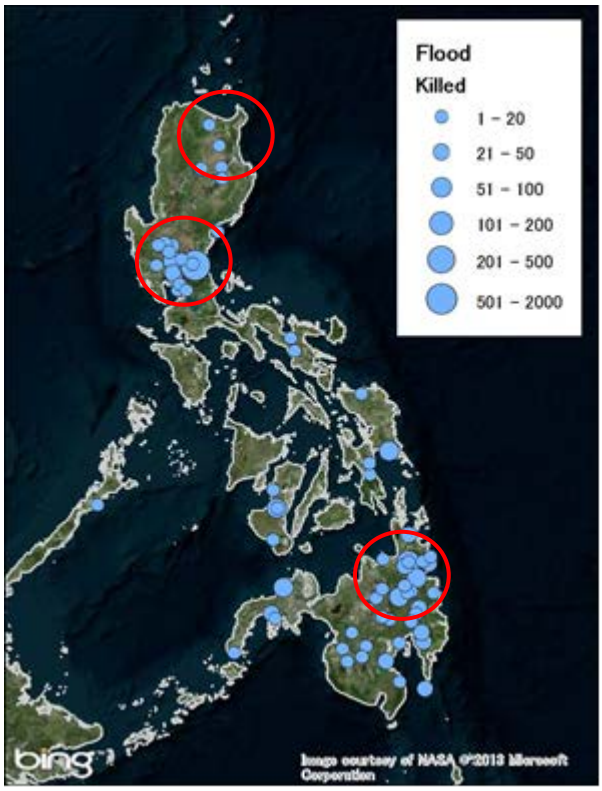


Figure 3.1.3 Hotspots of Human Loss

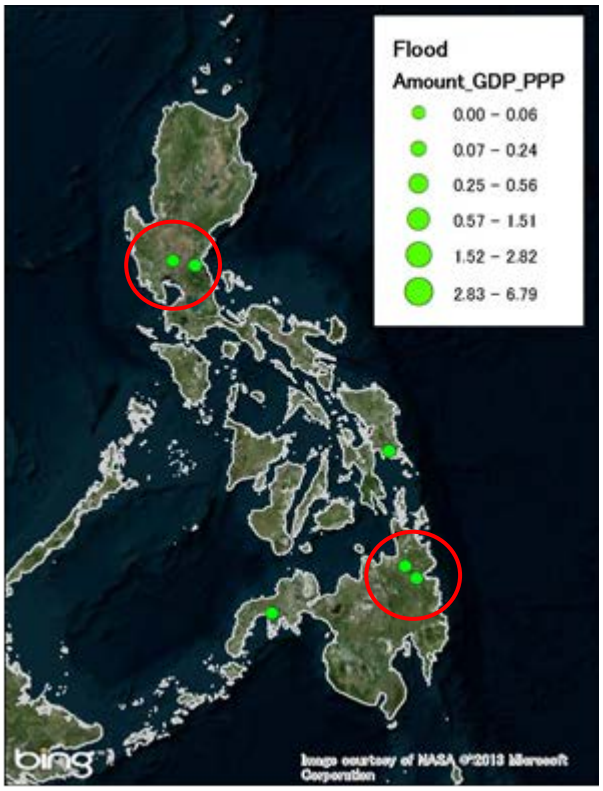


Figure 3.1.4 Hotspots of Economic Loss

(3) Efforts by the central government, local governments, and disaster management organizations

✓ National Disaster Risk Reduction and Managing Council（NDRRMC）

- In charge of policy–making, coordination, integration, supervision, monitoring, and evaluation of national level disaster risk management.
- Provides for a comprehensive, all-hazards, multi-sectoral, inter-agency, and community-based approach to disaster risk reduction and management.
- Gives advice to the President on the status of disaster preparedness, prevention, mitigation, response, and rehabilitation being undertaken by the government, private sector, and volunteers.
- Makes recommendations to the President regarding the declaration of a state of calamity in areas extensively damaged and submits proposals to restore normalcy in the affected areas, including calamity fund allocation.

✓ The Office of Civil Defense (OCD)

- Established as the secretariat of the NDRRMCl.
- Coordinates and oversees the implementation of the country's obligations with disaster risk reduction and management frameworks, policies, plans, programs, and projects.

(4) Hazard and risk information sources

Disaster risk reduction organizations

Table 3.1.1 List of Organizations for Disaster Risk Reduction

Organization	Post	Web Address
National Disaster Risk Reduction and Management Council (NDRRMC)		http://www.ndrrmc.gov.ph/
The Office of Civil Defense		http://ocd.gov.ph/
Philippine Atmospheric, Geophysical & Astronomical Services Administration (PAGASA)		http://www.pagasa.dost.gov.ph/index.shtml
The Department of Science and Technology-Information and Communications Technology Office (DOST-ICTO)		http://www.dost.gov.ph/
National Mapping and resource Information Authority (NAMRIA)		http://www.namria.gov.ph/
University of the Philippines Diliman (UP)		http://www.upd.edu.ph/

Reports

Table 3.1.2 List of Reference Books for Risk Analysis

Organization	Post	Title/ Web Address	Form
Asia Development Bank	Asian Water Development Outlook	Asian Water Development Outlook 2013;Asia-Pacific Water Forum	Report
		http://www.adb.org/publications/asian-water-development-outlook-2013	
World Bank	ASEAN Disaster Risk Management Initiative	Synthesis Report on Ten Asian Countries Disaster Risks Assessment ; December 2012	Report
		http://www.unisdr.org/files/18872_asean.pdf	
The Nature Conservancy	ASEAN Disaster Risk Management Initiative	World Risk Report 2012 ; October 2012	Report
		http://www.ehs.unu.edu/article/read/worldriskreport-2012	
World Bank	Framework and Options for Implementation	Advancing Disaster Risk Financing and Insurance in ASEAN Countries: April 2012	Report
		https://openknowledge.worldbank.org/bitstream/handle/10986/12628/714530v20ESW0W0AN0appendices0June12.pdf?sequence=1	
International Development Research Centre	Economy and Environment Program for Southeast Asia(EEPSA)	Climate Change Vulnerability Mapping for Southeast Asia: January 2009	Report
		http://web.idrc.ca/uploads/user-S/12324196651Mapping_Report.pdf	
UNEP,GRID,UNISDR		Global Risk Data Platform	Web Map
		http://preview.grid.unep.ch/index.php?preview=map&lang=eng	
UNISDR,GAR		Desinventar Disaster Information Management System	Web Map
		http://www.desinventar.net/	

Abbreviations

DOST-ICTO	The Department of Science and Technology-Information and Communications Technology Office
NDRRMC (previous: NDCC)	National Disaster Risk Reduction and Management Council (previous: National Disaster Risk Coordinating Council)
OCD	The Office of Civil Defense
PAGASA	Philippine Atmospheric, Geophysical & Astronomical Services Administration
NAMRIA	National Mapping and Resources Information Authority
UP	University of the Philippines Diliman

References :

1) Ministry of Foreign Affairs of Japan (2013): "Information on Philippines in Japanese", 02 2013.
2) ADRC: "Countries; Philippines", Information on Disaster Risk Reduction of the Member.
3) ADRC: "Philippines, Typhoon, 2001/07/04"
4) Relief Web; OCHA (2001): "Philippines - Typhoon Utor OCHA Situation Report No. 1", Report from UN Office for the Coordination of Humanitarian Affairs, 06 Jul 2001.
5) CNN NEWS (2001): "China, Philippines count cost of Utor's blast", July 8, 2001
6) ADRC: "Philippines, Typhoon, 2006/09/27"
7) BBC NEWS (2006): "Philippines pounded by typhoon", Thursday, 28 September 2006.
8) Relief Web; OCHA (2009):"Philippines, NDCC Update - Situation Report No. 41 on Tropical Storm "Ondoy" (Ketsana) and Typhoon "Pepeng" (Parma)", Government of the Philippines, 25 Oct 2009.
9) ADRC: "Philippines, Heavy Rain, Flood : 2012/08/07"
10) Relief Web; OCHA (2012b): "Philippines: Floods - Preliminary emergency appeal - Emergency appeal n° MDRPH010", Map from IFRC, 09 Aug 2012
11) CBC NEWS (2012): " Philippines digs out amid massive flood debris", Aug 9, 2012
12) BBC NEWS (2012): "Philippine floods: Nineteen dead as rain continues", 8 August 2012.
13) Relief Web; OCHA (2012c): "Philippines: Southwest Monsoon Rains Affected Persons and Persons in Evacuation Centers As of 10 August 2012", Map from UN Office for the Coordination of Humanitarian Affairs, 10 Aug 2012.
14) Relief Web; OCHA (2012a): "Philippines: Southwest Monsoon Rains Flood Affected Areas", Map from UN Office for the Coordination of Humanitarian Affairs, 08 Aug 2012.

3.2 Earthquakes

(1) Risk

Several thousand people were killed by the Moro Gulf Earthquake of Mindanao Island in 1976 (M8.1, 6,000 deaths) and the Luzon Island Inland Earthquake in 1990 (M=7.8, 2,421 deaths). These earthquakes also caused heavy damage to the economy of the Philippines. The losses caused by these earthquakes amounted to more than 0.2% of the GDP at the time.

Eight (8) earthquakes that caused more than 50 deaths have been recorded since 1900. Before then, earthquakes occurred near Manila in 1645 and 1863, causing more than several hundred deaths.

Earthquakes that occur inland such as the 2012 Negros Earthquake in 2012 may cause many fatalities, even with a lesser magnitude of 7.

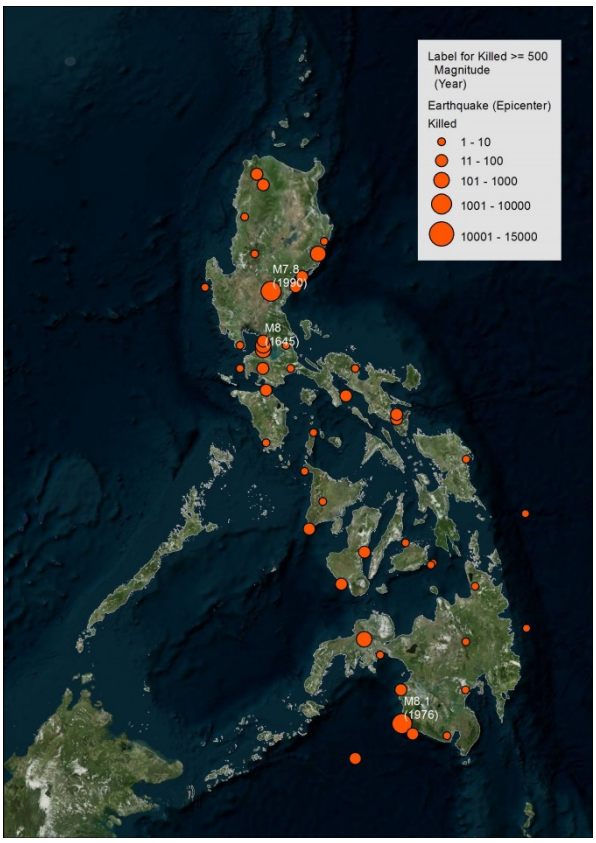


Figure 3.2.1 Earthquake Disasters: Human Losses

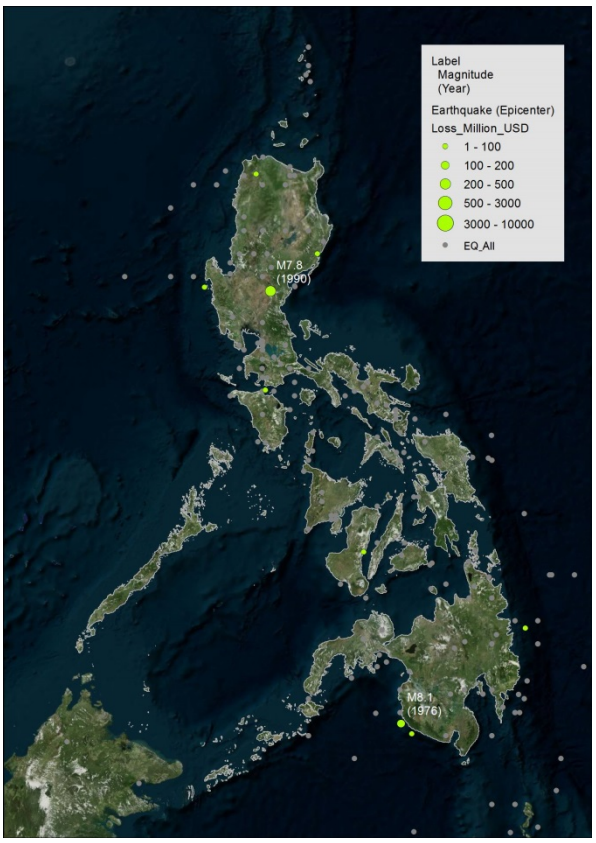


Figure 3.2.2 Earthquake Disasters: Economic Losses (% of GDP)

(2) Background

The Philippine Plate and the Eurasian Plate push into each other and form complex plate boundaries around the Philippine Islands.

The Philippine Plate is being subducted under the Eurasian Plate along from the Pacific Ocean side of south-east Luzon to Mindanao Island and forms the Philippine Trench. On the other hand, the Eurasian Plate is being subducted along the south-west coast of the Taiwan Island to the west side of Luzon in the eastern part of the South China See and forms the Manila Trench. Many faults are formed in the Philippine Islands by the pressure between the Philippine Trench and Manila Trench. (See Figure 3.2.3.)

Under these conditions, many large and small earthquakes have occurred offshore and inland of Philippine Islands (See Figure 3.2.1). Figure 3.2.4 is a seismic hazard map around the Philippines that considers all these conditions. The figure shows that MMI (modified Mercalli Intensity) VIII

(Destructive) or IX – XII (Ruinous ~ Disastrous ~ Very Disastrous ~ Catastrophic) earthquakes are expected with 20% probability of exceeding degrees of intensity shown on the map in 50 years for almost all areas in the Philippines except for a part of the western islands.

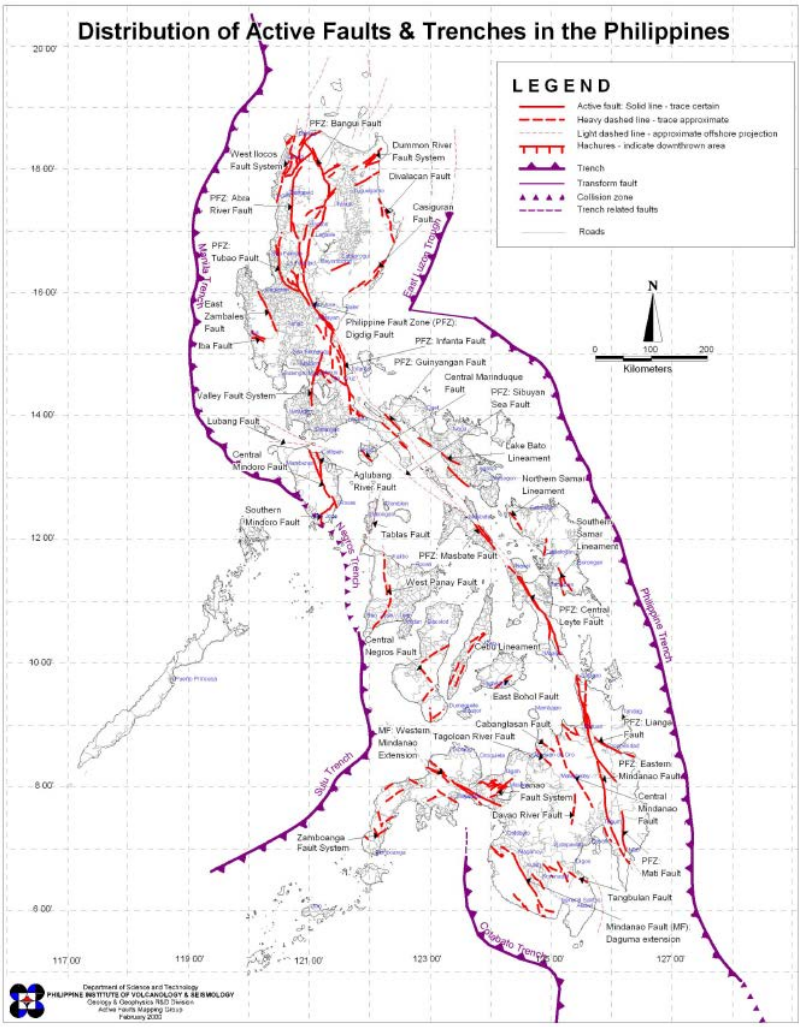


Figure 3.2.3 Distribution of Active Faults and Trenches in the Philippines (by PHIVOLCS)

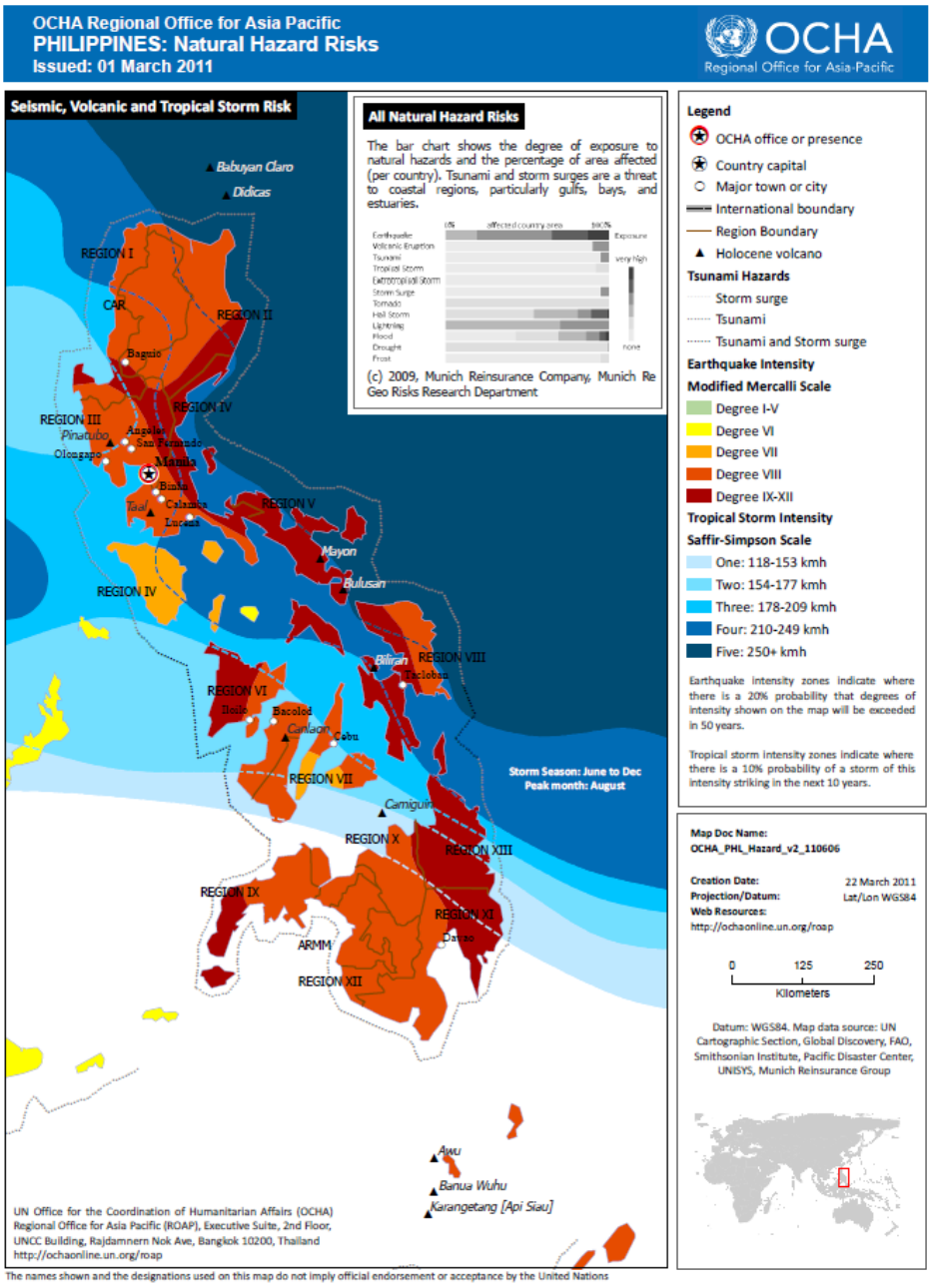


Figure 3.2.4 Seismic Hazard in Philippines

(3) Efforts by the central government, local governments, and disaster management organizations

Disaster Management Information

The Operations Center in National Disaster Risk Reduction Management Council (NDRRMC) has installed a Disaster Management Information System (DMIS) that is connected with relevant agencies and local governments. In emergency situations, the center collects and integrates information on damages and responses to the disaster using the DMIS.

Hazard maps covering ground shaking, liquefaction, tsunami, volcanoes, etc., in 22 provinces have been developed in the READY Project with assistance from the United Nations Development Programme (UNDP) and Australian Agency for International Development (AusAID).

Microzoning hazard maps of Metro Manila with scale of 1:5,000 were developed in the JICA development study, "Earthquake Impact Reduction Study for Metropolitan Manila, Republic of the Philippines," conducted in 2004. Philippine Institute of Volcanology and Seismology (PHIVOLCS) independently initiated the upgrading of the microzoning hazard map for completion in 2013.

Early Warning and Transmitting Information

PHIVOLCS has a total of 66 seismological observatories, comprised of 30 manned seismic observatories, 30 unmanned seismic observatories, and six observatories in Metro Manila.

PHIVOLCS has developed the Rapid Earthquake Damage Assessment System (REDAS). When an earthquake occurs, PHIVOLCS determines hypocenters and magnitudes, and estimates damage automatically using REDAS and transmits earthquake information within 15 minutes after the earthquake. The information is used for rescue and relief operations, and other life-saving activities. PHIVOLCS held training seminars on REDAS in local government units (LGUs) and other relevant authorities in order to promote REDAS to other organizations.

Preparedness and Education

A law for earthquake resistance standards was enacted in 1992 and amended in 2004. In Metro Manila, public building and structure cannot be built in hazardous areas where liquefaction is anticipated. The Department of Public Works and Highways (DPWH) has conducted basic and minor retrofitting for bridges, including the installation of collapse prevention devices on bridge girders and patching on bridge piers.

The Department of Education is in charge of school education and the Philippine Information Agency (PIA) is in charge of public awareness of local communities. There are primary and secondary school curricula on disaster prevention and mitigation. Drills are regularly conducted in schools and hospitals by the Department of Education and Department of Health. National

Disaster Consciousness Month is set every year and earthquake drills and search and rescue exercises are conducted during the period.

The Office of Civil Defense (OCD), PHIVOLCS, and relevant authorities have published pamphlets, posters, and videos, and have also conducted nationwide earthquake evacuation drills targeting school. Evacuation plans and evacuation route signboards based on the tsunami hazard maps created in the READY Project have been developed.

The Metro Manila Development Authority (MMDA) established contingency plans and developed emergency response plans, and also prepared essential materials and equipment for disaster rescue and relief.

(4) Hazard and risk information sources

Philippine Institute of Volcanology and Seismology (PHIVOLCS)
http://www.phivolcs.dost.gov.ph/
Philippine fault zone maps
http://www.phivolcs.dost.gov.ph/index.php?option=com_content&view=article&id=379&Itemid=500023
Active Faults and Trenches in the Philippines / Active Faults and Liquefaction Susceptibility Map
http://www.phivolcs.dost.gov.ph/index.php?option=com_content&view=article&id=78&Itemid=500024
Ready Project Maps
http://www.phivolcs.dost.gov.ph/index.php?option=com_content&view=article&id=465&Itemid=500028
Earthquake Monitoring
http://www.phivolcs.dost.gov.ph/index.php?option=com_content&view=article&id=38&Itemid=75
Mines and Geosciences Bureau (MGB)
http://198.57.185.212/default.aspx
Geological Database Information System
http://gdis.denr.gov.ph/mgbviewer/
National Mapping and Resource Information Authority (NAMRIA)
http://www.namria.gov.ph/
Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA)
http://www.pagasa.dost.gov.ph/

References:

1) EM-DAT: The OFDA/CRED International Disaster Database – www.emdat.be – Université Catholique de Louvain – Brussels – Belgium.
2) Japan International Cooperation Agency (JICA) (2012): "Data Collection Survey on ASEAN Regional Collaboration in Disaster Management"
3) United Nations Office for the Coordination of Humanitarian Affairs (OCHA), Regional Office for Asia Pacific (ROAP) (2011): "PHILIPPINES: Natural Hazard Risks", Downloaded from http://reliefweb.int/sites/reliefweb.int/files/resources/map_1301.pdf

3.3 Tsunami

(1) Risk

The Moro Gulf Earthquake of Mindanao Island in 1976 (M8.1, 6,000 deaths) is the largest tsunami earthquake in recent years for the Philippines. More than 4,000 people were killed by the tsunami alone. Most recently, the Mindoro Earthquake in 1994 (M7.1) caused about 80 deaths by tsunami.

As another example of tsunami-related deaths, the tsunami of the Chile Earthquake in 1960 caused 30 deaths.

In the Philippines, which is surrounded by ocean and experiences a lot of earthquakes, tsunami is one of the most catastrophic risks and attention should be paid to it.

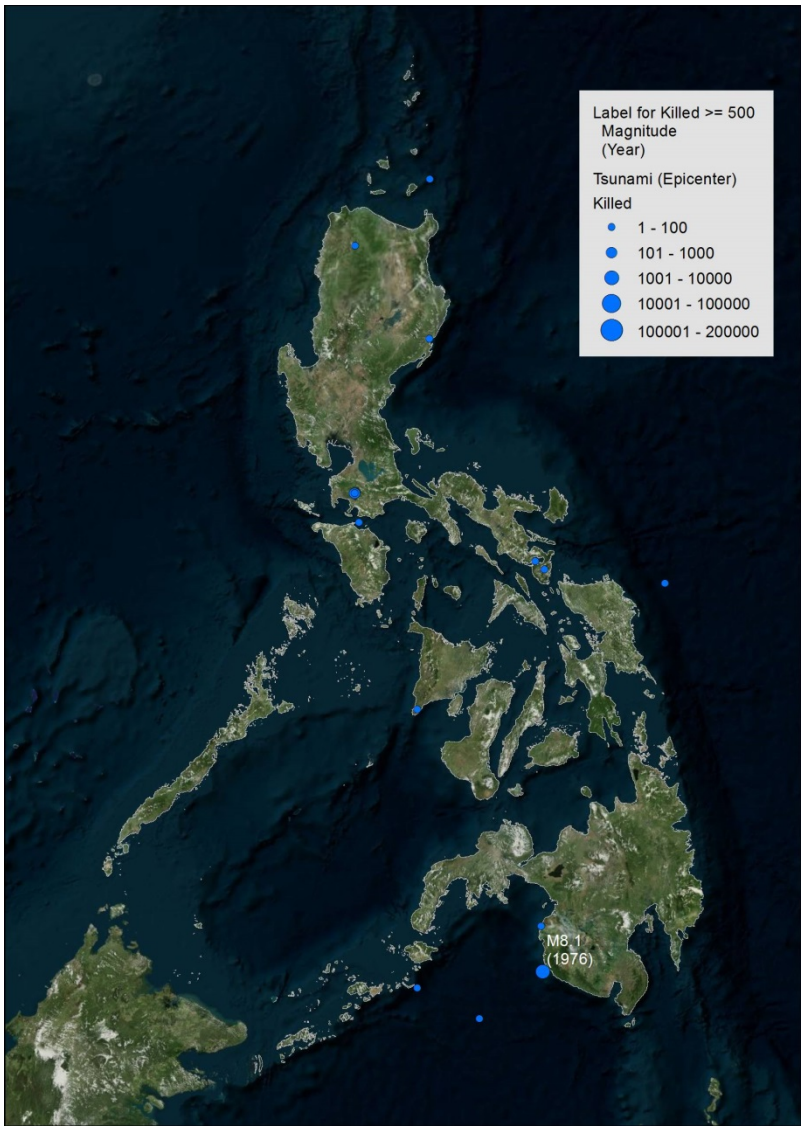


Figure 3.3.1 Tsunami Disasters: Human Losses

(2) Background

It is well known that tsunamis are generated by earthquakes, but an undersea volcanic eruption, an undersea landslide, or other disturbances above or below water can also generate a tsunami.

Philippine Institute of Volcanology and Seismology (PHIVOLCS) classified the coastline of the Philippines into 3 categories as shown by the characteristics of tsunami generation in Figure 3.3.2. In this figure, the coastline facing the Pacific Ocean shown as a red line is "prone to trench related local and distant tsunami." The coastline along the West Philippine Sea, the Sulu Sea, and the Celebes Sea shown as a purple line is "prone to trench related local tsunami." The coastline along inland seas surrounded by the Philippine Islands shown as a sky-blue line is "prone to offshore fault and submarine land slide related local tsunami."

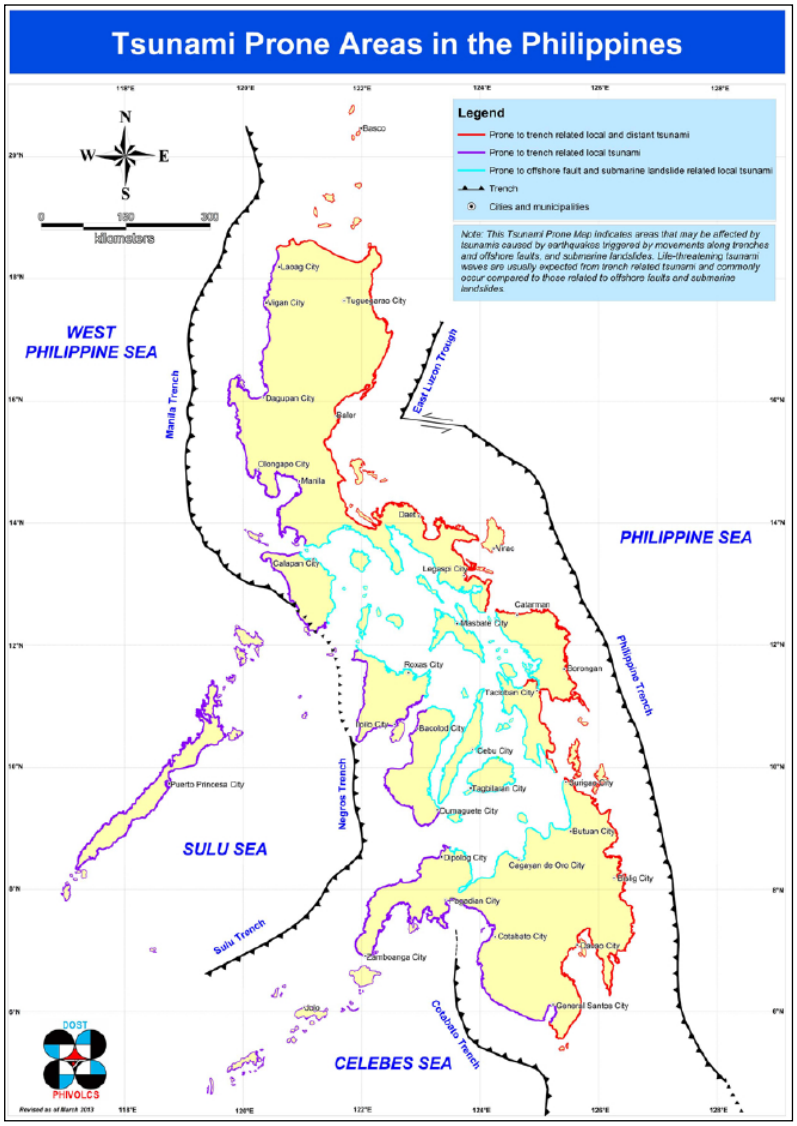


Figure 3.3.2 Tsunami Prone Areas in the Philippines (by PHIVOLCS)

(3) Efforts by the central government, local governments, and disaster management organizations

Disaster Management Information

Hazard maps covering ground shaking, liquefaction, tsunami, volcanoes, etc., in 22 provinces have been developed in the READY Project with assistance from the United Nations Development Programme (UNDP) and Australian Agency for International Development (AusAID).

Philippine Institute of Volcanology and Seismology (PHIVOLCS) conducted tsunami simulations in the Tsunami Mitigation Program from 2006 to 2007. Based on the simulations, tsunami hazard maps with scales of 1:100,000 to 1:50,000 in the three islands of Luzon, Mindanao, and Visayas were developed.

Early Warning and Transmitting Information

Tsunami observation is conducted by a tsunami-detecting instrument called the "WET sensor" of PHIVOLCS and by a tide-gauge of National Mapping and Resource Information Authority (NAMRIA). There is a plan to add more WET sensors. Tsunami information has been acquired from international agencies including the Japan Meteorological Agency (JMA) and the Pacific Tsunami Warning Center (PTWC).

PHIVOLCS issues tsunami warnings based on this data and information. Tsunami warnings are transmitted to communities through the Office of Civil Defense (OCD), Local Government Units, and mass media (TV and radio).

The mechanism of transmitting early warnings to relevant agencies has already been established. The National Disaster Risk Reduction and Management Council (NDRRMC) Operation Center receives information on earthquakes, tsunami, or volcanic activity from PHIVOLCS and issues early warnings to relevant agencies based on this information.

Preparedness and Education

The Office of Civil Defense (OCD), PHIVOLCS and relevant authorities have published pamphlets, posters, and videos, and have also conducted nationwide earthquake evacuation drills targeting school. Evacuation plans and evacuation route signboards based on the tsunami hazard maps created in the READY Project have been developed.

Regarding tsunami awareness, people learn through pamphlets and related websites. Signboards are installed at evacuation sites. Evacuation drills are carried out at schools and communities nationwide.

Rescue items and stockpiles are reserved within containers under bridges or other similar spaces.

(4) Hazard and risk information sources

Philippine Institute of Volcanology and Seismology (PHIVOLCS)
http://www.phivolcs.dost.gov.ph/
Tsunami Prone Areas & Tsunami Hazard Map
http://www.phivolcs.dost.gov.ph/index.php?option=com_content&view=article&id=312&Itemid=500027
Ready Project Maps
http://www.phivolcs.dost.gov.ph/index.php?option=com_content&view=article&id=465&Itemid=500028
National Mapping and Resource Information Authority (NAMRIA)
http://www.namria.gov.ph/

References:

1) EM-DAT: The OFDA/CRED International Disaster Database – www.emdat.be – Université Catholique de Louvain – Brussels – Belgium.
2) Japan International Cooperation Agency (JICA) (2012): "Data Collection Survey on ASEAN Regional Collaboration in Disaster Management"

3.4 Volcanoes

(1) Risk

The eruption of the Mt. Pinatubo in 1992 was the most devastating eruption in the Philippines during recent years and it was the second largest eruption of the 20th century in the world. More than 600 people were killed and about one million people were affected by the eruption. Many buildings and infrastructures around Mt. Pinatubo were damaged, and ash fall affected air transportation. The amount of loss exceeded 200 million dollars, which is equivalent to 0.2% of the Philippines' GDP at that time.

Mt. Mayon is an active volcano. Philippine Institute of Volcanology and Seismology (PHIVOLCS) has recorded 49 volcanic eruptions for Mt. Mayon. Seven (7) volcanic eruptions were recorded since 1990. About 80 people were killed and 160,000 people were affected by the eruption in 1993.

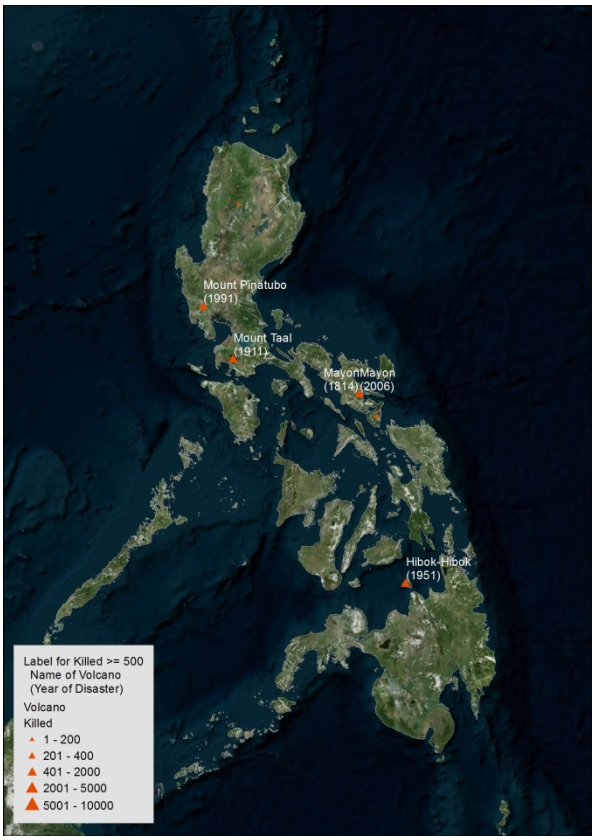


Figure 3.4.1 Volcanic Disasters: Human Losses

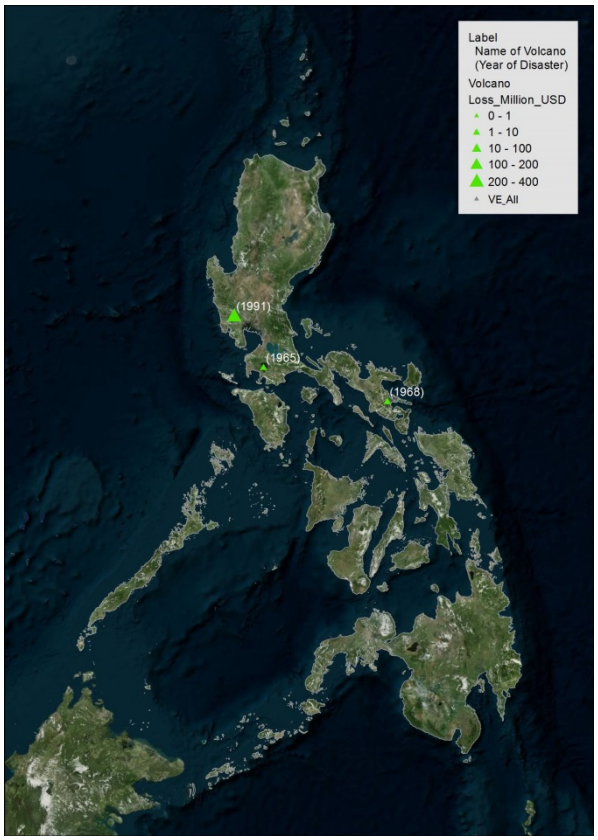


Figure 3.4.2 Volcanic Disasters: Economic Losses (% of GDP)

(2) Background

A volcano is formed when magma stored deep underground erupts to the ground surface or the sea floor. Magma is generated by subduction of the plates in and around the Philippine Islands and it forms volcanoes. Volcanic activity is closely related with plate motion as is with seismic activity.

There are about 400 volcanoes in the Philippines, 23 of which are active volcanoes and 26 of which are potentially active volcanoes. There are many recorded eruptions for Mt. Mayon, Mt. Taal, Mt. Kanloan, Mt. Bulsan, Mt. Hibok-Hibok, and Mt. Pinatubo. Volcanic activities before recorded history are confirmed for Mt. Pinatubo and Mt. Taal.

Major hazards caused by volcanic eruption are lava flow, pyroclastic flow, ash fall and "Lahar." Lava flow is a flow of melted rock along the slope. The rate of flow differs in accordance with the conditions of local topography and viscosity of magma. Pyroclastic flow is a flow of a mixture of hot dry masses of fragmented volcanic materials and volcanic gas along the slope. The rate of flow sometimes exceeds 100 km/hour in velocity because of low friction between the mixture's material and ground surface. Ash fall often spreads widely via the trade winds or the westerlies, causing damage over an extensive area. "Lahar" is originally an Indonesian term and is also called volcanic mud flow. It is a flow of a mixture of volcanic materials and water along the slope. The rate of flow sometimes exceeds 100 km/hour in velocity.

(3) Efforts by the central government, local governments, and disaster management organizations

Disaster Management Information

Hazard maps covering ground shaking, liquefaction, tsunami, volcanoes, etc., in 22 provinces have been developed in the READY Project with assistance from the United Nations Development Programme (UNDP) and Australian Agency for International Development (AusAID).

PHIVOLCS developed volcano hazard maps with scale of 1/25,000 for 14 out of the 23 active volcanoes. The hazard maps have been created to identify hazardous items such as volcanic ash, lava flow, pyroclastic flow, lahar, and volcanic mud flow, and are utilize for evacuation plans, quick response, and land use.

Early Warning and Transmitting Information

PHIVOLCS has set up 6 observatories and is monitoring the activity of 6 volcanoes including Taal, Pinatubo, Mayon, Bulusan, Hibok-hibok, and Kanlaon.

PHIVOLCS issues warning alerts based on volcanic observations. Volcano alert levels are classified into five levels, and are established based on eruption type and local circumstances at each volcano.

PHIVOLCS issues warning of volcanic eruption based on the observed data. Volcanic warnings are classified into five levels, taking into account eruption type and local circumstances of each volcano. However, there are only are 6 out of 23 active volcanoes with real-time monitoring systems. The other 17 volcanoes have limited in seismic activity observation.

Preparedness and Education

The Department of Education is in charge of school education, and primary and secondary school already have curricula for disaster management. Philippine Information Agency (PIA) is in charge of public awareness and capacity building for local communities.

Drills are regularly conducted in schools and hospitals by the Department of Education and Department of Health. PHIVOLCS and the DPWH have conducted evacuation drills for Community-Based Disaster Risk Management (CBDRM) on a per project basis.

The DPWH has constructed structural measures such as sabo dams (check dams) and dykes (mega dykes, super dykes) at the Pinatubo and Mayon volcanoes.

(4) Hazard and risk information sources

Philippine Institute of Volcanology and Seismology (PHIVOLCS)
http://www.phivolcs.dost.gov.ph/
Volcano Hazard Maps
http://www.phivolcs.dost.gov.ph/index.php?option=com_content&view=article&id=57:active-volcanoes&catid=55&Itemid=114
Ready Project Maps
http://www.phivolcs.dost.gov.ph/index.php?option=com_content&view=article&id=465&Itemid=500028

References:

1) Lee Siebert, Tom Simkin, and Paul Kimberly (2011): "Volcanoes of the World - Third Edition", Smithsonian Institute/University of California Press
2) EM-DAT: The OFDA/CRED International Disaster Database – www.emdat.be – Université Catholique de Louvain – Brussels – Belgium.
3) Japan International Cooperation Agency (JICA) (2012): "Data Collection Survey on ASEAN Regional Collaboration in Disaster Management"

3.5 Cyclone (Meteorological) Hazards

(1) Risk

The Philippines is an archipelagic nation located in the northwest Pacific Ocean. Three prominent bodies of water surround the archipelago: the Philippine Sea and the Pacific Ocean on the east, the South China Sea on the west and north, and the Celebes Sea and the coastal waters of Borneo on the south. The Philippines has a tropical maritime climate and is usually hot and humid. An average of around twenty typhoons (tropical cyclones) approach the country every year, with five to seven of them considered the most destructive. The typhoons usually affect the country between July and December.

Floods due to heavy rains, landslides, flash floods, tidal waves, and storm surges may occur.

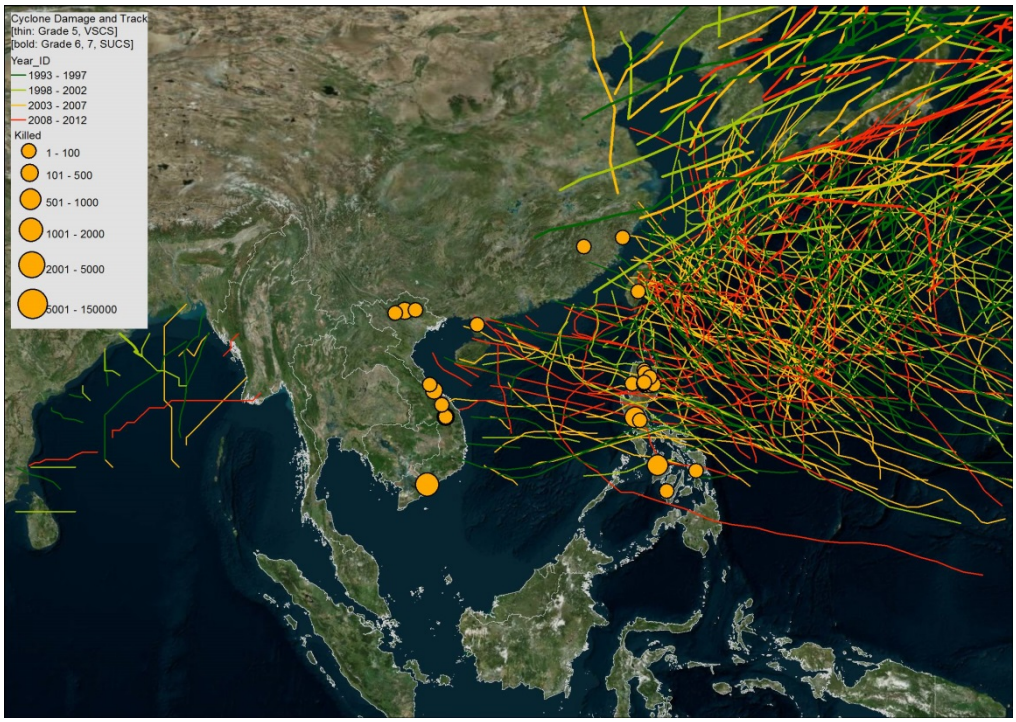


Figure 3.5.1 The Number of Deaths and Path of Typhoons (1993 - 2012)

Figure 3.5.2 below shows the frequency of tropical cyclone occurrence in the Philippines. As tropical cyclones (typhoons) are not usually generated in areas close to the equator, the probability of damages brought about by tropical cyclones (typhoons) in the Philippine island of Mindanao is quite low. Unusually, however, tropical storm Washi passed by this southern island in 2011. Table 3.5.1 above shows the history of typhoon disasters in the Philippines.

In 2009, tropical cyclone Ketsana, typhoon Parma and Mirinae hit Luzon. Tropical cyclone Ketsana brought unusually high volumes of rain causing widespread flooding. On September 26, a 12-hour rainfall was recorded as approximately around 450 mm at the Manila Observatory. These heavy rains caused extensive flooding in Metro Manila and the neighboring Rizal province. Tropical cyclone Ketsana was immediately followed by typhoon Parma. Typhoon Parma affected the Philippines during 3-9 October 2009 following a rather unusual path of impact over central and northern Luzon. It initially brought powerful winds, with maximum sustained velocities of about 195 km/h and gusts of up to 230 km/h. The typhoon also brought an extended period of heavy rains and, as it stalled in the northern part of Luzon then eventually reversed its track, poured large amounts of rainfall on agricultural areas with fully saturated soils. The highest cumulative rainfall amounts (exceeding 1,000 mm) were experienced along the west coast of northern Luzon. For example, Baguio City received 850 mm of rain during October 3-9. Ketsana and Parma resulted in large numbers of affected persons and casualties. The official and combined death toll from the two natural disasters was 956 people with 84 persons still missing and 736 injured.

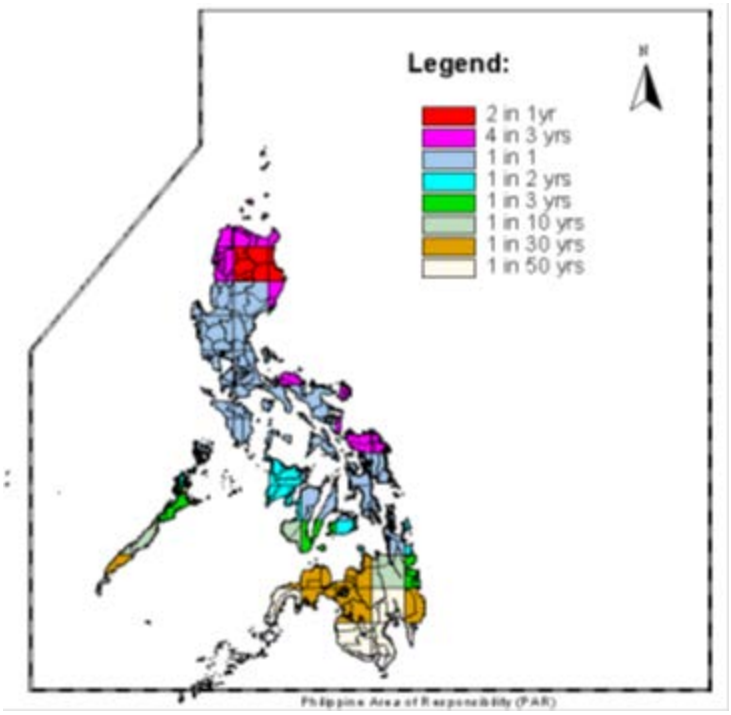


Figure 3.5.2 Frequency of Tropical Cyclones Occurrence in the Philippines

Table 3.5.1 Disastrous Typhoons in Terms of Damage (1990 - 2009)

Years	Typhoon name	Affected areas	Damage amount (Million US $)
1990	Mike	Central Visayas	235.86
1995	Angela	Southern Luzon	202.17
1993	Flo	Central Luzon	190.22
2006	Xangsane	Luzon	143.70
1988	Ruby	Southern Luzon	122.61
2006	Durian	Southern Luzon	118.48
1984	Ike	Northeastern Mindanao / Visayas	82.80
2001	Utor	Luzon	78.04
1991	Ruth	Northern Luzon	75.43
2001	Nanang	Visayas	70.65
2003	Imbudo	Luzon	70.22
1995	Sybil	Visayas	60.87
1988	Skip	Visayas	59.78
2004	Mindulle	Southern Luzon	53.26
2006	Chanchu	North & South Luzon	52.83
2008	Fengshen	Visayas and Luzon	293.48
2009	Ketsana	Luzon	241.30
2009	Parma	Luzon	426.74

Source: Office of Civil Defense

Table 3.5.2 Disastrous Typhoons in Terms of Damage (2010 - 2012)

Years	Typhoon name	Affected areas	Damage amount (Million US $)
2010	Megi	Luzon	235.86
2011	Nock-ten	Eastern Visayas and Northern Luzon	202.17
2011	Nesat		190.22
2011	Washi	Northeastern Mindanao and Central Visayas	143.70
2012	Bopha	Mindanao, Visayas and Luson	122.61

(2) Background

The southwest monsoon brings heavy rains to most parts of the country from May to September, while the northeast monsoon brings cooler and drier air from December to February with moderate to heavy rains in the eastern part of the country. The annual average rainfall ranges from as much as 5,000 mm in the mountainous east coast section of the country to less than 1,000 mm in some of the sheltered valleys. It is located along the typhoon belt in the western North Pacific Basin where about five to seven tropical cyclones (typhoons) are generated. Typhoons are especially hazardous for northern and eastern Luzon as well as eastern Visayas. In addition, highly urbanized Metro Manila gets devastated periodically, as the city is located in very low land and drainage facilities are not sufficient, with heavy rains causing floods and landslides brought by other weather systems related monsoon and ITCZ. Recently, destructive damage by typhoons was experienced in northern Luzon and Visayas in 2006, 2009, and 2012.

From September to December 2006, a series of typhoons hit the Philippines. Typhoon Xangsane hit Metro Manila, Typhoon Parma affected Northern Luzon provinces, Typhoon Durian devastated the provinces of Albay and Camarines Sur, and Typhoon Utor battered Tacloban City, the capital of Leyte province. The total estimated damages from the four typhoons amounted to US$ 286.96 million, almost 94% of the total damages for 2006 are estimated to be around US$ 306.52 million.

On 21 June 2008, Typhoon Fengshen brought untold suffering and devastation to millions of Filipinos nationwide. Its onslaught affected 4.7 million persons with 557 casualties, 826 injured, and 87 missing. It also caused one of the worst sea disasters in the country with the sinking of a major passenger ferry carrying toxic chemicals. Total damages to private properties, infrastructure, and agriculture amounted to US$ 293.48 million.

On 26 September 2009, Tropical Storm Ketsana brought torrential rains equivalent to one month of rainfall in just 6 hours on the Philippine capital of Manila causing extensive flooding. It affected 4.9 million persons with 464 casualties and damage to infrastructure and property amounting to US$ 234 million.

On 4 December 2012, Typhoon Bopha, an unusually very low-latitude but very powerful tropical cyclone, caused catastrophic damage in Mindanao. Bopha killed at least 1,146 people and cost $1.04 billion in the Philippines, becoming the deadliest storm worldwide in 2012 and the costliest Philippine typhoon in history.

Due to its numerous and complex coastlines, the Philippines is at greater risk of storm surges. Destruction of coral reefs and mangroves, change in shape of the natural breakwater of natural precipitation in the harbor and river delta, land reclamation, and destruction of form have all increased the storm surge hazard.

In the Philippines, increased frequency and intensity of extreme weather events as well as changes in weather patterns have been observed due to the effects of climate change.

Climate change vulnerability and impact in the Philippines are as follows.

- According to the IPCC (2007), the mean, maximum, and minimum temperatures of the Philippines have increased by 0.14°C per decade since 1971. The frequency of hot days and warm nights has also increased and the number of cold days and cool nights has decreased.
- There has also been an increase in the annual mean rainfall since the 1980s and in the number of rainy days since the 1990s in the Philippines (ADB 2009). As per ADB (2009), projected temperature increases of 1.2–3.9ºC in the Philippines by 2080 using all the IPCC emission scenarios is a distinct likelihood.
- Even under the most conservative scenario, sea level may be about 40 cm higher than today's level by the end of 21st century (WWF, 2007a). With a greater number of people living in the coastal plain, the overall vulnerability may increase considerably.

(3) Efforts by the central government, local governments, and disaster management organizations

The National Disaster Coordinating Council (NDCC) is the highest policy-making, coordinating, and supervising body at the national level for disaster risk management in the country. It actively carries out the notable efforts and programs of the government on disaster mitigation, preparedness, response, and rehabilitation. The NDCC also serves as an advisory body on disaster preparedness programs, disaster operations, and rehabilitation efforts undertaken by the government and other stakeholders. It also makes recommendations to the President of the Republic of the Philippines regarding the declaration of a state of calamity in disaster-affected areas and the release of national calamity funds as needed.

Meteorological service in the Philippines is under the responsibility of PAGASA (Philippine Atmospheric, Geophysical and Astronomical Services Administration). PAGASA provides various services and issues the following products.

1) Weather forecast (tropical cyclone warning information)
2) Warning and flood forecasting
3) Information on the climate
4) Information about astronomy

Table 3.5.3 Authorities of the Philippines Meteorological Service

Institution	Contact information
PAGASA (Philippine Atmospheric, Geophysical and Astronomical Services Administration) http://www.pagasa.dost.gov.ph/	TEL: +63-2-434-2696 E-mail : piias@pagasa.dost.gov.ph

(4) Hazard and risk information sources

The hazard risk assessment results related to tropical cyclones (meteorological) disasters are as follows.

Table 3.5.4 Source of Information on Tropical Cyclones (Meteorological Disasters)

Institution	Literature name
UNDP (2007)	Climate Variability and Climate Changes, and Their Implication Government http://www.undp.or.id/pubs/docs/Final% 20Country% 20Report% 20 -% 20Climate% 20Change.pdf
UNISDR (2010)	Synthesis Report on Ten ASEAN Countries Disaster Risks Assessment http://www.unisdr.org/files/18872_asean.pdf

Abbreviations

ITCZ	Intertropical Convergence Zone
NDCC	National Disaster Coordinating Council
PAGASA	Philippine Atmospheric, Geophysical and Astronomical Services Administration

Explanation of terms

ITCZ: This is a low-pressure (convergence) zone formed near the equator. In the lower levels (near the surface), the northeastern trade wind blows into the north area from the ITCZ and the southeastern trade wind blows into the southern area from the ITCZ.

References:

1) Country Assessment Report for the Philippines, 2012
2) Edwin ST Lai (2013): Overview of Member's Summary of Reports 2012, TC-45 Appendix VI - AWG Working Reports Members, WMO, pp.14-30
3) PAGASA(Website): http://www.pagasa.dost.gov.ph/index.shtml

3.6 Landslides

(1) Risk

According to the EM-DAT database (http://www.emdat.be/), more than 100 landslides have been recorded in the country. Six (6) of these landslides had more than 200 fatalities, four (4) of which occurred since 2000.

Landslides occur over the entire archipelago, but there are some areas of concentration. This indicates the relationship between landslides and some specific topographic and geologic features as shown in the figure below.

Recent catastrophic landslides were caused by slope collapse with debris flowing toward lower areas. However, the detailed mechanisms of these are unclear.

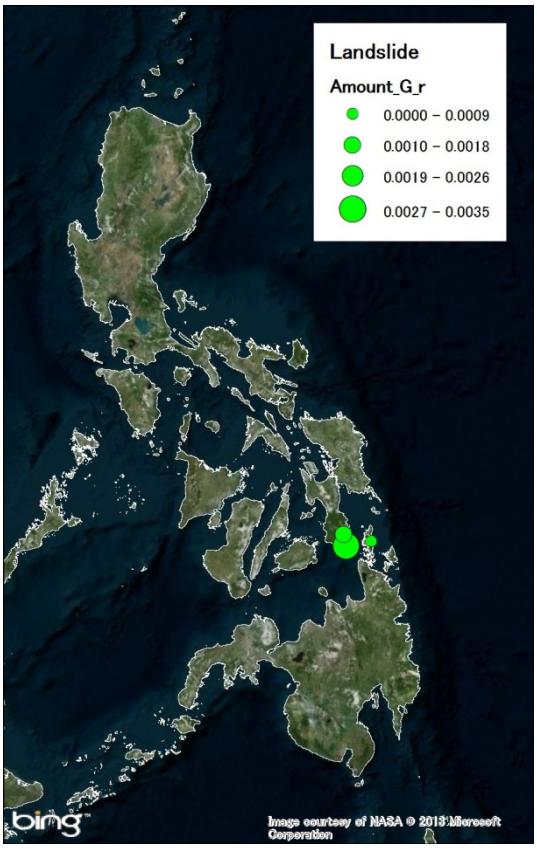


Figure 3.6.1 Landslide Damage: Human Losses

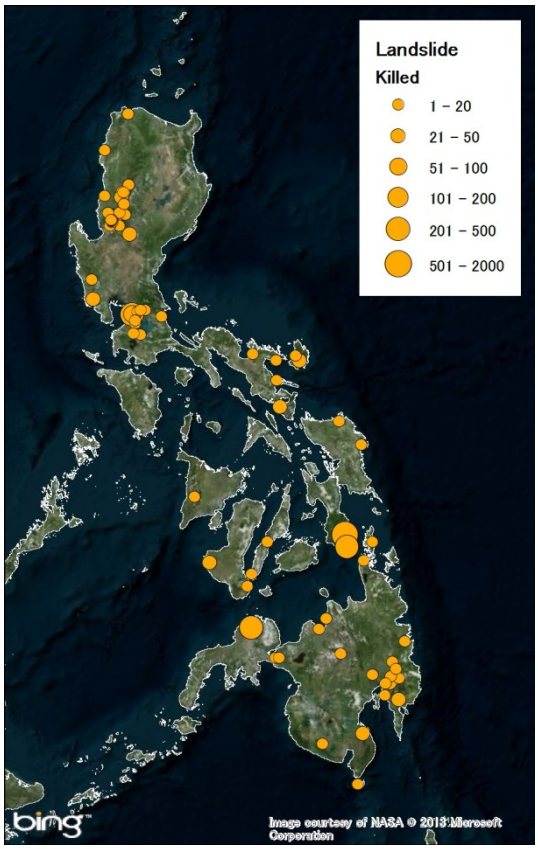


Figure 3.6.2 Landslide Damage: Economical Losses (% of GDP)

(2) Background

Notable example of landslides

The landslide that occurred in February 2007 in St. Bernard, Leyte Province recorded 1126 fatalities, which is the most in history. This disaster occurred along the Philippine Fault during the rainy season, illustrating a typical landslide in the Philippines.

The affected area extended to 3 km from the collapsed slope. [1)] The debris produced by this collapse flowed along a river and buried the entire Barangay residence area, which was abandoned after the tragedy.

Frequent landslide areas

The area affected by the landslide consists of soft rock slopes that are weakened by fault movement and volcanic area and covered by a fragile layer generated by volcanic activities, which spreads over the entire area of the country. [1)]

Landslide scenario

The frequent occurrence of landslides during the rainy season indicates some relevancy between landslides and rainfall. Exposure areas related to climate change are widely distributed across the in the entire country.[2)]

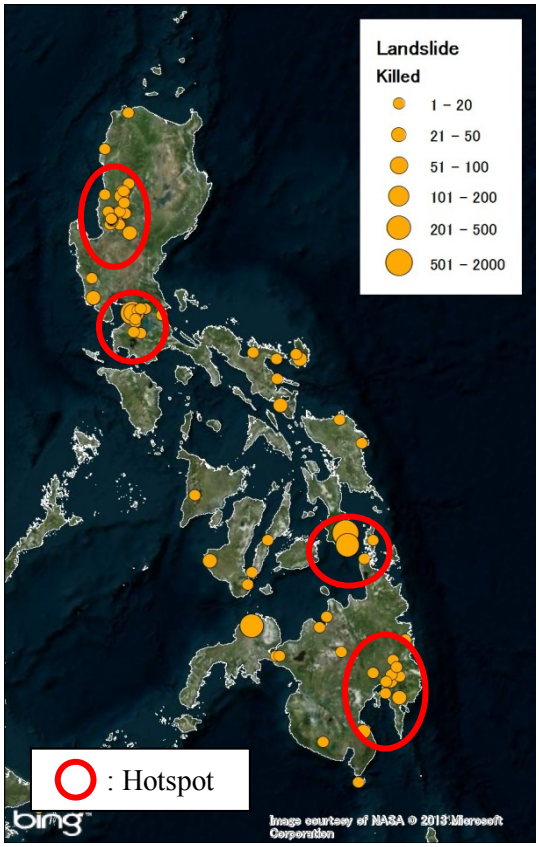


Figure 3.6.3 Hotspots of Human Losses

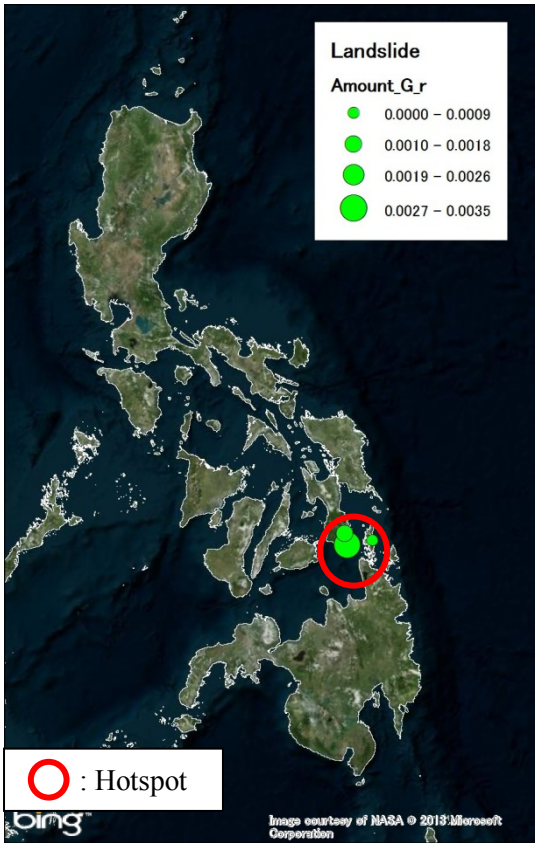


Figure 3.6.4 Hotspots of Economic Losses

(3) Efforts by the central government, local governments, and disaster management organizations

✓ National Disaster Risk Reduction and Managing Council (NDRRMC)

- The Present National Coordinating Council (NDCC) or the National Council is empowered with policy-making, coordination, integration, supervision, monitoring, and evaluation.
- Provides for a comprehensive, all-hazards, multi-sectoral, inter-agency and community-based approach to disaster risk reduction and management.

- Gives advice the President on the status of disaster preparedness, prevention, mitigation, response, and rehabilitation being undertaken by the government, private sector, and volunteers.
- Makes recommendations to the President regarding the declaration of a state of calamity in areas extensively damaged, and submits proposals to restore normalcy in the affected areas, including calamity fund allocation.

✓ The Office of Civil Defense (OCD)

- Established as the secretariat of the National Council.
- Coordinates and or oversees the implementation of the country's obligations with disaster risk reduction and management frameworks, policies, plans, programs, and projects.

(4) Hazard and risk information sources

Reports

✓ Synthesis Report on Ten Asian Countries Disaster Risks Assessment; December 2012
ASEAN Disaster Risk Management Initiative, World Bank
http://www.worldbank.org/

- Summarizing natural hazard and risks in 10 ASEAN countries.
- World Bank reported risks with respect to countries and categories of disaster.
- Although the data is only available up to 2009, the report is well assembled.

✓ World Risk Report 2012; October 2012, Alliance Development Works, The Nature Conservancy
http://www.nature.org/

- Natural disaster risks in 173 countries in the world are ranked in this report.
- Intended period is from 2002 to 2011.
- Vulnerabilities are assessed with respect to categories.
- The report is effective for comparing countries.

✓ Advancing Disaster Risk Financing and Insurance in ASEAN Countries: April 2012, Framework and Options for Implementation, Volume 2: Appendix 1
https://www.gfdrr.org/

- Summarizing natural hazard and risks in 10 ASEAN countries.
- Intended period is from 1970 to 2011.
- Vulnerabilities are assessed with respect to categories.
- Summary of countries is well assembled.

✓ Climate Change Vulnerability Mapping for Southeast Asia: January 2009, Economy and Environment Program for Southeast Asia (EEPSA)
http://www.idrc.ca/

- Natural disaster risks in Southeast Asia are mapped in the report.
- The report contains information on risks in states/provinces.

Risk maps

✓ Global Risk Data Platform; UNEP (United Nations Environment Program)/GRID, UNISDR (United Nations Office for Disaster Risk Reduction)
http://preview.grid.unep.ch/

- Disaster site from all over the world are mapped.
- The map shows disaster hotspots.

References

1) Sakurai, W, Tokunaga, Y, Jesse C Felizardo (2007): "Large Scale Deep sheeted Landslide in Leyte Province, Republic of Philippines", Journal of Sabo, Vol. 58, No.6, pp. 39 –43.(In Japanese)
2) Economy and Environment Program for Southeast Asia (EEPSEA) (2009): "Climate Change Vulnerability Mapping for Southeast Asia", p. 19

3.7 Predominant Natural Hazards

The records of natural disasters that affected the country are classified based on the impacts and frequency of occurrence. The results have been plotted on the impacts - frequency matrix and the most prevailing hazards studied.

3.7.1 Employed Data

The disaster records compiled in Appendix A3 are employed in this study. The records for the last 30 years, namely from 1983 to 2012, are used because the number of events included in the database before 1980 is significantly less than after 1980. The records of large disasters through earthquakes, tsunamis and volcano eruptions before 1983 are also used because the frequencies of occurrence for these hazards are significantly lower than floods, cyclones and landslides.

3.7.2 Study Method

The “Damage Amount / GDP” and ‘Number of Deaths” are used as indices to show the impacts of the disasters considered 6 natural hazards will be studied and compared. At the beginning of the study, only the “Damage Amount / GDP” was used as an index because the results can be used for Area BCP planning. However, the scarcity of information related to damage amounts became clear

as the study progressed. As the information on the "Number of Deaths" is substantial compared to the damage amount, the "Number of Deaths" has been added as an index of impact.

The process of the study is as follows;

1) Based on the Damage Amount / GDP or Number of Death, each disaster is classified according to the ranking system outlines in Table 3.7.1,
2) The number of disaster events for each country is added by type of hazard and disaster rank, and then classified into Table 3.7.2 below,
3) The above information is then plotted on the impacts - frequency matrix by country,
4) As for earthquakes, tsunamis and volcanic hazards, if an event occurred before 1983 that was of the same (or higher) disaster rank as the maximum disaster rank recorded between 1983 to 2012, a point is plotted on the matrix which corresponds to the relevant disaster and frequency rank (=1).

Table 3.7.1 Disaster Rank and Damage

Disaster Rank	Damage Amount / GDP[1]	Number of Deaths
5	1.0% -	10,001 -
4	0.1% - 1.0%	1,001 - 10,000
3	0.01% - 0.1%	101 - 1,000
2	0.001% - 0.01%	11 - 100
1	- 0.001%	- 10

Table 3.7.2 Frequency Rank and Number of Events

Frequency Rank	Number of Events from 1983 to 2012	Average Frequency (Events / Year)
5	7 or more	1/5 -
4	4 to 6	1/10 - 1/5
3	2 to 3	1/15 - 1/10
2	1	1/30
1	Large Events that occurred before 1983	-

3.7.3 Study Results

The following results are based on the available existing information. Not all information relating to the impacts of disasters was collected. Furthermore, the purpose of this study is not intended to evaluate the precise damage amounts or number of deaths. The purpose of this study is to rank 6 natural hazards according to their impacts.

[1] Gross domestic product based on the purchasing-power-parity (PPP) valuation of the country's GDP, according to the International Monetary Fund, World Economic Outlook Database, October 2012

As with Indonesia, all 6 types of disasters have been recorded. The most impact is caused by cyclones. On average, 5 to 6 cyclones which cause deaths occur every year. Cyclones also have the largest impact in terms of the amount of damage caused. Earthquakes, volcanoes and landslides also caused at least one disaster with more than 1000 deaths in the last 30 years. The number of deaths caused by one flood disaster is less but they occur more frequently. The impact of floods in view of the damage amount is next to that of cyclones. The impact of tsunamis in the last 30 years has not been substantial, however more than 4000 people were killed by the 1976 Mindanao Tsunami.

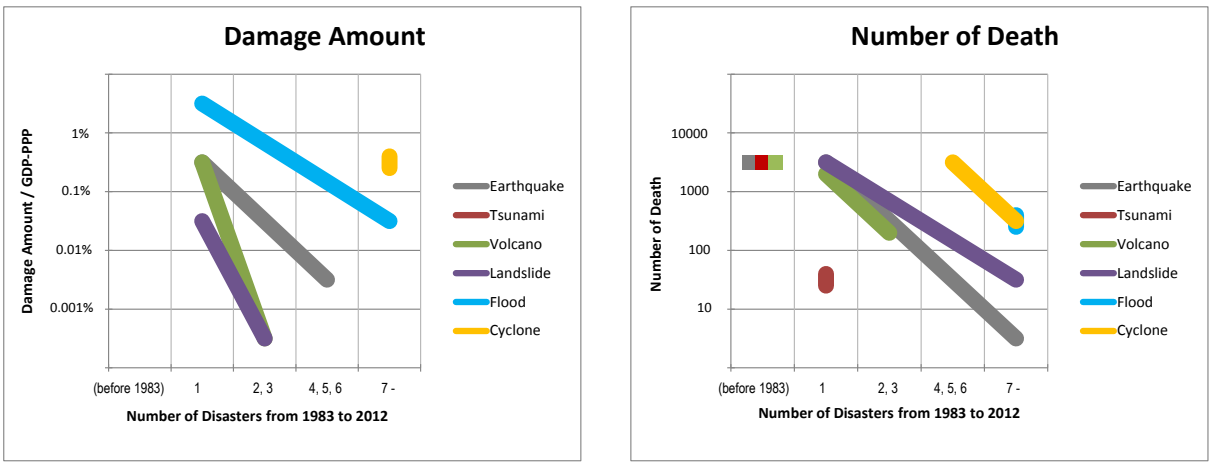


Figure 3.7.1 Impact of hazards in the Philippines

3.8 Existing Investigations and Studies

3.8.1 Methods and Scope of the Survey

This section reviews studies and research that have been conducted in the ASEAN region with a focus on natural hazards, risks, and vulnerability assessments. The target hazards are: floods, earthquakes, volcanoes, tsunamis, cyclones (typhoons)/meteorological disasters, and landslides. Information and study reports were reviewed from those that are available for the public and on the internet. The purpose of this section is to first gain an overview of the existing study results regarding hazard trends, encountering risks, and degrees of vulnerability throughout the entire ASEAN region as well as in each ASEAN member state. Another purpose it to produce a compilation of assessment reports of the region, which will be accessible as a reference for those who wish to plan an Area BCP.

Table 3.8.1 Methodology of Information Collection and Scope of Survey

Information Collected	Methodology	Scope of Survey
Existing studies and research	To collect existing studies and reports from public sources including the internet.	To summarize the studied hazards, areas, contents of hazard and risk analysis, vulnerability assessment of existing studies, and other research.

3.8.2 Outline of Collected Information and Data

Table 3.8.2 shows the outline of collected information and data. Summaries of existing studies and reports are compiled as data sheets in Appendix A4.

Table 3.8.2 Outline of the Collected Information and Data

Appendix A4 Subsection	Hazards	Outline
A4.1	Flood	Flood hazard, risk assessments, hazard maps, and vulnerability assessment have been conducted in ASEAN countries using data on rainfall, inundation areas, affected population, and monetary assessment. Hazard maps were produced with GIS tools. The usage of GIS tools for assessments is widely recognized and its usage has been explored to produce hazard maps. Some runoff analyses were conducted for selected areas. Limited information and data available for Brunei Darussalam.
A4.2	Earthquake	Many of the earthquake hazard studies in the area are probabilistic seismic hazard analyses (PSHA), not scenario earthquake studies. This is to quantify the probability of exceeding a specific ground-motion level at a site given all possible earthquakes. This methodology is descended from the Global Seismic Hazard Assessment Program (GSHAP). GSHAP was launched in 1992 by the International Lithosphere Program (ILP) with the support of the International Council of Scientific Unions (ICSU), and endorsed as a demonstration program in the framework of the United Nations International Decade for Natural Disaster Reduction (UN/IDNDR). Earthquakes are not equally distributed around the globe because of the generating mechanism. In the ASEAN region, many earthquakes are observed in and around Indonesia and Philippines, which are located in the convergent boundary (subduction) zone and fewer earthquakes are observed in and around Myanmar, which is in the transform boundary zone. There are fewer or no earthquakes observed in other regions. However, some regions are sometimes affected by the earthquakes which occur in neighboring countries. The northern regions of ASEAN countries are sometimes affected by the earthquakes that occur in the Yunnan province of China. A number of investigations and studies reflect this trend.
A4.3	Tsunami	There are only few investigations and studies about tsunami hazard or risk in the region, and most of them are compilations of past disasters. There is no probabilistic study as there is for earthquakes. There is a hazard map that encompasses several tsunami scenarios. There are studies targeting the Asia-Pacific area because tsunamis propagate in the sea. Large-sized tsunamis are caused by major earthquakes in the ocean. This is the reason that tsunamis are also not equally distributed around the globe. However, tsunamis affect a wider area than the ground-motion of earthquakes, as seen in the tsunami caused by the Sumatra earthquake on December 26th in 2004. Thus, tsunamis are sometimes studied in countries with few or no earthquakes.

A4.4	Volcano	Most volcanoes are also located along the convergent boundary (subduction) zone. This is the reason why volcanoes are also not equally distributed around the globe. Disasters caused by volcanic eruptions are lava flow, pyroclastic flow, lahar, and ash fall. Ash is scattered widely via the prevailing westerlies, but the other disaster types do not have an extensive reach. Regarding volcanic hazard, many investigations and studies are a compilation of areas affected by lava flow, pyroclastic flow, lahar, and ash fall from past volcanic eruptions for each volcano.
A4.5	Cyclone	Research on cyclone and meteorological hazard, and risk assessments have been conducted in ASEAN countries using data on tracks, damaged areas, and storm rainfall. The impact of climate change is also included in this research. Limited information and data available for Brunei Darussalam and Singapore.

3.8.3 Summary of Survey

(1) Floods

Some useful studies on flood hazard, risk, and vulnerability are publicly available presenting assessment results, case studies of countermeasures, as well as different methodological approaches. There are a few types of methodologies to assess risks and vulnerability including, for example, risks involving exposure to flooding events and population density. Vulnerability can be defined as a function of exposure, adaptive or coping capacity, and land-use etc. There are slightly different combinations of these factors with different studies for use. Therefore, these concepts must be defined in advance to plan a methodology for an assessment, in terms of which definitions are to be used in a certain analysis.

A summary of existing studies and reports is shown in Table 3.8.3 by country. A list of collected existing studies and reports is shown in Table 3.8.4.

Table 3.8.3 Summary of Existing Studies and Reports by Country: Flood

Country/Region	Summary of Existing Studies and Reports
ASEAN	There are a few reports that study natural disasters for ASEAN and the Pacific regions at large in recent years. Disaster risks are assessed by scenario, exposure, vulnerability, damage, and loss. An assessment framework is also sought to give an overview of risks, hazard and vulnerability.
Philippines	The National Disaster Coordinating Council administered by the Office of Civil Defense is taking the lead in formulating hazard mapping and assessment. There is a project being implemented in 27 provinces out of total of 80 provinces in the country.

Table 3.8.4 Existing Studies and Research: Flood

No	Country	Province/ City	Coordinates		Risk Assessment		Vulnera-bility Assess-ment	Organiza tion Produced	Document No. in Appendix A4.1
			Latitude	Longitude	Area	Popu-lation			
1	ASEAN	-	-	-	○	○	×	UNISDR/ WB	FL_001
2	Philippines	Quezon City	14.68988	121.0418	○	○	×	ADB	FL_002

Note: ○ indicates the existence of information. × indicates that information was not found in public resources.

(2) Earthquakes

Useful information and studies on earthquake hazard, risk, and vulnerability were collected from resources available in the public domain including websites. The information and studies include methodologies with analysis and assessment.

There is no standardized or authorized methodology for risk and vulnerability assessment. Therefore, the methodology should be selected or updated in accordance with the purpose when risk and vulnerability assessments are required.

A summary of existing studies and reports is shown in Table 3.8.5 by country. A list of collected existing studies and reports is shown in Table 3.8.6.

Table 3.8.5 Summary of Existing Studies and Reports by Country: Earthquake

Country/Region	Summary of Existing Studies and Reports
ASEAN	There are natural hazard assessment reports for ASEAN region created by international organizations like World Bank etc. They summarize frequency, vulnerability, loss, and others subject for each disaster. Some reports describe the methodology and assessment points/items.
Philippines	Many organizations executed earthquake hazard-related investigations and studies for the Philippines. PHIVOLCS publishes hazard maps for earthquakes, liquefaction, tsunamis, volcanoes, earthquake-induced landslides, and ground rupture for 27 high risk states among 80 states in the country. The maps were prepared in the READY Project by the government.

Table 3.8.6 Existing Studies and Research: Earthquake

No	Country	Province/ City	Hazard Assessment			Risk Assessment		Vulnera-bility Assess-ment	Organi-zation Produced	Document No. in Appendix A4.2
			Scena rio	Probabi listic	Method ology	Human Loss	Econom ic Loss			
1	Worldwide	-	×	○	×	○	○	○	UNISDR	EQ_001
2	ASEAN	-	×	○	×	×	×	×	GSHAP, USGS	EQ_002
3	Philippines	-	×	○	×	○	×	×	OCHA-ROAP	EQ_017
4	Philippines	-	○	×	×	×	×	×	PHIVOLCS	EQ_018
5	Philippines	-	×	○	×	×	×	×	USGS, GSHAP	EQ_019

6	Philippines	27 Provinces	○	×	×	×	×	×	PHIVOLCS	EQ_020
7	Philippines	Metro Manila	○	×	○	○	○	○	PHIVOLCS	EQ_021
8	Philippines	Metro Manila	○	×	×	×	×	×	PHIVOLCS	EQ_022

(3) Tsunamis

Useful information and studies on tsunami hazard, risk, and vulnerability were collected from resources available in the public domain including websites. The information and studies include methodologies with analysis and assessment.

There is no standardized or authorized methodology for risk and vulnerability assessment. Therefore, methodology should be selected or updated in accordance with the purpose when risk and vulnerability assessment are required.

A summary of existing studies and reports is shown in Table 3.8.7 by country. A list of collected existing studies and reports is shown in Table 3.8.8.

Table 3.8.7 Summary of Existing Studies and Reports by Country: Tsunami

Country/Region	Summary of Existing Studies and Reports
ASEAN	Tsunami induced by the Sumatra earthquake on December 26, 2004 caused major damage to ASEAN countries. The disaster is summarized by organizations like ADB.
Philippines	PHIVOLCS and other organizations are executing several investigations and studies. PHIVOLCS publishes tsunami hazard maps for 49 states. In addition, PHIVOLCS publishes hazard maps for earthquakes, liquefaction, tsunamis, volcanoes, earthquake-induced landslides, and ground rupture for 27 high risk states among 80 states in the country. The maps were prepared in the READY Project by the government.

Table 3.8.8 Existing Studies and Research: Tsunami

No	Country	Province/ City	Hazard Assessment			Risk Assessment		Vulnera-bility Assess-ment	Organi-zation Produced	Document No. in Appendix A4.3
			track record	Scena rio	Metho dology	Human Loss	Economic Loss			
1	ASEAN	-	○	×	×	○	○	×	ADB	TN_002
2	Philippines	-	×	○	×	×	×	×	PHIVOLCS	TN_009
3	Philippines	27 provinces	×	○	×	×	×	×	PHIVOLCS	TN_010
4	Philippines	49 provinces	×	○	×	×	×	×	PHIVOLCS	TN_011

(4) Volcanoes

Useful information and studies on volcanic hazard, risk, and vulnerability were collected from resources available in the public domain including websites. The information and studies include methodologies for analysis and assessment.

There is no standardized or authorized methodology for risk and vulnerability assessment. Therefore, methodology should be selected or updated in accordance with the purpose when risk and vulnerability assessment are required.

A summary of existing studies and reports is shown in Table 3.8.9 by country. A list of collected existing studies and reports is shown in Table 3.8.10.

Table 3.8.9 Summary of Existing Studies and Reports by Country: Volcano

Country/Region	Summary of Existing Studies and Reports
ASEAN	UNOCHA summarized the scale of the explosion of volcanoes around the Asia-Pacific region using the Volcanic Explosivity Index (VEI).
Philippines	The governmental organization PHIVOLCS has prepared volcanic hazard maps. These maps are prepared for active volcanoes and show the possible expansion area of pyroclastic flow, lava flow, lahar, and ash fall. PHIVOLCS publishes hazard maps of earthquakes, liquefaction, tsunamis, volcanoes, earthquake-induced landslides, and ground rupture for 27 high risk states among 80 states in the country. The maps were prepared in the READY Project by the government. However, there are few states with volcanic hazard.

Table 3.8.10 Existing Studies and Research: Volcano

No	Country	Province/ City	Hazard Assessment			Risk Assessment		Vulnera-bility Assess-ment	Organi-zation Produced	Document No. in Appendix A4.4
			Track record	Scena rio	Metho dology	Human Loss	Economic Loss			
1	ASEAN Asia-Pacific	-	○	×	×	×	×	×	OCHA -ROAP	VE_001
2	Philippines	Each active volcano	×	○	×	×	×	×	PHIVOL CS	VE_003
3	Philippines	Southern Leyte Province	×	○	×	×	×	×	PHIVOL CS	VE_004
4	Philippines	Mt. Pinatubo	○	×	×	×	×	×	USGS	VE_005

(5) Cyclone (Typhoon) and Meteorological Hazard

"Cyclone" is a term to describe many types of of low pressure systems, of which tropical cyclones/typhoons are the main types creating disasters in the ASEAN region. Under the framework of WMO, leading countries implement monitoring/detection of tropical cyclones on a regional basis. Table 3.8.11 indicates the responsible territory allocated to ASEAN members and its leading country.

Table 3.8.11 Members of WMO Tropical Cyclone Committee

	Warning Zones	Members（ASEAN）	Leading Country
Western North Pacific Ocean and South China Sea	0° - 60°(N) 0° - 100°(E)	Cambodia, Lao PDR, Malaysia, Philippines, Singapore, Thailand, Vietnam	Japan
Bay of Bengal and the Arabian Sea	5°S - 45°(N) 30°E - 90°(E)	Myanmar, Thailand	India
South Pacific and South-East Indian Ocean	0°-50°(S) 90° - 170°(E)	Indonesia	Fiji

The dates and information utilized in this report have been acquired from various reports on the studies and research conducted on tropical cyclones and meteorological hazards published on the internet. Collected documents include evaluation results of hazards/risks, as well as their evaluation methods. With regard to tropical cyclones/typhoons, a meteorological organization of each country compiles a summary on the damage situation, including the number of casualties or loss of human lives, and the estimated amount of damage, etc.

A summary of existing studies and reports is shown in Table 3.8.12 by country. A list of collected existing studies and reports is shown in Table 3.8.13.

Table 3.8.12 Summary of Existing Studies and Reports by Country: Cyclone and Meteorological Hazard

Country/Region	Summary of Existing Studies and Reports
ASEAN	Study reports on natural disasters in the whole ASEAN region are available.
Philippines	Approximately, 20 typhoons per year are generated in the Pacific near the Philippines, and 5-7 typhoons land in the Philippines. Typhoon Bopha passed over the Philippine island of Mindanao in December 2012 leaving more than 1,000 casualties and 5.47 million victims.

Table 3.8.13 Existing Studies and Research: Cyclone and Meteorological Hazard

No	Country	Province/ City	Coordinates		Risk Assessment		Vulnera-bility Assess-ment	Organiza tion Produced	Document No. in Appendix A4.5
			Latitude	Longitude	Area	Popu-lation			
1	Philippines							ADPC	CM_001
2	Philippines							ADB	CM_002
3	Philippines							WB	CM_005

(6) Landslides

A summary of existing studies and reports is shown in Table 3.8.14 by country. A list of collected existing studies and reports is shown in Table 3.8.15.

Table 3.8.14 Summary of Existing Studies and Reports by Country: Landslide

Country/Region	Summary of Existing Studies and Reports
ASEAN	There have been a few reports that study landslides for ASEAN and the Pacific region at large in recent years. Disaster risks are assessed by scenario, exposure, vulnerability, damage, and loss. An assessment framework is also sought to give an overview of risks, hazard, and vulnerability.
Philippines	Hazard is distributed throughout the entire country, and high-level hazard areas including the capital Manila and its suburbs are common. The number of landslides per year, total number of deaths, deaths per year, and deaths per year per million people are ranked the highest, while the average annual economic loss is ranked second in ASEAN. Exposure is distributed throughout the entire country, and the area along the Philippine fault is notably high. Assessment of vulnerability for landslides is equivalent to floods. As the number of landslide has been continuously increasing over the past two decades, the decline in forest areas caused by urbanization is deemed to be a related factor. Large-scale hazard map are available in most areas. Rainfall prediction is conducted for the entire country, but there is no monitoring system for landslides yet. UNDP assesses vulnerability on a nationwide scale. Projects for early warning systems, hazard assessment, and landslide monitoring systems are implemented mainly by NDCC, which crosses government organizations.

Table 3.8.15 Existing Studies and Research: Landslide

No	Country	Province/ City	Coordinate		Risk Assessment		Vulnera-bility Assess-ment	Organization Produced	Document No. in Appendix A4.6
			Latitude	Longitude	Area	Popu-lation			
1	ASEAN				○	○	×	UNISDR/World Bank	LS-006
2	ASEAN				○	○	×	EEPSEA	LS-013
3	Philippines	Entire Country	14.619	120.987	○	×	×	PHIVOLCS	LS-005
4	Philippines	Entire Country	14.619	125.106	×	×	○	UNISDR	LS-008
5	Philippines	Guinsaugon	10.333	125.106	○	×	×	ADB	LS-009

Indicates Capital

References:

Flood

1) Arief Anshory Yusuf & Herminia Francisco (2009). Climate Change Vulnerability Mapping for Southeast Asia, Singapore: EEPSEA
2) National Disaster Coordinating Council (2010) Strategic National Action Plan 2009-2019, Strengthening Disaster Risk Reduction in the Philippines: Philippines
3) Renato Solidum (2009) Hazards Mapping and Assessment for Effective Community-based Disaster Risk Management or 'READY' Project: Philippines
4) Shigenobu Tanaka et al (2010). Progress Report on Flood Hazard Mapping in Asian Countries. PWRI.

5) Velasquez, Jerry et al (ed.) (2012). Reducing vulnerability and exposure to disasters: Asia-Pacific disaster report 2012, ESCAP/UNISDR AP
6) World Bank (2011). Advancing Disaster Risk Financing and Insurance in ASEAN Countries: Framework and Options for Implementation, Washington: Global Facility for Disaster Reduction and Recovery
7) World Bank, UNISDR (2010). Synthesis Report on Ten ASEAN Countries Disaster Risks Assessment.

Earthquake

1) JICA, MMDA, PHIVOLCS (2004). Metro Manila Earthquake Impact Reduction Study
2) OCHA-ROAP (2011). PHILIPPINES: Natural Hazard Risks
3) UNISDR (2009). Global assessment report on disaster risk reduction, Risk and poverty in a changing climate

Tsunami

1) ADB (2005). From Disaster to Reconstruction: A Report on ADB's Response to the Asian Tsunami

Volcano

1) Newhall, C.G., Punongbayan, R.S. (eds.), (1997). Fire and mud: Eruptions and lahars of Mt. Pinatubo, Philippines, Philippine Institute of Volcanology and Seismology, Quezon City and University of Washington Press, Seattle, 1126 p.
2) OCHA -ROAP (2011). Holocene Eruption and Selected Volcanoes in Asia-Pacific

Cyclone (Typhoon) and Meteorological Hazard

1) Country Assessment Report for the Philippines. "Strengthening of Hydrometeorological Services in Southeast Asia", Draft for consultation (22 April 2012)
2) ESCAP/WMO Typhoon Committee. (http://www.typhooncommittee.org/)
3) JMA/WMO Workshop on Quality Management in Surface, Climate and Upper-air Observations in RA II (Asia) 2011
4) Status of Implementation and Program/Project Evaluation and/or Assessment Reports (PAGASA)
5) PAGASA. Status of Implementation and Program/Project Evaluation and/or Assessment Reports (http://kidlat.pagasa.dost.gov.ph/PBB/PBB/StatusoIaP.pdf)
6) Typhoon Committee Expert Mission 23-27 April 2012 (2012). Assessment Report of the damages caused by Tropical Storm Washi and Introduction to the Typhoon Committee Disaster Information System
7) Vulnerability, Risk Reduction, and Adaptation to Climate Change Philippines (http://sdwebx.worldbank.org/climateportalb/doc/GFDRRCountryProfiles/wb_gfdrr_climate_change_country_profile_for_PHL.pdf)

8) WMO National Meteorological or Hydrometeorological Services of Members (http://www.wmo.int/pages/members/members_en.html)
9) WMO (2010). First Meeting of the Task Team on "Meteorological, Hydrological and Climate Services for Improved Humanitarian Planning and Response", WMO Headquarters, Geneva, Switzerland (31 August - 2 September, 2010)

Landslide

1) World Bank, UNISDR (2010). Synthesis Report on Ten ASEAN Countries Disaster Risks Assessment
2) World Bank, UNISDR (2011). Disaster Risk Management Programs for Priority Countries- 2nd edition

Figure 3.8.1 Existing Study on Natural Hazards in the Philippines

Chapter 4 Industrial Agglomerated Areas and Investment Risk

4.1 Historical Evolution of Industrial Agglomerated Areas

The failure of protectionist and import substitution policies to provide an efficient mechanism for allocating domestic resources in the Philippine economy resulted in a significant policy shift towards liberalization and export-oriented industrialization. Starting in the 1980s, manufacturing was liberalized by removing tariff and non-tariff barriers. Foreign investment rules were relaxed, and a new Omnibus Investment Code was legislated to simplify the investment incentive system.

To promote export-oriented investment, industrial parks, generally called economic zones in the Philippines, were established through Republic Act No. 7916 (The Special Economic Zone Act of 1995). The Philippine Economic Zone Authority (PEZA) was thereby created in 1995 and tasked to promote investments, extend assistance, register, grant incentives, and facilitate the business operations of investors in export-oriented manufacturing and service facilities inside proclaimed as PEZA economic zones. There were 16 economic zones set up in 1995, of which four were owned and managed by the government (Bataan, Mactan, Baguio City and Cavite Export Processing Zones). The rest were established by the private sector, but operate under PEZA rules.

Since then, the number of economic zones in the Philippines has grown at a rapid pace. As of 31 December 2012, there were over 300 economic zones operating across the country, hosting a total of 2,864 companies and providing direct employment to more than 900,000 workers. The majority of the economic zones are located in Luzon. The economic zones consist of some 65 manufacturing zones, 175 information technology (IT) parks and centers, as well as tourism zones, medical tourism parks and agro-industrial parks.

Economic zones have played a significant role in the Philippine economy, with their share of merchandise exports and total foreign direct investment growing considerably over the years. PEZA statistics show that exports from economic zones dominated the country's commodity exports over the last 12 years. From a 25% share in 1995, PEZA exports accounted 53% of total exports by 2000 and approximately 65% by 2002. In 2012, PEZA exports accounted for 75% of the country's merchandise exports, contributing a total export value of USD 37 billion.

Despite this trend, investments into economic zones have experienced an erratic growth pattern, rising steadily only since 2007. From PHP 52 billion in 1995, investments in economic zones hit close to PHP 312 billion in 2012. Total PEZA investments from 1995 to 2012 topped PHP 2.3 trillion. By product sector, electronics and semi-conductors represented the biggest investments at 45.52% from 1995 to 2011. The other major product sectors are metal and fabricated metal products at 10.33%, information technology at 7.7%, tourism at 6.22%, transport (automotive and shipbuilding) at 5.91%, and electrical machinery and apparatus at 5.08%.

4.2 Recent Trends and Japanese Investment

Japan has been one of the top three foreign investors in the Philippines. The Japanese Embassy in the Philippines revealed that investments from Japan amounted to USD 1.4 billion in 2010, USD 1.9 billion in 2011, and USD 1.7 billion in 2012. The 2011 investment figure was more than five times the level of a decade earlier. Japanese companies are the biggest investors in Philippine economic zones and industrial parks, contributing 33.58% of total PEZA investments from 1995 to 2011. The two other biggest contributors are local investors at 20.89% and US companies at 18.32%.

A number of Japanese companies have also been among the prime developers of Philippine economic zones. Sumitomo Corporation, which co-established the 349-hectare First Philippine Industrial Park (FPIF) in Batangas province in 1996, has announced plans to expand the park by another 100 hectares. Sumitomo owns 30% of FPIF with the majority 70% held by the Lopez group of companies. FPIF also stands out as the only industrial park in the Philippines that is Integrated Management System (ISO 9001:2000, ISO 14001, OHSAS 18001) certified. Marubeni Corporation co-established the Lima Technology Center also in Batangas province, and has more than 90 hectares more room for new investors.

Japan continues to regard the Philippines as a viable investment destination. A survey by the Japan External Trade Organization (JETRO) Manila from October to November 2012 showed that Japanese businessmen believe that Indonesia and the Philippines beat competitors in all industries as the "most profitable" investment destinations in Asia, with 74.4% and 71.9% profitability, respectively. The Philippines presented the least difficulty in terms of acquiring human capital and rated second most favorable market for customs and administrative procedures. However, major challenges remain for Japanese firms in the Philippines, notably the logistical costs and difficulty in securing raw inputs for industry, and the desire of Filipino workers to move overseas.

4.3 Observations from Data Collection

Transparency continues to be a major issue for most industrial parks. Publicly-available information is insufficient, fragmented and often outdated. Many parks have dedicated websites, although with varying levels of comprehensiveness and currency. Other parks do not have any online literature. PEZA industrial parks are generally well managed, and the continued influx of foreign investors to these parks demonstrates this. Given that some industrial park operators, especially of less developed parks, are unwilling to provide investors detailed information or may provide inaccurate information, PEZA is considered to be the most reliable source of industrial park information. PEZA is generally well equipped and willing to support foreign investors.

4.4 General Investment Risk

(1) Political Risk

Philippine politics is characterized by weak civilian political institutions and lack of any genuine political parties, in the sense of offering broad-based policies and coherent overarching political platforms. Politics is personality-led rather than ideology-based, with coalitions forming around presidential candidates. These weaknesses have hindered the ability of successive governments to implement reformist policies addressing the significant economic and social challenges the country is facing, including extreme poverty and widespread corruption. Further, the political system is dominated by powerful political families and there is regular in-fighting between clans over vested interests. The military's periodic interference in politics has added to the instability. Although the armed forces are under civilian control, there has been a history of attempted coups, most recently in February 2006 against former president Arroyo.

The Philippines is a democracy with an executive presidency. The current president, Benigno Aquino, came to power in the May 2010 presidential election, replacing Gloria Arroyo. Aquino's Liberal Party (LP) is the single largest in a coalition. The president serves for a single, six-year term and if unable to serve out his time in office or is forced to resign, will be succeeded by the vice president. The president is also the commander-in-chief of the armed forces.

The LP secured an overwhelming majority in both the House of Representatives and the Senate in the May 2013 mid-term election. Aquino's strong showing in the polls is not surprising, given that mid-term elections are traditionally considered as a referendum of the president's first three years in power. The ruling parties have traditionally been strong in mid-term elections and given Aquino's continuing popularity three years into his presidency, he always had a good chance of increasing his political support base. With a comfortable majority of legislators behind him and more importantly a greater support in the Senate, Aquino is likely to be able to push legislation through more easily. This should in turn ensure smooth rule for the remainder of Aquino's six-year term and further political stability. While prospects for the government's sustained efforts to eradicate corruption have seemingly never been better, implementing the far-reaching reforms likely to be slow and a difficult process.

The strong showing of number of Aquino's political rivals in the May 2013 mid-term election, including former president Joseph Estrada and former first lady Imelda Marcos as well as his incumbent vice-president Jejomar Binay, indicate that the next presidential election in 2016 will probably be tough for Aquino's chosen successor and his/her challengers. With Aquino's rivals already beginning to focus on the next presidential elections and differentiate themselves from Aquino, the president will probably come under pressure to maintain united ranks within his coalition.

(2) Economic Risk

The Philippine economy has evolved significantly from its original agrarian base, primarily through the development of a strong manufacturing base centered on goods processing. The economy has proved very resilient in the face of both external shocks and domestic political uncertainty in recent years. It expanded robustly in 2012 and edged out China as Asia's fastest-growing economy during the first quarter of 2013. We expect 2013 growth to reach 6.6%.

Sustained robust economic growth over the last decade has provided the government with some room for maneuver, allowing it to undertake and implement urgently needed macroeconomic reforms. Comprehensive fiscal reforms starting in 2004, along with the landmark reorganization of value-added tax in 2006, have greatly reduced fiscal imbalances, which in turn have eased debt levels. Continued fiscal consolidation should allow for further stabilization of debt levels, which reduces the economy's vulnerability to shocks.

Since the 1997 Asian financial crisis, the government has maintained a floating foreign exchange system and adhered to a liberal foreign exchange policy. The peso was valued at 42.35/1USD in May 2013, the lowest it has been since August 2012. However, this follows a period of appreciation in late 2012 and 2013. The government has initiated measures to control the rise of the peso, such as the prohibition on foreign funds investing in special deposit accounts, which was introduced in June 2012. Further capital controls would probably only be used as a last resort. In May 2013, the BSP governor said that capital controls were not being considered despite the peso's appreciation.

Meanwhile, as the economy remains sensitive to global trends through exports and remittances from abroad, global uncertainty and moderating growth across all major world economies will increase risks to the country's near-term outlook. With still-gloomy news from the US and particularly the Eurozone, the global economic outlook remains poor. With the outlook for external demand remaining uncertain, the Philippines' already struggling exports are unlikely to see a rapid recovery in coming months. Manufacturing sector growth and investment could also be undermined by the global economic turbulence. The Philippines' domestic consumption is highly dependent on remittances from abroad. Recent history showed that the country's remittances remained resilient to a slowdown in global growth, suggesting that the inflows from overseas Filipino workers, while potentially slowing from its current record levels, will nonetheless continue providing support to household spending. In addition, domestic demand should retain its momentum somewhat, given high government spending and relatively low interest rates. In the event of a downturn, however, additional fiscal stimulus implemented by the Philippine government should soften any potential slowdown.

(3) Legal Risk

The Philippines is considered to be a civil law jurisdiction. The legal system is primarily based on Spanish and US models, with laws affecting commerce derived mainly from the US. Under the constitution, the Supreme Court, which is the country's highest court, has the primary judicial power.

The system is slow and cumbersome, and even simple court cases normally take years to complete due to understaffing and an insufficient number of judicially competent personnel. The Philippines is a member of the International Centre for the Settlement of Investment Disputes (ICSID), and has also signed the Convention on the Recognition and Enforcement of Foreign Arbitrage Awards. Nonetheless, it has been reported that the Philippine courts have been disinclined to comply with the arbitration processes in some instances.

There are also perceived to be high levels of corruption in the legal system, with a lack of impartiality on the part of judges affecting foreign investors' confidence in the system. Foreign investors have regularly expressed concerns regarding the impartially of judges in disputed cases over contracts and property rights. President Benigno Aquino has pledged to reform the judiciary and improve its transparency and independence, but his administration's efforts have faced opposition from a court system dominated by supporters of the former president, Gloria Macapagal-Arroyo.

Foreign entities can conduct business in the Philippines by means of the following vehicles: corporations, partnerships, sole proprietorships, branches, representative offices or regional headquarters. Corporations are governed by the Corporation Code of the Philippines. The Foreign Investments Act of 1991 (also known as Republic Act 7042) is the basic law that describes the processes by which non-Philippine nationals can invest and conduct business in the country. The act opened most enterprises to 100% foreign-equity participation and simplified registration procedures for foreign investment. The Omnibus Investments Act of 2000 set the amount of capital which foreign companies must invest in order to qualify for incentives at USD 25 million.

(4) Tax Risk

The tax system in the Philippines is complicated and highly inefficient, with tax evasion common among local companies. Previous reform efforts have included an expanded value-added tax (E-VAT) bill, introduced in 2005, which subsequently increased VAT from 10% to 12% in February 2006. The former Arroyo government also raised corporate income tax from 32% to 35%, but in January 2009 this was reduced to 30% in a bid to make the Philippines more attractive to foreign investors. Although measures to improve revenue collection, such as pre-auditing income and corporate taxes, have improved efficiency, the implementation of the 2005 law has also increased taxpayer exemptions, thereby cutting revenues.

Corruption remains a major hindrance to the efficient functioning of the Philippine Bureau of Internal Revenue, and as a result, the Philippines is among the worst countries in the world for discriminate application of the tax law. In order to tackle these challenges, President Aquino instigated a high-profile campaign against tax evasion in 2010, including the Run After Tax Evaders (RATA) and Run After the Smugglers (RATS) program to improve the tax efficiency. According to the Department of Finance, tax collection increased in 2012 to 12.8% of GDP from 11.8% in 2011, but still short of the government's target of 13.2% for the year. Further strengthening of the taxation system is thus essential to increase government revenues and investor confidence.

Some tax exemptions or holidays may be available to companies, domestic and foreign, which are registered with the Board of Investments (BOI) under the 1987 Omnibus Investment Code. Enterprises in Special Economic Zones (SEZs) may be granted the right to a 5% tax on gross income instead of being subject to all local and national taxes. Income tax holidays are also available for investments in the SEZs. The Philippines has concluded some 40 tax treaties which may bring the rates down further.

(5) War Risk

The Philippines has territorial disputes with Brunei, China, Malaysia, Taiwan and Vietnam over several islands in the South China (West Philippine) Sea. These include the Spratly Islands and Scarborough (Panatag) Shoal. Except Brunei, all the countries have troops in the area. Offshore energy reserves exacerbate the dispute. Reserve estimates range from 28 to 213 million barrels of oil and at least 3.79 trillion cubic meters of undiscovered conventional gas in the South China Sea area. In March 2009, the Philippines passed a law that recognized parts of the Spratly Islands as its territory. In July 2012, the Philippines invited tenders for three oil blocks; two of which are in disputed waters. The response was limited and predominantly from domestic companies.

The Philippines and China have increased paramilitary patrols in the South China Sea as disputes over oil exploration and fishing rights have escalated. Both countries are likely to demonstrate their ability to maintain sovereignty through assertive paramilitary action, making sporadic skirmishes and boarding a high risk in extreme cases. In April 2012, the Philippines Navy boarded Chinese fishing vessels at Panatag (Scarborough) Shoal for alleged illegal fishing. Although fishing vessels are most likely to be affected, commercial vessels face an elevated risk of being targeted. In March 2011, Chinese paramilitary vessels encircled a Forum Energy oil exploration ship contracted by the Philippines off the coast of Palawan.

President Aquino has sought Western military and diplomatic support, particularly from the US, to counter China's claims in the South China Sea and its superior military. In July 2012, the US government agreed to help the Philippines military achieve 'minimum credible defense'. In February 2013, the Japanese government announced it would give the Filipino coast guard 10 new patrol boats, as it recognized China as a common threat. However, the desire among all the countries involved in the South China Sea dispute to maintain regional stability means that the dispute will probably be resolved diplomatically rather than lead to further military escalation.

The Philippines also has an unresolved dispute with Malaysia over the status of Sabah. The government has tried to persuade the Malaysian government to bring the dispute to the International Court of Justice for resolution. The dispute escalated in February 2013 when around 200 Filipino militants of the self-proclaimed Royal Sulu Sultanate Army crossed into Sabah, claiming the state as its territory. Despite opposition criticism, it is unlikely President Aquino will call for any military action against Malaysia. Rather, Aquino accepted the Malaysian account of the incident and called for a full investigation.

(6) Terrorism Risk

The Abu Sayyaf Group (ASG) is an Islamist militant group that is primarily active in the southern islands of Jolo, Basilan and Mindanao. ASG's capability has been heavily reduced, primarily due to the death or capture of most of its leaders. We assess that ASG has shifted its focus away from major attacks, such as the 2004 passenger ship bombing in Manila Bay. ASG militants are more likely to attempt kidnappings and extort businesses, which is much more lucrative for them. In June 2013 ASG militants released a Filipino-Chinese businessman after holding him captive 14 months in Jolo, Sulu.

The Moro Islamic Liberation Front (MILF) is a militant group engaged in an insurgency primarily in the districts of North Cotabato, Maguindanao, South Cotabato and Sultan Kudarat. In October 2012, the government and MILF representatives signed a framework agreement peace deal that is envisaged to eventually lead to a semi-autonomous region in Mindanao. Some splinter groups, including the Bangsamoro Islamic Freedom Fighters (BIFF) and Moro National Liberation Front (MNLF), have refused to accept the peace deal and are likely to continue small arms attacks. While commercial assets and foreign individuals are unlikely to be specifically targeted, some collateral damage to property and loss of life to bystanders is probable. In February 2013, MNLF-backed militants unsuccessfully invaded Sabah in Malaysia, which was probably an attempt to demonstrate the group's influence. President Aquino's February 2013 visit to a MILF camp indicates that the peace deal is progressing strongly, but the Sabah incursion will probably delay any conclusion as it will probably force the government to incorporate the MNLF into its peace deal. Fighting is likely to resume if the peace negotiations break down, which has happened previously. In this case, MILF fighters would primarily target security forces, government buildings, cargo used to support government-sponsored construction activity and telecom assets in Mindanao.

The communist New People's Army (NPA) is most active and capable in Mindanao. The group is likely to target security forces, mining assets, construction sites, mobile phone towers, power assets and foreign agricultural firms. Firms will probably be targeted for refusing to pay 'revolutionary taxes'. When perimeter security is breached, arson and IEDs are often used. In the NPA's most complex and coordinated attack, the compounds of Taganito Mining Corporation, Taganito HPAL Nickel Corporation and Platinum Group Metals in Claver City were attacked in October 2011. Over USD 60 million worth of damage was caused, three security personnel were killed and several employees were taken hostage. In February 2013, NPA militants simultaneously attacked a Del Monte Philippines Inc. warehouse and a Dole Philippines Inc. plantation in Bukiodon, killing one person and causing about UDS 700,000 in damages.

(7) Civil Unrest Risk

Protests in the Philippines occur frequently and are motivated by a wide range of issues. Anti-mining groups are strengthened by support from the Catholic Church as well as some local politicians, both of which sometimes organize protests. In April 2012, four Catholic prelates in South Cotabato urged

the government to maintain its ban on open-pit mining at the Tampakan gold and copper project owned by a local affiliate of Glencore Xstrata. In Nueva Vizcaya province, the govenor has contested several mining projects, including Metals Exploration plc's Runruno village project. Anti-mining protests are likely to occur in Palawan, Marinduque, Oriental Mindoro, Misamis Oriental, Mindanao, Cagayan and Caraga. These protests are generally peaceful and are unlikely to result in damage to property, although protesters do use roadblocks on occasion.

Politically-motivated protests are likely in Manila. Protests in 1986 and 2001, led to the removal of former presidents Ferdinand Marcos and Josef Estrada respectively. Further protests are likely to be motivated by particular political issues, such as the Reproductive Health Law, rather than calling for the removal of President Aquino. Protests will probably take place in Manila's Makati central business district, near Congress, or in the Pasig district, but will pose a low risk to property and bystanders, and usually only last for a day. In July 2012, 5,000 left-wing activists demonstrated outside the Congress building to oppose President Aquino's speech to the nation. The protest was largely peaceful, with some fighting with police.

The continuing confrontation with China over the Panatag (Scarborough) Shoal territorial dispute has spurred anti-Chinese demonstrations such as in May 2012, when 1,000 anti-Chinese protesters gathered in Manila. There is also rising opposition to the US military presence in the Philippines. In April 2012, 2,000 people protested against a joint Philippines-US military exercise in Zamboanga City. In February 2013, a few hundred people protested outside the US embassy in Manila following the grounding of a US Navy minesweeper at Tubbataha Reef. Both anti-Chinese and anti-American protests involve burning effigies and scuffling with police, but are generally peaceful, with minimal property damage.

Another cause of protests is reactions to international incidents that are perceived as insulting Islam. Protests in response to such incidents are likely to be peaceful and will probably take place in Mindanao and Metro Manila, particularly in the Pasay City neighborhood. In September 2012, 3,000 people demonstrated and burned US and Israeli flags in Marawi, Mindanao, after an anti-Islam film was uploaded to YouTube.

Although strikes were common in the 1980s, they have decreased substantially since the government implemented a conciliation program and set up the National Conciliation and Mediation Board (NCMB) in 1987. From a record high of 581 factory strikes in 1986, the number fell to fewer than 10 strikes each year from 2007 to 2011. In 2012, just three strikes, or 1.4% of the 207 strike notices filed before the NCMB, were carried out. Stable industrial relations have consequently significantly reduced the risk of violent labor-related conflicts that could pose a danger to company personnel and property. In May 2013, Coca-Cola Bottlers Philippines Inc. workers went on a three-day strike that ended following an amicable settlement. The decrease in strikes reflects the general decline of militancy in organized labor and an improvement in economic conditions for workers. In addition to NCMB conciliation efforts, clearer government policy, better labor law enforcement and companies' greater familiarity with collective bargaining have also helped reduce industrial action. In March

2013, President Benigno Aquino signed two laws seen to further enhance industrial peace. The first law, declared tripartism in labor relations as a state policy, allowing employers and workers to become part of policy-making bodies of the government. The second law, which amends the Labor Code, mandates mandatory conciliation of all issues arising from labor disputes. While labor laws apply equally in special economic zones, few unions operate there and industrial action is less likely.

(8) Infrastructure Risk

The Philippines' infrastructure lags behind several regional competitors, with infrastructure problems regularly cited as a deterrent to businesses operations and investment.

Air: The Philippines has more than 85 airports, with main international entry points into the country located at Manila (Ninoy Aquino International Airport) and Cebu (Mactan International Airport). Air travel is an important form of travel in the Philippine archipelago, and has experienced strong growth, both in terms of passenger traffic and cargo volumes, over the past decade.

Road: The road network is fairly extensive but is badly maintained in many regions and regularly cited as a deterrent to investment. Connections to industrial areas and special investment areas tend to be better. A sky-road in the capital, Manila, has provided slight relief for the city's gridlock, but more needs to be done for improvements to be felt. Outside Manila, new roads are being constructed, but these are unlikely to improve the situation in the short term.

Rail: The majority of the country's rail system is in need of modernization and essential upgrading. The government is seeking to expand and rehabilitate the rail system, which is suffering from general degradation as part of its bid to reduce the burden on the country's congested road network and spur economic growth through infrastructure development. The state-owned Philippine National Railways (PNR) operates commuter and long-distance services on Luzon. The only operating railway line, South Rail, runs from Manila to Naga in southern Luzon. The Metro Rail Transit Authority (MRT) and Light Rail Transit Authority (LRT) operate elevated light-rail lines in Metro Manila, which is a quick and inexpensive way of travelling in the capital and surrounding area.

Maritime: Being an archipelago, the Philippines has more than 1,000 ports, of which 117 are designated international ports with 12 of them having major cargo and passenger terminals. The main maritime gateway to the Philippines is the Port of Manila. A number of cities such as Batangas, Cagayan de Oro, Cebu City, Davao City, San Fernando, Subic Bay Freeport, Zamboanga, Matnog, Allen, Ormoc, and Dalahican have ports that are part of the so-called Strong Republic Nautical Highway, allowing land vehicles to use a 24-hour Roll-on Roll-off (Ro-Ro) ship service linking the country’s different islands at minimal cost. The Philippines has a number of privately controlled ports, which tend to handle international trade while government-controlled ones handle domestic trade.

Waterways: The Philippines has 3,219km of inland waterways, only accessible to shallow-draft vessels of up to 1.5m draught. The country's longest river is the 350-km Cagayan River on Luzon.

The 25-km Pasig River is the Philippines main internal waterway running from Manila Bay through the capital to Laguna de Bay, which is the country's largest freshwater lake.

Communications: Telecommunications links have improved rapidly in recent years. Fixed-line connections are up, and the market for mobile telephones has boomed. Foreign investment has helped boost capacity and coverage. Most telecommunication services can be obtained by businesses in all but the most remote parts of the country. The fixed-line sector consisted of 4.1 million lines in 2009, representing a penetration level of approximately 4.5%. Meanwhile, mobile subscribers amounted to 88.6 million at the end of 2010, equating to 94.6% of the population. There were also an estimated 33.6 million Internet users as of December 2011, amounting to a penetration level of 33%.

Utilities: The country used to be renowned for its power cuts, or "brownouts." These have been reduced sharply, although they still occur periodically, even in the economically important island of Luzon.

4.5 Industrial Agglomerated Areas and Natural Disaster Risk

Several distribution maps are shown overlaying natural disaster risk as follows. List of industrial agglomerated areas are attached at the end of this report.

Figure 4.5.1 Distribution of Industrial Park in the Philippines

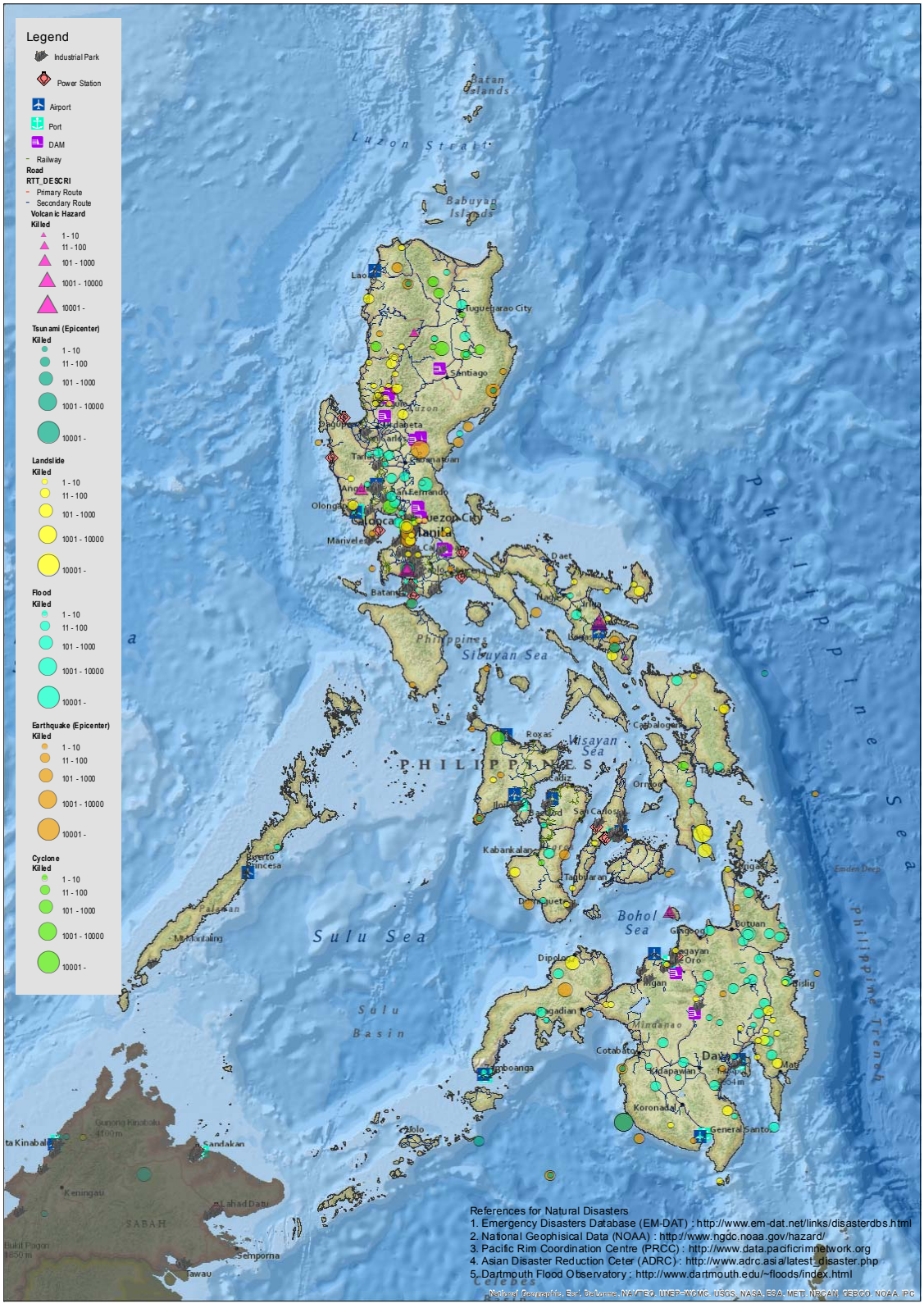


Figure 4.5.2 Distribution of Industrial Park, Major Infrastructures and Natural Hazards on number of killed in the Philippines

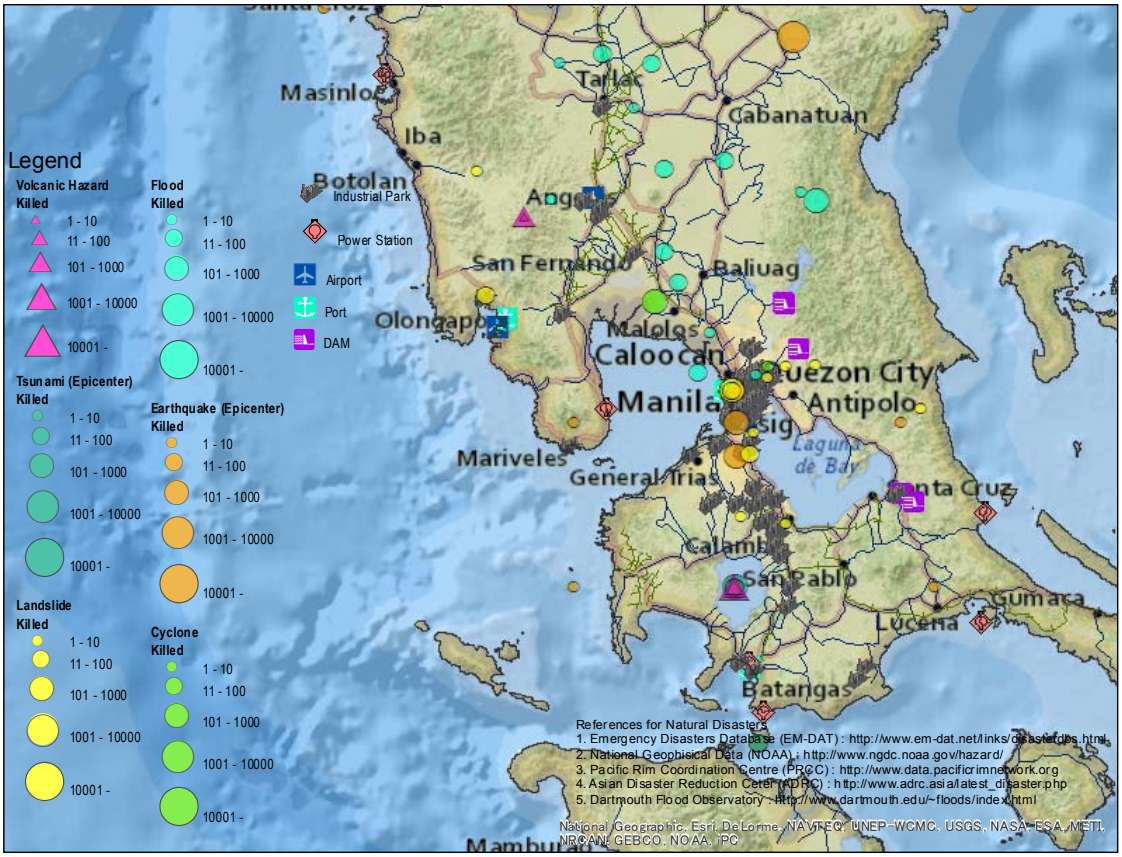


Figure 4.5.3 Distribution of Industrial Park, Major Infrastructures and Natural Hazards on number of killed in and around Metro Manila

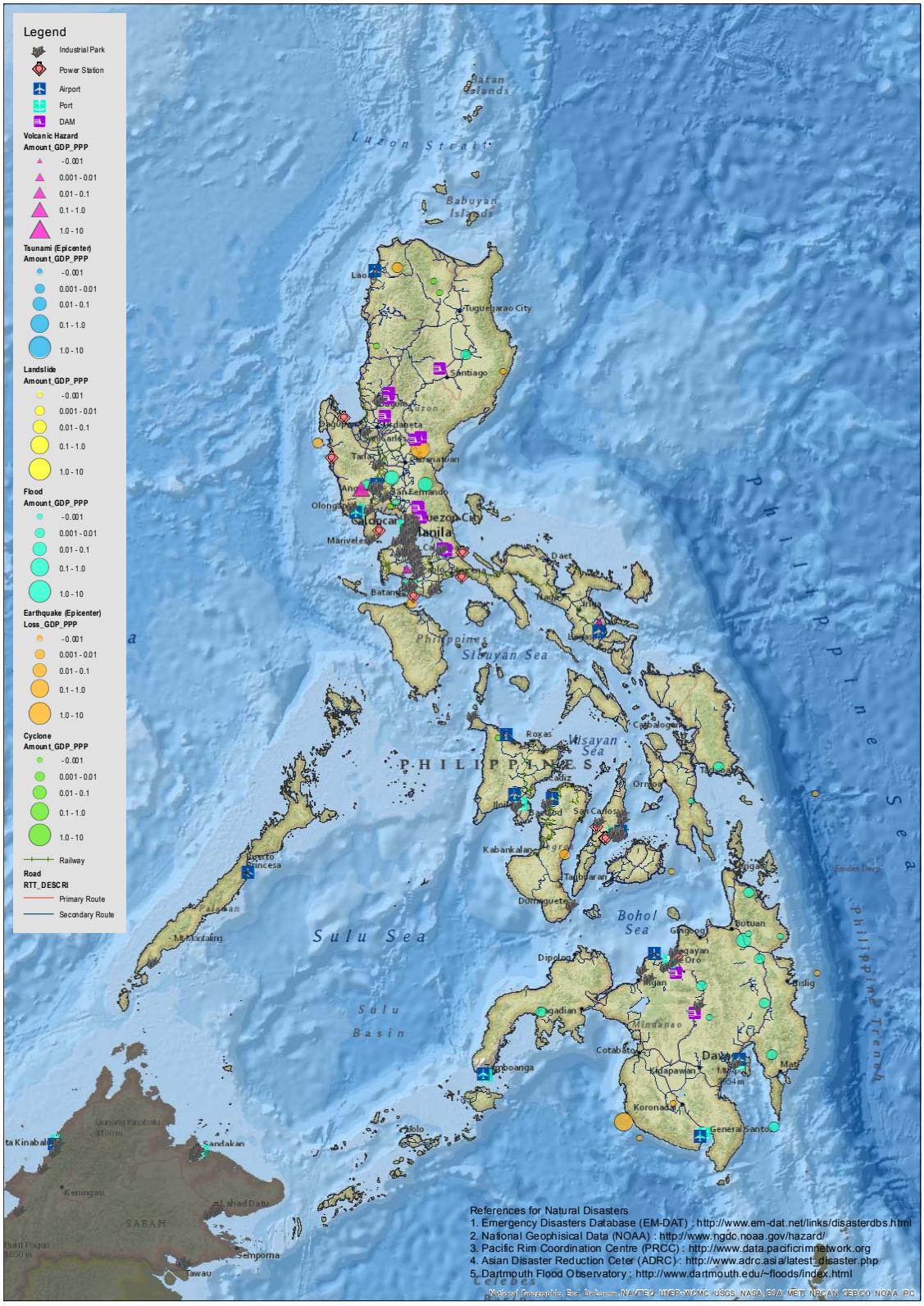


Figure 4.5.4 Distribution of Industrial Park, Major Infrastructures and Natural Hazards on loss rate to GDP in the Philippines

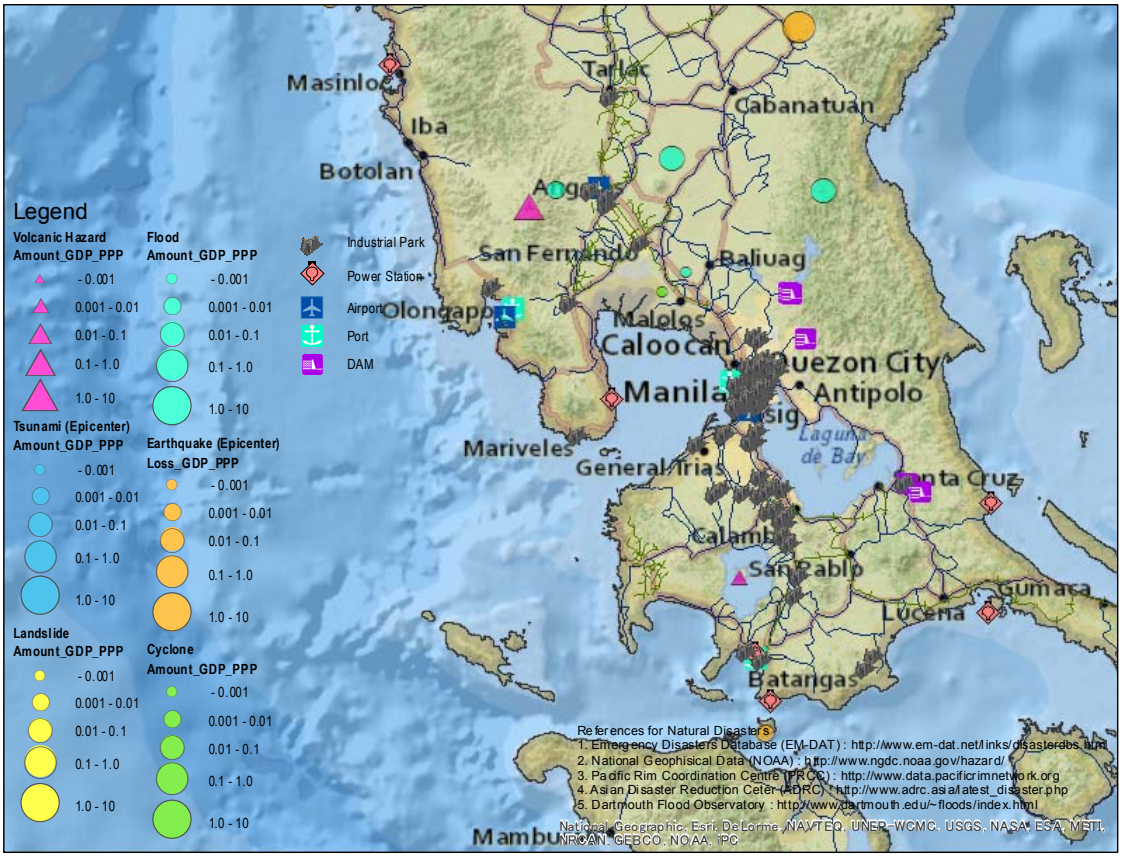


Figure 4.5.5 Distribution of Industrial Park, Major Infrastructures and Natural Hazards on loss rate to GDP in and around Metro Manila

Chapter 5 Relevant Infrastructure and Natural Disaster Issues

5.1 Infrastructure Conditions

5.1.1 Roads

The length of ordinary national roads is about 31,700 km, and the total road length including local roads is about 200,000 km. The superhighway (or toll road) is about 200 km in total, but its development is delayed. The proportion of paved roads is 80%, even for ordinary roads, and 100% for the Manila Metropolitan area. But this ratio drops to 23% when including local roads, which cannot be considered sufficient. It is pointed out that even if roads are paved, there is a lack of maintenance and also a lack of painted lines separating traffic.

If including the suburbs of the Manila Metropolitan area, the population has already reached 21,290,000 (in 2011), and the population density is about 3 times that of Tokyo. However, the transportation network needed to support the population is still at an insufficient level.

Although it is improving gradually by the development of annular/radiating roads and superhighways etc., traffic congestion is still a serious issue.

Although transportation has been gradually switching over to rail transportation after the introduction of a railway traffic system, the traffic system of the Metro Manila area still generally dependent on road traffic. Road traffic routes include the South Luzon Expressway (SLEX) and Metro Skyway which connect southern Metro Manila to the Province of Laguna, and the Manila-Cavite toll road which connects southern Metro Manila to the Province of Cavite and the Subic-Clark-Tarlac Expressway in the northern Manila.

The only route of the Asian Highway in located in the Philippines is AH26 from northern Luzon to southern Mindanao Island.

Table 5.1.1 Current Condition of Asian Highway

Route	Total Extension	Paved Road	Unpaved Road (Gravel Road)	Ferry	Basis of Selection
AH-26	3,517 km	2,979 km	388 km	150 km	Industrial estate/agricultural area connection Major port road
Ratio	100 %	84.7 %	11.0 %	4.3 %	

Source: Ministry of land, infrastructure, Transport and Tourism, Asian Highway Database

5.1.2 Ports

Since the Philippines is an island country, it has as many as 2,450 ports, of which 1600 ports are public ports owned by the central and local governments, 1600 ports are privately owned, and the remaining 420 ports are fishing ports.

All the ports except fishing ports, Cebu port, and Subic port are under the management of the Philippine Ports Authority (PPA), which is under the Department of Transportation and Communication (DOTC).

The cargo throughput at PPA ports in 2011 was 178.3 million tons, and a total volume of containers was 4.93 million TEUs. The cargo throughput has remarkably increased since 2009. The throughput of Manila port, which is the largest in the Philippines, accounts for about 30% of the total.

Table 5.1.2 Cargo Throughput, Passenger and Ship Call

		2011	Growth Rate (%) (From 2010)
Cargo (ton)		178,278,562	7.14
	Domestic	74,171,940	6.27
	Foreign	104,106,622	7.77
	Import	53,354,108	-3.22
	Export	50,752,514	22.39
Container (TEUs)		4,932,492	9.67
	Domestic	1,923,666	17.31
	Foreign	3,008,826	5.29
	Import	1,502,878	4.11
	Export	1,505,948	6.48
Passenger (numbers)		49,485,001	-6.10
	Domestic	49,434,551	-6.09
	Foreign	50,450	-21.20
Ship Call		341,455	-1.31
	Domestic	330,577	-1.38
	Foreign	10,878	0.74

Source: PPA, Annual Report 2011

5.1.3 Railways

(1) Summary

One (1) Philippine National Railway (PNR) line and three (3) Rapid Transit Lines are running.

(2) Philippine National Railway (PNR)

Due to the maintenance of road networks, natural disasters, decrease of passengers etc., the railway currently operates in only four (4) directions from Metro Manila. This service is called Commute Express or Commex. 47,000 passengers are carried by 24 cars.

Table 5.1.3 Operational Conditions of PNR

Line	Section length	Operation	Remarks
Manila-Legazpi	474 km	one-round trip per day	Bicol Train

Manil-Naga		2 per day	One way
Manila-Binan	40 km	one-round trip per day	Commuter train
Manila-Alaban		23 round trips per day	

Source: JBIC, Investment Environment of Philippines 2013

(3) Rapid Transit Line

In Metro Manila, there are No. 1 line and No. 2 line of LRT (Light Railway Train), and No.3 of MRT (Metro Rail Transit). LRT is under the Light Rail Transit Authority (LRTA), and MRT is under management of the Department of Transportation and Communications (DOTC). The Metro Rail Transit Corporation (MRTC) is in charge of management. There is almost no increase in passengers

Table 5.1.4 Outline of Rapid Transit Lines

Name	Length (km)	Start Year	Station	Average Passenger	Operation interval at rush hour
LRT1	18	1985	20	About 470,000 people/day	1 in 1 minute
LRT2	13	2004	11	About 200,000 people/day	1 in 5 minutes
MRT3	17	2000	13	About 500,000 people/day	1 in 3 minutes

Source: JBIC, Investment Environment of Philippines 2013

Table 5.1.5 Passengers (million people)

Name	2010	2011
LRT1	155.87	156.66
LRT2	63.36	63.83
MRT3	153.15	158.81
Total	372.38	379.30

Source: LRTA and DOTC / Metrostar Express

5.1.4 Airports

In the Philippines, ten (10) international airports are located in Manila, Cebu, etc., and 75 airports are used only for domestic flights. The government organization with jurisdiction is the Civil Aviation Authority of the Philippines CAAP), which is under the DOTC and manages all airports except the four (4) international airports of Manila, Mactan Cebu, Clark, and Subic Bay, which are managed by the following organizations:

1) Manila International Airport Authority (MIAA),
2) Mactan Cebu International Airport Authority (MCIAA),
3) Clark International Airport Corporation (CIAC), and
4) Subic Bay Metropolitan Authority (SBMA).

At all airports and airspace, CAAP carries out air-traffic control.

Note: NAIA: Ninoy Aquino International Airport

Table 5.1.6 Passengers, etc. in International Airports 2009

International Airport	Passengers (in thousands)	%	Caro Throughput (in thousand tons)	%	Aircraft departures/landings	%
NAIA	11,203	88.5	238	62.8	64,356	86.3
Mactan Cebu	852	6.7	13	3.4	6,452	8.6
Clark	559	0.25	128	33.8	2,613	3.5
Davao	32	0.08	0.08	0.02	566	0.8
Laoag	10	0.01	0.1	0.02	184	0.2
Kalibo	1.7	0	-	-	350	0.5
Tsguegarao	0.8	0	0.06	0.01	-	-
Subic	-	-	-	-	-	-
Total	12,659	100	379	100	74,547	100

Source: Ministry of Land, Infrastructure, Transport and Tourism, Transportation Situation of the Philippines 2011

Table 5.1.7 Passengers, etc. in Domestic Airports 2009

Domestic Airport	Passengers (in thousands)	%	Caro Throughput (in thousand tons)	%	Aircraft departures/landings	%
NAIA	12,680	45.2	183,274	53.7	121,310	41.9
Mactan	3,515	12.5	27,877	8.2	34,202	11.8
Davao	1,927	6.8	34,171	10.0	14,816	5.1
Iloilo	1,324	4.7	9,330	2.7	12,252	4.2
Cagayan de Oro	-	-	16,163	4.7	10,404	3.5
Bacolod	1,044	3.7	11,674	3.4	9,676	3.3
General Santos	-	-	9,522	2.8	-	-
Tacloban	830	2.9	-	-	8,758	3.0
Pto.Princesa	584	2.1	5,439	1.6	6,292	2.2
Zamboanga	582	2.0	7,690	2.2	7,424	2.6
Tagbilaran	-	-	5,097	1.5	-	-
Caticlan	500	1.8	-	-	14,530	5.0
Total	28,021	100	340,879	100	289,558	100

Source: Ministry of Land, Infrastructure, Transport and Tourism, Transportation Situation of the Philippines 2011

5.2 Public Services

5.2.1 Electricity

Electricity generation in the Philippines depends about 34% on coal and 28% on natural gas, 15% on geothermal, 12% on hydropower, and 10% on fossil fuels.

Table 5.2.1 Percentage of Energy Sources in 2010

Source of Power Generating Energy	Produced Electricity (GWh)	Share (%)
Coal	23,301	34.4
Natural Gas	19,518	28.2
Geo Thermal	9,929	14.7
Hydro	7,803	11.5
Oil	7,101	10.5
Wind	62	0.1
Biomass	27	0.04
Sunlight	1	0.001
Total	67,743	100

Source: Philippine Investment Environment 2013.6

The broad-based power failure lasting for up to 8 hours, which occurred in Luzon in May, 2013, was the warning needed by the government to increase the estimated electric power demand.

In Luzon, only one new main power plant has been built during the past 10 years. Many of the existing power plants were built during the electric power crisis 20 years ago.

The National Power Corporation (NPC) is in charge of power generating operations and the contracting of Independent Power Producer (IPP), etc.

If the relation between the fundamental electric power demand and supply in the Philippines is reviewed, an increase in the electric power supply capacity will be necessary by 2020, even if it is enough at present.

Table 5.2.2 Situation of Electricity in the Philippines

	Luzon	Visayas	Mindanao	Total
Electricity Generating Capacity Installed (MW: 2010)	11,981	2,407	1,971	16,359
Electricity Generating Capacity Dependence (MW: 2010)	10,498	1,745	1,658	13,901
Expected Demand in 2013	8,577	1,747	1,472	11,796
Expected Demand in 2020	21,181	3,367	3,051	27,599

Source: Ueno Green Solutions, Investigation about the spread of solar hybrid systems in newly emerging countries and Pacific island countries

5.2.2 Water

(1) Water supply

About the water supply business, various government organizations are related and the organizations have played their own roles

Table 5.2.3 Main Government Organizations for Water Supply Services

National Economic and Development Authority: NEDA
National Water Resource Board: NWRB
Department of Public Works and Highways: DPWH
Local Water Utilities Administration: LWUA
Metropolitan Waterworks and Sewerage System: MWSS
Department of Interior and Local Government: DILG
Department of Health: DOH

Source: Ministry of Health, Labor and Welfare, International Water Promotion Report 2012.3

Although water supply services cover 88 million people throughout country, the access rate to safe water is 83%. The lowest area is 48% in the Muslim Mindanao Autonomous regions. The diffusion rate of water supply service itself is 53.2%, and the length of pipeline is 60,800 km.

The improvement of sanitary facilities still lags and the non-revenue rate of the water supply services is over 50%.

The access rates to water supply facilities and sewerage facilities are shown below.

Table 5.2.4 Access Rate to the Water Supply facilities in the Philippines 2010

Type		Urban Area (49% of Population)	Rural Area (51% of Population)	Total
Water Supply	Broad Definition	93	92	92
	Connection with Homes	61	25	43

Source: Wikipedia, Water supply and sanitation in the Philippines

(2) Sewerage

The pollution of the rivers and lakes in urban areas is a big issue. However, the amendment of the Philippine Clean Water Act in 2004 was a turning point in changing the water management of the Philippines.

In Manila, the diffusion rate of the septic tanks has reached 75-85% including portable toilets, but the rate is 40% for the whole country.

Although the septic tank BOD reduction rate is 30-60%, and it is comprehensible that septic tanks have contributed to the treatment of domestic wastewater to some extent, they are not effective overall because urban waste water has not been properly treated. The area for which the wastewater is properly treated is only 5%, even in Manila.

Table 5.2.5 Access to Sewerage Facilities in the Philippines in 2010

Type		Urban Area (49% of Population)	Rural Area (51% of Population)	Total
Sewerage	Broad Definition	79	69	74
	Connection with Homes	7	2	5

Source: Wikipedia, Water supply and sanitation in the Philippines

5.2.3 Communication

(1) Summary

In the Philippines, the diffusion rate of fixed-line telephones is low; therefore, their dependence on wireless communication, especially mobile phones, is high, which is related to the quick spread of the Internet. As for communications businesses, two companies, Philippine Long Distance Telephone Company (PLDT) and Glove Telecom, monopolize the market. The National Telecommunications Commission (NTC) performs regulation and control of the telecommunication business.

(2) Fixed-line and mobile phones

In the Philippines, there are few subscribers to fixed-line phones. There are about 3.55 million subscribers with a diffusion rate of 3.8% as of 2011. The geographical conditions of the country, which consists of island groups, affects the situation greatly. On the other hand, there are 94 mobile phone subscribers. The diffusion rate is 99.3%, with one mobile phone per person. Smart phone usage is expected to increase greatly in the future.

(3) Internet

In 2011, there were 5.2 million internet subscribers, with a diffusion rate of 5.5%. There are 1.8 million broadband subscribers, with a diffusion rate of 1.9%. Although Internet usage is growing steadily, the spread of broadband is not progressing because of the high monthly fees.

The main Internet sites in the Philippines are: 1. Facebook.com, 2. Google Sites, 3. Yahoo Sites, 4. Wikimedia Foundation Sites, and 5. Microsoft Sites. The devices used to access the internet are: 61% desktop PCs, 28% laptop PCs, and 3% mobile devices.

(4) Broadcasting

Terrestrial television broadcasting is offered by three (3) commercial broadcasting companies: ABC-CBN, GMA, and ABC, and three (3) government-controlled broadcasting stations: People's TV, Solar TV, and IBC. Cable TV is offered by more than 1000 companies.

5.2.4 Waste

The solid waste (urban garbage) generated in the Philippines in 2005 was estimated to be about 24,000 tons/day, of which 6000 tons/day was generated in Metro Manila. From this, it can be extrapolated that about 29,000 tons/day and about 10.49 million tons per year of waste was generated in 2010.

The national average collection rate of solid waste is only 40%, and even main cities are collecting only 70%.

Measures to reduce and recycle solid waste have started based on sorted trash collection in the urban area, and the shift from open-type disposal landfills to the sanitary landfills, in which water from the disposal site is to be treated, is gradually being implemented. However, the country does not have a systematic solid waste collection system, and illegal disposal and disposal in open-type landfills is conducted. Also resource recovery is conducted informally.

In Metro Manila, the dispersion of solid waste in urban areas has been decreasing because solid waste collection operations have been contacted to the private sector.

According to the investigation of the composition of household waste at six barangays in Cebu City by Ms. Edna Gapuz of the Environment Management Office performed in 2011, the average composition is shown in the following table. The largest amount of solid waste is organic matters like food, followed by plastic and paper.

Table 5.2.6 Composition of Household Waste

Type	Share %
Bio	57
Plastic	18
Paper	12
Glass	6
Metal	3
Wood	2
Other Waste	5

Source: UNEP/ Edna Gapuz, Waste Plastic to Fuel Project in the Philippines

5.3 Natural Disaster Issues

About 20 typhoons are generated in the surrounding ocean of the Philippine Islands every year, and about five (5) seasonal typhoons pass Luzon every year, causing serious damage in the country. The country is in what is called a Pacific Ocean typhoon belt.

Moreover, the volcanic zone of the Pacific Rim, which runs in a north-south direction, make up the geographical environment of the Philippines. Earthquakes and volcanoes are easily generated due to the "Ring of Fire" phenomenon.

Since tsunami occurs due to earthquakes, it may hit coastal areas. It may be generated in the Philippine Trench on the east side, and also it may be generated in the Manila Trench in the west side.

There are many mountain ranges, where landslide disasters, flash floods, and flood disasters are caused by the storm rainfalls of the monsoon.

If you look at the natural disaster situation in Philippines, it turns out that almost all natural disasters occur, as is the case in Japan, and cause serious damage every year. Recently, a M7.8 earthquake in 1990, the eruption of the Pinatubo volcano in 1991, and the typhoon Ondoy in 2009 were listed.

Based on this, countermeasures against natural disasters should be planned. Earthquakes may occur in places where floods do not, and ash fall caused by volcanic eruptions may be experienced. In the Philippines, roads, buildings, railways, lifelines, and industrial estates can be impacted by disaster at any point. Therefore, disaster risks must be ranked and caution must be observed.

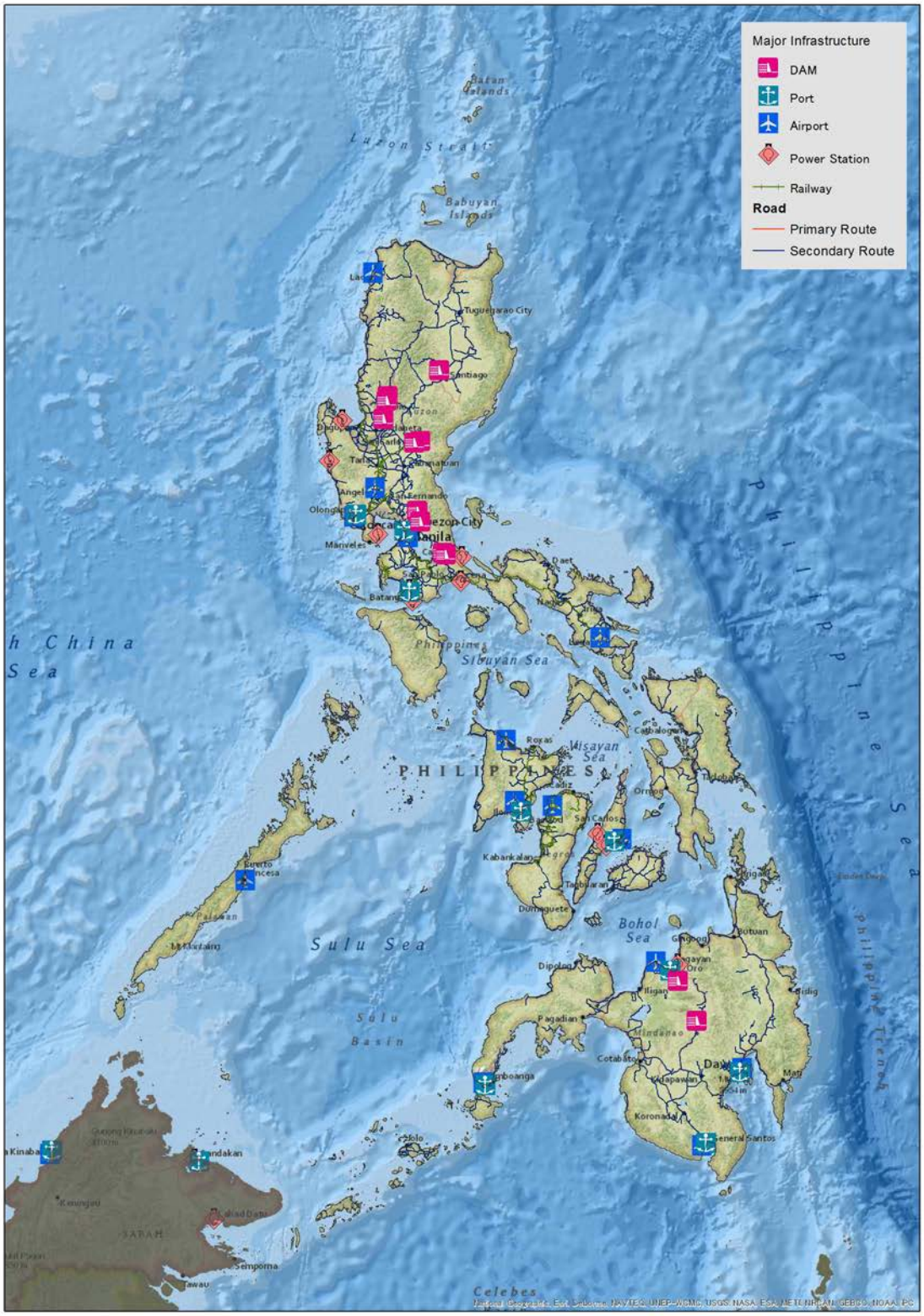


Figure 5.3.1 Major Infrastructures in the Philippines

Chapter 6 Economy, Industry, and Trade

In this survey, the general outline of economy and trade in the Republic of the Philippines and the cases in which disaster impact analyses were conducted are examined. The purpose is to estimate the impact of a disaster on the economy of the nation and surrounding regions in the event that an industrial agglomerated area in the Philippines is hit by a disaster.

The following topics were explored using existing data and information from sources such as the internet, research papers, reports and other materials.

- Overview of the economy and industry of the Philippines
- Overview of trade in the Philippines

In order to understand the conditions of the economy and trade in the Philippines, relevant information was gathered/organized based on a review of reference materials listed below.

No.	Reference	Remarks
1	ASEAN-JAPAN CENTRE website http://www.asean.or.jp/	Statistical data on economy, industry and trade of ASEAN
2	JETRO 2009, "ASEAN Economic Community (in Japanese)"	Regional corporation framework in East Asia
3	ASEAN Stats database http://aseanstats.asean.org/	Trade values of ASEAN by commodity and partner country, etc.
4	ASEAN website (2013), "Key basic ASEAN indicators in 2011, Last update 14 January 2013"	Key basic indicators of ASEAN
5	International Monetary Fund, World Economic Outlook Database	Macroeconomic indicators of ASEAN
6	Industrial agglomerated areas in ASEAN, IHS	Detailed information on industrial agglomerated areas in ASEAN
7	Ministry of Foreign Affairs of Japan http://www.mofa.go.jp/index.html	Information on regional affairs etc.

6.1 Overview of the economy

The GDP of the Philippines is 250.4 billion USD (2012), and the GDP per capita is 2,614 USD (2012 (estimated figure)).

The GDP per capita of the Philippines is a little lower than the average GDP per capita of ASEAN, which is 3,745 USD (estimated figure)). The country's economic growth rate is 12.6% (2011), and while it is a little below the average of ASEAN (15.7% (2011)), it is expected that the country's economy will grow at a faster rate than the ASEAN average in the future. Foreign direct investment in the Philippines is very small with only about 2.2% of the total foreign direct investment in ASEAN (2010).

Before 2005, the unemployment rate was hovering at a high level of over 10%, but the rate fell in 2006, and has been in the 7% range since then. It is estimated that the unemployment rate will stay at

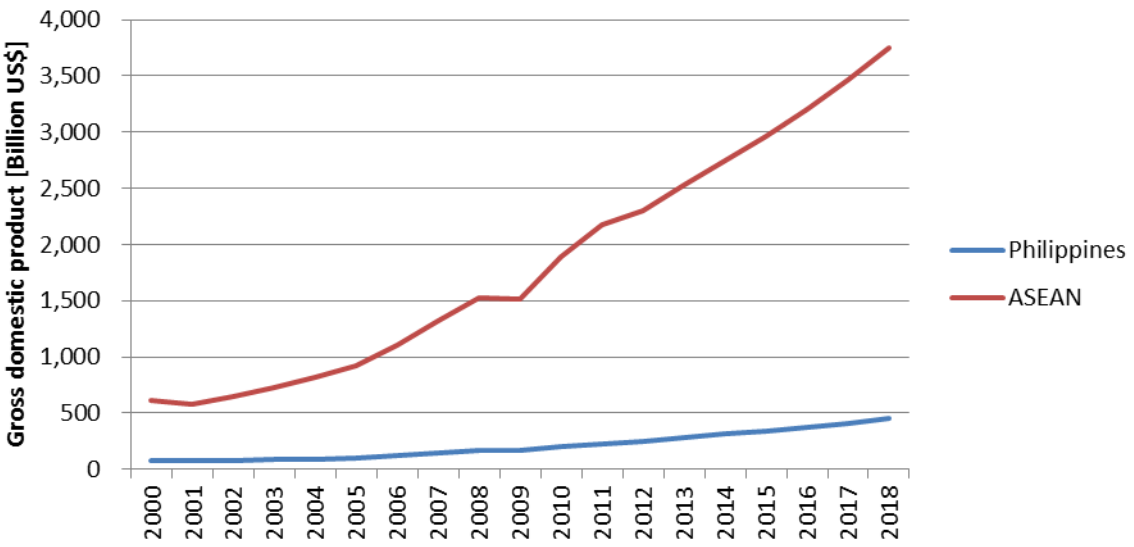
the same level, which means that it will still remain at a higher level compared to other ASEAN countries (Cf. The unemployment rate in Japan as of 2012 is 4.4%).

As for industrial composition, the service sector including Business Process Outsourcing (BPO) is growing rapidly, and currently comprises about 53% of the total. The next largest sector is the agriculture, forestry, and fisheries sector, which comprises about 32%.

Major industrial parks in the Philippines, in which many Japanese companies are operating, are summarized in the table below.

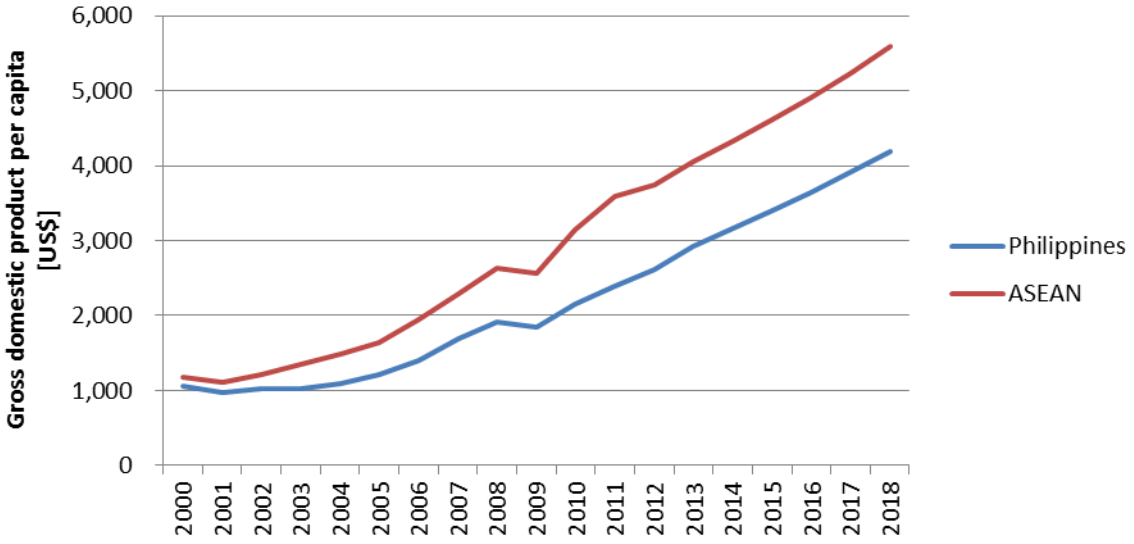
Name of Industrial Park	Number of Japanese companies operating	Description
Carmelray Industrial Park I	12 (19)	Located 45 km from Makati. Magnetic/magnetic optical disk manufacturing companies have a presence in this industrial park.
Carmelray Industrial Park II	15 (16)	Located 58 km from Makati business district. Occupied mainly by companies engaged in metallic processing.
Cavite Economic Zone	96 (114)	Located 40 km from Ninoy Aquino International Airport. Occupied mainly by companies engaged in auto-parts and electronic parts businesses. This economic zone has the largest number of Japanese companies in the Philippines.
First Cavite IE	32 (56)	Located 30 km south of Makati. Industrial equipment manufacturing companies have a presence in the park.
First Philippine Industrial Park	10 (45)	Located 49 km from Ninoy Aquino International Airport. Companies engaged in motorcycle assembly and in manufacturing of precision equipment have a presence in the park.
Laguna Technopark	51	Located 45 km south of Makati. Occupied mainly by companies engaged in auto-parts and automobile sales.
Light Indutry & Science Park of the Philippines I	21	Located 35 km south of Makati. Companies manufacturing printers and telephone parts have a presence in the park.
Light Industry & Science Park of the Philippines II	12	Located 35 km south of Makati. Occupied mainly by companies engaged manufacturing of printers and plastics products.
Light Industry & Science Park of the Philippines III	12 (>5)	Located 35 km south of Makati. Occupied mainly by companies engaged in the rubber molding parts business.
Mactan Export Processing Zone	65	Located 1 km of Mactan-Cebu International Airport and 14 km of Cebu city. Companies engaged in manufacturing of communication devices and cameras have a presence in the park.
Mactan Economic Zone II	18	Located in Lapu Lapu city, Cebu. Medical instrument manufacturing companies have a presence in the park.

Reference: The table was created based on information from ASEAN-Japan Centre (https://www.asean.or.jp/)
Note) Numbers shown in parentheses were obtained from resources provided by IHS.



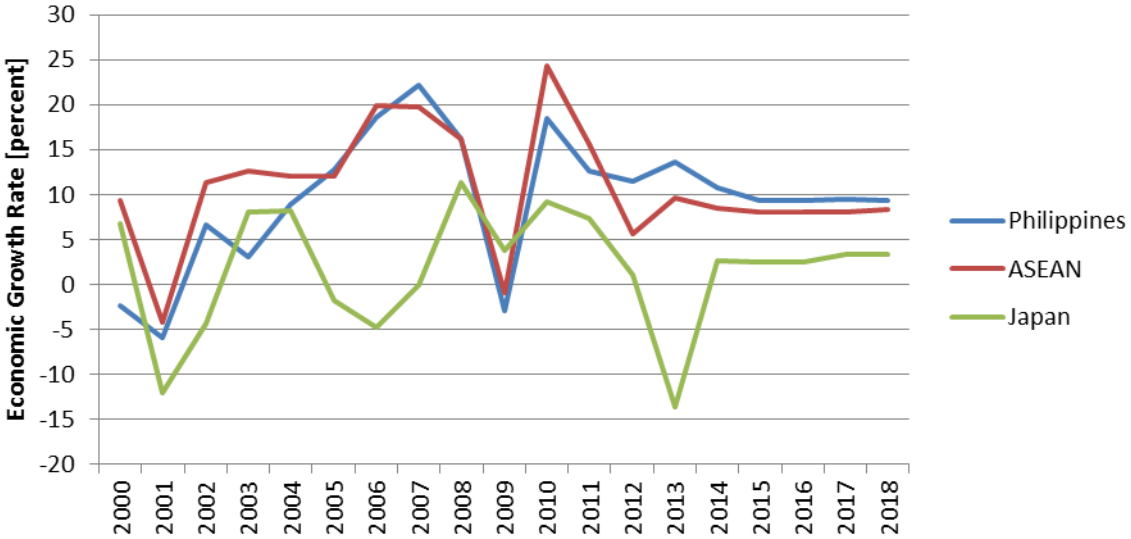
Source: International Monetary Fund, World Economic Outlook Database, April 2013

Figure 6.1.1 Gross Domestic Product in Philippines, ASEAN countries and Japan (2000-2018), current prices (Estimation in Philippines and Japan starting from 2013; in ASEAN starting from 2012)



Source: International Monetary Fund, World Economic Outlook Database, April 2013

Figure 6.1.2 Gross Domestic Product per capita in Philippines, ASEAN countries and Japan (2000-2018), current prices (Estimation in Philippines starting from 2012; in ASEAN starting from 2007)



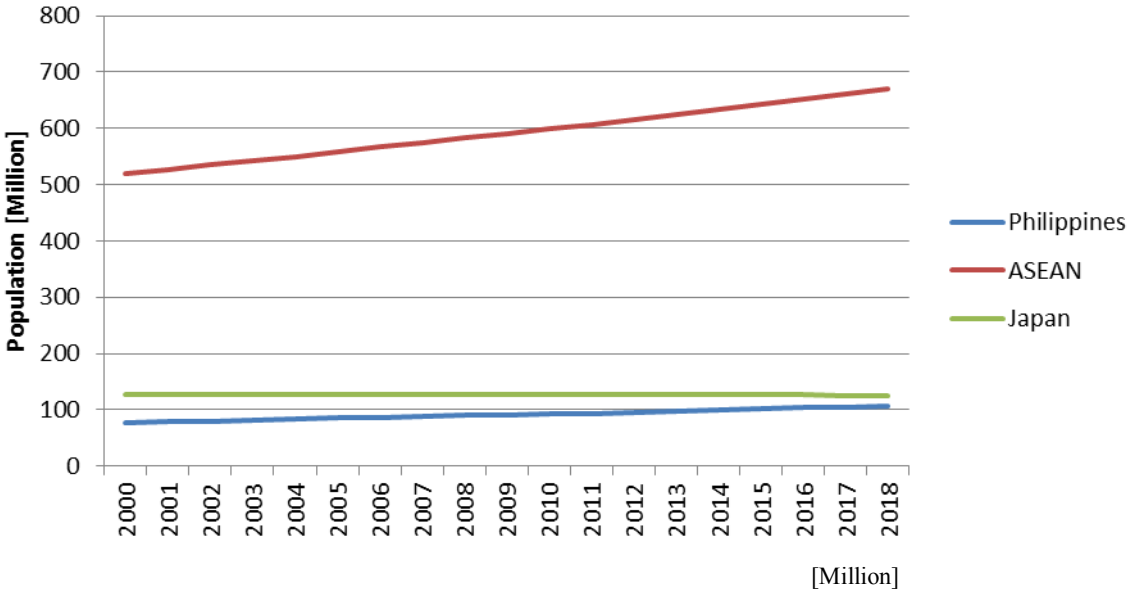
Source: International Monetary Fund, World Economic Outlook Database, April 2013

Figure 6.1.3 Economic Growth Rate in Philippines, ASEAN countries and Japan (2000-2018), current prices (Estimation in Philippines and Japan starting from 2013; in ASEAN starting from 2012)

Table 6.1.1 Average growth rate in Philippines, ASEAN countries and Japan (2013-2017)

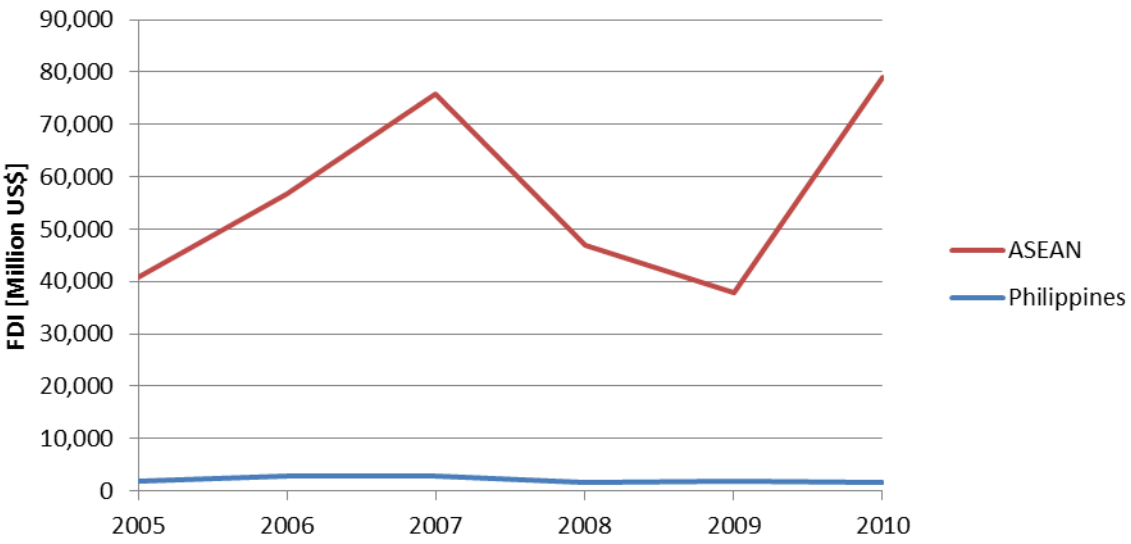
	Philippines	ASEAN	Japan
Average growth rate (2013-2017) (%)	10.5	8.5	-0.53

Source: International Monetary Fund, World Economic Outlook Database, April 2013, calculated by MRI



Source: International Monetary Fund, World Economic Outlook Database, April 2013

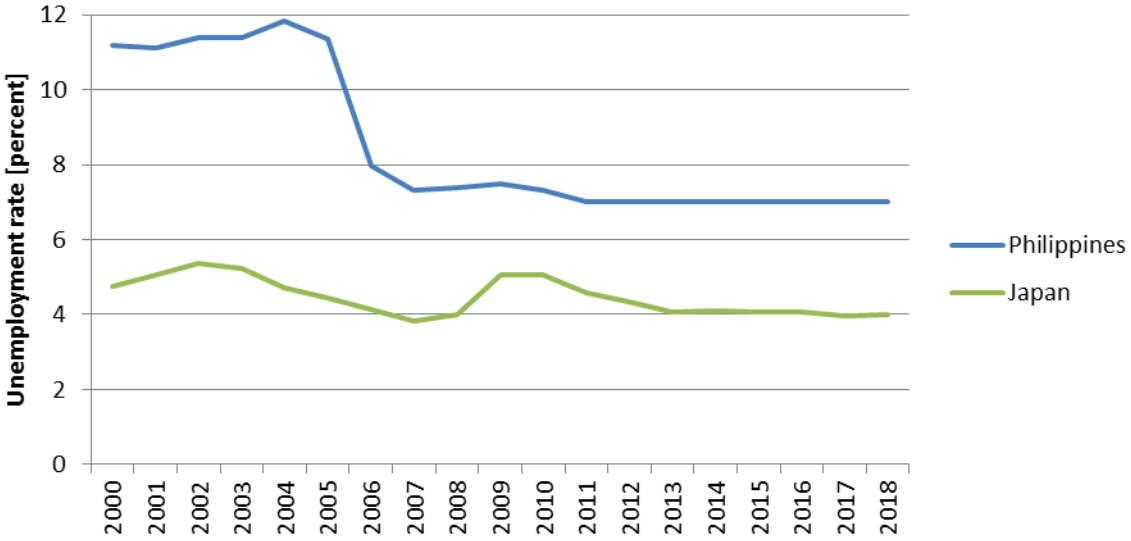
Figure 6.1.4 Population (2000-2018) (Estimation in Philippines starting from 2012; ASEAN starting from 2007; in Japan starting from 2013)



[Million US$]

Source: ASEAN-Japan Centre website

Figure 6.1.5 Foreign Direct Investment to Philippines and ASEAN (2005-2010)



Source: International Monetary Fund, World Economic Outlook Database, April 2013

Figure 6.1.6 Unemployment rate in Philippines and Japan (2000-2018) (Estimation starting from 2013)

6.2 Overview of trade

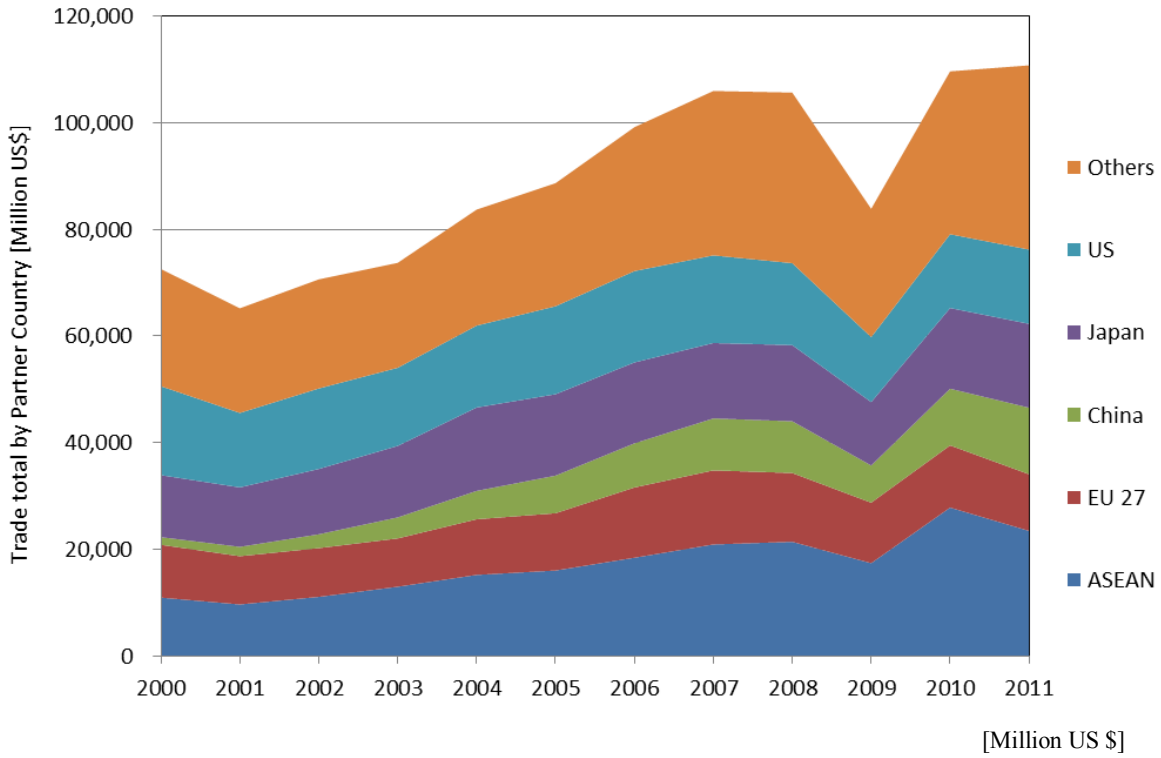
(1) Amount of foreign trade value/major trading partners

Trends in the Philippines' foreign trade by partner countries (2000 – 2011) are illustrated in the figure below. The Philippines' foreign trade has been growing steadily since 2000. Although foreign trade dropped in year 2009, after the collapse of Lehman Brothers in the fall of 2008, all

regions recovered quickly from the crisis. However, overall trade performance was sluggish in 2011.

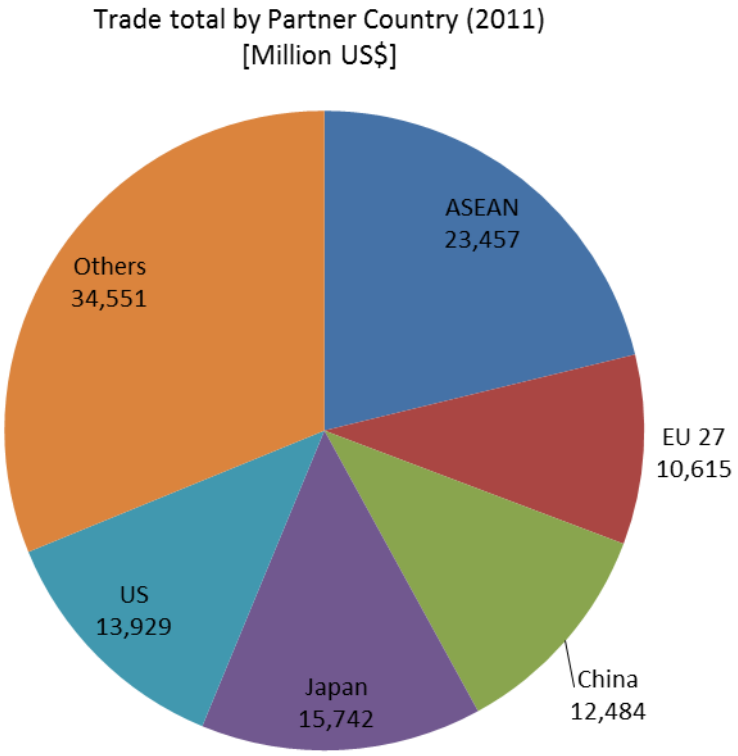
As of 2011, the largest trading partner of the Philippines is other ASEAN countries, with 21% of the total trade being associated with the countries in this region. The second largest trading partner is Japan, accounting for 14% of the total trade. The USA comes next, with 13%, followed by China and the EU, with 11% and 10% shares, respectively.

Looking at trends in recent years, it is observed that the growth rate of trade with the ASEAN countries and China is high. Trade value with other developed countries such as Japan, the EU, and the USA remain at the same level.



Source: ASEAN Stats database (http://aseanstats.asean.org/)

Figure 6.2.1 External Trade Value by Partner - Total (2000-2011)



[Million US $]

Source: ASEAN Stats database (http://aseanstats.asean.org/)

Figure 6.2.2 External Trade Value by Partner - Total (2011)

(2) Categories of major trading commodities

Export values of the Philippines by commodity (2011) are shown in the table below.

Examining the export values by major export commodities, it can be observed that the largest group of products exported from Philippines is machinery and transport equipment, which accounts for 66% of the total export value (27,955 million USD). Manufactured goods comes next, accounting for 11% of the total exports (4,585 million USD).

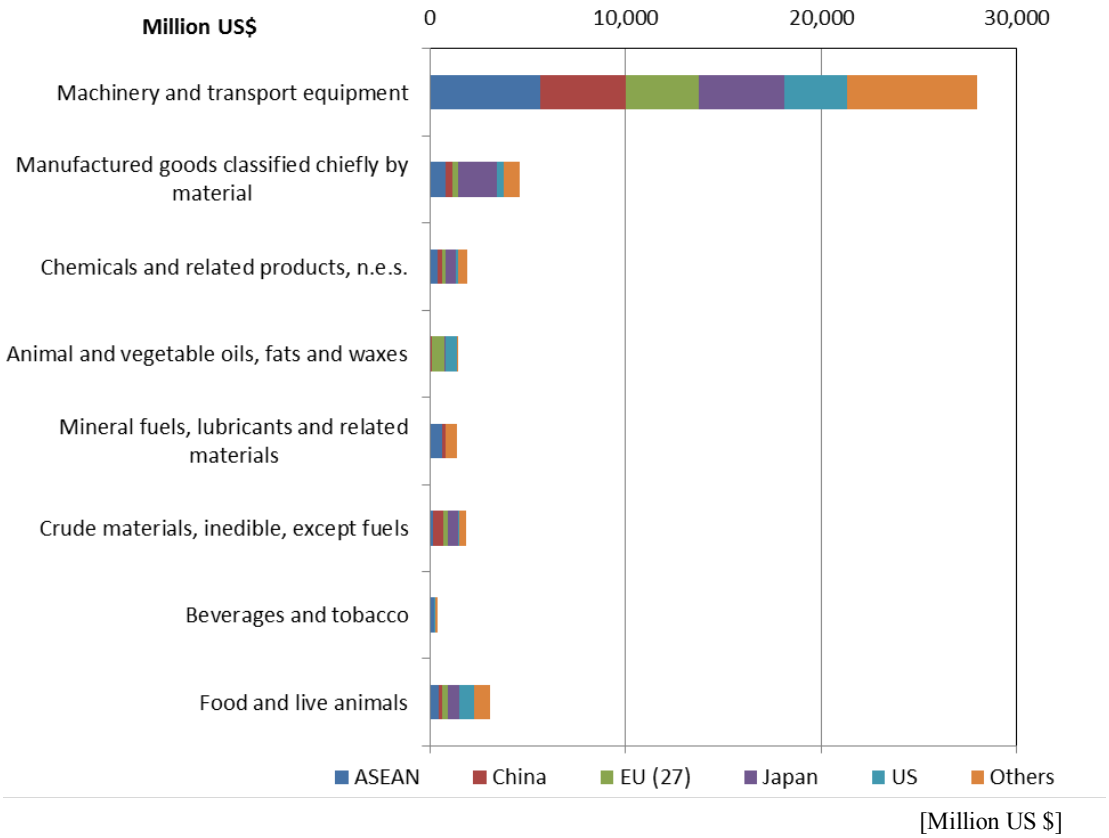
The largest export destination for machinery and transport equipment is ASEAN, buying 5,660 million USD. This is followed by China and Japan, with export values of 4,375 million USD and 4,413 million USD, respectively.

Table 6.2.1 Trade values (exports) of Philippines by commodity and partner country (2011)

[Million US $]

Category	ASEAN	China	EU (27)	Japan	US	Others	WORLD
Food and live animals	456	148	308	561	793	789	3,055
Beverages and tobacco	184	1	33	1	29	149	398
Crude materials, inedible, except fuels	179	525	197	540	56	339	1,836
Mineral fuels, lubricants and related materials	626	177	0	5	0	595	1,403
Animal and vegetable oils, fats and waxes	7	86	629	78	604	32	1,437
Chemicals and related products, n.e.s.	407	235	131	523	125	488	1,908
Manufactured goods classified chiefly by material	770	379	311	1,985	332	808	4,585
Machinery and transport equipment	5,660	4,375	3,681	4,413	3,191	6,635	27,955

Source: ASEAN Stats database (http://aseanstats.asean.org/)



[Million US $]

Source: ASEAN Stats database (http://aseanstats.asean.org/)

Figure 6.2.3 Trade values (exports) of Philippines by commodity and partner country (2011)

Import values of the Philippines by commodity (2011) are shown in the table below.

Examining the import values by major import commodities, it can be observed that the largest group of products imported by the Philippines is machinery and transport equipment, same as in the case of export, which accounts for 44% of the total import value (26,606 million USD). Mineral fuels comes next, accounting for 21% of the total imports (12,720 million USD).

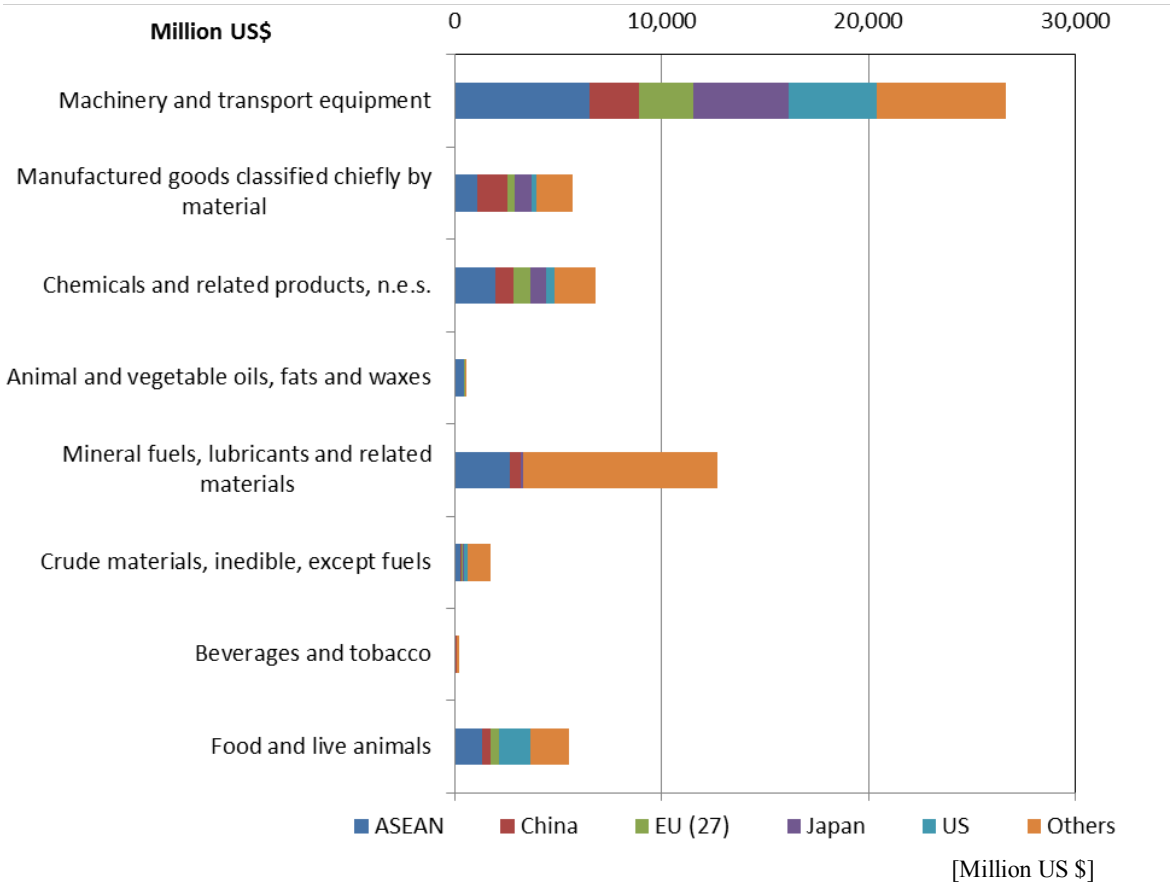
The largest exporter of machinery and transport equipment to the Philippines is ASEAN, exporting a total of 6,480 million USD. This is followed by Japan and USA, with import values of 4,613 million USD and 4,282 million USD, respectively.

Table 6.2.2 Trade values (imports) of Philippines by commodity and partner country (2011)

[Million US $]

Category	ASEAN	China	EU (27)	Japan	US	Others	WORLD
Food and live animals	1,305	406	422	23	1,489	1,895	5,540
Beverages and tobacco	46	26	30	0	10	113	226
Crude materials, inedible, except fuels	290	63	39	58	149	1,103	1,702
Mineral fuels, lubricants and related materials	2,684	502	3	110	12	9,409	12,720
Animal and vegetable oils, fats and waxes	466	2	28	0.087865	3	31	530
Chemicals and related products, n.e.s.	1,963	846	817	771	392	1,994	6,783
Manufactured goods classified chiefly by material	1,069	1,455	383	827	226	1,750	5,711
Machinery and transport equipment	6,480	2,396	2,640	4,613	4,282	6,195	26,606

Source: ASEAN Stats database (http://aseanstats.asean.org/)



Source: ASEAN Stats database (http://aseanstats.asean.org/)

Figure 6.2.4 Trade values (imports) of Philippines by commodity and partner country (2011)

Chapter 7 Physical Distribution Network

The themes of this survey are divided into three categories as follows: 1) Understanding of Supply Chain Circumstances in ASEAN Countries, 2) Understanding of Circumstances on Physical Distribution Network, and 3) Organizing the framework of vulnerability analysis for natural disasters on the ASEAN Logistics Network.

7.1 Understanding of Supply Chain Circumstances in the Philippines

(1) Relation to Logistics Performance Index on International Physical Distribution

Table 7.1.1 International LPI (Logistics Performance Index)[*1] Ranking 2012

Rank	Country	LPI	Customs	Infrastructure	International Shipment	Logistics Competence	Tracing & Tracking	Timeliness
44	**Philippines**	**3.14**	**2.67**	**2.57**	**3.4**	**2.95**	**3.29**	**3.83**

Source: World Bank Connecting to Compete 2012 Trade Logistics in the Global Economy

(2) Features of Physical Distribution in Relation to Main Industries in Industrial Parks

The lists of ASEAN-JAPAN CENTER (AJC)[*2] web-site have no specific time of investigation by year/month, but it is considered that the general current status of industry agglomeration at the time of the investigation can be obtained.

The industries in industrial parks are classified into the following 13 categories:

1) Fishery/Foodstuff, 2) Textile/Apparel, 3) Pulp/Paper, 4) Chemicals, Oil, Rubber/Ceramic, 5) Steel/Nonferrous metal, 6) Transport machines (Cars), 7) Electrical/Electronics/Precision apparatus, 8) Other industries, 9) Commerce (wholesale, retail), 10) Real estate, 11) Logistics/Warehouse, 12) Finance/Insurance/Other services, and 13) Information/Telecommunication.

The objective industrial parks are selected based on the criterion such as: 1) Degree of geographic accumulation, 2) Having sufficient operational experiences, 3) The size and number of Japanese companies, 4) Located in the pilot area in case of Vietnam, the Philippines and Indonesia.

Based on the industrial classifications above, the characteristics of distributions of the products from industrial parks are estimated.

There are total of 108 industrial parks in 17 regions of the Philippines in the list of AJC.

Circumferential environment about physical distribution in the Philippines is prospected by Japanese affiliated companies and their products in the selected industrial parks of Cavite Economic Zone, Laguna Technopark and Mactan Export Processing Zone

In Laguna, various kinds of parts of textile, chemical, machinery, electric/precision devices and so on, are manufactured, because Honda assembly plant has been in operation. Matsushita, Fujitsu Ten manufacture overseeing TV camera, audio goods respectively; in Laguna, in this regard, parts related to these products are in wide ranges manufactured. The supply chain of these intermediate and final goods is supposed to

conclude almost within Laguna.

Top three items of the major export/import goods are as follows (Ministry of Foreign Affairs of Japan, country and regional situation, the Phlippines, Economy)[*3]:

- Export: Electric devices, Electric equipment, Transport equipment
- Import: Crude, intermediate materials, Capital goods, Fuel

Electric devices, Electric equipment of export items mean that goods manufactured in each industrial park are to be exported to main trade counterparts, Japan, USA, Singapore, and to be shipped to industrial parks in ASEAN Regions through intra and extra ASEAN trade as well.

Crude, intermediate materials oil of import mean that fuel bulk cargo is transshipped at Manila Port and other major ports, and then transported to distribution depots in various islands.

There is no logistics company in the above three industrial parks, and location of warehouse/distribution centers between the ports and the parks are also not clear. By present information and items of export goods, it is considered that physical distribution would reach a sphere of logistics management to some degree, which accompanies horizontal international specialization, even if it will mainly be of extra-ASEAN basis.

(3) Supply Chain Circumstances

Physical distribution is evolving by the stages of Physical Distribution Development Phasing (PDDP) as follows:

1) Physical distribution control: Company's own sphere of materials/ products distribution (PDC).
2) Logistics management: Company's own distribution management by the market-in strategy (LGM).
3) Supply chain management: Integrated distribution management from company's own to systemized one by the collaboration with other logistics operator resources (SCM)

Other criteria can be considered applicable, so that the development phase may be justified, based on industrial categories and their products' varieties and volumes in the selected industrial parks.

1) Kinds and diversity of products (intermediate or final products).
2) Whether production of high valued goods like cars, electrical/ electronic/ precision devices or not, and the levels.
3) Correspondence of export/import major items of goods to, classification of intermediate/ final products
4) Existence of a regional head office of a company which power is vested from the headquarter, and the power strength in management term.
5) Existence of logistics operator as a 3PL and maturity of the business
6) Inter dependency of industrial parks/ SEZ with megalopolises in the vicinity.

The result of assessment is shown in the table below which is made by LPI of the World Bank and by supply chain circumstances determined by above mentioned industries in the industrial park as well as major export/import items in the light of the above three stages of PDDP. The evaluation is shown by

relative evaluation of five levels among ASEAN countries. Since there are no distinction time and contents wise in PDDP, the level of development is indicated as a continuous line in the table below.

Table 7.1.2 Physical Distribution Development Phasing

LPI	Country	PDDP								
					Criteria					
		PDC	LGM	SCM	Products diversified	High valued goods	Export/ Import	Regional head office	Logistics operator	Products diversified
3.14	**Philippines**				**3**	**3**	**3**	**3**	**3**	**3**

Source: JICA Study Team

7.2 Current Status and Trends of Philippines Logistics Network

(1) Domestic Physical Distribution Network

The industrial agglomeration is formed at Cavite and Laguna in central south part of Luzon Island where many industrial estates are distributed.

The characteristic of the Philippines' distribution network is that the north-south route connecting this industry agglomeration and Manila port functions as the main distribution corridor in the Philippines.

In addition, in Cebu metropolitan area having population of 2.7 million people, foreign companies are having R&D centers for the including software industry. Cebu port has become the second largest hub of distribution base, next to Manila port.

(2) Intra-ASEAN Physical Distribution Network

According to ASEAN Strategic Transport Plan 2011-2015, intra-ASEAN trade of Philippines is reported to be about 23% of the total trade amount. The main intra-ASEAN trade partner is as in the order of Singapore of 43%, Thailand of 19%, Malaysia of 17%, Indonesia of 14%, and Vietnam of 5%. Considerably large portion of cargo traffics to and from main ports in Philippines are considered to be transshipped at Port of Singapore.

(3) Extra-ASEAN Physical Distribution Network

According to ASEAN Strategic Transport Plan 2011-2015, extra-ASEAN trade amount of Philippines is about 77% against the total trade amount.

The main trade partner countries are Japan and USA.

From those macro data, the distribution network outside the ASEAN region seems to form the trunk route with regular services between major ports of above mentioned countries/region and main ports of Philippines, including transshipment at Port of Singapore and Hong Kong.

7.3 Analysis Frame on Physical Distribution Network

This section studies frame for assessment of the vulnerability of logistics network against natural disasters in consideration of the actual situation of supply chain, as a preparedness of formulation of area BCP.

The vulnerability itself is to be assessed after the further survey.

Table 7.3.1 Natural Disaster Prevention Related Matters in relation to vulnerability of Physical Distribution Facilities

Industrial Park Name represented	Cavite Economic Zone
Features	Place: Cavite For features outline, refer to Survey Report 2 "Chapter 3 Industrial Agglomerated Areas"
Vulnerability Assessment Frame for Each Industrial Park (IPK)	
Natural Disaster Risk(NDR): Extract from Survey Report 1 "Chapter 5 Existing Investigations and Studies"	
■ Flooding	The Philippines is a country with higher flood hazard possibility. Flood hazard possibility is high at, Pampanga River in national capital region on Luzon Island where the Metro Manila is situated.
■ Seismic intensity/ Tsunami	The Philippines is one of the countries with highest earthquake hazard level in ASEAN countries. A number of earthquake disasters are 2nd after Indonesia. Southern area of Luzon Is. falls in GSHAP of 4.0~ 4.8 zones. The Philippines is one of the countries with highest tsunami hazard level in ASEAN countries.
■ Volcano	The Philippines is one of the countries with highest volcanic hazard level in ASEAN countries. After the 18th century, over 50 volcanic disasters are recoded in the database. Mt. Pinatubo, Mt. Taal, Mt. Mayon and Mt. Bulusan in Luzon Island are the representative volcanoes.
■ Cyclone, Meteorological Disaster, Landslide	The impact of cyclone hazard in the Philippines is the highest in ASEAN countries. The hazard of northern part in the country is higher than that of southern part in the country. According to 1980-2012 records, 228 disasters have been caused by storms in the Philippines. Landslide hazard distributes over entire country. Several areas including the suburbs of Metro Manila show high hazard possibility. The area along Philippines Fault is notably high hazard possible zone.
Brief Descriptions on Counter-measures (CMS) for NDR	
1) Private sector facilities: To follow further Survey	
Land, In-park Roads:	
Plant facilities:	
Physical Distribution Facilities:	
Others, if any:	
2) Infrastructures: Extracted from field reports of the second survey	
Road: • Development of north-south highway is necessary connecting Manila city from Batangas in the south to Clark airport in the north. • Frequent flood damage sections shall be prioritized to take countermeasures by raising road surfaces or elevating road structure. • Earthquake resistant construction of the bridge is being carried out with the assistance of JICA. (Dr. Jun.T.Castro @School of Urban and Regional Planning, University of the Philippines)	
Railway:	
Port: In order to secure logistics from industrial clusters in Cavite and Languna district, development of Batangas port is urgently required. Particularly, improvement of container handling facilities is utmost important. (Dr. Jun.T.Castro)	
Airport: Rehabilitation of Cavite airport which was previously used by US forces is an effective measure to having an alternative to Ninoy Aquino international airport. (Dr. Jun.T.Castro)	
Electric power/Fuel: Power transmission damage by typhoon and floods can be mitigated by underground installation of power transmission cables (Mr. Fujii, the Vice President of Japanese Chamber of Commerce of Manila). In addition, fuel stockpiling for the backup power generation shall be seriously considered.	
Water-supply:	
Sewage: Preferential installations of storm water drainage facilities in Manila city and other flooding prone district is	

required.
Solid waste:
Telecommunication:

Note:

*1 The summary of "Logistics Performance Index" by the World Bank is as follows.

(1) LPI score and category wise score is indicated by each country

(2) Score is ranked from one to five

(3) LPI of international logistics is scored based on the interviewing following six items to major importers and logistics companies in the neighboring countries (total of over 1000 companies).

1) Efficiency of the clearance process i.e. Speed, simplicity and predictability of formalities by border control agencies, including Customs
2) Quality of trade and transport related infrastructure e.g. Ports, railroads, roads, information technology
3) Ease of arranging competitively priced shipments
4) Competence and quality of logistics services e.g. transport operators, customs brokers
5) Ability to track and trace consignments)
6) Timeliness of shipments in reaching destination within the scheduled or expected delivery time.

*2 http://www.asean.or.jp/ja/invest/about/country_info/brunei/invest_info/industrialestate/

*3 http://www.mofa.go.jp/mofaj/area/brunei/data.html#04

References :

1) ASEAN-JAPAN CENTER, Lists of Industrial Parks/Estate/SEZ by Member Country (in Japanese)
2) World Bank Connecting to Compete 2012 Trade Logistics in the Global Economy
3) Shinya Nakata (2012), Introduction to Logistics, NIKKEI Newspapers in Japan (in Japanese)
4) JETRO (2008), ASEAN Physical Distribution Network 2008 (in Japanese)
5) ERIA: ASEAN Strategic Transport Plan 2011-2015.
6) ASEAN Secretariat, ASEAN Statistics on Intra and Extra_ ASEAN trade 2011

Chapter 8 Legislative Systems

A survey on the legislative systems concerned with disaster management, business continuity, environmental pollution, and development in the Philippines is conducted in this chapter.

The survey of the Philippines is mostly based on research through the website of ministries and agencies of the Philippines and several leading international institutes that contributed to disaster research such as the Asia Disaster Reduction Center. In addition, information for BCP/CDM regulations is collected from the websites of financial authorities. Laws, regulations, national implementation plans, guidelines, and statutes are referred to within the scope of the survey.

The table below shows the methodology for collecting information.

Information Collected	Methodology	Scope of Survey
Legislative Systems for Disaster Management	To collect information from the internet, which is published by international agencies such as ADRC and disaster management institutes in Philippines. And to refer to the report by the JICA research team.	Laws and policies of disaster management. Strategies and national action plans for disaster risk mitigation.
Regulations and Standards for BCM / BCP	To collect information from the websites of financial authorities regulating the BCM/BCP.	Regulations and circulars related to BCM/BCP.
Legislative Systems for Environment and Pollution	To collect information from the websites of ministries and agencies responsible for environmental management.	Decrees for environmental assessments. Laws, regulations, and governmental orders on environmental pollution control for industrial activities.
Legislative Systems for Development including Land use, River and Building Regulations	To collect information from the websites of ministries and agencies related to land use, rivers, or development.	Laws and regulations describing town development, land use. Regulations for the building code.

The laws, regulations, decrees, and guidelines regulating the target fields defined above are compiled in this survey. The results of the survey in the Philippines are summarized below.

Scope	Information
Legislative Systems for Disaster Management in Philippines	[Strategies and Plans] "Republic Act 101211 on Disaster Risk Reduction, 2010", "Republic Act 9729 (Climate Change Act, 2009)". [Regulations, Standard and Guidelines] "Strategic National Action Plan 2009-2019", "Mindanao declaration on disaster risk reduction priorities".
Regulations and Standards for BCM / BCP in Philippines	"Circular No.268", "Circular No.269", "Circular No.542", "Manila Bank BCP"

Legislative Systems for Environment and Pollution in Philippines	[Laws for Environment] "Environmental Policy Law", "Philippine Environment Policy of 1977", "Philippine Environment Code of 1977", "Environmental Impact Statement [EIS] System". [Laws and Regulations for Environmental Pollution Control] "Clean Water Act (Republic Act No.9275)", "Clean Air Act of 1999", "Toxic Substances and Hazardous and Nuclear Wastes Control Act of 1990", "Ecological Solid Waste Management of 2000", "Implementing Rules and Regulations of Republic Act No.9003", "Implementing Rules and Regulations for the Philippine Environmental Impact Statement [EIS] System", "Revised Air Quality Standards of 1992, Revising and Amending the Air Quality Standards of 1978", "Revised Water Usage and Classification/Water Quality Criteria", "DENR Ambient Noise Quality Standards".
Legislative Systems for Development including Land Use, River and Building Regulations in Philippines	"An Act Providing for the Establishment and Management of National Integrated Protected Areas System, Defining Its Scope and Coverage, and for Other Purposes", "An Act to Provide for a Comprehensive and Continuing Urban Development and Housing Program, Establish the Mechanism for its Implementation, and for other Purposes", "An Act to Facilitate the Acquisition of Right-Of-Way, Site or Location for National Government Infrastructure Projects and for other Purposes", "Board of Development Affairs Act, 1993", "Subdivision Law", "Watershed Law", "the National Building Code of the Philippines"

The available results on the survey about the laws and regulations for disaster management, BCP/BCM, environmental conservation and provisions for development in the Philippines are summarized below.

8.1 Legislative systems for disaster management

(1) Disaster management laws

Table 8.1.1 Laws and Regulations of Disaster Management in the Philippines

	Laws / Regulations	Supervisory Authority	Subject
Law	Republic Act 101211 on Disaster Risk Reduction, 2010	National Disaster Risk Reduction and Management Council (NDRRMC)	Disaster Management
Law	Republic Act 9729 (Climate Change Act, 2009)	under survey	Climate Change

The Republic Act 101211 on Disaster Risk Reduction was issued in 2010 aiming at strengthening the disaster management system with a management framework. The act also institutionalizes the management plan and appropriation fund. The Republic Act 101211 complement the Republic Act 9729 (Climate Change Act) in terms of implementing rules and regulations.

(2) Disaster management strategies and plans

Table 8.1.2 Strategies and Plan for Disaster Management in the Philippines

	Laws / Regulations	Supervisory Authority	Subject
Plan	Strategic National Action Plan 2009-2019	NDRRMC	General Disasters
Plan	Mindanao declaration on disaster risk reduction priorities	under survey	General Disasters

In February 2012, the National Disaster Risk Reduction and Management Plan (NDRRMP) 2011-2028 was approved. NDRRMP covers four thematic areas: i) disaster prevention and

mitigation, ii) disaster preparedness, iii) disaster response, and iv) disaster rehabilitation and recovery, with the indication of the expected outcome, outputs, activities, lead agencies, and partners setting timelines from short- to long-term. An implementation plan is also believed to be necessary.

8.2 Regulations and standards for business continuity management

Table 8.2.1 Regulations, Standards or Guidelines for BCM/BCP in the Philippines

	Laws / Regulations	Supervisory Authority	Subject
Regulation	Circular No. 268 (Philippines Central Bank)	Monetary Board	BCM
Regulation	Circular No. 269 (Philippines Central Bank)	Monetary Board	BCM
Regulation	Circular No. 542 (Philippines Central Bank)	Monetary Board	BCM
Guideline	Manila Bank BCP	Bank of Central Philippines (Local Central Bank)	BCM

In Philippines, circulars describing bank management policies in times of disaster have been enacted. Circular No. 268 stipulates policies on outsourcing certain functions in banking, and the outsourcing of disaster recovery and BCP procedures is defined in the policies. Circular No. 269 stipulates the necessity of descriptions of electrical banking systems in a time of contingency and disaster recovery. Moreover, Circular No. 542 stipulates the security and availabilities for e-banking systems in emergencies.

No Manila Bank BCP Guideline documents have been verified.

8.3 Legislative systems for the environment and pollution control

(1) Environmental laws and regulations

Table 8.3.1 Laws and Regulations regarding the Environment in the Philippines

	Laws / Regulations	Supervisory Authority	Subject
Law	Environmental Policy Law	Department of Environment and Natural Resources	Environment Management
Decree	Presidential Decree No.1151 (Philippine Environment Policy of 1977)	Department of Environment and Natural Resources, Environment Management Bureau	Environmental Assessment
Decree	Presidential Decree No.1152 (Philippine Environment Code of 1977)	Department of Environment and Natural Resources	Environmental Assessment
Decree	Presidential Decree No.1586 (Environmental Impact Statement [EIS] System)	Department of Environment and Natural Resources	Environmental Assessment

About the legal system concerning the environment of the Philippines, regulation by presidential order is issued based on Environmental Policy Law. Regulation by each statute and presidential order is under the jurisdiction of the Department of Environment and Natural Resources, Environment Management Bureau, and the National Environment Protection Council.

(2) Pollution control laws and regulations

Table 8.3.2 Laws and Regulations for Environmental Pollution Control in the Philippines

	Laws / Regulations	Supervisory Authority	Subject
Law	Clean Water Act (Republic Act No.9275)	Department of Environment and Natural Resources	Water Pollution
Law	Clean Air Act of 1999, (Republic Act No.8749)	Department of Environment and Natural Resources	Air Pollution
Law	Toxic Substances and Hazardous and Nuclear Wastes Control Act of 1990 (Republic Act No.6969)	Department of Environment and Natural Resources	Industrial Waste
Law	Republic Act No.9003 (Ecological Solid Waste Management of 2000)	Department of Environment and Natural Resources	Industrial Waste
Governmental Order	DAO No.2001-34 (Implementing Rules and Regulations of Republic Act No.9003)	Department of Environment and Natural Resources	Industrial Waste
Governmental Order	DAO No.2003-30 (Implementing Rules and Regulations for the Philippine Environmental Impact Statement [EIS] System)	Department of Environment and Natural Resources	Environmental Assessment
Governmental Order	DAO No. 1993-14, Revised Air Quality Standards of 1992, Revising and Amending the Air Quality Standards of 1978	Department of Environment and Natural Resources	Air Pollution
Governmental Order	DAO 1990-34, Revised Water Usage and Classification/Water Quality Criteria	Department of Environment and Natural Resources	Water Pollution
Standard	DENR Ambient Noise Quality Standards	Department of Environment and Natural Resources	Noise

In the Philippines, the environmental pollution regulations for industrial activity are prescribed in detail by individual statutes. The target regulations are regulations about water pollution, air pollution, industrial waste, manufactory wastewater, noise, etc., as well as regulations about environmental assessment targets and standards.

8.4 Legislative systems for development such as land use, rivers, and building codes

Table 8.4.1 Laws and Regulations for Land, Rivers, and Building Code in the Philippines

	Laws / Regulations	Supervisory Authority	Subject
Law	Republic Act No.7586, An Act Providing for the Establishment and Management of National Integrated Protected Areas System, Defining Its Scope and Coverage, and for Other Purposes	under survey	Development, Land Use
Law	Republic Act No.7279, An Act to Provide for a Comprehensive and Continuing Urban Development and Housing Program, Establish the Mechanism for its Implementation, and for other Purposes	Housing and Land Use Regulatory Board	Development, Land Use
Law	Republic Act No.8974, An Act to Facilitate the Acquisition of Right-Of-Way, Site or Location for National Government Infrastructure Projects and for other Purposes, November 2000	under survey	Development, Land Use
Law	Board of Development Affairs Act, 1993	under survey	Development
Law	Subdivision Law	under survey	Land Use
Law	Watershed Law	under survey	River
Law	Republic Act No. 6541, the National Building Code of the Philippines	under survey	Building Standards

In the Philippines, the regulations relevant to land use and urban development are prescribed by Republic Acts. In addition, although statutes about land use, river management, and development are defined, information about the details of the regulations is insufficient.

About construction standards, a National Building Code is specified and the legal standards on the regulations for ensuring building safety have been established. Definitions of dangerous buildings that suffered damage from disasters are also shown.

Chapter 9 Implementation of BCP

9.1 Major natural disasters and disaster management awareness

In the Philippines, typhoons, floods, landslides, and earthquakes are envisioned as the major natural disasters. Most enterprises are not overly concerned about natural disaster risk. The necessity of preparing for disaster risk management (DRM) and emergency response is not yet well understood.

For most business people in Philippines, the concept of BCP is somewhat unfamiliar, with little distinction made between BCM and DRM.

9.2 Current state of BCP implementation

9.2.1 Implementation of BCP in enterprises

The business community in the Philippines has not experienced a major disaster in Manila, thereby making awareness of risk management for natural disaster quite low. General enterprises have yet to develop disaster management plans or contingency plans. Furthermore, most enterprises have not conducted activities that would allow for the continuation of business during times of disaster.

As an example of implementing DRM, manufacturing companies tend to include disaster risk items in their corporate crisis management plans. Some enterprises dealing with international business have also thought about BCM and have developed BCP.

Most SMEs fully rely on local authorities or large-scale companies to establish their disaster risk mitigation systems, since they cannot afford to assess risk management.

9.2.2 Implementation of BCP in utility suppliers and distributors

Utility companies handling electricity, water, and telecommunications address crisis management and DRM quite well. Some of these companies have also developed disaster contingency and recovery plans.

Most major electricity companies have established a disaster risk management system and BCM. The individual structures of DRM and BCM are implemented at each of their branches, customer centers and data centers. They also plan to establish inclusive disaster risk management systems through the integration of individual structures.

There are no laws or regulations which obligate even utility suppliers to conduct risk assessment and risk management for natural disasters.

9.2.3 Implementation of BCP in foreign capital companies and Japanese companies

Foreign capital companies which are located in industrial parks including automobile manufacturers, electronic manufacturers, and food manufacturers are regarded as advanced

enterprises for corporate disaster management. Moreover, some enterprises dealing with international business are required to create a contingency plan for disaster and/or BCP as part of international agreements and bidding rules.

On the other hand, even among foreign capital companies, only some enterprises can afford to conduct BCM for disaster risks. The implementation of BCM/BCP will be widely addressed in the future.

9.3 Effort on furthering BCP implementation

9.3.1 Regulations and guidelines for BCP implementation

Along with the revision of the law on disaster risk management in 2010, the government also revised its disaster management policy to place a high value on disaster preparedness and rehabilitation. Before the revision, the priority issue for governmental policy was emergency response. This revised law established the obligation for all local authorities including provinces, municipalities, towns, and barangay communities to develop disaster risk reduction management plan (DRRMP). However, no specific laws or guidelines stipulating the implementation of BCM/BCP have been considered.

For private enterprises, no laws or regulations stipulating the implementation of disaster risk management have been established. Cooperation with national and local disaster risk management systems is expressly stipulated in the National Disaster Risk Reduction Management Plan (NDRRMP) for every private enterprise and civil organization. Private enterprises are also required to implement their own risk management along with the national and local disaster risk management systems.

After the development of DRRMP by all local authorities is complete, the Office of Civil Defense (OCD) plans to disseminate preparedness plans for disaster risk, emergency response plans, and post-disaster rehabilitation plans. Furthermore, they also believe that BCP should be required in the DRRMP in the future.

9.3.2 Efforts on disseminating and increasing awareness of BCP by the private sector

Some efforts for spreading BCP implementation have been conducted in the private sector. Conferences, review meetings, and seminars for BCP among private enterprises have been held with support from international authorities such as UNISDR and discussions have been held on efforts for increasing awareness of the concept of BCP. As an example of efforts undertaken by private enterprises, at industrial symposiums held regularly by a major retail company in Philippines, the implementation of business continuity in crisis management has been the main topic for discussion.

9.4 BCP implementation problems

Infrastructure such as electricity and water supply has not been sufficiently established. Additionally, the main roads in Manila, except for toll roads, are continuously flooded due to heavy rain or storms, which cause trouble for business commuters. Since the road network is often congested with heavy traffic, it can be considered one of the bottlenecks when considering BCM.

In addition, most local enterprises in Philippines cannot afford to establish DRM and BCP under the present circumstances.

List of Agglomerated Areas

ID	Short List	LongList	COUNTRY	PROVINCE	PARK NAME	ADDRESS
PH0001			Philippines		500 Shaw Zentrum	Shaw Blvd Mandaluyong City, Philippines
PH0002			Philippines		6750 Ayala Avenue Building	Ninoy Aquino Monument Makati City, Philippines
PH0003			Philippines		6780 Ayala	6780 Ayala Ave, Lungsod ng Makati, Philippines
PH0004			Philippines		6788 Ayala Avenue Building	6788 Ayala Ave Lungsod ng Makati, Philippines
PH0005			Philippines		A. D. Gothong Information Technology Center	Don Carlos Gothong Sr. Ave City of Dumaguete
PH0006			Philippines		AG&P Special Economic Zone	AG&P Special Economic Zone, Barangay San Roque Bauan 4201, Philippines
PH0007			Philippines		Agrotex Gensan Economic Zone	
PH0008			Philippines		AJMR Agro-Industrial Economic Zone	
PH0009			Philippines		Alcos Global I.T. Park	Topy's Place Bldg Calle Industria, Quezon City, Philippines
PH0010			Philippines		Allegis Information Technology Park	Makiling Dr Carmelray Industrial Park 2, Calamba City, Philippines
PH0011			Philippines		Allegro Center	Allegro Center, 2284 Chino Roces Ave, Lungsod ng Makati,
PH0012			Philippines		Alphaland Southgate Towers	Alphaland Southgate Tower Chino Roces Ave, Lungsod ng Makati, Philippines
PH0013			Philippines		Amigo Mall	
PH0014			Philippines		Amkor Technology Special Economic Zone	San Juan-Laiya Rd San Juan, Philippines
PH0015			Philippines		Angeles Industrial Park	Richthofen St Angeles City, Philippines
PH0016			Philippines		Anson's Center	Ansons Appliance Center Makati City, Philippines
PH0017			Philippines		Araneta Cyber Park	M. Araullo St Manila, Philippines
PH0018			Philippines		Arcenas Estate IT Building	
PH0019			Philippines		Asahi Special Economic Zone	16 Bataan Quezon City, Philippines
PH0020			Philippines		Aseana One	Aseana Ave Manila, Philippines 26
PH0021			Philippines		Asian Star Building	Asian Star Bldg ASEAN Dr, Muntinlupa City 1781, Philippines
PH0022			Philippines		Ayala North Point TechnoHub	Del Rio Dr Talisay City, Philippines
PH0023			Philippines		BA Lepanto Building	BA Lepanto Bldg 8749 Paseo de Roxas, Lungsod ng Makati, Philippines
PH0024			Philippines		Bagong Nayong Pilipino – Entertainment City Manila	Diamond Bacoor City, Philippines
PH0025		**XXPH01**	Philippines		Baguio City Economic Zone	210 Loakan Rd Baguio City 2600, Philippines
PH0026			Philippines		Balo-I Agro-Industrial Economic Zone	
PH0027			Philippines		Batangas Racing Circuit Tourism Estate	P. Burgos Batangas City, Philippines
PH0028			Philippines		Benedicto I.T. Center	Benedicto Compound Marikina City, Philippines
PH0029			Philippines		Bigfoot Information Technology Park	N.Cabahug Mandaue City, Philippines
PH0030			Philippines		Blue Wave Marikina IT Center	Bicycle Ln Marikina City, Philippines
PH0031			Philippines		Boracay Eco-Village Resort Tourism	Boracay Tambisaan Jetty Port Rd Malay

ID	Short List	LongList	COUNTRY	PROVINCE	PARK NAME	ADDRESS
					Economic Zone	
PH0032			Philippines		BPI Buendia Center	BPI Buendia Center Makati
PH0033			Philippines		Burgundy Corporate Tower	Burgundy Corporate Tower 252 Senator Gil Puyat Ave, Lungsod ng Makati
PH0034	**XXPH02**	**XXPH02**	Philippines		**C**alamba **P**remiere **I**nternational **P**ark	CPIP Main Rd Calamba Premiere Industrial Park, Calamba City
PH0035			Philippines		Camarines Sur Information Technology Park	
PH0036	**XXPH03**	**XXPH03**	Philippines		Carmelray Industrial Park I	Carmelray Industrial Park 1, Calamba City, Philippines
PH0037	**XXPH04**	**XXPH04**	Philippines		Carmelray Industrial Park II	Makiling Dr Carmelray Industrial Park 2, Calamba City, Philippines
PH0038			Philippines		Carmelray International Business Park	C. A. Yulo Ave Silangan Industrial Park, Calamba City, Philippines
PH0039			Philippines		Carmen Cebu Gum Industrial Zone	Calamba-Tagaytay Rd Calamba City
PH0040	**XXPH05**	**XXPH05**	Philippines		Cavite Economic Zone	Cavite Economic Zone Municipality of Rosario
PH0041			Philippines		Cavite Economic Zone II	Cavite Economic Zone Municipality of Rosario
PH0042			Philippines		CBP-IT Park	
PH0043		**XXPH06**	Philippines		Cebu I.T. Park	Luzon Ave Dakbayan sa Sugbu, Philippines
PH0044			Philippines		Cebu I.T. Tower	Central Nautical Highway Carmen, Philippines
PH0045		**XXPH07**	Philippines		Cebu Light Industrial Park	Lapu-Lapu city ,Cebu
PH0046			Philippines		Cebu South Road Properties	No Address
PH0047			Philippines		Century City	Leon Guinto Sr. Manila, Philippines
PH0048			Philippines		CIIF Agro-Industrial Park	
PH0049			Philippines		CIIF Agro-Industrial Park - Davao	
PH0050		**XXPH08**	Philippines		Clark Special Economic Zone	Andres Soriano Senior Angeles City, Philippines
PH0051			Philippines		Clark TI Special Economic Zone	
PH0052		**XXPH09**	Philippines		Cocochem Agro-Industrial Park	Cocochem Administration Bauan, Philippines
PH0053			Philippines		Convergys IT Building	
PH0054			Philippines		Creativo IT Center	
PH0055			Philippines		Crown 7 I.T. Center	
PH0056			Philippines		Cyber Park Building One	
PH0057			Philippines		DADC Economic Zone	
PH0058	**XXPH10**	**XXPH10**	Philippines		Daiichi Industrial Park	Kaong Silang, Philippines
PH0059			Philippines		Damosa I.T. Park	
PH0060			Philippines		DBP IT Plaza	No Address
PH0061			Philippines		DG3 I.T. Center	
PH0062			Philippines		DPC Place Building	
PH0063			Philippines		East Cyber Gate	
PH0064			Philippines		Eastbay Arts, Recreational and Tourism Zone	
PH0065	**XXPH11**	**XXPH11**	Philippines		Eastwood City CyberPark	Orchard Rd Quezon City, Philippines
PH0066			Philippines		ECO Plaza	No Adddress(Eco West Driv)

ID	Short List	LongList	COUNTRY	PROVINCE	PARK NAME	ADDRESS
PH0067			Philippines		Ecofuel Agro-Industrial Ecozone	25 ADB Ave Pasig City 1600, Philippines
PH0068			Philippines		EDSA Central IT Center	
PH0069			Philippines		EDSA Central IT Center 2	
PH0070			Philippines		EMI Special Economic Zone	
PH0071			Philippines		ePLDT Ventus Jupiter Building	
PH0072			Philippines		ePLDT Ventus Libertad Building	
PH0073			Philippines		EROS Building	EROS Bldg Dr V. Locsin St, Dumaguete City 6200, Philippines
PH0074			Philippines		E-Square Information Technology Park	
PH0075			Philippines		Eton Centris	
PH0076			Philippines		Eton Cyberpod Corinthian	
PH0077			Philippines		Eugenio Lopez Jr. Communication Center	
PH0078			Philippines		Exportbank Plaza Building	Urban Ave Lungsod ng Makati, Philippines
PH0079			Philippines		Filandia IT Center	
PH0080		**XXPH12**	Philippines		Filinvest Technology Park - Calamba	Calamba-Tagaytay Rd Calamba City, Philippines
PH0081	**XXPH13**	**XXPH13**	Philippines		First Cavite Industrial Estate	6th St First Cavite Industrial Estate, Dasmariñas City, Philippines
PH0082			Philippines		First Oriental Business and Industrial Park	
PH0083		**XXPH14**	Philippines		First Philippine Industrial Park	Tanauan Alt Rd Tanauan City, Philippines
PH0084			Philippines		Food Terminal Incorporated Special Economic Zone	
PH0085			Philippines		Fort Ilocandia Tourism Economic Zone	
PH0086			Philippines		G. T. Tower International	Limketkai Hotel and Resort Iligan City, Philippines
PH0087	**XXPH16**	**XXPH16**	Philippines		Gateway Business Park	Crisanto M. De Los Reyes Ave General Trias, Philippines
PH0088			Philippines		Gateway Office Tower	
PH0089			Philippines		Gateway Tower	Limketkai Hotel and Resort Iligan City, Philippines
PH0090			Philippines		Gernarine Information Technology Center	
PH0091			Philippines		Global Trade Center	Global Trade Center Bldg 1024 U-Turn Slot, Quezon City, Philippines
PH0092			Philippines		Glorietta 2 BPO	
PH0093			Philippines		Glorietta 5	Crisanto M. De Los Reyes Ave General Trias, Philippines
PH0094			Philippines		Golden Mile Business Park	
PH0095			Philippines		Goodland I.T. Center	
PH0096			Philippines		Green Tourism Ecozone - Pangulasian	
PH0097	**XXPH17**	**XXPH17**	Philippines		Greenfield Automotive Park	Manila Quezon City, Philippines
PH0098			Philippines		Hanston Square	Hanston Square Pasig City, Philippines
PH0099			Philippines		Harvester Corporate Center	

ID	Short List	LongList	COUNTRY	PROVINCE	PARK NAME	ADDRESS
PH0100		**XXPH18**	Philippines		Hermosa Ecozone Industrial Park	Bataan Provincial Highway Hermosa, Philippines
PH0101			Philippines		HPI Corporate Center	
PH0102			Philippines		HTMT Cyber Park	
PH0103			Philippines		HVG Arcade IT Park	
PH0104			Philippines		Iloilo Commercial Development Corp. Building	ICDC Bldg Iloilo City 5000, Philippines
PH0105			Philippines		Iloilo Technohub	Ayala Iloilo Technohub 1 Boardwalk Ave, Dakbanwa Sang Iloilo 5000, Philippines
PH0106			Philippines		Insular Life Building	Insular Life Bldg Ayala Ave, Lungsod ng Makati, Philippines
PH0107			Philippines		Insular Life Corporate Center	
PH0108			Philippines		I-Square Building	J Square Bldg Makati City, Philippines
PH0109			Philippines		Jasaan Misamis Oriental Ecozone	Iligan-Cagayan de Oro-Butuan Rd Jasaan, Philippines
PH0110			Philippines		JELP Business Solution Center	
PH0111			Philippines		JESA Building	
PH0112			Philippines		JG Summit Center	Robinsons Summit Center 6783 Ayala Ave, Lungsod ng Makati 1200, Philippines
PH0113			Philippines		JGC Philippines Building	
PH0114			Philippines		John Hay Special Tourism Economic Zone	
PH0115			Philippines		Jose Panganiban SEZ	
PH0116			Philippines		JY Square IT Center	JY Cebu City, Philippines
PH0117			Philippines		JY Square IT Center II	No Address
PH0118			Philippines		JY Square IT Center III	No Address
PH0119			Philippines		Kamanga Agro-Industrial Economic Zone	
PH0120			Philippines		Keppel Center	Keppel Center Cebu City, Philippines
PH0121			Philippines		Keppel Philippines Marine Special Economic Zone	
PH0122			Philippines		King's Court IT Center	
PH0123			Philippines		K-Pointe Technology Center	
PH0124			Philippines		KRC I.T. Zone	Lopez Jaena, Ceb, Philippines
PH0125	**XXPH19**	**XXPH19**	Philippines		Laguna International Industrial Park	Lungsod ng Santa Rosa, Philippines
PH0126	**XXPH20**	**XXPH20**	Philippines		Laguna Technopark	S Science Ave Santa Rosa City, Philippines
PH0127			Philippines		Laguna Technopark Annex	Lumban-Caliraya-Cavinti Rd Lumban, Philippines
PH0128			Philippines		Lakeside EvoZone	
PH0129			Philippines		Lexmark Plaza	Lexmark Plaza 3 Cebu City 6000, Philippines
PH0130			Philippines		Leyte Industrial Development Estate	
PH0131			Philippines		Leyte Information Communication Tech. Park	
PH0132	**XXPH21**	**XXPH21**	Philippines		Light Industry & Science Park I	Park Dr Cabuyao City, Philippines -> Cabuyao,Laguna
PH0133	**XXPH22**	**XXPH22**	Philippines		Light Industry & Science Park II	Park Dr Cabuyao City, Philippines ->Calamba City
PH0134		**XXPH23**	Philippines		Light Industry &	Park Dr Cabuyao City, Philippines -> Sto.

ID	Short List	LongList	COUNTRY	PROVINCE	PARK NAME	ADDRESS
					Science Park III	Tomas,Batangas
PH0135		**XXPH24**	Philippines		Lima Technology Center	Brgy. Plaridel Road, Lipa City , Philipines
PH0136			Philippines		LinkSy IT Park	
PH0137			Philippines		Lopue's South Square IT Park	
PH0138			Philippines		Lopue's East I. T. Center	
PH0139			Philippines		LP Information Technology Park	
PH0140			Philippines		Luisa Avenue Square IT Center	
PH0141			Philippines		Luisita Industrial Park	
PH0142			Philippines		Luxur Plaza ITformation Centre	San Juan - Laiya Rd San Juan, Philippines
PH0143			Philippines		Macroasia Ecozone	
PH0144			Philippines		Mactan Economic Zone	PENTAX Ricoh Imaging Products Co. Mactan Economic Zone 1, Lapu-Lapu City, Cebu Province, Philipines
PH0145		**XXPH25**	Philippines		Mactan Ecozone II	Masulog Rd Lapu-Lapu City, Philippines
PH0146			Philippines		Mango Square	General Maxilom Ave Cebu City 6000, Philippines
PH0147			Philippines		Manila Harbour Center	Escaldo Manila, Philippines
PH0148			Philippines		Manticao Ecozone Corporation SEZ	Butuan-Cagayan de Oro-Iligan Rd Manticao, Philippines
PH0149			Philippines		Market! Market!	Market Market Mall Taguig City, Philippines
PH0150			Philippines		Marvin Plaza Building	
PH0151	**XXPH26**	**XXPH26**	Philippines		McKinley Hill Cyber Park	Campus Ave Taguig City, Philippines
PH0152			Philippines		MDC 100	MDC 100 Eastwood Ave, Quezon City, Philippines
PH0153			Philippines		Misibis Resorts and Estates	
PH0154			Philippines		MJ Plaza	MJ Plaza 106 Valero, Lungsod ng Makati, Philippines
PH0155			Philippines		Monfort Information Technology Building	
PH0156		**XXPH28**	Philippines		MRI Ecozone	Near Sabung elementary school
PH0157			Philippines		MSE Center	
PH0158			Philippines		Multinational Bancorporation Centre	Multinational Bancorp Center 6805 Ayala Ave, Lungsod ng Makati, Philippines
PH0159			Philippines		NCCC Davao IT Center	No Address
PH0160			Philippines		New Cebu Township	No Address
PH0161			Philippines		New Jubilee Agro-Industrial Economic Zone	
PH0162			Philippines		Newport City CyberTourism Zone	
PH0163			Philippines		Niscom IT Building	
PH0164			Philippines		Northgate Cyber Zone	Northgate Cyberzone Northgate Ave Muntinlupa City 1780, Philippines
PH0165			Philippines		NYK-TDG I.T. Park	
PH0166			Philippines		Oakridge Information Technology Center	
PH0167			Philippines		Octagon IT Center	
PH0168			Philippines		Okada Resorts	
PH0169			Philippines		One Corporate Centre	One Corporate Center Meralco Ave, Pasig City, Philippines

ID	Short List	LongList	COUNTRY	PROVINCE	PARK NAME	ADDRESS
PH0170			Philippines		One Global Place	One Global Place 25th St, Taguig City 1634, Philippines
PH0171			Philippines		One Julia Vargas Building	Julia Vargas Bridge Pasig City, Philippines
PH0172			Philippines		One Sanparq	
PH0173			Philippines		Pacific Information Technology Center	
PH0174			Philippines		Pacific Star Building	Pacific Star Bldg Makati City, Philippines
PH0175			Philippines		Pamalican Island Tourism Ecozone	No Address
PH0176			Philippines		Pampanga Economic Zone	Lipa St Angeles City, Philippines
PH0177			Philippines		Pangasinan Industrial Park II	Lokeb Brgy Rd Malasiqui, Philippines
PH0178			Philippines		Paseo del Rio de Cagayan Economic Tourism Zone	
PH0179			Philippines		PBCom Tower	PBCom Tower V.A. Rufino St, Lungsod ng Makati, Philippines
PH0180			Philippines		PDC Information Techno Park	
PH0181	**XXPH35**	**XXPH35**	Philippines		People's Technology Complex	S gate People's Technology Complex, Carmona, Philippines
PH0182			Philippines		Peoplesupport Center IT Building	Philam Life Tower Paseo de Roxas, Makati City, Philippines
PH0183			Philippines		Phil. BXT Corp. Tourism Economic Zone	Pajac-Maribago Rd Lapu-Lapu City, Philippines
PH0184			Philippines		Philamlife I.T. Building	Philamlife Bldg General Malvar Ave, Ali Mall, Quezon City, Philippines
PH0185			Philippines		Philamlife IT Tower	
PH0186			Philippines		Philippine Packing Agricultural Export Processing Zone	
PH0187			Philippines		Philplans Corporate Center	PhilPlans Corporate Center Makati City, Philippines
PH0188			Philippines		Philtown Technology Park	
PH0189		**XXPH29**	Philippines		Phividec Industrial Estate-Economic Zone	Phividec Industrial Authority Administration Bldg Tagoloan, Philippines
PH0190			Philippines		Pioneer House Cebu	
PH0191			Philippines		Plastic Processing Center SEZ	
PH0192			Philippines		PLDT Garnet Building	
PH0193			Philippines		PLDT Sampaloc Building	
PH0194		**XXPH30**	Philippines		Pueblo de Oro IT Park	Masterson Ave Cagayan de Oro, Philippines
PH0195			Philippines		Q Plaza Building II	Plaza Quezon City, Philippines
PH0196			Philippines		Rapu-Rapu Ecozone	
PH0197			Philippines		RCBC Plaza	RCBC Plaza Tower 2 RCBC Plaza H.V. Dela Costa, Lungsod ng Makati, Philippines
PH0198			Philippines		Rio Tuba Export Processing Zone	Macadam Hwy Rio Tuba, Philippines
PH0199			Philippines		Riverbank Center ICT Bldg I	
PH0200			Philippines		Riverbank Center ICT Bldg II	
PH0201			Philippines		Robinland IT/BPO Center	
PH0202			Philippines		Robinsons Big R Supercenter Cainta Junction	

ID	Short List	LongList	COUNTRY	PROVINCE	PARK NAME	ADDRESS
PH0203			Philippines		Robinsons Cybergate Cebu	Robinson's Cybergate Cebu City, Philippines
PH0204			Philippines		Robinsons Cybergate Center	No Address (Roxas City,Block 6 St.(Jantotolo Chsnnel))
PH0205			Philippines		Robinsons Cybergate Davao	Robinson's Cybergate J.P. Laurel Ave, Dakbayan sa Dabaw, Philippines
PH0206			Philippines		Robinsons CyberPark	
PH0207			Philippines		Robinsons Luisita	
PH0208			Philippines		Robinsons Place Lipa	
PH0209			Philippines		Robinsons Place Novaliches	
PH0210			Philippines		Robinsons Place Otis (Manila Gas)	
PH0211			Philippines		Robinsons Place Sta. Rosa	Robinson's Cir Manila, Philippines
PH0212			Philippines		Robinsons-Equitable Tower	Robinsons Equitable Tower Quezon City, Philippines
PH0213			Philippines		Rockwell Business Center	
PH0214			Philippines		Saint Frances Cabrini Medical Tourism Park	
PH0215			Philippines		Samar Agro-Industrial Economic Zone	
PH0216			Philippines		San Carlos Ecozone	
PH0217			Philippines		San Lazaro Tourism and Business Park	
PH0218			Philippines		Sanctuary IT Building	
PH0219			Philippines		Sarangani Agro-Industrial Eco Zone	No Address
PH0220			Philippines		Sarangani Economic Development Zone	No Address
PH0221			Philippines		SDC IT Building	
PH0222			Philippines		Silver City	22 Silver Caloocan City, Philippines
PH0223			Philippines		SLC Building	SLC Bldg 6797 Ayala Ave, Lungsod ng Makati, Philippines
PH0224			Philippines		SM Baguio Cyberzone Building	210 Loakan Rd Baguio City 2600, Philippines
PH0225			Philippines		SM City Bacoor	SM Parking Rd Bacoor City, Philippines
PH0226			Philippines		SM City Fairview – Annex II	Annex 2 Bldg SM City Fairview, Quezon City, Philippines
PH0227			Philippines		SM City Pampanga	Consunji St City of San Fernando, Philippines
PH0228			Philippines		SM CyberZone 1	SM Cyberzone 1 Makati City, Philippines
PH0229			Philippines		SM iCity	SM City Lipa Lipa City, Philippines
PH0230			Philippines		SM iCity 2	SM City Bacoor Tirona Hwy, Bacoor City 4102, Philippines
PH0231			Philippines		SM Makati Cyber Zone 2 Building	
PH0232			Philippines		SM Makati Cyberzone Building	
PH0233			Philippines		SM Megamall I.T. Center	
PH0234			Philippines		SM Mezza Strip IT Center	
PH0235			Philippines		SM Seaside City Tourism Economic Zone	
PH0236			Philippines		SMCI IT Center	
PH0237			Philippines		SMNE IT Center	
PH0238			Philippines		SMPIC Special Economic Zone	

ID	Short List	LongList	COUNTRY	PROVINCE	PARK NAME	ADDRESS
PH0239			Philippines		Solaris One	Solaris One Makati City, Philippines
PH0240			Philippines		SRC Allah Valley Economic Development Zone	
PH0241			Philippines		SRC Calumpang Economic Development Zone	
PH0242			Philippines		St. Luke's Medical Center Global City	32nd St Taguig City, Philippines
PH0243			Philippines		Sta. Maria Industrial Park	Park Ave Quezon City, Philippines
PH0244			Philippines		Sta. Rosa Commercial IT Park	Radial Road 3 Santa Rosa City, Philippines
PH0245		**XXPH31**	Philippines		Subic Shipyard Special Economic Zone	RH 5 National Hwy Subic, Philippines
PH0246			Philippines		Summit One Office Tower	
PH0247			Philippines		Sun Plaza	Sun Plaza Mandaluyong City, Philippines
PH0248			Philippines		Sunnymede IT Center	Sunnymede IT Center 1614 Panay Ave, Quezon City 1103, Philippines
PH0249			Philippines		Supima eCircle	
PH0250			Philippines		Synergis IT Center	Synergis IT Center Mandaue City, Philippines
PH0251			Philippines		Tabangao Special Economic Zone	
PH0252			Philippines		Taganito Special Economic Zone	
PH0253			Philippines		Tarlac Provincial Information Technology Park II	MacArthur Hwy Tarlac City, Philippines
PH0254			Philippines		TECO Special Economic Zone	
PH0255			Philippines		The Block IT Park	
PH0256			Philippines		The Discovery Center	SM Mall of Asia Complex Ocean Dr SM Mall of Asia, Pasay City, Philippines
PH0257			Philippines		The Enterprise Center	The Enterprise Center Tower 1 Paseo de Roxas, Lungsod ng Makati, Philippines
PH0258			Philippines		The Orient Square IT Center	
PH0259			Philippines		The Paragon Corporate Centre	The Paragon Corporate Center Industry St, Muntinlupa City 1780, Philippines
PH0260			Philippines		The Paseo Center IT Building	
PH0261	**XXPH32**	**XXPH32**	Philippines		Toyota Sta. Rosa (Laguna) Special Economic Zone	Santa Rosa-Tagaytay Rd Santa Rosa City, Philippines
PH0262			Philippines		Trafalgar Plaza	Trafalgar Plaza 105 H.V. Dela Costa, Lungsod ng Makati, Philippines
PH0263			Philippines		Transcom Center	
PH0264			Philippines		Transcom Center Bacolod	
PH0265			Philippines		Two Sanparq	
PH0266			Philippines		UnionBank Plaza	UnionBank Plaza Meralco Ave, Pasig City, Philippines
PH0267			Philippines		UP Science And Technology Park (North)	Commonwealth Ave Quezon City, Philippines
PH0268			Philippines		UP Science And Technology Park (South)	Commonwealth Ave Quezon City, Philippines
PH0269			Philippines		Valencia Special Economic Zone	Rizal Park Valencia City 8709, Philippines
PH0270			Philippines		Victoria Wave Special Economic Zone	

ID	Short List	LongList	COUNTRY	PROVINCE	PARK NAME	ADDRESS
PH0271			Philippines		Vitro Internet Data Center Building	
PH0272			Philippines		Waltermart-North EDSA	
PH0273		**XXPH33**	Philippines		West Cebu Industrial Park	Toledo-Tabuelan-San Remigio Rd Philippines
PH0274			Philippines		Worldwide Corporate Center	Worldwide Corporate Center Mandaluyong City, Philippines
PH0275			Philippines		Wynsum Corporate Plaza IT Building	
PH0276			Philippines		YTMI Realty Special Economic Zone	
PH0277			Philippines		Zuellig Building	
PH0278			Philippines		CCTC Information Technology Park	
PH0279			Philippines		Cebu (LapuLapuCity) MEPZ 1	PENTAX Ricoh Imaging Products Corp. 4th St., Blk C4 MEPZ1 3rd Avenue Rd, Mactan Export Processing Zone 1, LapuLapu City, Phi.
PH0280			Philippines		The Freeport Area of Bataan Mariveles	Freeport Area of Bataan Bataan Provincial Highway, Mariveles, Philippines
PH0281			Philippines		Lima Technology Center Special Economic Zone	
PH0282			Philippines		Oledan Square Ayala Avenue	SKY Plaza Bldg 6788 Ayala Ave, Lungsod ng Makati, Philippines
PH0283		**XXPH15**	Philippines		Freeport Area of Bataan（FAB）	Freeport Area of Bataan, 2/F AFAB Adminstration Bldg, Bataan Provincial Highway, Mariveles 2106 Philippines
PH0284		**XXPH27**	Philippines		Mactan Export Processing Zone I	MEPZ1 Main Rd, Lapu-Lapu City, Philippines
PH0285	**XXPH34**	**XXPH34**	Philippines		Canlubang Industrial Estate - Teleray Phas	Sucat Muntinlupa city

SINGAPORE

Table of Contents

Chapter 1 Introduction

The report is a draft version of the Country Report for Singapore, which will be a reference document for organizations of the private and public sectors wishing to prepare an Area Business Continuity Plan (Area BCP) and develop an Area Business Continuity Management System (Area BCM System).

The country report contains information on natural disaster risks, industrial parks and investment risk, key infrastructure and lifeline systems, as well as issues to consider during natural disasters. It also presents an outline of economy and trade, an outline of physical distribution, and current practices for implementing business continuity management (BCM) in the country.

The draft report will be refined and finalized at the end of the Project.

Chapter 2 Overview of the Country

Singapore is a city-state consisting of Singapore Island, which is located close to the southern edge of the Malay Peninsula, and 62 other smaller outlying islands. Singapore is ranked as the second most densely populated country in the world, after Monaco. With four languages being used as official languages, the country itself is a competitive business district. Therefore, there are many residents other than Singaporean living in the country.

Singapore is one of the founding members of ASEAN (founded on August 8, 1967), and the leading economy in ASEAN. Cooperation with ASEAN countries is a basic diplomatic policy of Singapore.

Singapore is part of the Commonwealth Nations, and has a constitutional republican government. The current President of Singapore is Dr. Tony Tan. Since the founding of the nation, the politics of Singapore have been almost completely dominated by a single party, the People's Action Party, and its internal affairs are stable.

Basic Information of Singapore

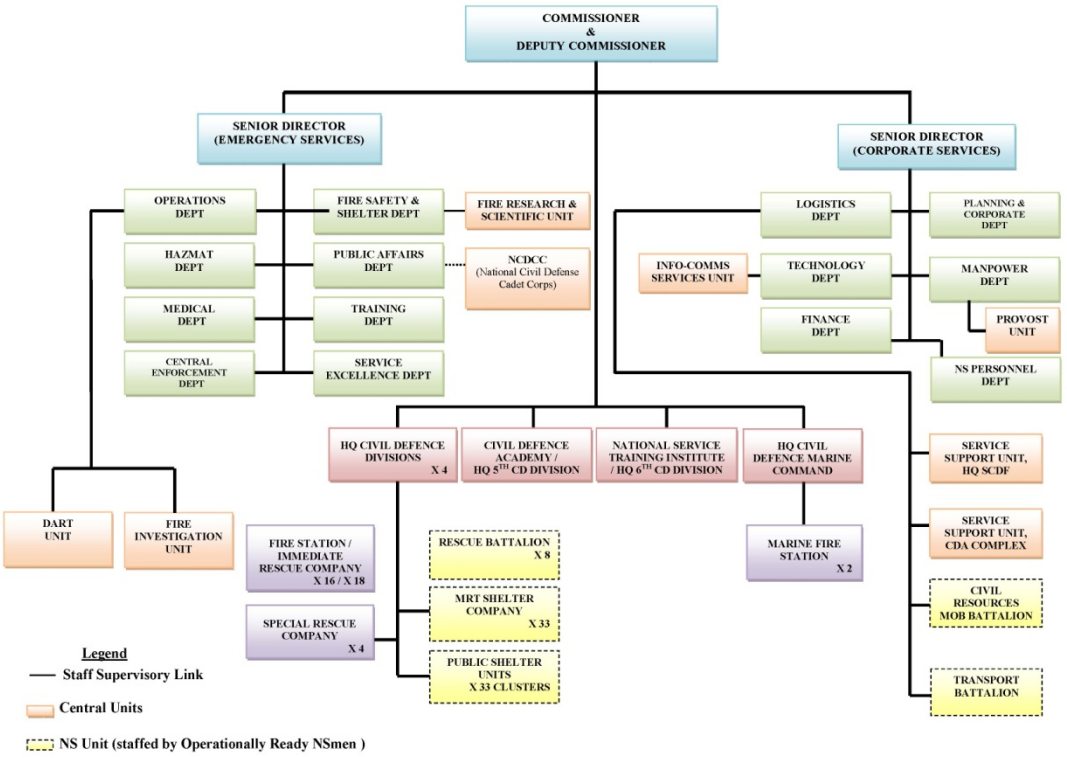
National Flag

Capital	Singapore (city-state)
Ethnic Groups	Chinese 74%, Malay 13%, Indian 9%, Others 3%
Languages	Malay (National/Official language), English, Chinese, Tamil (Official languages)
Religions	Buddhism, Islam, Christianity, Daoism, Hinduism
Area (km^2)	Total: 710 Land: 700 Inland Water: 10

Population	5,312,400
Population density(people/ km^2 of land area)	7,589
Population growth (annual %)	2.5
Urban population (% of total)	100
GDP (current US$) (billion)	275
Economic growth rate (annual %)	1.3
GNI per capita, PPP (current international $)	60,110
Agriculture, value added (% of GDP)	0
Industry, value added (% of GDP)	27
Services, etc., value added (% of GDP)	73

Features of Disasters

Singapore does not have tropical cyclone, earthquake nor volcano eruption. (Possibility of man-made disasters in urban area where various human activities concentrate.)



Source: SCDF (The organizational chart as of November 1, 2011)

Sources; Map and Flag: CIA(Central Intelligence Agency) website (2014) (https://www.cia.gov)

Capital, Ethnic Groups, Languages and Religions: Ministry of Foreign Affairs website (2013) (http://www.mofa.go.jp)

Area, Population, Population density, Population growth, Urban population, GDP, Economic growth rate, GNI per capita, PPP, Agriculture, value added, Industry, value added and Services, etc., value added: The World Bank Data Bank website (2012) (http://data.worldbank.org)

Chapter 3 Natural Disaster Risk

3.1 Floods

(1) Risk

Summary of flood disaster

In Singapore, there are storm rainfalls in the rainy season (from November to March), but there are no major flood events in the country. Torrential rains can cause local flooding in some low-lying parts of the country. The country is vulnerable to low levels of hazards from floods. The country does not suffer from flood disaster due to continuous drainage improvement work.

Notable floods and disasters in recent years

1. Torrential rainfalls triggered local floods in June 2010 and June 2011, causing inundation damage on Orchard Road and the vicinity.
2. Due to the improvement of the drainage system, the inundated areas in urban floods are decreasing.

(2) Background

Characteristics of floods

- No severe flood damage.

Notable examples of flood events

- Inundation damages were caused by torrential rains. The torrential rains of June 2010 and June 2011 caused local inundation damage at shopping malls and underground parking lots in the city. The torrential rainfall amount on the morning of June 5 was 124 mm, which is about 80% of the monthly mean total precipitation in June.

(3) Efforts by the central government, local governments, and disaster management organizations

✓ The Ministry of Home Affairs (MHA)

- As the disaster risk management organization, the MHA has taken a leading role as a policy-making government organization in order to secure safety and protect Singapore from disasters.
- In case of a national disaster such as a natural disaster or terrorism, the MHA takes a leading role and conducts overall coordination for disaster risk management.

✓ Singapore Civil Defense Force (SCDF)

- In order to reduce the impacts of disasters, the SCDF coordinates the plans of the related organizations that conduct actual disaster management activities and implementation of the plans.
- The SCDF has the role of formulating rules for firefighting, rescue operations, emergency transportation, fire prevention, and resident protection.
- The SCDF distributes an emergency handbook for emergency response.

(4) Hazard and risk information sources

Disaster risk reduction organizations

Table 3.1.1 List of Organizations for Disaster Risk Reduction

Organization	Post	Note
Ministry of Home Affairs (MHA)	Disaster Management	http://www.mkn.gov.my/mkn/default/article_e.php?mod=4&fokus=17
Singapore Civil Defense Force (SCDF)		http://www.scdf.gov.sg/content/scdf_internet/en.html
Meteorological Service Singapore (MSS)		http://www.weather.gov.sg/wip/c/portal/layout?p_l_id=PUB.1001.4
National University of Singapore (NUS)		http://www.nus.edu.sg/
Nanyang Technological University (NTU)		http://www.ntu.edu.sg/Pages/index.aspx

Reports

Table 3.1.2 List of Reference Reports for Risk Analysis

Organization	Post	Title/ Web Address	Form
Asia Development Bank	Asian Water Development Outlook	Asian Water Development Outlook 2013; Asia-Pacific Water Forum	Report
		http://www.adb.org/publications/asian-water-development-outlook-2013	
World Bank	ASEAN Disaster Risk Management Initiative	Synthesis Report on Ten Asian Countries Disaster Risks Assessment; December 2012	Report
		http://www.unisdr.org/files/18872_asean.pdf	
The Nature Conservancy	ASEAN Disaster Risk Management Initiative	World Risk Report 2012;October 2012	Report
		http://www.ehs.unu.edu/article/read/worldriskreport-2012	
World Bank	Framework and Options for Implementation	Advancing Disaster Risk Financing and Insurance in ASEAN Countries: April 2012	Report
		https://openknowledge.worldbank.org/bitstream/handle/10986/12628/714530v20ESW0W0AN0appendices0June12.pdf?sequence=1	
International Development Research Centre	Economy and Environment Program for Southeast Asia (EEPSA)	Climate Change Vulnerability Mapping for Southeast Asia: January 2009	Report
		http://web.idrc.ca/uploads/user-S/12324196651Mapping_Report.pdf	
UNEP, GRID, UNISDR		Global Risk Data Platform	Web Map
		http://preview.grid.unep.ch/index.php?preview=map&lang=eng	

Abbreviations

MHA	Ministry of Home Affaires
SCDF	Singapore Civil Defense Force
MSS	Meteorological Service Singapore
NUS	National University of Singapore
NTU	Nanyang Technology University

References :

1) Ministry of Foreign Affairs of Japan (2013): “Information on Singapore in Japanese”, 05 2013

3.2 Earthquakes

(1) Risk

Earthquake disasters are not common in Singapore. There is no record of significant disaster caused by earthquakes in its history.

Figure 3.2.1 shows earthquake risk in the Asia-Pacific region. The zones indicate where there is a probability of 20% that degrees of intensity shown on the map will be exceeded in 50 years. This probability figure varies with time; i.e., it is lower for shorter periods and higher for longer periods. Singapore is categorized as VI on the Modified Mercalli Scale.

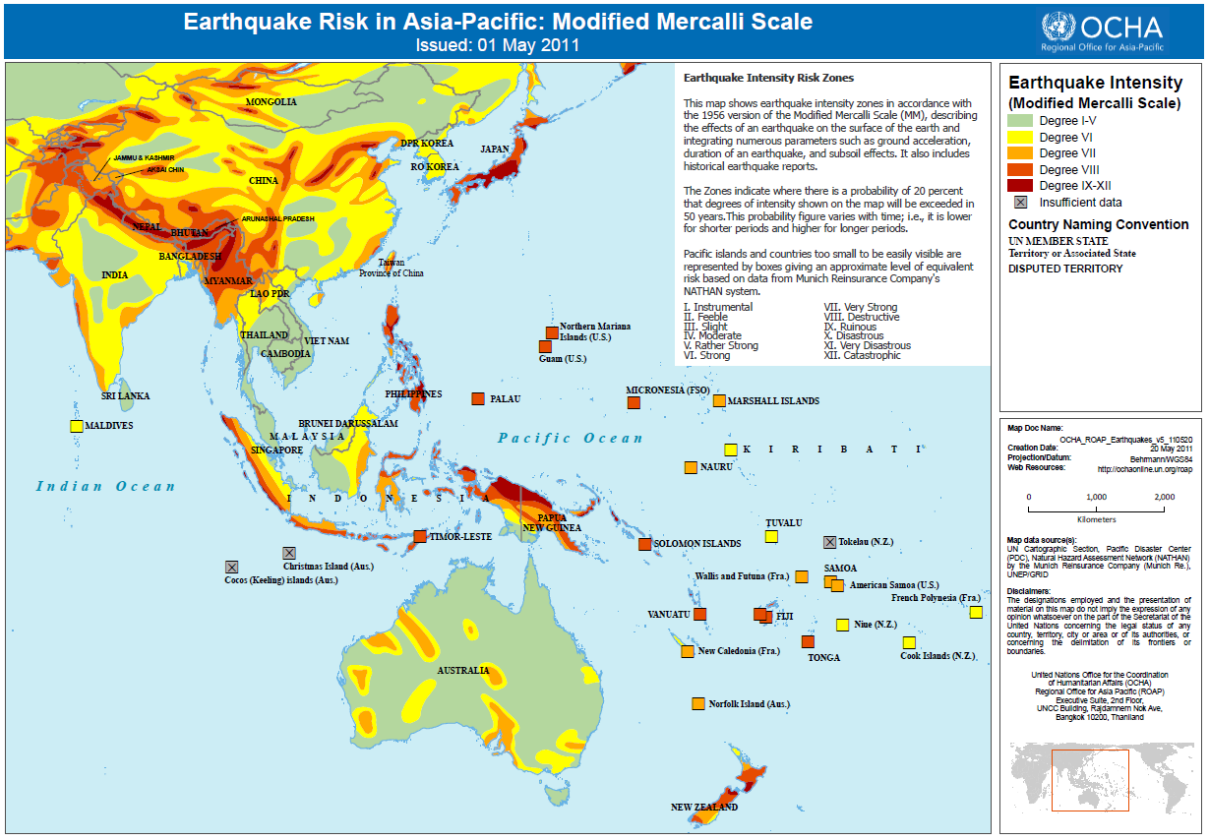


Figure 3.2.1 Earthquake Risk in Asia-Pacific

(2) Efforts by the central government, local governments, and disaster management organizations

The National Environment Agency (NEA) provides weather surveillance and multi-hazard warning services on a 24/7 basis to the public, industry, and relevant agencies in Singapore.

NEA established the Meteorological Service Singapore (MSS). MSS provides the country's weather forecasts, heavy rain warnings, smoke haze advisories, and information of earthquake/shaking/tsunami.

(3) Hazard and risk information sources

National Environment Agency
http://app2.nea.gov.sg/
Meteorological Service Singapore (MSS)

References :

1) EM-DAT: The OFDA/CRED International Disaster Database – www.emdat.be – Université Catholique de Louvain – Brussels – Belgium.
2) Japan International Cooperation Agency (JICA) (2012): "Data Collection Survey on ASEAN Regional Collaboration in Disaster Management"
3) United Nations Office for the Coordination of Humanitarian Affairs (OCHA), Regional Office for Asia Pacific (ROAP) (2011): "Earthquake Risk in Asia-Pacific: Modified Mercalli Scale", Downloaded from http://reliefweb.int/sites/reliefweb.int/files/resources/map_613.pdf

3.3 Tsunami

(1) Risk

It is well known that tsunamis are generated by sea floor earthquakes. However an undersea volcanic eruption, an undersea landslide, or and other disturbances above or below water can also generate a tsunami. There is very low probability that large earthquakes along the coast of Singapore will generate tsunamis and cause major disasters. In fact, there is no record of significant disaster caused by tsunamis.

However, tsunami disasters may occur due to large earthquakes occurring outside the country.

(2) Efforts by the central government, local governments, and disaster management organizations

The National Environment Agency (NEA) provides weather surveillance and multi-hazard warning services on a 24/7 basis to the public, industry, and relevant agencies in Singapore.

NEA established the Meteorological Service Singapore (MSS). MSS provides the country's weather forecasts, heavy rain warnings, smoke haze advisories, and information of earthquake/shaking/tsunami.

(3) Hazard and risk information sources

National Environment Agency
http://app2.nea.gov.sg/
Meteorological Service Singapore (MSS)

References:

1) EM-DAT: The OFDA/CRED International Disaster Database – www.emdat.be – Université Catholique de Louvain – Brussels – Belgium.
2) Japan International Cooperation Agency (JICA) (2012): "Data Collection Survey on ASEAN Regional Collaboration in Disaster Management"

3.4 Volcanoes

(1) Risk

There is no volcano in Singapore and also no record of significant disaster caused by volcanic eruption in its history.

Major hazards caused by volcanic eruption are lava flow, pyroclastic flow, "Lahar" (volcanic mud flow), and volcanic ash fall. Lava flow is a flow of melted rock along the slope. Pyroclastic flow is the flow of a mixture of hot dry masses of fragmented volcanic materials and volcanic gas along the slope. "Lahar" is originally an Indonesian term and is also called volcanic mud flow. It is the flow of a mixture of volcanic materials and water along the slope. These flows cause enormous damage to the side and foot of the volcano, but generally do not have an extended reach. However, volcanic ash fall often spreads widely via the trade winds or the westerlies, causing damage over and extensive area. Therefore, there is a possibility that a volcanic eruption in neighboring countries might wreak a volcanic ash fall on Singapore.

Figure 3.4.1 shows the volcanoes in the Asia-Pacific region which erupted during the Holocene. The Holocene is a geological epoch from 10,000 years ago to the present. The map indicates that many volcanic eruptions have occurred in Indonesia, Philippines, and other neighboring countries.

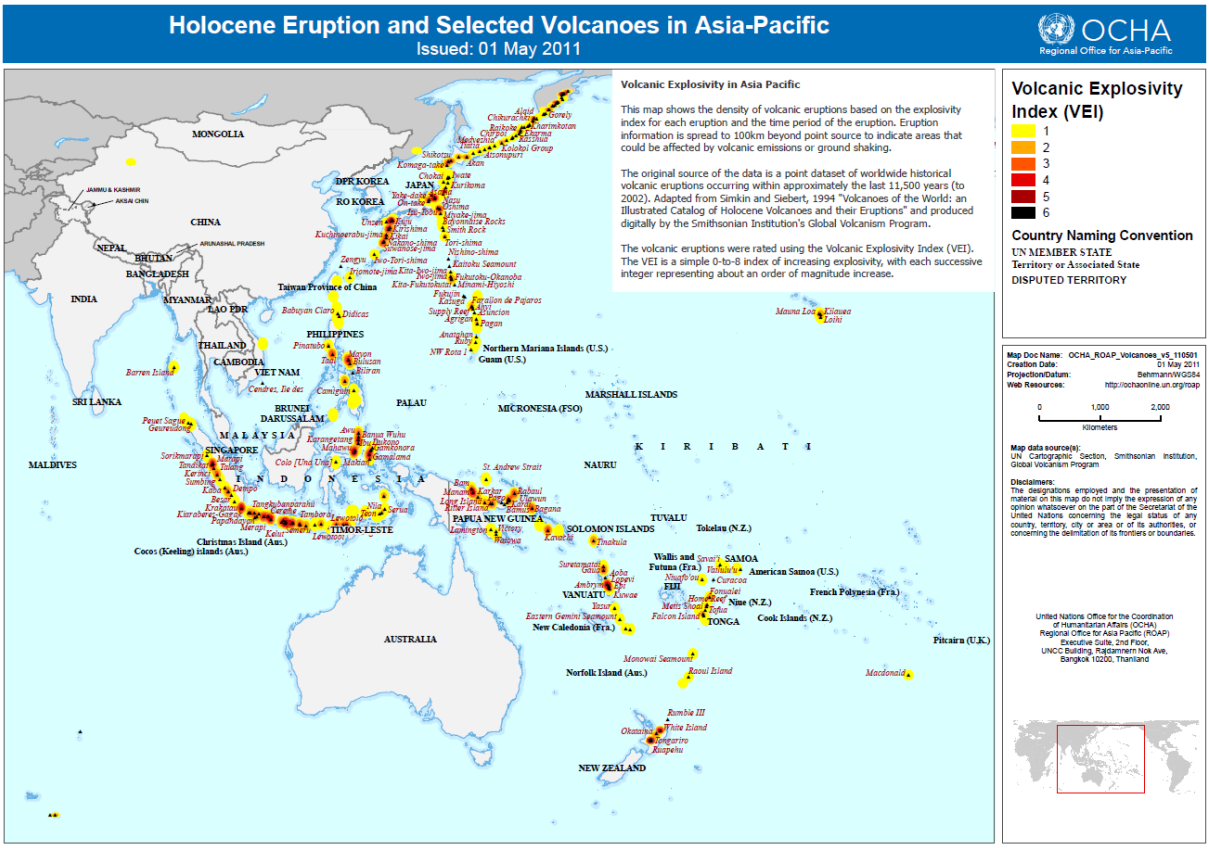


Figure 3.4.1 Holocene Eruption and Selected Volcanoes in Asia-Pacific

(2) Efforts by the central government, local governments, and disaster management organizations

The National Environment Agency (NEA) provides weather surveillance and multi-hazard warning services on a 24/7 basis to the public, industry, and relevant agencies in Singapore.

NEA established the Meteorological Service Singapore (MSS). MSS provides the country's weather forecasts, heavy rain warnings, smoke haze advisories, and information of earthquake/shaking/tsunami.

(3) Hazard and risk information sources

National Environment Agency
http://app2.nea.gov.sg/
Meteorological Service Singapore (MSS)

References:

1) Lee Siebert, Tom Simkin, and Paul Kimberly (2011): "Volcanoes of the World - Third Edition", Smithsonian Institute/University of California Press

2) EM-DAT: The OFDA/CRED International Disaster Database – www.emdat.be – Université Catholique de Louvain – Brussels – Belgium.

3) Japan International Cooperation Agency (JICA) (2012): "Data Collection Survey on ASEAN Regional Collaboration in Disaster Management"
4) United Nations Office for the Coordination of Humanitarian Affairs (OCHA), Regional Office for Asia Pacific (ROAP) (2011): "Holocene Eruption and Selected Volcanoes in Asia-Pacific", Downloaded from "http://reliefweb.int/sites/reliefweb.int/files/resources/map_619.pdf"

3.5 Cyclone (Meteorological) Hazards

(1) Risk

Singapore is located on the equator, latitude 1° 17' to the north and longitude 103° 51' to the east. This country has a tropical climate, so the island is warm and humid throughout the year. It is included within the monsoon zone, but the distinction between the rainy season and the dry season is not very clear. The wind usually blows from the north or northeast between December and early March and from the south or southwest between June and September. Annual rainfall is about 2,400 mm. Monthly rainfall does not coincide exactly with the monsoon wind. Rather, increasingly wet weather is observed from October, peaking in December.

As the country is located on the equator, it is not affected by typhoons and tropical cyclones.

Meteorological disasters in Singapore are mainly caused by heavy rains in the short-term. As the city center is located in relatively low-lying land, it is especially prone to flooding. In recent years, the risk of flooding has decreased in Singapore. However, extremely heavy rainfall can sometimes exceed the capacity that the drains were designed for, especially in low-lying areas. That is when flash floods – small and localized floods that come and go relatively quickly – may occur.

(2) Background

Singapore is within the monsoon area. The wind usually blows from the north or northeast between December and early March and from the south or southwest between June and September. The transitions between the monsoon seasons occur gradually, generally over a period of two months.

The weather is classified into four periods as below.

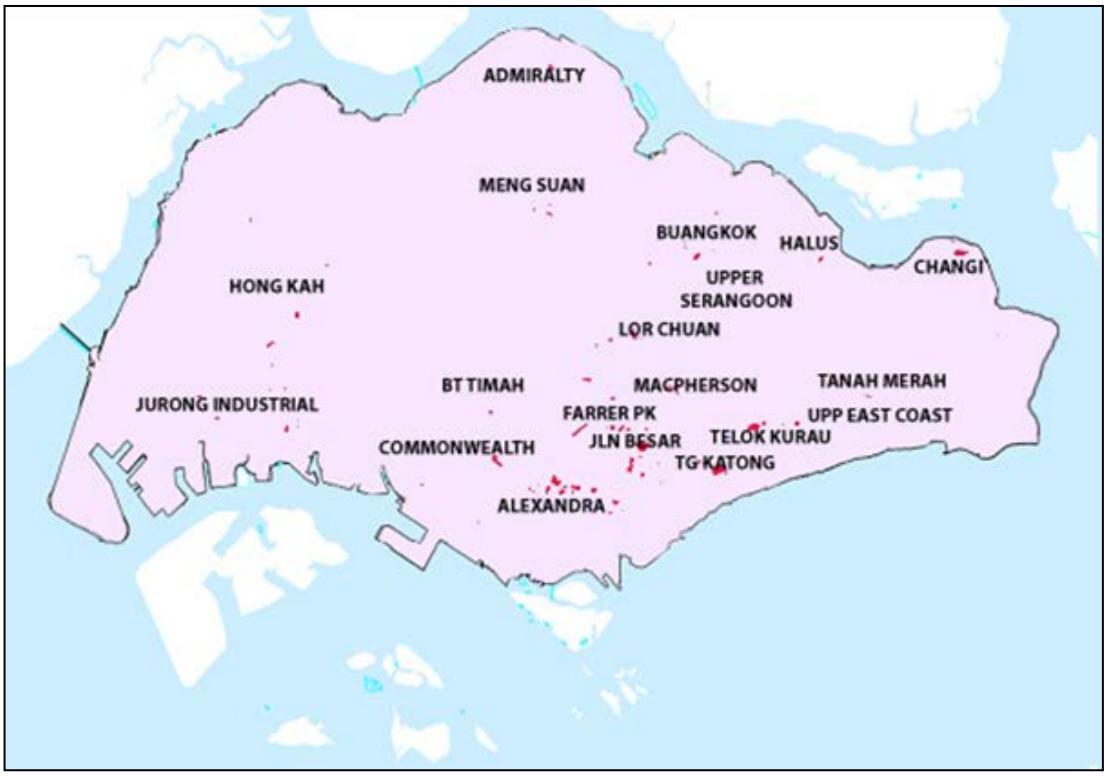
1) Northeast monsoon season (December to early March)
2) Inter-monsoon period 1 (Late March to May)
3) Southwest monsoon season (June to September)
4) Inter-monsoon period 2 (October to November)

December is usually the wettest month of the year in Singapore. A few heavy rain spells normally contribute to most of the rainfall during the month because the rain belt is more likely to be positioned close to Singapore during this period. From February to early March, the country often

sees a sharp drop in rainfall and the number of rainy days in Singapore, because the rain belt tends to move south to affect Java in Indonesia.

During the southwest monsoon period, a squall line can bring about two hours of thunderstorm, called the Sumatra squall, in the Malay Peninsula.

A flash flood is caused by localized rainfall occurring in a short time. For this reason, floods are most likely to occur in low-lying areas close to the coast. The current flood-prone areas are indicated in Figure 3.5.1.



Source: http://www.pub.gov.sg/managingflashfloods/Pages/default.aspx

Figure 3.5.1 Flood-prone areas (red colored regions)

The Public Utilities Board (PUB) issued the following.

High tides of at least 3.4 metres are expected from 12-15 January 2013. Afternoon showers with thunder are expected for the next few days. During this period, heavy rain coinciding with high tides may lead to localised flash floods, especially in the low-lying coastal areas such as Fort Road and Meyer Road. Canals that are easily influenced by tides, such as the Bedok Canal and the Siglap Canal, will see high water levels even in the absence of rain.

Climate change vulnerability and impact in Singapore are as follows.

- According to the IPCC (2007), the projected temperature rise by the end of the century in Singapore is 2.5° C, with a range of 1.7 ~ 4.4 (ADB 2009). Changes in annual precipitation for Singapore may range from -2% to + 15%, with a median of about + 7% per cent.

- In this country, extreme rainfall and winds associated with tropical cyclones are likely to increase.
- Sea level rise in Singapore is likely to be close to levels of global concern. Increased coastal erosion has already affected some areas.

(3) Efforts by the central government, local governments, and disaster management organizations

Through concerted efforts, careful land development planning, and a comprehensive and continuous drainage improvement program, flood prone areas have been greatly reduced from about 3,200 hectares in the 1970s to about 40 hectares today. This is despite increased urbanization, which would usually result in increased flooding.

The Singapore Meteorological Service is in charge of the NEA (National Environment Agency). Currently, the NEA issues the following products and provides various services:

1) weather forecasts,
2) information on air pollution,
3) lightning affected regions,
4) rainfall affected regions,
5) wind and tide information,
6) flood information, and
7) earthquake information.

For now, the terms of forecast include 3-hour, 12-hour, 3-day, and weekly forecasts.

Table 3.5.1 Authority of the Singapore Meteorological Service

Institution	Contact Information
National Environment Agency (NEA) (Ministry of the Environment) http://app2.nea.gov.sg/	**TEL: +65** 1800-225 5632 Emil: contact_nea@nea.gov.sg

(4) Hazard and risk information sources

The hazard risk assessment results related to tropical cyclones (meteorological) disasters are as follows.

Table 3.5.2 Source of Information on Tropical Cyclones (Meteorological Disasters)

Institution	Literature name
Economy and Environment Program for Southeast Asia (2010)	Climate Change Vulnerability Mapping for Southeast Asia http://css.escwa.org.lb/sdpd/1338/d2-5a.pdf
UNISDR (2010)	Synthesis Report on Ten ASEAN Countries Disaster Risks Assessment http://www.unisdr.org/files/18872_asean.pdf

Abbreviations

ITCZ	Intertropical Convergence Zone

PUB	Public Utilities Board
NEA (Ministry of the Environment)	National Environment Agency

Explanation of terms

ITCZ: This is a low-pressure (convergence) zone formed near the equator. In the lower levels (near the surface), the northeastern trade wind blows into the northern area from the ITCZ and the southeastern trade wind blows into the southern area from the ITCZ.

References:

1) National Environment Agency (Website):
http://app2.nea.gov.sg/weather-climate/meteorological-services-singapore/meteorological-services
2) PUB, Singapore's National Water Agency
http://www.pub.gov.sg/managingflashfloods/Pages/default.aspx

3.6 Landslides

(1) Risk

The risk of landslides in the country is low. There is one record of landslide in 2007.

(2) Background

The disaster in 2007 was a slope collapse along a development for residences, but there were no fatalities. The Ministry of National Development (MND) and other organizations recommended countermeasures for slope to the land owners.

There are no areas in the country with exposure to landslide disaster related to climate change.[1)]

(3) Efforts by the central government, local governments, and disaster management organizations

✓ The Ministry of Home Affairs (MHA)
http://www.mha.gov.sg/

- As the disaster risk management organization, the MHA has taken a leading role as the policy- making government organization in order to secure safety and protect Singapore from disasters.
- In case of a national disaster like a natural disaster or terrorism, the MHA takes a leading role and conducts overall coordination for disaster risk management.

- ✓ Singapore Civil Defense Force (SCDF)
  http://www.scdf.gov.sg/
  - In order to reduce the impacts of disasters, the SCDF coordinates the plans of the related organizations that conduct actual disaster management activities and implementation of the plans.
  - The SCDF has the role of formulating rules for firefighting, rescue operations, emergency transportation, fire prevention, and resident protection.
  - The SCDF distributes an emergency handbook for emergency response.

(4) Hazard and risk information sources

Reports

- ✓ Synthesis Report on Ten Asian Countries Disaster Risks Assessment; December 2012
  ASEAN Disaster Risk Management Initiative, World Bank
  http://www.worldbank.org/
  - Summarizing natural hazard and risks in 10 ASEAN countries.
  - The World Bank reported risks with respect to countries and categories of disaster.
  - Although the data is only available up to 2009, the report is well assembled.
- ✓ World Risk Report 2012; October 2012, Alliance Development Works, The Nature Conservancy
  http://www.nature.org/
  - Natural disaster risks in 173 countries in the world are ranked in this report.
  - Intended period is from 2002 to 2011.
  - Vulnerabilities are assessed with respect to categories.
  - The report is effective for comparing countries.
- ✓ Advancing Disaster Risk Financing and Insurance in ASEAN Countries: April 2012, Framework and Options for Implementation, Volume 2: Appendix 1
  https://www.gfdrr.org/
  - Summarizing natural hazard and risks in 10 ASEAN countries.
  - Intended period is from 1970 to 2011.
  - Summary of countries is well assembled.
- ✓ Climate Change Vulnerability Mapping for Southeast Asia: January 2009, Economy and Environment Program for Southeast Asia (EEPSA)
  http://www.idrc.ca/
  - Natural disaster risks in Southeast Asia are mapped in the report.

- The report contains information on risks in states/provinces.

Risk maps

✓ Global Risk Data Platform; UNEP (United Nations Environment Program)/GRID, UNISDR (United Nations Office for Disaster Risk Reduction)
http://preview.grid.unep.ch/

- Disaster sites from all over the world are mapped.
- The map shows disaster hotspots.

References:

1) Economy and Environment Program for Southeast Asia (EEPSEA) (2009): "Climate Change Vulnerability Mapping for Southeast Asia", p. 19

3.7 Predominant Natural Hazards

The records of natural disasters that affected the country are classified based on the impacts and frequency of occurrence. The results have been plotted on the impacts - frequency matrix and the most prevailing hazards studied.

3.7.1 Employed Data

The disaster records compiled in Appendix A3 are employed in this study. The records for the last 30 years, namely from 1983 to 2012, are used because the number of events included in the database before 1980 is significantly less than after 1980. The records of large disasters through earthquakes, tsunamis and volcano eruptions before 1983 are also used because the frequencies of occurrence for these hazards are significantly lower than floods, cyclones and landslides.

3.7.2 Study Method

The "Damage Amount / GDP" and 'Number of Deaths" are used as indices to show the impacts of the disasters considered and 6 natural hazards will be studied and compared. At the beginning of the study, only the "Damage Amount / GDP" was used as an index because the results can be used for Area BCP planning. However, the scarcity of information related to damage amounts became clear as the study progressed. As the information on the "Number of Deaths" is substantial compared to the damage amount, the "Number of Deaths" has been added as the index of impact.

The process of the study is as follows;

1) Based on the Damage Amount / GDP or Number of Death, each disaster is classified according to the ranking system in Table 3.7.1,
2) The number of disaster events for each country is added by type of hazard and disaster rank, and then classified into Table 3.7.2 below,

3) The above information is then plotted on the impacts - frequency matrix by country,
4) As for earthquakes, tsunamis and volcanic hazards, if an event occurred before 1983 that was of the same (or higher) disaster rank as the maximum disaster rank recorded between 1983 to 2012, a point is plotted on the matrix which corresponds to the relevant disaster and frequency rank (=1).

Table 3.7.1 Disaster Rank and Damage

Disaster Rank	Damage Amount / GDP[1]	Number of Deaths
5	1.0% -	10,001 -
4	0.1% - 1.0%	1,001 - 10,000
3	0.01% - 0.1%	101 - 1,000
2	0.001% - 0.01%	11 - 100
1	- 0.001%	- 10

Table 3.7.2 Frequency Rank and Number of Events

Frequency Rank	Number of Events from 1983 to 2012	Average Frequency (Events / Year)
5	7 or more	1/5 -
4	4 to 6	1/10 - 1/5
3	2 to 3	1/15 - 1/10
2	1	1/30
1	Large Events that occurred before 1983	-

3.7.3 Study Results

The following results are based on the available existing information. Not all information relating to the impacts of the disasters was collected. Furthermore, and the purpose of this study is not intended to evaluate the precise damage amounts or number of deaths. The purpose of this study is to rank 6 natural hazards according to their impacts.

No disasters that have caused significant damage or deaths have been recorded.

[1] Gross domestic product based on the purchasing-power-parity (PPP) valuation of the country's GDP, according to the International Monetary Fund, World Economic Outlook Database, October 2012

3.8 Existing Investigations and Studies

3.8.1 Methods and Scope of the Survey

This section reviews studies and research that have been conducted in the ASEAN region with a focus on natural hazards, risks, and vulnerability assessments. The target hazards are: floods, earthquakes, volcanoes, tsunamis, cyclones (typhoons)/meteorological disasters, and landslides. Information and study reports were reviewed from those that are available for the public and on the internet. The purpose of this section is to first gain an overview of the existing study results regarding hazard trends, encountering risks, and degrees of vulnerability throughout the entire ASEAN region as well as in each ASEAN member state. Another purpose it to produce a compilation of assessment reports of the region, which will be accessible as a reference for those who wish to plan an Area BCP.

Table 3.8.1 Methodology of Information Collection and Scope of Survey

Information Collected	Methodology	Scope of Survey
Existing studies and research	To collect existing studies and reports from public sources including the internet.	To summarize the studied hazards, areas, contents of hazard and risk analysis, vulnerability assessment of existing studies, and other research.

3.8.2 Outline of Collected Information and Data

Table 3.8.2 shows the outline of collected information and data. Summaries of existing studies and reports are compiled as data sheets in Appendix A4.

Table 3.8.2 Outline of the Collected Information and Data

Appendix A4 Subsection	Hazards	Outline
A4.1	Flood	Flood hazard, risk assessments, hazard maps, and vulnerability assessment have been conducted in ASEAN countries using data on rainfall, inundation areas, affected population, and monetary assessment. Hazard maps were produced with GIS tools. The usage of GIS tools for assessments is widely recognized and its usage has been explored to produce hazard maps. Some runoff analyses were conducted for selected areas. Limited information and data available for Brunei Darussalam.
A4.2	Earthquake	Many of the earthquake hazard studies in the area are probabilistic seismic hazard analyses (PSHA), not scenario earthquake studies. This is to quantify the probability of exceeding a specific ground-motion level at a site given all possible earthquakes. This methodology is descended from the Global Seismic Hazard Assessment Program (GSHAP). GSHAP was launched in 1992 by the International Lithosphere Program (ILP) with the support of the International Council of Scientific Unions (ICSU), and endorsed as a demonstration program in the framework of the United Nations International Decade for Natural Disaster Reduction (UN/IDNDR). Earthquakes are not equally distributed around the globe because of the generating

		mechanism. In the ASEAN region, many earthquakes are observed in and around Indonesia and Philippines, which are located in the convergent boundary (subduction) zone and fewer earthquakes are observed in and around Myanmar, which is in the transform boundary zone. There are fewer or no earthquakes observed in other regions. However, some regions are sometimes affected by the earthquakes which occur in neighboring countries. The northern regions of ASEAN countries are sometimes affected by the earthquakes that occur in the Yunnan province of China. A number of investigations and studies reflect this trend.
A4.3	Tsunami	There are only few investigations and studies about tsunami hazard or risk in the region, and most of them are compilations of past disasters. There is no probabilistic study as there is for earthquakes. There is a hazard map that encompasses several tsunami scenarios. There are studies targeting the Asia-Pacific area because tsunamis propagate in the sea. Large-sized tsunamis are caused by major earthquakes in the ocean. This is the reason that tsunamis are also not equally distributed around the globe. However, tsunamis affect a wider area than the ground-motion of earthquakes, as seen in the tsunami caused by the Sumatra earthquake on December 26th in 2004. Thus, tsunamis are sometimes studied in countries with few or no earthquakes.
A4.4	Volcano	Most volcanoes are also located along the convergent boundary (subduction) zone. This is the reason why volcanoes are also not equally distributed around the globe. Disasters caused by volcanic eruptions are lava flow, pyroclastic flow, lahar, and ash fall. Ash is scattered widely via the prevailing westerlies, but the other disaster types do not have an extensive reach. Regarding volcanic hazard, many investigations and studies are a compilation of areas affected by lava flow, pyroclastic flow, lahar, and ash fall from past volcanic eruptions for each volcano.
A4.5	Cyclone	Research on cyclone and meteorological hazard, and risk assessments have been conducted in ASEAN countries using data on tracks, damaged areas, and storm rainfall. The impact of climate change is also included in this research. Limited information and data available for Brunei Darussalam and Singapore.

3.8.3 Summary of Survey

(1) Floods

Some useful studies on flood hazard, risk, and vulnerability are publicly available presenting assessment results, case studies of countermeasures, as well as different methodological approaches. There are a few types of methodologies to assess risks and vulnerability including, for example, risks involving exposure to flooding events and population density. Vulnerability can be defined as a function of exposure, adaptive or coping capacity, and land-use etc. There are slightly different combinations of these factors with different studies for use. Therefore, these concepts must be

defined in advance to plan a methodology for an assessment, in terms of which definitions are to be used in a certain analysis.

A summary of existing studies and reports is shown in Table 3.8.3 by country. A list of collected existing studies and reports is shown in Table 3.8.4.

Table 3.8.3 Summary of Existing Studies and Reports by Country: Flood

Country/Region	Summary of Existing Studies and Reports
ASEAN	There are a few reports that study natural disasters for ASEAN and the Pacific regions at large in recent years. Disaster risks are assessed by scenario, exposure, vulnerability, damage, and loss. An assessment framework is also sought to give an overview of risks, hazard and vulnerability.
Singapore	The website of the Singapore Government, PUB has extensive data information on the flood situation and strategies to prepare for flooding.

Table 3.8.4 Existing Studies and Research: Flood

No	Country	Province/ City	Coordinates		Risk Assessment		Vulnera-bility Assess-ment	Organiza tion Produced	Document No. in Appendix A4.1
			Latitude	Longitude	Area	Popu-lation			
1	ASEAN	-	-	-	○	○	×	UNISDR/ WB	FL_001
2	Singapore	Singapore	1.282547	103.8329	○	○	×	ADB	FL_002

Note: ○ indicates the existence of information. × indicates that information was not found in public resources.

(2) Earthquakes

Useful information and studies on earthquake hazard, risk, and vulnerability were collected from resources available in the public domain including websites. The information and studies include methodologies with analysis and assessment.

There is no standardized or authorized methodology for risk and vulnerability assessment. Therefore, the methodology should be selected or updated in accordance with the purpose when risk and vulnerability assessments are required.

A summary of existing studies and reports is shown in Table 3.8.5 by country. A list of collected existing studies and reports is shown in Table 3.8.6.

Table 3.8.5 Summary of Existing Studies and Reports by Country: Earthquake

Country/Region	Summary of Existing Studies and Reports
ASEAN	There are natural hazard assessment reports for ASEAN region created by international organizations like World Bank etc. They summarize frequency, vulnerability, loss, and others subject for each disaster. Some reports describe the methodology and assessment points/items.

Singapore	There is no record of earthquake disaster in Singapore and no investigations or studies limited to this country and its regions was found.

Table 3.8.6 Existing Studies and Research: Earthquake

No	Country	Province/ City	Hazard Assessment			Risk Assessment		Vulnera-bility Assess-ment	Organi-zation Produced	Document No. in Appendix A4.2
			Scena rio	Probabi listic	Method ology	Human Loss	Econom ic Loss			
1	Worldwide	-	×	○	×	○	○	○	UNISDR	EQ_001
2	ASEAN	-	×	○	×	×	×	×	GSHAP, USGS	EQ_002

(3) Tsunamis

Useful information and studies on tsunami hazard, risk, and vulnerability were collected from resources available in the public domain including websites. The information and studies include methodologies with analysis and assessment.

There is no standardized or authorized methodology for risk and vulnerability assessment. Therefore, methodology should be selected or updated in accordance with the purpose when risk and vulnerability assessment are required.

A summary of existing studies and reports is shown in Table 3.8.7 by country. A list of collected existing studies and reports is shown in Table 3.8.8.

Table 3.8.7 Summary of Existing Studies and Reports by Country: Tsunami

Country/Region	Summary of Existing Studies and Reports
ASEAN	Tsunami induced by the Sumatra earthquake on December 26, 2004 caused major damage to ASEAN countries. The disaster is summarized by organizations like ADB.
Singapore	There is no record of tsunami disaster in Singapore and no investigations or studies limited to this country and its regions were found.

Table 3.8.8 Existing Studies and Research: Tsunami

No	Country	Province/ City	Hazard Assessment			Risk Assessment		Vulnera-bility Assess-ment	Organi-zation Produced	Document No. in Appendix A4.3
			track record	Scena rio	Metho dology	Human Loss	Economic Loss			
1	ASEAN	-	○	×	×	○	○	×	ADB	TN_002

(4) Volcanoes

Useful information and studies on volcanic hazard, risk, and vulnerability were collected from resources available in the public domain including websites. The information and studies include methodologies for analysis and assessment.

There is no standardized or authorized methodology for risk and vulnerability assessment. Therefore, methodology should be selected or updated in accordance with the purpose when risk and vulnerability assessment are required.

A summary of existing studies and reports is shown in Table 3.8.9 by country. A list of collected existing studies and reports is shown in Table 3.8.10.

Table 3.8.9 Summary of Existing Studies and Reports by Country: Volcano

Country/Region	Summary of Existing Studies and Reports
ASEAN	UNOCHA summarized the scale of the explosion of volcanoes around the Asia-Pacific region using the Volcanic Explosivity Index (VEI).
Singapore	There is no record of volcanic disaster in Singapore and no investigations or studies limited to this country and its regions were found.

Table 3.8.10 Existing Studies and Research: Volcano

No	Country	Province/ City	Hazard Assessment			Risk Assessment		Vulnera-bility Assess-ment	Organi-zation Produced	Document No. in Appendix A4.4
			Track record	Scena rio	Metho dology	Human Loss	Economic Loss			
1	ASEAN Asia-Pacific	-	○	×	×	×	×	×	OCHA -ROAP	VE_001

(5) Cyclone (Typhoon) and Meteorological Hazard

"Cyclone" is a term to describe many types of of low pressure systems, of which tropical cyclones/typhoons are the main types creating disasters in the ASEAN region. Under the framework of WMO, leading countries implement monitoring/detection of tropical cyclones on a regional basis. Table 3.8.11 indicates the responsible territory allocated to ASEAN members and its leading country.

Table 3.8.11 Members of WMO Tropical Cyclone Committee

	Warning Zones	Members（ASEAN）	Leading Country
Western North Pacific Ocean and South China Sea	0° - 60°(N) 0° - 100°(E)	Cambodia, Lao PDR, Malaysia, Philippines, Singapore, Thailand, Vietnam	Japan
Bay of Bengal and the Arabian Sea	5°S - 45°(N) 30°E - 90°(E)	Myanmar, Thailand	India

South Pacific and South-East Indian Ocean	0°-50°(S) 90° - 170°(E)	Indonesia	Fiji

The dates and information utilized in this report have been acquired from various reports on the studies and research conducted on tropical cyclones and meteorological hazards published on the internet. Collected documents include evaluation results of hazards/risks, as well as their evaluation methods. With regard to tropical cyclones/typhoons, a meteorological organization of each country compiles a summary on the damage situation, including the number of casualties or loss of human lives, and the estimated amount of damage, etc.

A summary of existing studies and reports is shown in Table 3.8.12 by country. A list of collected existing studies and reports is shown in Table 3.8.13.

Table 3.8.12 Summary of Existing Studies and Reports by Country: Cyclone and Meteorological Hazard

Country/Region	Summary of Existing Studies and Reports
ASEAN	Study reports on natural disasters in the whole ASEAN region are available.
Singapore	There is no indication of tropical cyclones or meteorological hazards.

Table 3.8.13 Existing Studies and Research: Cyclone and Meteorological Hazard

No	Country	Province/ City	Coordinates		Risk Assessment		Vulnera-bility Assess-ment	Organiza tion Produced	Document No. in Appendix A4.5
			Latitude	Longitude	Area	Popu-lation			
1	Singapore							ADB	CM_002

(6) Landslides

A summary of existing studies and reports is shown in Table 3.8.14 by country. A list of collected existing studies and reports is shown in Table 3.8.15.

Table 3.8.14 Summary of Existing Studies and Reports by Country: Landslide

Country/Region	Summary of Existing Studies and Reports
ASEAN	There have been a few reports that study landslides for ASEAN and the Pacific region at large in recent years. Disaster risks are assessed by scenario, exposure, vulnerability, damage, and loss. An assessment framework is also sought to give an overview of risks, hazard, and vulnerability.
Singapore	There is no record of or assessment on landslides in Singapore.

Table 3.8.15 Existing Studies and Research: Landslide

No	Country	Province/ City	Coordinate		Risk Assessment		Vulnera-bility Assess-ment	Organization Produced	Document No. in Appendix A4.6
			Latitude	Longitude	Area	Popu-lation			
1	ASEAN				○	○	×	UNISDR/World Bank	LS-006
2	ASEAN				○	○	×	EEPSEA	LS-013
3	World				○	○	○	WB	LS-007

References:

Flood

1) Shigenobu Tanaka et al (2010). Progress Report on Flood Hazard Mapping in Asian Countries. PWRI.
2) Velasquez, Jerry et al (ed.) (2012). Reducing vulnerability and exposure to disasters: Asia-Pacific disaster report 2012, ESCAP/UNISDR AP
3) World Bank (2011). Advancing Disaster Risk Financing and Insurance in ASEAN Countries: Framework and Options for Implementation, Washington: Global Facility for Disaster Reduction and Recovery
4) World Bank, UNISDR (2010). Synthesis Report on Ten ASEAN Countries Disaster Risks Assessment.

Earthquake

1) UNISDR (2009). Global assessment report on disaster risk reduction, Risk and poverty in a changing climate

Tsunami

1) ADB (2005). From Disaster to Reconstruction: A Report on ADB's Response to the Asian Tsunami

Volcano

1) OCHA -ROAP (2011). Holocene Eruption and Selected Volcanoes in Asia-Pacific

Cyclone (Typhoon) and Meteorological Hazard

1) National Environment Agency (Singapore). Annual Weather Review 2011 (http://app2.nea.gov.sg/annual_review_new.aspx)
2) WMO National Meteorological or Hydrometeorological Services of Members (http://www.wmo.int/pages/members/members_en.html)

3) WMO (2010). First Meeting of the Task Team on "Meteorological, Hydrological and Climate Services for Improved Humanitarian Planning and Response", WMO Headquarters, Geneva, Switzerland (31 August - 2 September, 2010)

Landslide

1) World Bank, UNISDR (2010). Synthesis Report on Ten ASEAN Countries Disaster Risks Assessment

Chapter 4 Industrial Agglomerated Areas and Investment Risk

4.1 Historical Evolution of Industrial Agglomerated Areas

Industrial estate development in Singapore began in the 1960s. Initially, industrial estate planning was conducted through designated government agencies. The Economic Development Board brought in FDI and the state-owned JTC Corporation, Singapore's largest industrial landowner and developer, handled implementation. Today, JTC continues to own a significant share of industrial estates; the rest is shared between another government body, the Housing and Development Board, and the private sector.

In the early stages of industrial park development, the government was focused on estates dedicated to labor-intensive, export-oriented production, which corresponded with the economic realities of 1960s Singapore. Larger estates, like Jurong, occupied suburban and rural parts of the island, while light industrial parks operated within the limits of different urban centers. Due to environmental concerns and policy efforts to develop key industries, namely the petroleum petrochemical industries, in the 1970s, Singapore saw the formation of industry-specific and small industry clusters.

Over the next 20 years, Singapore transitioned towards more higher-end, capital intensive industries. JTC's Jurong Island (petrochemical), One North (biomedical), and Singapore Science Park (R&D) were all examples of new specialized science and business parks. The JTC Corporation also initiated land reclamation projects with emphasis on environmental preservation and plot optimization. New stack-up factories replaced low plot ratio buildings, and infrastructure developments sought to attract high value-added companies, in order to achieve steeper land productivity growth.

By the end of the 1990s, the industrial and service sectors were becoming equally important to Singapore's economy. Technology-intensive industries migrated to new business and science clusters situated in high-density urban areas, which offered abundant amenities, business services, and easy access to infrastructure. The concept of the knowledge-based industrial estate offered a modern "work-live-play-learn" environment, where high-tech enterprises could concentrate on knowledge creation and its practical implementation. Today, JTC conducts next-generation land intensification, commercialization and optimization. Besides building multi-story factories and designing offshore floating storage facilities, JTC is also introducing East Asia's first underground liquid hydrocarbon storage facility, where applications of technological innovation meets strategic economic planning.

Manufacturing remains Singapore's economic powerhouse, with the chemicals, electronics, and the fast-growing precision engineering clusters at the top. Physical sciences, engineering, and ICT clusters are also growing. A second phase of divestment in 2011 of ready-built properties to private developers underlined the government's commitment to a diverse and competitive industrial estate market. In addition, land for industrial and commercial use is projected to increase from 13%-17% in the next 20 years.

4.2 Recent Trends and Japanese Investment

As one of the world's biggest oil-refining bases, Singapore attracted Japanese investment in petrochemical complexes as early as 1961 (Cosmo Sekiyu Co. Ltd.). In the 1970s, Japanese FDI in Singapore centered on labor-intensive, assembly production. By the mid-1980s, Japanese textile companies and other labor-intensive manufacturers withdrew from Singapore due to wage increases. The push for the development of capital intensive, high technology industries at this time attracted Japanese investors to the computer sector. After the 1985 Plaza Accord, Japanese FDI in Singapore's manufacturing sector increased by 34% over a five-year period. However, much of this was offset by Japanese tax reforms in the early 1990s, which saw companies like Sony, Toshiba, and Fujikura exit Singapore to avoid taxation on foreign subsidiaries at home.

Singapore's upgraded infrastructure, human capital base, and manufacturing facilities later attracted Japanese automakers like Isuzu (1996), Toyota (2001), and Nissan (2005). However, as a percentage of total FDI into Singapore, Japanese investment in manufacturing continued to decline, especially after the 1997 Asian Financial Crisis. As of 2011, manufacturing was the third largest share of Japanese FDI into Singapore, after retail trade and financial services. Incorporation of Japanese manufacturing companies also declined from 800 in 1997 to 197 in 2012. Dropping from USD 4.5billion in 2011, Japanese FDI into Singapore amounted to USD 1.5 billion in 2012, USD 967 million of which was invested in manufacturing and services.

4.3 Observations from Data Collection

Public information on Singapore's industrial estates is readily available, but often lacking detail, especially for older and government-owned estates. Information on ownership structures, park history, number and type of buildings, tenant businesses, and future development plans can be hard to find. The relevant government agencies are willing to provide such information and support foreign investors when contacted. In contrast, detailed information is readily available for privately-owned and publicly-listed industrial estates. Detailed information on these parks is available on their websites and from their marketing teams, who are well-prepared to support incoming investors.

4.4 General Investment Risk

(1) Political Risk

The People's Action Party (PAP) government, which has been in power since independence in 1965, has established efficient public services and has a strong, ingrained anti-corruption policy, making corruption a low risk to businesses. Although it still holds a firm grip on power, the PAP's popularity at the polls has steadily declined over the past two elections. In the May 2011 elections - the first time opposition parties mounted a comprehensive electoral challenge - the PAP secured 60% of the

popular vote, its lowest level since independence. Despite this, the PAP retained 81 seats, meaning the government is still able to plan and implement long-term economic policies with ease.

The government is under pressure to satisfactorily address grievances over high immigration, which is overburdening public housing and transport. This contributed to the reduced support for the PAP in the May 2011 polls and led to the government-backed candidate, Tony Tan, winning the presidential elections by a very narrow margin in August 2011. If the government is perceived not to have addressed these grievances by the next general election in 2016, its support would probably be further eroded, though it would still retain power. Since 2011, the government has introduced immigration quotas and removed tax incentives for immigrants.

(2) Economic Risk

A highly industrialized and successful free-market economy, Singapore is renowned for its strong economic fundamentals and prudent macroeconomic policies. The country has achieved significant economic progress over the last 40 years. Under the aegis of the PAP, the city-state has been transformed from its underdeveloped state in the 1960s to an advanced global trading and financial center, consistently ranked as one of the world's most open economies.

The country's healthy public finances, strong net-creditor position, solid economic fundamentals, and stable political environment all contribute to its economic stability. The government has actively welcomed foreign investment for decades, and virtually tariff-free trade has allowed Singapore's economy to flourish despite the city-state's lack of natural resources. Well-organized governance has given rise to sound infrastructure, including sophisticated telecommunications networks, extensive public transportation, well-managed healthcare and education, and modern air and seaport facilities.

In the near term, major risks to the export-reliant economy center on poor global demand, with GDP growth set to only marginally recover in 2013. Meanwhile, over the medium and longer terms, the economy will grow at more sustainable rates, in line with economic fundamentals, as Singapore's per capita income begins to converge with those of other advanced economies and as competition from low-cost producers such as China and India intensifies. The government has consistently demonstrated its commitment to enhancing economic competitiveness and maintaining solid macroeconomic policies to foster economic growth and stability.

(3) Legal Risk

Singapore's legal system is consistent, transparent, efficient, and internationally respected, providing a positive environment for foreign and domestic business operations. The legal framework is based mainly on English common law, but certain aspects of law have been modified and incorporated into statutory law. Respect for the law is widespread, and contractual rights and intellectual property rights are protected and can be enforced without difficulty. There is no restriction on the type of business that may be established in Singapore, but all businesses must be registered with the Accounting and Corporate Regulatory Authority (ACRA). Singapore has no requirements for local

equity participation in foreign businesses, which can be 100%-owned by a foreign national or company. The judiciary is competent, experienced, and independent. There are no notable legal risks to investment in Singapore.

(4) Tax Risk

Tax system in Singapore is transparent and tax rates are generally low. The tax regime is designed to enhance the country's competitiveness, and is considered to be attractive to business. It has undergone a number of systematic changes, resulting in the reduction of direct corporate and individual tax rates to 17% and 20% respectively by 2010. Capital gains or outbound dividends are not taxed and there are various tax incentives, exemptions, and reductions available for specific pioneer industries and expanding businesses. Singapore also has a wide tax treaty network of some 70 comprehensive treaties, meaning possible further reductions to tax rates. Over the past few years, the government has also made substantial progress in improving transparency and complying with the global standard for tax co-operation and exchange of information.

(5) War Risk

Relations with Indonesia, Thailand and Malaysia occasionally come under strain as a result of political disputes, although these disagreements are very unlikely to lead to armed hostilities. These countries are substantial trading partners and are among the principal members of the Association of Southeast Asian Nations committed to keeping the region peaceful. Further, Singapore’s strategic relationship with the US, under which the US regional naval fleet has a base in Singapore, reduces the risk of interstate war with its neighbors.

Singapore also has intermittent disputes with the Malaysian government, from which it gained independence in 1965. Previous disputes have revolved around the status of island territories along their maritime boundary and the joint management of the two causeways linking the two countries. Two border disputes over Pedra Branca and a maritime territory were resolved by international arbitration in 2008 and 2003 respectively. The government's move to build desalination plants in order to meet national water requirements has mitigated the risk of disputes with Malaysia arising from the fact that Singapore sources its water from Malaysia. Disputes that do arise are usually resolved at the prime ministerial level, making a military confrontation unlikely.

(6) Terrorism Risk

Singapore is an attractive target for international and regional Muslim militant groups given its role as a supporter of US counterterrorism activities and as a base for the US navy. Moreover, being a largely non-Muslim country in a region with countries with substantial Muslim populations - such as Indonesia and Malaysia - further marks Singapore as a target for militants. Despite this, the risk of a militant attack has been moderate since the end of 2001, when a Jemaah Islamiyah (JI) militant cell was found to be operating in the country with plans to target US naval personnel, the US Embassy and other key buildings. Following the discovery of this cell, suspected JI cell members were

arrested. Since then, the capability of JI has deteriorated due to joint counterterrorism operations in Indonesia between Singaporean and Indonesian authorities and from the killing and arrest of senior JI leaders. Furthermore, the new generation of jihadist militants in Indonesia is increasingly focused on domestic issues, making it unlikely that they would target Singapore. In the unlikely event of an attack, militants would most probably target Sembawang naval base, Changi naval base (where US aircraft carriers dock) or the MRT subway system along with ports, Changi Airport, embassies, oil refineries and hotels. There is no indication of any home-grown militant threat.

(7) Civil Unrest Risk

Throughout the country's brief history, labor unrest has been rare and poses little risk to business continuity. The government has a close relationship with the National Trade Unions Congress, ensuring smooth labor-management relations. Further, the government can also rely on the pro-government media to support its policies concerning wage reform and the need for workers to retrain and upgrade their skills. Recently however, unequal treatment of foreign workers has become a more prominent issue. In December 2012, four foreign bus drivers from China were charged with inciting Singapore's first labor strike in 26 years after 171 went on a two-day strike over being paid almost 25% less than their Malaysian colleagues. While further protests related to this issue are likely, we expect them to remain infrequent and brief.

The risk of political protests is low. The PAP has been in power since 1965 with little political opposition. Over the years, the PAP government has delivered a substantial increase in living standards to the population. In February 2012, the country's GDP per capita was around USD 56,000, bettered only by Qatar and Luxembourg. The economy is open and export-oriented so it is sensitive to global economic conditions. In 2008, the economy contracted due to the global economic slowdown and went into recession, causing a rise in unemployment. However, the government successfully undertook stimulus measures making new jobs available. Future global economic problems will likewise affect domestic economic conditions and unemployment levels, but the government is likely to respond with remedial measures that make it very unlikely that unemployment would rise to levels that would prompt social unrest.

4.5 Industrial Agglomerated Areas and Natural Disaster Risk

Several distribution maps are shown overlaying natural disaster risk as follows. List of industrial agglomerated areas are attached at the end of this report.

Figure 4.5.1 Distribution of Industrial Park in Singapore

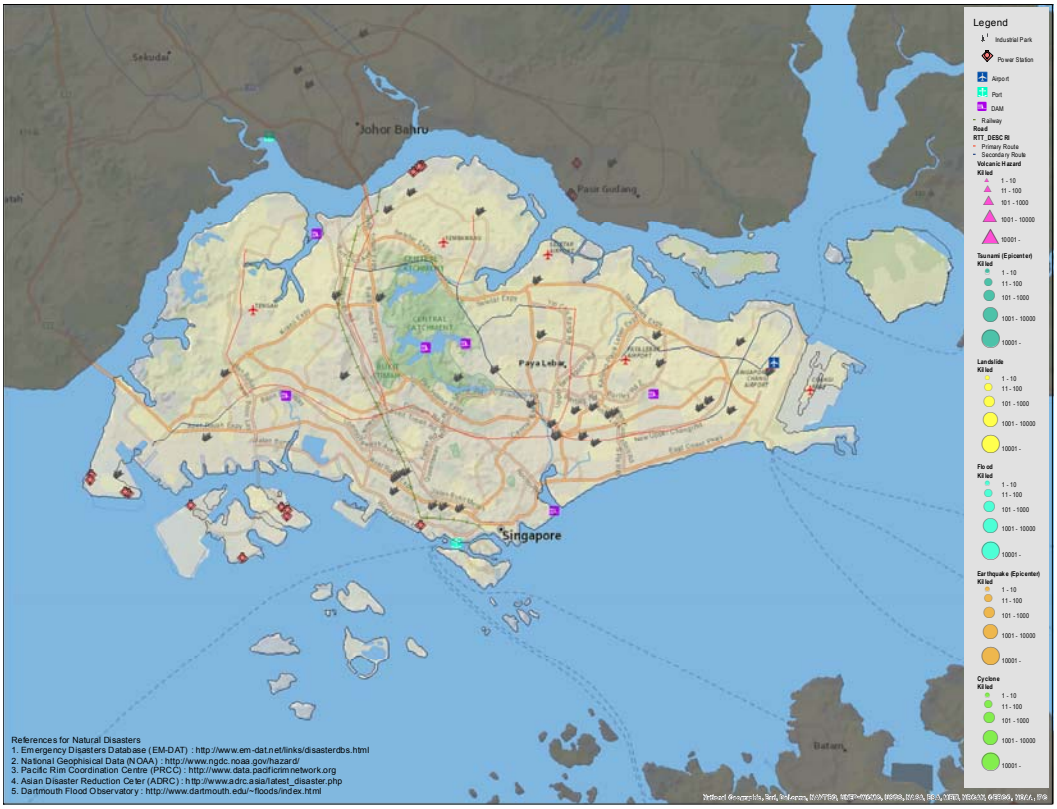


Figure 4.5.2 Distribution of Industrial Park, Major Infrastructures and Natural Hazards on number of killed in Singapore

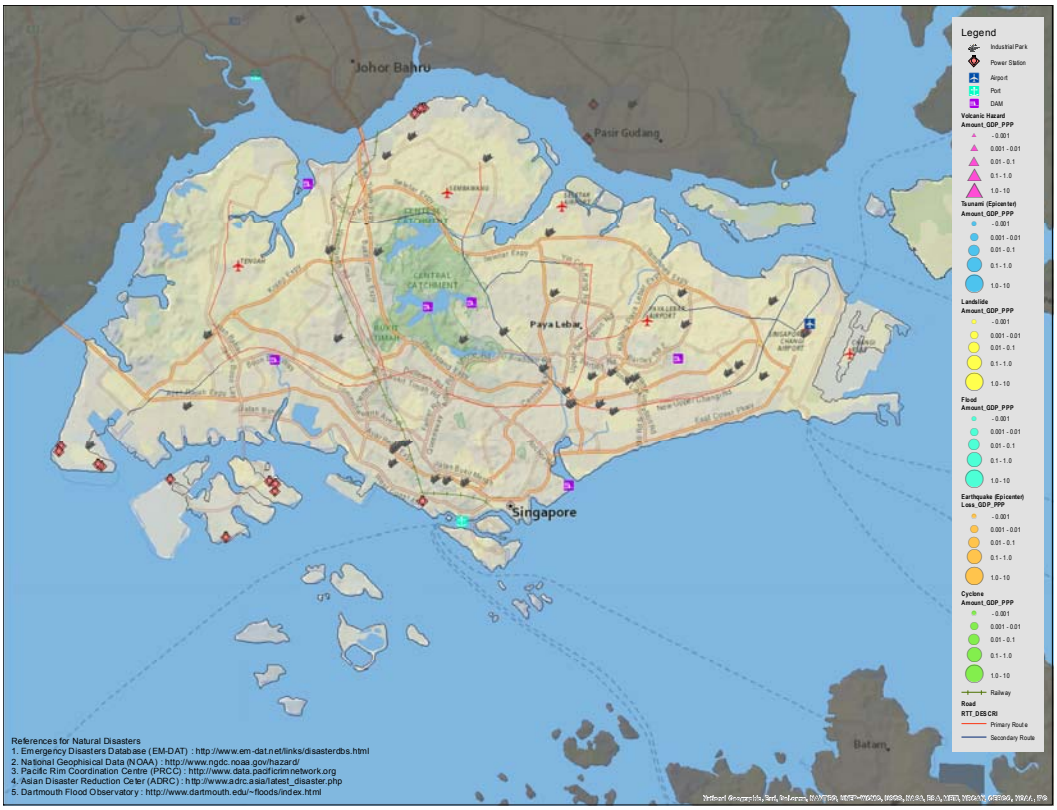


Figure 4.5.3 Distribution of Industrial Park, Major Infrastructures and Natural Hazards on loss rate to GDP in Singapore

Chapter 5 Relevant Infrastructure and Natural Disaster Issues

5.1 Infrastructure Conditions

5.1.1 Roads

(1) Expressway

In Singapore, construction management of all public roads from the expressway to district roads is under control of the Land Transport Authority (LTA) affiliated with the Ministry of Transportation. The total length of the public road network is 3,356 km. 161 km of the expressway and other major road networks cover all of the country.

The expressway in Singapore is not highway but expressway. There are 9 expressways, which are called AYE, BKE, CTE, ECP, KPE, KJE, PIE, SLE, and TPE. (Incidentally, AYE represents Ayer Rajah Expressway)

(2) Bus

Bus routes cover the entire island. Regular service is managed by SBSS and SMRT. A total of 339 lines and 3,393 buses are in operation.

(3) Taxi

As of September 2010, about 25,600 taxies provided by 8 companies are available. The number of passengers per day is 864,000.

5.1.2 Ports

The Port of Singapore is a base port of the city state which has population of approximately five (5) million people. It is an international hub port since it is located at the entrance of the Strait of Malacca, which connects the Pacific Ocean to Indian Ocean.

Container throughput as of 2009 is 2,587 TEUs, which is largest amount in the world. Facilities are operated and managed by the Port of Singapore Authority (PSA). 80% of throughput consists of transit shipment.

Table 5.1.1 Container Throughput by Year

Item	2006	2007	2008	2009
Number of Entering vessels	128,922	128,568	131,695	130,575
Entering vessels (thousand Gross Tons)	1,314,990	1,459,221	1,621,065	1,784,669
Throughput (thousand TEUs)	448,504	483,616	515,415	472,300
Container Throughput (thousand TEUs)	24,792	27,935	28,918	25,867

Source: The Council of Local Authorities for International Relations (CLAIR), Japan, Port and Airport in the Policy of Singapore

Table 5.1.2 Container Terminals in Port of Singapore

Terminal Name	Berth Length (m)	Number of Berths	Maximum Depth (m)
Tanjong Pagar	2,300	8	-14.8
Keppel	3,200	14	-15.5
Brani	2,600	9	-15.0
Pasir Panjang	7,900	23	-16.0
Total	16,000	54	

Source: PSA

5.1.3 Railways

The mass transport system is indispensable since five (5) million people live in the island which is the size of Awaji Island. An underground railway called MRT, buses, and taxi services are used as mass transport systems.

1) Mass Rapid Transit System (MRT)

MRT is an urban-type transit system which runs underground in the city area, and on elevated ways in the suburb area. The average number of passengers per day is over 183 million as of 2009. Currently, five (5) lines are running.

Table 5.1.3 MRT

Line Name	Color	Number of Stations	Operating Distances (km)	Remarks
North-South Line	Red	25	44	
East-West Lines	Green	31	49.2	
North-East Line	Purple	16	20	
Circle Line	Orange	29	33.3	
Downtown Line	Brown	34	41.9	Soft Opening as of 2013

Source: The Council of Local Authorities for International Relations (CLAIR), Japan, Land Transportation in the Policy of Singapore

A Light Rapid Transit System (LRT) is also in operation.

Table 5.1.4 LRT

Name	Number of Stations	Operating Distances (km)
Bukit Panjang	14	7.8
Sengkang	14	10.7
Punggol	15	10.3

Source: The Council of Local Authorities for International Relations (CLAIR), Japan, Land Transportation in the Policy of Singapore

5.1.4 Airports

(1) Summary

Changi Airport is the only international airport in Singapore, which opened in 1981 as a 24-hour airport. Currently, more than 80 airlines provide services at the Changi Airport, which is the world's leading hub airport and is getting larger year by year. In 2010, the number of passengers exceeded 40 million for the first time.

The Changi Airport Group (GAG) is responsible for the management of airports and business expansion to overseas markets.

Table 5.1.5 Status of Utilization of Changi International Airport

		2009	2010	2011	2012
Aircraft (No)		120,184	131,769	150,827	162,349
Passengers (thousands)					
	Departures	18,063	20,437	22,651	24,854
	Arrivals	18,026	20,486	22,778	25,056
	Transit	1,115	1,115	1,115	1,272
Mail (tons)					
	In-coming	12,113	11,165	14,361	15,789
	Out-going	14,945	16,027	19,235	19,844

Source: Yearbook of Statistics Singapore 2013

(2) Airport facility

Table 5.1.6 Outline of Changi Airport

Location	East end of Singapore
Number of Terminal	4 (Passenger Terminal 3, Budget Terminal 1)
Area	1,300ha (including 870ha of reclaimed land)
Runways	4,000m×60m 、2 lines

Source: The Council of Local Authorities for International Relations (CLAIR), Japan, Port and Airport in the Policy of Singapore

5.2 Public Services

5.2.1 Electricity

Electricity and gas services were managed by the Public Utilities Board (PUB), which was established in 1965. However, the Energy Market Authority (EMA) took over its responsibility in 2001.

After the market liberalization around 2000, the Singapore Electricity Pool was adopted. This introduced the principle of competition among the three power companies (Tuas Power, Senoko

Power, and Power Seraya), the Ministry of the Environment (ENV), and Independent Power Producers (IPP).

Table 5.2.1 Electricity Generating Capacity

Electric Company	Generation Capacity (thousand kW)
Tuas Power	2670
Senoko Power	2635
Power Seraya	2700
SembCorp Cogen	785
Keppel Merlimau Cogen	500
Others	29.1

Source: Japan Petroleum Energy Center, JPEC Report 2011

Large-scale incineration plants have been installed by Mitsubishi Heavy Industry (MHI) at Tuas Power and Senoko Power and garbage incineration power generation has started.

5.2.2 Water

(1) Water supply

The Public Utilities Board (PUB), which is under the jurisdiction of the Ministry of the Environment and Water Resource (MEWR), is responsible for water resource development and management.

Water supply and demand forecast in Singapore are shown as follows.

Table 5.2.2 Water Demand and Supply Forecast by PUB Long Term Water Plans

		2010	2060
Total Demand (per day)		1,730,000 m^3	3,460,000m^3
	Household	45%	30%
	Others	55%	70%
Water Reuse		40%	80%
	NE water	30%	50%
	Desalination	10%	30%

Source: The Council of Local Authorities for International Relations (CLAIR), Japan, Water Supply and Sanitation in the Policy of Singapore

Currently, the total length of water supply pipes is 7,000 km, and the water supply service rate is 100%. Water resources in Singapore come from “four national taps”, which are 1) water from local catchment, 2) imported water from Johor, 3) reused water called NEWater, and 4) desalinated water.

The target amount of water use is 155 liters per capita per day in 2020, and it is planned to be reduced to 147 liters in 2020.

(2) Sewerage

The sewer system of Singapore adopts separate systems for waste water and rainwater. Waste water is conveyed through a network of gravity sewers, and rainwater is collected separately by drainage systems and discharged to rivers or reservoirs. Currently, the sewerage service area is 100%.

Waste water is collected through 3100 km of sewer pipes with 131 pump stations, which have been equipped with 210 km of waste water conveyance pipes.

Singapore has six (6) Water Reclamation Plants (WRPs) as follows:

Kranji WRP, Jurong WRP, Ului Padan WRP, Seletar WRP, Klm Chuan WRP, and Bedok WRP.

The government has been developing the New Deep Tunnel Sewerage System (DTSS) in order to conduct efficient sewer treatment. The system consists of two (2) large, deep tunnels crisscrossing the island, two centralized water restoration plants, deep sea outfall pipes, and sewer link networks.

5.2.3 Communications

(1) Internet and broadband

As of March 2012, DSL holds about 45% of the broadband market share, and cable broadband holds 55%, making them nearly equal.

The optical-fiber-based NGNBN covers about 83%, and the number of subscribers amounts to 100,000.

The number of broadband subscribers is 1.323 million as of 2011, and the diffusion rate is 25.5%.

(2) Mobile phones

As of March 2012, SingTel holds about 50% of the market, and Starhub and M! each hold 25% of the rest. The number of subscribers to 3G service is 5.92 million (79% of the total mobile phone subscribers).

The number of subscribers to mobile phone is 7.755 million as of 2011, and the diffusion rate is 149.5%, which is 1.5 mobile phones/person.

(3) Fixed-line phones

The number of subscribers of fixed-line phones has shown a decreasing trend every year. The number of subscribers to fixed-line phones is 2.017 million as of 2011, and the diffusion rate is 38.9%.

(4) Broadcasting

The Terrestrial Broadcasting Service is monopolized by the Media Corp Group, which provides seven (7) channels (English, 2 Chinese, Malay, Tamil, 2 English news). Direct-wave reception of

satellite broadcasting is prohibited. Cable television service is monopolized by Starhub, and the number of subscribers is 541,000 as of September 2012.

5.2.4 Waste management

Singapore aims to attain living conditions appropriate for the so-called "Garden City" and prioritizes environmental measures. The Ministry of the Environmental Water Resource (MEWR) is responsible for waste management.

The MEWR has worked out the Singapore Green Plan 2012 and aims to achieve a sustainable society. As for waste, it has set a target to increase the recycle ratio of waste from 44% to 60%, and increase the life of landfill disposal sites by decreasing the amount of waste to eliminate landfill disposal sites in the future.

Due to economic development, the amount of waste is increasing yearly. The basis for waste disposal is incineration. 90% of the waste that can be incinerated is burned at the four (4) incineration facilities, and the remaining 10% of the waste is disposed of in landfills. The disposal sites have been moved from the main island to the sea. Semakau Landfill Site, which is located 8 km south off the main island, is in operation and will become an island of 350ha in 2045.

Table 5.2.3 Amount of Waste Disposal per day by Year (Tons)

Year	2005	2006	2007	2008	2009
Industrial	3,099	3,021	2,928	3,122	3,032
Household	3,883	4,002	4,104	4,057	4,172
Total	6,982	7,023	7,032	7,179	7,203

Source: The Council of Local Authorities for International Relations (CLAIR), Japan, Environment in the Policy of Singapore

5.3 Natural Disaster Issues

In Singapore, although there are storm rainfalls caused by the north-east monsoon during the rainy season (November to March), natural disasters rarely hit Singapore. If anything, prevention measures for human-induced disasters resulting from urbanization should be taken.

Figure 5.3.1 Major Infrastructures in Singapore

Chapter 6 Economy, Industry, and Trade

In this survey, the general outline of economy and trade in the Republic of Singapore and the cases in which disaster impact analyses were conducted are examined. The purpose is to estimate the impact of a disaster on the economy of the nation and surrounding regions, in the event that an industrial agglomerated area in Singapore is hit by a disaster.

The following topics were explored using existing data and information from sources such as the internet, research papers, reports, and other materials.

- Overview of the economy and industry in Singapore
- Overview of trade in Singapore

In order to understand the conditions of economy and trade in Singapore, relevant information was gathered/organized based on review of reference materials listed below.

No.	Reference	Remarks
1	ASEAN-JAPAN CENTRE website http://www.asean.or.jp/	Statistical data on economy, industry and trade of ASEAN
2	JETRO 2009, “ASEAN Economic Community (in Japanese)”	Regional corporation framework in East Asia
3	ASEAN Stats database http://aseanstats.asean.org/	Trade values of ASEAN by commodity and partner country, etc.
4	ASEAN website (2013), "Key basic ASEAN indicators in 2011, Last update 14 January 2013"	Key basic indicators of ASEAN
5	International Monetary Fund, World Economic Outlook Database	Macroeconomic indicators of ASEAN
6	Industrial agglomerated areas in ASEAN, IHS	Detailed information on industrial agglomerated areas in ASEAN
7	Ministry of Foreign Affairs of Japan http://www.mofa.go.jp/index.html	Information on regional affairs, etc.

6.1 Overview of the economy

The GDP of Singapore is 276.5 billion USD (2012). The country's GDP per capita is 51,162 USD (2011), and this is the highest level among the ASEAN countries.

The country's economic growth rate, which is 3% (2011), is below the average of ASEAN (15.7% (2011)). By looking at the timeline, the country's growth rate had moved in line with ASEAN countries until 2011, but it is expected that the growth rate will continue to be slower than the ASEAN average in the future. Foreign direct investment in Singapore is 38.6 billion USD, which accounts for almost 50% of total foreign direct investment in ASEAN (2010).

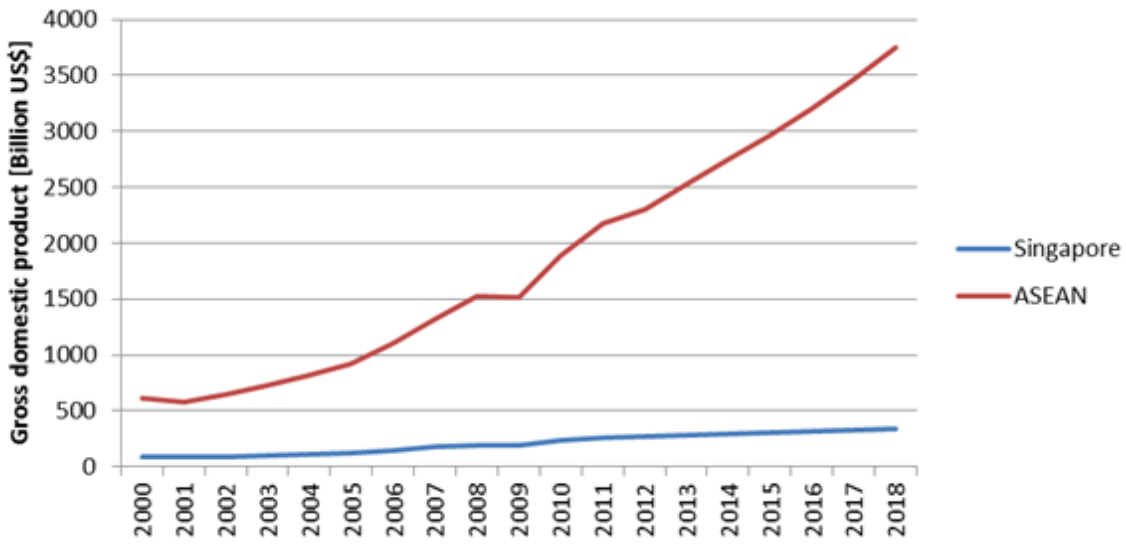
The unemployment rate is low, at 1.95% (2012). It is estimated that the rate will continue to stay in the low 2% range. However, the unemployment rate rose once in 2009, and it is thus considered that it will continue to be influenced by world economic trends.

As for the composition of the GDP by industry, the manufacturing sector, especially companies engaged in the manufacturing of electronics, chemicals, biomedical products, transportation equipment, and precision equipment, represents the largest share. The commercial sector, business service sector, transportation/communications sector, and financial services sectors are also active.

Major industrial parks in Singapore, in which many Japanese companies are operating, are summarized in the table below.

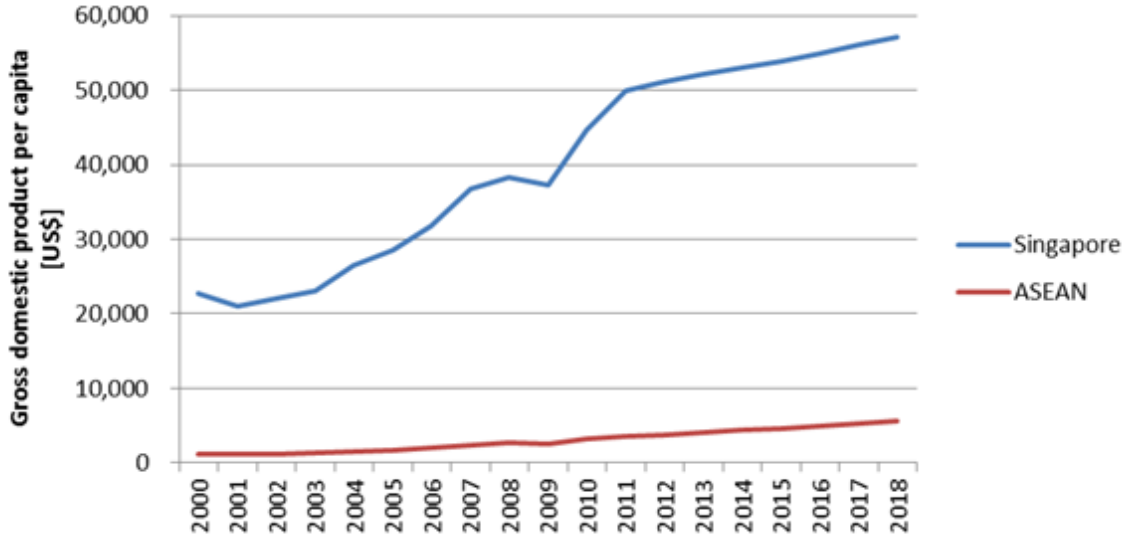
Name of Industrial Park	Number of Japanese companies operation	Description
Ang Mo Kio Industrial Estate	16 (17)	Located 15 km from Changi International Airport. Companies engaged in electric and electronic equipment manufacturing are gathered. Air conditioning equipment manufacturing companies are also operating in this industrial park.
Ayer Rajah Industrial Estate	17	Located 22 km from Changi International Airport. Companies engaged in electric and electronic equipment manufacturing are gathered.
Kallang Basin Industrial Estate	14	Located 15 km from Changi International Airport. Companies engaged in electric and electronic equipment manufacturing are gathered. Manufacturers of daily consumable products are also operating in this industrial park.
Bedok Industrial Estate	11 (10)	Located 9 km from Changi International Airport. Companies engaged in electric and electronic equipment manufacturing are gathered.
Jurong Industrial Estate	175 (11)	Located 37 km from Changi International Airport. Companies engaged in electric and electronic equipment manufacturing are gathered. Food manufacturers are also operating in this industrial park.
Airport Logistics Park of Singapore (ALPS)	(18)	Located nearby Changi International Airport. Companies engaged in transport business are operating in this industrial park.

Reference: The table was created based on information from ASEAN-Japan Centre (https://www.asean.or.jp/)
Note) Numbers shown in parentheses were obtained from resources provided by IHS.



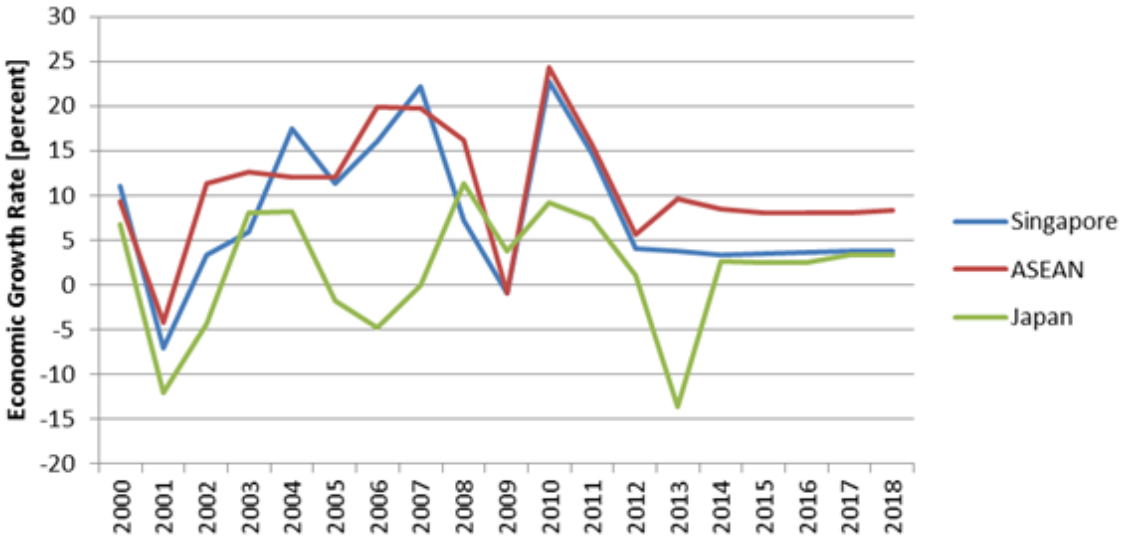
Source: International Monetary Fund, World Economic Outlook Database, April 2013

Figure 6.1.1 Gross Domestic Product in Singapore, ASEAN countries and Japan (2000-2018), current prices (Estimation in Singapore starting from 2013; in ASEAN starting from 2012)



Source: International Monetary Fund, World Economic Outlook Database, April 2013

Figure 6.1.2 Gross Domestic Product per capita in Singapore, ASEAN countries and Japan (2000-2018), current prices (Estimation in Singapore starting from 2012; in ASEAN starting from 2007)



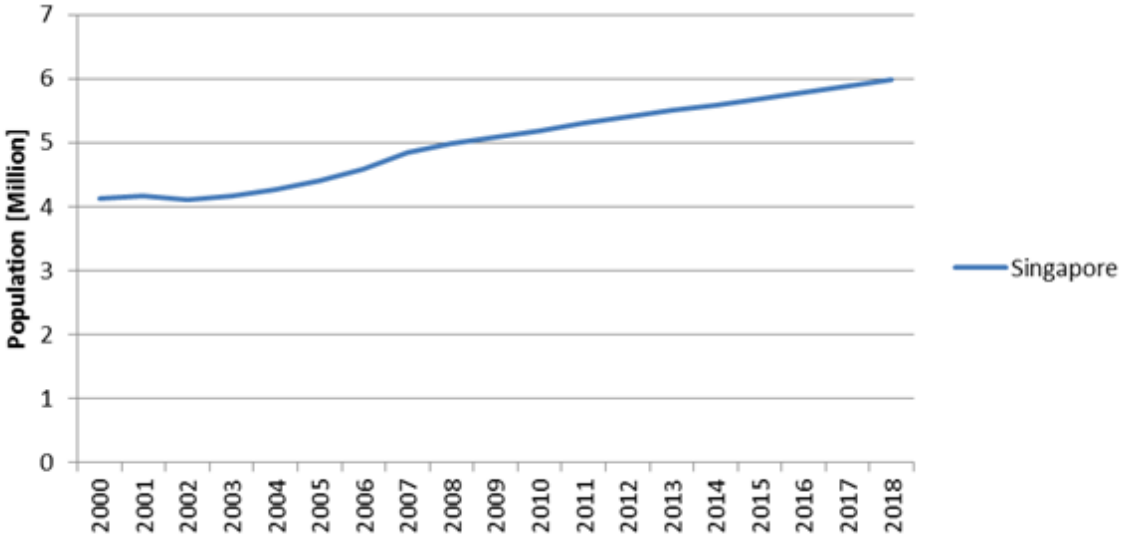
Source: International Monetary Fund, World Economic Outlook Database, April 2013

Figure 6.1.3 Economic Growth Rate in Singapore, ASEAN countries and Japan (2000-2018), current prices (Estimation in Singapore and Japan starting from 2013; in ASEAN starting from 2012)

Table 6.1.1 Average growth rate in Singapore, ASEAN countries and Japan (2013-2017)

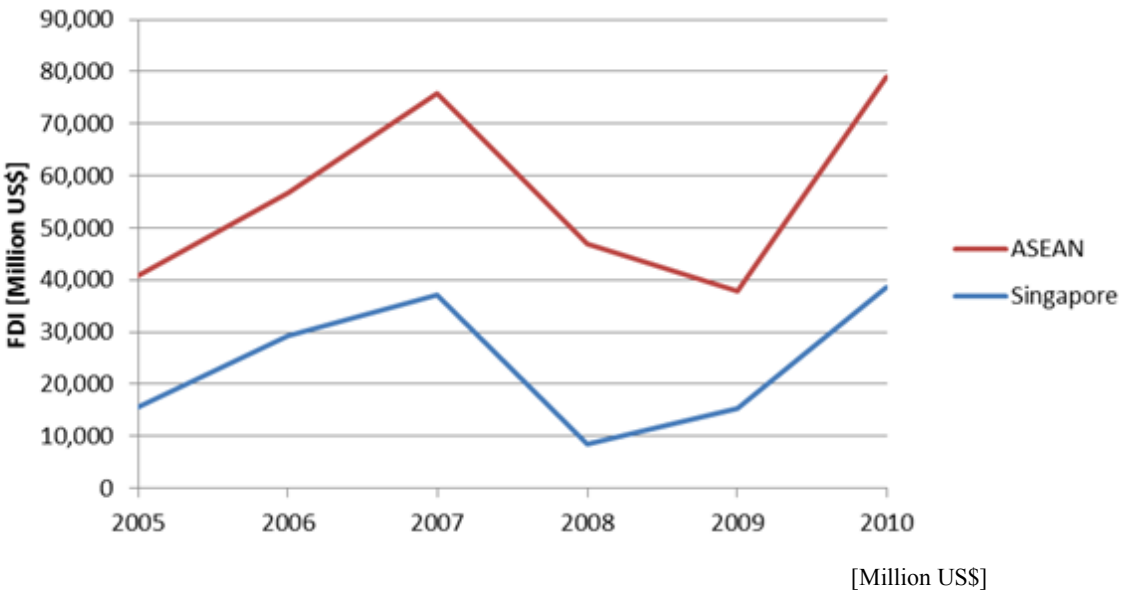
	Singapore	ASEAN	Japan
Average growth rate (2013-2017) (%)	3.6	8.5	-0.53

Source: International Monetary Fund, World Economic Outlook Database, April 2013, calculated by MRI



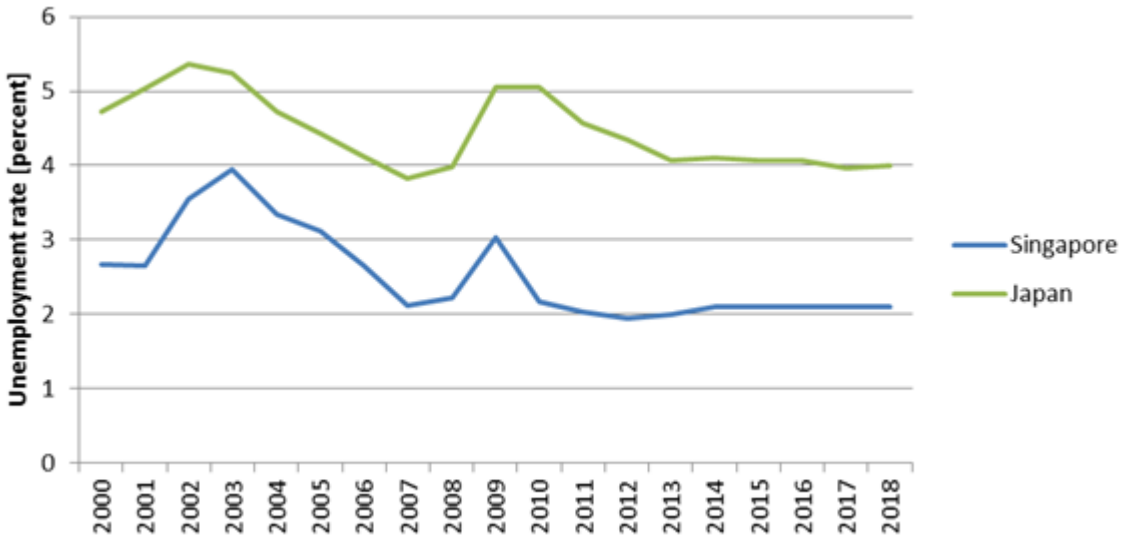
Source: International Monetary Fund, World Economic Outlook Database, April 2013

Figure 6.1.4 Population (2000-2018) (Estimation in Singapore starting from 2012; ASEAN starting from 2007)



Source: ASEAN-Japan Centre website

Figure 6.1.5 Foreign Direct Investment to Singapore and ASEAN (2005-2010)



Source: International Monetary Fund, World Economic Outlook Database, April 2013

Figure 6.1.6 Unemployment rate in Singapore and Japan (2000-2018) (Estimation starting from 2013)

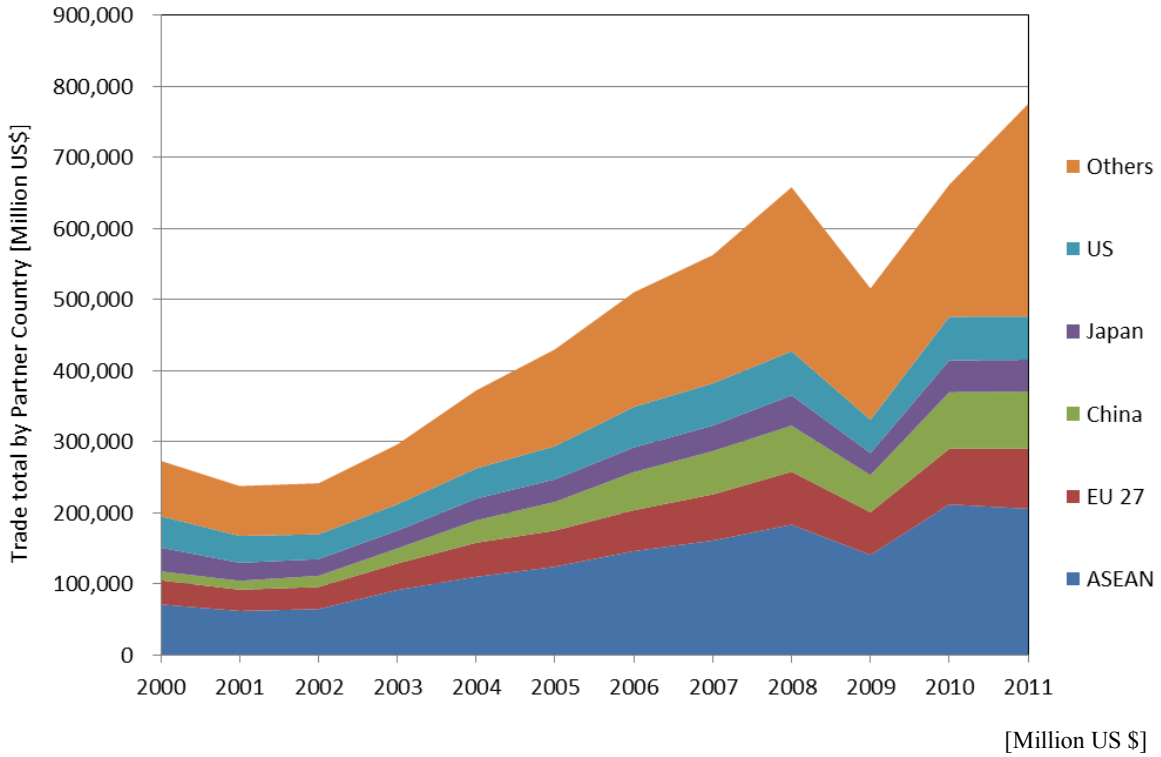
6.2 Overview of trade

(1) Amount of foreign trade/major trading partners

Trends in Singapore's foreign trade by partner countries (2000 – 2011) are illustrated in the figure below. Singapore's foreign trade has been growing steadily since 2000. Although foreign trade dropped in year 2009, after the collapse of Lehman Brothers in the fall of 2008, all regions recovered quickly from the crisis.

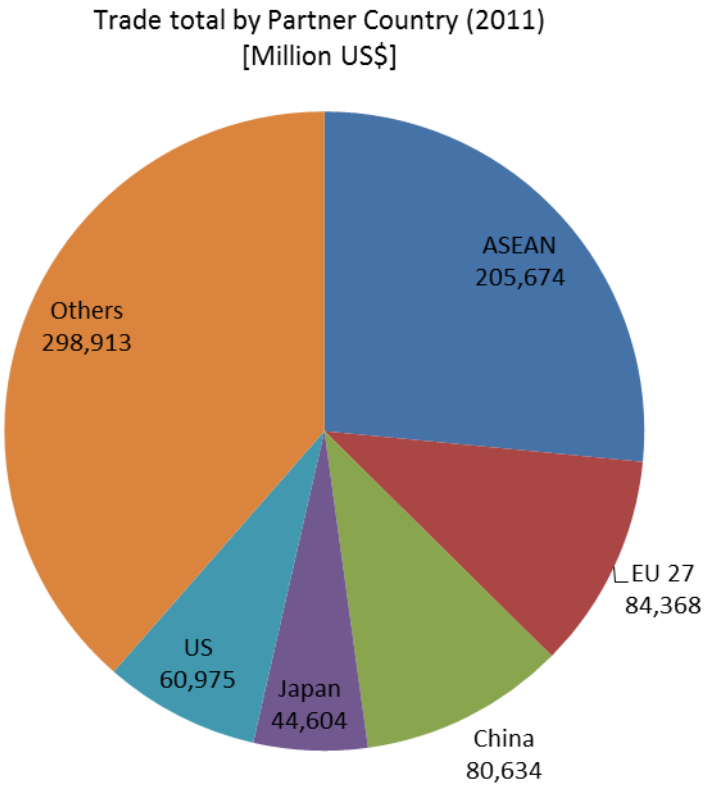
As of 2011, the largest trading partner of Singapore is other ASEAN countries, with 27% of the total trade being associated with the countries in this region. The second largest trading partner is the EU, accounting for 11% of the total trade. China comes next, with 10%, followed by the USA and Japan with 8% and 6% shares, respectively.

Looking at trends in recent years, it is observed that while Singapore's foreign trade is increasing with all trading partners, the growth rate of trade with the ASEAN countries and with China are high.



Source: ASEAN Stats database (http://aseanstats.asean.org/)

Figure 6.2.1 External Trade Value by Partner - Total (2000-2011)



Source: ASEAN Stats database (http://aseanstats.asean.org/)

Figure 6.2.2 External Trade Value by Partner - Total (2011)

(2) Categories of major trading commodities

Export values of Singapore by commodity (2011) are shown in the table below.

Examining the export values by major export commodities, it can be observed that the largest group of products exported from Singapore is machinery and transport equipment, which accounts for 54% of the total export value (187,146 million USD). Mineral fuels comes next, accounting for 23% of the total exports (81,018 million USD).

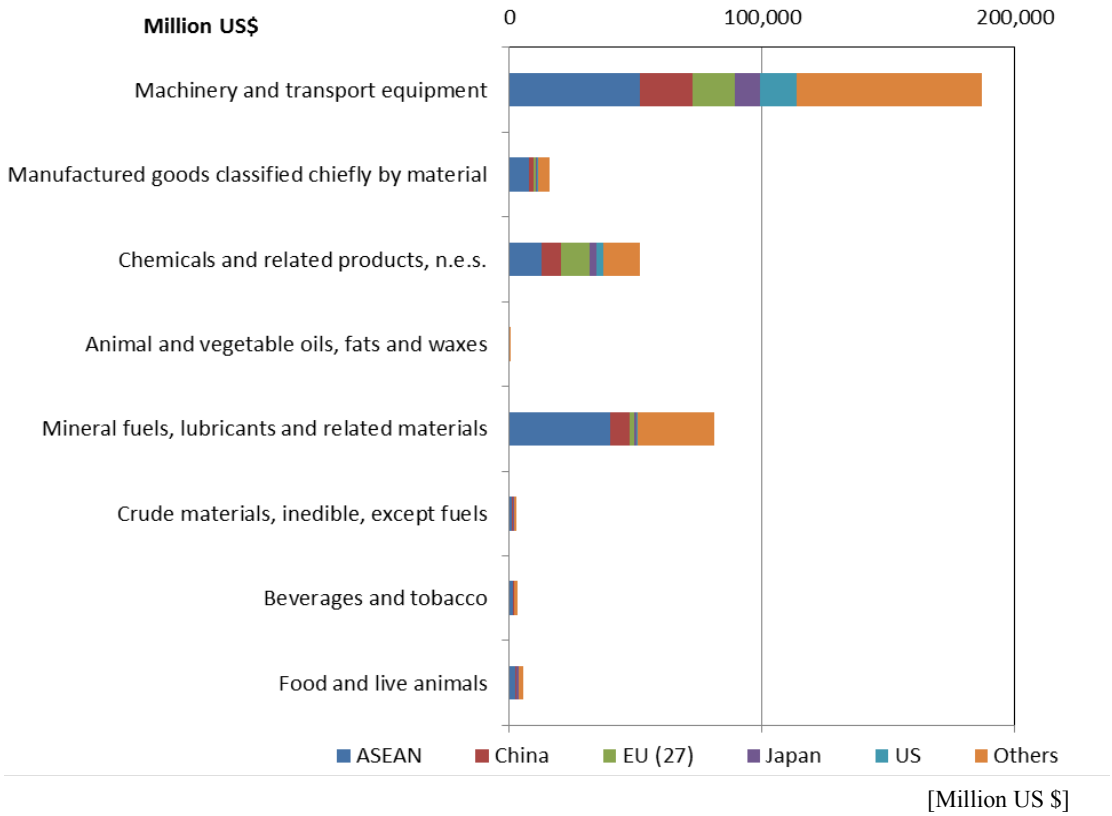
The largest export destination for machinery and transport equipment is ASEAN countries, buying 51,583 million USD. This is followed by China and the EU, with export values of 20,866 million USD and 16,866 million USD, respectively. Exports to Japan were 9,871 million USD.

Table 6.2.1 Trade values (exports) of Singapore by commodity and partner country (2011)

[Million US $]

Category	ASEAN	China	EU (27)	Japan	US	Others	WORLD
Food and live animals	2,292	484	190	621	194	1,523	5,304
Beverages and tobacco	1,504	291	21	205	9	981	3,010
Crude materials, inedible, except fuels	850	425	298	186	91	769	2,620
Mineral fuels, lubricants and related materials	39,996	7,666	1,623	938	474	30,321	81,018
Animal and vegetable oils, fats and waxes	103	11	20	9	3	288	433
Chemicals and related products, n.e.s.	12,904	7,616	11,150	2,580	2,715	14,587	51,552
Manufactured goods classified chiefly by material	7,831	1,606	983	536	361	4,409	15,726
Machinery and transport equipment	51,583	20,866	16,866	9,871	14,403	73,558	187,146

Source: ASEAN Stats database (http://aseanstats.asean.org/)



Source: ASEAN Stats database (http://aseanstats.asean.org/)

Figure 6.2.3 Trade values (exports) of Singapore by commodity and partner country (2011)

Import values of Singapore by commodity (2011) are shown in the table below.

Examining the import values by major import commodities, it can be observed that the largest group of products imported by Singapore is machinery and transport equipment, which is the same for exports and accounts for 45% of the total import value (149,752 million USD). Mineral fuels comes next, accounting for 36% of the total imports (119,376 million USD).

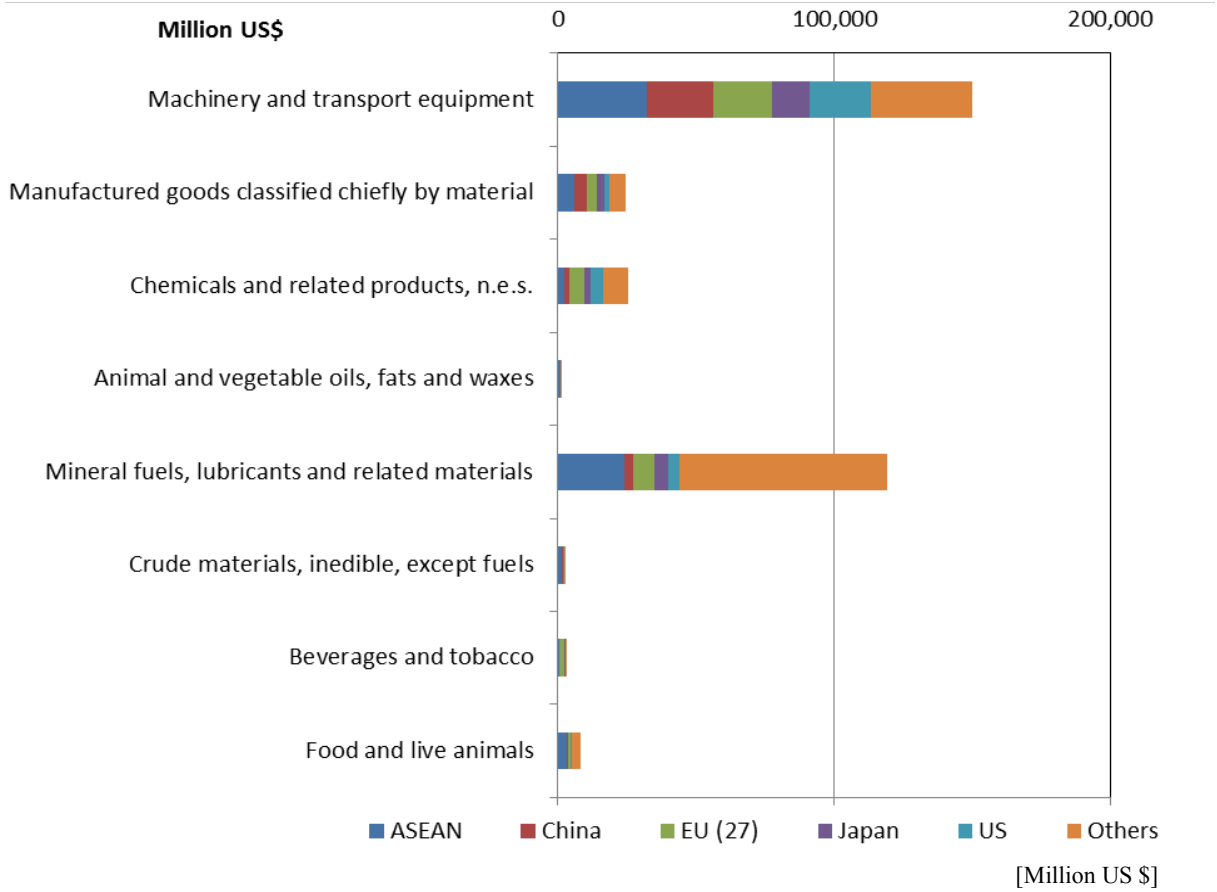
The largest exporter of machinery and transport equipment to Singapore is ASEAN, exporting a total of 32,370 million USD. This is followed by China and the USA, with import values of 23,908 million USD and 22,225 million USD, respectively. Imports from Japan were 13,235 million USD.

Table 6.2.2 Trade values (imports) of Singapore by commodity and partner country (2011)

[Million US $]

Category	ASEAN	China	EU (27)	Japan	US	Others	WORLD
Food and live animals	3,089	562	758	176	641	2,864	8,089
Beverages and tobacco	468	168	1,873	37	36	346	2,928
Crude materials, inedible, except fuels	1,534	172	164	73	379	624	2,946
Mineral fuels, lubricants and related materials	24,056	3,064	7,666	4,898	4,430	75,261	119,376
Animal and vegetable oils, fats and waxes	917	29	21	1.188566	1	208	1,177
Chemicals and related products, n.e.s.	2,506	1,639	5,536	1,929	4,661	9,096	25,367
Manufactured goods classified chiefly by material	6,087	4,415	3,502	2,916	1,624	5,836	24,380
Machinery and transport equipment	32,370	23,908	21,380	13,235	22,225	36,634	149,752

Source: ASEAN Stats database (http://aseanstats.asean.org/)



Source: ASEAN Stats database (http://aseanstats.asean.org/)

Figure 6.2.4 Trade values (imports) of Singapore by commodity and partner country (2011)

Chapter 7 Physical Distribution Network

The themes of this survey are divided into three categories as follows: 1) Understanding of Supply Chain Circumstances in ASEAN Countries, 2) Understanding of Circumstances on Physical Distribution Network, and 3) Organizing the framework of vulnerability analysis for natural disasters on the ASEAN Logistics Network.

7.1 Understanding of Supply Chain Circumstances in Singapore

(1) Relation to Logistics Performance Index on International Physical Distribution

Table 7.1.1 International LPI (Logistics Performance Index) *[1] Ranking 2012

Rank	Country	LPI	Customs	Infrastructure	International Shipment	Logistics Competence	Tracing & Tracking	Timeliness
2	**Singapore**	**4.09**	**4.02**	**4.22**	**3.86**	**4.12**	**4.15**	**4.23**

Source: World Bank Connecting to Compete 2012 Trade Logistics in the Global Economy

(2) Features of Physical Distribution in Relation to Main Industries in Industrial Parks

The lists of ASEAN-JAPAN CENTER (AJC) web-site*[2] have no specific time of investigation by year/month, but it is considered that the general current status of industry agglomeration at the time of the investigation can be obtained.

The industries in industrial parks are classified into the following 13 categories:

1) Fishery/Foodstuff, 2) Textile/Apparel, 3) Pulp/Paper, 4) Chemicals, Oil, Rubber/Ceramic, 5) Steel/Nonferrous metal, 6) Transport machines (Cars), 7) Electrical/Electronics/Precision apparatus, 8) Other industries, 9) Commerce (wholesale, retail), 10) Real estate, 11) Logistics/Warehouse, 12) Finance/Insurance/Other services, and 13) Information/Telecommunication.

The objective industrial parks are selected based on the criterion such as: 1) Degree of geographic accumulation, 2) Having sufficient operational experiences, 3) The size and number of Japanese companies, 4) Located in the pilot area in case of Vietnam, the Philippines and Indonesia.

Based on the industrial classifications above, the characteristics of distributions of the products from industrial parks are estimated.

There are 56 industrial parks in the AJC list. It can be said generally about industrial parks in Singapore is that Singapore-based companies manufacture intermediate and final products covering almost all fields of industries. Not only industrial products makers locate, but also regional head office of companies who deal with such industries as Commerce (wholesale, retail), Real estate, Logistics/Warehouse, Finance/Insurance/Other services like R&D and design, and Information/Telecommunication, are operating in major industrial parks and in the City area.

There is no car assembly plant in Singapore; instead, lots of products related to ship building industry are to be remarkable. No pulp, paper and no associated industries are operating.

Trade dependency of Singapore excess GDP outstandingly, to more than approximately 150%, this shows that facilities related to logistics are located in a well-systemized, as well as high level of infrastructures.

Logistics Performance Index by World Bank ranks Singapore at the first or second, abreast of Germany. Besides sufficiency of infrastructure facilities, Government Policy is worthy of noticing, by which institutional design is not only highly attractive for first class talents in the world to draw, but also play the key role of being expected to lead ASEAN members.

(3) Supply Chain Circumstances

Physical distribution is evolving by the stages of Physical Distribution Development Phasing (PDDP) as follows:

1) Physical distribution control: Company's own sphere of materials/ products distribution (PDC).
2) Logistics management: Company's own distribution management by the market-in strategy (LGM).
3) Supply chain management: Integrated distribution management from company's own to systemized one by the collaboration with other logistics operator resources (SCM)

Other criteria can be considered applicable, so that the development phase may be justified, based on industrial categories and their products' varieties and volumes in the selected industrial parks/ SEZ.

1) Kinds and diversity of products (intermediate or final products).
2) Whether production of high valued goods like cars, electrical/ electronic/ precision devices or not, and the levels.
3) Correspondence of export/import major items of goods to, classification of intermediate/ final products
4) Existence of a regional head office of a company which power is vested from the headquarter, and the power strength in management term.
5) Existence of logistics operator as a 3PL and maturity of the business
6) Inter dependency of industrial parks/ SEZ with megalopolises in the vicinity.

The result of assessment is shown in the table below which is made by LPI of the World Bank and by supply chain circumstances determined by above mentioned industries in the industrial park as well as major export/import items in the light of the above three stages of PDDP. The evaluation is shown by relative evaluation of five levels among ASEAN countries. Since there are no distinction time and contents wise in PDDP, the level of development is indicated as a continuous line in the table below.

Table 7.1.2 Physical Distribution Development Phasing

LPI	Country	PDDP								
					Criteria					
		PDC	LGM	SCM	Products diversified	High valued goods	Export/ Import	Regional head office	Logistics operator	Products diversified
4.09	**Singapore**				**5**	**5**	**5**	**5**	**5**	**5**

Source: JICA Study Team

7.2 Current Status and Trends of Singapore Logistics Network

(1) Domestic Physical Distribution Network

Singapore has a special presence in the ASEAN countries. With the evaluation on developed transportation infrastructure, world-first class port and airport, wide public transportation network and information and communication infrastructures, the country forms worldwide logistics hub not only for ASEAN, but also in worldwide economy in terms of global supply chain management.

(2) Intra-ASEAN Physical Distribution Network

Regarding solving the problems toward ASEAN economic integration, Singapore has already made the function of ASEAN logistics hub decisively firm.

(3) Extra-ASEAN Physical Distribution Network

Physical distributions to and from ASEAN are either by sea and air. At present, marine transportation is the most commonly-used means of transportation on both weight and value basis.

In the marine transport, containerized cargo is a typical form of transport at this moment among the general cargo, except bulk cargo.

While ASEAN major economic power countries have developed modernized container wharves, annual container cargo volumes in TEU remain still as much as the levels of 25% at Klang Port of Malaysia and 20% at Laem Chabang Port, and other main ports of 10% against those of 30 million of Singapore.

From the above situation viewed, it can be said that Port of Singapore's hub function bears most of extra-ASEAN logistics for other ASEAN member countries.

7.3 Analysis Frame on Physical Distribution Network

This section studies frame for assessment of the vulnerability of logistics network against natural disasters in consideration of the actual situation of supply chain, as a preparedness of formulation of area BCP.

The vulnerability itself is to be assessed after the further survey.

Table 7.3.1 Natural Disaster Prevention Related Matters in relation to vulnerability of Physical Distribution Facilities

Industrial Park Name represented	Singapore can be said to be highly developed industrial agglomerated area as a whole, and it is considered that it will have been played an important role as ASEAN Hub from the following views: • Natural disaster occurrence possibility is low. • Business environmental assessment has been ranked World No.1, which ranking is evaluated annually by World Bank Group. • Roads and streets network is of quite high quality and traffic is well controlled to reduce the roads congestion. • Port of Singapore has won a renown of World hub port after Shanghai in terms of cargo traffics, and efficiency in port administration. • Changi International Airport is also of World hub function, and enables one day business trip by the access to major ASEAN cities within three and half hours. • Telecommunication and Utilities services infrastructures are sufficient, and are of high quality.

	• Political situation is stable itself. • Lots of foreign companies have regional headquarter offices. From the above point of views, Singapore could work as logistics infrastructure redundancy hub as well, once a certain ASEAN member country suffers from devastated natural disaster.
Features	Place: N/A as well as features below. Operation commenced in: Nos of Operating Enterprises : Total IPK Annual Turn-over (Mill.US$):
Vulnerability Assessment Frame for Each Industrial Park (IPK)	
Natural Disaster Risk(NDR): Extract from Survey Report 1 "Chapter 5 Existing Investigations and Studies"	
■ Flooding	The possibility of flood hazard is low. There are very few reported disaster damages in the data base as well.
■ Seismic intensity/ Tsunami	Earthquake hazard level in Singapore is low. No earthquake disaster is recorded in the database. Tsunami hazard level of Singapore is low. No tsunami disaster is recorded in the database.
■ Volcano	Volcano hazard level of Singapore is low. No volcanic disaster is recorded in the database.
■ Cyclone, Meteorological Disaster, Landslide	The impact of cyclone hazard on whole the country is low. According to 1980 - 2012 records, no storm has devastated Singapore. For landslide, There is no record and assessment about landslide in Singapore.
Brief Descriptions on Counter-measures (CMS) for NDR	
1) Private sector facilities: To follow further Survey	
Land, In-park Roads:	
Plant facilities:	
Physical Distribution Facilities:	
Others, if any:	
2) Infrastructures: As stated above: nevertheless, protective countermeasures need to be studied against earthquake and tsumani disasters, because earthquake itself will recur in a very long return period of 1000 year order,	
Road :	
Railway :	
Port:	
Airport:	
Electric power/Fuel:	
Water-supply:	
Sewage:	
Solid waste:	
Telecommunication:	

Note:

*1 The summary of "Logistics Performance Index" by the World Bank is as follows.

(1) LPI score and category wise score is indicated by each country

(2) Score is ranked from one to five

(3) LPI of international logistics is scored based on the interviewing following six items to major importers and logistics companies in the neighboring countries (total of over 1000 companies).

1) Efficiency of the clearance process i.e. Speed, simplicity and predictability of formalities by border control agencies, including Customs
2) Quality of trade and transport related infrastructure e.g. Ports, railroads, roads, information technology
3) Ease of arranging competitively priced shipments
4) Competence and quality of logistics services e.g. transport operators, customs brokers
5) Ability to track and trace consignments)
6) Timeliness of shipments in reaching destination within the scheduled or expected delivery time.

*2 http://www.asean.or.jp/ja/invest/about/country_info/brunei/invest_info/industrialestate/

*3 http://www.mofa.go.jp/mofaj/area/brunei/data.html#04

References :

1) ASEAN-JAPAN CENTER, Lists of Industrial Parks/Estate/SEZ by Member Country (in Japanese)

2）World Bank Connecting to Compete 2012 Trade Logistics in the Global Economy
3）Shinya Nakata (2012), Introduction to Logistics, NIKKEI Newspapers in Japan (in Japanese)
4）JETRO (2008), ASEAN Physical Distribution Network 2008 (in Japanese)
5）ERIA: ASEAN Strategic Transport Plan 2011-2015.
6）ASEAN Secretariat, ASEAN Statistics on Intra and Extra_ ASEAN trade 2011

Chapter 8 Legislative Systems

A survey on the legislative systems concerned with disaster management, business continuity, environmental pollution, and development in Singapore is conducted in this chapter.

The survey of Singapore is mostly based on research through the website of ministries and agencies of Singapore, and also several leading international institutes that contributed to disaster research such as the Asia Disaster Reduction Center and standardization agencies in Singapore. Laws, regulations, national implementation plans, and statutes are referred to within the scope of the survey.

The table below shows the methodology for collecting information.

Information Collected	Methodology	Scope of Survey
Legislative Systems for Disaster Management	To collect information from the internet, which is published by international agencies such as ADRC and disaster management institutes in Singapore. And to refer to the report by the JICA research team.	Law or acts for civil defense. Emergency policies and national plans.
Regulations and Standards for BCM / BCP	To collect information from the websites of financial authorities regulating the BCM/BCP and Singapore standardization agencies.	Standards and regulations related to BCM. Policies and guidelines indicating development of BCP.
Legislative Systems for Environment and Pollution	To collect information from the websites of ministries and agencies responsible for environmental management.	Laws and regulations on environmental management and pollution control for industrial activities
Legislative Systems for Development including Land use, River and Building Regulations	To collect information from the website of ministries and agencies related to land use, rivers, or development.	Laws and regulations describing town development, land use, and building control or standards.

The laws, regulations, decrees, and or guidelines regulating the target fields defined above are compiled in this survey. The results of the survey in Singapore are summarized below.

Scope	Information
Legislative Systems for Disaster Management in Singapore	[Strategies and Plans] "Civil Defense Act, 1986", "Civil Defense Shelter Act, 1997", "Fire Safety Act, 1986". [Regulations, Standard and Guidelines] "Operations Civil Emergency Plan", "National Tsunami Response Plan".
Regulations and Standards for BCM / BCP in Singapore	"Singapore Standard 540:2008", "Singapore Standard 507:2004", "MAS Business Continuity Management Guidelines, June 2003", "MAS Consultation Paper On Business Continuity Planning Guidelines, 2003", "Guidelines for Company Emergency Response Plan", "Business Continuity Management Requirements for SGX members".
Legislative Systems for Environment and Pollution in Singapore	[Laws and Regulations for Environmental Pollution Control] "Environmental Pollution Control Act, 2002", "Environmental Pollution Control (Trade Effluent) Regulations", "Environmental Pollution Control (Air Impurities) Regulations", "Environmental Pollution Control (Hazardous Substances) Regulations", "Environmental Public Health Act", "Environmental Public Health (Toxic Industrial Waste) Regulations", "Sewerage and Drainage Act", "Sewerage and Drainage (Trade Effluent) Regulations".
Legislative Systems for	"Planning Act, Chap.232, 1998", "Land Acquisition Act, Chap.152, 2007", "Building

Development including Land Use, River and Building Regulations in Singapore	Control Act, Chap.29, 2007", "Building Control Regulations, 2007"

The available results on the survey about the laws and regulations for disaster management, BCP/BCM, environmental conservation, and provisions of development in Singapore are summarized below.

8.1 Legislative systems for disaster management

(1) Disaster management laws

Table 8.1.1 Laws and Regulations of Disaster Management in Singapore

	Laws / Regulations	Supervisory Authority	Subject
Law	Civil Defense Act, 19.36	Ministry of Home Affairs	General Disaster
Law	Civil Defense Shelter Act, 1997	Ministry of Home Affairs	General Disaster
Law	Fire Safety Act, 1986	Ministry of Home Affairs	Fire

No comprehensive disaster management law exists, only individual laws by disaster. These is the Fire Safety Act (1986) and Environmental Pollution Control Act (2002). In relation to emergency response, there is the Civil Defense Act (1986) and Civil Defense Shelter Act (1997).

(2) Disaster management strategies and plans

Table 8.1.2 Strategies and Plan for Disaster Management in Singapore

	Laws / Regulations	Supervisory Authority	Subject
Plan	Operations Civil Emergency (Ops CE) Plan	Ministry of Home Affairs, SCDF	Emergency
Plan	National Tsunami Response Plan	Ministry of Home Affairs, SCDF	Tsunami

Singapore has an Operation Civil Emergency (Ops CE) Plan, which is a national contingency plan.

The National Tsunami Response Plan has also been developed, and establishment of an early warning system is discussed in this plan.

8.2 Regulations and standards for business continuity management

Table 8.2.1 Regulations, Standards or Guidelines for BCM/BCP in Singapore

	Laws / Regulations	Supervisory Authority	Subject
Standard	Singapore Standard 540:2008 (SPRING: Singapore productivity and innovation)	Business Continuity Management Technical Committee	BCP
Standard	Singapore Standard 507:2004 (SPRING: Singapore productivity and innovation)	SPRING Singapore, Ministry of Trade and Industry	BCP
Guideline	MAS Business Continuity Management Guidelines, June 2003	Monetary authority of Singapore	BCP
Guideline	MAS Consultation Paper On Business Continuity Planning (BCP) Guidelines, 2003	Monetary authority of Singapore	BCP
Guideline	Guidelines for Company Emergency Response Plan	Ministry of Home Affairs, SCDF	Business Contingency
Guideline	Business Continuity Management Requirements	Singapore Exchange	BCP

	for SGX members		

SPRING (Standards, Productivity, and Innovation Board) Singapore is the governmental board under the Ministry of Trade and Industry, and it is in charge of standardization and the development of product quality in Singapore. The Singapore Standards 540 introduces the BCM framework and indicates the direction of BCM establishment in industries. The Singapore Standards 507 also indicates providers of business continuity and disaster recovery services.

The MAS Business Continuity Management Guidelines issues principles on senior management responsibilities for BCM. The MAS Consultation Paper on BCP Guidelines was developed in order to encourage the adoption of BCP practices by financial institutions in Singapore.

8.3 Legislative systems for the environment and pollution control

(1) Environmental laws and regulations

Laws and regulations for the environment are stated in 2) Pollution control laws and regulations. In Singapore, law and regulations for the environment are based on the same laws regarding pollution control.

(2) Pollution control laws and regulations

Table 8.3.1 Laws and Regulations for Environmental Pollution Control in Singapore

	Laws / Regulations	Supervisory Authority	Subject
Law	Environmental Pollution Control Act, 2002	National Environment Agency	Environment
Regulation	Environmental Pollution Control (Trade Effluent) Regulations	National Environment Agency	Industrial Effluent
Regulation	Environmental Pollution Control (Air Impurities) Regulations	National Environment Agency	Air Pollution
Regulation	Environmental Pollution Control (Hazardous Substances) Regulations	National Environment Agency	Industrial Waste
Law	Environmental Public Health Act	under survey	Environment
Regulation	Environmental Public Health (Toxic Industrial Waste) Regulations	under survey	Industrial Waste
Law	Sewerage and Drainage Act	Public Utilities Board	Industrial Effluent
Regulation	Sewerage and Drainage (Trade Effluent) Regulations	Public Utilities Board	Industrial Effluent

The laws and regulations concerning the environment and environmental pollution prevention in Singapore are mainly prescribed by the statute of Environmental Pollution Control Act of 2002 and the Environmental Public Health Act. By each statute, regulations are defined regarding individual environmental pollution factors including, industrial wastewater regulations, air pollution regulation, regulations about toxic substance management, and regulations about industrial waste management.

Moreover, there is also regulation provided by the Sewerage and Drainage Act.

8.4 Legislative systems for development such as land use, rivers, and building codes

Table 8.4.1 Laws and Regulations for Land, River and Building Code in Singapore

	Laws / Regulations	Supervisory Authority	Subject
Law	Planning Act, Chap.232, 1998	Ministry of National Development	Development
Law	Land Acquisition Act, Chap.152, 2007	under survey	Land Acquisition
Law	Building Control Act, Chap.29, 2007	Building & Construction Authority, Ministry of National Development	Building Standards
Regulation	Building Control Regulations, 2007	Building & Construction Authority, Ministry of National Development	Building Standards

The regulations relevant to the land use concerning development are defined in the Planning Act, Chap. 232, of 1998. Moreover, the legal system about land expropriation is specified in the Land Acquisition Act, Chap.152-2007.

Building Control Act of 2007 defines regulations about construction standards in Singapore and the standards for ensuring building safety are shown. In the law, regulations about environmental maintenance (Environmental Sustainability) in building construction are also specified.

Chapter 9 Implementation of BCP

Standards and guidelines for the development of BCP among the financial institutes such as banking companies are established by the governmental monetary authorities. Moreover, by the Singapore Standards, the standards for BCP development in general companies are also established.

Information about the actual condition of development of BCP and effort to disperse the BCP among companies in Singapore are not sufficiently disclosed in the internet. The on-site surveys and interviews of institutions concerned are required.

List of Agglomerated Areas

ID	Short List	LongList	COUNTRY	PROVINCE	PARK NAME	ADDRESS
SG0001			Singapore		Kranji Industrial Estate	Gali Batu Flyover
SG0002			Singapore		Sungei Kadut Industrial Estate	114 Windsor Park Rd Singapore 574178
SG0003			Singapore		Woodlands Central Industrial Estate	114 Windsor Park Rd Singapore 574178
SG0004			Singapore		Woodlands East Industrial Estate	114 Windsor Park Rd Singapore 574178
SG0005			Singapore		Woodlands West Industrial Estate	114 Windsor Park Rd Singapore 574178
SG0006		**XXSG20**	Singapore		Woodlands Industrial Park	122 Woodlands Industrial Park E3 Singapore 757848
SG0007			Singapore		Yew Tee Industrial Estate	365 Woodlands Rd Singapore 677932
SG0008		**XXSG03**	Singapore		Ang Mo Kio Industrial Park	30 Ang Mo Kio Industrial Park 2 Singapore 569509
SG0009		**XXSG04**	Singapore		Ayer Rajah Industrial Estate	N Buona Vista Rd Singapore
SG0010			Singapore		Bishan Industrial Estate	114 Windsor Park Rd Singapore 574178
SG0011		**XXSG06**	Singapore		Henderson Industrial Park	Henderson Industrial Park 209 Henderson Rd, Singapore 159552
SG0012		**XXSG09**	Singapore		Kallang Basin Industrial Estate	77 Gey lang Bahru
SG0013			Singapore		Kallang Park Industrial Estate	20 Kallang Ave Singapore 339411
SG0014			Singapore		Kampong Ampat Industrial Estate	159 Kampong Ampat Singapore 368328
SG0015		**XXSG11**	Singapore		Kolam Ayer Industrial Estate	Pan Island Expy Singapore
SG0016			Singapore		Redhill Industrial Estate	114 Windsor Park Rd Singapore 574178
SG0017			Singapore		St. Michael's Industrial Estate	114 Windsor Park Rd Singapore 574178
SG0018		**XXSG14**	Singapore		Singapore Science Park I, II	2 Science Park Dr Singapore 118222
SG0019			Singapore		Sims Avenue Industrial Estate	Paya Lebar Rd Singapore 408999
SG0020			Singapore		Tanglin Halt Industrial Estate	114 Windsor Park Rd Singapore 574178
SG0021			Singapore		Tanjung Rhu Industrial Estate	114 Windsor Park Rd Singapore 574178
SG0022		**XXSG17**	Singapore		Telok Blangah Industrial Estate	1200 Depot Road
SG0023			Singapore		Tiong Bahru Industrial Estate	114 Windsor Park Rd Singapore 574178
SG0024		**XXSG18**	Singapore		Toa Payoh Industrial Estate	Block 230 230 Lorong 8 Toa Payoh, Singapore 310230
SG0025	**XXSG05**	**XXSG05**	Singapore		Bedok Industrial Park	3013 Bedok Industrial Park E Singapore
SG0026			Singapore		Changi North Industrial Estate	114 Windsor Park Rd Singapore 574178
SG0027			Singapore		Changi South Industrial Estate	114 Windsor Park Rd Singapore 574178
SG0028		**XXSG08**	Singapore		Kaki Bukit Industrial Estate	6 Kaki Bukit Avenue 1 Singapore 417940
SG0029		**XXSG10**	Singapore		Kampong Ubi Industrial Estate	New Paya Lebar Proton Ubi Ave2
SG0030		**XXSG12**	Singapore		Loyang Industrial Estate	222 Loyang Ave Singapore 509068
SG0031		**XXSG15**	Singapore		Tai Seng Industrial Estate	Tai Seng Ave.
SG0032			Singapore		Yio Chu Kang Industrial Estate	114 Windsor Park Rd Singapore 574178
SG0033			Singapore		Tampines Industrial Park	20 Tampines Industrial Crescent Singapore 528812

ID	Short List	LongList	COUNTRY	PROVINCE	PARK NAME	ADDRESS
SG0034			Singapore		Clementi West Industrial Estate	Hillview Industrial Estate 27 Hillview Terrace, Singapore 669266
SG0035		**XXSG07**	Singapore		Jurong Industrial Estate	Pioneer Road,Gul Road/Circle.Benoi Sector and Shdipyard Roa
SG0036			Singapore		Southern Islands Jurong Island	114 Windsor Park Rd Singapore 574178
SG0037			Singapore		Eunos Techpark & Eunos Technolink	114 Windsor Park Rd Singapore 574178
SG0038			Singapore		Tuas View Industrial Estate	114 Windsor Park Rd Singapore 574178
SG0039		**XXSG19**	Singapore		Tuas Biomedical ParkI,II	31 TUAS south Ave.6
SG0040			Singapore		North Coast Wafer Fab Park	114 Windsor Park Rd Singapore 574178
SG0041			Singapore		Woodlands Wafer Fab Park	114 Windsor Park Rd Singapore 574178
SG0042			Singapore		Seletor Aerospace Park	Seletar Aerospace Rd Singapore
SG0043			Singapore		Pasir Ris Wafer Fab Park	114 Windsor Park Rd Singapore 574178
SG0044		**XXSG02**	Singapore		Airport Logistics Park of Singapore (ALPS)	Changi Airport
SG0045		**XXSG16**	Singapore		Tampines Wafer Fab Park	6 Tampines Industrial Avenue 5
SG0046		**XXSG01**	Singapore		Advanced Display Park	10 Tampines Industrial Avenue 3
SG0047			Singapore		Changi International LogisPark (North)	114 Windsor Park Rd Singapore 574178
SG0048			Singapore		Changi International LogisPark (South)	114 Windsor Park Rd Singapore 574178
SG0049			Singapore		Biopolis	Biopolis Rd Singapore
SG0050			Singapore		Fusionopolis	11 Portsdown Rd Singapore 139301
SG0051			Singapore		Mediapolis	114 Windsor Park Rd Singapore 574178
SG0052			Singapore		Clementi West LogisPark	114 Windsor Park Rd Singapore 574178
SG0053			Singapore		Toh Tuck LogisPark	114 Windsor Park Rd Singapore 574178
SG0054			Singapore		Toh Guan LogisPark	114 Windsor Park Rd Singapore 574178
SG0055			Singapore		Banyan LogisPark	114 Windsor Park Rd Singapore 574178
SG0056			Singapore		Meranti LogisPark	114 Windsor Park Rd Singapore 574178
SG0057			Singapore		Tampines LogisPark	54 Harvey Ave Singapore 489526
SG0058			Singapore		Tukang Innovation Park	3 International Business Park Singapore
SG0059			Singapore		International Business Park	3 International Business Park Singapore
SG0060			Singapore		Changi Business Park	7 Changi Business Park Vista Singapore
SG0061			Singapore		CleanTech Park	85 Lorong Tawas Singapore 639823
SG0062			Singapore		Paya Lebar iPark	114 Windsor Park Rd Singapore 574178
SG0063			Singapore		Senoko Industrial Estate	114 Windsor Park Rd Singapore 574178
SG0064			Singapore		Defu Industrial Estate	114 Windsor Park Rd Singapore 574178
SG0065			Singapore		Alexandra Village Industrial Estate	114 Windsor Park Rd Singapore 574178
SG0066			Singapore		Aljunied Industrial Estate	114 Windsor Park Rd Singapore 574178
SG0067			Singapore		Bukit Batok Industrial Estate	Hillview Industrial Estate 27 Hillview Terrace, Singapore 669266
SG0068			Singapore		Depot Lane Industrial Estate	4006 Depot Ln Singapore
SG0069			Singapore		Eunos Industrial Estate	114 Windsor Park Rd Singapore 574178
SG0070			Singapore		Geylang Bahru Industrial Estate	80 Geylang Bahru Singapore

ID	Short List	LongList	COUNTRY	PROVINCE	PARK NAME	ADDRESS
SG0071			Singapore		Geylang East Industrial Estate	117 Aljunied Avenue 2 Singapore 380117
SG0072			Singapore		Marsiling Industrial Estate	Marsiling Industrial Estate Road 10 Singapore
SG0073			Singapore		Sin Ming Industrial Estate	15 Sin Ming Industrial Estate Sector A Singapore
SG0074			Singapore		Yishun Industrial Park	10 Yishun Industrial Park A Singapore
SG0075		**XXSG13**	Singapore		One-North	JTC Corporation, The JTC Summit, 8 Jurong Town Hall Road, Singapore 609434

THAILAND

Table of Contents

Chapter 1 Introduction

The report is a draft version of the Country Report for Thailand, which will be a reference document for organizations of the private and public sectors wishing to prepare an Area Business Continuity Plan (Area BCP) and develop an Area Business Continuity Management System (Area BCM System).

The country report contains information on natural disaster risks, industrial parks and investment risk, key infrastructure and lifeline systems, as well as issues to consider during natural disasters. It also presents an outline of economy and trade, an outline of physical distribution, and current practices for implementing business continuity management (BCM) in the country.

The draft report will be refined and finalized at the end of the Project.

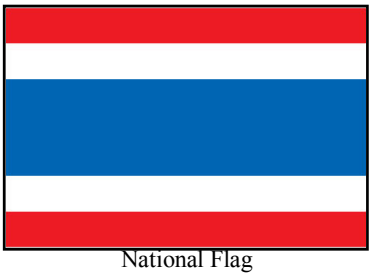
Chapter 2 Overview of the Country

Thailand occupies the Indochina peninsula and northern part of the Malay Peninsula. Thai is the dominant ethnic group of Thailand. Northern Thailand is mountainous, with farmland spread across central and southern Thailand. The Chao Phraya River flows through Central Thailand and the Mekong River runs along the border between Laos.

Thailand is one of the founding members of ASEAN (founded on August 8, 1967). Thailand serves as a trading hub between foreign countries and other ASEAN countries.

Thailand is a constitutional monarchy. The head of state is King Bhumibol Adulyadej, and Prime Minister Yingluch Shinawatra is the head of government. Continuing from the former Thaksin administration, the government pursues economic diplomacy aiming at the conclusion of free trade agreements.

Basic Information of Thailand

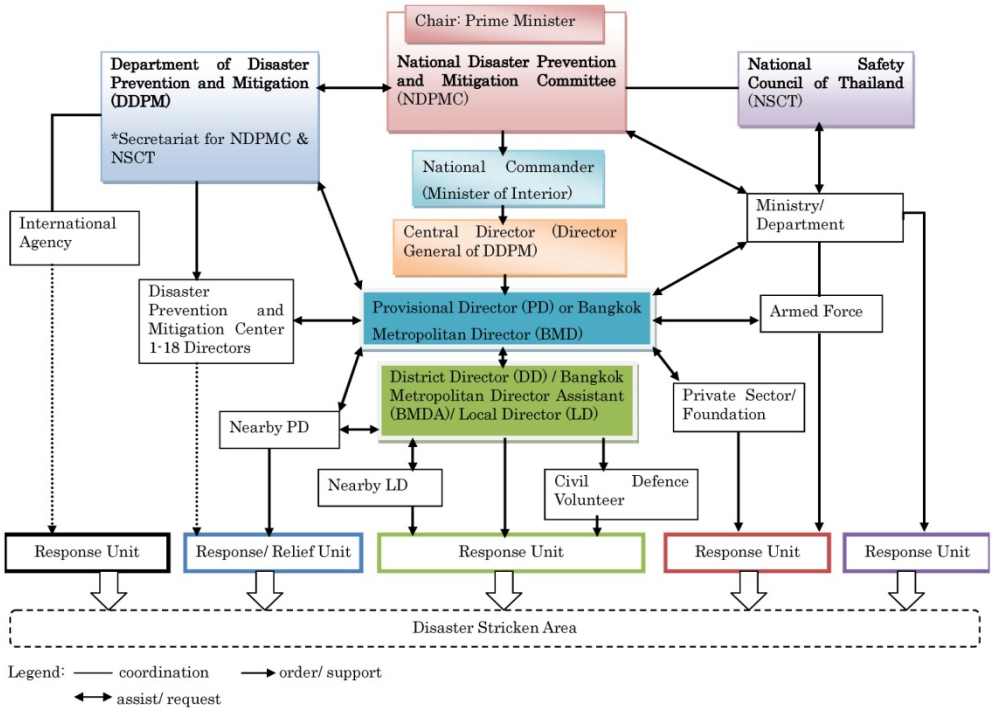


National Flag

Capital	Bangkok
Ethnic Groups	The dominant ethnic group is Thai. Other ethnic groups include Chinese, Malay and hill-tribe minority groups.
Languages	Thai
Religions	Buddhism 94%, Islam 5%
Area (km^2)	Total: 513,120 Land: 510,890 Inland Water: 2,230
Population	66,785,001
Population density(people/ km^2 of land area)	131
Population growth (annual %)	0.3
Urban population (% of total)	34
GDP (current US$) (billion)	366
Economic growth rate (annual %)	6.5
GNI per capita, PPP (current international $)	9,280
Agriculture, value added (% of GDP)	12
Industry, value added (% of GDP)	44
Services, etc., value added (% of GDP)	44

Features of Disasters

58% of the number of disasters was caused by floods followed by storm (29%), while flood (58%) and drought (37%) are the two major disasters that affect the largest number of people. On the other hand, earthquake caused 65% of the total deaths that is because of the tsunami induced by the Sumatra Earthquake in 2004; flood caused 27% of the total deaths that largely attributes to the flood disaster of 2011. As for the estimated damage cost (economic loss), flood is the disaster that caused 95% of total economic losses, most of which was caused by the flood in 2011 that caused the loss of US$40 million.



Source: NDPMC "National Disaster Prevention and Mitigation Plan B.E. 2553-2557 (2010-2014)", p.18.

Sources; Map and Flag: CIA(Central Intelligence Agency) website (2014) (https://www.cia.gov)

Capital, Ethnic Groups, Languages and Religions: Ministry of Foreign Affairs website (2013) (http://www.mofa.go.jp)

Area, Population, Population density, Population growth, Urban population, GDP, Economic growth rate, GNI per capita, PPP, Agriculture, value added, Industry, value added and Services, etc., value added: The World Bank Data Bank website (2012) (http://data.worldbank.org)

Chapter 3 Natural Disaster Risk

3.1 Floods

(1) Risk

Summary of flood disaster

In Thailand, floods occur in the central part of the country, especially in the Chao Phraya River basin, caused by rainfalls in the rainy season from May to October and strong rainfalls in the monsoons from August to October. Floods are triggered by long-term rainfalls and storm rainfalls that cause water to pool in the low-lying areas of the central plain, and the prolonged floods cause human losses and economic losses. In urban areas local inundation damage occur due to insufficient drainage systems and insufficient maintenance work. Bangkok is also vulnerable to floods from the Chao Phraya and local floods because Bangkok is located downstream of the Chao Phraya River. Also, there is ground subsidence from the current overuse of groundwater for industries, etc., and insufficient capacity for the drainage system in the tidal areas.

Notable flood damage in recent years

Notable recent floods occurred in October 2002, October 2008, October 2010, and a disastrous flood lasted from August 2011 to January 2012.

1. The flood of October 5, 2002 was caused by storm rainfalls and caused 150 fatalities and affected 3.3 million persons, according to the EM-DAT (The International Disaster Database).
2. The flood of October 2008 caused 18 fatalities and affected about 840,000 persons.
3. The flood of October 2010 caused 260 fatalities and affected about 9.0 million persons.
4. The flood from August 2011 to January 2012 caused 820 fatalities/missin persons and affected about 9.5 million persons with economic losses of USD 40,000 million.

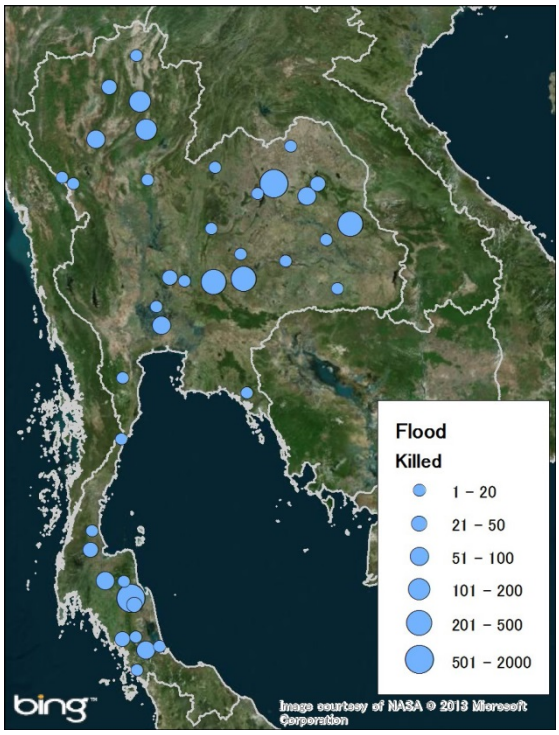


Figure 3.1.1 Flood Disasters: Human Losses

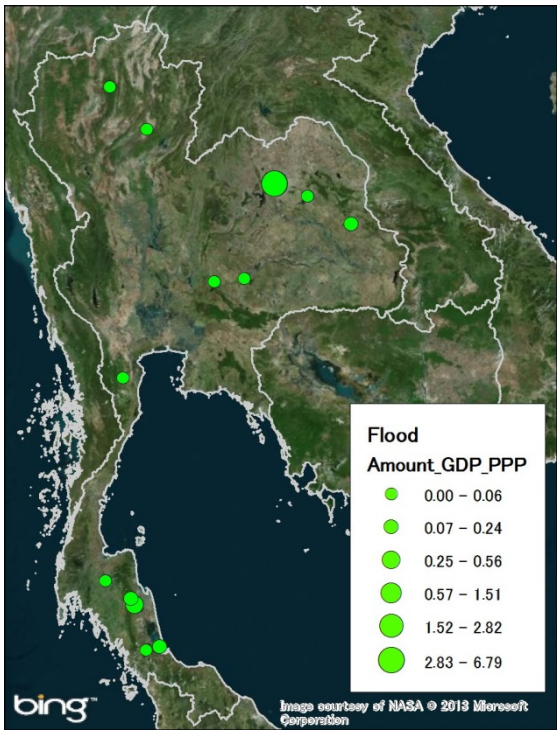


Figure 3.1.2 Flood Disasters: Economic Losses (% of GDP)

(2) Background

Characteristics of floods

Floods mostly occur in the Chao Phraya River Basin from August to October. Rainfalls in the mountainous region of the northern part of the basin inundate the central plain of the Chao Phraya River for a few months. Bangkok and the other major cities in the Chao Phraya River Basin are promoting flood control measures like ring dykes.

Notable examples of flood events

1. The flood on October 5, 2002 triggered by storm rainfall in the northern area caused damage in 43 provinces in the northern and the central parts.
2. The flood of October 2008 triggered by storm rainfalls which had continued since the middle of September caused damage at Lopburi, Phitsanulok, and surrounding area in the northern area and the northeast area.
3. The flood of October 2010 triggered by strong monsoon rainfalls caused severe damage at Nakhon Ratchasima in the northeast area and Ayutthaya and Lopburi in the central area.
4. The flood from August 2011 to January 2012 was said to be a 100-year flood in terms of probability. It caused inundation damages at industrial estates together with Bangkok, Ayutthya, and the many cities for more than three months at the midle reach and lower reach of the Chao Phraya River Basin. As the results, the damage caused a worldwide shortage of parts supplied from Thailand.

Frequently flooded areas

- Middle reach of the Chao Phraya River Basin
- Downstream of the Chao Phraya River Basin, Bangkok and its surroundings

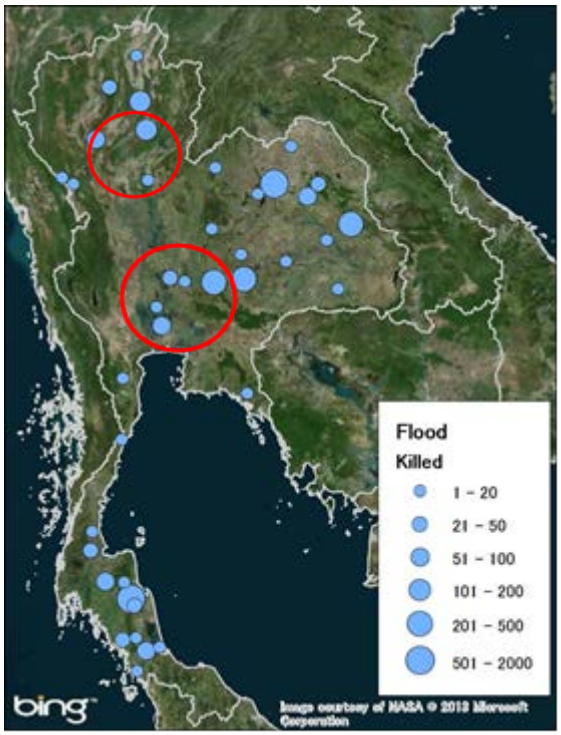


Figure 3.1.3 Hotspots of Human Loss

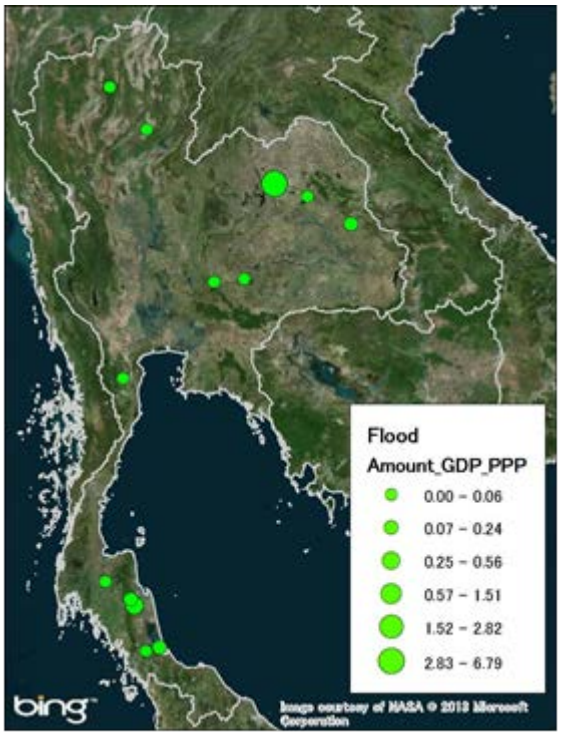


Figure 3.1.4 Hotspots of Economic Loss

(3) Efforts by the central government, local governments, and disaster management organizations

✓ The National Disaster Prevention and Mitigation Committee

- As a policy-making committee at the national level, the Prime Minister or appointed Deputy Prime Minister chairs the committee, which is comprised of representatives of related ministries and agencies.

✓ The BMA Disaster Prevention and Mitigation Committee

- It was established for disaster prevention and mitigation of BMA.

✓ The Provincial Disaster Prevention and Mitigation Committee

- It was established for local level disaster prevention and mitigation.

✓ Department of Disaster Preparedness and Mitigation (DDPM) under Ministry of Interior

- The DDPM was established in 2002 as the leading agency to regulate disaster management activities at all levels for the relevant organizations.

- In order to reduce disaster risks, the DDPM cooperates with the Thai Meteorological Department (TMD), Ministry of Information and Communication Technology, Royal Irrigation department (RID), Ministry of Agriculture and Cooperatives (MOAC), Ministry of Natural Resources and Environment (MONRE), and other relevant ministries and agencies.

✓ Disaster Prevention and Mitigation Academy (DPMA)

- It was established to develop human resources for disaster risk reduction.

(4) Hazard and risk information sources

Disaster risk reduction organizations

Table 3.1.1 List of Organizations for Disaster Risk Reduction

Organization	Post	Web Address
National Disaster Prevention and Mitigation Committee (NDPMO)		
National Security Division (NSD)		
The Provincial Disaster Prevention and Mitigation Committee(DPMC)		
Department of Disaster Prevention and Mitigation, Ministry of Interior (DDPM)		http://www.disaster.go.th/dpm/index.php?option=com_content&task=view&id=13&Itemid=135
Thai Meteorological Department (TMD)		http://www.tmd.go.th/en/
Chulalongkorn University (CU)		http://www.chula.ac.th/cuen/index.htm
King Mongkut's Institute of Technology Ladkrabang (KMITL)		http://www.kmitl.ac.th/en/main.php

Reports

Table 3.1.2 List of Reference Reports for Risk Analysis

Organization	Post	Title/ Web Address	Form
Asia Development Bank	Asian Water Development Outlook	Asian Water Development Outlook 2013;Asia-Pacific Water Forum	Report
		http://www.adb.org/publications/asian-water-development-outlook-2013	
World Bank	ASEAN Disaster Risk Management Initiative	Synthesis Report on Ten Asian Countries Disaster Risks Assessment; December 2012	Report
		http://www.unisdr.org/files/18872_asean.pdf	
The Nature Conservancy	ASEAN Disaster Risk Management Initiative	World Risk Report 2012;October 2012	Report
		http://www.ehs.unu.edu/article/read/worldriskreport-2012	
World Bank	Framework and Options for Implementation	Advancing Disaster Risk Financing and Insurance in ASEAN Countries: April 2012	Report
		https://openknowledge.worldbank.org/bitstream/handle/10986/12628/714530v20ESW0W0AN0appendices0June12.pdf?sequence=1	
International Development Research Centre	Economy and Environment Program for Southeast Asia (EEPSA)	Climate Change Vulnerability Mapping for Southeast Asia: January 2009	Report
		http://web.idrc.ca/uploads/user-S/12324196651Mapping_Report.pdf	
UNEP,GRID,UNISDR		Global Risk Data Platform	WebMap
		http://preview.grid.unep.ch/index.php?preview=map&lang=eng	

Abbreviations

BMA-DPMC	Bangkok, Metropolitan Area-Disaster Prevention and Mitigation Committee
CU	Chulalongkorn University
DDPM	Department of Disaster Prevention and Mitigation, Ministry of Interior
DPMC	The Provincial Disaster Prevention and Mitigation Committee
KMITL	King Mongkut's Institute of Technology Ladkrabang
NDPMC	National Disaster Prevention and Mitigation Committee
TMD	Thai Meteorological Department

References:

1) Ministry of Foreign Affairs of Japan (2013): "Information on Thailand (in Japanese)", 6 2013
2) Asian Disaster Reduction Center (ADRC): "Countries; Thailand", Information on Disaster Risk Reduction of the Member.
3) ADRC: "Thailand ,Heavy rain, 2002/09/03
4) Relief Web; OCHA (2002): "Thailand - Floods OCHA Situation Report No. 1",Report from UN Office for the Coordination of Humanitarian Affairs,10 Oct 2002
5) BBC NEWS (2002):"Flood devastation in northern Thailand floods affect 90,000 families", 6 September, 2002.
6) ADRC: "Thailand, Flash flood, 2010/10/16", Details of Disaster Information.
7) IRIN(2008):"THAILAND: Flash floods continue to batter farmlands"
8) ADRC: "Thailand , Flash flood ,2010/10/16"
9) Relief Web; OCHA (2010):"Flash floods kill seven in Thailand", Report from Agence France-Presse,19 Oct 2010
10) ADRC: "Thailand , Tropical Storm, Flood , 2011/08/03"
11) Relief Web; OCHA (2011):"Thailand: Time Series Analysis of Thailand Flooding 2011", Map from UN Institute for Training and Research, UNOSAT, 22 Nov 2011.

3.2 Earthquakes

(1) Risk

There are few records of disaster caused by earthquakes in Thailand. The earthquake that occurred in Myanmar in 2011 and the earthquake that occurred in Yunnan province of China in 1995 caused some damage in Thailand. However, the largest earthquake occurring recently in the country was an earthquake with magnitude 5.9 that occurred near Bangkok in 1983.

The area with relatively high earthquake risk is the area along the border with Myanmar.

(2) Background

Figure 3.2.1 shows active faults in Thailand. Most active faults are seen along the border with Myanmar.

Figure 3.2.2 is a seismic hazard map prepared by the Department of Mineral Resources (DMR). The map classifies areas of country into 4 zones with seismic hazard levels. The highest seismic hazard zone is the northwest area along the border with Myanmar. The zone is evaluated as 2B where VII-VIII in the Modified Mercalli Scale is expected and described as "slight to moderate damage in well-built ordinary structures." The second highest seismic hazard zone is an area inside of the highest zone. The zone is evaluated as 2A where V-VII in Modified Mercalli Scale is expected and described as "felt by nearly everyone, unstable objects overturn."

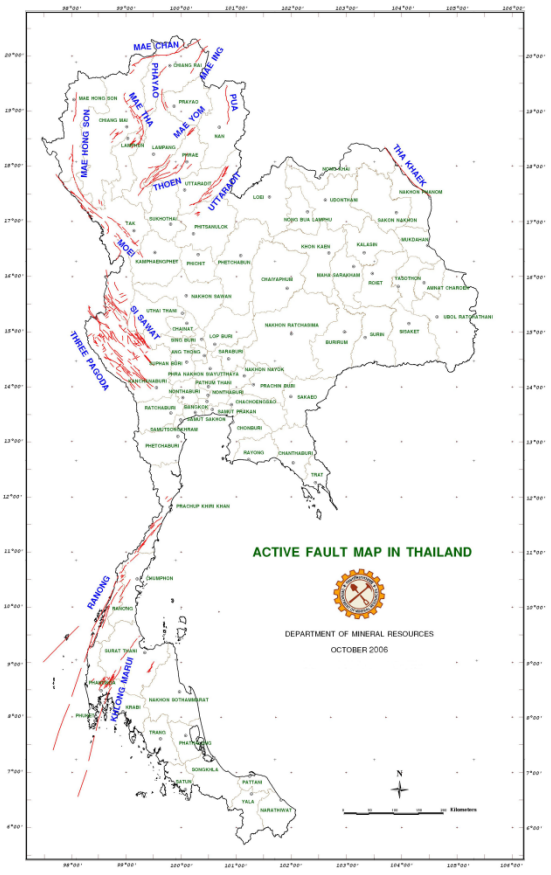


Figure 3.2.1 Active Fault Map in Thailand

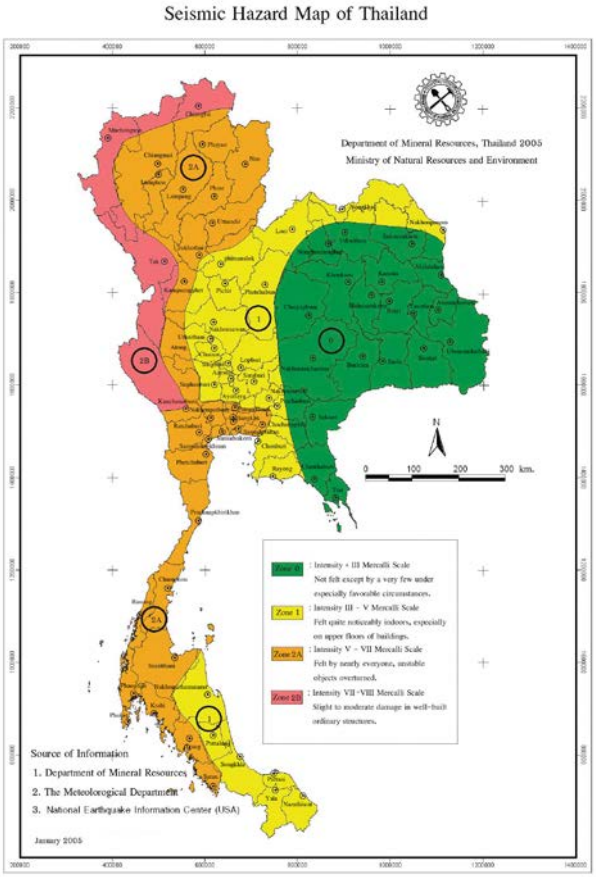


Figure 3.2.2 Seismic Hazard Map of Thailand

(3) Efforts by the central government, local governments, and disaster management organizations

Disaster Management Information

The Department of Mineral Resources (DMR) has developed the Active Fault Map in Thailand and Seismic Hazard Map of Thailand as shown above. As for active faults, the DMR has investigated their historical activities through trenching surveys.

Early Warning and Transmitting Information

An earthquake and tsunami observation network for Thailand has been implemented and strengthened after the catastrophe caused by the tsunami in 2004. The Thai Meteorological Department (TMD) installed a total of 41 broadband seismographs. 15 seismographs, manufactured in Canada, were installed in Phase-1 from 2006, and 26 seismographs, manufactured in Australia, were installed in Phase-2 from 2009.

Hypocenter and magnitude are determined by the TMD. The TMD conducts the analysis within about ten minutes. In case of an earthquake abroad, it takes about 15 minutes to analyze using the information obtained through GTS operated by the World Meteorological Organization (WMO). The TMD disseminates earthquake and tsunami information to mass media and relevant authorities via fax and SMS within about 15 minutes after an earthquake occurs.

Preparedness and Education

The law regarding quake resistance standards was enacted in 1997, but it was applicable only to ten prefectures. The law was amended in 2007 to increase the applied areas from 10 to 22

(4) Hazard and risk information sources

Thai Meteorological Department (TMD)
http://www.tmd.go.th/en/
Department of Mineral Resources (DMR)
http://www.dmr.go.th/main.php?filename=web_en
The National Disaster Warning Center (NDWC)
http://www.ndwc.go.th/web/

References:

1) EM-DAT: The OFDA/CRED International Disaster Database – www.emdat.be – Université Catholique de Louvain – Brussels – Belgium.
2) Japan International Cooperation Agency (JICA) (2012): "Data Collection Survey on ASEAN Regional Collaboration in Disaster Management"

3.3 Tsunami

(1) Risk

The tsunami induced by 2004 Sumatra Earthquake (M9.1) caused more than 8,000 missing and dead in Phuket and other southern areas in Thailand. It also caused losses of US$ 1 billion, corresponding to 0.24% of the GDP at that time. There is another old record that a tsunami induced by an earthquake occurred in 1955 in the Indian Ocean, causing around 500 fatalities.

The tsunami disaster is not so frequent in Thailand, but it is one of the major disasters in Thailand.

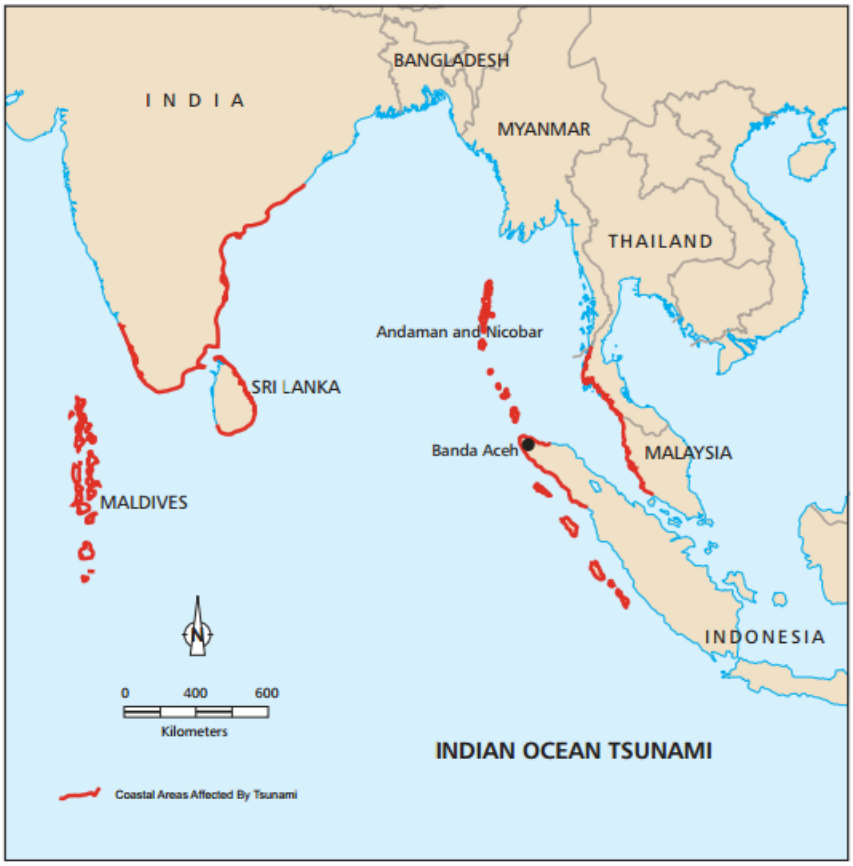


Figure 3.3.1 Coastal Areas Affected By Tsunami by 2004 Sumatra Earthquake

(2) Efforts by the central government, local governments, and disaster management organizations

Disaster Management Information

Tsunami hazard maps with scale of 1:5,000 for the six prefectures of southern Thailand have been developed based on tsunami risk assessment. Tsunami damage not only due to earthquake, but also landslide by volcanic activity have been anticipated in Nicobar Island in the Andaman Sea.

Early Warning and Transmitting Information

The Meteorological Department (TMD) disseminates earthquake and tsunami information to mass media and relevant authorities via fax and SMS within about 15 minutes after an earthquake occurs.

After the earthquake in the Indian Ocean off the coast of Sumatra in 2004, warning towers were built at 328 sites, not only in tsunami disaster areas, but throughout the entire country including mountainous areas. The warning towers along Andaman Coast were built at beaches and parks, and on the roof of hotel buildings. A warning tower is capable of transmitting warnings within a 1.0 to 1.5 km radius, and is equipped with a siren, loudspeaker, and solar panel and battery. In the international resort area of Phuket, warnings are issued in five languages including English, German, Chinese, Japanese, and Thai.

The National Disaster Warning Center (NDWC) issues tsunami early warnings based on input data from TMD, RID, Royal Thai Navy (RTN), international organizations (e.g. PTWC, JMA, USGS), and NDWC Contact Center (e.g. amateur radio, general public). NDWC then delivers the tsunami warning to the central government and local governments, rescue units, affected communities, and people.

As the means of information dissemination, NDWC uses SMS (more than 20 million mobile phones), fax (16 ports), e-mail, mass media (television, radio), warning towers (328 towers, installed also inland), local dissemination network (500 small towers and 1,500 special radios for leaders of village), and so on. Warning towers are 25 m in height and can broadcast sirens and pre-recorded voice messages (in multiple languages). A single tower can cover up to a 4 km radius.

Preparedness and Education

A considerable number of warning towers and tsunami shelters have been built in tsunami disaster areas.

Tsunami evacuation drills are conducted at schools and hotels once a year.

(3) Hazard and risk information sources

Thai Meteorological Department (TMD)
http://www.tmd.go.th/en/
Department of Mineral Resources (DMR)
http://www.dmr.go.th/main.php?filename=web_en
The National Disaster Warning Center (NDWC)
http://www.ndwc.go.th/web/

References:

1) EM-DAT: The OFDA/CRED International Disaster Database – www.emdat.be – Université Catholique de Louvain – Brussels – Belgium.
2) Asian Development Bank (2005): “From Disaster to Reconstruction: A Report on ADB's Response to the Asian Tsunami”
3) Japan International Cooperation Agency (JICA) (2012): “Data Collection Survey on ASEAN Regional Collaboration in Disaster Management”

3.4 Volcanoes

(1) Risk

There is no volcano in Thailand and also no record of significant disaster caused by volcanic eruption in its history.

Major hazards caused by volcanic eruption are lava flow, pyroclastic flow, "Lahar" (volcanic mud flow), and volcanic ash fall. Lava flow is a flow of melted rock along the slope. Pyroclastic flow is a flow of a mixture of hot dry masses of fragmented volcanic materials and volcanic gas along the slope. "Lahar" is originally an Indonesian term and is also called volcanic mud flow. It is a flow of a mixture of volcanic materials and water along the slope. These flows cause enormous damage to the side and foot of the volcano, but generally do not have an extended reach. However, volcanic ash fall often spreads widely via the trade winds or the westerlies, causing damage over an extensive area. Therefore, there is a possibility that a volcanic eruption in the neighboring countries might wreak a volcanic ash fall on Thailand.

Figure 3.4.1 shows the volcanoes in the Asia-Pacific region which erupted during the Holocene. The Holocene is a geological epoch from 10,000 years ago to the present. The map indicates that many volcanic eruptions have occurred in Indonesia, Philippines and other neighboring countries.

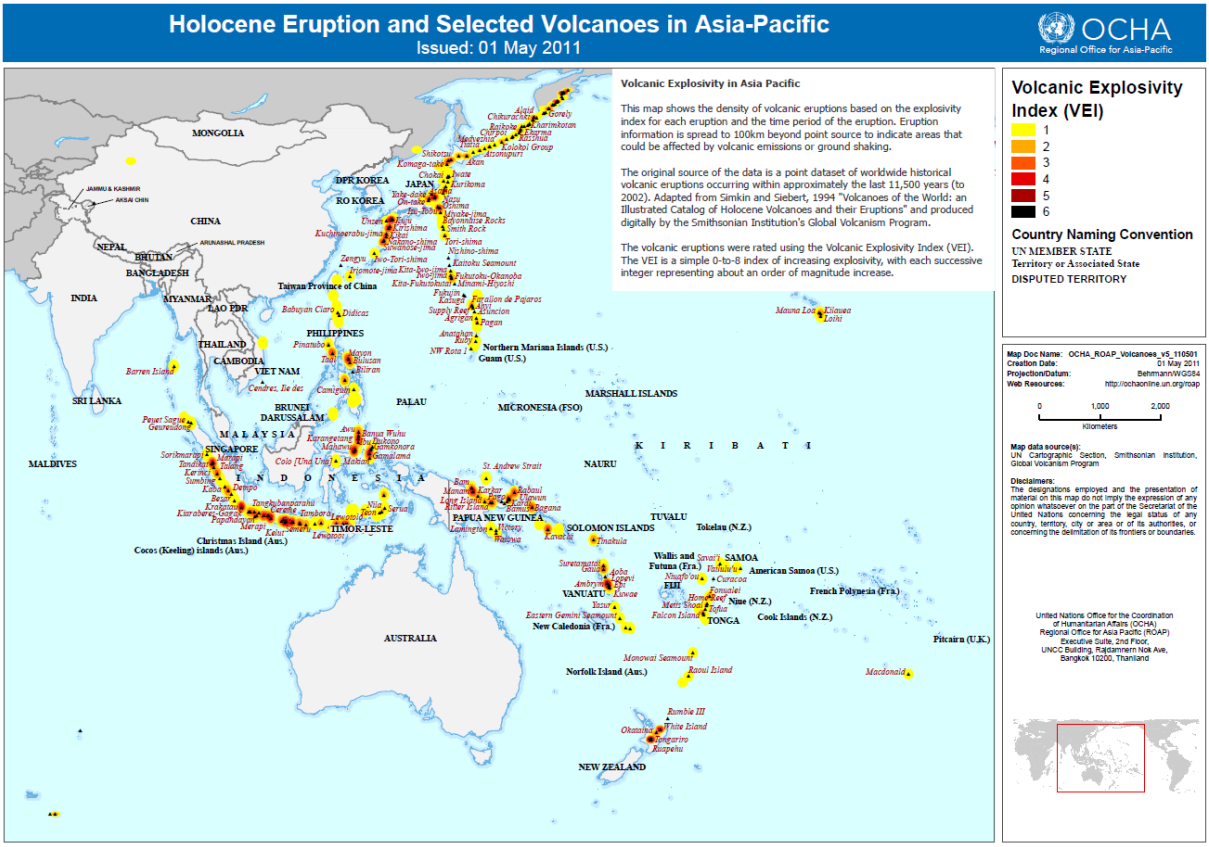


Figure 3.4.1 Holocene Eruption and Selected Volcanoes in Asia-Pacific

(2) Efforts by the central government, local governments, and disaster management organizations

There are no special measures focusing on volcanic disaster.

References:

1) Lee Siebert, Tom Simkin, and Paul Kimberly (2011): "Volcanoes of the World - Third Edition", Smithsonian Institute/University of California Press
2) EM-DAT: The OFDA/CRED International Disaster Database – www.emdat.be – Université Catholique de Louvain – Brussels – Belgium.
3) Japan International Cooperation Agency (JICA) (2012): "Data Collection Survey on ASEAN Regional Collaboration in Disaster Management"
4) United Nations Office for the Coordination of Humanitarian Affairs (OCHA), Regional Office for Asia Pacific (ROAP) (2011): "Holocene Eruption and Selected Volcanoes in Asia-Pacific", Downloaded from "http://reliefweb.int/sites/reliefweb.int/files/resources/map_619.pdf"

3.5 Cyclone (Meteorological) Hazards

(1) Risk

Thailand is located between latitudes 5° and 20° to the north and longitudes 97° and 105° to the east. This country is located in the tropical monsoon area. The northern part of the country is mountainous, covered by dense forests, and the central part of the country is covered predominantly by the flat Chao Phraya river valley, which runs into the Gulf of Thailand. The southern part of the country is the Malay Peninsula. The Peninsula is also located between two oceans, namely, the South China Sea (Gulf of Thailand) and the Andaman Sea. As a result, the country is susceptible to extreme weather such as droughts and floods due to El Niño and changes in the monsoon.

The climate of Thailand may be divided into three seasons - rainy season (southwest monsoon), dry season (northeast monsoon) and the pre-monsoon season. The average annual rainfall is approximately 1,200 to 1,600 mm. The monthly rainfall in September (200 to 300 mm) is the highest among all of the months. Some areas on the windward side, particularly, the Trat province in the eastern area and the Ranong province on the southern west coast, have more than 4,000 mm a year.

Tropical cyclones affecting Thailand usually move from the western North Pacific Ocean or the South China Sea. Thailand is normally affected by tropical depressions because of its location further inland. There are some mountain ranges, which obstruct and decrease wind speed, except in the southern area, which has a relatively high risk of tropical storms and typhoons. Tropical storms usually make landfall once every few years in Peninsular Malaysia in the south from the Gulf of Thailand or the South China Sea causing damage to the area.

Table 3.5.1 Tropical Cyclone Disaster in Terms of Number of Deaths (1980- 2011)

Year (Month)	Typhoon, cyclone (name)	Deaths	Total Affected
November 1989	Tropical Cyclone (Guy)	458	199,000
October 1997	Tropical Cyclone (Linda)	152	-
December 1981	Storm	55	-
September 1997	Tropical Cyclone (Sita)	46	50,394
August 1991	Tropical Cyclone	38	1,894,238
October 1990	Tropical Cyclone (Ira)	36	-
August 1995	Tropical Cyclone	27	-
August 2011	Tropical Cyclone (Nok-ten)	18	1,000,000
May 2004	Storm	13	5,050
September 1994	Tropical Cyclone (Hari)	10	-
September 2005	Tropical Cyclone (Damurei)	10	2,000

Severe flooding occurred during the 2011 monsoon season in Thailand. Beginning at the end of July and triggered by the landfall of Tropical Storm Nock-ten, flooding soon spread through the provinces of northern, northeastern and central Thailand along the Mekong and Chao Phraya river basins. In October of the same year, floodwaters reached the mouth of the Chao Phraya and inundated parts of the capital city of Bangkok.

Flooding persisted in some areas until mid-January 2012 and resulted in a total of 815 deaths, 950 million affected people, and 45.7 billion US$ in economic damages and losses.

Table 3.5.2 shows the meteorological disasters in Thailand (1984~2013).

Table 3.5.2 Meteorological Disasters in Thailand (EMDAT: 1984 ~ 2013)

Cause	No. of events	Killed	Total Affected	Damage (millions U.S. $)
Drought	8	-	29,982,602	424.3
Flood (including flash flood)	56	3,345	44,862,036	44295.4
Landslide	3	47	43,110	-
Storm	31	881	4,362,703	879.3
Forest fires	1	-	-	-

(2) Background

The southwest monsoon brings warm and moist airstreams passing from the Indian Ocean towards Thailand in May. The first region affected is southern Thailand, especially the west coast of the peninsula. Later on, this wind moves to the central, north-eastern, and northern regions. Another factor causing rainfall during this period is the movement of the ITCZ. The ITCZ also arrives in May in the southern area, and then moves northward to Southern China around June to early July. In August, the ITCZ moves southward over northern and northeastern Thailand, and then over the central regions in September and the southern part by October. As a result, the most abundant amount of rainfall usually occurs from August to October for central Thailand, although the rainy season begins sometime in May.

Even though there are many tropical cyclones in the North West Pacific region, tropical cyclones are rare in the Gulf of Thailand. However, this infrequency increases the danger to people and properties. The tropical storm Harriet that came on shore at Laem Taloom Pook killed more than 900 people in 1962 and Typhoon Linda in 1997 killed more than 330 with 2,200 people missing.

Table 3.5.3 shows typhoon (tropical storm) damage in the southern part of Thailand.

Table 3.5.3 Typhoon (Tropical Cyclone) Damage in the Southern Part of Thailand

Year (Month)	Typhoon name	Affected area
October 1962	Tropical Cyclone Harriet	Leam Talumpuk, NakornSriThammarat province
November 1989	Typhoon Guy	Chumporn province
November 1997	Typhoon Linda	Thupsake, PrachuapKirikhan province

Table 3.5.4 shows the characteristics of typhoons (tropical cyclones) damage in this country

Table 3.5.4 Characteristics of Typhoon (Tropical Cyclone) Damage

Regions	Term	Typhoon Track	Disaster Type
North and Northeast (central and eastern)	May - November (September, October)	from Vietnam after landing	Floods, flash floods, landslides
Southern, Central	September- December	from the Gulf of Thailand	High waves, storm surge

Severe flooding occurred during the 2011 monsoon season in Thailand. In 2011, flash floods affected some areas of upper Thailand since mid-May. During late June following tropical depression Haima, Thailand experienced heavy rainfall in several areas, especially in the northern parts where flash floods and landslides were reported. In July, heavy rainfall occurred in many locations throughout the month caused the active southwest monsoon and monsoon trough, which lies across upper Thailand. Beginning at the end of July and triggered by the landfall of Tropical Storm Nock-ten, flooding soon spread through the provinces of northern, northeastern and central Thailand along the Mekong and Chao Phraya river basins. In October, floodwaters reached the mouth of the Chao Phraya and inundated parts of the capital city of Bangkok. Flooding persisted in some areas until mid-January 2012 and resulted in a total of 815 deaths (as of January 17, 2012) (with 3 missing) and 13.6 million people in 4 regions were affected. Sixty-five (65) of Thailand's 77 provinces were declared flood disaster zones and over 20,000 square kilometers (7,700 sq mi) of farmland were damaged. The disaster has been described as "the worst flooding yet in terms of the amount of water and people affected." The World Bank has estimated around 1,425 billion baht (US$ 45.7 Bn) in economic damages and losses due to flooding as of 1 December 2011. Most of the damage was to the manufacturing industry, as seven major industrial estates were inundated by as much as 3 meters (10 feet) during the floods.

Climate change vulnerability and impact in Thailand are as follows.

- In Thailand, observations during the last 50 years show temperature increases ranging from 0.10–0.18 °C per decade.
- Based on the climate data generated by the global circulation model, Thailand’s temperature is projected to increase 2–4 ºC by the end of this century.

(3) Efforts by the central government, local governments, and disaster management organizations

The Department of Disaster Prevention and Mitigation (DDPM) was established under the Ministry of Interior as the primary agency for coordinating disaster risk management activities by all related organizations at all levels. The DDPM is the core government department in handling national disaster management work. It also authorizes local governments to take responsibility of disaster management in their respective areas in line with the Provincial Plan. At the national level, the National Disaster Prevention and Mitigation Committee (NDPMC), chaired by the Prime Minister or designated Deputy Prime Minister, has prominent tasks and responsibilities for policy-making on disaster risk management. At the local level, the Provincial Disaster Prevention and Mitigation Committee and the Bangkok Metropolitan Committee are formed.

The National Disaster Warning Centre (NDWC) collects hydrological and meteorological data and provided early warnings.

The Thai Meteorological Department (TMD) issues routine weather forecasts, tropical cyclone warnings, aviation forecasts, and shipping and ocean wave forecasts. The types of forecast include very short (24 hours), middle range (7 days) and seasonal (three monthly forecast and summer forecast) forecasts.

The TMD uses operational numerical weather predictions with resolutions of 100 km for the entire globe, 50 km for Southeast Asia and 17 km for Thailand. The TMD has also provided daily wave analysis and 24-hour wave forecasting charts to the general public. Their domain covers the Gulf of Thailand, the Andaman Sea, and the South China Sea.

To strengthen monitoring of typhoons, the TMD have implemented the following.

1. Enhancement of radar network to strengthen severe weather observations and monitoring networks and nowcasting of the country.
2. Enhancement of the meteorological satellite data receiving station to monitor severe weather including typhoon and typhoon-related disasters.
3. Improvement of storm surge forecasts.
4. Enhancement of the meteorological telecommunication network control system.

Table 3.5.5 Authorities of Thailand Meteorological Service

Institution	Contact information
Thai Meteorological Department (TMD) http://www.tmd.go.th/en/	Tel: E-mail :

(4) Hazard and risk information sources

The hazard risk assessment results related to tropical cyclones (meteorological) disasters are as follows.

Table 3.5.6 Source of Information on Tropical Cyclones (Meteorological Disasters)

Institution	Literature name
Economy and Environment Program for Southeast Asia (2010)	Climate Change Vulnerability Mapping for Southeast Asia http://css.escwa.org.lb/sdpd/1338/d2-5a.pdf
UNISDR (2010)	Synthesis Report on Ten ASEAN Countries Disaster Risks Assessment http://www.unisdr.org/files/18872_asean.pdf

Abbreviations

ITCZ	Intertropical Convergence Zone
IPCC	Intergovernmental Panel on Climate Change
DDPM	Department of Disaster Prevention and mitigation
NDWC	National Disaster Warning Center
TMD	Thai Meteorological Department

Explanation of terms

ITCZ: A relatively narrow zone where the trade winds from both the Northern and the Southern Hemisphere merge.

References:

1) Edwin ST Lai (2013): "Overview of Member's Summary of Reports 2012, TC-45 Appendix VI - AWG Working Reports Members, WMO, p.24
2) Thai Meteorological Department (2011): “Rainfall and Severe flooding over Thailand on 2011”, http://www.tmd.go.th/en/event/flood_in_2011.pdf
3) “Natural Disasters 2011”, Climatological Center Bureau, 2011
4) Mekong River Commission (2011): “Flood Situation Report 2011”, MRC Technical Report Paper No.36 2011
5) Thai Meteorological Department (Website): http://www.tmd.go.th/en/

3.6 Landslides

(1) Risk

According to the EM-DAT database (http://www.emdat.be/), the recorded number of landslides is 14: however, landslides with fatalities have occurred every year since 2004 in this country. A large-scale debris flow hit Krabi province and Nakhonsithamrat province in 2011, causing 16 fatalities and losses amounting to over 10 billion THB.

It is assumed that there are ordinal landslide occurrences in 6,450 villages among 51provinces.[1)]

Landslides with many fatalities are distributed in the mountainous area near the border with Myanmar and southern part of Malay Peninsula.

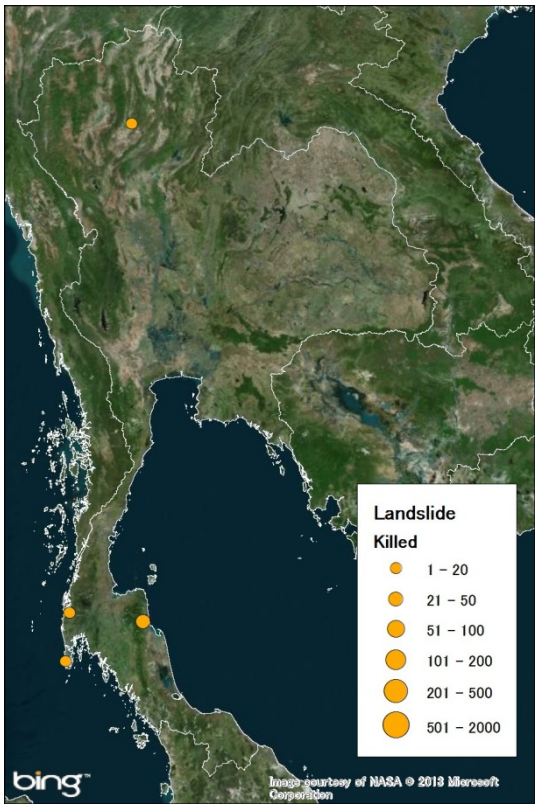


Figure 3.6.1 Landslide Damage: Human Losses

(2) Background

Notable example of landslides

A landslide occurred on the border between Krabi province and Nakhonsithamrat province in 2011, causing large-scale debris flow during heavy rain with 14 fatalities. Traffic and communication networks were interrupted for a long period.

Frequent landslide areas

Exposure related to climate change is distributed in the narrow area of the mountainous region bordering with Myanmar.[2)]

(3) Efforts by the central government, local governments, and disaster management organizations

✓ The National Disaster Prevention and Mitigation Committee

- As a policy-making committee at the national level, the Prime Minister or appointed Deputy Prime Minister chairs the committee, which is comprised of representatives of related ministries and agencies.

✓ The BMA Disaster Prevention and Mitigation Committee

- It was established for disaster prevention and mitigation of BMA.

✓ The Provincial Disaster Prevention and Mitigation Committee

- It was established for local level disaster prevention and mitigation.
- Department of Disaster Preparedness and Mitigation（DDPM）under Ministry of Interior; http://www.disaster.go.th/dpm/
  The DDPM was established in 2002 as the leading agency to regulate the disaster management activities of all levels for relevant organizations.
- In order to reduce disaster risks, the DDPM cooperates with the Thai Meteorological Department (TMD), Ministry of Information and Communication Technology, Royal Irrigation department (RID), Ministry of Agriculture and Cooperatives (MOAC), Ministry of Natural Resources and Environment (MONRE), and other relevant ministries and agencies.

✓ Disaster Prevention and Mitigation Academy (DPMA)）

- It was established to develop human resources for disaster risk reduction.

(4) Hazard and risk information sources

The 70-area hazard map for landslides has been issued by the Department of Mineral Resources (DMR; http://www.dmr.go.th/), and 190 areas are planned for addition in 2012.

An emergency survey on debris flow has been implemented by DMR upon requests from provincial governments. Physical infrastructure for landslide prevention is quite uncommon.

✓ Synthesis Report on Ten Asian Countries Disaster Risks Assessment; December 2012
ASEAN Disaster Risk Management Initiative, World Bank
http://www.worldbank.org/

- Summarizing natural hazard and risks in 10 ASEAN countries.
- The World Bank reported risks with respect to countries and categories of disaster.
- Although the data is only available up to 2009, the report is well assembled.

✓ World Risk Report 2012; October 2012, Alliance Development Works, The Nature Conservancy
http://www.nature.org/

- Natural disaster risks in 173 countries in the world are ranked in this report.
- Intended period is from 2002 to 2011.
- Vulnerabilities are assessed with respect to categories.
- The report is effective for comparing countries.

✓ Advancing Disaster Risk Financing and Insurance in ASEAN Countries: April 2012, Framework and Options for Implementation, Volume 2: Appendix 1
https://www.gfdrr.org/

- Summarizing natural hazard and risks in 10 ASEAN countries.
- Intended period is from 1970 to 2011.

- Summary of countries is well assembled.

✓ Climate Change Vulnerability Mapping for Southeast Asia: January 2009, Economy and Environment Program for Southeast Asia (EEPSA)
http://www.idrc.ca/

- Natural disaster risks in Southeast Asia are mapped in the report.
- The report contains information on risks in states/provinces.

Risk maps

✓ Global Risk Data Platform; UNEP (United Nations Environment Program)/GRID, UNISDR (United Nations Office for Disaster Risk Reduction)
http://preview.grid.unep.ch/

- Disaster sites of from all over the world are mapped.
- The map shows disaster hotspots.

References:

1) JICA(2012): "Data Collection Survey on ASEAN Regional Collaboration in Disaster Management : Country Report THAILAND", pp. 4-12
2) Economy and Environment Program for Southeast Asia (EEPSEA) (2009): "Climate Change Vulnerability Mapping for Southeast Asia", p. 19

3.7 Predominant Natural Hazards

The records of natural disasters that have affected the country are classified based on the impacts and frequency of occurrence. The results have been plotted on the impacts - frequency matrix and the most prevailing hazards studied.

3.7.1 Employed Data

The disaster records compiled in Appendix A3 are employed in this study. The records for the last 30 years, namely from 1983 to 2012, are used because the number of events included in the database before 1980 is significantly less than after 1980. The records of large disasters through earthquakes, tsunamis and volcano eruptions before 1983 are also used because the frequencies of occurrence for these hazards are significantly lower than floods, cyclones and landslides.

3.7.2 Study Method

The “Damage Amount / GDP” and ‘Number of Deaths” are used as indices to show the impacts of the disasters considered and 6 natural hazards will be studied and compared. At the beginning of the study, only the “Damage Amount / GDP” was used as an index because the results can be used for

Area BCP planning. However, the scarcity of information related to damage amounts became clear as the study progressed. As the information of the "Number of Deaths" is substantial compared to the damage amount, the "Number of Deaths" has been added as an index of impact.

The process of the study is as follows;

1) Based on the Damage Amount / GDP or Number of Death, each disaster is classified following the rank in Table 3.7.1,
2) The number of disaster events for each country is added by type of hazard and disaster rank, and then classified into Table 3.7.2 below,
3) The above information is then plotted on the impacts - frequency matrix by country,
4) As for earthquakes, tsunamis and volcanic hazards, if an event occurred before 1983 that was of the same (or higher) disaster rank as the maximum disaster rank recorded between 1983 to 2012, a point is plotted on the matrix which corresponds to the relevant disaster and frequency rank (=1).

Table 3.7.1 Disaster Rank and Damage

Disaster Rank	Damage Amount / GDP[1]	Number of Deaths
5	1.0% -	10,001 -
4	0.1% - 1.0%	1,001 - 10,000
3	0.01% - 0.1%	101 - 1,000
2	0.001% - 0.01%	11 - 100
1	- 0.001%	- 10

Table 3.7.2 Frequency Rank and Number of Events

Frequency Rank	Number of Events from 1983 to 2012	Average Frequency (Events / Year)
5	7 or more	1/5 -
4	4 to 6	1/10 - 1/5
3	2 to 3	1/15 - 1/10
2	1	1/30
1	Large Events that occurred before 1983	-

3.7.3 Study Results

The following results are based on the available existing information. Not all information relating to the impacts of the disasters was collected. Furthermore, and the purpose of this study is not intended to evaluate the precise damage amount or number of deaths. The purpose of this study is to rank 6 natural hazards according to their impacts.

[1] Gross domestic product based on the purchasing-power-parity (PPP) valuation of the country's GDP, according to the International Monetary Fund, World Economic Outlook Database, October 2012

The largest human loss in the last 30 years was caused by the 2004 Indian Ocean Tsunami and there are no records of similar scale events occurring even in historical documents. Floods occur frequently and their impact is the largest in terms of the amount of damage caused. Cyclones have the next biggest impact.

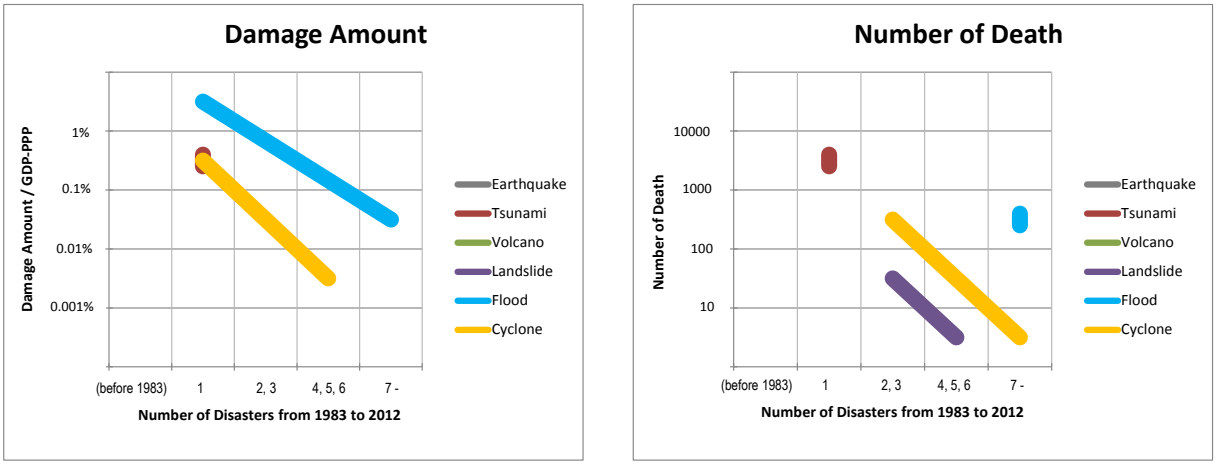


Figure 3.7.1 Impact of hazards in Thailand

3.8 Existing Investigations and Studies

3.8.1 Methods and Scope of the Survey

This section reviews studies and research that have been conducted in the ASEAN region with a focus on natural hazards, risks, and vulnerability assessments. The target hazards are: floods, earthquakes, volcanoes, tsunamis, cyclones (typhoons)/meteorological disasters, and landslides. Information and study reports were reviewed from those that are available for the public and on the internet. The purpose of this section is to first gain an overview of the existing study results regarding hazard trends, encountering risks, and degrees of vulnerability throughout the entire ASEAN region as well as in each ASEAN member state. Another purpose it to produce a compilation of assessment reports of the region, which will be accessible as a reference for those who wish to plan an Area BCP.

Table 3.8.1 Methodology of Information Collection and Scope of Survey

Information Collected	Methodology	Scope of Survey
Existing studies and research	To collect existing studies and reports from public sources including the internet.	To summarize the studied hazards, areas, contents of hazard and risk analysis, vulnerability assessment of existing studies, and other research.

3.8.2 Outline of Collected Information and Data

Table 3.8.2 shows the outline of collected information and data. Summaries of existing studies and reports are compiled as data sheets in Appendix A4.

Table 3.8.2 Outline of the Collected Information and Data

Appendix A4 Subsection	Hazards	Outline
A4.1	Flood	Flood hazard, risk assessments, hazard maps, and vulnerability assessment have been conducted in ASEAN countries using data on rainfall, inundation areas, affected population, and monetary assessment. Hazard maps were produced with GIS tools. The usage of GIS tools for assessments is widely recognized and its usage has been explored to produce hazard maps. Some runoff analyses were conducted for selected areas. Limited information and data available for Brunei Darussalam.
A4.2	Earthquake	Many of the earthquake hazard studies in the area are probabilistic seismic hazard analyses (PSHA), not scenario earthquake studies. This is to quantify the probability of exceeding a specific ground-motion level at a site given all possible earthquakes. This methodology is descended from the Global Seismic Hazard Assessment Program (GSHAP). GSHAP was launched in 1992 by the International Lithosphere Program (ILP) with the support of the International Council of Scientific Unions (ICSU), and endorsed as a demonstration program in the framework of the United Nations International Decade for Natural Disaster Reduction (UN/IDNDR). Earthquakes are not equally distributed around the globe because of the generating mechanism. In the ASEAN region, many earthquakes are observed in and around Indonesia and Philippines, which are located in the convergent boundary (subduction) zone and fewer earthquakes are observed in and around Myanmar, which is in the transform boundary zone. There are fewer or no earthquakes observed in other regions. However, some regions are sometimes affected by the earthquakes which occur in neighboring countries. The northern regions of ASEAN countries are sometimes affected by the earthquakes that occur in the Yunnan province of China. A number of investigations and studies reflect this trend.
A4.3	Tsunami	There are only few investigations and studies about tsunami hazard or risk in the region, and most of them are compilations of past disasters. There is no probabilistic study as there is for earthquakes. There is a hazard map that encompasses several tsunami scenarios. There are studies targeting the Asia-Pacific area because tsunamis propagate in the sea. Large-sized tsunamis are caused by major earthquakes in the ocean. This is the reason that tsunamis are also not equally distributed around the globe. However, tsunamis affect a wider area than the ground-motion of earthquakes, as seen in the tsunami caused by the Sumatra earthquake on December 26th in 2004. Thus, tsunamis are sometimes studied in countries with few or no earthquakes.
A4.4	Volcano	Most volcanoes are also located along the convergent boundary (subduction) zone. This is the reason why volcanoes are also not equally distributed around the globe. Disasters caused by volcanic eruptions are lava flow, pyroclastic flow, lahar, and ash fall. Ash is scattered widely via the prevailing westerlies, but the other disaster types do

		not have an extensive reach. Regarding volcanic hazard, many investigations and studies are a compilation of areas affected by lava flow, pyroclastic flow, lahar, and ash fall from past volcanic eruptions for each volcano.
A4.5	Cyclone	Research on cyclone and meteorological hazard, and risk assessments have been conducted in ASEAN countries using data on tracks, damaged areas, and storm rainfall. The impact of climate change is also included in this research. Limited information and data available for Brunei Darussalam and Singapore.

3.8.3 Summary of Survey

(1) Floods

Some useful studies on flood hazard, risk, and vulnerability are publicly available presenting assessment results, case studies of countermeasures, as well as different methodological approaches. There are a few types of methodologies to assess risks and vulnerability including, for example, risks involving exposure to flooding events and population density. Vulnerability can be defined as a function of exposure, adaptive or coping capacity, and land-use etc. There are slightly different combinations of these factors with different studies for use. Therefore, these concepts must be defined in advance to plan a methodology for an assessment, in terms of which definitions are to be used in a certain analysis.

A summary of existing studies and reports is shown in Table 3.8.3 by country. A list of collected existing studies and reports is shown in Table 3.8.4.

Table 3.8.3 Summary of Existing Studies and Reports by Country: Flood

Country/Region	Summary of Existing Studies and Reports
ASEAN	There are a few reports that study natural disasters for ASEAN and the Pacific regions at large in recent years. Disaster risks are assessed by scenario, exposure, vulnerability, damage, and loss. An assessment framework is also sought to give an overview of risks, hazard and vulnerability.
Thailand	GISDA is producing GIS maps on flooding. World Bank undertook an assessment of the damage and losses caused by the flood of the Chao Phraya river in 2011. There is a flood risk assessment case study to evaluate susceptibility to hazard and risks. Reducing vulnerability is also a key to lowering risks. Examples of non-structural risk reduction measures are also presented.

Table 3.8.4 Existing Studies and Research: Flood

No	Country	Province/ City	Coordinates		Risk Assessment		Vulnera-bility Assess-ment	Organiza tion Produced	Document No. in Appendix A4.1
			Latitude	Longitude	Area	Popu-lation			
1	ASEAN	-	-	-	○	○	×	UNISDR/ WB	FL_001

2	Thailand	Bangkok	13.78207	100.4931	○	○	×	ADB	FL_002
3	Thailand	Hat Yai	7.021846	100.4533	○	×	×	Journal of Natural Disaster Science	FL_017

Note: ○ indicates the existence of information. ×indicates that information was not found in public resources.

(2) Earthquakes

Useful information and studies on earthquake hazard, risk, and vulnerability were collected from resources available in the public domain including websites. The information and studies include methodologies with analysis and assessment.

There is no standardized or authorized methodology for risk and vulnerability assessment. Therefore, the methodology should be selected or updated in accordance with the purpose when risk and vulnerability assessments are required.

A summary of existing studies and reports is shown in Table 3.8.5 by country. A list of collected existing studies and reports is shown in Table 3.8.6.

Table 3.8.5 Summary of Existing Studies and Reports by Country: Earthquake

Country/Region	Summary of Existing Studies and Reports
ASEAN	There are natural hazard assessment reports for ASEAN region created by international organizations like World Bank etc. They summarize frequency, vulnerability, loss, and others subject for each disaster. Some reports describe the methodology and assessment points/items.
Thailand	There are few records of earthquake disaster in Thailand, but some organizations surveyed earthquake hazard.

Table 3.8.6 Existing Studies and Research: Earthquake

No	Country	Province/ City	Hazard Assessment			Risk Assessment		Vulnera-bility Assess-ment	Organi-zation Produced	Document No. in Appendix A4.2
			Scena rio	Probabi listic	Method ology	Human Loss	Econom ic Loss			
1	Worldwide	-	×	○	×	○	○	○	UNISDR	EQ_001
2	ASEAN	-	×	○	×	×	×	×	GSHAP, USGS	EQ_002
3	Thailand	-	×	○	×	○	×	×	OCHA-ROAP	EQ_023
4	Thailand	-	×	○	○	×	×	×	USGS	EQ_024

(3) Tsunamis

Useful information and studies on tsunami hazard, risk, and vulnerability were collected from resources available in the public domain including websites. The information and studies include methodologies with analysis and assessment.

There is no standardized or authorized methodology for risk and vulnerability assessment. Therefore, methodology should be selected or updated in accordance with the purpose when risk and vulnerability assessment are required.

A summary of existing studies and reports is shown in Table 3.8.7 by country. A list of collected existing studies and reports is shown in Table 3.8.8.

Table 3.8.7 Summary of Existing Studies and Reports by Country: Tsunami

Country/Region	Summary of Existing Studies and Reports
ASEAN	Tsunami induced by the Sumatra earthquake on December 26, 2004 caused major damage to ASEAN countries. The disaster is summarized by organizations like ADB.
Thailand	There are a few recorded tsunami disaster in Thailand. The inundation area caused by the Sumatra earthquake on December 26, 2004 is summarized.

Table 3.8.8 Existing Studies and Research: Tsunami

No	Country	Province/ City	Hazard Assessment			Risk Assessment		Vulnera-bility Assess-ment	Organi-zation Produced	Document No. in Appendix A4.3
			track record	Scena rio	Metho dology	Human Loss	Economic Loss			
1	ASEAN	-	○	×	×	○	○	×	ADB	TN_002
2	Thailand	Southern area	○	×	×	×	×	×	DFO	TN_012

(4) Volcanoes

Useful information and studies on volcanic hazard, risk, and vulnerability were collected from resources available in the public domain including websites. The information and studies include methodologies for analysis and assessment.

There is no standardized or authorized methodology for risk and vulnerability assessment. Therefore, methodology should be selected or updated in accordance with the purpose when risk and vulnerability assessment are required.

A summary of existing studies and reports is shown in Table 3.8.9 by country. A list of collected existing studies and reports is shown in Table 3.8.10.

Table 3.8.9 Summary of Existing Studies and Reports by Country: Volcano

Country/Region	Summary of Existing Studies and Reports
ASEAN	UNOCHA summarized the scale of the explosion of volcanoes around the Asia-Pacific region using the Volcanic Explosivity Index (VEI).
Thailand	There is no record of volcanic disaster in Thailand and no investigations or studies limited to this country and its regions were found.

Table 3.8.10 Existing Studies and Research: Volcano

No	Country	Province/ City	Hazard Assessment			Risk Assessment		Vulnera-bility Assess-ment	Organi-zation Produced	Document No. in Appendix A4.4
			Track record	Scena rio	Metho dology	Human Loss	Economic Loss			
1	ASEAN Asia-Pacific	-	○	×	×	×	×	×	OCHA -ROAP	VE_001

(5) Cyclone (Typhoon) and Meteorological Hazard

"Cyclone" is a term to describe many types of of low pressure systems, of which tropical cyclones/typhoons are the main types creating disasters in the ASEAN region. Under the framework of WMO, leading countries implement monitoring/detection of tropical cyclones on a regional basis. Table 3.8.11 indicates the responsible territory allocated to ASEAN members and its leading country.

Table 3.8.11 Members of WMO Tropical Cyclone Committee

	Warning Zones	Members（ASEAN）	Leading Country
Western North Pacific Ocean and South China Sea	0° - 60°(N) 0° - 100°(E)	Cambodia, Lao PDR, Malaysia, Philippines, Singapore, Thailand, Vietnam	Japan
Bay of Bengal and the Arabian Sea	5°S - 45°(N) 30°E - 90°(E)	Myanmar, Thailand	India
South Pacific and South-East Indian Ocean	0°-50°(S) 90° - 170°(E)	Indonesia	Fiji

The dates and information utilized in this report have been acquired from various reports on the studies and research conducted on tropical cyclones and meteorological hazards published on the internet. Collected documents include evaluation results of hazards/risks, as well as their evaluation methods. With regard to tropical cyclones/typhoons, a meteorological organization of each country compiles a summary on the damage situation, including the number of casualties or loss of human lives, and the estimated amount of damage, etc.

A summary of existing studies and reports is shown in Table 3.8.12 by country. A list of collected existing studies and reports is shown in Table 3.8.13.

Table 3.8.12 Summary of Existing Studies and Reports by Country: Cyclone and Meteorological Hazard

Country/Region	Summary of Existing Studies and Reports
ASEAN	Study reports on natural disasters in the whole ASEAN region are available.
Thailand	Typhoons occurring between October and December and landing in central Vietnam can create damage that extends to Thailand. Abnormal weather due to the climate change has occurred.

Table 3.8.13 Existing Studies and Research: Cyclone and Meteorological Hazard

No	Country	Province/ City	Coordinates		Risk Assessment		Vulnera-bility Assess-ment	Organiza tion Produced	Document No. in Appendix A4.5
			Latitude	Longitude	Area	Popu-lation			
1	Thailand							ADB	CM_002
2	Thailand							UN	CM_006

(6) Landslides

A summary of existing studies and reports is shown in Table 3.8.14 by country. A list of collected existing studies and reports is shown in Table 3.8.15.

Table 3.8.14 Summary of Existing Studies and Reports by Country: Landslide

Country/Region	Summary of Existing Studies and Reports
ASEAN	There have been a few reports that study landslides for ASEAN and the Pacific region at large in recent years. Disaster risks are assessed by scenario, exposure, vulnerability, damage, and loss. An assessment framework is also sought to give an overview of risks, hazard, and vulnerability.
Thailand	High levels of hazard are distributed in the border area with Laos, but there is no hazard in the lowland where the capital Bangkok and other main cities are located. Vulnerability indicated by occurrence of landslide and deaths is medium to low level. Exposure is distributed in a narrow area near the border with Myanmar. Large-scale hazard maps are being developed and an early warning system for flash floods is being prepared. Countermeasures for roadside slopes are also being conducted.

Table 3.8.15 Existing Studies and Research: Landslide

No	Country	Province/ City	Coordinate		Risk Assessment		Vulnera-bility Assess-ment	Organization Produced	Document No. in Appendix A4.6
			Latitu de	Longitu de	Area	Popu-lation			
1	ASEAN				○	○	×	UNISDR/Wor ld Bank	LS-006
2	ASEAN				○	○	×	EEPSEA	LS-013
3	World				○	○	○	WB	LS-007

References:

Flood

1) Arief Anshory Yusuf & Herminia Francisco (2009). Climate Change Vulnerability Mapping for Southeast Asia, Singapore: EEPSEA
2) Asian Disaster Preparedness Center (2011) Program for Hydro-Meteorological Disaster Mitigation in Secondary Cities in Asia (PROMISE) 2005 to 2010: Bangkok
3) Shigenobu Tanaka et al (2010). Progress Report on Flood Hazard Mapping in Asian Countries. PWRI.

4) TanavudCharlchai et al, (2004) Assessment of flood risk In Hat Yai Municipality, Southern Thailand, using GIS: Journal of Natural Disaster Science, Volume 26, Number 1, 2004, pp1-14
5) Velasquez, Jerry et al (ed.) (2012). Reducing vulnerability and exposure to disasters: Asia-Pacific disaster report 2012, ESCAP/UNISDR AP
6) World Bank (2011) Thailand Flooding 2554 Rapid Assessment for Resilient Recovery and Reconstruction Planning: Bangkok
7) World Bank (2011). Advancing Disaster Risk Financing and Insurance in ASEAN Countries: Framework and Options for Implementation, Washington: Global Facility for Disaster Reduction and Recovery
8) World Bank, UNISDR (2010). Synthesis Report on Ten ASEAN Countries Disaster Risks Assessment.

Earthquake

1) Mark Petersen et al. (2007). , Documentation for the Southeast Asia Seismic Hazard Maps, USGS
2) OCHA-ROAP (2011). THAILAND: Natural Hazard Risks
3) UNISDR (2009). Global assessment report on disaster risk reduction, Risk and poverty in a changing climate

Tsunami

1) ADB (2005). From Disaster to Reconstruction: A Report on ADB's Response to the Asian Tsunami

Volcano

1) OCHA -ROAP (2011). Holocene Eruption and Selected Volcanoes in Asia-Pacific

Cyclone (Typhoon) and Meteorological Hazard

1) ESCAP/WMO Typhoon Committee. (http://www.typhooncommittee.org/)
2) JMA/WMO Workshop on Quality Management in Surface, Climate and Upper-air Observations in RA II (Asia) 2011
3) WMO National Meteorological or Hydrometeorological Services of Members (http://www.wmo.int/pages/members/members_en.html)
4) WMO (2010). First Meeting of the Task Team on “Meteorological, Hydrological and Climate Services for Improved Humanitarian Planning and Response”, WMO Headquarters, Geneva, Switzerland (31 August - 2 September, 2010)

Landslide

1) World Bank, UNISDR (2010). Synthesis Report on Ten ASEAN Countries Disaster Risks Assessment

Figure 3.8.1 Existing Study on Natural Hazards in Thailand

Chapter 4 Industrial Agglomerated Areas and Investment Risk

4.1 Historical Evolution of Industrial Agglomerated Areas

The development of industrial estates in Thailand began under the directive of the Ministry of Industry during the Thanom Kittikajorn government in the 1960s. Thailand officially began to pursue export-oriented development in 1966; however, it was very limited and restricted to certain types of agricultural products until the 1970s. In 1972, the Industrial Estate Authority of Thailand (IEAT) was set up as a state enterprise attached to the Ministry of Industry. It was responsible for implementing the government's industrial development policy, which included industrial estate development was an important part of state-directed industrialization. Key policies such as tax exemptions and various investment incentives began in the mid-1970s. In the early period of industrial development, industrial estates represented joint investment by the Thai state, overseas development assistance (mostly from Japan) and occasional private entities. Successive governments invested heavily in the building of infrastructure to attract and support foreign investment in industrial estates.

Since the 1970s, every successive Thai government has continued to pursue export-oriented development goals. The state has invested and encouraged the development of new industrial estates throughout Thailand, with the focus on the greater Bangkok area and the eastern coastal area (Eastern Sea Board). New roads, airports and sea ports were built to facilitate investment in industrial parks in these areas. Despite many episodes of political upheavals and the Asian Financial Crisis in 1997, every government has vowed to support further foreign investment, industry development and export-oriented manufacturing, resulting in high-level policy continuity. What has varied between governments are targeted industries. Since the government of Thaksin Shinawatra began in 2001, the Ministry of Industry and the Board of Investment (BOI) have set out to promote industries that have high domestic value add. Targeted industries include automobile and automobile parts, agro-industry, fashion/jewelry, and electronics. Joint ventures between the Thai state and private companies or private firms alone now account for the vast majority of growth of industrial estates in Thailand.

4.2 Recent Trends and Japanese Investment

Japan has for some time been the largest investor in Thailand's industrial estates. This is no surprise given that the Japanese Bank of International Cooperation was crucial to the initial development of infrastructure and parks in Thailand. As of 2010, Japanese investment in Thai industrial parks accounted for 41% of total investment, followed by ASEAN at 38%. In some estates, such as Amata Nakorn, Japanese investment accounts for more than 60% of total investment. The significant presence of Japanese investment is beneficial for incoming Japanese investors, as the majority of Thai estates are familiar with supporting Japanese companies and provide tailored, high quality services.

The 2011 floods dealt a heavy blow to Japanese manufacturing companies, causing significant damage to more than 300 Japanese firms and disrupted their global supply chains. Government agencies are working to put flood control measures into place in flood-prone areas, but these efforts are unlikely to result in sufficient flood control capability for at least five years. As a result, industrial park operators are working to develop new estates in Thailand outside of flood-prone areas. We are aware of at least four such large developments in Prachinburi and Nakonnaiyok provinces. These new estates will have the added advantage of being close to the planned Greater Mekong Sub-region Southern Corridor Transportation Route that will connect to Vietnam and Myanmar. Parks in the Eastern Seaboard region are also likely to gain from the relocation of Japanese firms.

4.3 Observations from Data Collection

Our research experience shows that Thai industrial parks remain among the most attractive sites for foreign investors in ASEAN. Parks are generally very well managed and enjoy good infrastructure designed specifically to support foreign investors and exporters. They are also well connected to ports and airports. Most parks are also self-contained and offer a range of facilities, including accommodation for workers, one-stop investment services, and a range of amenities. Clear and detailed information on most parks is available online in at least two languages - Thai and English. Several parks also have Japanese language information. Park staff are helpful and often speak English or Japanese. They are happy to provide park information. The IEAT and BOI also have up-to-date information on parks in multiple languages, are responsive to investor enquiries and have English-speaking staff.

4.4 General Investment Risk

(1) Political Risk

Thailand is a constitutional monarchy with a parliamentary system of government. The prime minister is indirectly elected through parliamentary elections every five years. King Bhumibol Adulyadej does not intervene directly in politics, but is influential in that he is held in great esteem by all political parties and the Army.

Thai politics is divided between Red and Yellow Shirt-affiliated groups. Red Shirts are primarily rural residents and urban poor who support exiled Puea Thai party founder and former Prime Minister Thaksin Shinawatra. Yellow Shirt supporters are mostly middle and upper class urban residents and members of the monarchy, military and bureaucracy, many of whom support former Prime Minister Abhisit Vejjajiva's Democrat Party. The Army has intervened regularly in politics, with nine successful or attempted coups since 1971, most recently in 2006. In May 2010, the Army forcibly ended Red Shirts protests in Bangkok, killing over 80 civilians. Since the Puea Thai party's victory in the July 2011 elections, the Army and Prime Minister Yingluck Shinawatra, Thaksin's sister, appear to have reached an understanding that ensures their peaceful co-existence, short of a few trigger events.

In March 2013, Thaksin urged the Puea Thai party to approve amnesty laws for the Red Shirt supporters convicted of committing crimes during the 2010 violence. The Democrat Party opposes the laws and claim they would pave the way for Thaksin's return. However, Yingluck is unlikely to push for Thaksin's return until she has the support of the Army, without which a coup would become likely. Given that Thaksin's return is the most contentious issue in Thai politics, such an agreement is unlikely to be reached in the next year.

The King's death could be a potential trigger for a coup. The King is to be succeeded by Crown Prince Vajiralongkorn who has a close relationship with Thaksin. The military and the Privy Council have expressed concern about this relationship and would intervene if they perceived the new king was changing the political status quo. However, a coup would be met with a violent uprising, surpassing the level of violence seen in the 2010 protests. The Army would face civil unrest in the central Bangkok business districts of Ratchaprasong and Pathum Wan and an insurgency in northern provinces such as Chiang Mai and Udon Thani. As such a coup would result in business disruption, but pro-business policies would likely remain once order was restored. The projected level of violence is likely to restrain both the Army and the Puea Thai, mitigating coup risks.

(2) Economic Risk

Driven by the post-flood surge in investment and private consumption, the economy grew 6.5% in 2012. It is questionable how long this momentum will last, though. It is quite likely that, on the consumption front at least, some of the 2012 over-performance involved pulling forward purchases that would have otherwise occurred in 2013, thereby weakening the outlook going forward. We expect investment growth to suffer from unfavorable base effects, but we still expect fairly robust investment spending, encouraged by ongoing incentives and lower corporate tax rates. We expect the economy to expand by 4.4% in 2013.

Despite rapid economic growth and higher incomes, inflation has remained remarkably low in recent quarters and is unlikely to turn problematic in 2013. That the robustness of domestic demand has not yet translated in demand-pull price pressures, probably due to sufficient supply conditions. The sufficient supply is a reflection of tame global commodity prices amid weak global demand. The Thai baht was stable early in 2013 but since mid-May has weakened as talk of the US Federal Reserve Bank’s plans to taper its quantitative easing program has weighed on the currency. Further depreciation of the local currency would put upward pressure on import prices. We currently anticipate average consumer price inflation of 2.6% in 2013.

In light of growing competition from China, Vietnam, Indonesia, and other regional manufacturing centers, moving up the value-added chain is the Thai economy's challenge. Although this need is apparently recognized by policymakers, they have yet to engage in open debate or a concerted planning effort to develop Thailand's position as a more advanced producer. Currently, the country is uncomfortably stuck somewhere between a major agricultural and successful light industry producer, which has nonetheless failed to build up higher-value industries such as high-tech or bio-tech. Rather

than strengthening the environment for foreign investment, the current administration has so far chosen to focus on developing local small and medium-sized enterprises to strengthen domestic activity and counterbalance any future drop in exports.

(3) Legal Risk

Thailand's legal system is generally satisfactory and effective in enforcing property and contractual rights. However, in practice, the legal processes can be slow and there is a need to improve the environment for foreign investors. Transparency is sometimes missing, and although the judiciary is generally independent, well-connected third parties have been known to influence the outcome of court cases through extra-legal means. There is also a widespread perception that the judiciary is politically biased – it has been selectively ruling against supporters of former Prime Minister Thaksin Shinawatra and the Puea Thai in a number of high-profile cases. Such issues are less prevalent in commercial cases.

(4) Tax Risk

The tax system in Thailand is modern and relatively simple compared to most other countries in the region. The corporate tax rate was lowered from 30% to 23% in January 2012, and further reduced to 20% on 1 January 2013. The new rates lower the direct tax burden levels for companies and bring them more in line with those in the other countries of the region. While Thailand's revenue department expects the rate reduction to result in revenue losses over the next few years, in the medium term the tax cut should improve Thailand's competitiveness in relation to its neighbors and boost foreign direct investment levels. The move is also in response to Thai business representatives' calls to cut corporate income tax permanently.

In August 2012, the Ministry of Finance announced its decision to maintain the country's value-added tax (VAT) rate at 7% until the end of September 2014. The VAT rate was reduced from 10% over a decade ago and this reduction was due to expire on 30 September 2012. Thai government is keen to keep the reduced VAT rate in place as it hopes to revive and promote the domestic economy following dramatic declines in industrial production during the October–November 2011 floods and amid global economic uncertainty. The 7% VAT rate is relatively low compared to other countries in the region, with Indonesia and Vietnam holding their standard VAT rates at 10%, and the Philippines at 12%. The populist Thai government will probably keep the reduced VAT rate in place even after the two-year extension period expires in order to keep the costs of living down.

Further improvements still need to be made to encourage entrepreneurship and close loopholes in the system that has led to widespread tax evasion. In GDP terms, the country's tax income is generally below regional standards, with funds generated by personal taxation particularly small. The investment incentive system is also in a need of reform, and would ideally be replaced with legislation more conducive to entrepreneurship.

(5) War Risk

Thailand's relations with neighboring states are largely positive, although there are border disputes with Cambodia. Thailand and Cambodia dispute a 4.6 sq km territory on around the Preah Vihear temple. From February-May 2011, both sides exchanged artillery rounds and gunfire, killing several soldiers and displacing thousands of villagers. From May 2011, a ceasefire has been in effect. The dispute is unlikely to develop into a wider conflict given election of a Puea Thai-led government in July 2011. Puea Thai founder and former Prime Minister Thaksin Shinawatra, has good relations with the Cambodian leader Hun Sen. Both sides argued their case in the International Court of Justice in April 2013 and a verdict is expected in October 2013. As the disputed area is small and rural, the border dispute poses no significant cargo and trade risks. The risk of conflict over the disputed territory would increase if the Democrat Party returns to power, regardless of the ICJ's verdict.

The presence of energy resources in the Gulf of Thailand has exacerbated maritime demarcation disputes with Cambodia. Three blocks in the gulf, with an estimated 10-11 trillion cubic feet of gas reserves, are subject to overlapping claims with Cambodia. The Cambodian government is willing to jointly develop the overlapping areas with Thailand so as to begin bidding rounds as quickly as possible, but Thailand prefers that the countries justify the existing claims instead. It is unlikely that military vessels will harass commercial vessels working at Thai or Cambodian offshore facilities.

Internally, there is a separatist insurgency in the far south is confined to the provinces of Songkhla, Pattani, Yala and Narathiwat, which have predominantly Thai-Malay and Muslim populations. Active military deployments are ongoing in these provinces.

(6) Terrorism Risk

We assess that southern separatists are unlikely to be able to widen the conflict to other parts of the country. Tourism assets, hotels, restaurants, banks, and other commercial targets including automotive showrooms and rubber storage facilities, are at risk of crude IED attacks in the four southernmost provinces. The government is likely to seek a peaceful resolution of the insurgency. In February 2013, the Barisan Revolusi Nasional (BRN), one of the insurgent groups in the south, agreed to enter peace talks with the government. We assess that peace talks are unlikely to reduce attacks given that the BRN is one of several insurgent groups in the region and the other groups are likely to increase attacks to project their power and relevance.

(7) Civil Unrest Risk

Industrial unrest in Thailand is relatively infrequent and does not pose significant risks to business continuity. Most strikes occur in the greater Bangkok metropolitan area. These mainly involve walk-outs and picketing and rarely result in property damage. Strikes at state firms often involve demonstrations outside government offices in Bangkok. Strikes in the private sector are generally confined to single factories, mostly in the garment and manufacturing sectors.

Greater business continuity risks arise from the risk of politically-motivated protests, though this risk has been significantly reduced under the current Puea Thai government. If the Democrat Party were to return to power, protest risks would increase. Previous protests, both by the Puea Thai-aligned Red Shirts and anti-Thaksin Yellow Shirts, resulted in substantial loss of life as well as property damage to commercial and government assets in Bangkok. In May 2010, the Army forcefully ended protests by 100,000 Red Shirts, resulting in 91 deaths, while protesters set fire to over 30 government and commercial properties including the Central World Shopping Mall, causing about USD 1 billion in damage.

4.5 Industrial Agglomerated Areas and Natural Disaster Risk

Several distribution maps are shown overlaying natural disaster risk as follows. List of industrial agglomerated areas are attached at the end of this report.

Figure 4.5.1 Distribution of Industrial Park

Figure 4.5.2 Distribution of Industrial Park, Major Infrastructures and Natural Hazards on number of killed in Thailand

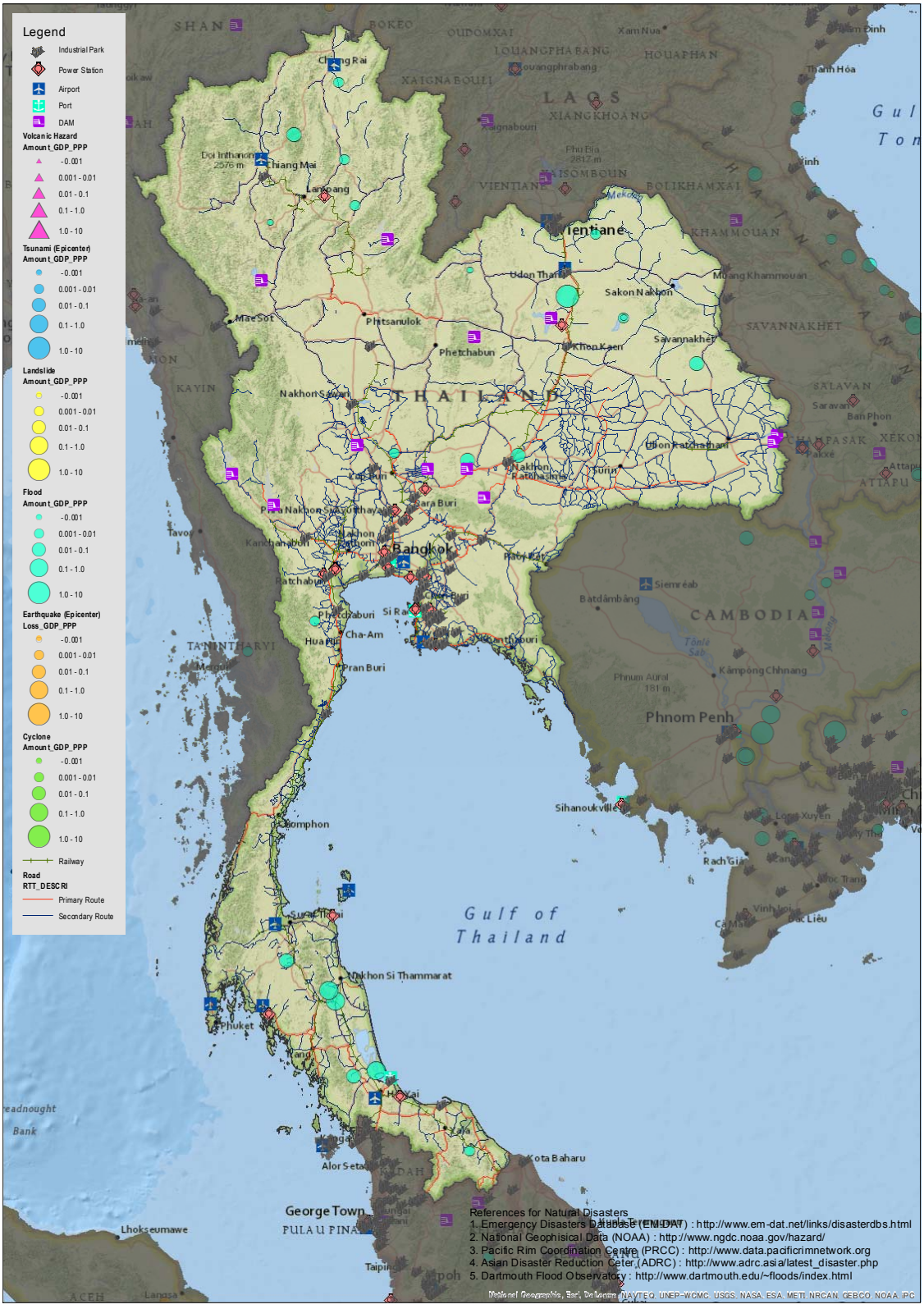


Figure 4.5.3 Distribution of Industrial Park, Major Infrastructures and Natural Hazards on loss rate to GDP in Thailand

Chapter 5 Relevant Infrastructure and Natural Disaster Issues

5.1 Infrastructure Conditions

5.1.1 Roads

In Thailand, the road systems were developed by the U.S. Army during the Vietnam War when their bases were located in Thailand. The total length of motorways is more than 67,000 km, and the pavement rate is more than 98%.

The Asian Highway, as an international trunk line, has nine (9) routes with a total length of 5,000 km in Thailand, all segments of which are more than 2-lane road and paved. These form a corridor of the Greater Mekong Subregion (GMS). A CCTV system has been installed along the main trunk roads in Bangkok to enable assessment of traffic conditions in real time.

Table 5.1.1 Status of Asian Highway in Thailand

Route No.	Total Distance (km)	Number of Lanes
AH1	701	2-4-6-8
AH2	1,549	2-4-6-8
AH3	117	2
AH12	511	4-6-8
AH13	555	2-4
AH15	243	2-6-8
AH16	708	2-4-6-8
AH18	268	4
AH19	459	2-4
Total	5,111	

Source: UNESCAP, Asian Highway Database 2008

The public roads in Thailand are categorized as shown below.

1) National Highways (Primary, and Secondary National Highway)
2) Provincial Highways
3) Municipal City Roads
4) Municipal Tambon Roads

The Expressway Authority of Thailand (EXAT) is responsible for the management of the expressways. The total distance of roads is shown below.

Table 5.1.2 Total distance and Density of Road in Thailand

Road Length (km)				Density Rate
Total	Main Trunk Road (with Highway)	Secondary Road	Others	(km/km^2)
180,053	51,855	44,000	84,198	0.35

Source: Ministry of Land, Infrastructure, Transport and Tourism (MLIT), World Road Extension and Pavement Rate

In Thailand, motorcycles are a major means of transportation. They are more popular in rural areas than in Bangkok.

Table 5.1.3 Number of the Registered Cars in Thailand as of 2009

No.	Type	Whole Country (A)	Bangkok	
			Total (B)	B/A (%)
1	Sedan (Not more than 7 Passengers)	4,078,547	2,190,150	54
2	Microbus and Passenger Van	383,684	192,911	50
3	Van and Pick Up	4,696,897	960,645	20
4	Urban Taxi	90,999	90,005	99
5	Tuk Tuk	21,615	9,034	42
6	Motorcycle	16,549,307	2,390,366	14
7	Automobile Trailer	1,987	1,213	61
8	Public Motorcycle	157,144	70,531	45
9	Bus	127,553	34,695	27
10	Truck	791,414	114,570	14
Others		285,430	49,599	17
Total		27,184,577	6,103,719	22

Source: IDE-JETRO, Industrial Estates, Ports, Airports and City Transport in the Greater Bangkok Area for Promoting Connectivity in the Mekong Region

5.1.2 Ports

Currently, there are five (5) major ports in Thailand. They are: Bangkok Port, Laem Chabang Port, KlongToey Port, Maptaphut Port, and Songkhla Port. These ports are operated and managed by the Port Authority of Thailand (PAT), which is established under the Ministry of Transport. Of these ports, the three (3) ports of Bangkok Port, Laem Chabang Port and Songkhla Port are included in the 47 ports designated by ASEAN.

Throughputs of these ports are shown in the following table.

Table 5.1.4 Throughput of the three ports designated by ASESN 2008

Port Name	Throughput (Tons)
Bangkok	17,767,818
Laem Chabang	54,837,542
Songkhla	1,830,381

Source: ASEAN/ERIA, ASEAN Strategic Transport Plan 2011-2015

5.1.3 Railways

(1) State railway of Thailand

The railway in Thailand is a major means of transportation. There are four major railways (North railway, Northeastern railway, East railway, South railway), and the Mae Klong line, which is an independent railway section, and an airport railway link connecting with the airport. The operating distance is 4,071 km with almost all sections being a single track. The number of total passengers is 46,600 thousand. It is an important national transportation device.

There are freight trains for oil, cement, LPG exclusive freight trains, and export-and-import container traffic trains, etc.

(2) Elevated railway (BTS)

Elevated railway (BTS) (commonly known as Sky Train) and subway (MRT) have been introduced to improve the car-centered traffic system in Bangkok. The BTS started operations in December 1999. Currently, two lines, the Sukhumvit line and Si Lom line, are operating with a total length of 25.7 km.

(3) Underground railway

In addition to BTS, the first underground railway service started in July 2004. At the present, the line from Hua Lamphong station to Bang Sue station (20 km total distance) is operating.

5.1.4 Airports

In Thailand there are seven (7) international airports: Suvarnabhumi,Don Muang,Chiang Mai,Chiang Rai, Hat Yai, Phuket, and Ko Samui.

The Thailand Airport Company (AOT) operates and manages six (6) of the international airports, not including Ko Samui.

Table 5.1.5 Number of Services and Passengers at Thailand International Airports 2010.9

Airport Name	Passengers		Throughputs	
	(thousands)	(%)	(thousand tons)	(%)
Svarnabhumi	42,500	74.0	1,274	94.8
Phuket	6,800	11.8	26	1.9
Chaing Mai	3,180	5.5	21	1.5
Don Muang	2,760	4.8	7	0.5
Hat Yai	1,460	2.6	13	1.0
Chaing Rai	720	1.3	3	0.2
Total	57,430	100.0	1,343	100.0

Source: JBIC, Investment Environment in Thailand 2010.10

5.2 Public Services

5.2.1 Electricity

The growth rate of electrical power in Thailand slowed greatly in both in 2008 and in 2009, but it recovered by 10% in 2010, and has been growing at an average of 6% since the beginning of the 21st century.

It is stable, though there are still about 1 or 2 momentary power failures per month.

The momentary power failures occur in 2 cases: one case occurs in the rainy season (June to October) and the other case occurs during the maximum power demand period (March to May). It recovers within less than one (1) hour and does not cause any big impacts.

According to the Electricity Generating Authority of Thailand (EGAT), about 70% of the electric power of Thailand depends on natural gas, and the share of the hydro-power generation is small.

When the oil platform of the Yadana Gas field in Myanmar, which supplies natural gas, stopped their operations for repairs in April 2013, it caused a large-scale electric power shortage.

Table 5.2.1 Container Throughput at Sihanoukville Autonomous Port

Resources	Million kWh	Ratio (%)
Natural Gas	104,228	71.8
Coal-Fired Power	28,717	19.8
HydroPower	6,964	4.8
Renewable Energy	2,116	1.5
Oil	607	0.4
Import Electricity	2,601	1.8
Total	145,233	100.0

Source: JBIC, Investment Environment in Thailand 2012.10

5.2.2 Water

(1) Water supply

Although the public water service rate in Thailand is about 82% in urban areas (access rate is 96%), it is very low in farm villages.

However, communities have their own small-scale water services, superficially increasing water service rates. The length of the water supply pipeline is 106,500 km.

In Thailand, according to the Decentralization Promotion Law in 1999, it was decided that local government units should manage the water supply and sewage.

1) Metropolitan Waterworks Authority (MWA):

The water supply target area is the Bangkok metropolitan area.

2) Provincial Waterworks Authority (PWA):

The water supply target areas are the cities with a population of more than 5,000, not including the Bangkok metropolitan area.

3) Others:

The water supply target areas are the cities with a population of less than 5,000 and local government units with a population of more than 5,000.

The water supply system of urban areas mainly takes raw water from rivers and lakes, processes it at a water purification plant, and supplies water to each home. At the water purification plant, a slow sand filter system and the flocculation and precipitation filtration system are used.

The slow sand filter system processes water by sand filtration at a large site, and a filtration rate is slow at 4~5 m/day. The flocculation and precipitation filtration system processes water at a high speed of 120~150 m/ day, and it is a city-type disposal method. Each is used depending on the characteristics of the area.

Although public water service has improved and water is supplied in the city by individual home, many homes are equipped with the water tanks.

It draws water with a domestic pump can be used in the same manner as the normal water services.

The system which collects and uses rain water is taken in rural areas, and plastic water jars are installed in many homes. The amount of the water used per person in Thailand is below half of Japan at 100L. This water is used for items such as cooking, washing, toilet, etc. at a reduced amount.

(2) Sewerage

Around the center of Bangkok metropolitan area, which is densely inhabited, river water is polluted by domestic waste water and industrial waste from the urban areas, aggravating water pollution.

The notification from the Ministry of Science, Technology and Environment (MOSTE) and an ordinance of the Bangkok Metropolitan Administration require the installation of septic tanks for building of a certain size or larger.

Although the construction of a sewage disposal plant has also started, the Wastewater Management Authority, which is responsible for it, does not fully demonstrate the work. The diffusion rate of the sewer network is 9.6%. However, although human waste is disposed of in septic tanks, raw sewage treatment efficiency is very low, causing river contamination. Thus, it is necessary to upgrade the raw sewage disposal capacity of the septic tank.

In Thailand, because the design of the sewage disposal plant is inappropriate, and the operation and management organization of each sewage disposal plant is unsatisfactory, many of the existing sewage disposal plants have not been functioning normally and are inefficient. For these reasons, the improvement of the efficiency at the existing sewage disposal plants in Thailand is an urgent need.

5.2.3 Communication

(1) Internet and broadband

There are 3.74 million subscribers with a diffusion rate of 5.4% as of 2011. The companies offering internet services are TOT, True Corporation, and TT&T.

WiFi connection services show a growing trend, and have been installed at about 40,000 places as of September 2011.

(2) Mobile phones

There are 78.67 million subscribers to mobile phone services as of 2011 with a diffusion rate of 113.2%, which exceeds one device per person. The main companies in the mobile communications field are AIS, DTAC, True Move, and CAT Telecom, with 3G services currently being mainstream.

(3) Fixed-line phones

There are 6.72 million subscribers to fixed-line phone services as of 2011, with a diffusion rate of 9.7%. The diffusion rate is very low and is decreasing yearly.

(4) Broadcasting

Radio broadcasting companies include the state-run Radio Thailand, which is managed by NBT, the MCOT Radio Network (62 station), which is managed by the Mass Communication Organization of Thailand (MCTT), and more than 500 commercial broadcasting companies. There is also large number of army or community-related broadcasting stations.

In addition to the television broadcasting conducted by NBT, MOT, and Royal Thai Army Television, commercial broadcasters include the Bangkok Entertainment Channel and Bangkok Broadcasting & TV. TPBS is a public broadcasting company.

5.2.4 Waste

In Thailand systems regarding the disposal of hazardous waste have been developed; however, there is no law to manage waste disposal overall, including urban waste.

In 1992, the Enhancement and Conservation of National Environment Quality Act B.E.2535 was enacted as a law relating to the environment. Although a system has been developed for hazardous waste processing management, there is no law to manages waste disposal overall, including city garbage.

Here, waste is broadly defined as “urban waste, dirt, wastewater, air pollutants, and solid/fluid/gas which contain toxic waste.” Industrial waste was made the responsibility of municipalities by the Public Health Act of the same year.

The Enhancement and Conservation of National Environmental Quality Policy and Plan in 1996, established the following targets about general waste. (1997-2016)

1) The amount of general waste shall be less than 1.0 kg per person per day.
2) The recycling rate of waste in Bangkok and the municipalities throughout the country will be more than 15%.
3) All the waste in municipalities should be managed, and the unprocessed waste in the outskirts of municipalities should be less than 10%.
4) Each province shall formulate a master plan for hygienic management of general waste.

Fifteen (15) million tons of urban waste were generated in Thailand in 2008, and 12.9 million tons (equivalent to 86%) were collected. 4.3 million tons (27%) were disposed of by landfill dumping. As for the remainder, about 7 million tons was dumped illegally.

Although about 30% of general waste can be recycled, only about 70% of them were recycled.

The Pollution Control Department (PCD) is in charge of the management of waste.

5.3 Natural Disaster Issues

An exceptional flood took place in the Chao Phraya River Basin between July and October in 2011. It caused 446 deaths and affected 2.3 million people. The flood went from Chiang Mai to Bangkok city, inundating more than 6 million ha, causing flood damage to 58 provinces along the Chao Phraya River.

Seven industrial estates were inundated at maximum depths of 3m; they remained inundated for 40 days. Many Japanese companies operating there were severely damaged (loss equated to more than 3% of the GDP). Prolonged flooding also severely impacted the tourist industry due to the decrease of tourists.

The topography in Thailand can be divided into four areas. The northern area is characterized by the mountains with sharp ups and downs. This area is vulnerable to natural disasters such as floods, landslides, and earthquakes. The central basin area is vulnerable to natural disasters such as floods and earthquakes. The northeastern area is characterized as dry highland, and is vulnerable to floods. The southern area is peninsula characterized by forest, and is vulnerable to floods, typhoons, and landslides.

Flood has damaged Thailand most severely. Monsoon season starts from June and continues until the end of September. Therefore, Bangkok is often called the “Wet City.”

Flood impact widely in the Chao Phraya River basin, and the riverside areas must be managed and planned particularly carefully.

There are no earthquakes in Bangkok, but the earthquakes that occur in other areas at long distances from Bangkok may affect the tall buildings in Bangkok, since the city is located on the soft ground.

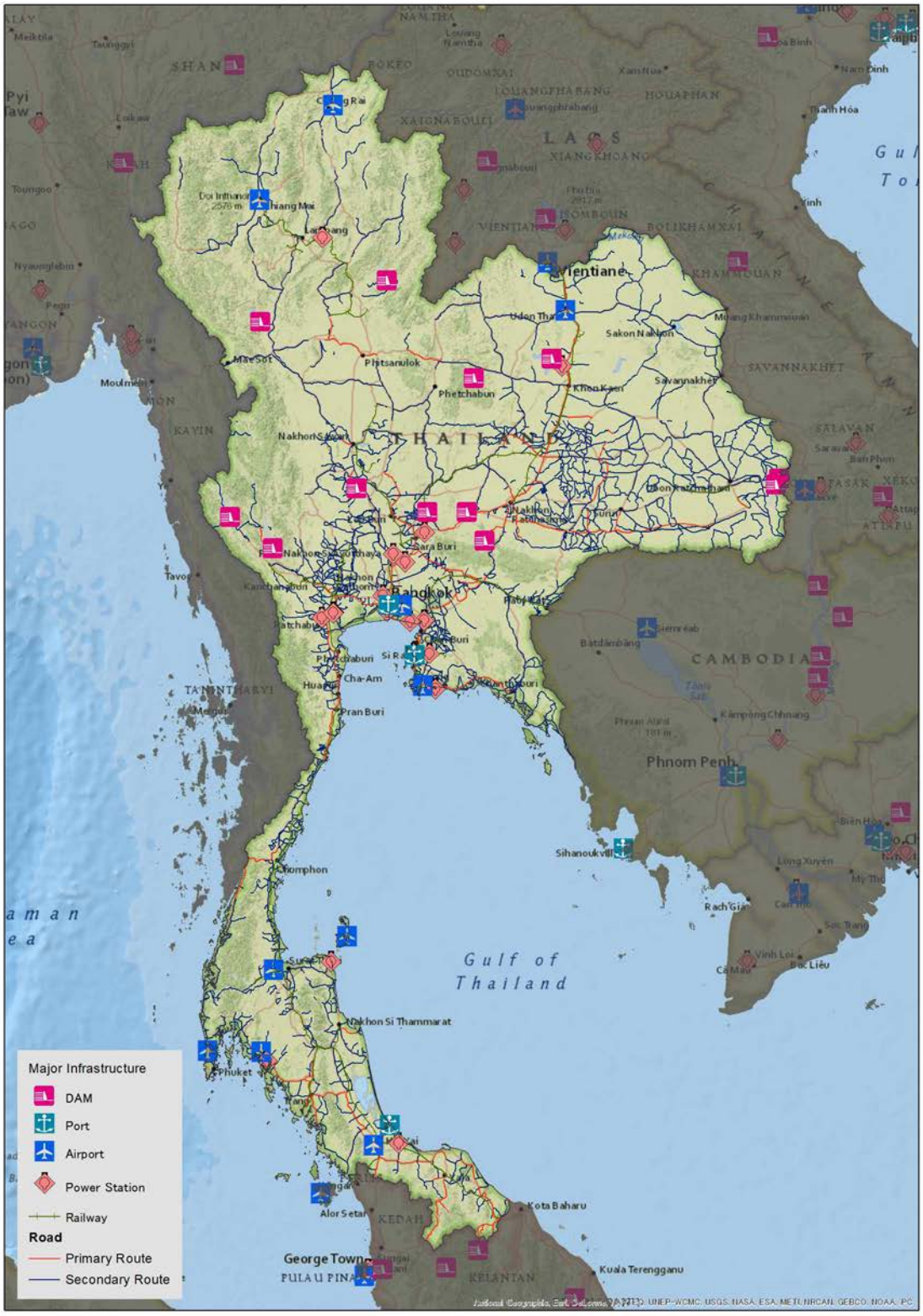


Figure 5.3.1 Major Infrastructures in Thailand

Chapter 6 Economy, Industry, and Trade

In this survey, the general outline of economy and trade in the Kingdom of Thailand and the cases in which disaster impact analyses were conducted are examined. The purpose is to estimate the impact of a disaster on the economy of the nation and surrounding regions in the event that an industrial agglomerated area in Thailand is hit by a disaster.

The following topics were explored using existing data and information from sources such as the internet, research papers, reports, and other materials.

- Overview of the economy and industry in Thailand
- Overview of trade in Thailand

In order to understand the conditions of the economy and trade in Thailand, relevant information was gathered/organized based on a review of the reference materials listed below:

No.	Reference	Remarks
1	ASEAN-JAPAN CENTRE website http://www.asean.or.jp/	Statistical data on economy, industry and trade of ASEAN
2	JETRO 2009, "ASEAN Economic Community (in Japanese)"	Regional corporation framework in East Asia
3	ASEAN Stats database http://aseanstats.asean.org/	Trade values of ASEAN by commodity and partner country, etc.
4	ASEAN website (2013), "Key basic ASEAN indicators in 2011, Last update 14 January 2013"	Key basic indicators of ASEAN
5	International Monetary Fund, World Economic Outlook Database	Macroeconomic indicators of ASEAN
6	Industrial agglomerated areas in ASEAN, IHS	Detailed information on industrial agglomerated areas in ASEAN
7	Ministry of Foreign Affairs of Japan http://www.mofa.go.jp/index.html	Information on regional affairs etc.

6.1 Overview of the economy

The GDP of Thailand is 365.6 billion USD (2012), which is second largest in ASEAN, after Indonesia. The country's GDP per capita is 5,678 USD (2012), and while this is roughly half the world average, and it is ranked the fourth among ASEAN countries. It is thought that the fact Thailand adopted a policy of promoting exports through industrialization from a relatively early stage is one of the reasons why Thailand is ranked higher.

The country's economic growth rate, which is 8.4% (2011), is below the average of ASEAN (15.7% (2011)), but this reflects the effects of the severe flooding. By looking at the timeline, the country's growth rate had moved almost in line with ASEAN countries. It is expected that the growth rate will continue to grow at a rate similar to or a little below the ASEAN average.

In 2011, Thailand had the lowest unemployment rate among ASEAN countries at 0.4%. It is estimated that the rate will stay at or below 1% for the next five years. (Cf. The unemployment rate in Japan as of 2012 is 4.4%).

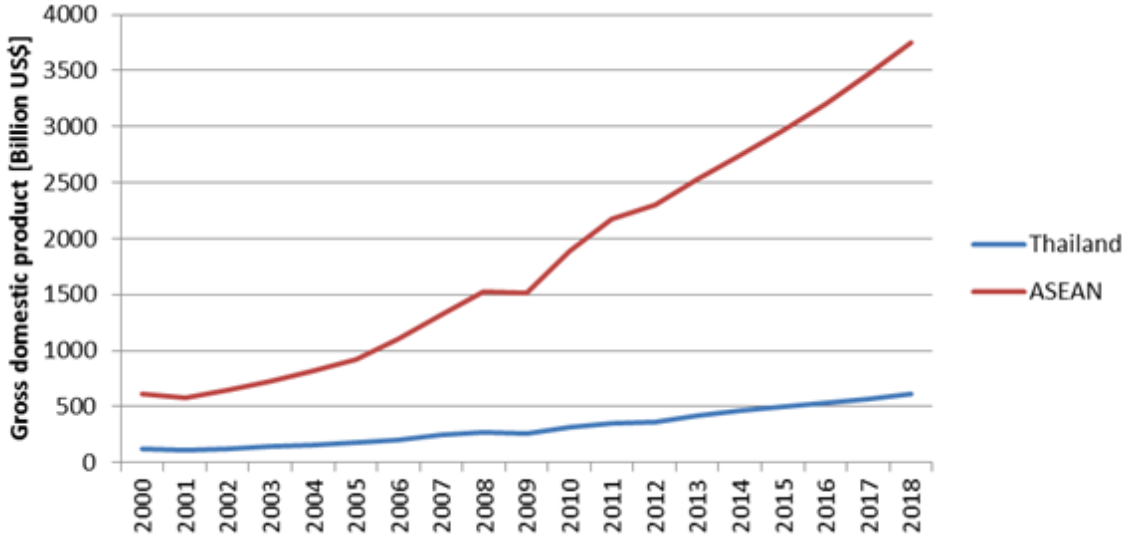
As for the component ratio of the GDP by industry, the manufacturing sector represents the largest share accounting for approximately 34% of the total GDP. This sector also accounts for almost 90% of the total export value. The agriculture sector accounts for about 12% of the total GDP, but the number of people employed in the agriculture sector is almost 40% of the entire working population, and it is a major industry in Thailand. Also, the tourism industry centered around the resort areas and ancient ruins is also active in Thailand.

Major industrial parks in Thailand, in which many Japanese companies are operating, are summarized in the table below:

Name of Industrial Park	Number of Japanese companies operating	Description
Northern Region Industrial Estate	28	Located 23 km south of Chiang Mai. Companies engaged in leather products and food related business operate in this industrial park.
Bang-Pa-In Industrial Estate	11	Located 45 km north of Bangkok. Companies engaged in chemical products are gathered.
High-Tech Industrial Estate	13	Located 59 km north of Bangkok. Companies engaged in food and textile goods manufacturing are gathered.
Rojana Industrial Park	74	Located 90 km from Bangkok. Companies engaged in electric and electronic products and automobile business are gathered.
Kabinburi Industrial Zone	18	Located 165 km from Bangkok. Companies engaged in food and home electric appliances business are operating in this industrial park.
304 Industrial Park	18	Located 140 km from Bangkok. Companies engaged in automobile business are gathered.
Navanakorn Industrial Zone	62	Located 46 km north of Bangkok. Companies engaged in manufacturing of home electric appliance and precision equipment are operating in this industrial park.
Bankadi Industrial Park	24	Located 47 km north of Bangkok. Companies engaged in electric appliance business are gathered.
Bangchan Industrial Estate	17	Located 30 km east of Bangkok. Companies engaged in food and chemical products business and automobile business are gathered.
Lardcrabang Industrial Estate	43	Located 35 km east of Bangkok. Companies engaged in automobile business are gathered.
Wellgrow Industrial Estate	15	Located 47 km east of Bangkok. Companies engaged in manufacturing of home electric appliances and chemical products are operating in the industrial park.
Gateway City Idustrial Estate	23	Located 85 km east of Bangkok. Companies engaged in construction, food and automobile business are operating in this industrial park.
Amata Nakorn Industrial Estate	189	Located 57 km east of Bangkok. Companies engaged in electric and electronic products, chemical products and automobile business are operating in this industrial park.
Pinthong Industrial Park	13	Located 95 km from Bangkok. Companies engaged chemical products business are gathered.
Hemaraj Eastern Seaboard Industrial Estate(Rayong)	58	Located 117 km southeast of Bangkok. Companies engaged in automobile business are gathered.
Map Ta Phut Industrial Estate	10	Located 190 km southeast of Bangkok. Companies engaged in chemical products business are gathered.
Amata City Rayong	23	Located 115 km from Bangkok. Companies engaged in automobile business are gathered. Glass manufacturing companies also operate in this industrial park.
Bang Plee Industrial Estate	42	Located 60 km south of Bangkok. Companies engaged in home electric appliance and metallic processing business are gathered.
Bang Poo Industrial Estate	75	Located 37 km south of Bangkok. Companies engaged in food and warehousing/transport businesses are operating in this industrial park.

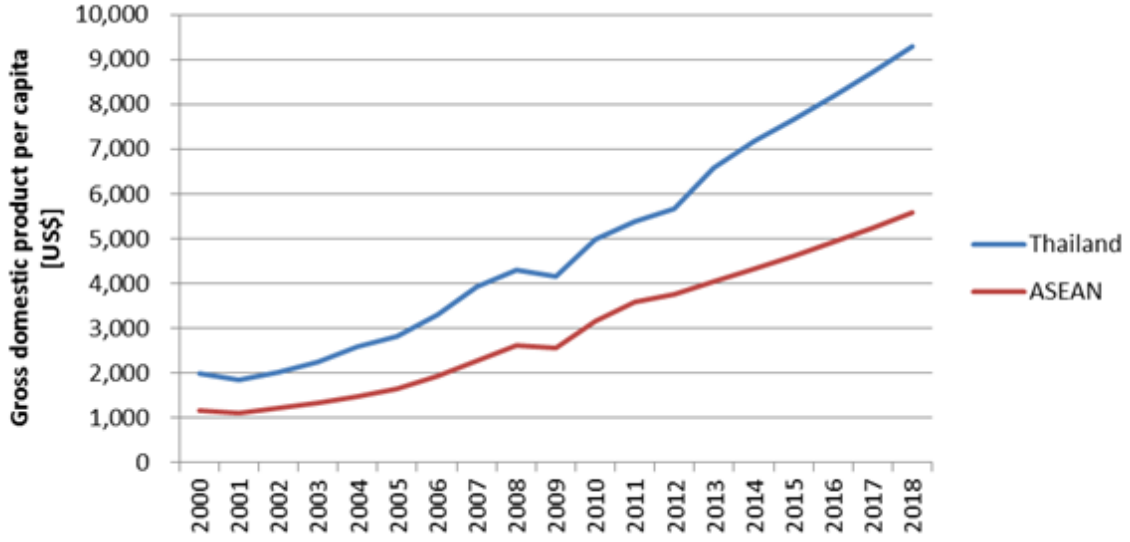
Name of Industrial Park	Number of Japanese companies operating	Description
Suranaree Industrial Zone	25	Located 273 km northeast of Bangkok. Companies engaged in electric and electronic products business and chemical products business are gathered in this industrial park.
Siam Eastern Industrial Park	17	Located 134 km from Bangkok. 57% of the companies are Japanese.

Reference: The table was created based on information from ASEAN-Japan Centre (https://www.asean.or.jp/)
Note) Numbers shown in parentheses were obtained from resources provided by IHS.



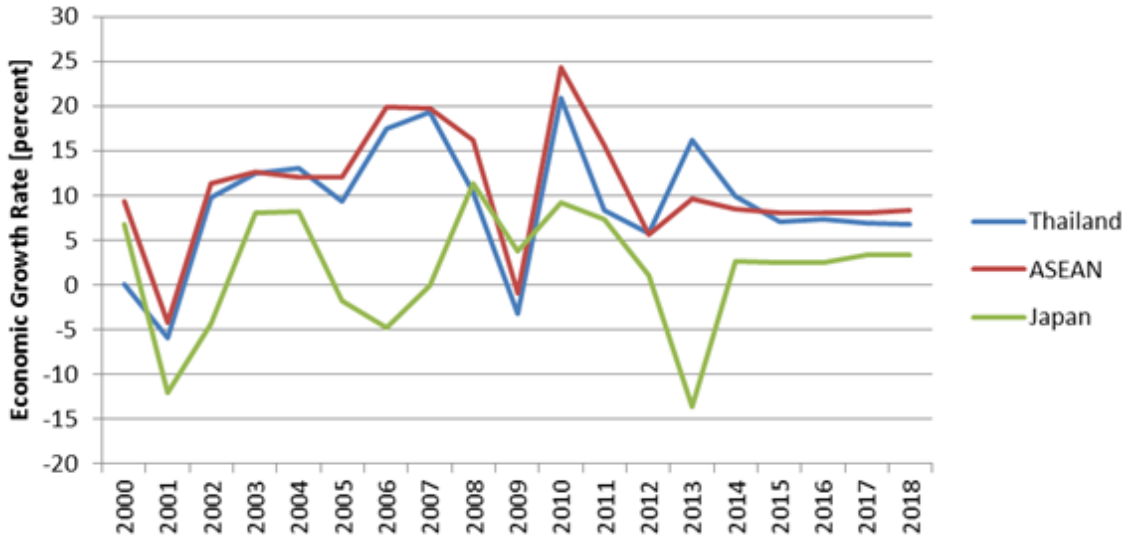
Source: International Monetary Fund, World Economic Outlook Database, April 2013

Figure 6.1.1 Gross Domestic Product in Thailand, ASEAN countries and Japan (2000-2018), current prices (Estimation in Thailand and ASEAN starting from 2012)



Source: International Monetary Fund, World Economic Outlook Database, April 2013

Figure 6.1.2 Gross Domestic Product per capita in Thailand, ASEAN countries and Japan (2000-2018), current prices (Estimation in Thailand starting from 2012; in ASEAN starting from 2007)



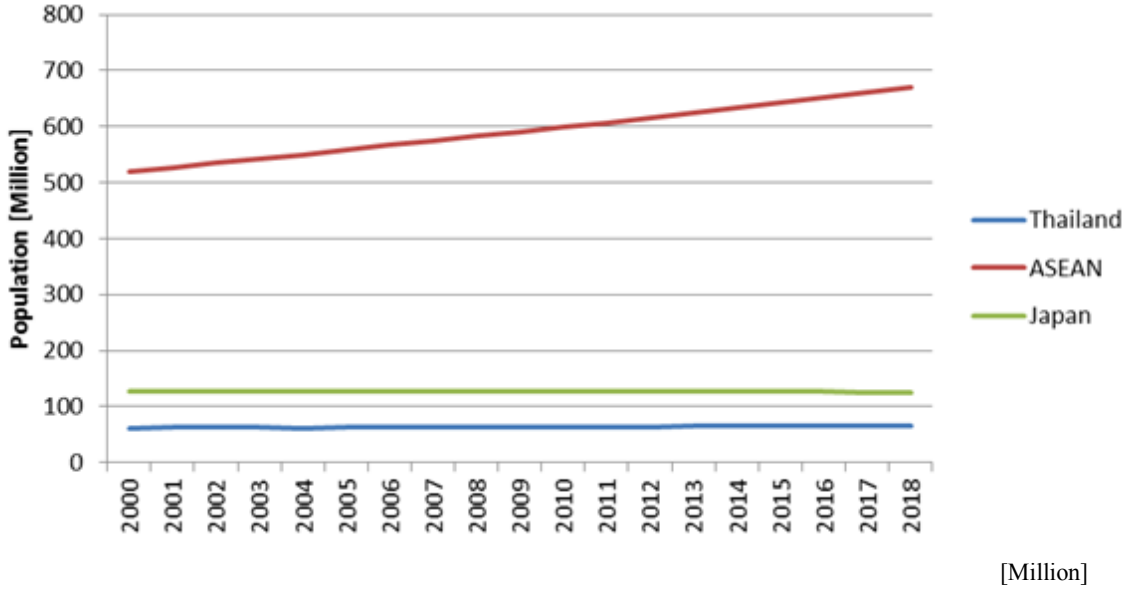
Source: International Monetary Fund, World Economic Outlook Database, April 2013

Figure 6.1.3 Economic Growth Rate in Thailand, ASEAN countries and Japan (2000-2018), current prices (Estimation in Japan starting from 2013; in Thailand and ASEAN starting from 2012)

Table 6.1.1 Average growth rate in Thailand, ASEAN countries and Japan (2013-2017)

	Thailand	ASEAN	Japan
Average growth rate (2013-2017) (%)	9.5	8.5	-0.53

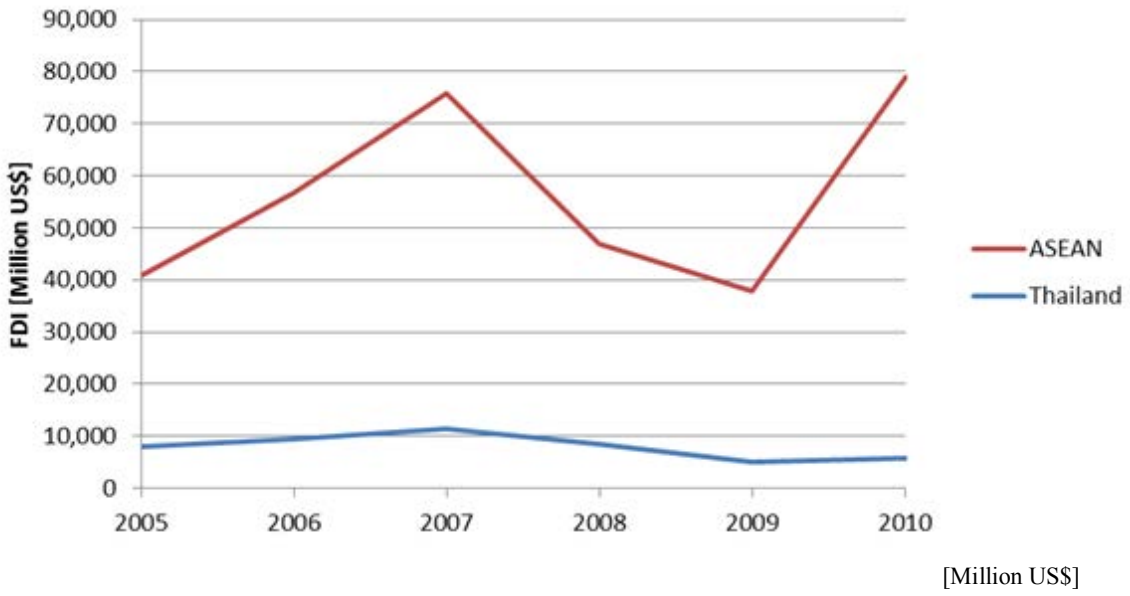
Source: International Monetary Fund, World Economic Outlook Database, April 2013, calculated by MRI



[Million]

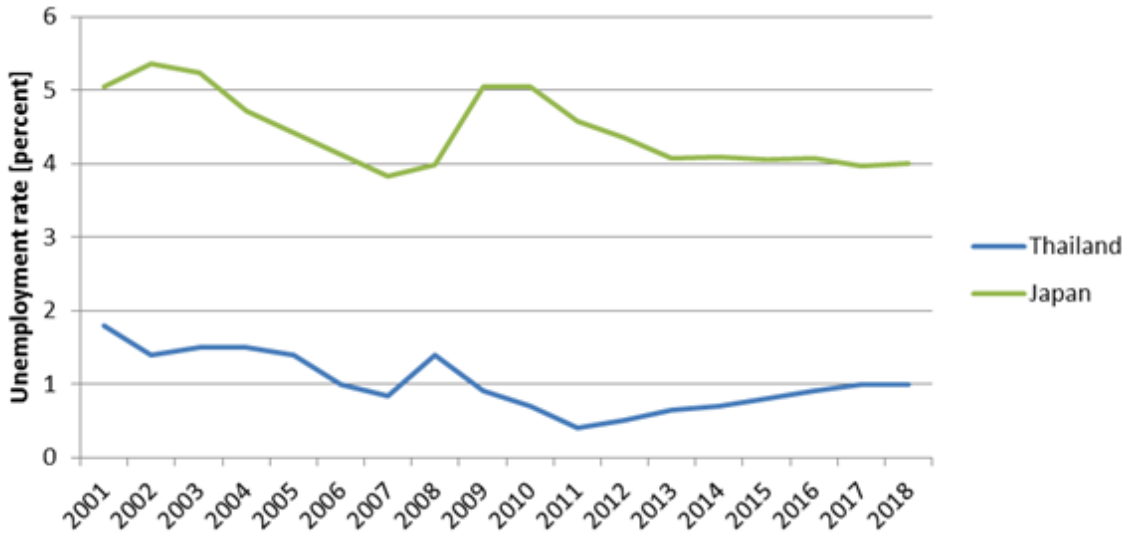
Source: International Monetary Fund, World Economic Outlook Database, April 2013

Figure 6.1.4 Population (2000-2018) (Estimation in Thailand starting from 2012; ASEAN starting from 2007; in Japan starting from 2013)



Source: ASEAN-JAPAN CENTRE website

Figure 6.1.5 Foreign Direct Investment to Thailand and ASEAN (2005-2010)



Source: International Monetary Fund, World Economic Outlook Database, April 2013

Figure 6.1.6 Unemployment rate in Thailand and Japan (2001-2018)
(Estimation in Thailand starting from 2012; in Japan starting from 2013)

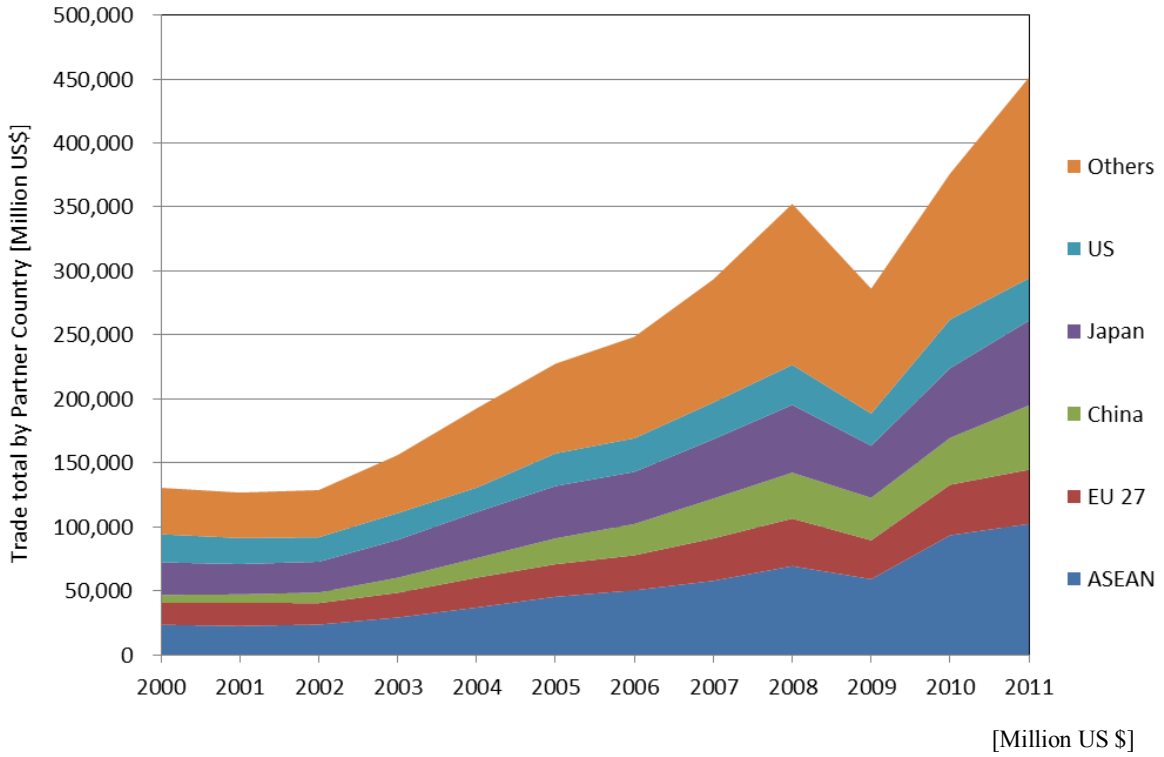
6.2 Overview of trade

(1) Amount of foreign trade/major trading partners

Trends in Thailand's foreign trade by partner countries (2000 – 2011) are illustrated in the figure below. Thailand's foreign trade has been growing steadily since 2000. Although foreign trade dropped in year 2009, after the collapse of Lehman Brothers in the fall of 2008, all regions recovered quickly from the crisis.

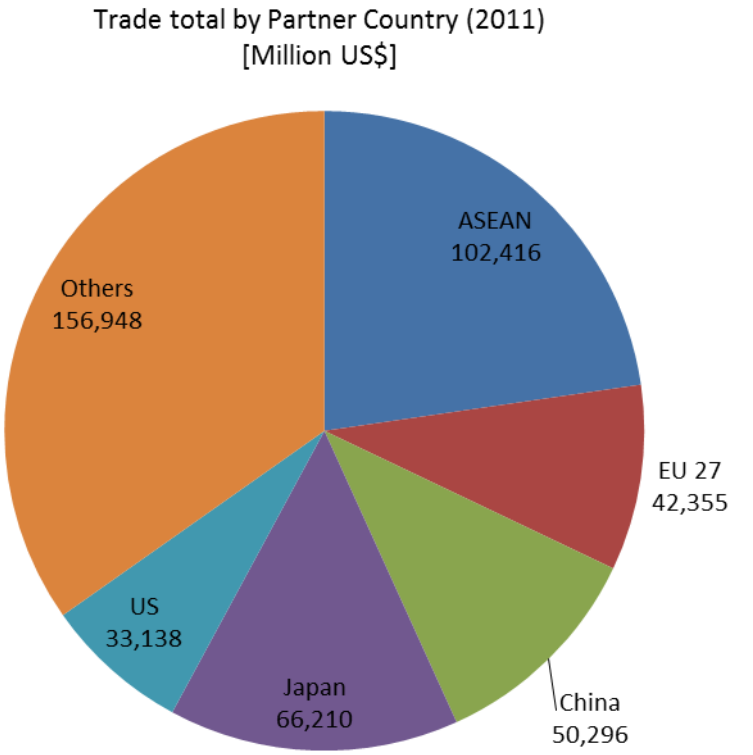
As of 2011, the largest trading partner of Thailand is other ASEAN countries, with 23% of the total trade being associated with the countries in this region. The second largest trading partner is Japan, accounting for 15% of the total trade. China comes next, with 11%, followed by the EU and the USA, with 9% and 7% shares, respectively.

Looking at the trend in recent years, it is observed that while Thailand's foreign trade is increasing with all trading partners, and the growth rates for trade with the ASEAN countries and with China are high.



Source: ASEAN Stats database (http://aseanstats.asean.org/)

Figure 6.2.1 External Trade Value by Partner - Total (2000-2011)



[Million US $]

Source: ASEAN Stats database (http://aseanstats.asean.org/)

Figure 6.2.2 External Trade Value by Partner - Total (2011)

(2) Categories of major trading commodities

Export values of Thailand by commodity (2011) are shown in the table below.

Examining the export values by major export commodities, it can be observed that the largest group of products exported from Thailand is machinery and transport equipment, which accounts for 43% of the total export value (85,715 million USD). Food comes next, accounting for 15% of the total exports (29,784 million USD).

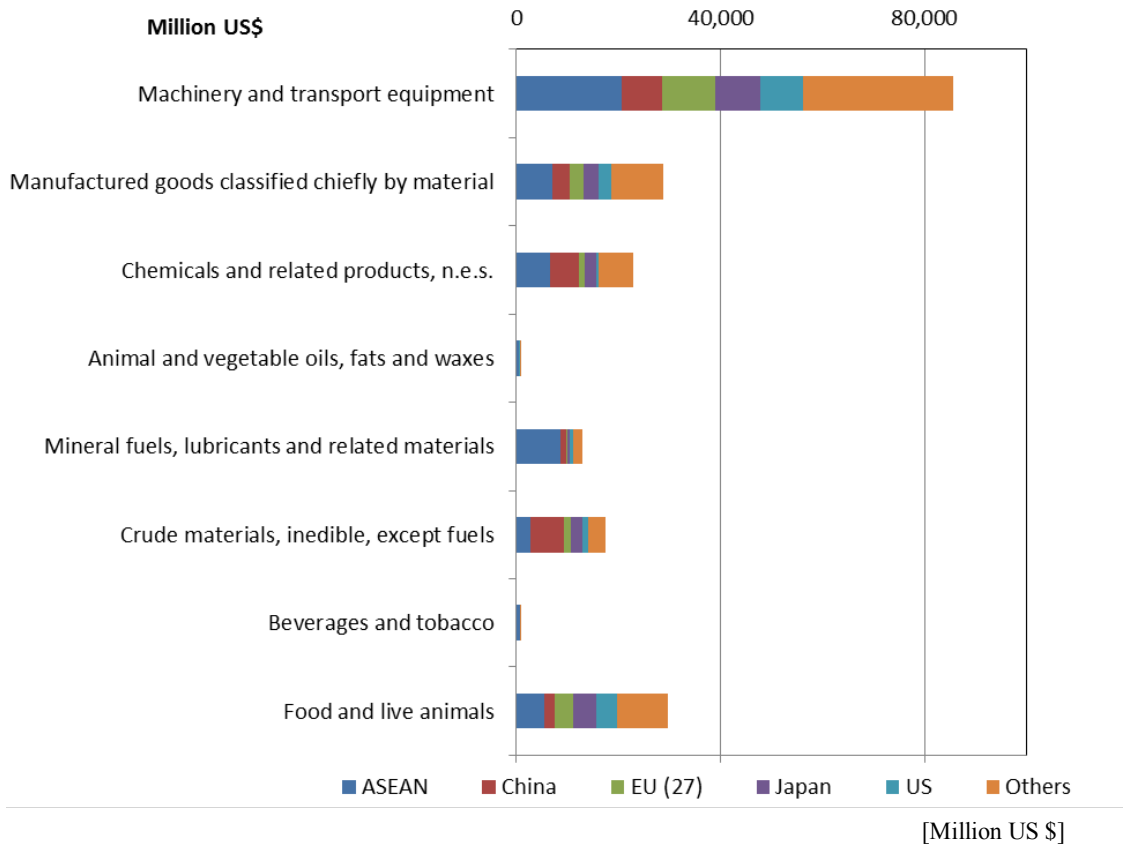
The largest export destination for machinery and transport equipment is ASEAN countries, buying 20,619 million USD. This is followed by the EU and Japan, with export values of 10,286 million USD and 8,843 million USD, respectively.

Table 6.2.1 Trade values (exports) of Thailand by commodity and partner country (2011)

[Million US $]

Category	ASEAN	China	EU (27)	Japan	US	Others	WORLD
Food and live animals	5,412	2,108	3,539	4,562	4,053	10,110	29,784
Beverages and tobacco	686	10	44	20	17	109	887
Crude materials, inedible, except fuels	2,741	6,466	1,411	2,202	1,136	3,488	17,445
Mineral fuels, lubricants and related materials	8,654	1,124	260	398	722	1,712	12,871
Animal and vegetable oils, fats and waxes	365	25	182	12	4	125	712
Chemicals and related products, n.e.s.	6,546	5,686	1,172	2,226	453	6,768	22,851
Manufactured goods classified chiefly by material	7,132	3,269	2,671	2,954	2,594	10,217	28,837
Machinery and transport equipment	20,619	8,019	10,286	8,843	8,370	29,578	85,715

Source: ASEAN Stats database (http://aseanstats.asean.org/)



Source: ASEAN Stats database (http://aseanstats.asean.org/)

Figure 6.2.3 Trade values (exports) of Thailand by commodity and partner country (2011)

Next, import values of Thailand by commodity (2011) are shown in the table below.

Examining the import values by major import commodities, it can be observed that the largest group of products imported by Thailand is machinery and transport equipment, same as in the case of export, which accounts for 37% of the total import value (74,584 million USD). Mineral fuels comes next, accounting for 22% of the total imports (43,496 million USD).

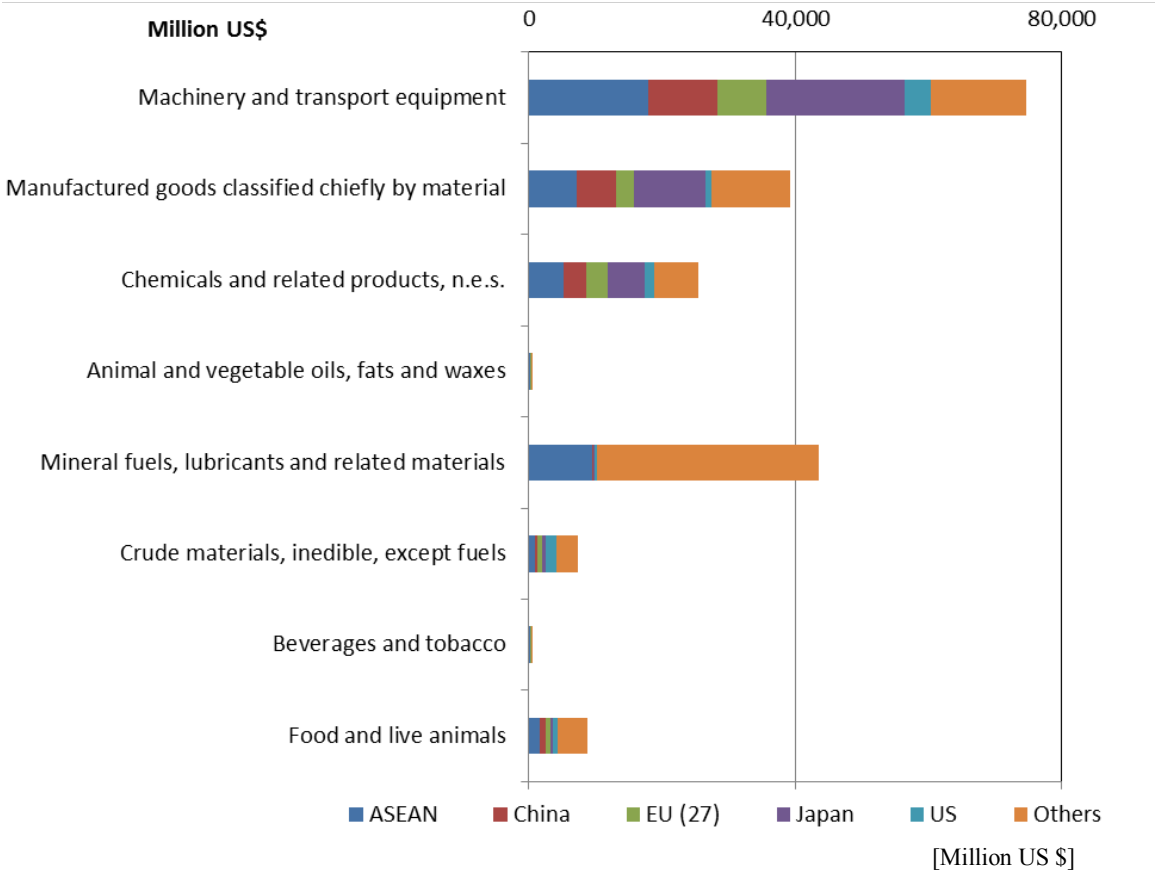
The largest exporter of machinery and transport equipment to Thailand is Japan, exporting a total of 20,723 million USD. This is followed by ASEAN and China, with the import values of 17,860 million USD and 10,354 million USD, respectively.

Table 6.2.2 Trade values (imports) of Thailand by commodity and partner country (2011)

[Million US $]

Category	ASEAN	China	EU (27)	Japan	US	Others	WORLD
Food and live animals	1,553	932	809	264	732	4,482	8,772
Beverages and tobacco	246	9	131	3	19	37	446
Crude materials, inedible, except fuels	955	391	589	611	1,564	3,273	7,384
Mineral fuels, lubricants and related materials	9,461	162	131	178	369	33,195	43,496
Animal and vegetable oils, fats and waxes	256	14	30	3.62078	3	62	369
Chemicals and related products, n.e.s.	5,197	3,378	3,250	5,468	1,558	6,571	25,422
Manufactured goods classified chiefly by material	7,236	5,830	2,699	10,814	827	11,762	39,168
Machinery and transport equipment	17,860	10,354	7,408	20,723	3,978	14,260	74,584

Source: ASEAN Stats database (http://aseanstats.asean.org/)



Source: ASEAN Stats database (http://aseanstats.asean.org/)

Figure 6.2.4 Trade values (imports) of Thailand by commodity and partner country (2011)

Chapter 7 Physical Distribution Network

The themes of this survey are divided into three categories as follows: 1) Understanding of Supply Chain Circumstances in ASEAN Countries, 2) Understanding of Circumstances on Physical Distribution Network, and 3) Organizing the framework of vulnerability analysis for natural disasters on the ASEAN Logistics Network.

7.1 Understanding of Supply Chain Circumstances in Thailand

(1) Relation to Logistics Performance Index on International Physical Distribution

Table 7.1.1 International LPI (Logistics Performance Index) *[1] Ranking 2012

Rank	Country	LPI	Customs	Infrastructure	International Shipment	Logistics Competence	Tracing & Tracking	Timeliness
35	**Thailand**	**3.29**	**3.02**	**3.16**	**3.27**	**3.16**	**3.41**	**3.73**

Source: World Bank Connecting to Compete 2012 Trade Logistics in the Global Economy

(2) Features of Physical Distribution in Relation to Main Industries in Industrial Parks

The lists of ASEAN-JAPAN CENTER (AJC) web-site*[2] have no specific time of investigation by year/month, but it is considered that the general current status of industry agglomeration at the time of the investigation can be obtained.

The industries in industrial parks are classified into the following 13 categories:

1) Fishery/Foodstuff, 2) Textile/Apparel, 3) Pulp/Paper, 4) Chemicals, Oil, Rubber/Ceramic, 5) Steel/Nonferrous metal, 6) Transport machines (Cars), 7) Electrical/Electronics/Precision apparatus, 8) Other industries, 9) Commerce (wholesale, retail), 10) Real estate, 11) Logistics/Warehouse, 12) Finance/Insurance/Other services, and 13) Information/Telecommunication.

The objective industrial parks are selected based on the criterion such as: 1) Degree of geographic accumulation, 2) Having sufficient operational experiences, 3) The size and number of Japanese companies, 4) Located in the pilot area in case of Vietnam, the Philippines and Indonesia.

Based on the industrial classifications above, the characteristics of distributions of the products from industrial parks are estimated.

According to the AJC list, Industrial parks where Japanese affiliated companies operate are enumerated in the order of the numbers: That is, there are 209 in Chon Buri, 116 in Samut Prakan, 109 in Rayong, 103 in Ayuttahya, and 85 in Phathumthani prefectures and 62 in Bangkok megalopolis.

Of the above industrial parks, the four (4) parks of Bang Poo Industrial Estate, Rojana Industrial Park, Amata Nakorn Industrial Estate and Eastern Seaboard Industrial Estate (Rayong) are selected to understand the characteristics of distributions.

Agglomeration of diversified industries in the industrial parks in Thailand can be said to be outstanding, in particular, to be so is in Rojana in Ayutthaya.

Car assembly plants have been operated in Rojana and Amata, and in addition to Japanese makers affiliated, General Motors and Ford Motors have assembly plants as well.

After the devastated flood disaster in 2011, Honda have constructed car plant in Rojana Pranchinburi Industrial Park on the South Economic Corridor north-east from Bangkok, so that they may start car assembly in 2015.

As far as car manufacturing in Thailand is concerned, the numbers reaches 2.4 million productions of cars in 2012, and accordingly are ranked as top ten in the world.

The car export also increased to number of more than 1 million with accompanying exports of services parts, and thus car industry can be said to contribute to develop physical distribution in Thailand into logistics management level.

As to industries such as machinery, chemicals, electrical/ precision devices other than car manufacturing, a lot of final products companies have been operating, therefore, it is considered that many parts makers are to form vertical supply chain within each industrial parks.

In order to transport final and intermediate products, logistics companies also locate in the above parks, which bear integrated function of in-park, domestic, intra and extra-ASEAN logistics. It is inferred that some of the above companies have already worked to be a role of 3PL (Third Party Logistics), which proposes an optimum solution about shippers' logistics and trustees comprehensively.

Top three share of the major export/import items of Thailand are as follows (Ministry of Foreign Affairs of Japan, country and regional situation, Thailand, Economy)[*3]:

- Export: Computer parts, Vehicle parts, Natural rubber
- Import: Crude oil, Industrial machine/parts, Electric machine /parts

It is considered that Thailand is one of top leading position in ASEAN members with respect to logistics industry as well as Singapore and Malaysia from the high agglomeration of industries.

(3) Supply Chain Circumstances

Physical distribution is evolving by the stages of Physical Distribution Development Phasing (PDDP) as follows:

1) Physical distribution control: Company's own sphere of materials/ products distribution (PDC).
2) Logistics management: Company's own distribution management by the market-in strategy (LGM).
3) Supply chain management: Integrated distribution management from company's own to systemized one by the collaboration with other logistics operator resources (SCM)

Other criteria can be considered applicable, so that the development phase may be justified, based on industrial categories and their products' varieties and volumes in the selected industrial parks/ SEZ.

1) Kinds and diversity of products (intermediate or final products).
2) Whether production of high valued goods like cars, electrical/ electronic/ precision devices or not,

and the levels.

3) Correspondence of export/import major items of goods to, classification of intermediate/ final products
4) Existence of a regional head office of a company which power is vested from the headquarter, and the power strength in management term.
5) Existence of logistics operator as a 3PL and maturity of the business
6) Inter dependency of industrial parks/ SEZ with megalopolises in the vicinity.

The result of assessment is shown in the table below which is made by LPI of the World Bank and by supply chain circumstances determined by above mentioned industries in the industrial park as well as major export/import items in the light of the above three stages of PDDP. The evaluation is shown by relative evaluation of five levels among ASEAN countries. Since there are no distinction time and contents wise in PDDP, the level of development is indicated as a continuous line in the table below.

Table 7.1.2 Physical Distribution Development Phasing

LPI	Country	PDDP								
					Criteria					
		PDC	LGM	SCM	Products diversified	High valued goods	Export/ Import	Regional head office	Logistics operator	Products diversified
3.29	**Thailand**				**4**	**4**	**4**	**4**	**4**	**3**

Source: JICA Study Team

7.2 Current Status and Trends of Thailand Logistics Network

(1) Domestic Physical Distribution Network

Thailand directly shares border with Cambodia, Lao, Malaysia and Myanmar and indirectly with Vietnam through Cambodia and Laos.

From this geographical characteristic, Thailand is increasing its presence by functioning as the logistics hub in East-West, South and North-South Economic Corridors as the leading country in Mekong economic zone

The logistics network in Thailand is formed by the trunk road running through the industrial parks along the Chao Phraya River, industrial parks near Bangkok Port, Bangkok City and Laem Chabang port.

Thailand has become the world's leading production base of automotive industry and electrical and electronics industry. Especially in automotive industry, more than 2,000 Japanese companies including secondary and tertiary parts makers are located out of about 4,000 Japanese companies in total operating in Thailand.

Reflecting the status above, Thailand is strengthening its position as the center of international supply chain of international horizontal specialization amongst neighboring countries, Japan and countries outside ASEAN.

(2) Intra-ASEAN Physical Distribution Network

According to ASEAN Strategic Transport Plan 2011-2015, intra-ASEAN trade of Thailand is reported to be as high as about 56% of the total trade amount. Of that share, main intra-ASEAN trade partner is well distributed as in the order of Singapore of 38%, Malaysia of 26%, Indonesia of 14%, Myanmar of 10%, Philippines of 6%, and Vietnam of 4% in order. The reason for small trade amount among neighboring ASEAN countries except for Myanmar is assumed that the supply chain is sufficiently completed within Thailand.

(3) Extra-ASEAN Physical Distribution Network

Main trade partner countries of Thailand are China, Japan, and USA.

From the above macro-data, the distribution network outside the ASEAN region seems to form the regular services trunk routes with major ports and industrial parks of above mentioned countries/regions.

7.3 Analysis Frame on Physical Distribution Network

This section studies frame for assessment of the vulnerability of logistics network against natural disasters in consideration of the actual situation of supply chain, as a preparedness of formulation of area BCP.

The vulnerability itself is to be assessed after the further survey.

Table 7.3.1 Natural Disaster Prevention Related Matters in relation to vulnerability of Physical Distribution Facilities

Industrial Park Name	Not designated yet
Features	Place: Operation commenced in: Nos of Operating Enterprises : Total IPK Annual Turn-over (Mill.US$):
Vulnerability Assessment Frame for Each Industrial Park (IPK)	
Natural Disaster Risk(NDR): Extract from Survey Report 1 "Chapter 5 Existing Investigations and Studies"	
■ Flooding	Flood hazard possibility is high in Chao Phraya River flowing through the capital city Bangkok. Flooding is likely to occur at the periphery of Tapi River in the southern Tapie. 2011 Flood is anew reminded of that severe damage to economy.
■ Seismic intensity / Tsunami	Earthquake hazard level in Thailand is low in general.
■ Volcano	Volcano hazard level of Thailand is low.
■ Cyclone, Meteorological Disaster, Landslide	The impact of cyclone hazard on whole the country is not so high. A typhoon, occurring and landing on Central Vietnam, can create damage even in Thailand. High landslides hazard possibility area distributes in the border area with Lao PDR.
Brief Descriptions on Counter-measures (CMS) for NDR For concrete measures for disaster prevention and mitigation, separate survey will be required.	
1) Private sector facilities: To follow further Survey	
Land, In-park Roads: In Rojana Industrial Park/ Ayutthaya, 1,4m high, 77km long periphery waterproof wall has been constructed after the flood in 2011.	
Plant facilities:	
Physical Distribution Facilities:	
Others, if any:	
2) Infrastructures	

Road: Thailand has solidified its position as an integrated cluster of the automotive industry. In order to support the supply chain of auto parts, the development of the road requires to expand Asian road to four lanes and to construct bypass road for the major highway.
Railway: There are 19 railway extension plans including section between Map Ta Phut and Rayong as of 2010.
Port: It is important to promote expansion plan of Laem Chabang port, which is planned to increase 70% of cargo handling capacity by adding 6 berths. Since Laem Chabang port is outstanding in terms of national cargo traffics, it is suggested that development of alternative port including Dawei port in Myanmar is a matter of investigation as one of disaster prevention measures.
Airport: Electric power/Fuel: Water-supply: Sewage: Solid waste: Telecommunication: There is no common description on facilities identified at this stage. Below is an example in Rojana IP/Ayutthaya.
Electric power/Fuel: Having two series of equipment: Provincial Electricity Authority (PEA) and in-house power generation
Water-supply: Measures are taken by the enhancement of the public water supply and own self facilities
Sewage: Sewage treatment is conducted in accordance with the effluent standards of the public and of their own.
Solid waste: Equipped with waste management facilities for general and industrial waste.
Telecommunication: Installed automatic switching equipment which corresponds to demands of international telephone, ISDN, Internet.

Note:

*1 The summary of "Logistics Performance Index" by the World Bank is as follows.

(1) LPI score and category wise score is indicated by each country

(2) Score is ranked from one to five

(3) LPI of international logistics is scored based on the interviewing following six items to major importers and logistics companies in the neighboring countries (total of over 1000 companies).

1) Efficiency of the clearance process i.e. Speed, simplicity and predictability of formalities by border control agencies, including Customs
2) Quality of trade and transport related infrastructure e.g. Ports, railroads, roads, information technology
3) Ease of arranging competitively priced shipments
4) Competence and quality of logistics services e.g. transport operators, customs brokers
5) Ability to track and trace consignments)
6) Timeliness of shipments in reaching destination within the scheduled or expected delivery time.

*2 http://www.asean.or.jp/ja/invest/about/country_info/brunei/invest_info/industrialestate/

*3 http://www.mofa.go.jp/mofaj/area/brunei/data.html#04

References :

1) ASEAN-JAPAN CENTER, Lists of Industrial Parks/Estate/SEZ by Member Country (in Japanese)
2) World Bank Connecting to Compete 2012 Trade Logistics in the Global Economy
3) Shinya Nakata (2012), Introduction to Logistics, NIKKEI Newspapers in Japan (in Japanese)
4) JETRO (2008), ASEAN Physical Distribution Network 2008 (in Japanese)
5) ERIA: ASEAN Strategic Transport Plan 2011-2015.
6) ASEAN Secretariat, ASEAN Statistics on Intra and Extra_ ASEAN trade 2011

Chapter 8 Legislative Systems

A survey on the legislative systems concerned with disaster management, business continuity, environmental pollution, and development in Thailand is conducted in this chapter.

The survey of Thailand is mostly based on research through the websites of Thai ministries and agencies and also several leading international institutes that contributed to disaster research such as the Asia Disaster Reduction Center. Information from the websites of standardization agencies in Thailand is also used. Laws, regulations, national implementation plans, and statutes are referred to within the scope of the survey.

The table below shows the methodology for collecting information.

Information Collected	Methodology	Scope of Survey
Legislative Systems for Disaster Management	To collect information from the internet, which is published by international agencies such as ADRC and disaster management institutes in Thailand. And to refer to the report by the JICA research team.	Law on disaster management, strategies and plans for disaster risk mitigation, and national action plans.
Regulations and Standards for BCM / BCP	To collect information from the websites of financial authorities regulating BCM/BCP and standardization agencies in Thailand.	Standards and regulations related to BCM. Policies and guidelines indicating the development of BCP.
Legislative Systems for Environment and Pollution	To collect information from the website of ministries and agencies responsible for environmental management.	Laws and regulations on environmental management and pollution control for the industrial activities
Legislative Systems for Development including Land use, River and Building Regulations	To collect information from the websites of ministries and agencies related to land use, rivers, or development.	Laws and regulations describing land use, rivers, and building controls or standards.

The laws, regulations, decrees, and guidelines regulating the target fields defined above are compiled in this survey. The results of the survey in Thailand are summarized below.

Scoop	Information
Legislative Systems for Disaster Management in Thailand	[Strategies and Plans] "Disaster Prevention and Mitigation Act, 2007" [Regulations, Standard and Guidelines] "National Civil Defense Plan 2005", "Strategic National Action Plan for Disaster Risk Reduction 2010-2019", "National Disaster Prevention and Mitigation Plan 2010-2014", "Flood, storm and landslide prevention master plan for natural disaster prevention and relief of affected people".
Regulations and Standards for BCM / BCP in Thailand	"TIS 22301-2553, Business Continuity Management Systems", "118/2550 - Policy on BCM and BCP for Financial Institutions".
Legislative Systems for Environment and Pollution in Thailand	[Laws for Environment] "Enhancement and Conservation of National Environmental Quality Act B.E.2535, 1992". [Laws and Regulations for Environmental Pollution Control] "Notification the Ministry of Science, Technology and Environment, No. 3, B.E.2539", "Factory Act B.E.2535", "Hazardous Substance Act B.E.2535", "Public Health Act B.E.2535", "Public Cleansing Act B.E. 2535", "Water Quality Standards, 2009", "Air Quality and Noise Standards, 2007", "Soil Quality Standards, 2004", "Pollution Prevention and Mitigation Policy in accordance with

	the Policy and Perspective Plan for Enhancement and Conservation of the National Environmental Quality 1997-2016".
Legislative Systems for Development including Land Use, Rivers, and Building Regulations in Thailand	"Land Readjustment Act B.E.2547", "National Reserve Forest Act, 1964", "O Groundwater Act B.E. 2520", "Building Control Act, 1979".

The available results on the survey about the laws and regulations for disaster management, BCP/BCM, environmental conservation, and provisions for development in Thailand are summarized below.

8.1 Legislative systems for disaster management

(1) Disaster management laws

Table 8.1.1 Laws and Regulations of Disaster Management in Thailand

	Laws / Regulations	Supervisory Authority	Subject
Law	Disaster Prevention and Mitigation Act, 2007	NDPMC	Disaster Management

The Disaster Prevention and Mitigation Act was issued in 2007.

The flood disaster in 2011 provided an opportunity to review the policy. More solid prevention and mitigation measures are being considered.

(2) Disaster management strategies and plans

Table 8.1.2 Strategies and Plan for Disaster Management in Thailand

	Laws / Regulations	Supervisory Authority	Subject
Plan	National Civil Defense Plan 2005	DDPM	General Disasters
Plan	Strategic National Action Plan for Disaster Risk Reduction 2010-2019 (SNAP)	DDPM	General Disasters
Plan	National Disaster Prevention and Mitigation Plan 2010-2014 (NDPMP)	DDPM	General Disasters
Plan	Flood, storm, and landslide prevention master plan for natural disaster prevention and relief of affected people (2008-2012)	DDPM	Flood, Storm, Landslide

In 2010, the National Disaster Prevention and Mitigation Plan 2010-2014 (NDPMP) was established. The framework of the NDPMP is largely composed of i) management principle, ii) countermeasure procedure, and iii) security threat management & countermeasure procedure. It designates, as disaster countermeasure procedures, 14 disaster cases and the standing order for each of them. In addition, based on the NDPMP, it is expected that local DPMPs will also be prepared.

In light of the flood disaster event in 2011, a contingency plan is also planned for preparation in April 2012.

Moreover, the "Flood, storm and landslide prevention master plan for natural disaster prevention and relief of affected people (2008-2012)" was approved by the Cabinet.

8.2 Regulations and standards for business continuity management

Table 8.2.1 Regulations, Standards or Guidelines for BCM/BCP in Thailand

	Laws / Regulations	Supervisory Authority	Subject
Standard	TIS 22301-2553, Business Continuity Management Systems	Thai Industrial Standards Institute (TISI)	BCM
Guideline	118/2550 - Policy on BCM and BCP for Financial Institutions	Bank of Thailand	BCM

The Policy on BCM and BCP for Financial Institutions was developed for financial institutes in order to help them to enhance their preparedness for BCM and to establish a BCP. This policy statement briefly addresses directions and requirements for BCM / BCP, and procedures for a preparation of a BCP in banks are indicated. This includes, for example, the necessity of the identification of impacts from disruption of critical business functions and setting recovery time objectives in order to prepare the BCP.

Although in this statement, it is noted that the Contingency Plan for Information Technology policy statement was issued by Bank of Thailand in 2005, published information or documents has not been found. No documents of "TIS 22301-2553, Business Continuity Management Systems" have been verified.

8.3 Legislative systems for the environment and pollution control

(1) Environmental laws and regulations

Table 8.3.1 Laws and Regulations regarding the Environment in Thailand

	Laws / Regulations	Supervisory Authority	Matter
Law	Enhancement and Conservation of National Environmental Quality Act B.E.2535, 1992	The Minister of Science, Technology and Environment	Environment Management

The Enhancement and Conservation of National Environmental Quality Act B.E.2535 was established as an integrated law for environmental conservation in Thailand. The act describes the policy of public participation for the enhancement and conservation of environmental qualities, and also defines roles of agencies rerated to environmental pollution control.

(2) Pollution control laws and regulations

Table 8.3.2 Laws and Regulations for Environmental Pollution Control in Thailand

	Laws / Regulations	Supervisory Authority	Subject
Decree	Notification the Ministry of Science, Technology and Environment, No. 3, B.E.2539, 1996	Ministry of Science, Technology and Environment, Pollution Control Department	Industrial Effluent
Law	Factory Act B.E.2535	Ministry of Industry	Factory
Law	Hazardous Substance Act B.E.2535	Ministry of Industry, Department of Industrial Works	Industrial Waste
Law	Public Health Act B.E.2535, 1992	Ministry of Public Health	Environmental

			Pollution
Law	Public Cleansing Act B.E.2535, 1992	under survey	Environmental Pollution
Standard	Water Quality Standards, 2009	Pollution Control Department (PCD), Ministry of Natural Resources and Environment	Water Pollution
Standard	Air Quality and Noise Standards, 2007	PCD, Ministry of Natural Resources and Environment	Air Pollution
Standard	Soil Quality Standards, 2004	PCD, Ministry of Natural Resources and Environment	Soil Pollution
Plan	Pollution Prevention and Mitigation Policy in accordance with the Policy and Perspective Plan for Enhancement and Conservation of the National Environmental Quality 1997-2016 (1992)	PCD, Ministry of Natural Resources and Environment	Environmental Management

The regulations for control criteria of effluent from factories and industrial complexes are stipulated in the Notification the Ministry of Science, Technology and Environment, No. 3, B.E.2539, 1996. In addition, the Factory Act and the Hazardous Substance Act were developed in order to prescribe rules regarding industrial pollution.

Criteria for controlling pollution that threatens human health are described in the Public Health Act B.E2535, and the implementation of public cleaning by the Pollution Control Department (PCD) is stipulated in the Public Cleansing Act B.E.2535.

There are several standards regulating the conservation of water, air, and soil quality, in which the standard values of contamination and methods for analysis are prescribed.

8.4 Legislative systems for development including land use, rivers, and building codes

Table 8.4.1 Laws and Regulations for Land, River and Building Code in Thailand

	Laws / Regulations	Supervisory Authority	Matter
Law	Land Readjustment Act B.E.2547	under survey	Land Use
Law	National Reserve Forest Act, 1964	under survey	Forestry
Law	Groundwater Act B.E. 2520, 1977	under survey	Water Resources
Law	Building Control Act, 1979	under survey	Building Standards

In Thailand, regulations related to land use and development are established as the Land Readjustment Act B.E.2547 and the National Reserve Forest Act, 1964.

No information or published documents about the Building Control Act have been verified.

Chapter 9 Implementation of BCP

Guideline for the development of BCP among the financial institutes such as banking companies is established by the financial authorities in Thailand. However, any regulations or guidelines for BCM/BCP in industrial companies have not been developed.

Information about the actual condition of development of BCP and effort to disperse the BCP among companies are not sufficiently disclosed in the internet. The on-site surveys and interviews of institutions concerned are required.

List of Agglomerated Areas

ID	Short List	LongList	COUNTRY	PROVINCE	PARK NAME	ADDRESS
TH0001			Thailand	Bangkok	Bangchan Industrial Estate	Khwaeng Si Phraya, Khet Bang Rak, Krungthep Mahanakorn 10500
TH0002			Thailand	Bangkok	Banthongkasem Industrial Estate	Khwaeng Si Phraya, Khet Bang Rak, Krungthep Mahanakorn 10500
TH0003			Thailand	Bangkok	Gemopolis Industrial Estate	Khwaeng Si Phraya, Khet Bang Rak, Krungthep Mahanakorn 10500
TH0004			Thailand	Bangkok	Jongsatit Industrial Park	Khwaeng Si Phraya, Khet Bang Rak, Krungthep Mahanakorn 10500
TH0005			Thailand	Bangkok	Kantana Movie Town (2002) Co., Ltd.	Khwaeng Si Phraya, Khet Bang Rak, Krungthep Mahanakorn 10500
TH0006			Thailand	Bangkok	Lardkrabang Industrial Estate	Khwaeng Si Phraya, Khet Bang Rak, Krungthep Mahanakorn 10500
TH0007			Thailand	Bangkok	Thapaya International Industrial City	Khwaeng Si Phraya, Khet Bang Rak, Krungthep Mahanakorn 10500
TH0008		**XXTH02**	Thailand	Chachoengsao	304 Industrial Park 2 2, 3, 6	Phanom Surakham District,Chachoengsao
TH0009			Thailand	Chachoengsao	Alpha Technopoolis Bonded Warehouse	Niyomthai Tambon Na Muang, Chang Wat Chachoengsao 24000
TH0010		**XXTH09**	Thailand	Chachoengsao	Gateway City Idustrial Estate	Gateway City Soi5 Rd. Hua Samrong,Plaeng Yao,Chachoengsao
TH0011		**XXTH25**	Thailand	Chachoengsao	Wellgrow Industrial Estate	Bang Pakog District, Chachoengsao
TH0012	**XXTH03**	**XXTH03**	Thailand	Chonburi	Amata Nakorn Industrial Estate	Ban Kao 6, Tambon Ban Kao, Chang Wat Chon Buri 20160
TH0013		**XXTH07**	Thailand	Chonburi	Chon Buri Industrial Estate(Bo Win)	331, Tambon Bo Win, Chang Wat Chon Buri 20230
TH0014			Thailand	Chonburi	Eastern Industrial Estate (Map Ta Phut) (Hemaraj EIE)	Tambon Bang Pla Soi, Chang Wat Chon Buri 20000,
TH0015	**XXTH10**	**XXTH10**	Thailand	Chonburi	Hemaraj Chonburi Ineustrial Estate (Hemaraj CIE)	3311 8-9 Moo6 High Way 331,Km.91-92,Bo-Win-Sub District,Muang Distrct,Chonburi
TH0016			Thailand	Chonburi	Leamchabang Industrial Estate	Tambon Bang Pla Soi, Chang Wat Chon Buri 20000,
TH0017			Thailand	Chonburi	Nong Bon Garden Industrial Zone	Tambon Bang Pla Soi, Chang Wat Chon Buri 20000,
TH0018		**XXTH17**	Thailand	Chonburi	Pinthong Industrial Estate 1	Si Racha District , Chon Buri
TH0019		**XXTH18**	Thailand	Chonburi	Pinthong Industrial Estate 2	Si Racha District , Chon Buri
TH0020		**XXTH19**	Thailand	Chonburi	Pinthong Industrial Estate 3	Si Racha District , Chon Buri
TH0021			Thailand	Chonburi	Saha-Group Industrial Park Sriracha	Tambon Bang Pla Soi, Chang Wat Chon Buri 20000,
TH0022		**XXTH04**	Thailand	Chonburi	Amata City Industrial Estate	700 Moo 1, Klong Tamru, Muang,Chombri 20000
TH0023			Thailand	Chonburi	Panthong Kasem Industrial Estate	Tambon Bang Pla Soi, Chang Wat Chon Buri 20000,
TH0024			Thailand	Chonburi	TFD Industrial Estate	Tambon Bang Pla Soi, Chang Wat Chon Buri 20000,
TH0025			Thailand	Kanchanaburi	Ratchaburi Industrial Estate	Tambon Ban Tai, Chang Wat Kanchanaburi 71000
TH0026			Thailand	Khon Kaen	Khon Kaen Small Industrial Estate 5	Khon Kaen, Thailand
TH0027			Thailand	Lamphun	Northem Region Industrial Estate	Rop Mueang Nai Tambon Nai Mueang, Chang Wat Lamphun 51000
TH0028			Thailand	Lamphun	Saha Group Industrial Park	Rop Mueang Nai Tambon Nai Mueang, Chang Wat Lamphun 51000
TH0029			Thailand	Nakhon Ratchasima	Nava Nakorn Industrial Zone Nakhon Ratchasima	224 Tambon Nai Mueang, Thesaban Nakhon Nakhon Ratchasima, Chang Wat Nakhon Ratchasima 30000
TH0030		**XXTH23**	Thailand	Nakhon Ratchasima	Suranaree Industrial Zone	Suranaree Tambon Nai Mueang, Thesaban Nakhon Nakhon Ratchasima, Chang Wat Nakhon Ratchasima 30000
TH0031			Thailand	Nakhon Sawan	Network Industrial Estate	Phaholyothin Rd Tambon Pak Nam Pho, Thesaban Nakhon Nakhon Sawan, Chang Wat Nakhon Sawan 60000

ID	Short List	LongList	COUNTRY	PROVINCE	PARK NAME	ADDRESS
TH0032			Thailand	Pathum Thani	Bankadi Industrial park	3111 Tambon Bang Prok, Chang Wat Pathum Thani 12000
TH0033			Thailand	Pathum Thani	Nava Nakorn	Thanon Navanakorn 5 Tambon Khlong Nung, Chang Wat Pathum Thani 12120
TH0034			Thailand	Pathum Thani	Thailand Science Park	3111 Tambon Bang Prok, Chang Wat Pathum Thani 12000
TH0035			Thailand	Pattani	Halal Food Industrial Estate	42 Tambon Chabangtiko, Chang Wat Pattani 94000
TH0036			Thailand	Phetchaburi	Khoa Yoi Industrial Park 1999-2000	Tambon Khlong Kra Saeng, Chang Wat Phetchaburi 76000
TH0037			Thailand	Phichit	Northem Region Industrial Estate	Phra Phichit 3 Tambon Nai Mueang, Chang Wat Phichit 66000
TH0038			Thailand	Phra Nakhon Si Ayutthaya	Bangpa-in Industrial Estate	Chikun Tambon Pratuchai, Thesaban Nakhon Phra Nakhon Si Ayutthaya, Chang Wat Phra Nakhon Si Ayutthaya 13000
TH0039			Thailand	Phra Nakhon Si Ayutthaya	Chutikam Factory House Industrial Estate	Chikun Tambon Pratuchai, Thesaban Nakhon Phra Nakhon Si Ayutthaya, Chang Wat Phra Nakhon Si Ayutthaya 13000
TH0040			Thailand	Phra Nakhon Si Ayutthaya	Factoryland Wang Noi 6	Khrongkan Tambon Wang Chula Rd Tambon Khao Ngam, Chang Wat Phra Nakhon Si Ayutthaya 13170
TH0041			Thailand	Phra Nakhon Si Ayutthaya	Hi-Tech Industrial Estate	Chikun Tambon Pratuchai, Thesaban Nakhon Phra Nakhon Si Ayutthaya, Chang Wat Phra Nakhon Si Ayutthaya 13000
TH0042	**XXTH20**	**XXTH20**	Thailand	Phra Nakhon Si Ayutthaya	Rojana Industrial Park(Ayutthaya)	Ban Khai Distrit , Rayong
TH0043			Thailand	Phra Nakhon Si Ayutthaya	Saha Rattana Nakorn	Chikun Tambon Pratuchai, Thesaban Nakhon Phra Nakhon Si Ayutthaya, Chang Wat Phra Nakhon Si Ayutthaya 13000
TH0044		**XXTH01**	Thailand	Prachinburi	304 Industrial Park	Si Maha Phot District, Prachin Buri
TH0045		**XXTH06**	Thailand	Prachinburi	Bor-Thong Industrial Zone	Near Bor Thong, Prachin Buri
TH0046		**XXTH13**	Thailand	Prachinburi	Kabinburi Industrial Zone	Near Kabin Bri rict District Prachin Buri (Near Kantary Hotel)
TH0047		**XXTH21**	Thailand	Prachinburi	Saha Group Kabinburi Industrial Park	Kabin Bri rict District Prachin Buri (Near Kantary Hotel)
TH0048			Thailand	Prachuap Khiri Khan	SV Western Seaboard	Sala Cheep Tambon Prachuap Khiri Khan, Chang Wat Prachuap Khiri Khan 77000
TH0049			Thailand	Prachuap Khiri Khan	Bangsaphan Steel Industrial Estate	Sala Cheep Tambon Prachuap Khiri Khan, Chang Wat Prachuap Khiri Khan 77000
TH0050			Thailand	Ratchaburi	Ratchaburi Industrial Estate	Amphoe Tambon Na Muang, Chang Wat Ratchaburi 70000
TH0051			Thailand	Ratchaburi	V.R.M. Ratchaburi Industrial Estate	Amphoe Tambon Na Muang, Chang Wat Ratchaburi 70000
TH0052		**XXTH05**	Thailand	Rayong	Amata City Rayong	Phon Prapha Tambon Mapyangphon, Chang Wat Rayong 21140
TH0053			Thailand	Rayong	Asia Industrial Estate	W 7 Rd Tambon Ban Chang, Chang Wat Rayong 21130
TH0054			Thailand	Rayong	C.P.Industrial Estate(Rayong)	Rural Road Chon Buri 5068 Tambon Khao Khan Song, Chang Wat Chon Buri 20110
TH0055			Thailand	Rayong	Eastern Industrial Estate Pic. (Map Ta Phut)	Thanon Sukhum Vit Tambon Noen Phra, Thesaban Nakhon Rayong, Chang Wat Rayong 21000
TH0056			Thailand	Rayong	Eastern Seaboard Industrial Estate(Rayong)	Rural Road Chon Buri 5068 Tambon Khao Khan Song, Chang Wat Chon Buri 20110
TH0057			Thailand	Rayong	G.K.Land Industrial Park	Thanon Sukhum Vit Tambon Noen Phra, Thesaban Nakhon Rayong, Chang Wat Rayong 21000
TH0058		**XXTH11**	Thailand	Rayong	Hemaraj Eastern Seaboard Industrial Estate	Moo4 Highway 331 K.M. 91.5 Pluak Deang Sub-District ,Pluak Deang District,Rayong
TH0059		**XXTH12**	Thailand	Rayong	Hemaraj Rayong Industrial land	222 Moo 11 Ban Khai-Nong La Lok,Ban Khai District , Rayong
TH0060		**XXTH16**	Thailand	Rayong	Map Ta Phut Industrial Estate	I-ha Rd Tambon Map Ta Phut, Chang Wat Rayong 21150
TH0061			Thailand	Rayong	Padaeng Industrial Estate	Thanon Sukhum Vit Tambon Noen Phra, Thesaban Nakhon Rayong, Chang Wat Rayong 21000

ID	Short List	LongList	COUNTRY	PROVINCE	PARK NAME	ADDRESS
TH0062			Thailand	Rayong	Rayong Industrial Land	Tambon Tha Pradu, Thesaban Nakhon Rayong, Chang Wat Rayong 21000
TH0063			Thailand	Rayong	Rojana Industrial Park(Rayong)	3138 Tambon Nong Bua, Chang Wat Rayong 21120 -> Pluak Daeng District, Rayong
TH0064		**XXTH22**	Thailand	Rayong	Siam Eastern Industrial Park	Thanon Sukhum Vit Tambon Noen Phra, Thesaban Nakhon Rayong, Chang Wat Rayong 21000
TH0065			Thailand	Rayong	SSP Industrial Park	Thanon Sukhum Vit Tambon Noen Phra, Thesaban Nakhon Rayong, Chang Wat Rayong 21000
TH0066			Thailand	Rayong	T.C.C.Industrial Park	3138 Tambon Nong Bua, Chang Wat Rayong 21120
TH0067			Thailand	Rayong	Thai Singapore 21	Thanon Sukhum Vit Tambon Noen Phra, Thesaban Nakhon Rayong, Chang Wat Rayong 21000
TH0068		**XXTH15**	Thailand	Rayong	Hemaraj Eastern Industrial Estate (Map Ta Phut)	Pakon Songkrohraj Rd. Huay Pong Sub-District,Muang District Rayong
TH0069			Thailand	Rayong	IRPC Industrial Estate (Ban Khai)	Thanon Sukhum Vit Tambon Noen Phra, Thesaban Nakhon Rayong, Chang Wat Rayong 21000
TH0070			Thailand	Rayong	IRPC Industrial Estate (Wang Chan)	3471 Tambon Bang But, Chang Wat Rayong 21120
TH0071			Thailand	Samut Prakan	Bangplee Industrial Estate	Thanon Sukhum Vit Tambon Pak Nam, Thesaban Nakhon Samut Prakan, Chang Wat Samut Prakan 10270
TH0072			Thailand	Samut Prakan	Bangpoo Industrial Estate	Thanon Sukhum Vit Tambon Pak Nam, Thesaban Nakhon Samut Prakan, Chang Wat Samut Prakan 10270
TH0073			Thailand	Samut Sakhon	Maharajnakorn Industrial Estate (under construction)	Hwy 3091Tambon Mahachai, Thesaban Nakhon Samut Prakan, Chang Wat Samut Sakhon 74000
TH0074			Thailand	Samut Sakhon	Samut Sakhon Industrial Estate	Hwy 3091Tambon Mahachai, Thesaban Nakhon Samut Prakan, Chang Wat Samut Sakhon 74000
TH0075			Thailand	Samut Sakhon	Sinsakhon Industrial Estate	Hwy 3091Tambon Mahachai, Thesaban Nakhon Samut Prakan, Chang Wat Samut Sakhon 74000
TH0076			Thailand	Saraburi	Kaengkhoi Industrial Estate 5	3041 Tambon Pak Prieo, Chang Wat Saraburi 18000
TH0077			Thailand	Saraburi	Nong Khae Industrial Estate	329 Tambon Nong Chik, Chang Wat Saraburi 18140
TH0078			Thailand	Saraburi	Saraburi Industrial Park	3041 Tambon Pak Prieo, Chang Wat Saraburi 18000
TH0079			Thailand	Saraburi	Siam Cement Industrial Land	3041 Tambon Pak Prieo, Chang Wat Saraburi 18000
TH0080			Thailand	Saraburi	SIL Industrial Land (Saraburi) 2, 4, 6	3041 Tambon Pak Prieo, Chang Wat Saraburi 18000
TH0081			Thailand	Sing Buri	Indra Industrial Park(Phase I)	Phan Ruaeng Tambon Bang Phutsa, Chang Wat Sing Buri 16000
TH0082			Thailand	Songkhla	Southern Industrial Estate	Karnjanavanit Tambon Khao Rup Chang, Chang Wat Songkhla 90000
TH0083			Thailand	Songkhla	Thepaya International MD.City	Karnjanavanit Tambon Khao Rup Chang, Chang Wat Songkhla 90000
TH0084			Thailand	Udon Thani	Udon Thani Industrial Estate	210 Tambon Nong Khon Kwang, Thesaban Nakhon Udon Thani, Chang Wat Udon Thani 41000
TH0085		**XXTH14**	Thailand	Bangkok	Lak Chai Rubber City Industrial Estate	238/9 Ratchadapisek Road, Huay Kwang Bangkok 10310
TH0086		**XXTH08**	Thailand	Rayong	Hemaraj Eastern Industrial Estate (EISE)	112 Moo 4 Highway 331 Km. 91.5 Pluak Daeng, Rayong 21140
TH0087		**XXTH24**	Thailand	Chachoengsao	TFD Industrial Estate	TFD Industrial Estate Motor Way Road, Ta Sa-an Bang Pakong, Chachoengsao

VIETNAM

Table of Contents

Chapter 1 Introduction

The report is a draft version of the Country Report for Vietnam, which will be a reference document for organizations of the private and public sectors wishing to prepare an Area Business Continuity Plan (Area BCP) and develop an Area Business Continuity Management System (Area BCM System).

The country report contains information on natural disaster risks, industrial parks and investment risk, key infrastructure and lifeline systems, as well as issues to consider during natural disasters. It also presents an outline of economy and trade, an outline of physical distribution, and current practices for implementing business continuity management (BCM) in the country.

The draft report will be refined and finalized at the end of the Project.

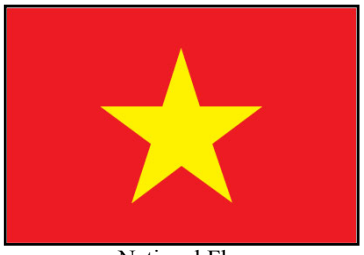
Chapter 2 Overview of the Country

Vietnam is located on the eastern part of the Indochina peninsula, with a long strip of land stretching north to south. Vietnam is bordered by China to the north, and by Laos and Cambodia to the west. The Mekong River, the largest river in South-East Asia, flows through the south of Vietnam, and Ho Chi Minh City, the largest city in Vietnam, is located at the mouth of the river.

Vietnam joined ASEAN on July 28, 1995. It had been a one-party state dominated by the Communist party until it joined ASEAN and changed its foreign policy.

Vietnam is a socialist republic with a one-party system led by the Vietnamese Communist Party. Truong Tan Sang is the current president of the country. The country created a competitive economic environment since Doi Moi policies were adopted in 1986. The country is still undergoing significant development today, and foreign countries are trying to expand their business presence in Vietnam.

Basic Information of Vietnam

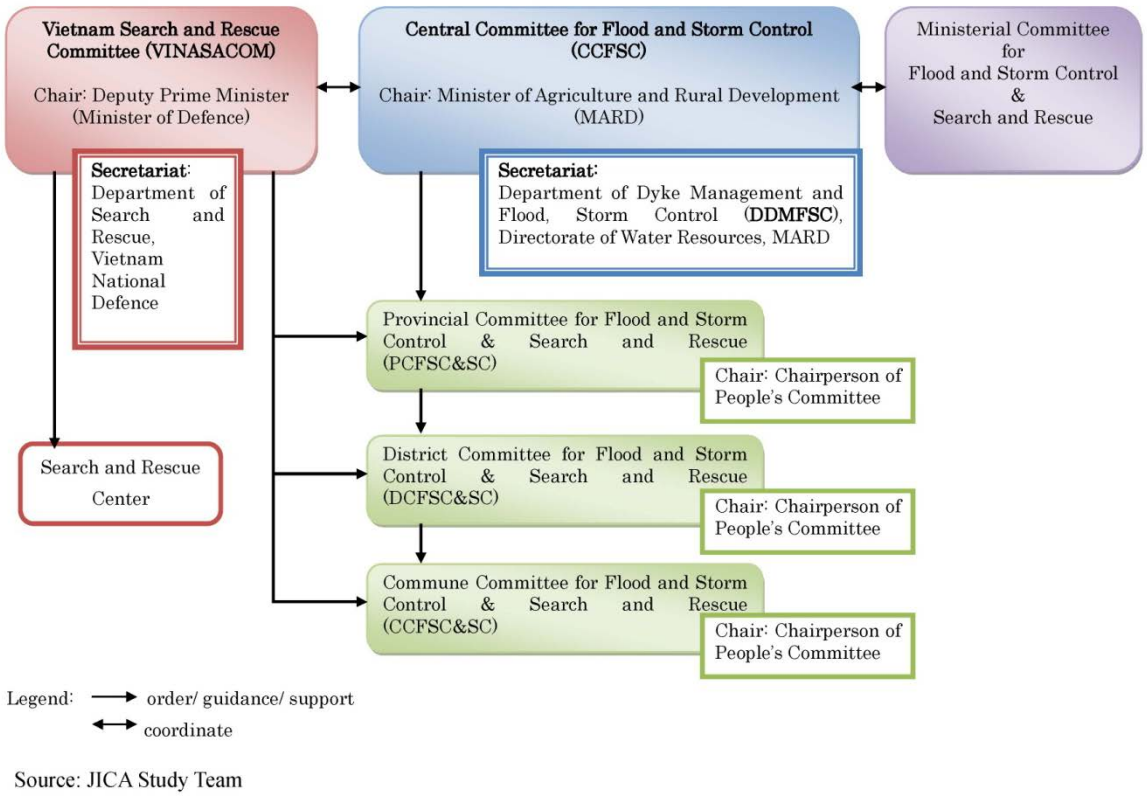


National Flag

Capital	Hanoi
Ethnic Groups	Kinh (Viet) constitutes approx. 86% of the population. Also, there are about 53 ethnic minority groups.
Languages	Vietnamese
Religions	Buddhism, Catholic, Cao Dai, and others
Area (km^2)	Total: 330,957 Land: 310,070 Inland Water: 20,887
Population	88,775,500
Population density(people/ km^2 of land area)	286
Population growth (annual %)	1.1
Urban population (% of total)	32
GDP (current US$) (billion)	156
Economic growth rate (annual %)	5.2
GNI per capita, PPP (current international $)	3,620
Agriculture, value added (% of GDP)	20
Industry, value added (% of GDP)	38
Services, etc., value added (% of GDP)	42

Features of Disasters

The Storm and floods are the frequent disasters (storm: 52%, flood: 42% of the total number of disasters) in Vietnam that caused 92% of the total affected people (storm: 59%, flood: 33%), 98% of total deaths (storm: 68%, and flood: 30%), and 92% of estimated cost (storm: 50%, flood: 42%). Storm and flood are the most noteworthy disasters in Vietnam.



Source: JICA Study Team

Sources; Map and Flag: CIA(Central Intelligence Agency) website (2014) (https://www.cia.gov)

Capital, Ethnic Groups, Languages and Religions: Ministry of Foreign Affairs website (2013) (http://www.mofa.go.jp)

Area, Population, Population density, Population growth, Urban population, GDP, Economic growth rate, GNI per capita, PPP, Agriculture, value added, Industry, value added and Services, etc., value added: The World Bank Data Bank website (2012) (http://data.worldbank.org)

Chapter 3 Natural Disaster Risk

3.1 Floods

(1) Risk

Summary of flood disaster

In Vietnam, floods occur in the rainy season (June to November) influenced by the tropical monsoons, and also during the typhoon season (September to October) in the northern and central part areas where typhoons land. Storm rainfalls in the upper basin of the Mekong cause flood disaster over wide areas in the Mekong delta.

Notable floods and disasters in recent years

Recent notable floods occurred in September 2000 and on November 1, 2008, caused by storm rainfalls, and on October 3, 2010 and September 30, 2011, caused by typhoons.

1. Storm rainfalls floods on February 5, 2007 and January 15-25, 2013 caused large disasters. Flooding occurred due dam collapse on March 27, 2009.
2. The flood of the Mekong River in September 2000 triggered by the storm rainfalls that started at the end of July caused wide inundation damage in the Mekong delta. According to the EM-DAT (The International Disaster Database) the flood caused 480 fatalities and affected 5.0 million persons with economic losses of about USD 250 million.
3. The flood triggered by the storm rainfalls from November 1 to 3, 2008, caused the 99 fatalities, and affected 600,000 persons in the capital city of Hanoi, as well as central and northern areas.
4. The flood on October 3, 2010 triggered by a typhoon caused 80 fatalities and affected about 700,000 persons.
5. The flood on September 30, 2011 triggered by storm rainfalls brought by a typhoon in the upper basin of the Mekong caused about 30 fatalities and affected 300,000 persons in the central and southern areas.

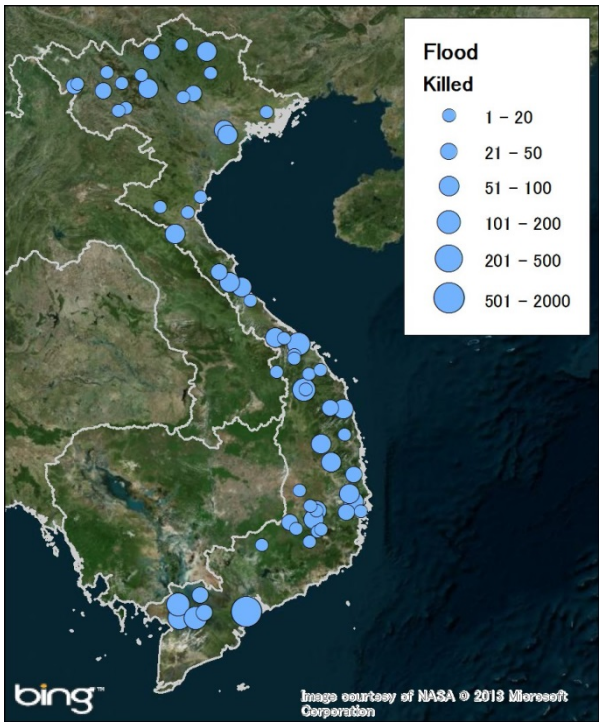


Figure 3.1.1 Flood Damage: Human Losses

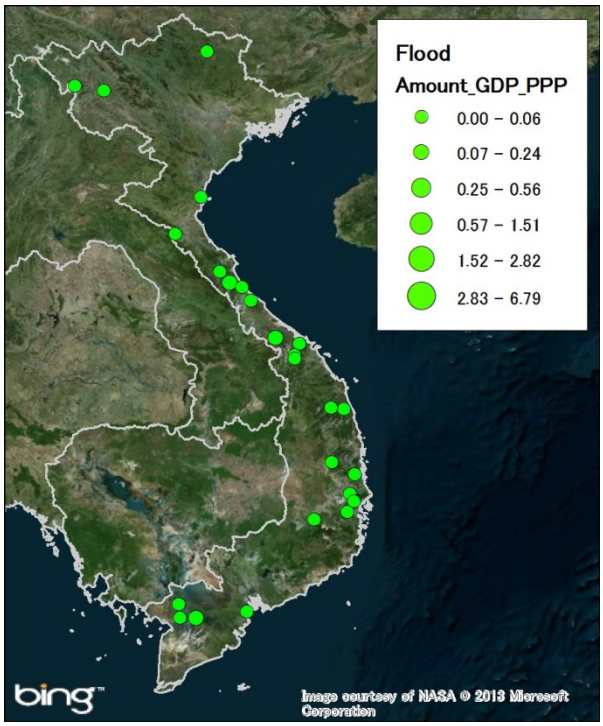


Figure 3.1.2 Flood Damage: Economic Losses (% of GDP)

(2) Background

Characteristics of floods

- Floods are caused by very strong rainfalls during monsoons in the rainy season (June to November).
- Large floods are caused by typhoon landings in the typhoon season of July to October.
- The Red River in the northern area has a basin has with a large mountainous region. Here, floods are caused by a rapid increase in the river level.
- In the northern area, flood damage tends to be increased by storm surges.
- In the central part the coastal river basins where the mountainous region are close to the coastal area, floods are caused due to a sudden increase of river water levels.
- The Mekong River Basin in the southern area has a wide and long basin, and an extensive flat plain in the lower reach. The Mekong River causes prolonged flood damage.
- At the river mouth in the southern area, the subsiding of flood levels if often delayed by the effects of storm surges.
- Flood disasters in urban areas like Hanoi and Ho Chi Minh City tend to be amplified because of their poor drainage systems.

Notable examples of flood events

1. The flood of September 2000 was caused by storm rainfalls in Laos in the upper basin of the Mekong River. The Mekong River caused flood damage at the various areas of Long An, Kien Giang, An Giang, Can Tho, and Dong Thap provinces. The total economic losses were

estimated at about USD 250 million. According to the Vietnam Red Cross, there were about 800,000 flooded homes and the duration of the inundation was about one month.

2. The flood of November 2008 triggered by the storm rainfalls of three days from November 1 caused the worst flood damage in the last 20 years in the capital of Hanoi and its surrounding area, as well as 17 provinces in the central region. The economic losses were estimated at about USD 400 million.
3. The flood on October 3, 2010 triggered by a typhoon that hit the central region caused severe flood damage including collapsed houses, dyke breaches, and damage to agricultural crops in Ha Tinh Province and its surrounding area.
4. The flood on September 30, 2011 triggered by the storm rainfalls of Typhoon Nesat caused damage in the central areas, and flooding from the Mekong River caused damage in Ho Chi Minh and its surrounding area.

Frequently flooded areas

- Northern area: Red River and vicinity
- Central area: Coastal area
- Southern area: Mekong River and vicinity

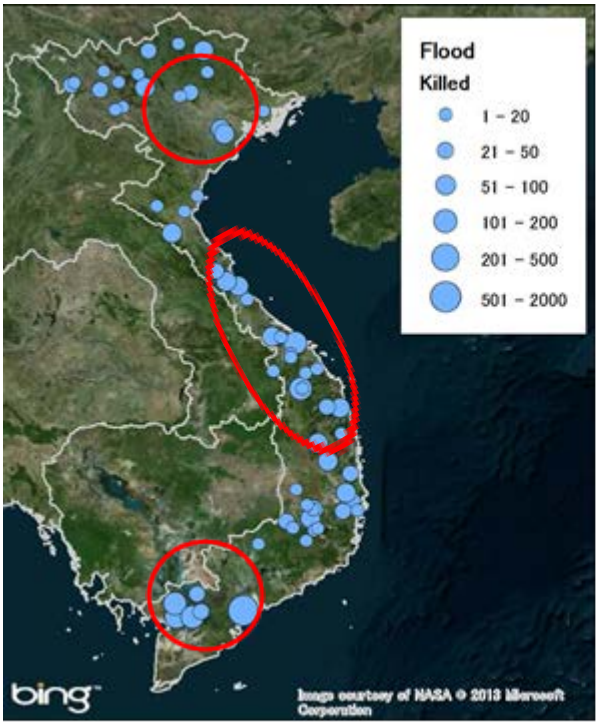


Figure 3.1.3 Hotspots of Human Loss

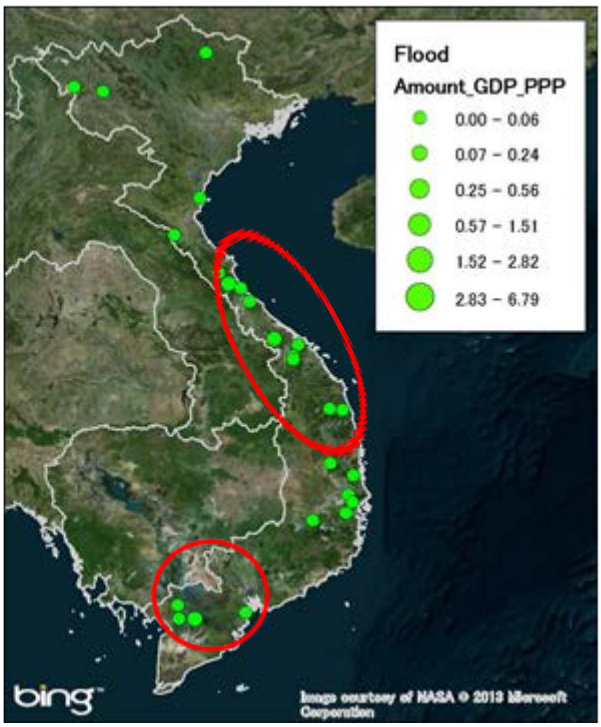


Figure 3.1.4 Hotspots of Economic Loss

(3) Efforts by the central government, local governments, and disaster management organizations

✓ National Disaster Reduction Committee

- The National Committee coordinates the disaster reduction activities of the ministries and agencies.
- Management and Flood Control (DDMFC) acts as the secretariat of the National Committee.

✓ Central Committee for Flood and Storm Control (CCSFSC);
http://www.ccfsc.gov.vn/KW367A21/Trang-chu.aspx

- Formulates all regulations and disaster risk reduction measures relevant to typhoons and floods.

✓ Committee for Flood and Storm Control (CSFC)

- Coordinates on-site emergency response

(4) Hazard and risk information sources

Disaster risk reduction organizations

Table 3.1.1 List of Organizations for Disaster Risk Reduction

Organization	Post	Web Address
Ministry of Agriculture and Rural Development (MARD)		http://www.agroviet.gov.vn/en/Pages/default.aspx
Central Committee for Flood and Storm Control (CCFSC)		http://www.ccfsc.gov.vn/KW367A21/Trang-chu.aspx
Committee for Flood and Storm Control (CFSC)		http://www.ccfsc.gov.vn/KW367A21/Trang-chu.aspx
National Hydro-Meteorological Services of Viet Nam (NHMS)		http://www.nchmf.gov.vn/web/en-US/43/Default.aspx
Vietnamese Academy of Science and Technology (VAST)		http://www.vast.ac.vn/en/
Hanoi University Science and Technology (HUST)		http://en.hust.edu.vn/home;jsessionid=3B761135553EC65597E3EA1F1D2C6F2C
Ho Chi Minh City - University of Technology		http://www.hcmut.edu.vn/en

Reports

Table 3.1.2 List of Reference Books for Risk Analysis

Organization	Post	Title/ Web Address	Form
Asia Development Bank	Asian Water Development Outlook	Asian Water Development Outlook 2013;Asia-Pacific Water Forum	Report
		http://www.adb.org/publications/asian-water-development-outlook-2013	
World Bank	ASEAN Disaster Risk Management Initiative	Synthesis Report on Ten Asian Countries Disaster Risks Assessment；December 2012	Report
		http://www.unisdr.org/files/18872_asean.pdf	
The Nature Conservancy	ASEAN Disaster Risk Management Initiative	World Risk Report 2012；October 2012	Report
		http://www.ehs.unu.edu/article/read/worldriskreport-2012	
World Bank	Framework and Options for Implementation	Advancing Disaster Risk Financing and Insurance in ASEAN Countries: April 2012	Report
		https://openknowledge.worldbank.org/bitstream/handle/10986/12628/714530v20ESW0W0AN0appendices0June12.pdf?sequence=1	
International Development Research Centre	Economy and Environment Program for Southeast Asia(EEPSA)	Climate Change Vulnerability Mapping for Southeast Asia: January 2009	Report
		http://web.idrc.ca/uploads/user-S/12324196651Mapping_Report.pdf	
UNEP, GRID, UNISDR		Global Risk Data Platform	Web Map
		http://preview.grid.unep.ch/index.php?preview=map&lang=eng	
UNISDR, GAR		Desinventar Disaster Information Management System	Web Map
		http://www.desinventar.net/	

Abbreviations

CCFSC	Central Committee for Flood and Storm Control
CFSC	Committee for Flood and Storm Control
DDMFC	Department of Dyke Management and Flood Control
HCMUT	Vietnam National University, Ho Chi Minh City – University of Technology
HUST	Hanoi University Science and Technology
MARD	Ministry of Agriculture and Rural Development
NHMS	National Hydro-Meteorological Services of Viet Nam
VAST	Vietnamese Academy of Science and Technology

References:

1) Ministry of Foreign Affairs of Japan (2013): “Information on Viet Nam (in Japanese)”,07 2013
2) ADRC: “Countries; Viet Nam”, Information on Disaster Risk Reduction of the Member.
3) ADRC: “Viet Nam, Flood, 2000/09”
4) Relief Web; OCHA (2000): Report from UN Children's Fund ,UNICEF Humanitarian Action: Vietnam Donor Update 27 Oct 2000, 27 Oct 2000
5) Relief Web; OCHA (2000): “Viet Nam: Floods and Storm Appeal No. 23/00, Situation Report No. 2”, Report from IFRC, 31 Oct 2000.

6) ADRC: "Viet Nam, Floods ,2008/11/01"
7) Relief Web; OCHA (2008): "North Vietnam loses over $370.5 million in flood", Report from Government of Viet Nam, 12 Nov 2008.
8) ADRC: "Viet Nam, Flood, 2010/10/03"
9) Relief Web; OCHA (2010): "ESTIMATED RAINFALL ACCUMULATION IN VIET NAM: ESTIMATED TOTAL RAINFALL ACCUMULATION FOR THE PERIOD: 1 - 6 OCTOBER 2010", Map from International Charter, UNOSAT, 07 Oct 2010.
10) Relief Web; OCHA (2010): "Viet Nam Situation Report No. 10 Floods Central Vietnam", Report from UN Country Team in Viet Nam, Oct 2010.
11) Relief Web; OCHA (2010): "South East Asia: millions affected by six natural disasters", Report from IFRC, 28 Oct 2010.
12) UNITED NATIONS: "Flood Central Viet Nam October 26, 2010 -5pm(Viet Nam time) ",Viet Nam Situation Report No.10.
13) ADRC: "Viet Nam, Typhoon, Flood,2011/09/30"
14) Relief Web; OCHA (2011):"Viet Nam Red Cross appeals for 1.1 million Swiss francs for flood response", Report from IFRC, 10 Nov 2011.
15) OCHA (2011):"Southeast Asia; Flooding (12 October 2011)"

3.2 Earthquakes

(1) Risk

Earthquakes less than magnitude 7 have been recorded in Vietnam. One earthquake that occurred offshore of Ham Tan in 1923 was caused by volcanic eruption.

However, there is no record of the earthquakes over magnitude 7 or damage caused by earthquakes.

(2) Background

There are many faults in the northern region of Vietnam and more earthquakes occurred there than in middle and southern regions of Vietnam.

Figure 3.2.2 is the earthquake hazard map of Vietnam that considers all types of earthquakes and their probabilities. This figure shows that an earthquake larger than MMI VI or VII is expected for the northern region and an earthquake larger than MMI V is expected for the middle and southern regions at 20% probability in 50 years.

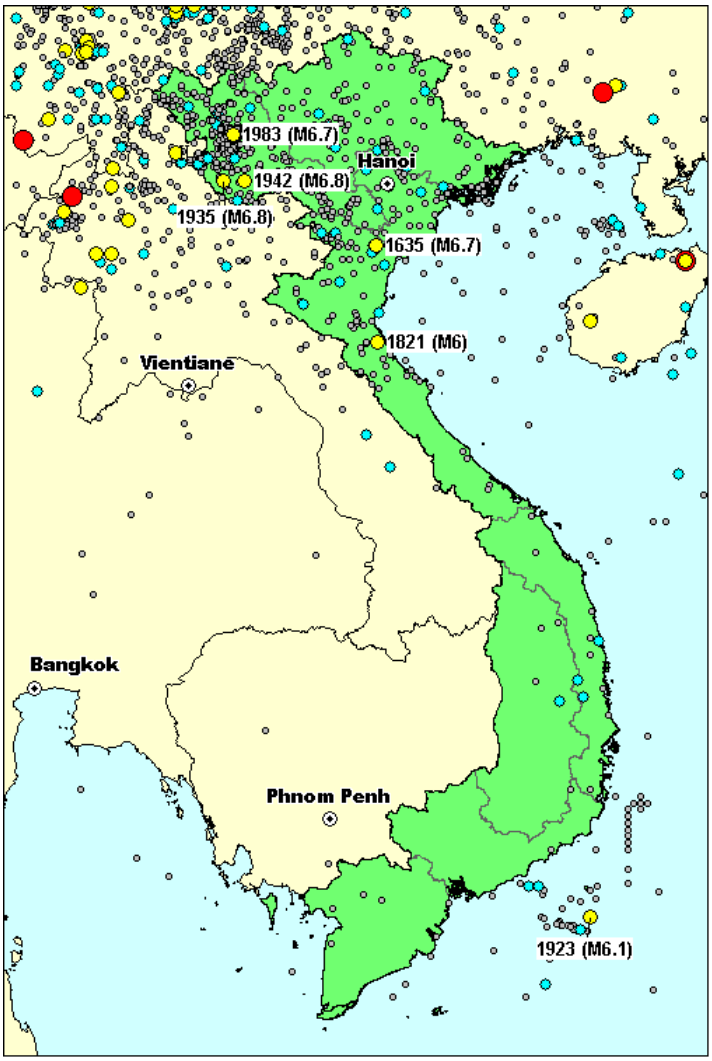


Figure 3.2.1 Historical Earthquakes (Data by IGP Data)

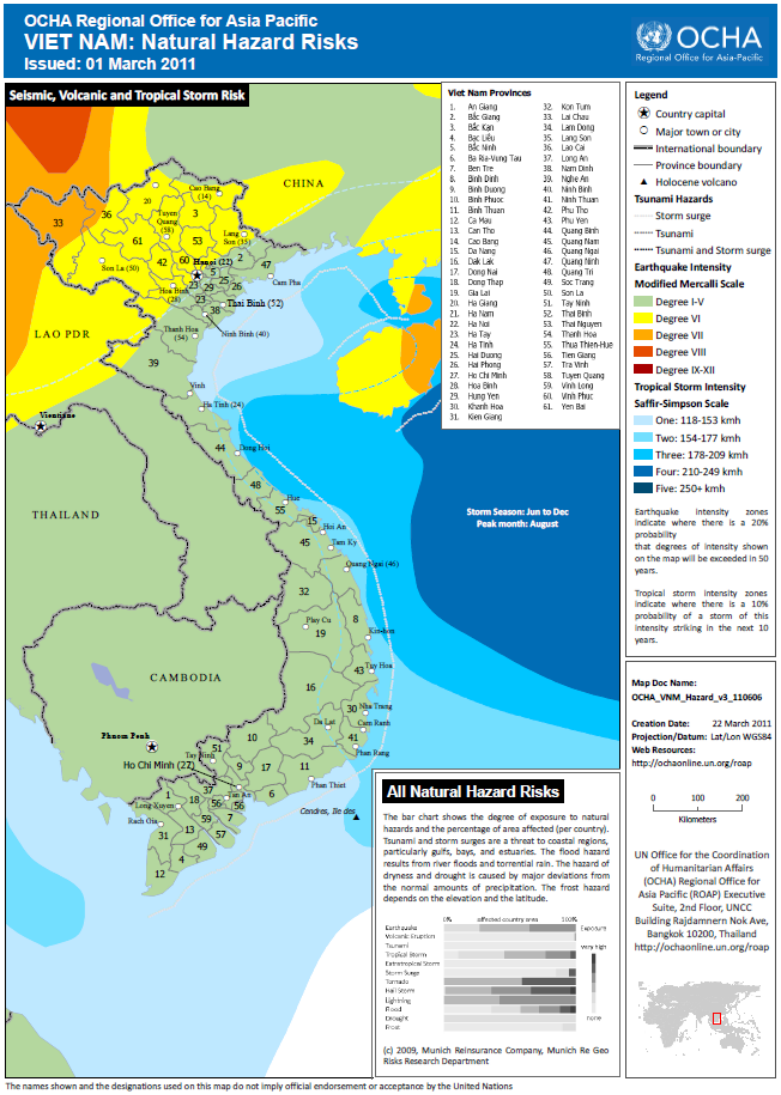


Figure 3.2.2 Seismic Hazard in Vietnam

(3) Efforts by the central government, local governments, and disaster management organizations

Earthquakes in and around Vietnam are observed by the Vietnam National Seismic Network (VIETNET). The network consists of 25 short-period sensors and 5 broadband sensors, and it covers all areas of Vietnam with a focus on the northern region. There is a plan to add broadband sensors. Telecommunications systems are in operation in the Hanoi area.

(4) Hazard and risk information sources

Institute of Geophysics, Vietnam Academy of Science and Technology (IGP-VAST)
http://www.igp-vast.vn/
Vietnam Academy of Science and Technology (VAST)
http://www.vast.ac.vn/

References:

1) EM-DAT: The OFDA/CRED International Disaster Database – www.emdat.be – Université Catholique de Louvain – Brussels – Belgium.
2) Japan International Cooperation Agency (JICA) (2012): "Data Collection Survey on ASEAN Regional Collaboration in Disaster Management"
3) United Nations Office for the Coordination of Humanitarian Affairs (OCHA), Regional Office for Asia Pacific (ROAP) (2011): "Viet Nam: Natural Hazard Risks", Downloaded from "http://reliefweb.int/sites/reliefweb.int/files/resources/map_1322.pdf"

3.3 Tsunami

(1) Risk

Due to its location, it is difficult for the Vietnamese coast to be affected by destructive tsunamis originating in the central Pacific Ocean, the Sea of Japan, and East China Sea on its northeast side, or from the Sunda Trench or the Philippine Trench. In fact, there is no record of damage caused by tsunamis.

However, tsunami threats might come from inside the East Vietnam Sea, according to experts. Recent research results show that the maximum expected earthquake magnitude for the Manila Trench may reach M8.7, with a tsunami, up to 5 m in height can reach the Vietnamese coast in 2 hours at the earliest from the source region (See Figure 3.3.1).

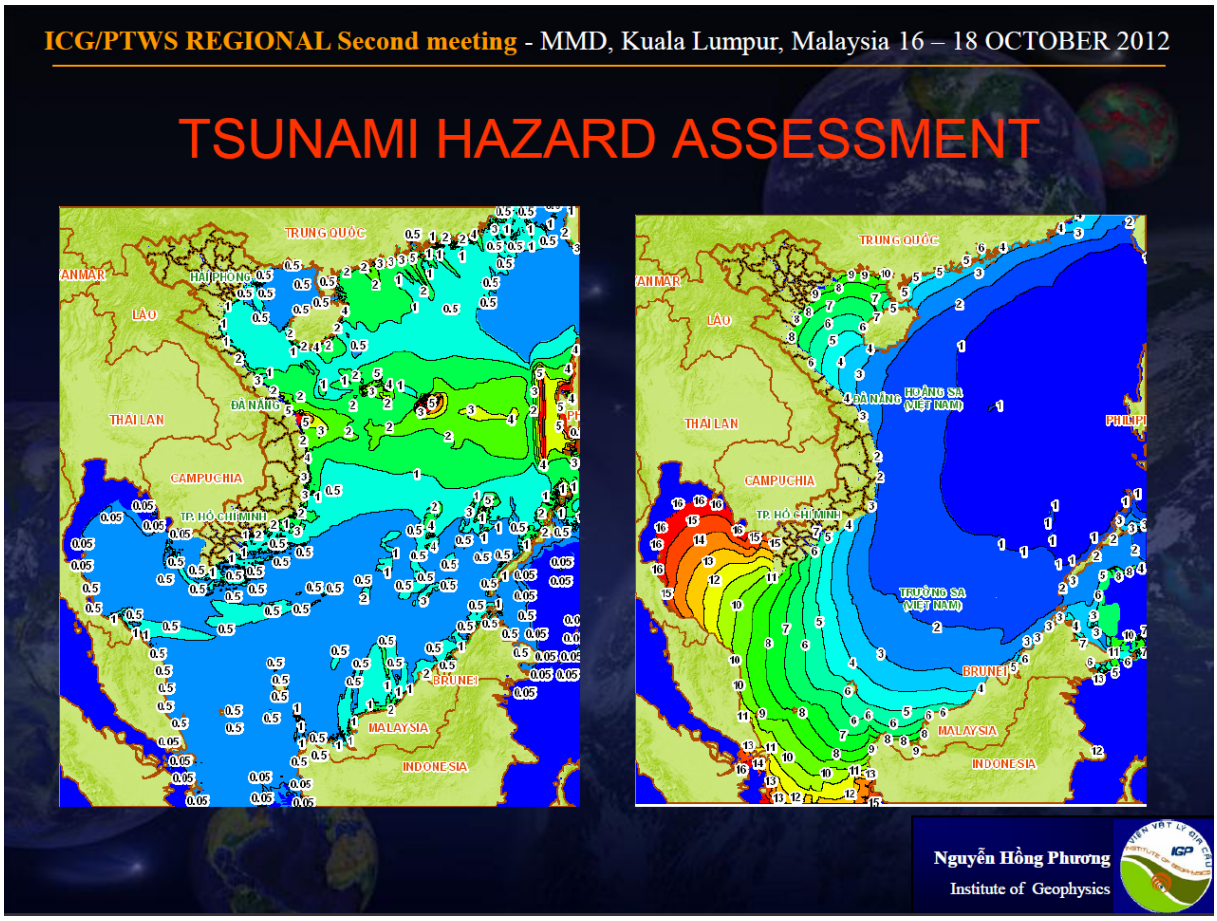


Figure 3.3.1 Tsunami Hazard Assessment (provided by Dr. Phuong of IGP-VAST)

(2) Efforts by the central government, local governments, and disaster management organizations

The Institute of Geophysics (IGP) is in charge of tsunami early warning. IGP has established the Earthquake Information and Tsunami Warning Center and is monitoring tsunamis that may cause damage to Vietnam 24 hours/day. Once a tsunami occurs, the center issues an early warning. The warning is transmitted directly to Da Nang city and it is disseminated to the citizens through the ten (10) sirens which are installed in the city. The warning is transmitted to other relevant agencies and organizations, but there is no other areas in which a means of communication to the citizens is established.

A drill on tsunami response was conducted in Da Nang city in 2011.

(3) Hazard and risk information sources

Institute of Geophysics, Vietnam Academy of Science and Technology (IGP-VAST)
http://www.igp-vast.vn/
Vietnam Academy of Science and Technology (VAST)
http://www.vast.ac.vn/

References:

1) EM-DAT: The OFDA/CRED International Disaster Database – www.emdat.be – Université Catholique de Louvain – Brussels – Belgium.
2) Nguyen Hong Phuong (2012): "Vietnam National Progress Report", Centre for Earthquake Information and Tsunami Warning, Institute of Geophysics, VAST, ICG/PTWS REGIONAL Second meeting -MMD, Kuala Lumpur, Malaysia 16 –18 OCTOBER 2012
3) Japan International Cooperation Agency (JICA) (2012): "Data Collection Survey on ASEAN Regional Collaboration in Disaster Management"

3.4 Volcanoes

(1) Risk

There are 4 inland volcanoes including the Cu-Lao Re Group, Toroeng Prong, Haut Dong Nai, and Bas Dong Nai, and 2 undersea volcanoes including the Ile des Cendres and Veteran. Ile des Cendres erupted in 1923 and there is evidence that other volcanoes erupted in the age of Holocene (from 12,000 years ago to present), with the exception of Veteran. However, there is no record of damage caused by the eruptions.

Figure 3.4.1 shows the volcanic activity in the Asia-Pacific area including Vietnam.

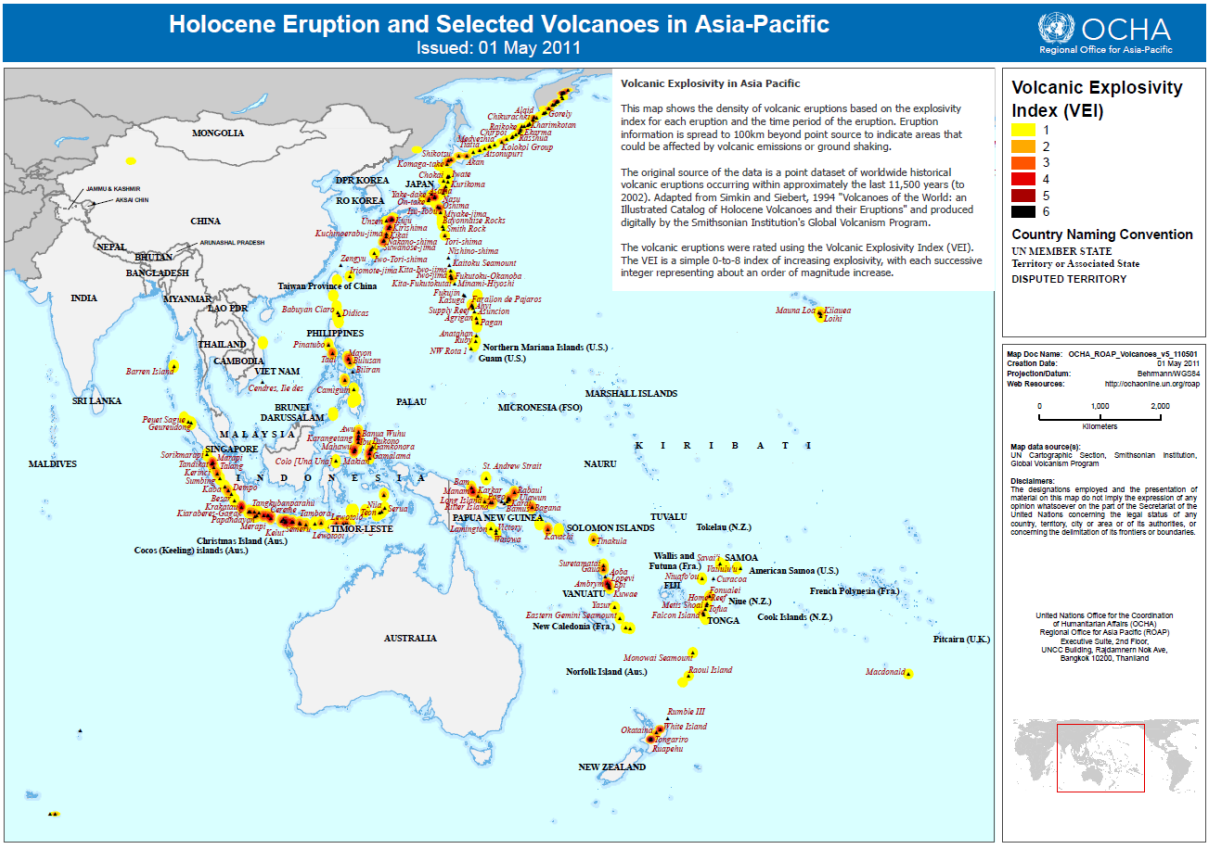


Figure 3.4.1 Holocene Eruption and Selected Volcanoes in Asia-Pacific

(2) Efforts by the central government, local governments, and disaster management organizations

No special measures are taken focusing on volcanoes.

(3) Hazard and risk information sources

Institute of Geophysics, Vietnam Academy of Science and Technology (IGP-VAST)
http://www.igp-vast.vn/
Vietnam Academy of Science and Technology (VAST)
http://www.vast.ac.vn/

References:

1) Lee Siebert, Tom Simkin, and Paul Kimberly (2011): "Volcanoes of the World - Third Edition", Smithsonian Institute/University of California Press
2) EM-DAT: The OFDA/CRED International Disaster Database – www.emdat.be – Université Catholique de Louvain – Brussels – Belgium.
3) Japan International Cooperation Agency (JICA) (2012): "Data Collection Survey on ASEAN Regional Collaboration in Disaster Management"
4) United Nations Office for the Coordination of Humanitarian Affairs (OCHA), Regional Office for Asia Pacific (ROAP) (2011): "Holocene Eruption and Selected Volcanoes in Asia-Pacific", Downloaded from "http://reliefweb.int/sites/reliefweb.int/files/resources/map_619.pdf"

3.5 Cyclone (Meteorological) Hazards

(1) Risk

Vietnam is located on the eastern edge of the Indochina Peninsula. It borders the Gulf of Tonkin and the South China Sea on the east, the Gulf of Thailand on the southwest, and China, Lao PDR, and Cambodia. It has a tropical monsoon climate except in the northern mountainous areas. An average of six to seven typhoons and/or tropical cyclones hit the country every year. It is also affected by typhoons passing through its coastal waters. Flooding due to heavy rains and high waves as well as other damages brought by meteorological disasters have occurred following typhoons from the Philippines.

Figure 3.5.1 shows the number of deaths and typhoon tracks.

Ketsana made landfall in Vietnam during the mid-afternoon of September 29 about 60 km south of Da Nang, Quang Nam province. Heavy rains and strong winds lashed a 400 km stretch of coastline from Thua Thien Hue to Quang Ngai with rainfall causing massive flood surges in Huế, Binh Dinh, and Kon Tum provinces. The typhoon killed at least 162 people in Vietnam, 14 people were reported to be missing and 616 injured. Total damage of Ketsana is estimated to be at around $785

million. Strong winds also destroyed parts of the North-South high voltage power line, the backbone of Vietnam's electricity grid.

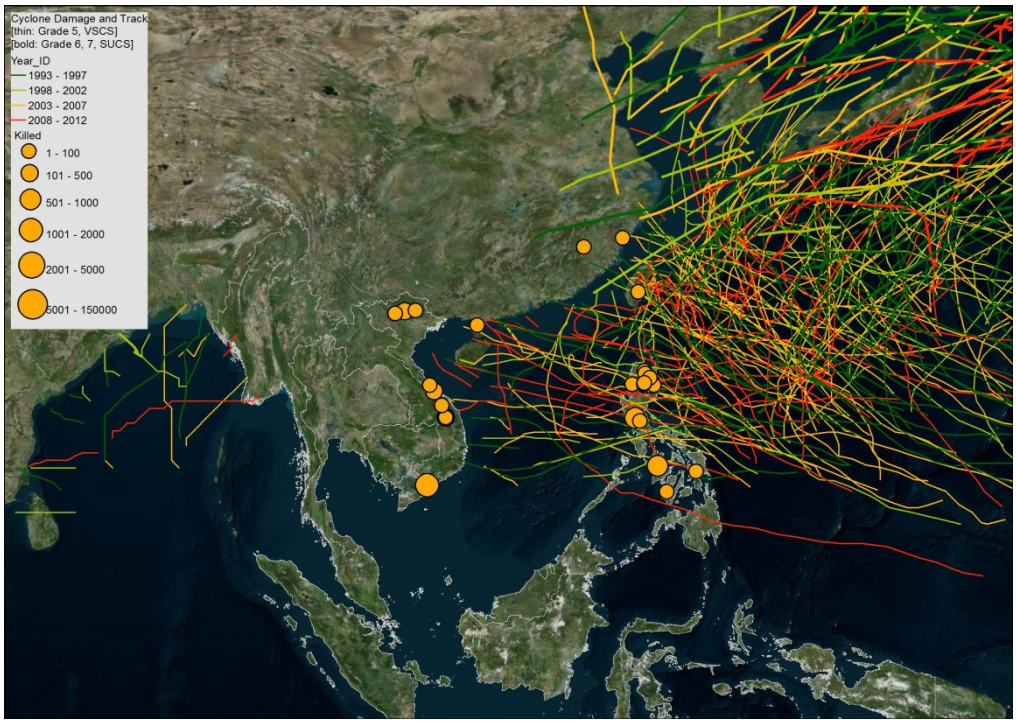


Figure 3.5.1 The Number of Deaths and Path of Typhoon Trucks (1993 - 2012)

(2) Background

The country has a north-to-south distance of 1,650 km with a coastline of 3,260 km. The east-west distance is 600 km (maximum) in the north and 50 km (minimum) in Quang Binh province, the central part of the country. Mountains and highlands cover three-fourths of the country.

The northeast monsoon during winter is from October to May with a peak during November and early January. Southwest monsoon wind during summer is strong in the west slopes of Sung Mountains, but is not prominent in the northern and central areas located behind the mountains. Rainfall is governed by the monsoon. The distinction between rainy season (from May to October) and dry season (from November to April) is very clear in the southern region. It has much rain due to the influence of the monsoon in the northern region. Annual rainfall is about 2,000 mm almost everywhere in the country. However, annual rainfall is higher in the highlands in the northern and southern regions with a range of 3,000 to 4,000 mm.

The landing of typhoons usually begins in the northern and central part of the country in May. Typhoons seem most prevalent in the northern area from June to August, the whole country in September and October, and southern part of the country in November to December. The impact and extent of damage due to typhoons depends on the speed and course of the typhoon and circumference environment, etc.

In more than 50 years (1954-2006), there have been a total of 380 typhoons and tropical depressions in Vietnam, of which 31% hit the north area, 36% in the northern central and middle central regions, and 33% in the southern central and the southern regions. Typhoon landfalls are usually accompanied by high tides and heavy rains, thus resulting in heavy and long rains and floods. It is estimated that up to 80-90% of Vietnam's population is affected by typhoons.

Meteorological disaster conditions in Vietnam are as follows.

Table 3.5.1 Situation of Meteorological Disasters in Vietnam

Region	Meteorological disasters
Northern and Central Mountains	• Flash floods (landslide) due to heavy rain. • Flooding was observed in a small steep basin upstream.
Red River Delta	• Flood season in the Red River and Thai Binh River system normally occurs from May to September. • Floods, high waves, and storm surges due to typhoons (tropical cyclones) and floods due to heavy rains caused by monsoons.
Central plains	• Flood season on the rivers from Thanh Hoa to Ha Tinh is from June to October every year. • Floods on these rivers generally occur on the main streams as a result of the dyke systems which prevent overflow.
Mekong Delta	• The flooding level in the Mekong River delta is generated from upstream floods and is also directly influenced by tides and the water reserving capacity of Tonle Sap. • The progress of floods in the Mekong river delta is slow, and floods last for a long period of 4 to 5 months annually, causing inundation in almost all areas of the Mekong river delta.

Climate change vulnerability and impact in Vietnam are as follows.

- Most regions in Vietnam may experience an increase in temperature of 2–4ºC by 2100. Vietnam's rainfall pattern may also be greatly affected by the Southwest Monsoon. As per ADB (2009), future rainfall in most of the areas of Vietnam may increase by 5–10% towards the end of this century.
- Typhoons, droughts, floods, and heat waves are among the most significant and extreme events in Vietnam. The peak month for typhoon landfalls in Vietnam has shifted from August to November over the last 50 years. The frequency of floods and droughts has also increased.
- In Vietnam, an upward trend in mean sea level has been observed with an average increase of 2–3 mm per year.

(3) Efforts by the central government, local governments, and disaster management organizations

At the central level, the National Committee, an inter-ministerial institution serves as the coordinating body for disaster reduction efforts in Vietnam. Its secretariat is provided by the Department of Dyke Management and Flood Control (DDMFC) of the Ministry of Agriculture and Rural Development (MARD). The CCFSC (Central Committee for Flood and Storm Control) from the same Ministry formulates all regulations and mitigation measures related to typhoons and floods with emphasis on dyke protection, surveillance, and maintenance. Local emergency work is

coordinated by the provincial CFSC. Typhoon warnings and forecasts are issued by the National Hydro-Meteorological Service (NHMS), but the transmission of detailed information, including support for disaster prevention, is carried out by the Committee of Flood and Storm Control (CFSC).

Meteorological service in Vietnam is under the responsibility of the NCHMF (National Centre for Hydro-meteorological Forecasting), an operational unit under the NHMS (National Hydro-meteorological Service) and the MONRE (Ministry of Natural Resources and Environment).

The main functions and tasks of the NCHMF include the following.

1) Formulating annual and long-term strategies, programs, and plans related to hydro-meteorological forecasting.
2) Formulating regulations, rules, and socio-technical standardization on hydro-meteorological forecasting.
3) Regular monitoring of hydro-meteorological conditions over the whole country and related areas.
4) Issuing assigned hydro-meteorological forecasts, warnings and advisories for disaster prevention and preparedness, socio-economic development, and national defense security.
5) Establishing and managing a telecommunication network to meet the requirements of hydro-meteorological forecasting in exchanging and transmitting hydro-meteorological data.
6) Providing consultancy and services on hydro-meteorological forecasting to organizations and private sectors under the current laws.
7) Carrying out research and application of new technologies on hydro-meteorological forecasting.
8) Supplying instructions on operational hydro-meteorological forecasting and telecommunication, and validating the implementation of these instructions at the Regional and Provincial Hydro-meteorological Centers.
9) Organizing training courses on operational hydro-meteorological forecasting and telecommunication.
10) Conducting international cooperation projects and programs on hydro-meteorological forecasting, data transmission, and other related issues.

The NCHMF is responsible for weather, marine, severe weather, and hydrological forecasts. The terms of forecast include short range, middle range, monthly and seasonal forecasts. The NHMS issues the following products.

Table 3.5.2 Weather Information Supplied by the NHMS

Type of information	Content
Weather Forecast	Weather forecast, Marine weather, 10 day forecast, Monthly outlook, Seasonal outlook
Severe weather	Tropical cyclone (typhoon)
River system	Short-Range Forecast, Medium-term forecast, Monthly forecast, Seasonal forecast
Marine Hydrology	Wave map, Storm surge, Tide, Current map, rate, Warning
Extreme weather information on hydrological systems	Flood warning, Drought warning
Other products	Weather satellite images, radar images, numerical weather prediction

Table 3.5.3 Authorities of Vietnam Meteorological Service

Institution	Contact information
NCHMF (National Centre for Hydro-Meteorological Forecasting) http://www.nchmf.gov.vn/web/en-US/43/Default.aspx	Tel: +84-4-38244919 E-mail : met_int@hn.vnn.vn

(4) Hazard and risk information sources

The hazard risk assessment results related to tropical cyclones (meteorological) disasters are as follows.

Table 3.5.4 Source of Information on Tropical Cyclones (Meteorological Disasters)

Institution	Literature name
Economy and Environment Program for Southeast Asia (2010)	Climate Change Vulnerability Mapping for Southeast Asia http://css.escwa.org.lb/sdpd/1338/d2-5a.pdf
UNISDR (2010)	Synthesis Report on Ten ASEAN Countries Disaster Risks Assessment http://www.unisdr.org/files/18872_asean.pdf
International Centre for Environmental Management (2008)	Rapid Assessment of the extent and Impact of Sea Level Rise in Viet Nam

Abbreviations

MARD	The Ministry of Agriculture and Rural Development
DDMFC	The Department of Dyke Management and Flood Control
CCFSC	The Central Committee for Flood and Storm Control
CFSC	The Committee of Flood and Storm Control
NCHMF	The National Center for Hydro-Meteorological Forecasting
MONRE	The Ministry of Natural Resources and Environment
NHMS	National Hydro-Meteorological Service

Explanation of terms

ITCZ: This is a low-pressure (convergence) zone formed near the equator. In the lower levels (near the surface), the north-eastern trade wind blows into the northern area from the ITCZ and the south-eastern trade wind blows into the southern area from the ITCZ.

References:

1) Socialist Republic of Vietnam (2007): "National Strategy for Natural Disaster Prevention, Response and mitigation to 2020.
2) The World Bank (2010): "Weathering the Storm: Options for Disaster Risk Financing in Vietnam."
3) Edwin ST Lai (2013): "Overview of Member's Summary of Reports 2012, TC-45 Appendix VI - AWG Working Reports Members, WMO, p.30
4) NCHMF (Website): http://www.nhmf.gv.v/web/en-US/43/Default.Aspx

3.6 Landslides

(1) Risk

The area affect by landslides spreads widely in the northern mountain area and is distributed narrowly in the middle of the country near the border with Lao PDR and the coastal region. A rehabilitation project for these disasters has been conducted by ADB and other donors.

According to the EM-DAT database (http://www.emdat.be/), the landslide with the most fatalities on record (200 people) occurred in Cao Bang province in the northwest region where annual precipitation reaches over 4000 mm.

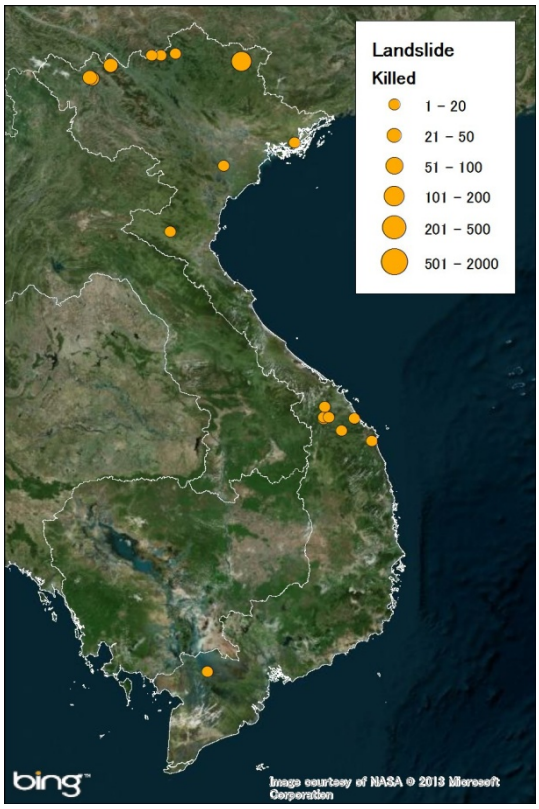


Figure 3.6.1 Landslide Damage: Human Losses

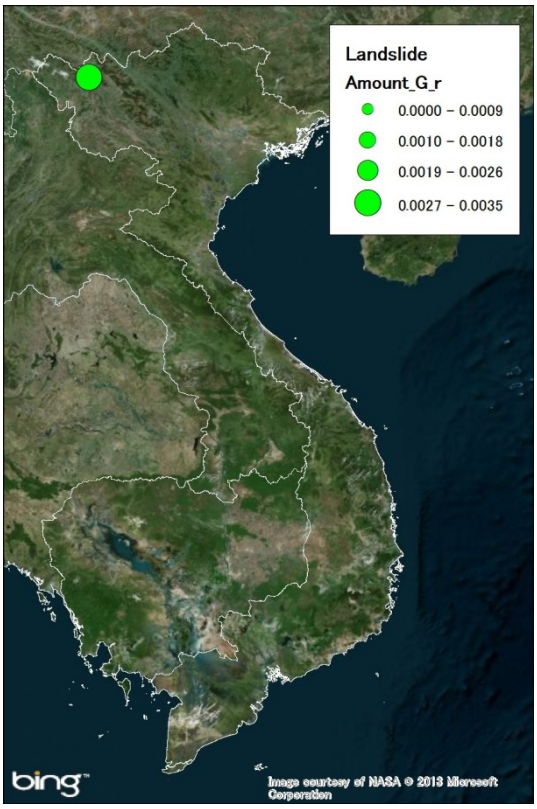


Figure 3.6.2 Landslide Damage: Economy Losses (% of GDP)

(2) Background

Notable examples of landslides

Landslides triggered by the heavy rain during a typhoon or tropical storm are distributed in the sedimentary rock area containing limestone in the precipitous northern region, and the granite area in Quang Ngai province in the central region.

Because the trigger for landslides is the heavy rain during a typhoon or tropical storm, the risk of landslide rises as climate change causes growth in the number and strength of typhoons. The exposure related to climate change is distributed in the northern and central regions.[1)]

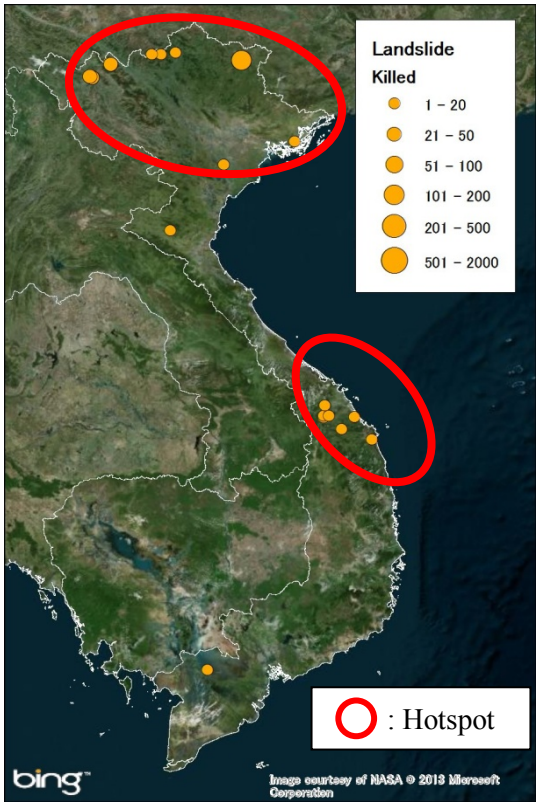


Figure 3.6.3 Hotspots of Human Losses

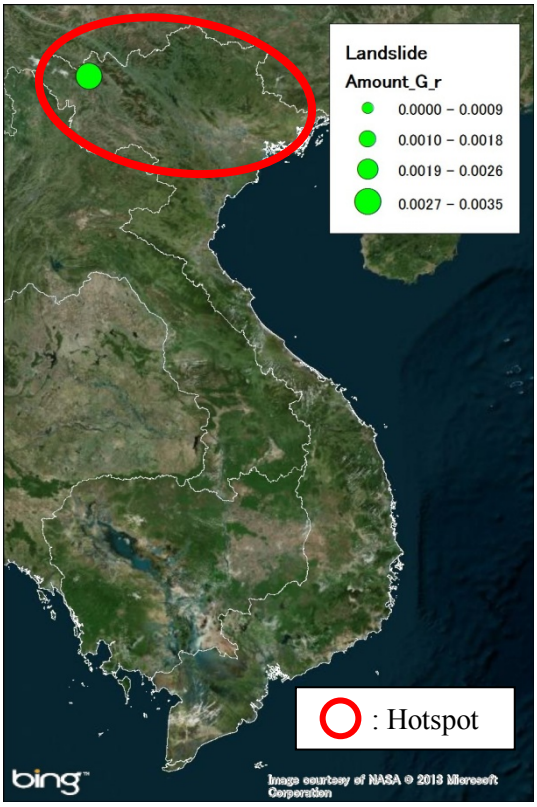


Figure 3.6.4 Hotspots of Economic Losses

(3) Efforts by the central government, local governments, and disaster management organizations

A hazard map for landslides has not been created and related laws are under development. There have been pilot projects for an early warning system for landslides, but the system has not yet performed effectively. The practical activities for risk assessment and vulnerability in local areas are not sufficient.

Several projects for the early warning system and the study of landslide records and risk management for the landslide is ongoing. (e.g. Emergency Rehabilitation of Calamity Damage Project (ADB), Geo-Information Technology for Hazard Risk Assessment（ADB)).

✓ National Disaster Reduction Committee

- The National Committee coordinates the disaster reduction activities of the ministries and agencies.

✓ Central Committee for Flood and Storm Control (CCFSC); http://www.ccfsc.org.vn

- Formulates all regulations and disaster risk reduction measures relevant to typhoons and floods.

Address: A4, MARD, 2 Ngoc Ha St., Hanoi
Telephone: +84 437335693
Email: dmc@ccfsc.org.vn

✓ National Committee for Search and Rescue in Vietnam, Department of Economics; http:// www.ckt.gov.vn, http://www.doemod.gov.vn

28A, Dien Bien Phu,, Ba Dinh, Hanoi
Tel: (84-4) 734 0346
(84-69) 551562
Fax: (84-4) 733 6036
Email: ckte@cktqp.gov.vn
xttm@cktqp.gov.vn

✓ Provincial/District/Commune Committee for Flood and Storm Control

✓ The National Center for Hydro-meteorological Forecasting

Address: No. 4 Dang Thai Than Street, Hoan Kiem District, Ha Noi
Tel: 84-4-38244919; 84-4-38244916; 84-4-38241600
E-mail: met_int@hn.vnn.vn

(4) Hazard and risk information sources

Reports

✓ Synthesis Report on Ten Asian Countries Disaster Risks Assessment; December 2012
ASEAN Disaster Risk Management Initiative, World Bank
http://www.worldbank.org/

- Summarizing natural hazard and risks in 10 ASEAN countries.
- The World Bank reported risks with respect to countries and categories of disaster.
- Although the data is only available up to 2009, the report is well assembled.

✓ World Risk Report 2012; October 2012, Alliance Development Works, The Nature Conservancy
http://www.nature.org/

- Natural disaster risks in 173 countries in the world are ranked in this report.
- Intended period is from 2002 to 2011.
- Vulnerabilities are assessed with respect to categories.
- The report is effective for comparing countries.

✓ Advancing Disaster Risk Financing and Insurance in ASEAN Countries: April 2012, Framework and Options for Implementation, Volume 2: Appendix 1
https://www.gfdrr.org/

- Summarizing natural hazard and risks in 10 ASEAN countries.
- Intended period is from 1970 to 2011.
- Summary of countries is well assembled.

✓ Climate Change Vulnerability Mapping for Southeast Asia: January 2009, Economy and Environment Program for Southeast Asia (EEPSA)
http://www.idrc.ca/

- Natural disaster risks in Southeast Asia are mapped in the report.
- The report contains information on risks in states/provinces.

Risk maps

✓ Global Risk Data Platform; UNEP (United Nations Environment Program)/GRID, UNISDR (United Nations Office for Disaster Risk Reduction)
http://preview.grid.unep.ch/

- Disaster site of occurrence on entire world are mapped.
- The map shows hotspots of disasters.

✓ Desinventar Disaster Information Management System; UNISDR, GAR
http://www.desinventar.net/

- Risk map of states or provinces
- Indonesia, Vietnam, and Lao PDR are included from Southeast Asia

References:

1) Economy and Environment Program for Southeast Asia (EEPSEA) (2009): "Climate Change Vulnerability Mapping for Southeast Asia", p. 19

3.7 Predominant Natural Hazards

The natural disaster records that affected to the country are classified based on the impacts and frequency of occurrence. The results are plotted on the impacts - frequency matrix and the prevailing hazards are studied.

3.7.1 Employed Data

The disaster records compiled in the Appendix A3 are employed in the study. The records for recent 30 years, namely from 1983 to 2012, are used because the number of the events included in the database before 1980 is significantly smaller than after 1980. The records of large disaster by earthquake, tsunami and volcano eruption before 1983 are also used because the frequencies of occurrence of these hazards are significantly low than flood, cyclone and landslide.

3.7.2 Study Method

The "Damage Amount / GDP" and 'Number of Death" are used as the index to show the impacts of the disaster considering that 6 natural hazards are studied and compared. At the beginning of the study, only "Damage Amount / GDP" was use as the index because the results may be used for Area BCP planning, however, the scarcity of the information relating damage amount became clear with the progress of the study. As the information of "Number of Death" is rich compared to the damage amount, "Number of Death" is added as the index of impact.

The process of the study is as follows;

1) Each disaster is classified following the rank in Table 3.7.1 based on the Damage Amount / GDP or Number of Death,
2) The number of disaster event is added by country, type of hazard and disaster rank, and classified following Table 3.7.2,
3) The above information is plotted on the impacts - frequency matrix by country,
4) As for the earthquake, tsunami and volcanic hazards, if the events of same or larger disaster rank occurred before 1983 compared to the maximum disaster rank between 1983 to 2012 period, a point is plotted corresponding disaster rank and frequency rank (=1) on the matrix.

Table 3.7.1 Disaster Rank and Damage

Disaster Rank	Damage Amount / GDP[1]	Number of Death
5	1.0% -	10,001 -
4	0.1% - 1.0%	1,001 - 10,000
3	0.01% - 0.1%	101 - 1,000
2	0.001% - 0.01%	11 - 100

[1] Gross domestic product based on purchasing-power-parity (PPP) valuation of country GDP, International Monetary Fund, World Economic Outlook Database, October 2012

1	- 0.001%	- 10

Table 3.7.2 Frequency Rank and Number of Events

Frequency Rank	Number of Events from 1983 to 2012	Average Frequency (Events / Year)
5	7 or more	1/5 -
4	4 to 6	1/10 - 1/5
3	2 to 3	1/15 - 1/10
2	1	1/30
1	Large Events occurred before 1983	-

3.7.3 Study Results

The following results are based on the available existing information. Not all the information relating the impacts by the disaster was collected, and the purpose of this study is not intended to evaluate the precise damage amount or number of death. The purpose of this study is to show the order of impacts by 6 natural hazards.

The impact of cyclone is the largest in view of death and flood is the next. The impacts of cyclone and flood are same in view of damage amount.

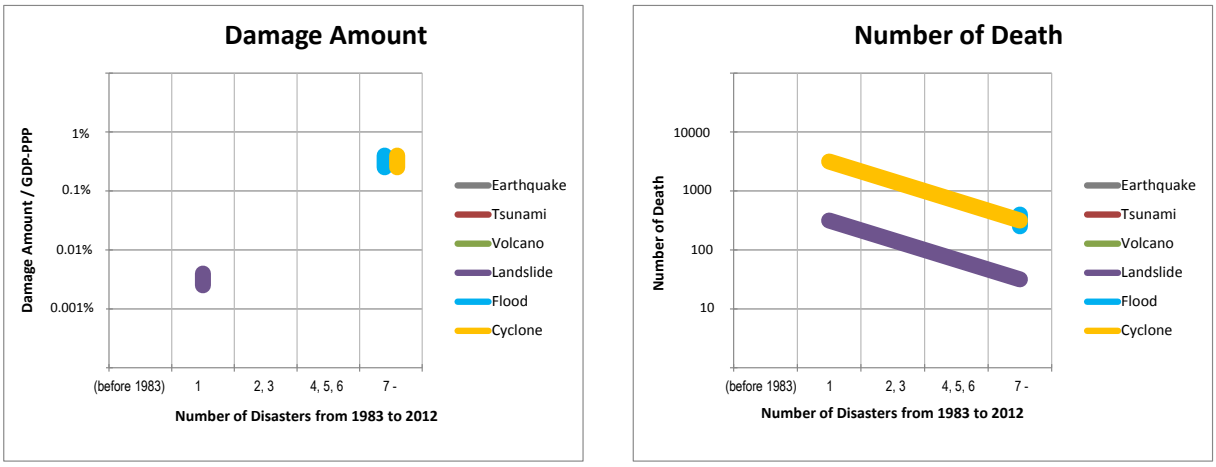


Figure 3.7.1 Impact of hazards in Vietnam

3.8 Existing Investigations and Studies

3.8.1 Methods and Scope of the Survey

This section reviews studies and research that have been conducted in the ASEAN region with a focus on natural hazards, risks, and vulnerability assessments. The target hazards are: floods, earthquakes, volcanoes, tsunamis, cyclones (typhoons)/meteorological disasters, and landslides. Information and study reports were reviewed from those that are available for the public and on the

internet. The purpose of this section is to first gain an overview of the existing study results regarding hazard trends, encountering risks, and degrees of vulnerability throughout the entire ASEAN region as well as in each ASEAN member state. Another purpose it to produce a compilation of assessment reports of the region, which will be accessible as a reference for those who wish to plan an Area BCP.

Table 3.8.1 Methodology of Information Collection and Scope of Survey

Information Collected	Methodology	Scope of Survey
Existing studies and research	To collect existing studies and reports from public sources including the internet.	To summarize the studied hazards, areas, contents of hazard and risk analysis, vulnerability assessment of existing studies, and other research.

3.8.2 Outline of Collected Information and Data

Table 3.8.2 shows the outline of collected information and data. Summaries of existing studies and reports are compiled as data sheets in Appendix A4.

Table 3.8.2 Outline of the Collected Information and Data

Appendix A4 Subsection	Hazards	Outline
A4.1	Flood	Flood hazard, risk assessments, hazard maps, and vulnerability assessment have been conducted in ASEAN countries using data on rainfall, inundation areas, affected population, and monetary assessment. Hazard maps were produced with GIS tools. The usage of GIS tools for assessments is widely recognized and its usage has been explored to produce hazard maps. Some runoff analyses were conducted for selected areas. Limited information and data available for Brunei Darussalam.
A4.2	Earthquake	Many of the earthquake hazard studies in the area are probabilistic seismic hazard analyses (PSHA), not scenario earthquake studies. This is to quantify the probability of exceeding a specific ground-motion level at a site given all possible earthquakes. This methodology is descended from the Global Seismic Hazard Assessment Program (GSHAP). GSHAP was launched in 1992 by the International Lithosphere Program (ILP) with the support of the International Council of Scientific Unions (ICSU), and endorsed as a demonstration program in the framework of the United Nations International Decade for Natural Disaster Reduction (UN/IDNDR). Earthquakes are not equally distributed around the globe because of the generating mechanism. In the ASEAN region, many earthquakes are observed in and around Indonesia and Philippines, which are located in the convergent boundary (subduction) zone and fewer earthquakes are observed in and around Myanmar, which is in the transform boundary zone. There are fewer or no earthquakes observed in other regions. However, some regions are sometimes affected by the earthquakes which occur in neighboring countries. The northern regions of ASEAN countries are sometimes

		affected by the earthquakes that occur in the Yunnan province of China. A number of investigations and studies reflect this trend.
A4.3	Tsunami	There are only few investigations and studies about tsunami hazard or risk in the region, and most of them are compilations of past disasters. There is no probabilistic study as there is for earthquakes. There is a hazard map that encompasses several tsunami scenarios. There are studies targeting the Asia-Pacific area because tsunamis propagate in the sea. Large-sized tsunamis are caused by major earthquakes in the ocean. This is the reason that tsunamis are also not equally distributed around the globe. However, tsunamis affect a wider area than the ground-motion of earthquakes, as seen in the tsunami caused by the Sumatra earthquake on December 26th in 2004. Thus, tsunamis are sometimes studied in countries with few or no earthquakes.
A4.4	Volcano	Most volcanoes are also located along the convergent boundary (subduction) zone. This is the reason why volcanoes are also not equally distributed around the globe. Disasters caused by volcanic eruptions are lava flow, pyroclastic flow, lahar, and ash fall. Ash is scattered widely via the prevailing westerlies, but the other disaster types do not have an extensive reach. Regarding volcanic hazard, many investigations and studies are a compilation of areas affected by lava flow, pyroclastic flow, lahar, and ash fall from past volcanic eruptions for each volcano.
A4.5	Cyclone	Research on cyclone and meteorological hazard, and risk assessments have been conducted in ASEAN countries using data on tracks, damaged areas, and storm rainfall. The impact of climate change is also included in this research. Limited information and data available for Brunei Darussalam and Singapore.

3.8.3 Summary of Survey

(1) Floods

Some useful studies on flood hazard, risk, and vulnerability are publicly available presenting assessment results, case studies of countermeasures, as well as different methodological approaches. There are a few types of methodologies to assess risks and vulnerability including, for example, risks involving exposure to flooding events and population density. Vulnerability can be defined as a function of exposure, adaptive or coping capacity, and land-use etc. There are slightly different combinations of these factors with different studies for use. Therefore, these concepts must be defined in advance to plan a methodology for an assessment, in terms of which definitions are to be used in a certain analysis.

A summary of existing studies and reports is shown in Table 3.8.3 by country. A list of collected existing studies and reports is shown in Table 3.8.4.

Table 3.8.3 Summary of Existing Studies and Reports by Country: Flood

Country/Region	Summary of Existing Studies and Reports
ASEAN	There are a few reports that study natural disasters for ASEAN and the Pacific regions at large in recent years. Disaster risks are assessed by scenario, exposure, vulnerability, damage, and loss. An assessment framework is also sought to give an overview of risks, hazard and vulnerability.
Vietnam	A relatively large number of studies and assessments are publicly available for Vietnam. Hazard and risk assessments are conducted using MIKE11 for the Hoang Long River basin. Simulations of the magnitude of floods are conducted for 5, 10, 20, 50, 100, and 200 year return periods. For the Thach Han River basin, an analysis was also made using hydraulic models with MIKE and socioeconomic data. This combination of statistical analysis and social surveys made flood vulnerability assessment possible.

Table 3.8.4 Existing Studies and Research: Flood

No	Country	Province/ City	Coordinates		Risk Assessment		Vulnera-bility Assess-ment	Organiza tion Produced	Document No. in Appendix A4.1
			Latitude	Longitude	Area	Popu-lation			
1	ASEAN	-	-	-	○	○	×	UNISDR/ WB	FL_001
2	Vietnam	Ho Chi Minh	10.90074	106.6328	○	○	×	ADB	FL_002
3	Vietnam	Hanoi	21.03612	105.8498	○	○	×	ADB	FL_002
4	Vietnam	Quang Tri	16.68356	107.0074	○	×	○	Hanoi Univ. Vietnam Univ.	FL_022
5	Vietnam	Nihn Binh	20.25898	105.9741	○	○	○	Nakhon Pathom Rajabhat Univ.	FL_021

Note: ○ indicates the existence of information. ×indicates that information was not found in public resources.

(2) Earthquakes

Useful information and studies on earthquake hazard, risk, and vulnerability were collected from resources available in the public domain including websites. The information and studies include methodologies with analysis and assessment.

There is no standardized or authorized methodology for risk and vulnerability assessment. Therefore, the methodology should be selected or updated in accordance with the purpose when risk and vulnerability assessments are required.

A summary of existing studies and reports is shown in Table 3.8.5 by country. A list of collected existing studies and reports is shown in Table 3.8.6.

Table 3.8.5 Summary of Existing Studies and Reports by Country: Earthquake

Country/Region	Summary of Existing Studies and Reports
ASEAN	There are natural hazard assessment reports for ASEAN region created by international organizations like World Bank etc. They summarize frequency, vulnerability, loss, and others subject for each disaster. Some reports describe the methodology and assessment points/items.
Vietnam	There is no record of earthquake disaster in Vietnam and no investigations or studies limited to this country and its regions is found.

Table 3.8.6 Existing Studies and Research: Earthquake

No	Country	Province/ City	Hazard Assessment			Risk Assessment		Vulnera-bility Assess-ment	Organi-zation Produced	Document No. in Appendix A4.2
			Scena rio	Probabi listic	Method ology	Human Loss	Econom ic Loss			
1	Worldwide	-	×	○	×	○	○	○	UNISDR	EQ_001
2	ASEAN	-	×	○	×	×	×	×	GSHAP, USGS	EQ_002
3	Vietnam	-	×	○	×	○	×	×	OCHA-ROAP	EQ_025

(3) Tsunamis

Useful information and studies on tsunami hazard, risk, and vulnerability were collected from resources available in the public domain including websites. The information and studies include methodologies with analysis and assessment.

There is no standardized or authorized methodology for risk and vulnerability assessment. Therefore, methodology should be selected or updated in accordance with the purpose when risk and vulnerability assessment are required.

A summary of existing studies and reports is shown in Table 3.8.7 by country. A list of collected existing studies and reports is shown in Table 3.8.8.

Table 3.8.7 Summary of Existing Studies and Reports by Country: Tsunami

Country/Region	Summary of Existing Studies and Reports
ASEAN	Tsunami induced by the Sumatra earthquake on December 26, 2004 caused major damage to ASEAN countries. The disaster is summarized by organizations like ADB.
Vietnam	There is no record of tsunami disaster in Vietnam and no investigations or studies limited to this country and its regions were found.

Table 3.8.8 Existing Studies and Research: Tsunami

No	Country	Province/ City	Hazard Assessment			Risk Assessment		Vulnera-bility Assess-ment	Organi-zation Produced	Document No. in Appendix A4.3
			track record	Scena rio	Metho dology	Human Loss	Economic Loss			
1	ASEAN	-	○	×	×	○	○	×	ADB	TN_002

(4) Volcanoes

Useful information and studies on volcanic hazard, risk, and vulnerability were collected from resources available in the public domain including websites. The information and studies include methodologies for analysis and assessment.

There is no standardized or authorized methodology for risk and vulnerability assessment. Therefore, methodology should be selected or updated in accordance with the purpose when risk and vulnerability assessment are required.

A summary of existing studies and reports is shown in Table 3.8.9 by country. A list of collected existing studies and reports is shown in Table 3.8.10.

Table 3.8.9 Summary of Existing Studies and Reports by Country: Volcano

Country/Region	Summary of Existing Studies and Reports
ASEAN	UNOCHA summarized the scale of the explosion of volcanoes around the Asia-Pacific region using the Volcanic Explosivity Index (VEI).
Vietnam	There is no record of volcanic disaster in Vietnam and no investigations or studies limited to this country and its regions were found.

Table 3.8.10 Existing Studies and Research: Volcano

No	Country	Province/ City	Hazard Assessment			Risk Assessment		Vulnera-bility Assess-ment	Organi-zation Produced	Document No. in Appendix A4.4
			Track record	Scena rio	Metho dology	Human Loss	Economic Loss			
1	ASEAN Asia-Pacific	-	○	×	×	×	×	×	OCHA -ROAP	VE_001

(5) Cyclone (Typhoon) and Meteorological Hazard

"Cyclone" is a term to describe many types of of low pressure systems, of which tropical cyclones/typhoons are the main types creating disasters in the ASEAN region. Under the framework of WMO, leading countries implement monitoring/detection of tropical cyclones on a regional basis. Table 3.8.11 indicates the responsible territory allocated to ASEAN members and its leading country.

Table 3.8.11 Members of WMO Tropical Cyclone Committee

	Warning Zones	Members（ASEAN）	Leading Country
Western North Pacific Ocean and South China Sea	0° - 60°(N) 0° - 100°(E)	Cambodia, Lao PDR, Malaysia, Philippines, Singapore, Thailand, Vietnam	Japan
Bay of Bengal and the Arabian Sea	5°S - 45°(N) 30°E - 90°(E)	Myanmar, Thailand	India
South Pacific and South-East Indian Ocean	0°-50°(S) 90° - 170°(E)	Indonesia	Fiji

The dates and information utilized in this report have been acquired from various reports on the studies and research conducted on tropical cyclones and meteorological hazards published on the internet. Collected documents include evaluation results of hazards/risks, as well as their evaluation methods. With regard to tropical cyclones/typhoons, a meteorological organization of each country compiles a summary on the damage situation, including the number of casualties or loss of human lives, and the estimated amount of damage, etc.

A summary of existing studies and reports is shown in Table 3.8.12 by country. A list of collected existing studies and reports is shown in Table 3.8.13.

Table 3.8.12 Summary of Existing Studies and Reports by Country:

Cyclone and Meteorological Hazard

Country/Region	Summary of Existing Studies and Reports
ASEAN	Study reports on natural disasters in the whole ASEAN region are available.
Vietnam	Vietnam comes second in terms of the occurrence of large storms after the Philippines. The National Strategy of Natural Disaster Prevention and the Action & Adoption Plan for Natural Disaster by 2020 were approved in November 2007. Development of financial solutions (including insurance) for disaster risks has been recommended.

Table 3.8.13 Existing Studies and Research: Cyclone and Meteorological Hazard

No	Country	Province/ City	Coordinates		Risk Assessment		Vulnera-bility Assess-ment	Organiza tion Produced	Document No. in Appendix A4.5
			Latitude	Longitude	Area	Popu-lation			
1	Vietnam							ADPC	CM_001
2	Vietnam							ADPC	CM_002
3	Vietnam	ThuaThien Hue	21.03612	105.8498	×	×	×	ADPC	CM_007
4	Vietnam	Quang Tri	16.68356	107.0074	×	×	×	ADB	CM_007
5	Vietnam	Quang Nam	21.03612	105.8498	×	×	×	WB	CM_007

(6) Landslides

A summary of existing studies and reports is shown in Table 3.8.14 by country. A list of collected existing studies and reports is shown in Table 3.8.15.

Table 3.8.14 Summary of Existing Studies and Reports by Country: Landslide

Country/Region	Summary of Existing Studies and Reports
ASEAN	There have been a few reports that study landslides for ASEAN and the Pacific region at large in recent years. Disaster risks are assessed by scenario, exposure, vulnerability, damage, and loss. An assessment framework is also sought to give an overview of risks, hazard, and vulnerability.
Vietnam	High levels of hazard are distributed in the northern and central areas. The frequency of landslides, number of deaths, and economic losses are ranked third in ASEAN. Exposure is widely distributed in the northern mountain area near the border with Laos and the coastal area in the central region. Although many mitigating activities in the damaged regions have been conducted by ADB and other donors, preparedness for hazards, such as mapping or risk assessment, has not yet been developed. A project for an early warning system was conducted in pilot regions, but is not currently functioning. Several projects for early warning systems, landslide hazard analysis, and management for landslide risk are on-going.

Table 3.8.15 Existing Studies and Research: Landslide

No	Country	Province/ City	Coordinate		Risk Assessment		Vulnera-bility Assess-ment	Organization Produced	Document No. in Appendix A4.6
			Latitude	Longitude	Area	Popu-lation			
1	ASEAN				○	○	×	UNISDR/World Bank	LS-006
2	ASEAN				○	○	×	EEPSEA	LS-013
3	Vietnam	Entire Country	21.085	105.856	×	×	○	UNISDR	LS-008
4	Vietnam	Entire Country	21.085	105.856	×	○	×	ADB	LS-010
5	Vietnam	Yen Bai	21.974	104.562	×	×	×	ADB	LS-011
6	Vietnam	QuangNgai	15.327	108.787	×	×	×	JICA	LS-012
7	World				○	○	○	WB	LS-007

Indicates Capital

References:

Flood

1) Arief Anshory Yusuf & Herminia Francisco (2009). Climate Change Vulnerability Mapping for Southeast Asia, Singapore: EEPSEA

2) Asian Disaster Preparedness Center (2011) Program for Hydro-Meteorological Disaster Mitigation in Secondary Cities in Asia (PROMISE) 2005 to 2010: Bangkok
3) ĐangĐinhKha et al (2010) Flood Vulnerability Assessment of Downstream Area in Thach Han River Basin, Quang Tri Province: Hanoi University of Science, Vietnam National University, Hanoi
4) Royal Haskoning, Deltares, Unesco-IHE. (2009) Flood Risk Management in the Border Zone between Cambodia and Vietnam: The Mekong River Commission Secretariat
5) Shigenobu Tanaka et al (2010). Progress Report on Flood Hazard Mapping in Asian Countries. PWRI.
6) TawatchaiTingsanchali (2010) Flood Hazard and Risk Assessment of Hoang Long River Basin, MIKE by DHI
7) Velasquez, Jerry et al (ed.) (2012). Reducing vulnerability and exposure to disasters: Asia-Pacific disaster report 2012, ESCAP/UNISDR AP
8) World Bank (2011). Advancing Disaster Risk Financing and Insurance in ASEAN Countries: Framework and Options for Implementation, Washington: Global Facility for Disaster Reduction and Recovery
9) World Bank, UNISDR (2010). Synthesis Report on Ten ASEAN Countries Disaster Risks Assessment.

Earthquake

1) OCHA-ROAP (2011). VIET NAM: Natural Hazard Risks
2) USGS (2009). Seismic Hazard of Western Indonesia

Tsunami

1) ADB (2005). From Disaster to Reconstruction: A Report on ADB's Response to the Asian Tsunami

Volcano

1) OCHA -ROAP (2011). Holocene Eruption and Selected Volcanoes in Asia-Pacific

Cyclone (Typhoon) and Meteorological Hazard

1) ESCAP/WMO Typhoon Committee. (http://www.typhooncommittee.org/)
2) WMO National Meteorological or Hydrometeorological Services of Members (http://www.wmo.int/pages/members/members_en.html)
3) WMO (2010). First Meeting of the Task Team on "Meteorological, Hydrological and Climate Services for Improved Humanitarian Planning and Response", WMO Headquarters, Geneva, Switzerland (31 August - 2 September, 2010)

Landslide

1) World Bank, UNISDR (2010). Synthesis Report on Ten ASEAN Countries Disaster Risks Assessment

2) World Bank, UNISDR (2011). Disaster Risk Management Programs for Priority Countries- 2nd edition

Chapter 4 Industrial Agglomerated Areas and Investment Risk

4.1 Historical Evolution of Industrial Agglomerated Areas

From the 1950s to the 1970s, Vietnam had a limited base for industry due to the economic system in place under French colonial rule and the impact of the Vietnam War. Though the US pursued industrial development in the south, particularly around Ho Chi Minh City, this was discontinued following reunification and the reintroduction of a centrally planned economy.

It was not until the late 1980s that significant development of industrial parks was pursued in Vietnam. 1986 saw the launch of 'doi moi' or 'renovation' measures, including, in 1987, the liberalization its FDI laws to permit foreign investment. Early foreign investors included Taiwan, Japan and Korea. Following the 1987 reforms, a rapid influx of foreign investment into industrial parks occurred. This often outpaced infrastructural investment, and unreliable power supplies, transport facilities, and telecommunications networks limited the ability of foreign investors to capitalize on opportunities. Legal constraints and bureaucratic obstacles also played a role. In addition, this influx was dependent on international market forces. For example, FDI fell from USD 8.3 billion in 1996 to USD 1.4 billion in 1999 following a downturn in the Asian markets. When this happened, industrial parks faced reduced demand, and the government was forced to take an increased role in subsidizing industrial park development.

Industrial parks have traditionally been located near to major urban centers such as Ho Chi Minh City and Hanoi. However, following the 1997 rural unrest in Thai Binh province the government has made an effort to encourage industrial parks in different areas of the country to spread economic growth. There are now 51 industrial parks in the Northern Economic Zone, and more than 300 across the whole country, housing more than 3,600 foreign investment projects. Foreign manufacturing investment is dominated by Asian firms. As of February 2012, 80% of projects and 85% of capital came from Chinese or Southeast Asian investors.

While privately-owned parks have increased, some of the structures of the centrally managed economy seen prior to 1987 have been maintained. The majority of industrial parks retain strong links with the Vietnamese government. These ties take a number of different forms. Parks are often developed by government ministries, such as the Department of Human Settlement and Housing Development, of the Ministry of Construction, or the Vietnam Chamber of Commerce and Industry, or joint stock companies where the government owns a stake. In addition, local People's Committees (local government committees) often hold a stake in the management of the parks through state-owned enterprises.

Since 2000, the Vietnamese government has sought to increase 'hi-tech' capacity industrial parks within Vietnam. There is a high-tech park in Hanoi, Ho Chi Minh City and Da Nang. Traditionally, industrial parks in Vietnam have focused on light industry and manufacturing such as garment, footwear and electrical goods. While several companies such as Canon have implemented state of

the art technology in their factories, hi-tech industrial parks have generally suffered from a lack of demand, such as in the case of Hao Lac Hi-tech Park.

4.2 Recent Trends and Japanese Investment

Japan was one of the early foreign investors in Vietnam following the relaxation of FDI laws in the late 1980s. Early major Japanese investors included Honda and Yamaha, both of which still have major assembly facilities in Vietnam. Other Japanese firms with a large presence include Canon, Daiwa and Denso. Some industrial parks, such as Long Duc, specifically target Japanese investors. Japanese firms have also been instrumental in developing industrial parks in Vietnam. In 1997, Sumitomo Corporation completed the development of its first industrial park, Thang Long Industrial Park, hear Hanoi. It completed a second park, Thang Long Industrial Park II, in 2009.

The Japanese government has also sought to promote Japanese investment in Vietnamese industrial parks. For example, the Japanese government has promoted infrastructure development by funding projects such as the East-West Economic Corridor, allowing for easier access from Da Nang to Myanmar, Thailand, Laos and Vietnam.

4.3 Observations from Data Collection

Development levels of parks in Vietnam vary significantly, with many catering to domestic firms and lacking capacity to communicate with foreign investors. Individual parks in Vietnam often have websites, either in their own right or in the form of pages on the website of the development company. While the industrial park's primary websites are often in Vietnamese, most have an English version, those these often contain less information. Detailed information on these websites is generally limited. Further information is available on central portals, especially the Vietnam Industrial Parks Information Portal (VIIPIP). However, this information often contradicts information from park websites and other portals, suggesting frequent inaccuracies. Further, information on park/developer websites and central portals is often out of date. Central government information on parks lacks detail, and is sometimes inconsistent or out of date. As such, reliable, up to date information can only be obtained directly from park operators.

4.4 General Investment Risk

(1) Political Risk

Vietnam enjoys a high degree of political stability, as a result of the uncontested dominance of the Communist Party of Vietnam (CPV). The apex of political power the CPV is the 15-member Politburo and the 150-member Central Committee, which represent the principal policy-making organs of the state. Broad policy is in theory set every five years at the party congresses. A National Assembly of 498 members is elected popularly every five years. Although this assembly traditionally does not hold real power, it is gaining momentum as a public forum and non-party members are

increasingly allowed to contest local constituencies. These bodies are divided between the 'reformist' and 'conservative' factions of the CPV.

Reformist Prime Minister Nguyen Tan Dung was re-elected in July 2011 and is regarded as the head of Vietnam's new generation of leaders. However, President Truong Tan Sang and the CPV's Secretary General Nguyen Phu Trong are opposed to Dung. A source in Vietnam reports that the Politburo held a secret meeting in June 2012 in which both the President and the Secretary General voted to remove Dung. Dung retained his position because of his support amongst other Politburo members and Deputy Prime Minister Nguyen Xuan Phuc. In October 2012, the Central Committee held a two-week meeting to assess Prime Dung's progress on the back of the economy's poor performance, but he retained his position again. Despite the fractious leadership, it is unlikely that the Dung will be removed in the next year as he has enough support in the Politburo and the CPV to hold power. Moreover, the CPV does not favor unscheduled leadership change as it would disrupt unity within the Party.

We assess that the current policy of gradually opening up the economy while maintaining one-party authority will continue to benchmark political governance in Vietnam. The CPV hopes that by securing continuing economic growth it will be able to satisfy the social and material needs of its people, thereby quelling discontent and demands for greater political and social freedoms. The government is likely to continue its focus on attracting FDI, most of which comes from within Asia. The government is likely to continue with privatization plans for state-owned firms but there are likely to be far fewer privatization projects in the next three years as the CPV deliberates such moves much more thoroughly. In the unlikely event that Dung is removed, we would not expect any policy changes.

There is no indication at present that the government will adopt a multi-party system of governance. The CPV is credited with improving living standards and establishing internal security. Opposition parties are illegal and wield limited support; most pro-democracy groups have been established by the Vietnamese diaspora who pose little challenge to the CPV.

(2) Economic Risk

Vietnam has made considerable developmental strides over the past decade, thanks primarily to a multifold expansion in external trade following entry into the World Trade Organization (WTO) in 2007. Unfortunately, the reform drive has slowed in recent years, with headlines grabbed by far more negative trends such as high inflation, external imbalances, and banking sector troubles. Lack of transparency about the performance of both state-owned companies and the banking sector hinders analysis and hints to considerable hidden risks.

Vietnam has been struggling with serious macroeconomic imbalances for the past few years and the road ahead remains difficult. While some risks have diminished, others have come to the fore. Inflation has eased markedly and the trade deficit has turned to a surplus in 2012, helping rebuild the foreign-exchange reserve cushion. But non-performing loans in the banking sector have risen to

almost 9.0% of the total and there have been persistent fears of a systemic crisis. Meanwhile, foreign direct investment remains sluggish, partly due to the slow recovery in global foreign direct investment flows, but even more importantly due to Vietnam's own problems, which have diverted potential funds elsewhere. Positively, the government has laid out a plan to more directly address banking-sector woes, including the creation of a new agency to handle bad debts. Resolving these problems will take years, however. Meanwhile, in the context of persistently weak external demand, and tight macroeconomic policies domestically, growth will remain sluggish. We anticipate the economy to only gain 5.2% in 2013, little better than the 2012 5.0% expansion. Performance should pick up more noticeably in 2014, but even then growth is expected to remain below the 6.0% mark.

Longer-term issues relate to the state's still-significant economic presence and its dominance of the financial sector, which undermines bank lending profitability, crowds out private investment, and undermines the health of the entire financial sector. Infrastructure development has not kept up with economic growth, leading to costly bottlenecks and pushing operating costs higher than in other countries in Asia. Electricity production, as well as port capacity, must expand quickly and substantially to keep up with booming demand. If this is not done, the country's hopes of becoming a regional manufacturing powerhouse may be stalled. The education system is also in dire need of business-oriented reforms to address skilled-labor shortages that are increasingly becoming a top investor concern. In addition, reform of state-owned enterprises remains inhibited by concerns over associated socioeconomic dislocations and their impact on the legitimacy of the Communist Party.

(3) Legal Risk

Vietnam's legal system is based on civil law, communist legal theory and the French civilian law system. The current constitution of Vietnam was adopted in 1992, and has only been amended once in 2001. Vietnam is currently in process of amending the constitution, and the revised constitution is expected to come into effect in 2014.

The legal system in Vietnam is evolving quickly from a base of limited experience with commercial law. Two key pieces of legislation, namely the Investment Law (IL) and the Enterprise Law (EL), were introduced in 2006, harmonizing the legal framework for business and investment. Under these laws, several types of business entities are possible: a wholly foreign-owned enterprise (either a limited-liability company or a shareholding company); a joint venture with Vietnamese investors; a contractual business co-operation arrangement; foreign contractor; a branch of an overseas company; or a representative office. It takes an average of 10 procedures and 34 days to establish a business in Vietnam.

A new law on commercial arbitration was passed by the National Assembly in June 2010 and came into effect in January 2011, replacing the previous 2003 law on commercial arbitration. The new law provides for extended scope of arbitration, applying for disputes arising from any commercial activities, as well as for increased flexibility in terms of governing law and the language of arbitration. While the law is expected to encourage the use of the country's arbitration system, it is

still advisable to try resolving business disputes through negotiation in the first instance. If that fails, then arbitration will become necessary. Where investors are free to choose the forum for resolving disputes, it is important that contracts provide for suitable arbitration. Foreign investors will frequently deal with the Vietnam International Arbitration Centre (VIAC). The VIAC has jurisdiction over disputes arising from international economic relations. The VIAC has powers to enforce its awards. Vietnam is also party to the Convention on the Recognition and Enforcement of Foreign Arbitral Awards (New York, 1958).

While there has been progress with passing laws, implementation of the legal and judicial reforms has been frustrated by a traditionally opaque bureaucracy, endemic corruption and political interference. The key outstanding problem for investors in Vietnam, however, remains the gap between the existing laws and their enforcement and the difficulty in forecasting how government bureaucrats or judges will interpret and apply laws. Patience and negotiation are required to navigate the regulatory framework successfully.

(4) Tax Risk

The tax system in Vietnam is in a state of flux; its structure is complicated, lacks transparency and is subject to sporadic changes. Over the past few years, Vietnam has however made consistent efforts to improve its tax performance and reduced corporate tax rates, in the government's bid to modernize the tax system, to bring it more into line with its regional neighbors, and to satisfy criteria for Vietnam's entry to regional and international bodies, including the WTO in 2007. However, the number of changes—not to mention the lack of clarity in their application—has been a source of frustration for foreign investors. Foreign businesses are sometimes accused of tax-dodging, although this is due to the complex nature of the system than deliberate avoidance.

The standard corporate income tax rate stands at 25%. Vietnam has endorsed nearly 60 double-taxation agreements that may reduce the rates further or eliminate them altogether. The corporate tax rate for enterprises operating in the oil and gas industry vary between 32% and 50%, depending on the project, while preferential tax rates of either 10% or 20% are available for encouraged projects for specific periods. Profits earned within Vietnam and either transferred abroad or retained offshore are subject to a withholding tax. The tax is calculated on 3% of transferred profits for investors who contribute at least USD 10 million to the legal capital of an enterprise, 5% of transferred profits for legal capital of between USD 5 million and USD 10 million, and 7% for those contributing less than USD 5 million.

In May 2011, Prime Minister Nguyen Tan Dung approved a new tax reform strategy for 2011–2020 under which Hanoi will be gradually reducing corporate income tax. The proposed changes include: 30% corporate income reduction for small and medium-sized enterprises; income tax exemption for individuals earning the bottom level of the tax ladder; and tax exemption for stock dividends. The new strategy includes plans for simplification of tax procedures and putting in place tax policies that will spur investment particularly into supporting industries and the production of high value-added

products. The strategy also envisages an increase in domestic tax revenues up to 70% of the state budget by 2015.

(5) War Risk

Vietnam's principal adversary in the region has been China, with whom it fought a brief war in 1979. The primary dispute between the two sides is their conflicting claims to the Spratly and Paracel Islands in the South China Sea. China seized control of the Paracel Islands from Vietnam in 1974, while Vietnam controls the majority of the atolls in the Spratlys. Vietnam is very unlikely to initiate a naval skirmish with China over the Paracel or Spratly Islands by force, as this would almost certainly provoke a strong Chinese retaliation.

In June 2012, the China National Offshore Oil Corporation (CNOOC) offered nine blocks within the disputed areas in Vietnam and China's '9 dotted line' claimant zone. Vietnam formally protested and declared the blocks 'illegal'. The nine blocks overlap with existing Vietnamese oil blocks, which were already awarded to foreign companies, including ExxonMobil, Talisman and Vietgazprom. This is likely to lead to confrontations, such as ramming or obstruction, between exploration vessels and drilling vessels contracted by either China or Vietnam and their paramilitary escorts.

In November 2012, China's Hainan province, which contains the disputed South China Sea claimant area, amended its laws to allow maritime security forces (although not the Navy) the right to 'board, inspect, detain, eject, order a halt, a change of course, and to return course' any vessels deemed illegally infringing on the waters. The new law increases war risks in the South China Sea, but is only an incremental step by the Chinese rather than a significant escalation. Further escalation depends on the movement of CNOOC deep drilling vessels and the increased deployment of marine paramilitary vessels by the Chinese. However, it should be noted that both countries said in September 2012 that they would seek to solve the dispute through negotiation and dialogue.

(6) Terrorism Risk

Opposition groups are banned in Vietnam so most opposition and anti-Communist groups are headquartered outside the country, though they do not seriously threaten the government. Based in California, the 'Government of Free Vietnam' (GFVN) is a group of South Vietnamese anti-Communist former soldiers and bureaucrats. It has been implicated in attempted bombings in Vietnam and on Vietnamese government facilities elsewhere in Southeast Asia. The most serious attempted attack by GFVN activists was in June 2001, when four members of the group threw an IED over the wall of the Vietnamese Embassy in Bangkok. However, GFVN activists are unlikely to be able to raise funds or access more sophisticated explosives to stage attacks in Vietnam.

Organized crime syndicates pose moderate extortion risks to businesses in major cities, including Ho Chi Minh City, Hanoi, Haiphong and Danang. In March 2013, police arrested a gang that extorted money from bus operators and their employees in Ho Chi Minh City. In June 2012, a gang member was convicted of threatening to kill a banker if he did not pay him USD 47,800 in Hanoi. Extortion

gangs are likely to target employees of companies that do not comply with their demands in knife attacks.

There is an elevated risk of pirates stealing goods from anchored vessels off Vietnam's extensive coastline stretching along the South China Sea. Most incidents involve robbery and minor theft, mainly while ships were berthed at anchorages. There were only four such incidents in 2012 compared to eight in 2011. In February 2013, attackers boarded and stole stores from a container ship at anchor at Haiphong Anchorage before escaping. In November 2012, robbers boarded a chemical tanker and stole a fire wire at Nha Be Terminal in Ho Chi Minh City Port.

(7) Civil Unrest Risk

The fact that the Communist party retains tight control and faces few organized challenges has resulted in a low risk of large-scale political unrest. Where unrest does occur, it is likely to be localized and will most probably not affect foreigners. The government has traditionally maintained a long-standing policy of zero tolerance towards political dissent. Despite this, protests over land disputes are a moderate risk, but are now more likely to turn violent as protesters are increasingly using petrol bombs and throwing rocks during demonstrations. These are likely to take place in rural areas such as Ha Tinh province, where in August 2012 hundreds of villagers attacked and vandalized a government office in response to the arrest of a villager who resisted a land seizure. However, such protests will probably last for only a matter of hours as the government will probably use force to disperse crowds. In December 2012, rice farmers, protesting against land grabs, threw stones at police forcing them to disperse.

Disputes between Vietnam and China over a maritime boundary dispute in the South China Sea will probably lead to protests in Hanoi and Ho Chi Minh City, especially around the Chinese Embassy. In December 2012, 20 protesters staged an anti-China rally in Hanoi outside the Chinese Embassy. In March 2013, around 20 protesters rallied in Hanoi to mark the anniversary of a naval battle with China. The risk to Chinese visitors is low, although some Chinese businesses in Hanoi and Ho Chi Minh City face moderate property risks during such protests.

Strikes tend to rise whenever inflation increases in Vietnam, as workers on relatively low wages have little ability to absorb increased living costs. Strikes are generally organized unofficially, given state control of unions. The state-controlled Vietnam General Confederation of Labor (VGCL) is the only legal union and all other unions are legally required to be VGCL affiliates. Moreover, in February 2008, the government enacted a decree that enables the prime minister to postpone or cancel strikes under a broad range of circumstances. Strikes are typically contained within a single factory and rarely turn violent. The government is likely to use force to end violent strikes. The actual number strikes are likely to be under-reported. Industrial action primarily affects foreign firms in low-end manufacturing such as garment factories, as they pay much lower salaries compared to state-owned enterprises. In January 2013, 2,000 workers at a Japanese-owned Nissey Vietnam

factory went on strike to demand a higher yearly bonus in Ho Chi Minh. The risk of strikes has been reduced by the January 2013 increase in minimum wage.

(8) Infrastructure Risk

Vietnam's infrastructure is generally poor, but improving. The government is aware that the state of the country's infrastructure is impeding foreign investment, so resources are being targeted towards numerous development projects. Project implementation, however, delays have hindered the progress. Approximately 9% to 10% of the country's GDP is directed into infrastructure development and the state budget for transport infrastructure development projects is set to increase by 15% annually. In addition, government bonds and official development assistance are used as main capital sources for infrastructure development. The government is also keen to increase the private sector's investment in infrastructure development.

Air: Vietnam has three main airports handling 45 domestic and foreign airlines operating 55 international and 40 domestic routes: Hanoi (Noi Bai), Ho Chi Minh City (Tan Son Nhat), and Da Nang. The aviation sector has experienced significant growth in recent years, fuelled by the country's growing middle-class and an influx of foreign investment amid rapid growth. In 2009, Vietnam's airports handled over 26 million passengers and 445,800 tonnes of cargo, four times more than in 2000. The country's air-passenger traffic is forecast to increase between 12% and 14% to 85 million by 2020.

Road: There is a dense road network in Vietnam, but the infrastructure is itself very poor, with only 20% of the country's estimated 200,000km road network sealed. Secondary roads become virtually impassable in the rainy season and many rivers can only be crossed by ferry. Although 40% of freight traffic travels by road, this tends to be for short journeys only. The country's long lack of decent north-south road links particularly hinders economic growth. In recent years the Vietnamese government has invested heavily in upgrading and expanding the country's road network. In addition, the construction of bridges in the Mekong Delta, the upgrade of roads towards the Cambodian border, and, most importantly, the enhancement of Highway 1 – the main north-south road – will lead to improvements in the longer term. The government has said it plans to spend an estimated USD14 billion between 2010 and 2015 on 2,160km of new highway projects and major upgrades of existing roads. Toll-road concessions and build-operate-transfer (BOT) deals are also under consideration for the private sector and foreign investors.

Rail: The railway system, although 2,600km in length, is more suited for leisurely exploration than efficient transport. Trains are old and very slow, plying six main routes: Hanoi-Ho Chi Minh City, Hanoi-Haiphong, Hanoi-Muc Quan, Hanoi-Thanh Hoa, Hanoi-Lao Cai and Dong Anh-Thai Nguyen. In recent years, upgrade and expansion of the national rail network has been high on the government agenda. Upgrade plans involve renovating the main Hanoi-Ho Chi Minh City service, expanding the current network to include the isolated Central Highlands and Mekong Delta regions and

construction of a rail link between Ho Chi Minh City and Phnom Penh, the final stretch of a planned rail link between Singapore and Kunming, China.

Maritime: Vietnam has 90 ports, the most important of them being at Hai Phong (in the northern part of the country), Ho Chi Minh City and Da Nang, which are run by the state-owned Vietnam National Shipping Lines (VINALINES). There are also five special ports for the shipment of oil and coal only. In 2009 Vietnam's ports handled more than five million 20-foot equivalent (TEU) container units. Port expansion has not kept up with increases in trade volume and congestion is an acute problem in the ports that are characterized by antiquated equipment and limited storage space. There are plans to invest more than USD10 billion in building new ports or expanding existing facilities in the decade up to 2020. How realistic this program is will depend on the government's ability to control inflation and modernize and reform other key sectors of the economy.

Waterways: The country has over 17,000km of waterways, more than 5,000km of which are navigable at all times. Waterways have traditionally played an important role in the transportation of people and goods, and their usage is again increasing, although poor maintenance has had a negative impact on their operation.

Communications: Since Vietnam's accession to the WTO in early 2007, the telecom sector has been expanding fast and considerable progress has been made. By late 2010, Vietnam's General Statistics Office (GSO) reported that the country had 144.4 million telephone subscribers, a year-on-year (y/y) increase of 5.4%, of whom 34.5 million are mobile phone users. The total number of telephone users was 83.8 million (including 72.1 million mobile users) by late 2010. These figures point to the high level of access to multiple systems by a significant percentage of the population, and the maturity of the market. According to the GSO, more than 3.6 million people are internet users, a 20.7% y/y increase on the same 10-month period in 2009.

Utilities: While electricity output is rising, the authorities continue to struggle to match fast-growing demand for power, not least because much of the country's energy supply is exported. As a result, power cuts are frequent, and large parts of the country remain beyond the reach of the national grid. The government has recognized the need to boost foreign investment in the sector to increase capacity, diversify the country's reliance on hydropower, and counter a potential impending supply crisis. There are also serious problems with the quality of water. It therefore comes as little surprise that waterborne diseases are a significant health problem, accounting for between 20% and 30% of child mortalities. The government has, however, approved a plan to provide all urban centers with access to clean water supplies by 2020.

4.5 Industrial Agglomerated Areas and Natural Disaster Risk

Several distribution maps are shown overlaying natural disaster risk as follows. List of industrial agglomerated areas are attached at the end of this report.

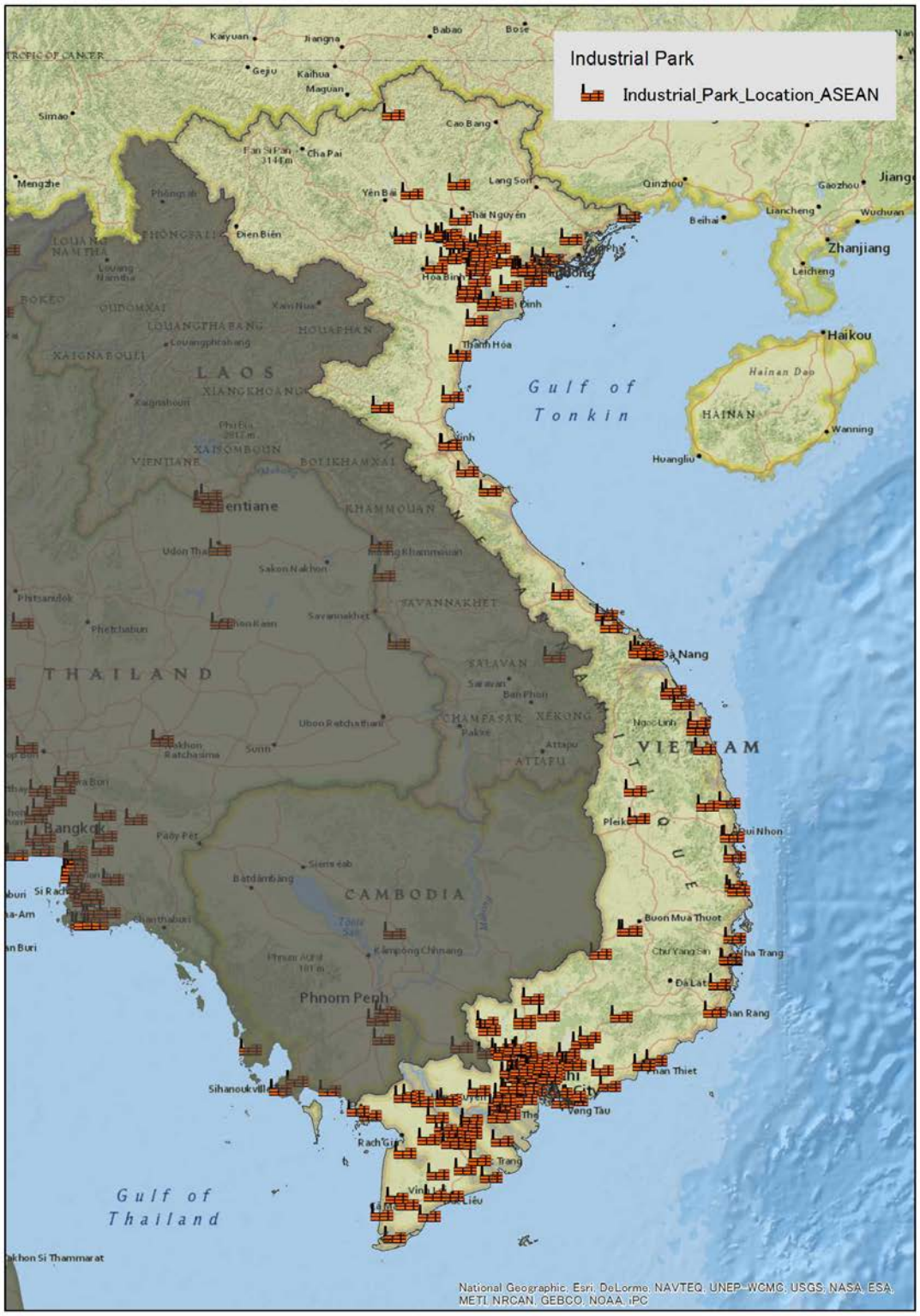


Figure 4.5.1 Distribution of Industrial Park in the Vietnam

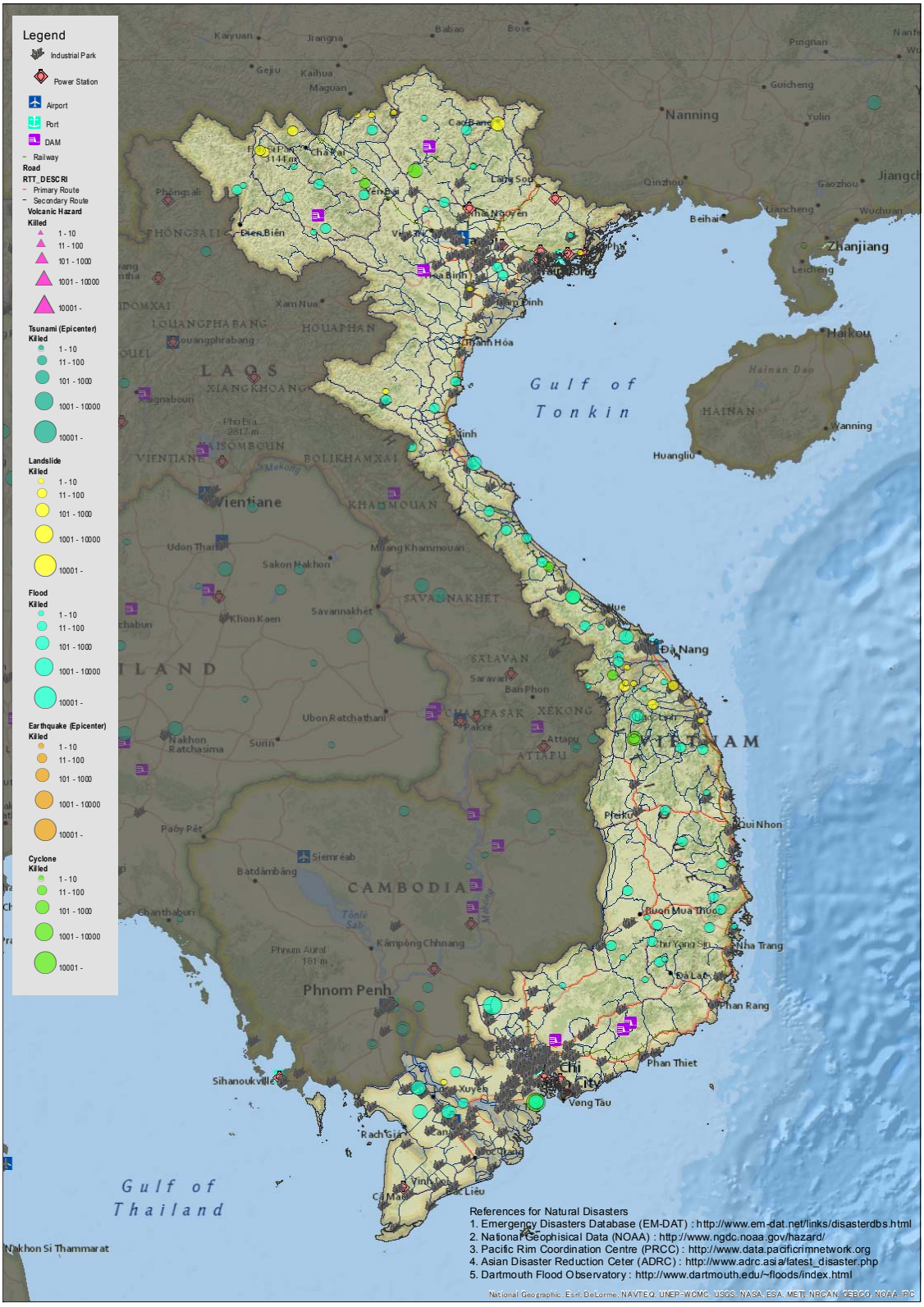


Figure 4.5.2 Distribution of Industrial Park, Major Infrastructures and Natural Hazards on number of killed in the Vietnam

Figure 4.5.3 Distribution of Industrial Park, Major Infrastructures and Natural Hazards on number of killed in and around Haiphong

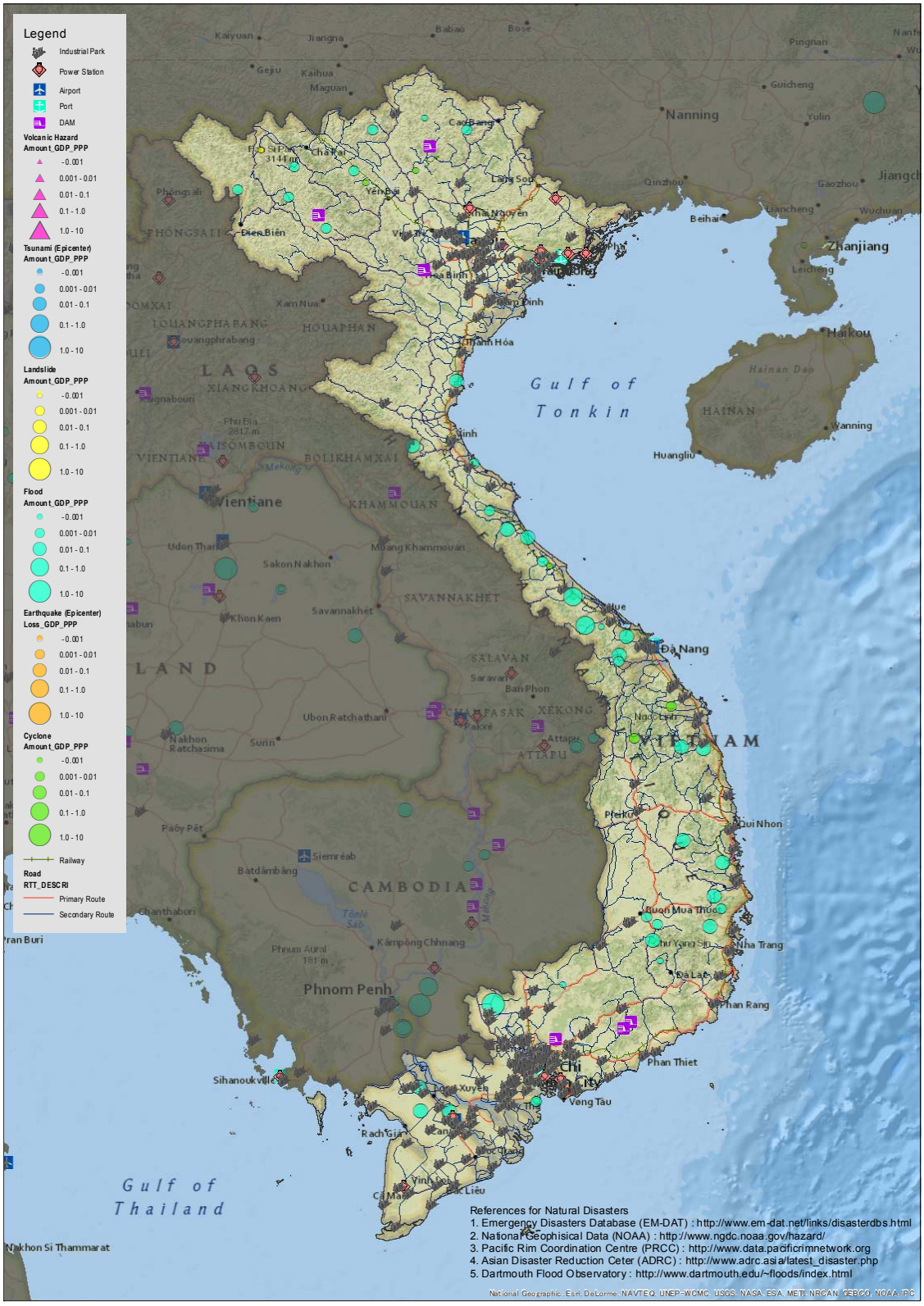


Figure 4.5.4 Distribution of Industrial Park, Major Infrastructures and Natural Hazards on loss rate to GDP in the Vietnam

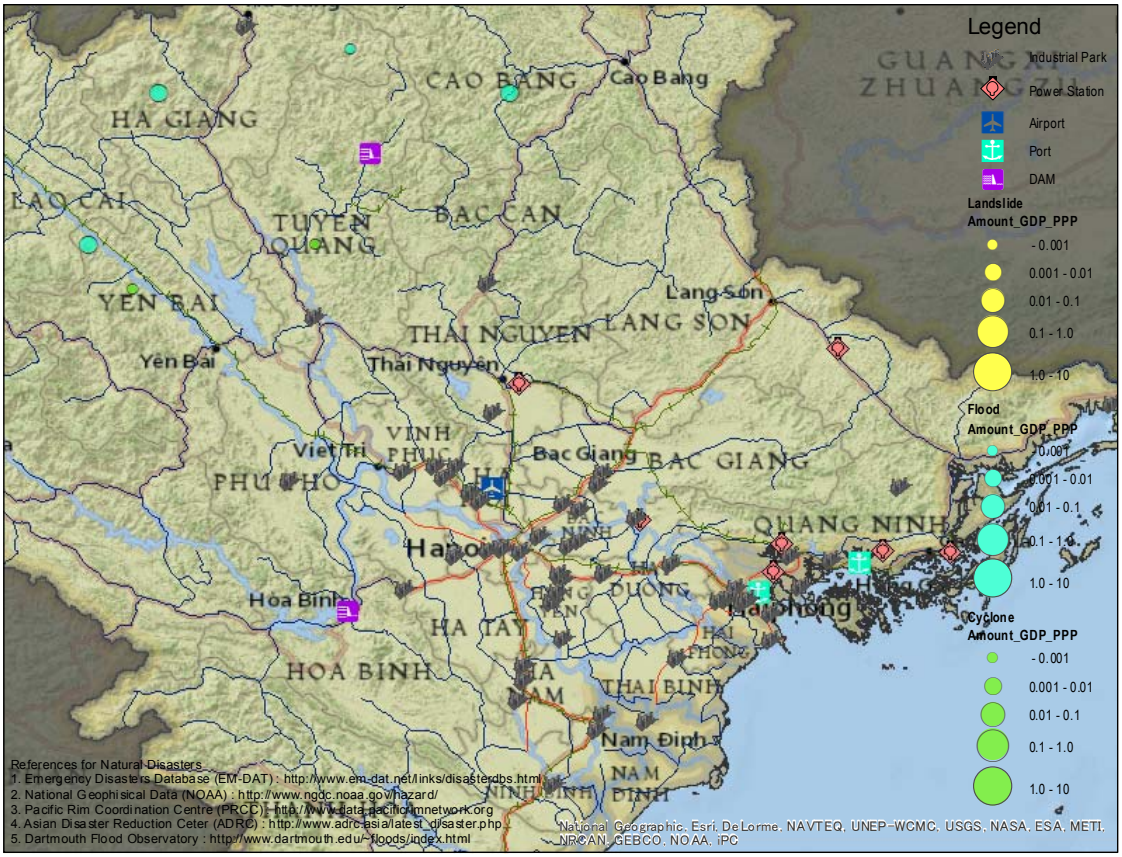


Figure 4.5.5 Distribution of Industrial Park, Major Infrastructures and Natural Hazards on loss rate to GDP in and around Haiphong

Chapter 5 Relevant Infrastructure and Natural Disaster Issues

5.1 Infrastructure Conditions

5.1.1 Roads

In Vietnam, the main trunk roads are national road route No. 1 connecting Hanoi and Ho Chi Minh, national road route No.5 connecting Hanoi and Haiphong, and national road route No. 18 connecting Hanoi and Cai Rang Bay, etc. The total length of national roads, provincial roads, and district roads is 251,787 km, of which 39,972 km (16%) is asphalt concrete paved road. The status of road development is shown as follows.

Table 5.1.1 Road Development Status in 2006

Classification	Extension (km)	Type of Pavement- (km)				
		Asphalt	Concrete	Low-cost	Gravel, Earth	Others
National	17,295	7,750	344	6,447	2,854	-
Provincial	23,138	3,474	701	11,030	7,889	44
District	54,962	1,762	2,581	10,992	112,158	3,601
Village	141,442	1,616	18,442	9,226	112,158	-
Urban	8,536	2,465	776	2,750	2,544	-
Others	6,414	-	160.4	547	5,393	-
Total	251,787	16,967	23,005	40,992	166,834	3,644

Source: Ministry of Economy, Trade and Industry, Vietnam Highway Management and Maintenance Project Finding Study Report 2010

Vehicle ownership of Vietnam in 2007 was 539,000, which is 0.8 vehicle per 100 persons. This is the lowest level in Asia. Although the length of the developed expressway is about 70 km (2008), 20 new routes have been planned for development by 2020, increasing its length to 5,900 km, according to the Expressway Development Plan by MOT, which was submitted to the Prime Minister in November 2007.

The Ministry of Transportation (MOT) is formulating a traffic infrastructure development plan and standards, etc.

5.1.2 Ports

There are many ports along the long coast line from north to south. According to the Vietnam Seaports Association, 54% of the cargo of the 54 ports in 2009 was handled, with 9% in the central area and 37% in the northern area. It is said that the center of port transportation is divided into the north and the south. As for container cargo, 65% is handled in the southern area, 3% in the central area, and the remaining 33% in the northern area.

Table 5.1.2 Cargo handled in Major Ports in Vietnam in 2009

Port		Cargo Throughput		Container Throughput		Ship Calls
		thousand tons	share (%)	thousand tons	share (%)	
Northern Part		63,752	37	1,762,627	33	10,089
	Hai Phong	14,370	8	816,000	15	4,779
	Dinh Vu	3,254	2	359,000	7	402
	Cai Rang	4,736	3	185,235	3	464
Central Part		14,994	9	142,229	3	8,804
	Qui Nohon	3,856	2	54,649	1	1,510
	Da Nang	3,132	2	69,720	1	1,800
	Nha Trang	1,334	1	3,942	0	688
Southern Part		93,382	54	3,494,246	65	13,128
	Saigon New	33,000	19	2,460,000	46	2,319
	Saigon	14,008	8	378,226	7	1,721
	Ben Bghe	4,354	3	140,922	3	870
	Phu Mi	3,133	2	-	-	412
	Dong Nai	2,366	1	-	-	741
Total		172,128	100	5,399,102	100	32,021

Source: JBIC, Investment Environment in Vietnam 2012.8

Saigon Port is a group of 24 ports located along the Saigon River. Although the Saigon Port handles ample cargo and containers, since they are all river ports, only ships below the 30,000-ton class are able to enter the ports.

Currently aiming to become an international gateway, the development of the Cai Mep /Thi Vai International Port along the Thi Vai River has been started.

5.1.3 Railways

The railway of Vietnam is runs from the northern to southern areas, with the total length of the railway at about 2,600 km.

Table 5.1.3 Outline of Main Routes of Vietnam Railway

Main Route	Extension (km)	Gauge (mm)
Hanoi~Ho Chi Minh	1,726	1,000
Hanoi~Hai Phong	102	1,000
Hanoi~Lao Cai	296	1,000
Hanoi~Dong Dang	162	1,435, 1,000
Hanoi~Quang Chau	75	1,435, 1,000
Kep~Uon Bi~Ha Long	106	1,435
Kep~Luu Xa	57	1,435

Source: Maeda Masayoshi, Transportation Condition of Vietnam (Okayama Prefecture, Vietnam Business Support Desk)

The railway is not yet electrified, and railroad tracks, roadbeds, signals, and communication facilities, etc. have become antiquated. Work to replace the aging 44 bridges has just been completed with assistance from Japan.

5.1.4 Airports

In Vietnam there are 21 commercial airports, of which the three (3) international airports are: Noi Bai International Airport (Hanoi City of the northern part), Tansonnhat International Airport (Ho Chi Minh City of the southern part), and Da Nang International Airport (Da Nang City of the central part). At these airports, 99% of the air cargo and about 89% of the plane passengers are transported in Vietnam (as of 2007).

Table 5.1.4 International Airports in Vietnam

International Airport	Airport Type	Operator	Location	Runways
Noi Bai	Joint military/civilian use	ACV	Hanoi City	3,800m×45m 3,800m×45m
Da Nang	Public (Joint use with military)	ACV	Da Nang City	3,048m×45m 3,048m×45m
Tansonnhat	Commercial	ACV	Ho Chi Minh City	3,048m×45m 3,800m×45m

Source: Wikipedia, List of airports in Vietnam

In regard to passenger transportation, of the three (3) international airports, the annual average growth rate from 2004 to 2008 was 20%, and improving the facilities in order to adapt to rapid passenger growth is an issue.

The government is rushing to develop domestic airports and unify the three (3) airport companies (companies for the northern, central and southern regions) into the Airport Corporation of Vietnam (ACV) in 2012.

The purpose is to attain the smooth execution of development plans for new airport construction and also to promote the efficient management of 21 airports across the country.

5.2 Public Services

5.2.1 Electricity

The capacity of electric power generation equipment was 26,836 MW in 2012, and electric power generation was 120,210 GWh in 2012.

Table 5.2.1 Power Supply Composition Rate 2012

Item	Power Generation Equipment Capacity	Power Generation Achievement
	26,836 MW	120,210 GWh
Hydro	48.3 %	43.9 %
Gas	26.5 %	34.2 %
Coal	17.7 %	18.9 %
Import	3.7 %	2.2 %
Oil	1.9 %	0.1 %
Other	1.9 %	0.7 %

Source: JETRO, Vietnam Electricity Survey 2013

In Vietnam, electricity is supplied through the local power distribution companies under the EVN. There are five (5) power distribution companies: the northern part (NPC), the central part (CPC), the southern part (SPC), Hanoi City (HANOI), and Ho Chi Minh City (HCMC). There are also power distribution companies under each of the five power distribution company depending on the area (province and district).

At NPC or SPC, power distribution to various industries is about 60%, and at Hanoi power, power distribution to the civilian field is about 55%. For all of Vietnam, power distribution to the industrial field is over 50%.

5.2.2 Water

(1) Water supply

Although the institution responsible for the water supply is the Ministry of Construction, water supply services for village where the service population is less than 5,000 are under the jurisdiction of the Ministry of Agriculture and Rural Development.

There are 78 water supply operations in 61 provinces and direct control cities throughout the country. They are composed of the northern part (41), the central part (12), and the southern part (25). It is said that the rate of non-revenue water is 30%.

The categories of the water supply operations for the urban areas in Vietnam are as follows.

Table 5.2.2 Category of the Urban Area

City Category	Urban Form	Population (thousands)	City
Special City	Big City	1,500 or more	Hanoi, Ho Chi Minh
Category I	Province City	500-1,500	Hai Phong, Da Nang, Can Tho
Category II	Local City	250-500	Hue, Nha Trang, and other 10 cities
Category III	District City	100-250	16 cities
Category IV	LGU	50-100	58 LGUs

Category V	LGU	4-50	612 LGUs

Source: Ministry of Health, Labor and Welfare, International Water Promotion Report 2009

Table 5.2.3 Outline of the Water Projects of Major Cities in Vietnam 2007

Indicator	Hanoi	Ho Chi Minh	Hue	Hai Phong	Whole Country
Management	Public Corporation	Public Corporation	Public Corporation	Public Corporation	-
Head	Ground water	River, ground water	River	River	-
Water Supply Area Population	3,007,000	5,630,192	1,118,612	829,000	About 83 million people (2004)
Water Service Diffusion Rate	70.0	63.0	37.0	44.3	-
Water Supply Number	257,915	393,269	45,467	165,000	-
Rate for receiving continuous water supply (%)	80.0	100.0	100.0	20	-
Amount of Production Clean Water / Water Supply (million m^3/year)	139.51	344.77	20.25	36	-
Water Consumption per Person (litters/ day)	71.2	119.6	80.1	-	-
Non-revue Water (%)	44.0	39.0	21.0	22	36.8

Source: Ministry of Health, Labor and Welfare, International Water Promotion Report 2008

(2) Sewerage

In Vietnam, industrialization due to economic advancement and the concentration of populations in urban area is ongoing. Industrial waste and domestic waste are discharged directly into the rivers because of a combined drainage system and insufficient sewerage system.

Although it is reported that about 1,100 km of sewer pipeline has already been installed, the sewerage service rate is low at 18%. The sewer system developed during the French colonial period is still used.

During rainstorms, urban areas are inundated because of faulty drainage capacities.

Table 5.2.4 Sewage-treatment Plants in Vietnam

Province/City	Sewage-treatment Plant	Disposal Capacity (m^3/day)
Hanoi City	Truc Bac	2,300
	Kim Lien	3,700
	North Thang Long	38,000
Quang Ninh Province / Ha Long City	Bai Chay	3,500
	Hon Gai	7,000
Danang City	Hai Chau	89,200
	Thanh Khe	
	Son Tra	
	Ngu Hanh Son	

Lam Dong Province/Da Lat City	Da Lat	7,400
Dak Lak Province/Buong Ma Thuot City	Buon Ma Thuot	7,000
Ho Chi Minh City	Binh Hung Hoa	30,000
	Binh Hung	141,000

Source: Nippon Koei and Yachiyo Engineering, The Study on Urban Environmental Management in Vietnam, Progress Report (2) 2011

5.2.3 Communications

(1) Summary

In Vietnam, six (6) companies are have entered the fixed communication market and provide Internet services including fixed-line telephone services and IP phone lines.

Table 5.2.5 Fixed Communication Enterprises of Vietnam

System	Company Name
Postal administration communication system	Vietnam Post & Telecommunications (VNPT)
National Ministry of Defense System	Vietnam Telephone. (Viettel)
National Power Corporation System	EVN Telecom
Government Joint Venture (JV)	Saigon Postel (SPT)
	Hanoi Telecom
Private Sector System	FPT Telecom

Source: Hanoi Telecom 2007

The companies providing mobile phone service are the following six (6) companies.

Table 5.2.6 Companies for Mobile Phones in Vietnam

System	Company Name
VNPT System	VinaPhone : GSM/GPRS
	MobiFne : GSM/GPRS
Viettel System	Viettel Mobile: GSM/GPRS
EVN Telecom System	VP Telecom : CDMA2000 1x
Saigon Post System	S-Telecom (S-Fone) : CDMA2000 1x
Hanoi Telecom System	HT Mobile : CDMA2000 1x

Source: Hanoi Telecom 2007

(2) Internet and broadband

As of June 2011, about 29 million people throughout the country use the Internet. Most people use one of the 6,600 tele-centers and internet cafes located throughout the country. There are 3.84 million subscribers to broadband with a diffusion rate of 4.3%.

(3) Mobile phones

There are 127.32 million subscribers to mobile phone service as of 2011, and this number is increasing yearly with a diffusion rate is 143.4%, which has far exceeded one unit per person.

(4) Fixed-line phones

The diffusion rate for fixed-line telephones has dropped rapidly since its peak in 2009. There are 10.18 million subscribers to fixed-line phones with a diffusion rate of 11.5%.

(5) Broadcasting

Terrestrial broadcasting is performed by 61 local stations. These stations are operated and managed by VTV, which is headquartered in the capital, and also by the people's committees of ministries and centrally-controlled municipalities. VTV provides nationwide terrestrial broadcasts through four lines.

5.2.4 Waste

A regulation for hazardous waste management (Decision No.1555/1999-/QD TTg) was issued in 1999 to define hazardous materials. A directive for enhancing the management of solid waste in urban centers and industrial parks (Directive No.23/2005-/CT_TTG) was also issued in 2005 to define the roles of each organization and the target treatment levels.

However, although the treatment level of solid waste in the central areas of cities and industrial estates is improving, the collection of the solid waste is still about 70%, with a low level of collection capacity. Hazardous waste is partly disposed at landfill sites, but not using proper methods. Medical waste is dumped without treatment.

Table 5.2.7 Waste Generation in Vietnam

Classification	Source	Description	Amount Generated (10,000 tons/year)		
			City	Village	Total
Urban waste	Household, commerce, markets	Dust, plastic, paper, glass	640	640	1,280
Industrial Waste (non-toxic)	Industry	Metal, wood	174	77	251
Industrial Waste (toxic)	Industry	Fuel oil, discarded sludge, organic chemicals	12.6	0.2	12.8
Medical Waste	Hospitals	Blood, syringes, etc.	-	-	213
Total (Non-agricultural waste)			827	717	1,546
Agricultural waste	Cultivation, stock raising	Plant substance	N.A.	6,456	6,456

Source: Kajima Corporation, Vietnam, Study of 3R Promotion and Stabilizing treatment of Urban Waste 2008.3

5.3 Natural Disaster Issues

According to the World Bank, the disaster risks in Vietnam are evaluated as follows.

Table 5.3.1 Hazard Risks

High	Medium	Low
Flood	Hail rain / tornado	Earthquake
Typhoon	Drought	Accident (Technology)
Inundation	Landslide	Frost
	Flash flood	Damaging cold
	Deforestation	

Source: The World Bank, Vietnam, Increasing Resilience to natural Hazards and Climate Change

In Vietnam, floods occur in the rainy season (June to November) influenced by the tropical monsoons, and also during the typhoon season (September to October) in the northern and central part areas where typhoons land. Storm rainfalls in the upper basin of the Mekong cause flood disaster over wide areas in the Mekong delta.

If a large flood is caused by the Red River, it is assumed that the flood level will be 13.11 at Hanoi and will cause complete paralysis of the urban functions, in addition to inundating industrial estates and roads, etc. (Reference: Dr. Kuldeep Pareta, Flood Monitoring Simulation Model: A Case of Red river Delta, Vietnam)

Hai Phong and its surroundings have not suffered from floods, but inundation of 40 to 60 caused by storm waters. The industrial estates have not had a problem with floods because the base levels of industrial estates have been developed 1.5 m higher than the road. However the roads in the surrounding area will be inundated by storm waters. The Hai Hong area has also been affected by storm surges.

Flash floods have occurred at the foot of the hills of the west side in Vietnam. The industrial estates in Hai Phong will be affected by heavy rains and storm surges brought by typhoons. Moreover, they will also have a great impact on the trunk road running from the north to the south area of the country and local roads in the area around the industrial complex.

Tsunami is not included in the World Bank report. However, if an earthquake of M8.6 occurs in the Philippine Trench, waves of up to eight (8) to nine (9) m will roll onto the seashore in Vietnam, bringing serious damage to roads, buildings, industrial complexes, etc., according to researchers in Vietnam.

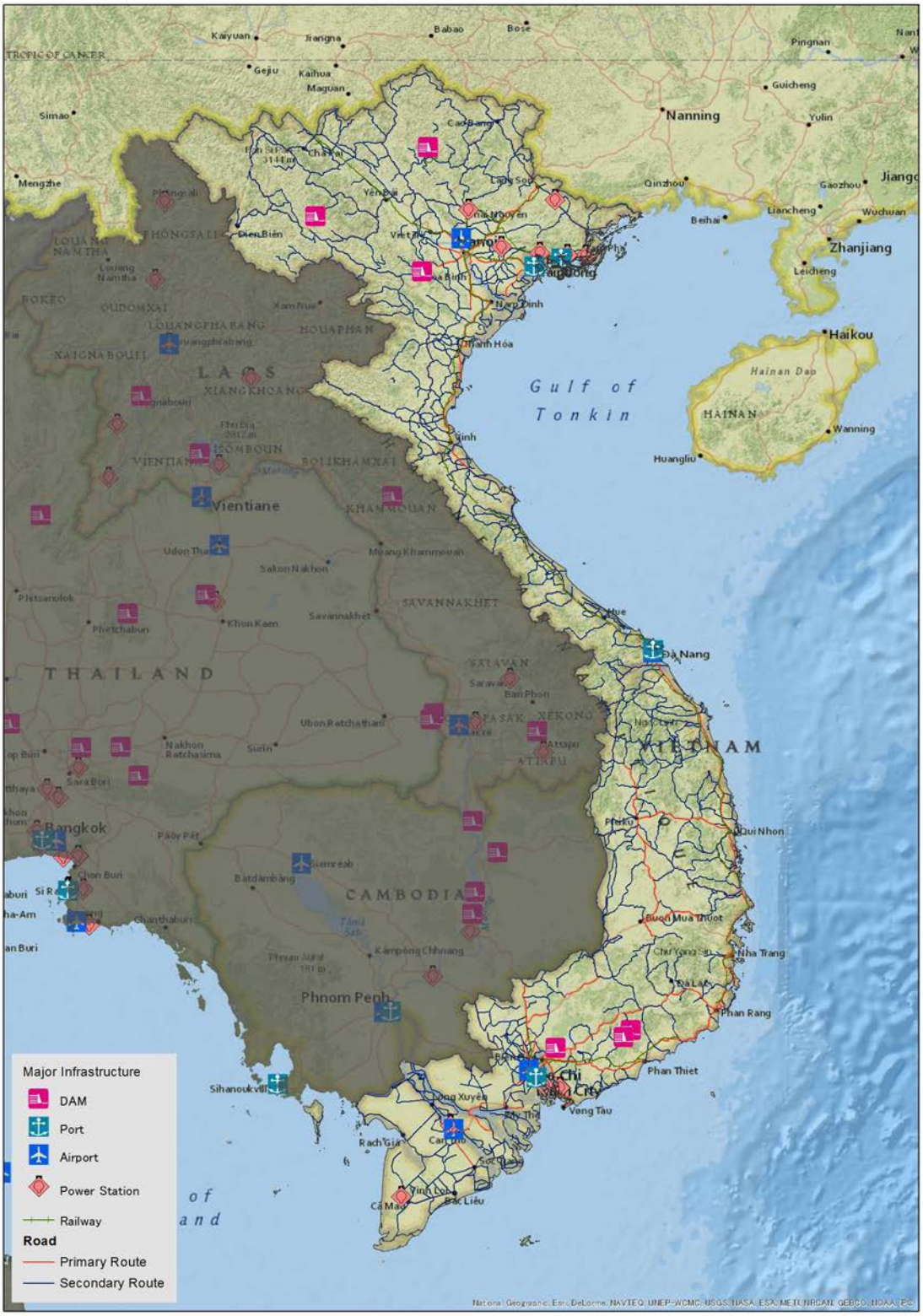


Figure 5.3.1 Major Infrastructures in Vietnam

Chapter 6 Economy, Industry, and Trade

In this survey, the general outline of economy and trade in Vietnam and the cases in which disaster impact analyses were conducted are examined. The purpose is to estimate the impact of a disaster on the economy of the nation and surrounding regions, in the event that an industrial agglomerated area in Vietnam is hit by a disaster.

The following topics were explored using existing data and information from sources such as the internet, research papers, reports, and other materials.

- Overview of the economy and industry of Vietnam
- Overview of trade in Vietnam

In order to understand the conditions of the economy and trade in Vietnam, relevant information was gathered/organized based on a review of reference materials listed below.

No.	Reference	Remarks
1	ASEAN-JAPAN CENTRE website http://www.asean.or.jp/	Statistical data on economy, industry and trade of ASEAN
2	JETRO 2009, "ASEAN Economic Community (in Japanese)"	Regional corporation framework in East Asia
3	ASEAN Stats database http://aseanstats.asean.org/	Trade values of ASEAN by commodity and partner country, etc.
4	ASEAN website (2013), "Key basic ASEAN indicators in 2011, Last update 14 January 2013"	Key basic indicators of ASEAN
5	International Monetary Fund, World Economic Outlook Database	Macroeconomic indicators of ASEAN
6	Industrial agglomerated areas in ASEAN, IHS	Detailed information on industrial agglomerated areas in ASEAN
7	Ministry of Foreign Affairs of Japan http://www.mofa.go.jp/index.html	Information on regional affairs etc.

6.1 Overview of the economy

The GDP of Vietnam is 122.7 billion USD (2011), and the GDP per capita is 1,374 USD (2011 (estimated figure)). While both the GDP and GDP per capita are significantly lower than the world average, the country has recently experienced rapid economic growth, and is attracting global attention.

The GDP per capita of Vietnam is only about a third of the average GDP per capita of the ASEAN average, which is 3,745USD (2012 (estimated figure)). However, the country's economic growth rate (18.5% (2011)) is slightly above the average of ASEAN (15.7% (2011)), and it is expected that the country's economy will grow at a rate similar to ASEAN in the future. Foreign direct investment in Vietnam accounts for 10% of the total foreign direct investment in ASEAN (2010).

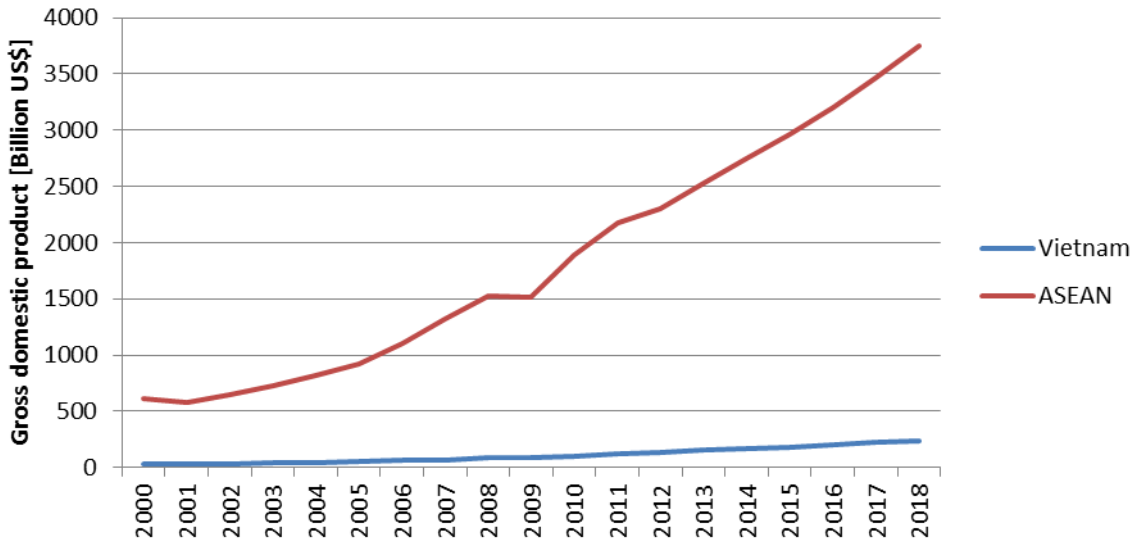
The unemployment rate has been decreasing steadily since 2000, and reached to 4.3% in 2010. It is estimated that the unemployment rate will remain in the low 4% range. (cf. The unemployment rate in Japan as of 2012 is 4.4%.)

As for industrial composition, the agriculture, forestry, and fisheries sector, mining sector, and the light industry sector are the main contributors to the country's economy.

Major industrial parks in Indonesia, in which many Japanese companies are operating, are summarized in the table below.

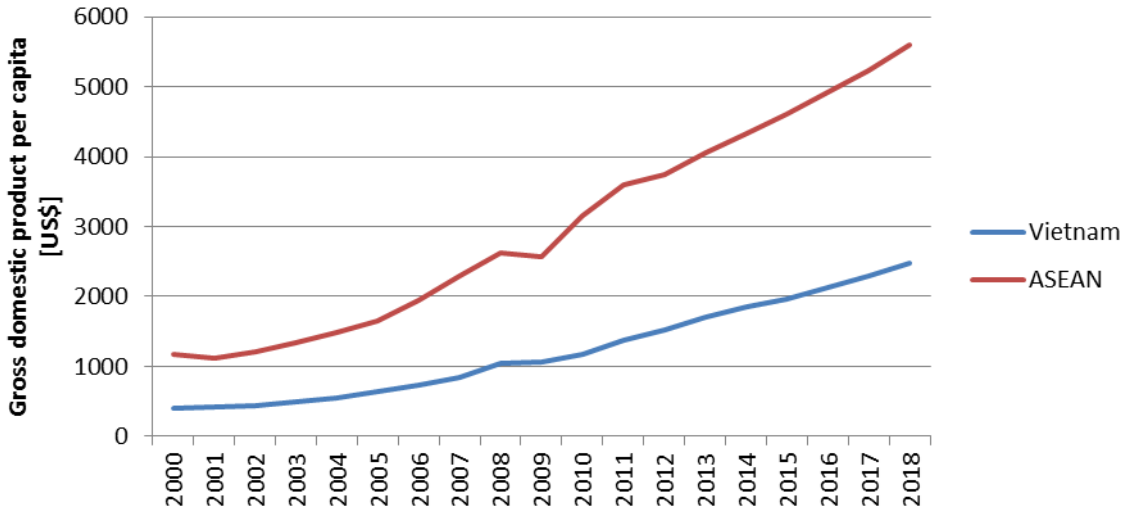
Name of Industrial Park	Number of Japanese companies operating	Description
Thang Long Industrial Park	52	Located 16 km from central Hanoi. More than 80% of the companies operating in the park are Japanese.
Tan Thuan EPZ	47	Located in Ho Chi Minh. It is a Taiwanese industrial park, but companies operating there are mostly Japanese.
Nomura-Haiphong Industrial Park	35	Located 20 km from Cat Ba Airport in Hai Phong and 15 km from Hai Phong port. 90% of the companies operating in the park are Japanese.
Long-Hau Industrial Park	23 (34)	Located 19 km south of Ho Chi Minh.
Amata Industrial Park	27 (37)	Located 30 km of Ho Chi Minh. Occupied mainly by companies engaged in auto-parts or metallic processing business, or electric/electronic products business.
Bau Bang Industrial Park	40	Located 65 km of Ho Chi Minh.
Vietnam-Singapore Industrial Park	83	Located 17 km north of Ho Chi Minh. Occupied mainly by companies engaged in electric/electronic products business.

Reference: The table was created based on information from ASEAN-Japan Centre (https://www.asean.or.jp/)
Note) Numbers shown in parentheses were obtained from resources provided by IHS.



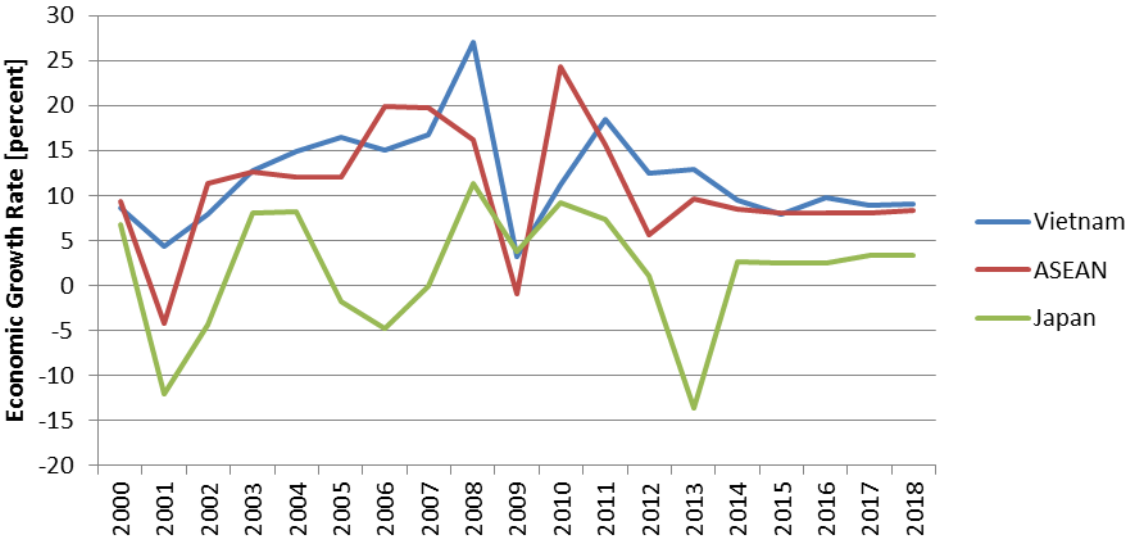
Source: International Monetary Fund, World Economic Outlook Database, April 2013

Figure 6.1.1 Gross Domestic Product in Vietnam, ASEAN countries and Japan (2000-2018), current prices (Estimation starting from 2012)



Source: International Monetary Fund, World Economic Outlook Database, April 2013

Figure 6.1.2 Gross Domestic Product per capita in Vietnam, ASEAN countries and Japan (2000-2018), current prices (Estimation in Vietnam starting from 2011; in ASEAN starting from 2007)



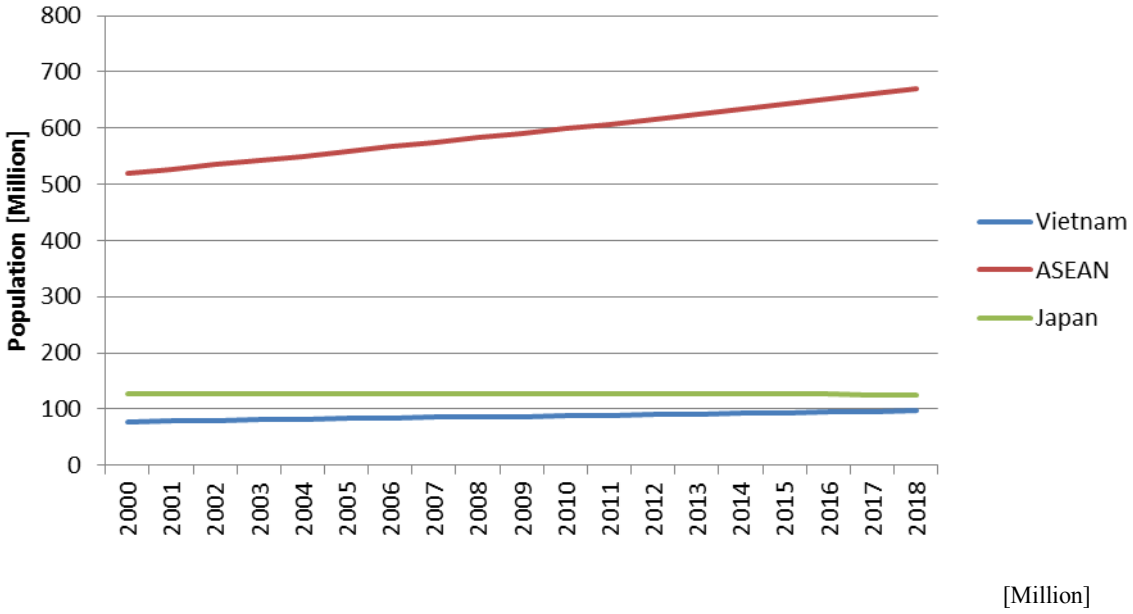
Source: International Monetary Fund, World Economic Outlook Database, April 2013

Figure 6.1.3 Economic Growth Rate in Vietnam, ASEAN countries and Japan (2000-2018), current prices (Estimation in Vietnam and ASEAN starting from 2012; in Japan starting from 2013)

Table 6.1.1 Average growth rate in Vietnam, ASEAN countries and Japan (2013-2017)

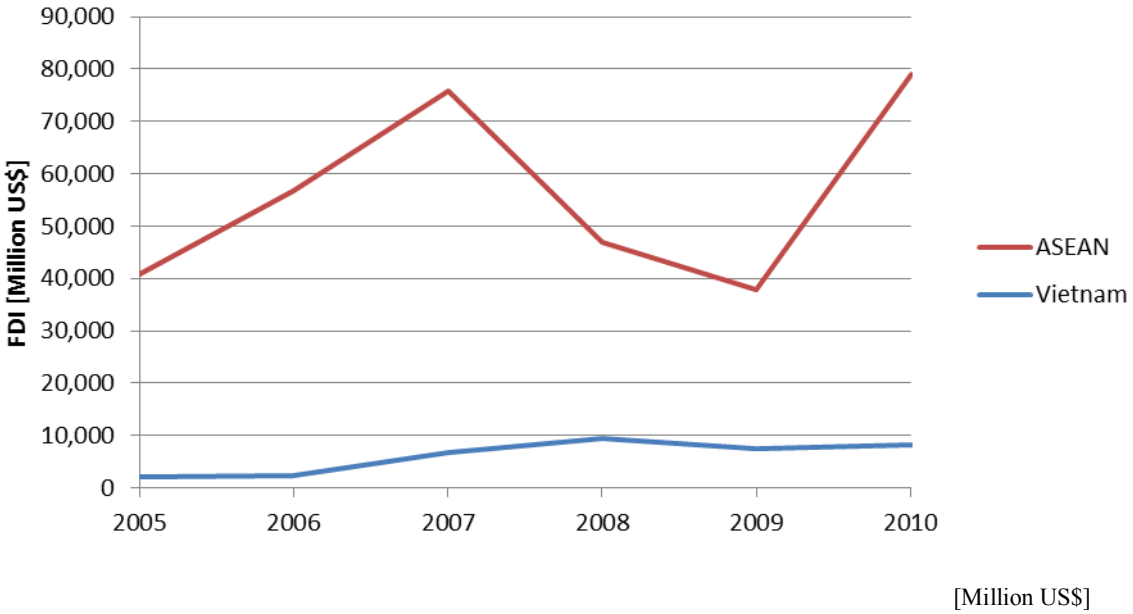
	Vietnam	ASEAN	Japan
Average growth rate (2013-2017) (%)	9.8	8.5	-0.53

Source: International Monetary Fund, World Economic Outlook Database, April 2013, calculated by MRI



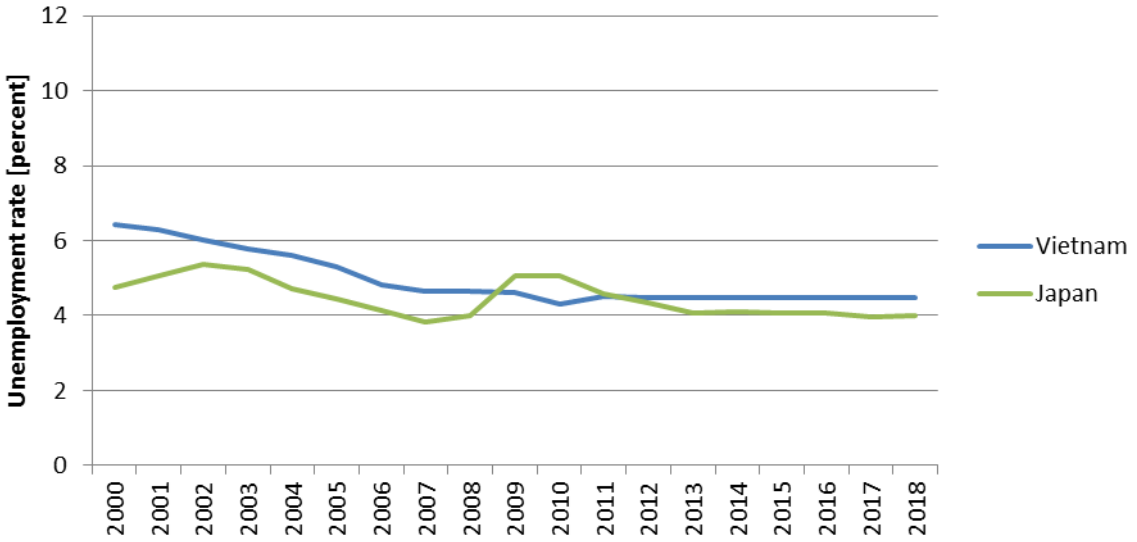
Source: International Monetary Fund, World Economic Outlook Database, April 2013

Figure 6.1.4 Population (2000-2018) (Estimation in Vietnam starting from 2011; ASEAN starting from 2007; in Japan starting from 2013)



Source: ASEAN-Japan Centre website

Figure 6.1.5 Foreign Direct Investment to Vietnam and ASEAN (2005-2010)



Source: International Monetary Fund, World Economic Outlook Database, April 2013

Figure 6.1.6 Unemployment rate in Vietnam and Japan (2000-2018) (Estimation in Vietnam starting from 2011; in Japan starting from 2013)

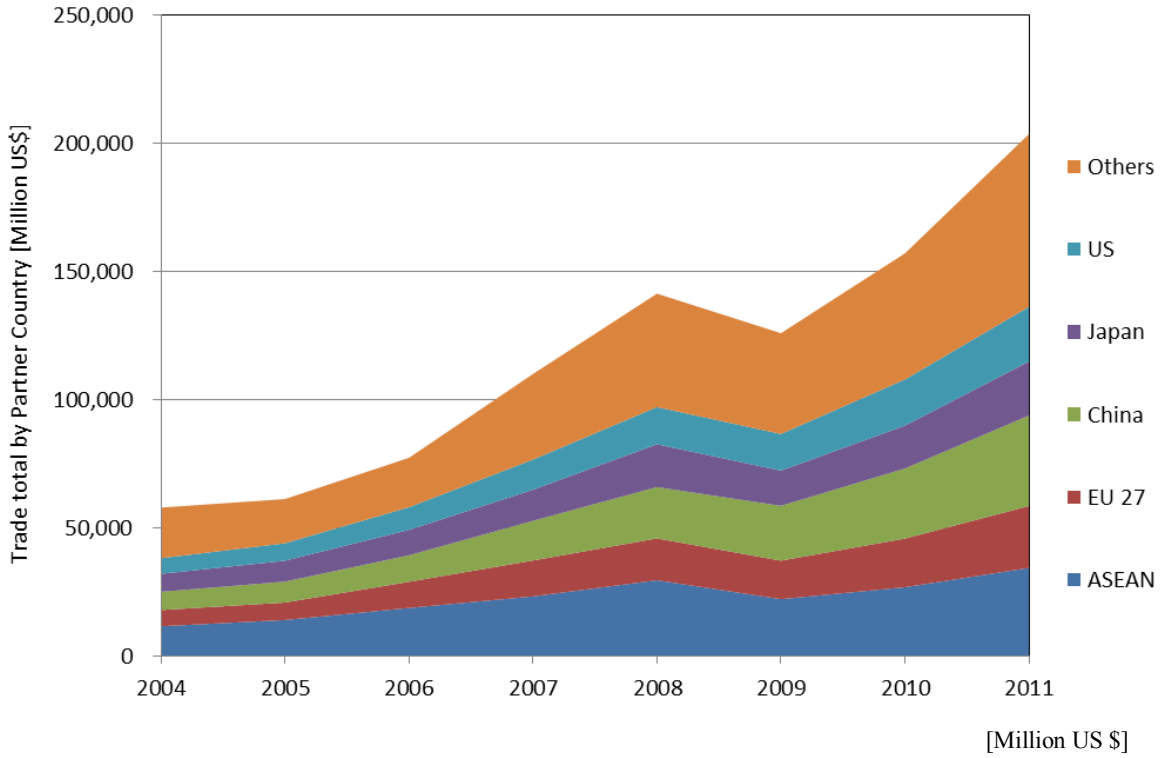
6.2 Overview of trade

(1) Amount of foreign trade/major trading partners

Trends in Vietnam's foreign trade by partner countries (2004 – 2011) are illustrated in the figure below. Vietnam's foreign trade has been growing steadily. Although foreign trade dropped in 2009, after the collapse of Lehman Brothers in the fall of 2008, all regions recovered quickly from the crisis.

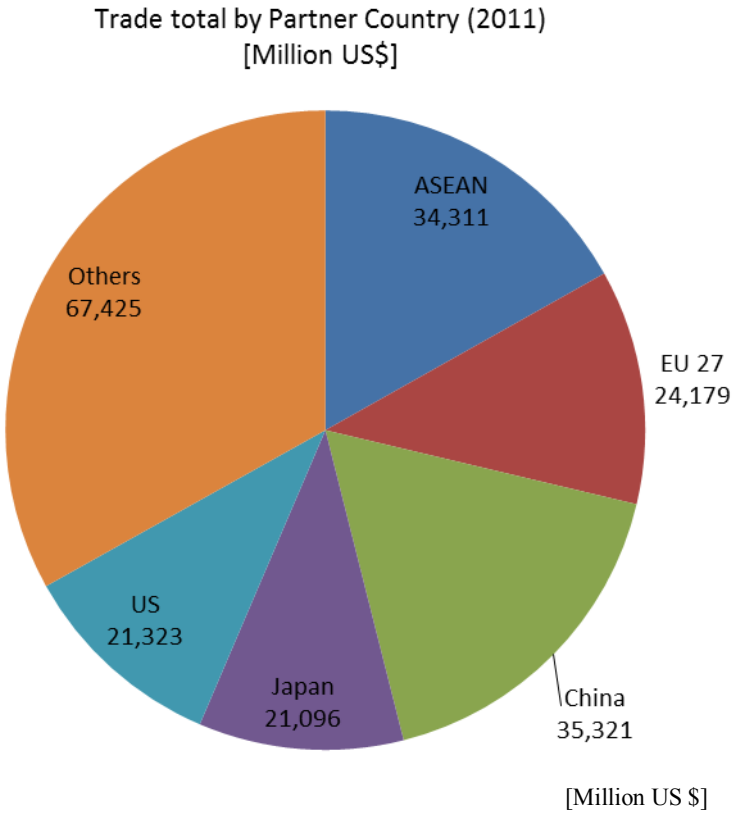
As of 2011, the largest trading partner of Vietnam is China, accounting for 17% of the total trade. The second largest trading partner is ASEAN countries, accounting for roughly 17%, almost the same as the trade value between China. The EU comes next, with 12%, followed by Japan and the USA, both accounting for approximately 10%.

Looking at trends in recent years, it is observed that while Vietnam's foreign trade is increasing with all trading partners, the growth rate of trade with China is higher, compared to the growth rate of trade with ASEAN countries, Japan, the EU and the USA.



Source: ASEAN Stats database (http://aseanstats.asean.org/)

Figure 6.2.1 External Trade Value by Partner - Total (2000-2011)



Source: ASEAN Stats database (http://aseanstats.asean.org/)

Figure 6.2.2 External Trade Value by partner - Total (2011)

(2) Categories of major trading commodities

Export values of Vietnam by commodity (2011) are shown in the table below.

Examining the export values by major export commodities, it can be observed that the largest group of products exported from Vietnam is machinery and transport equipment, which accounts for 28% of the total export value (13,789 million USD). Food comes next, accounting for 24% of the total exports (12,057 million USD).

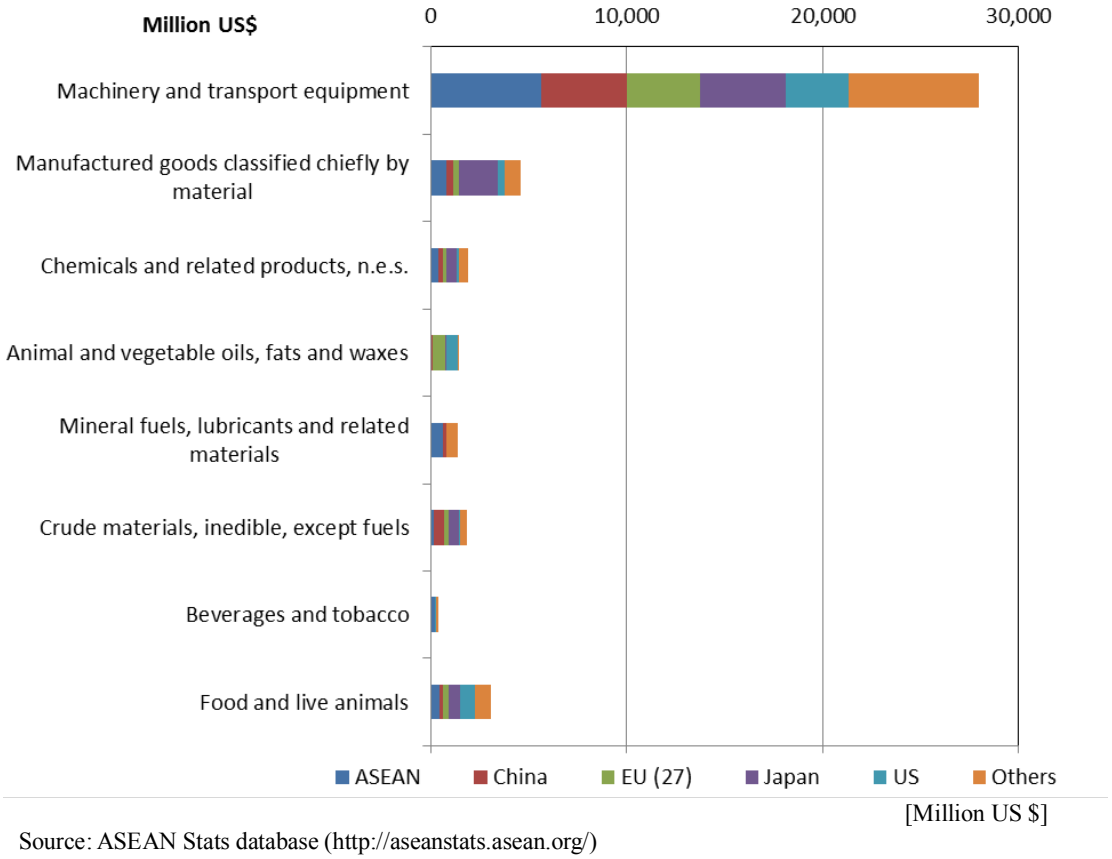
The largest export destination for machinery and transport equipment is the EU, buying 4,495 million USD. This is followed by Japan and ASEAN countries, with export values of 2,820 million USD and 2,775 million USD, respectively.

Table 6.2.1 Trade values (exports) of Vietnam by commodity and partner country (2011)

[Million US $]

Category	ASEAN	China	EU (27)	Japan	US	Others	WORLD
Food and live animals	3,090	1,622	3,209	1,272	2,209	655	12,057
Beverages and tobacco	118	71	10	19	3	1	222
Crude materials, inedible, except fuels	336	2,543	369	315	134	263	3,959
Mineral fuels, lubricants and related materials	2,719	2,826	6	1,866	454	1,029	8,900
Animal and vegetable oils, fats and waxes	79	25	3	11	2	28	148
Chemicals and related products, n.e.s.	955	656	133	344	61	124	2,272
Manufactured goods classified chiefly by material	2,709	1,219	1,088	982	1,123	870	7,991
Machinery and transport equipment	2,775	1,400	4,495	2,820	1,766	533	13,789

Source: ASEAN Stats database (http://aseanstats.asean.org/)



Source: ASEAN Stats database (http://aseanstats.asean.org/)

Figure 6.2.3 Trade values (exports) of Vietnam by commodity and partner country (2011)

Import values of Vietnam by commodity (2011) are shown in the table below.

Examining the import values by major import commodities, it can be observed that the largest group of products imported by Vietnam is machinery and transport equipment, same as in the case of export, which accounts for 37% of the total import value (28,159 million USD). Manufactured goods comes next, accounting for 25% of the total imports (19,649 million USD).

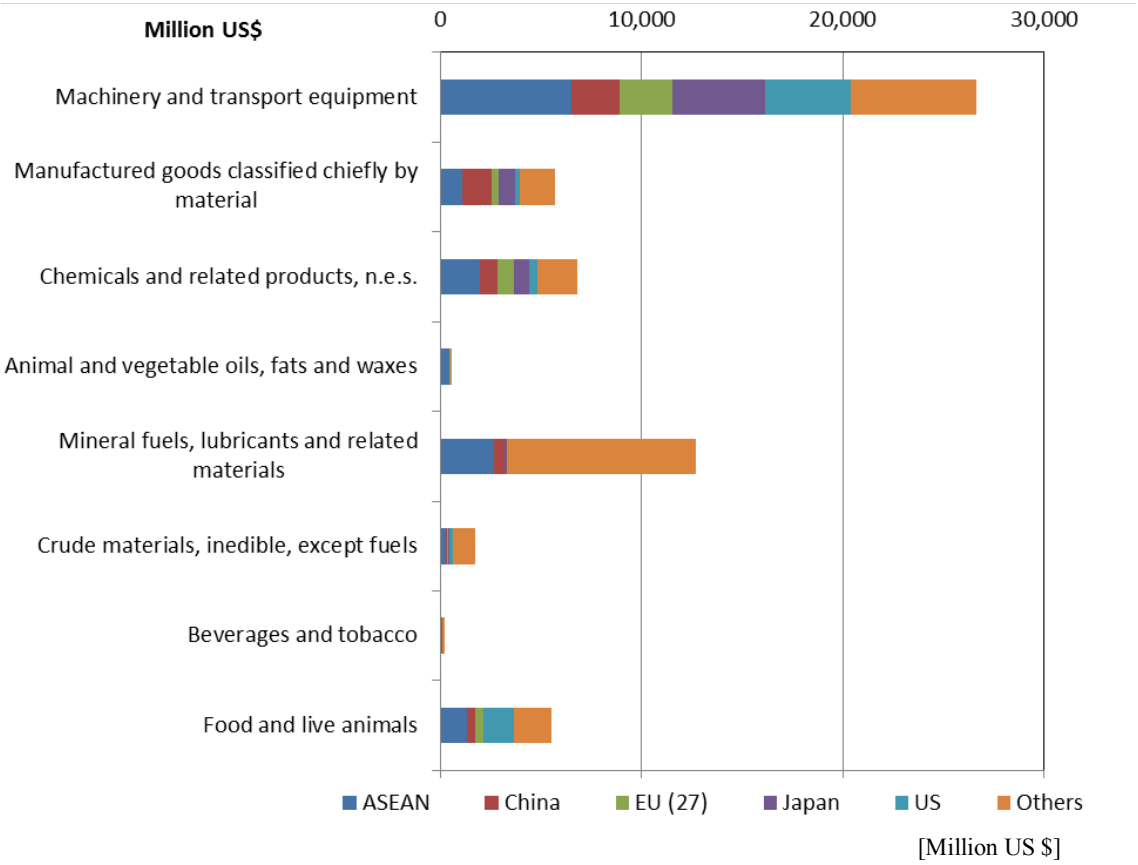
The largest exporter of machinery and transport equipment to Vietnam is China, exporting a total of 10,094 million USD. This is followed by Japan and ASEAN countries, with import values of 4,449 million USD and 4,415 million USD, respectively.

Table 6.2.2 Trade values (imports) of Vietnam by commodity and partner country (2011)

[Million US $]

Category	ASEAN	China	EU (27)	Japan	US	Others	WORLD
Food and live animals	1,412	452	664	67	739	87	3,421
Beverages and tobacco	65	44	61	1	10	2	183
Crude materials, inedible, except fuels	1,220	448	360	184	1,207	333	3,753
Mineral fuels, lubricants and related materials	6,013	2,028	35	146	22	1,198	9,442
Animal and vegetable oils, fats and waxes	737	6	4	0.793644	5	2	755
Chemicals and related products, n.e.s.	3,016	3,084	1,721	1,143	600	1,725	11,290
Manufactured goods classified chiefly by material	3,407	6,898	943	3,456	346	4,420	19,469
Machinery and transport equipment	4,415	10,094	3,354	4,449	1,157	4,691	28,159

Source: ASEAN Stats database (http://aseanstats.asean.org/)



Source: ASEAN Stats database (http://aseanstats.asean.org/)

Figure 6.2.4 Trade values (imports) of Vietnam by commodity and partner country (2011)

Chapter 7 Physical Distribution Network

The themes of this survey are divided into three categories as follows: 1) Understanding of Supply Chain Circumstances in ASEAN Countries, 2) Understanding of Circumstances on Physical Distribution Network, and 3) Organizing the framework of vulnerability analysis for natural disasters on the ASEAN Logistics Network.

7.1 Understanding of Supply Chain Circumstances in Vietnam

(1) Relation to Logistics Performance Index on International Physical Distribution

Table 7.1.1 International LPI (Logistics Performance Index) *[1] Ranking 2012

Rank	Country	LPI	Customs	Infrastructure	International Shipment	Logistics Competence	Tracing & Tracking	Timeliness
53	**Vietnam**	**2.96**	**2.68**	**2.56**	**3.04**	**2.89**	**3.1**	**3.44**

Source: World Bank Connecting to Compete 2012 Trade Logistics in the Global Economy

(2) Features of Physical Distribution in Relation to Main Industries in Industrial Parks

The lists of ASEAN-JAPAN CENTER (AJC) web-site[*2] have no specific time of investigation by year/month, but it is considered that the general current status of industry agglomeration at the time of the investigation can be obtained.

The industries in industrial parks are classified into the following 13 categories:

1) Fishery/Foodstuff, 2) Textile/Apparel, 3) Pulp/Paper, 4) Chemicals, Oil, Rubber/Ceramic, 5) Steel/Nonferrous metal, 6) Transport machines (Cars), 7) Electrical/Electronics/Precision apparatus, 8) Other industries, 9) Commerce (wholesale, retail), 10) Real estate, 11) Logistics/Warehouse, 12) Finance/Insurance/Other services, and 13) Information/Telecommunication.

The objective industrial parks are selected based on the criterion such as: 1) Degree of geographic accumulation, 2) Having sufficient operational experiences, 3) The size and number of Japanese companies, 4) Located in the pilot area in case of Vietnam, the Philippines and Indonesia.

Based on the industrial classifications above, the characteristics of distributions of the products from industrial parks are estimated.

While total 52 numbers of industrial Parks/SEZs have been registered in AJC List, industrial parks in big city regions like Hanoi, Haiphong and Ho Chi Minh City are to be noted among them.

Then, Thang Long IP/Hanoi, Tan Thuan EPZ/ Ho Chi Minh City, and Nomura-Haiphong Industrial Park/ Hai Phong City are selected as representatives to understand logistics from industrial parks.

According to AJC List, among three industrial parks, light industries which manufacture foods, clothes, and other goods, are overwhelming in selected three industrial parks.

Other than light industries, in the field of electric/precision devices industries, Cannon, Panasonic (Thang Long IP) and Rorze Robotech (Nomura-Haiphong Industrial Park) are operating in those industrial parks.

It is considered that intermediate goods like parts will be supplied to final products makers in the same industrial park, as well as that electrical parts and apparel goods will be exported to USA and Japan, and car parts are to be shipped to Thailand and Malaysia of ASEAN neighbor countries.

Top three share of the major export/import items of Vietnam are as follows (Ministry of Foreign Affairs of Japan, country and regional situation, Vietnam, Economy)[*3]:

- Export: Needle work products, Crude oil, Cell-phone/Parts
- Import: Machine and Parts, Petroleum products, PC and electrical goods/Parts

The kinds of products in the representative industrial parks and the export items above are effective in understanding the current situation of supply chain in Vietnam.

(3) Supply Chain Circumstances

Physical distribution is evolving by the stages of Physical Distribution Development Phasing (PDDP) as follows:

1) Physical distribution control: Company's own sphere of materials/ products distribution (PDC).
2) Logistics management: Company's own distribution management by the market-in strategy (LGM).
3) Supply chain management: Integrated distribution management from company's own to systemized one by the collaboration with other logistics operator resources (SCM)

Other criteria can be considered applicable, so that the development phase may be justified, based on industrial categories and their products' varieties and volumes in the selected industrial parks/ SEZ.

1) Kinds and diversity of products (intermediate or final products).
2) Whether production of high valued goods like cars, electrical/ electronic/ precision devices or not, and the levels.
3) Correspondence of export/import major items of goods to, classification of intermediate/ final products
4) Existence of a regional head office of a company which power is vested from the headquarter, and the power strength in management term.
5) Existence of logistics operator as a 3PL and maturity of the business
6) Inter dependency of industrial parks/ SEZ with megalopolises in the vicinity.

The result of assessment is shown in the table below which is made by LPI of the World Bank and by supply chain circumstances determined by above mentioned industries in the industrial park as well as major export/import items in the light of the above three stages of PDDP. The evaluation is shown by relative evaluation of five levels among ASEAN countries. Since there are no distinction time and contents wise in PDDP, the level of development is indicated as a continuous line in the table below.

Table 7.1.2 Physical Distribution Development Phasing

LPI	Country	PDDP								
					Criteria					
		PDC	LGM	SCM	Products diversified	High valued goods	Export/ Import	Regional head office	Logistics operator	Products diversified
2.96	**Vietnam**	[redacted]			**3**	**2**	**3**	**2**	**3**	**3**

Source: JICA Study Team

7.2 Current Status and Trends of Viet-Nam Logistics Network

(1) Domestic Physical Distribution Network

Economic and industrial bases in Vietnam are located in three regions; Hanoi and Hai Phong in the north, Da Nang in the central part and Ho Chi Minh City in the south.

In Vietnam, the Eastern Economic Corridor along the long coastline is positioned as a major trunk road which is running through those three zones.

In the GMS economic zone as a whole, three economic corridors from East to West such as Eastern Corridor, East-West Corridor, Southern Corridor, and also Central Corridor running South to North along the border are connecting Lao, Cambodia, Thailand and Myanmar.

Other than those land transportation, Ho Chi Minh economic zone in the south of Mekong Delta plays an important role in terms of the Mekong River water transportation.

Based on the feature of long extended land of Vietnam, in order to enhance the efficiency of the distribution network, it is important to expand and improve shipping hub such as Ho Chi Minh City port, Hai Phong port and Da Nang port as well as to develop alternative ports, road and railway for the improvement of land transportation logistics.

(2) Intra-ASEAN Physical Distribution Network

According to ASEAN Strategic Transport Plan 2011-2015, intra-ASEAN trade of Vietnam is reported to be about 26% of the total trade amount. Of that share, main intra-ASEAN trade partner is as in the order of Singapore of 45%, Thailand of 26%, Malaysia of 14%, Indonesia of 9%, and Philippines of 3%. Substantial part of cargo traffics to and from Singapore at the major ports in Vietnam is considered to include transshipments.

(3) Extra-ASEAN Physical Distribution Network

According to ASEAN Strategic Transport Plan 2011-2015, extra-ASEAN trade amount share is about 74% against the total amount.

Trade partner countries of extra-ASEAN are USA, China, and Japan for export; and China, Korea, and Japan for import.

From above macro-data and container cargo traffics at Ho Chi Minh and Hai Phong Ports and other ports

being overviewed, the trunk distribution network of regular services with extra-ASEAN region is considered to be established, by connecting major ports of above mentioned trade partner countries.

7.3 Analysis Frame on Physical Distribution Network

This section studies frame for assessment of the vulnerability of logistics network against natural disasters in consideration of the actual situation of supply chain, as a preparedness of formulation of area BCP.

The vulnerability itself is to be assessed after the further survey.

Table 7.3.1 Natural Disaster Prevention Related Matters in relation to vulnerability of Physical Distribution Facilities

Industrial Park Name represented	Nomura-Haiphong Industrial Park
Features	Place: Haiphong For features outline, refer to Survey Report 2 "Chapter 3 Industrial Agglomerated Areas"
Vulnerability Assessment Frame for Each Industrial Park (IPK)	
Natural Disaster Risk(NDR): Extract from Survey Report 1 "Chapter 5 Existing Investigations and Studies"	
■ Flooding	Northern and southern coastal areas are high with flood hazard possibility. In the north, there shows high frequency of flood hazard occurrence in Thi Binh river basin where the city of Haiphong is situated. Haiphong city area is vulnerable to storm surge (Interview during the second survey: Dr. & Eng.Tran Ngoc Anh, Vice President Vietnam National University).
■ Seismic intensity/ Tsunami	Earthquake hazard level in Vietnam is low in general. However, northern region near Yunnan Province of China is higher in the earthquake hazard level. Tsunami hazard level is also low.
■ Volcano	Volcano hazard level of Vietnam is low. No volcanic disaster is recorded in the database.
■ Cyclone, Meteorological Disaster, Landslide	After the Philippines, Vietnam comes second in terms of the occurrence of large storms. In general, a typhoon, which occurs between June to September, typically approaches Northern Vietnam while a typhoon occurring in May and between October to December approaches Southern-Central Vietnam.
Brief Descriptions on Counter-measures (CMS) for NDR	
1) Private sector facilities: To follow further Survey	
Land, In-park Roads: Nomura Hai Phong sometimes flooded by torrential rain. (Interview during the second survey: Nomura Hai Phong Mr. Masuno)	
Plant facilities: Nomura Hai Phong has back up equipment for the power supply, but requesting a backup of transmission line.	
Physical Distribution Facilities:	
Others, if any:	
2) Infrastructures	
Road: The new road between Hai Phong and Hanoi is under construction.	
Railway: There is a plan of new railway between Hai Phong and Ho Chi Minh, but the progress towards implementation may face some issues.	
Port: Bidding of Lac Hyen port construction work by Japanese ODA Loan has been completed.	
Airport: The new international terminal building at Cat Vi airport is under construction.	
Electric power/Fuel: Due to tight supply-demand condition, the increase of power generation capacity and the improvement of power transmission line are required.	
Water-supply: From the salt damage caused by high tide inundation, countermeasures for water quality retention are necessary.	
Sewage: Drainage facilities shall be developed as high tide measures.	
Solid waste:	
Telecommunication:	

Note:

*1 The summary of "Logistics Performance Index" by the World Bank is as follows.

(1) LPI score and category wise score is indicated by each country
(2) Score is ranked from one to five
(3) LPI of international logistics is scored based on the interviewing following six items to major importers and logistics companies in the neighboring countries (total of over 1000 companies).
   1) Efficiency of the clearance process i.e. Speed, simplicity and predictability of formalities by border control agencies, including Customs
   2) Quality of trade and transport related infrastructure e.g. Ports, railroads, roads, information technology
   3) Ease of arranging competitively priced shipments
   4) Competence and quality of logistics services e.g. transport operators, customs brokers
   5) Ability to track and trace consignments)
   6) Timeliness of shipments in reaching destination within the scheduled or expected delivery time.

*2 http://www.asean.or.jp/ja/invest/about/country_info/brunei/invest_info/industrialestate/

*3 http://www.mofa.go.jp/mofaj/area/brunei/data.html#04

References :

1）ASEAN-JAPAN CENTER, Lists of Industrial Parks/Estate/SEZ by Member Country (in Japanese)
2）World Bank Connecting to Compete 2012 Trade Logistics in the Global Economy
3）Shinya Nakata (2012), Introduction to Logistics, NIKKEI Newspapers in Japan (in Japanese)
4）JETRO (2008), ASEAN Physical Distribution Network 2008 (in Japanese)
5）ERIA: ASEAN Strategic Transport Plan 2011-2015.
6）ASEAN Secretariat, ASEAN Statistics on Intra and Extra_ ASEAN trade 2011

Chapter 8 Legislative Systems

A survey on the legislative systems concerned with disaster management, business continuity, environmental pollution, and development in Vietnam is conducted in this chapter.

The survey of Vietnam is mostly based on research through the websites of Vietnamese ministries and agencies, and also several leading international institutes that contributed to disaster research such as the Asia Disaster Reduction Center. Laws, regulations, national implementation plans, and statutes are referred to within the scope of the survey.

The table below shows the methodology for collecting information.

Information Collected	Methodology	Scope of Survey
Legislative Systems for Disaster Management	To collect information from the internet, which is published by international agencies such as ADRC and disaster management institutes in Vietnam. And to refer to the report by the JICA research team.	Laws and decrees on disaster management. Disaster risk mitigation plans and strategy, regulations.
Regulations and Standards for BCM / BCP	To collect information from the internet. No official institutes regulating BCM/BCP exist in Vietnam.	Standards or regulations related to BCM. No standards or policies are found in Vietnam.
Legislative Systems for Environment and Pollution	To collect information from the websites of ministries and agencies responsible for environmental management.	Laws and regulations on environmental conservation, pollution control, and water quality for industrial activities
Legislative Systems for Development including Land Use, Rivers, and Building Regulations	To collect information from the websites of ministries and agencies related to land use, rivers, or development.	Laws and ordinances describing land use, rivers. No official building standards exist in Vietnam.

The laws, regulations, decrees, and guidelines regulating the target fields defined above are compiled in this survey. The results of the survey in Vietnam are summarized below.

Scope	Information
Legislative Systems for Disaster Management in Vietnam	[Strategies and Plans] "Disaster management Law", "Decree for disaster management, Statutes on Dike Management, and Flood and Typhoon Mitigation", "Ordinance on Flood and Storm Control". [Regulations, Standard and Guidelines] "National Strategy for Natural Disaster Prevention, Response and Mitigation", "Implementation Plan of the National Strategy for Natural Disaster Prevention, Response and Mitigation", "Plan of operations of Vietnam National Committee on International Decade for Natural Disaster Reduction".
Regulations and Standards for BCM / BCP in Vietnam	No regulations, standards or guidelines for business continuity management in time of disaster have been identified in Vietnam.
Legislative Systems for Environment and Pollution in Vietnam	[Laws for Environment] "Law on Environmental Protection", "Law on Water Resources". [Laws and Regulations for Environmental Pollution Control] "Industrial technical regulations (QCVN) for water pollution, effluent and water resources", "QCVN for soil pollution", "QCVN for air pollution", "Law on Chemicals".
Legislative Systems for Development including Land	"Law of Land", "Statutes on Dike Management, and Flood and Typhoon Mitigation", "Ordinance on Water Resources Structures Protection"

Use, Rivers, and Building Regulations in Vietnam	

The available results on the survey about the laws and regulations for disaster management, BCP/BCM, environmental conservation, and provisions for development in Vietnam are summarized below.

According to a survey on legislative systems in Vietnam, no regulations, standards, or guideline defining Business Continuity Management has been determinably established.

8.1 Legislative systems for disaster management

(1) Disaster management laws

Table 8.1.1 Laws and Regulations of Disaster Management in Vietnam

	Laws / Regulations	Supervisory Authority	Subject
Law	Disaster Management Law (Draft)	Minister of Agriculture and Rural Development, Department of Dyke Management	Disaster Management
Decree	Decree No.168 - HDBT, 1990	under survey	Disaster Management
Decree	Statutes on Dike Management, and Flood and Typhoon Mitigation	Minister of Agriculture and Rural Development, Department of Dyke Management	Flood
Decree	Ordinance on Flood and Storm Control	under survey	Flood

The Disaster Management Law has been drafted with the support of the United Nations Development Programme, and is to be enacted in 2013.

Statutes on Dike Management, Flood and Typhoon Mitigation, and the Ordinance on Flood and Storm Control have been established for flood or storm disasters.

(2) Disaster management strategies and plans

Table 8.1.2 Strategies and Plan for Disaster Management in Vietnam

	Laws / Regulations	Supervisory Authority	Subject
Plan	National Strategy for Natural Disaster Prevention, Response and Mitigation to 2020 (2007 - 2020)	Minister of Agriculture and Rural Development, Department of Dyke Management	General Disasters
Plan	Implementation Plan of the National Strategy for Natural Disaster Prevention, Response and Mitigation to 2020, 2009	under survey	General Disasters
Plan	Plan of operations of Vietnam National Committee on International Decade for Natural Disaster Reduction (IDNDR)	under survey	General Disasters

The National Strategy for Natural Disaster Prevention, Response and Mitigation to 2020 emphasizes the policy shift from disaster prevention and mitigation based only on structural

measures to a policy including non-structural measures, from top-down to local government and community-based disaster management.

Provinces prepare their own implementation plans based on the Implementation Plan of the National Strategy for Natural Disaster Prevention, Response and Mitigation to 2020.

The National Strategy for Natural Disaster Prevention, Response and Mitigation to 2020 is an implementation plan issued in 2009 as guidelines for other ministries/agencies and local governments to apply according to local situations. Provinces prepare local implementation plans following this national framework.

8.2 Regulations and standards for business continuity management

No regulations, standards, or guidelines for business continuity management in time of disaster have been identified in Vietnam.

8.3 Legislative systems for Environment and Pollution Control

(1) Environmental laws and regulations

Table 8.3.1 Laws and Regulations of Environment in Vietnam

	Laws / Regulations	Supervisory Authority	Subject
Law	Law on Environmental Protection, revised in 2005	Ministry of Natural Resource and Environment	Environment Management
Law	Law on Water Resources, 1998	under survey	Water Resources

The Law on Environmental Protection, 2005 prescribes integrated environmental management regulations. The policy for the prevention of environmental incidents caused by disasters is also mentioned in the Environmental Law, Chap.9 and Chap.11.

Additionally, in the Law on Water Resources, the policy for the prevention of floods and other incidents caused by water is provided in Chapters 4 and 5.

(2) Pollution control law and regulations

Table 8.3.2 Laws and Regulations for Environmental Pollution Control in Vietnam

	Laws / Regulations	Supervisory Authority	Subject
Regulation	QCVN 08 : 2008/BTNMT	Ministry of Natural Resource and Environment	Water Pollution
Regulation	QCVN 14 : 2008/BTNMT	Ministry of Natural Resource and Environment	Industrial Effluent
Regulation	QCVN 09 : 2008/BTNMT	Ministry of Natural Resource and Environment	Water Resources
Regulation	QCVN 24: 2009/BTNMT, National Technical Regulation on Industrial Wastewater	Ministry of Natural Resource and Environment	Industrial Effluent
Regulation	QCVN 03 : 2008/BNMT	under survey	Soil Pollution
Regulation	QCVN 19 : 2009/BTNMT, National Technical	Ministry of Natural Resource	Air Pollution

	Regulation on Industrial Emission of Inorganic Substances and Dust	and Environment	
Regulation	QCVN 20 : 2009/BTNMT, National Technical Regulation on Industrial Emission of Organic Substances	Ministry of Natural Resource and Environment	Air Pollution
Law	Law on Chemicals (No.06/2007/QH12)	Ministry of Industry and Trade, Vinachemia	Industrial Waste

The law and regulations for prevention of environmental pollution are listed above. These regulations define the management of water pollution, soil pollution, air pollution, industrial effluent, and industrial waste. QCVN refers to national technical standards in environmental or industrial sectors.

Most of these regulations have the no published documents translated into English, thus their details are not clear in this report.

8.4 Legislative systems for development including land use, rivers, and building codes

Table 8.4.1 Laws and Regulations for Land, River and Building Code in Vietnam

	Laws / Regulations	Supervisory Authority	Subject
Law	Law of Land, 2003	Ministry of Natural Resource and Environment	Land Use
Regulation	Statutes on Dike Management, and Flood and Typhoon Mitigation	under survey	River
Regulation	Ordinance on Water Resources Structures Protection	under survey	River

The policy on the prevention of flooding and other water disasters is defined in the Statutes on Dike Management, and Flood and Typhoon Mitigation and the Ordinance on Water Resources Structures Protection.

Due to the absence of published documents, little information about the regulations for development or land use could be obtained in our research. In addition, no information about building standards in Vietnam has been verified.

Chapter 9 Situation of Implementation of BCP in Vietnam

9.1 Major natural disasters and disaster management awareness

In Vietnam, the government and enterprises consider typhoons, floods, and storm surges as natural disaster risks. A committee handling climate change and sea level rise has been established within governmental ministries in charge of disaster management such as the Ministry of Agriculture and Rural Development (MARD) and the Ministry of Industry and Trade (MOIT). These committees deal with the improvement of regulations for disaster risk control.

Since disasters causing damage to business activities are rarely observed in the northern part of Vietnam near Hanoi and Hai-Phong, the business community is not very concerned about natural disaster risks for business conditions and the necessity of a disaster management system in business is not well understood. Local administrative agencies also do not recognize the value of BCM/BCP.

The Vietnam Chamber of Commerce and Industry (VCCI) can support SMEs in establishing their activities for business continuity during emergencies in conjunction with a contingency response system. They do not make a distinction between the concepts of BCM and Disaster Risk Management (DRM).

9.2 Current state of BCP implementation

9.2.1 Implementation of BCP in enterprises

In Vietnam, enterprises generally do not conduct efforts for disaster risk mitigation in business, and most business managers do not value corporate disaster management to a high degree. Individual enterprises are less concerned about disaster risk mitigation, since they have not had much experience with large-scale disasters in northern Vietnam, especially in the industrial parks of Hai-Phong or other states.

As example of implementation of DRM, large-scale enterprises and foreign capital companies conduct disaster risk assessments and/or establish disaster risk management systems. However, most SMEs cannot afford to consider a DRM under present conditions. Enterprises which established DRM are mainly engaged in emergency response or contingency management, not disaster preparedness.

9.2.2 Implementation of BCP in utility suppliers and distributors

Enterprises handling hazardous materials such as oil, coal, or minerals, and enterprises in charge of utilities such as electricity companies have developed contingency plans and/or crisis management plans. These enterprises and companies are obligated by law to establish a crisis management system. Though corporate response during emergency situations caused by flood or storms, and

policy for the quick recovery of business activities are defined in these contingency or management plans, case of specific BCP development have not yet identified.

9.2.3 Implementation of BCP in foreign capital companies and Japanese companies

Although BCP is not yet well known by even among foreign capital companies in Vietnam, requirements for such from head offices or customers for BCP are gradually increasing. Moreover, Japanese enterprises have become increasingly concerned about BCP implementation, and the Japan Business Association in Vietnam (JBAV) is making an effort to increase awareness of BCP among its member companies.

Even foreign capital companies are generally not concerned about natural disaster risk. With the exception of certain large companies, most enterprises do not conduct BCM/BCP.

9.3 Effort for Implementation of BCP

9.3.1 Regulations and guidelines for BCP implementation

In the present legislative system, Decree No. 168-HDBT outlines the role of the Central Committee of Storm and Flood Control (CCSFC), committees, and sectors at each local level. In this decree, disaster damage assessments and rehabilitation action are defined as corporate obligations for the private sector. No laws for defining corporate efforts in the development of BCP or disaster risk management plans have been found.

The new Law of Disaster Risk Management will become effective in 2014. The new law requires all enterprises and agencies to develop disaster risk management plans. However the law does not regulate development of contingency plans or BCP.

Disaster management policy in Vietnam focuses on mitigating human suffering, not reducing business loss. Concerns regarding implementation of BCP have increased due to the consideration of disaster damage impacts on the economy and foreign investment. A symposium for ASEAN countries to discuss BCP has been held.

9.3.2 Efforts on disseminating and increasing awareness of BCP by the private sector

Efforts for disseminating DRM to SMEs are conducted by private sectors such as VCCI. Though the establishment of emergency response and disaster preparedness should be of a higher priority than BCP, symposiums for corporate DRM have been held. In general, enterprises are becoming more concerned with business continuity at in times of disaster.

VCCI is strongly motivated in the efforts to disseminate corporate disaster management to SMEs, and they are currently considering the creation of certification standards for disaster management as a part of CSR.

9.3.3 BCP implementation problems

In Vietnam, most enterprises and state administrations think DRM in business is less important, and have put weight on business growth instead of BCP implementation. DRM should be conducted first as a part of corporate risk management.

Due to a lack of resources using DRM or disaster risk assessment, improvement of social infrastructure such as electricity, water, and the traffic network has not been archived. Private enterprises assume that they cannot afford to develop their own disaster management systems or BCM.

The lack of knowledge and technical know-how regarding risk assessment and developing BCP, etc. is also regarded as a problem.

List of Agglomerated Areas

ID	Short List	LongList	COUNTRY	PROVINCE	PARK NAME	ADDRESS
VN0001			Vietnam	Ho Chi Minh City	AN HA Industrial Park	7 An Hạ, Phạm Văn Hai, Hóc Môn Ho Chi Minh City, Vietnam
VN0002			Vietnam	Ho Chi Minh City	Binh Chieu Industrial Park	1083 TL-43, Bình Chiểu, Thu Duc District Ho Chi Minh City, Vietnam
VN0003			Vietnam	Ho Chi Minh City	Cat Lai II Industrial Park	Số 23, Cát Lái, Quận 2 Hồ Chí Minh, Vietnam
VN0004			Vietnam	Ho Chi Minh City	Cơ Khí Ô Tô TP HCM Industrial Park	cầu Tham Lương, Phường 15, Tân Bình Hồ Chí Minh
VN0005		**XXVN08**	Vietnam	Ho Chi Minh City	Dong Nam Industrial Park	8Binh My Minh City HoChi Minh
VN0006			Vietnam	Ho Chi Minh City	Hiep Phuoc Industrial Park	Liên Ấp 2, Hiệp Phước, Nhà Bè Ho Chi Minh City, Vietnam
VN0007			Vietnam	Ho Chi Minh City	Le Minh Xuan Industrial Park	Lê Đình Chi, Lê Minh Xuân, Bình Chánh Ho Chi Minh City, Vietnam
VN0008			Vietnam	Ho Chi Minh City	Linh Trung I Export Processing Zone	219-239 Lê Văn Chí, Linh Trung, Thu Duc District Ho Chi Minh City
VN0009		**XXVN13**	Vietnam	Ho Chi Minh City	Linh Trung II Industrial Park	1 Dương Công Khi, Tân Thới Nhì, Hóc Môn, Hồ Chí Minh
VN0010			Vietnam	Ho Chi Minh City	Phong Phu Industrial Park	Đường D21, Khu dân cư Intresco 13E, Phong Phú, Bình Chánh Ho Chi Minh City, Vietnam
VN0011			Vietnam	Ho Chi Minh City	Quang Trung Solfware Park	Water Tank Tân Chánh Hiệp, Quận 12, Ho Chi Minh City, Vietnam
VN0012		**XXVN28**	Vietnam	Ho Chi Minh City	Saigon Hi-Tech Park	Hi-Tech Park, Tăng Nhơn Phú A, Quận 9 Ho Chi Minh City, Vietnam
VN0013		**XXVN31**	Vietnam	Ho Chi Minh City	Tan Binh Industrial Park	Hẻm 14 Văn Chung, phường 13, Tan Binh District Ho Chi Minh City, Vietnam
VN0014			Vietnam	Ho Chi Minh City	Tan Phu Trung Industrial Park	57 Hương Lộ 2, Tân Phú Trung, Củ Chi Ho Chi Minh City, Vietnam
VN0015			Vietnam	Ho Chi Minh City	Tan Tao Industrial Park	AH 1, Tân Tạo, Bình Tân Ho Chi Minh City, Vietnam
VN0016			Vietnam	Ho Chi Minh City	Tan Thoi Hiep Industrial Park	365 Tân Thới Hiệp 1, Tân Thới Hiệp, Quận 12 Ho Chi Minh City, Vietnam
VN0017		**XXVN33**	Vietnam	Ho Chi Minh City	Tan Thuan Export Processing Zone	Tân Thuận, Tân Thuận Đông, Quận 7 Ho Chi Minh City, Vietnam
VN0018			Vietnam	Ho Chi Minh City	Tay Bac Cu Chi Industrial Park	cầu Tham Lương, Phường 15, Tân Bình Hồ Chí Minh
VN0019		**XXVN37**	Vietnam	Ho Chi Minh City	Vinh Loc Industrial Park	1 Vĩnh Lộc, Phạm Văn Hai, Bình Chánh Ho Chi Minh City, Vietnam
VN0020			Vietnam	Ho Chi Minh City	Cat Lai IV IZ	Số 23, Cát Lái, Quận 2 Hồ Chí Minh, Vietnam
VN0021			Vietnam	Ho Chi Minh City	North Western Cu Chi IZ	cầu Tham Lương, Phường 15, Tân Bình Hồ Chí Minh, Vietnam
VN0022			Vietnam	Ho Chi Minh City	Phu Huu Industrial Zone	235 Phan Trung, Tân Tiến, Biên Hòa tỉnh Đồng Nai
VN0023			Vietnam	Dong Nai	AGTEX Long Binh Industrial Park	235 Phan Trung, Tân Tiến, Biên Hòa tỉnh Đồng Nai
VN0024		**XXVN01**	Vietnam	Dong Nai	AMATA Industrial Park	112 Amata, Amata Industrial Park, Long Bình, Biên Hòa tỉnh Đồng Nai, Vietnam
VN0025			Vietnam	Dong Nai	An Phuoc Industrial Park	Đường A, Tam Phước, Tp. Biên Hòa tỉnh Đồng Nai, Vietnam
VN0026			Vietnam	Dong Nai	Bau Xeo Industrial Park	235 Phan Trung, Tân Tiến, Biên Hòa tỉnh Đồng Nai
VN0027			Vietnam	Dong Nai	Bien Hoa I Industrial Park	QL 1, Long Bình Tân, Tp. Biên Hòa tỉnh Đồng Nai, Vietnam
VN0028			Vietnam	Dong Nai	Bien Hoa II Industrial Park	C.P. Vietnam Corporation Bien Hoa 2 Industrial Park,, Biên Hòa, Dong Nai, Vietnam
VN0029			Vietnam	Dong Nai	Dau Giay Industrial Park	ĐT769, Dầu Giây, Thong Nhat District Dong Nai, Vietnam
VN0030			Vietnam	Dong Nai	Dinh Quan Industrial Park	289 Quốc lộ 20, tt. Định Quán, Định Quán Dong Nai, Vietnam
VN0031			Vietnam	Dong Nai	Giang Dien Industrial Park	Khu Công Nghiệp Giang Điền, Giang Điền, Trảng Bom Dong Nai, Vietnam
VN0032			Vietnam	Dong Nai	Go Dau Industrial Park	235 Phan Trung, Tân Tiến, Biên Hòa tỉnh Đồng Nai

ID	Short List	LongList	COUNTRY	PROVINCE	PARK NAME	ADDRESS
VN0033			Vietnam	Dong Nai	Ho Nai Industrial Park	12 Nguyễn Ái Quốc, Hố Nai, Biên Hòa tỉnh Đồng Nai, Vietnam
VN0034			Vietnam	Dong Nai	LOC AN BINH SON IP Industrial Park	ĐT769, Bình Sơn, Long Thanh District Dong Nai, Vietnam
VN0035		**XXVN14**	Vietnam	Dong Nai	Long Duc Industrial Park	Đường C, Tam Phước, Tp. Biên Hòa tỉnh Đồng Nai, Vietnam
VN0036			Vietnam	Dong Nai	Long Khanh Industrial Park	235 Phan Trung, Tân Tiến, Biên Hòa tỉnh Đồng Nai
VN0037		**XXVN16**	Vietnam	Dong Nai	Long Thanh Industrial Park	Nguyễn Văn Cừ, tt. Long Thành, Long Thanh District Dong Nai, Vietnam
VN0038		**XXVN17**	Vietnam	Dong Nai	Loteco Industrial Park	235 Phan Trung, Tân Tiến, Biên Hòa tỉnh Đồng Nai, Vietnam
VN0039		**XXVN20**	Vietnam	Dong Nai	Nhon Trach 1 Industrial Park	162 QL 20, Gia Tân 1, Thống Nhất, tỉnh Đồng Nai
VN0040			Vietnam	Dong Nai	Nhon Trach II – Loc Khang Industrial Park	Nguyễn Hữu Cảnh, Nhon Trach District Dong Nai,
VN0041			Vietnam	Dong Nai	Nhon Trach II – Nhon Phu Industrial Park	Nguyễn Hữu Cảnh, Nhon Trach District Dong Nai,
VN0042			Vietnam	Dong Nai	Nhon Trach II Industrial Park	Nguyễn Hữu Cảnh, Nhon Trach District Dong Nai,
VN0043			Vietnam	Dong Nai	Nhon Trach III Industrial Park	Nguyễn Hữu Cảnh, Nhon Trach District Dong Nai,
VN0044			Vietnam	Dong Nai	Nhon Trach IV Industrial Park	Nguyễn Hữu Cảnh, Nhon Trach District Dong Nai,
VN0045			Vietnam	Dong Nai	Nhon Trach Textile Industrial Park	Nguyễn Hữu Cảnh, Nhon Trach District Dong Nai,
VN0046			Vietnam	Dong Nai	Nhon Trach V Industrial Park	Nguyễn Hữu Cảnh, Nhon Trach District Dong Nai,
VN0047			Vietnam	Dong Nai	Ong Keo Industrial Park	105/5 Doc Mo Quốc lộ 20, Thong Nhat District Dong Nai, Vietnam
VN0048			Vietnam	Dong Nai	Song May Industrial Park	235 Phan Trung, Tân Tiến, Biên Hòa tỉnh Đồng Nai
VN0049			Vietnam	Dong Nai	Suoi Tre Industrial Park	AH1, Suối Tre, tx. Long Khánh Dong Nai, Vietnam
VN0050			Vietnam	Dong Nai	Tam Phuoc Industrial Park	Đường số 9, Tam Phước, Tp. Biên Hòa tỉnh Đồng Nai, Vietnam
VN0051			Vietnam	Dong Nai	Tan Phu Industrial Park	131 Nguyễn Tất Thành, tt. Tân Phú, Tân Phú Dong Nai, Vietnam
VN0052			Vietnam	Dong Nai	Thanh Phu Industrial Park	ĐT768, Tân Phong, Tp. Biên Hòa tỉnh Đồng Nai, Vietnam
VN0053			Vietnam	Dong Nai	Xuan Loc Industrial Park	Nguyễn Trãi, Xuân Hoà, tx. Long Khánh Dong Nai, Vietnam
VN0054			Vietnam	Dong Nai	Nhon Trach 6 IZ	Đường Số 6, Phước Thiền, Nhon Trach District Dong Nai, Vietnam
VN0055			Vietnam	Binh Duong	Ascendas-Protrade Singapore Tech Park	NA2, Mỹ Phước, Ben Cat District Binh Duong province, Vietnam
VN0056		**XXVN02**	Vietnam	Binh Duong	Bau Bang Industrial Park	Lai Vyen Commune,Ben Cat District Binh Duong Province
VN0057			Vietnam	Binh Duong	Binh An Textile Industrial Park	Bình Thung, Bình An, tx. Dĩ An Binh Duong province, Vietnam
VN0058			Vietnam	Binh Duong	Binh Duong Industrial Park	NA2, Mỹ Phước, Ben Cat District Binh Duong province
VN0059			Vietnam	Binh Duong	Dai Dang Industrial Park	NA2, Mỹ Phước, Ben Cat District Binh Duong province
VN0060			Vietnam	Binh Duong	Dat Cuoc Industrial Park	NO ADRESS
VN0061		**XXVN07**	Vietnam	Binh Duong	Dong An Industrial Park	NA2, Mỹ Phước, Ben Cat District Binh Duong province
VN0062			Vietnam	Binh Duong	Kim Huy Industrial Park	NA2, Mỹ Phước, Ben Cat District Binh Duong province
VN0063			Vietnam	Binh Duong	Mai Trung Industrial Park	NA2, Mỹ Phước, Ben Cat District Binh Duong province
VN0064			Vietnam	Binh Duong	Mapletree Business City @ Binh Duong	NA2, Mỹ Phước, Ben Cat District Binh Duong province
VN0065			Vietnam	Binh Duong	Nam Tan Uyen Industrial Park	NA2, Mỹ Phước, Ben Cat District Binh Duong province
VN0066			Vietnam	Binh Duong	Phu Gia Industrial Park	ĐT743, Bình Chuẩn, Tan Uyen District Binh Duong province, Vietnam

ID	Short List	LongList	COUNTRY	PROVINCE	PARK NAME	ADDRESS
VN0067			Vietnam	Binh Duong	Rach Bap Industrial Park	NA2, Mỹ Phước, Ben Cat District Binh Duong province
VN0068			Vietnam	Binh Duong	Song Than I Industrial Park	NA2, Mỹ Phước, Ben Cat District Binh Duong province
VN0069			Vietnam	Binh Duong	Song Than II Industrial Park	NA2, Mỹ Phước, Ben Cat District Binh Duong province
VN0070		**XXVN30**	Vietnam	Binh Duong	Song Than III Industrial Park	cầu vượt Sóng Thần, tx. Dĩ An Binh Duong province, Vietnam
VN0071			Vietnam	Binh Duong	Tan Dong Hiep A Industrial Park	23/4A Mạch Thị Liễu, Đông Chiêu, Tân Đông Hiệp, tx. Dĩ An Binh Duong province
VN0072			Vietnam	Binh Duong	Tan Dong Hiep B Industrial Park	23/4A Mạch Thị Liễu, Đông Chiêu, Tân Đông Hiệp, tx. Dĩ An Binh Duong province
VN0073		**XXVN36**	Vietnam	Binh Duong	Thoi Hoa Industrial Park	QL 13, Thới Hòa, Ben Cat District Binh Duong province, Vietnam
VN0074			Vietnam	Binh Duong	Viet Huong I Industrial Park	NA2, Mỹ Phước, Ben Cat District Binh Duong province
VN0075			Vietnam	Binh Duong	Viet Huong II Industrial Park	NA2, Mỹ Phước, Ben Cat District Binh Duong province
VN0076		**XXVN29**	Vietnam	Binh Duong	Viet Nam Singapore Industrial Park	8 Huu Nghi Avenue Thuan An District
VN0077			Vietnam	Binh Duong	Moc Bai OEZ	NA2, Mỹ Phước, Ben Cat District Binh Duong province
VN0078		**XXVN18**	Vietnam	Binh Duong	My Phuoc II IZ	D1, Mỹ Phước, Ben Cat District Binh Duong province, Vietnam
VN0079			Vietnam	Long An	An Nhut Tan Industrial Park	TL. 832, An Nhựt Tân, Tan Tru District Long An province, Vietnam
VN0080			Vietnam	Long An	Bac Tan Tap Industrial Park	Kinh Bac Dong tt. Tân Thạnh, Tân Thạnh, Long An province, Vietnam
VN0081			Vietnam	Long An	Cau Tram Industrial Park	QL 62, tp. Tân An Long An province, Vietnam
VN0082			Vietnam	Long An	Duc Hoa 3 - Anh Hong Industrial Park	TL 825, tt. Đức Hoà, Đức Hòa Long An province
VN0083			Vietnam	Long An	Duc Hoa 3 - Cali Long Duc Industrial Park	TL 825, tt. Đức Hoà, Đức Hòa Long An province
VN0084			Vietnam	Long An	Duc Hoa 3 - Dong Phuong Industrial Park	TL 825, tt. Đức Hoà, Đức Hòa Long An province
VN0085			Vietnam	Long An	Duc Hoa 3 - Duc Loi Industrial Park	TL 825, tt. Đức Hoà, Đức Hòa Long An province
VN0086			Vietnam	Long An	Duc Hoa 3 - Hong Dat Industrial Park	TL 825, tt. Đức Hoà, Đức Hòa Long An province
VN0087			Vietnam	Long An	Duc Hoa 3 - Lien Thanh Industrial Park	TL 825, tt. Đức Hoà, Đức Hòa Long An province
VN0088			Vietnam	Long An	Duc Hoa 3 - Long Viet Industrial Park	TL 825, tt. Đức Hoà, Đức Hòa Long An province
VN0089			Vietnam	Long An	Duc Hoa 3 - Minh Ngan Industrial Park	TL 825, tt. Đức Hoà, Đức Hòa Long An province
VN0090			Vietnam	Long An	Duc Hoa 3 - Muoi Day Industrial Park	TL 825, tt. Đức Hoà, Đức Hòa Long An province
VN0091			Vietnam	Long An	Duc Hoa 3 - Silico Industrial Park	TL 825, tt. Đức Hoà, Đức Hòa Long An province
VN0092			Vietnam	Long An	Duc Hoa 3 - Song Tan Industrial Park	TL 825, tt. Đức Hoà, Đức Hòa Long An province
VN0093			Vietnam	Long An	Duc Hoa I - Lucky Industrial Park	TL 825, tt. Đức Hoà, Đức Hòa Long An province
VN0094			Vietnam	Long An	Duc Hoa III - RESCO Industrial Park	TL 825, tt. Đức Hoà, Đức Hòa Long An province
VN0095			Vietnam	Long An	Duc Hoa III - Viet Hoa Industrial Park	TL 825, tt. Đức Hoà, Đức Hòa Long An province
VN0096			Vietnam	Long An	KCN Đức Hoà 3 - Thái Hoà Industrial Park	Số 1, Phường 4, tp. Tân An Long An province
VN0097			Vietnam	Long An	Long Hau - Hoa Binh Industrial Park	Long Hậu, Can Giuoc District Long An province

ID	Short List	LongList	COUNTRY	PROVINCE	PARK NAME	ADDRESS
VN0098		**XXVN15**	Vietnam	Long An	Long Hau Industrial Park	Long Hậu, Can Giuoc District Long An province -> new TT. Can Giuqc
VN0099			Vietnam	Long An	Nam Tan Tap Industrial Park	Số 1, Phường 4, tp. Tân An Long An province
VN0100			Vietnam	Long An	Nhut Chanh Industrial Park	TL. 832, Nhựt Chánh, Ben Luc District Long An province, Vietnam
VN0101			Vietnam	Long An	Phu An Thanh Industrial Park	Tỉnh lộ 827A, Hiệp Thạnh, Châu Thành Long An province, Vietnam
VN0102			Vietnam	Long An	Phuc Long Industrial Park	Số 1, Phường 4, tp. Tân An Long An province, Vietnam
VN0103			Vietnam	Long An	PHUOC DONG INDUSTRIAL PARK AND PORT	Quốc lộ 50, Phước Đông, Cần Đước Long An province, Vietnam
VN0104			Vietnam	Long An	Tan Buu - Long hiep Industrial Park	Unnamed Rd, Tân Bửu, Ben Luc District Long An province
VN0105			Vietnam	Long An	Tan Buu Industrial Park	Unnamed Rd, Tân Bửu, Ben Luc District Long An province
VN0106		**XXVN32**	Vietnam	Long An	Tan Duc Industrial Park	Duc Hoa Ha Street,Duc Hoa District
VN0107			Vietnam	Long An	Tan Kim Industrial Park	Đường mòn, Tân Kim, Can Giuoc District Long An province, Vietnam
VN0108			Vietnam	Long An	Tan thanh Industrial Park	ĐT829, tt. Tân Thạnh, Tân Thạnh Long An province, Vietnam
VN0109			Vietnam	Long An	Thai Hoa Industrial Park	Số 1, Phường 4, tp. Tân An Long An province
VN0110			Vietnam	Long An	Thanh Duc Industrial Park	TP Hồ Chí Minh -Trung Lương, Thạnh Đức, Ben Luc District Long An province, Vietnam
VN0111			Vietnam	Long An	Thuan Dao Industrial Park	Số 1, Phường 4, tp. Tân An Long An province
VN0112			Vietnam	Long An	Vinh Loc 2 Industrial Park	Số 1, Phường 4, tp. Tân An Long An province
VN0113			Vietnam	Long An	Xuyen A IZ	Số 1, Phường 4, tp. Tân An Long An province
VN0114			Vietnam	Ba Ria Vung Tau	Cai Mep Industrial Park	Tỉnh lộ 52, Dat Do District Ba Ria-Vung Tau province
VN0115			Vietnam	Ba Ria Vung Tau	Dat Do Industrial Park	Tỉnh lộ 44A, tt. Đất Đỏ, Dat Do District Ba Ria-Vung Tau province, Vietnam
VN0116			Vietnam	Ba Ria Vung Tau	Đô Thị Châu Đức Industrial Park	Tỉnh lộ 52, Dat Do District Ba Ria-Vung Tau province
VN0117			Vietnam	Ba Ria Vung Tau	Dong Xuyen Industrial Park	Tỉnh lộ 52, Dat Do District Ba Ria-Vung Tau province
VN0118			Vietnam	Ba Ria Vung Tau	Long Sơn Industrial Park	Cầu Long Sơn, tp. Vũng Tàu Ba Ria-Vung Tau province, Vietnam
VN0119		**XXVN19**	Vietnam	Ba Ria Vung Tau	My Xuan A Industrial Park	7 Quốc lộ 51, Mỹ Xuân, Tan Thanh District Ba Ria-Vung Tau province
VN0120			Vietnam	Ba Ria Vung Tau	My Xuan A2 Industrial Park	7 Quốc lộ 51, Mỹ Xuân, Tan Thanh District Ba Ria-Vung Tau province
VN0121			Vietnam	Ba Ria Vung Tau	My Xuan B1 – Dai Duong Industrial Park	7 Quốc lộ 51, Mỹ Xuân, Tan Thanh District Ba Ria-Vung Tau province
VN0122			Vietnam	Ba Ria Vung Tau	My Xuan B1 – Tien Hung Industrial Park	7 Quốc lộ 51, Mỹ Xuân, Tan Thanh District Ba Ria-Vung Tau province
VN0123			Vietnam	Ba Ria Vung Tau	My Xuan B1 Industrial Park	7 Quốc lộ 51, Mỹ Xuân, Tan Thanh District Ba Ria-Vung Tau province
VN0124		**XXVN22**	Vietnam	Ba Ria Vung Tau	Phu My I Industrial Park	Phu My Town,Tan Than District
VN0125			Vietnam	Ba Ria Vung Tau	Phu My II Industrial Park	NO ADRESS
VN0126			Vietnam	Ba Ria Vung Tau	Thanh Binh Phu My Industrial Park	Vung Tau province, Vietnam
VN0127			Vietnam	Ba Ria Vung Tau	Phu My III IZ	NO ADRESS
VN0128			Vietnam	Tay Ninh	Bourbon An Hoa Industrial Park	Bourbon, Tân Hưng, Tân Châu Tay Ninh province
VN0129			Vietnam	Tay Ninh	Linh Trung III Industrial Park	Bời Lời, Phan, Tay Ninh Tay Ninh province, Vietnam
VN0130			Vietnam	Tay Ninh	Phuoc Dong Industrial Park	ĐT782, Phước Đông, Gò Dầu Tay Ninh province, Vietnam

ID	Short List	LongList	COUNTRY	PROVINCE	PARK NAME	ADDRESS
VN0131			Vietnam	Tay Ninh	Trang Bang Industrial Park	Đường Chùa Am, Gia Lộc, Trang Bang District Tay Ninh province, Vietnam
VN0132			Vietnam	Tay Ninh	An Phu IZ	244 Tỉnh Lộ 15, An Phú, Củ Chi Ho Chi Minh City, Vietnam
VN0133			Vietnam	Tien Giang	An Phuoc Seaport - Gia Thuan Industrial Complex	108 Ấp Bắc, Phường 10, tp. Mỹ Tho Tien Giang
VN0134			Vietnam	Tien Giang	Long Giang Industrial Park	108 Ấp Bắc, Phường 10, tp. Mỹ Tho Tien Giang
VN0135			Vietnam	Tien Giang	My Tho Industrial Park	8 Rạch Gầm, 1, My Tho Tien Giang, Vietnam
VN0136			Vietnam	Tien Giang	Soai Rap Shipyard Industrial Park	AH 1, tp. Mỹ Tho Tien Giang, Vietnam
VN0137			Vietnam	Tien Giang	Tan Huong Industrial Park	AH 1, Tân Hương, Châu Thành Tien Giang, Vietnam
VN0138			Vietnam	Binh Phuoc	Bac Dong Phu Industrial Park	NO ADRESS
VN0139			Vietnam	Binh Phuoc	Binh Tan Industry Groups Industrial Complex	NO ADRESS
VN0140			Vietnam	Binh Phuoc	Chon Thanh Industrial Park	QL 13, tt. Chơn Thành, Chơn Thành Binh Duong province, Vietnam
VN0141			Vietnam	Binh Phuoc	Dong Xoai Industrial Park	QL 14, Tân Thiện, tx. Đồng Xoài Binh Phuoc province, Vietnam
VN0142			Vietnam	Binh Phuoc	Minh Hung - South Korea Industrial Park	QL 13, Minh Hưng, Chơn Thành Binh Duong province
VN0143			Vietnam	Binh Phuoc	Minh Hung III Industrial Park	QL 13, Minh Hưng, Chơn Thành Binh Duong province
VN0144			Vietnam	Binh Phuoc	Nam Dong Phu Industrial Park	Đập, Long Bình, Bù Gia Mập Binh Phuoc province
VN0145			Vietnam	Binh Phuoc	Saigon BinhPhuoc Industrial Zone	Đập, Long Bình, Bù Gia Mập Binh Phuoc province
VN0146			Vietnam	Binh Thuan	Ham Kiem I Industrial Park	Hồ Quang Cảnh, Thiện Trung, Phan Thiết Bình Thuận Province
VN0147			Vietnam	Binh Thuan	Ham Kiem II Industrial Park	Hồ Quang Cảnh, Thiện Trung, Phan Thiết Bình Thuận Province
VN0148			Vietnam	Binh Thuan	Phan Thiet I Industrial Park	139 Lê Lợi, Hưng Long, Phan Thiet Bình Thuận Province
VN0149			Vietnam	Binh Thuan	Phan Thiet II Industrial Park	139 Lê Lợi, Hưng Long, Phan Thiet Bình Thuận Province
VN0150			Vietnam	Binh Thuan	Son My I Industrial Park	Quốc lộ 55, Sơn Mỹ, Ham Tan District Bình Thuận Province, Vietnam
VN0151			Vietnam	Binh Thuan	Tan Duc Industrial Park	AH 1, Tân Đức, Ham Tan District Bình Thuận Province, Vietnam
VN0152			Vietnam	An Giang	BINH HOA Industrial Park	Quốc lộ 91, Chau Thanh District An Giang province, Vietnam
VN0153			Vietnam	An Giang	Binh Long Industrial Park	43 Trần Khánh Dư, chợ Cái Dầu, Cái Dâu, Chau Phu District An Giang province, Vietnam
VN0154			Vietnam	An Giang	Vam Cong Industrial Park	Lê Lợi, Tân Hiệp, tt. Chi Lăng, Tịnh Biên An Giang province, Vietnam
VN0155			Vietnam	BẠC LIÊU	GÀNH HÀO Industrial Park	151 Phan Ngọc Hiển, Ganh Hao, Dong Hai Bac Lieu province, Vietnam
VN0156			Vietnam	BẠC LIÊU	LANG TRAM Industrial Park	400-404 Võ Thị Sáu, Bac Lieu Bac Lieu province, Vietnam
VN0157			Vietnam	BẠC LIÊU	NINH QUỚI Industrial Park	hương lộ Vĩnh Quới, Vĩnh Quới, Ngã Năm Soc Trang, Vietnam
VN0158			Vietnam	BẠC LIÊU	SEA HABOUR SERVICE Industrial Park	2, Vĩnh Bình, Hòa Bình Bac Lieu province
VN0159			Vietnam	BẠC LIÊU	Tra Kha Industrial Park	2, Vĩnh Bình, Hòa Bình Bac Lieu province
VN0160			Vietnam	Ben Tre	An Hiep Industrial Park	TL 884, An Hiệp, Châu Thành Ben Tre province, Vietnam
VN0161			Vietnam	Ben Tre	Giao Long Industrial Park	883, Giao Long, Châu Thành Ben Tre province, Vietnam

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VN0162			Vietnam	Ca Mau	Hoa Trung Industrial Park	40 Lý Bôn, LÂM THÀNH MẬU, 4, Ca Mau Vietnam
VN0163			Vietnam	Ca Mau	Khanh An Industrial Park	Đường về U Minh, Khánh An, U Minh District Ca Mau, Vietnam
VN0164			Vietnam	Ca Mau	Nam Can Industrial Park	893 Nguyễn Tất Thành, tt. Năm Căn, Nam Can District Ca Mau, Vietnam
VN0165			Vietnam	Ca Mau	Song Doc Industrial Park	Đường Phú Mỹ, Phú Thuận, Phu Tan District Ca Mau, Vietnam
VN0166			Vietnam	Vinh Long	Binh Minh Industrial Park	107-109 Nguyễn Huệ, Phường 2, Vinh Long Vietnam
VN0167			Vietnam	Vinh Long	Co Chien Industrial Park	Nguyễn Đức Cảnh, Hung Binh, Vinh Nghe An, Vietnam
VN0168			Vietnam	Vinh Long	Hoa Phu Industrial Park	Bà Lan, Hoà Phú, Long Ho District Vinh Long, Vietnam
VN0169			Vietnam	Vinh Long	Tam Binh Industrial Complex	TL 905, Mỹ Thạnh Trung, Tam Binh District Vinh Long, Vietnam
VN0170			Vietnam	Dong Thap	Hau River Industrial Park	TL 847, Cao Lanh Dong Thap province
VN0171			Vietnam	Dong Thap	Sa Đec Industrial Park	TL 847, Cao Lanh Dong Thap province
VN0172			Vietnam	Dong Thap	Tran Quoc Toan Industrial Park	Nguyễn Văn Tiệp, Mỹ Phú, tp. Cao Lãnh Dong Thap province, Vietnam
VN0173			Vietnam	Tra Vinh	Long Duc Industrial Park	Đường số 1, Long Đức, tp. Trà Vinh Tra Vinh, Vietnam
VN0174			Vietnam	Cần Thơ	Bac O Mon Industrial Park	66 Nam Kỳ Khởi Nghĩa, Tân An, Ninh Kiều Cần Thơ, Vietnam
VN0175			Vietnam	Cần Thơ	Hung Phu 1 Industrial Park	Unnamed Rd, Hưng Phú, Cái Răng Cần Thơ
VN0176			Vietnam	Cần Thơ	Hung Phu 2A Industrial Park	Unnamed Rd, Hưng Phú, Cái Răng Cần Thơ
VN0177			Vietnam	Cần Thơ	Hung Phu 2B Industrial Park	Unnamed Rd, Hưng Phú, Cái Răng Cần Thơ
VN0178			Vietnam	Cần Thơ	O Mon Industrial Park	158 Trần Hưng Đạo, Châu Văn Liêm, Ô Môn Cần Thơ, Vietnam
VN0179			Vietnam	Cần Thơ	Thot Not 1 Industrial Park	QL 91, Thốt Nốt Cần Thơ
VN0180			Vietnam	Cần Thơ	Thot Not 2 Industrial Park	QL 91, Thốt Nốt Cần Thơ
VN0181			Vietnam	Cần Thơ	Thot Not Industrial Park	QL 91, Thốt Nốt Cần Thơ
VN0182			Vietnam	Cần Thơ	Tra Noc 1 Industrial Park	Nguyễn Thị Hồng Gấm, Trà Nóc, Bình Thủy Cần Thơ, Vietnam
VN0183			Vietnam	Cần Thơ	Tra Noc 2 Industrial Park	Nguyễn Thị Hồng Gấm, Trà Nóc, Bình Thủy Cần Thơ, Vietnam
VN0184			Vietnam	Soc Trang	An Nghiep Industrial Park	Tỉnh lộ 13, Mỹ Tú Soc Trang
VN0185			Vietnam	Soc Trang	Cai Con Industrial Complex	Tỉnh lộ 13, Mỹ Tú Soc Trang
VN0186			Vietnam	Soc Trang	Dai Ngai Industrial Park	542 60, Đại Ngãi, Long Phu District Soc Trang, Vietnam
VN0187			Vietnam	Soc Trang	Tran De Industrial Park	13 Nam Sông Hậu, tt. Trần Đề, Trần Đề Soc Trang, Vietnam
VN0188			Vietnam	Hau Giang	Phu Huu A Industrial Complex	Nam Sông Hậu, Phú Hữu A, Châu Thành Hau Giang province, Vietnam
VN0189			Vietnam	Hau Giang	Song Hau Industrial Park	NO ADRESS
VN0190			Vietnam	Hau Giang	Tan Phu Thanh Industrial Complex	286 Quốc lộ 1A, Tân Phú Thạnh, Châu Thành Hau Giang province, Vietnam
VN0191			Vietnam	Kiên Giang	Kien Luong II Industrial Park	QL 80, tt. Kiên Lương, Kiên Lương Kien Giang province
VN0192			Vietnam	Kiên Giang	Kien Luong Industrial Park	QL 80, tt. Kiên Lương, Kiên Lương Kien Giang province
VN0193			Vietnam	Kiên Giang	Tac Cau Industrial Park	QL 63, Hưng Yên, An Bien District Kien Giang province
VN0194			Vietnam	Kiên Giang	Thanh Loc Industrial Complex	Cầu, Thạnh Lộc, Giong Rieng District Kien Giang province, Vietnam
VN0195			Vietnam	Kiên Giang	Thuan Yen Industrial Complex	QL 80, Thuận Yến, Ha Tien Kien Giang province, Vietnam

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VN0196			Vietnam	Kiên Giang	Xeo Ro Industrial Complex	QL 63, Hưng Yên, An Bien District Kien Giang province
VN0197			Vietnam	Hà Nội City	Bac Thang Long Industrial Park	20-22 Lương Văn Can, Hàng Đào, Hoan Kiem District Hanoi
VN0198			Vietnam	Hà Nội City	Bac Thuong Tin Industrial Park	20-22 Lương Văn Can, Hàng Đào, Hoan Kiem District Hanoi
VN0199			Vietnam	Hà Nội City	Dong Anh Industrial Park	20-22 Lương Văn Can, Hàng Đào, Hoan Kiem District Hanoi
VN0200			Vietnam	Hà Nội City	Ha Noi - Dai Tu Industrial Park	20-22 Lương Văn Can, Hàng Đào, Hoan Kiem District Hanoi
VN0201			Vietnam	Hà Nội City	Khu Công nghệ cao Sinh học Industrial Park	20-22 Lương Văn Can, Hàng Đào, Hoan Kiem District Hanoi
VN0202			Vietnam	Hà Nội City	Nam Thang Long Industrial Park	20-22 Lương Văn Can, Hàng Đào, Hoan Kiem District Hanoi
VN0203			Vietnam	Hà Nội City	Noi Bai Industrial Park	20-22 Lương Văn Can, Hàng Đào, Hoan Kiem District Hanoi
VN0204		**XXVN23**	Vietnam	Hà Nội City	Phu Nghia Industrial Park	Ngõ 1194 - Láng, Láng Thượng, Đống Đa, Hà Nội
VN0205		**XXVN25**	Vietnam	Hà Nội City	Quang Minh Industrial Park	Quang Minh Commune,Me Linh District
VN0206			Vietnam	Hà Nội City	Sai Dong A Industrial Park	20-22 Lương Văn Can, Hàng Đào, Hoan Kiem District Hanoi
VN0207		**XXVN27**	Vietnam	Hà Nội City	Sai Dong B Industrial Park	Thach Ban Ward,Long Bien District
VN0208			Vietnam	Hà Nội City	Soc Son Industrial Park	20-22 Lương Văn Can, Hàng Đào, Hoan Kiem District Hanoi
VN0209			Vietnam	Hà Nội City	Thach That - Quoc Oai Industrial Park	20-22 Lương Văn Can, Hàng Đào, Hoan Kiem District Hanoi
VN0210		**XXVN34**	Vietnam	Hà Nội City	Thang Long Industrial Park	My Hao Hung Yen
VN0211			Vietnam	Hà Nội City	Quang Minh II IP	20-22 Lương Văn Can, Hàng Đào, Hoan Kiem District Hanoi
VN0212			Vietnam	Hà Nội City	Thang Long IP II - Japan	20-22 Lương Văn Can, Hàng Đào, Hoan Kiem District Hanoi
VN0213			Vietnam	Hà Nội City	Daewoo-Hanel (SDA) IP - Korea	20-22 Lương Văn Can, Hàng Đào, Hoan Kiem District Hanoi
VN0214			Vietnam	Hà Nội City	Dai Tu - Hanoi IP	20-22 Lương Văn Can, Hàng Đào, Hoan Kiem District Hanoi
VN0215		**XXVN12**	Vietnam	Hà Nội City	Hoa Lac Hi-tech Park	Đại lộ Thăng Long, Song Phương, Hoài Đức, Hà Nội
VN0216			Vietnam	Hà Nội City	Ninh Hiep IZ	20-22 Lương Văn Can, Hàng Đào, Hoan Kiem District Hanoi
VN0217			Vietnam	Hà Nội City	North Phu Cat IP	20-22 Lương Văn Can, Hàng Đào, Hoan Kiem District Hanoi
VN0218			Vietnam	Hà Nội City	Phung Hiep IP	20-22 Lương Văn Can, Hàng Đào, Hoan Kiem District Hanoi
VN0219			Vietnam	Vinh Phuc	Ba Thien Industrial Park	TL 302B, Bá Hiến, tx. Phúc Yên Vinh Phuc province, Vietnam
VN0220			Vietnam	Vinh Phuc	Binh Xuyen Industrial Park	Đường tỉnh 305B, Hương Canh, Bình Xuyên Vinh Phuc province, Vietnam
VN0221			Vietnam	Vinh Phuc	Chan Hung Industrial Park	TL 309, Vinh Tuong District Vinh Phuc province, Vietnam
VN0222			Vietnam	Vinh Phuc	Khai Quang Industrial Park	Nguyễn Tất Thành, Khai Quang, tp. Vĩ nh YênVinh Phuc province, Vietnam
VN0223			Vietnam	Vinh Phuc	Kim Hoa Industrial Park	TL 135, Thanh Xuân, Soc Son District Hanoi, Vietnam
VN0224		**XXVN25**	Vietnam	Vinh Phuc	Quang Minh IZ	Bắc Thăng Long - Nội Bài, Quang Minh, Mê Linh Hanoi, Vietnam
VN0225			Vietnam	Quảng Ninh	Cai Lan Industrial Park	QL 18, Cẩm Hải, tp. Cẩm Phả Quang Ninh province, Vietnam
VN0226			Vietnam	Quảng Ninh	Dong Mai Industrial Park	đường vào xã Sông Khoai, Đông Ma iHải Phòng, Vietnam
VN0227			Vietnam	Quảng Ninh	Hai Yen Industrial Park	Bến Mười, Hải Yên, tp. Móng Cái Quang Ninh province, Vietnam
VN0228			Vietnam	Quảng Ninh	Viet Hung Industrial Park	Đồng Đăng, Việt Hưng, Ha Long Quang Ninh province, Vietnam
VN0229			Vietnam	Bac Ninh	Nam Son - Hap Linh Industrial Park	Đê, Yen Dung District Bac Giang province, Vietnam

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VN0230		**XXVN26**	Vietnam	Bac Ninh	Que Vo I Industrial Park	QL 18, tp. Bắc Ninh, Bắc Ninh
VN0231			Vietnam	Bac Ninh	Que Vo II Industrial Park	QL 18, Que Vo District Bac Ninh province
VN0232			Vietnam	Bac Ninh	Que Vo III Industrial Park	QL 18, Que Vo District Bac Ninh province
VN0233			Vietnam	Bac Ninh	Thuan Thanh 1 Industrial Park	TL282, Thuan Thanh District Bac Ninh province
VN0234			Vietnam	Bac Ninh	Thuan Thanh II Industrial Park	TL282, Thuan Thanh District Bac Ninh province
VN0235			Vietnam	Bac Ninh	Thuan Thanh III Industrial Park	TL282, Thuan Thanh District Bac Ninh province
VN0236			Vietnam	Bac Ninh	Tien Son Industrial Park	84 Thiên Đức, Bac Ninh Bac Ninh province
VN0237			Vietnam	Bac Ninh	Yen Phong I Industrial Park	NO ADRESS
VN0238			Vietnam	Bac Ninh	Yen Phong II Industrial Park	NO ADRESS
VN0239		**XXVN06**	Vietnam	Bac Ninh	Dai Dong - Hoan Son Industrial Park	Dai Dong and Hoan Son Commune Tien Du District
VN0240			Vietnam	Bac Ninh	Do Thi Dai Kim Industrial Park	84 Thiên Đức, Bac Ninh Bac Ninh province
VN0241			Vietnam	Bac Ninh	Hanaka Industrial Park	84 Thiên Đức, Bac Ninh Bac Ninh province
VN0242			Vietnam	Bac Ninh	VSIP Bac Ninh IP	Trục chính VSIP, tx. Từ Sơn Bac Ninh province, Vietnam
VN0243	**XXVN38**	**XXVN38**	Vietnam	Hai Phong	Dinh Vu Industrial Park	4 Tran Phu Street, Ngo Quyen District,Hai Phong city
VN0244	**XXVN39**	**XXVN39**	Vietnam	Hai Phong	Do Son Industrial Park	TL 361, Đồng Tiến, Đồ Sơn Hải Phòng, Vietnam
VN0245	**XXVN40**	**XXVN40**	Vietnam	Hai Phong	Nam Cau Kien Industrial Park	8 Lý Thường Kiệt, Quang Trung, Hồng Bàng Hải Phòng
VN0246	**XXVN21**	**XXVN21**	Vietnam	Hai Phong	Nomura Industrial Park	TT.AN Duong , An Duong, Hai Phong
VN0247	**XXVN41**	**XXVN41**	Vietnam	Hai Phong	Trang Due Industrial Park	TL 208, An Dương Hải Phòng, Vietnam
VN0248	**XXVN42**	**XXVN42**	Vietnam	Hai Phong	Trang Cat Industrial Park	Near Hai An, Haipong, Vietnam
VN0249			Vietnam	Hai Phong	An Duong Industrial Park	Ngõ 185 Tôn Đức Thắng, Lê Chân Hải Phòng, Vietnam
VN0250			Vietnam	Hai Phong	Hai Phong 96 EPZ	Ngõ Trương Hán Siêu, An Biên, Lê Chân Hải Phòng, Vietnam
VN0251	**XXVN43**	**XXVN43**	Vietnam	Hai Phong	Vietnam Singapore Industrial Park(VSIP)	8 Lý Thường Kiệt, Quang Trung, Hồng Bàng Hải Phòng, Vietnam
VN0252			Vietnam	Hưng Yên	Det may Pho Noi B Industrial Park	QL 39 Hung Yen province
VN0253			Vietnam	Hưng Yên	Minh Duc Industrial Park	QL 39 Hung Yen province
VN0254			Vietnam	Hưng Yên	Pho Noi A Industrial Park	QL 39, Pho Noi, Liêu Xá, Yên Mỹ Hung Yen province, Vietnam
VN0255		**XXVN35**	Vietnam	Hưng Yên	Thang Long 2 Industrial Park	QL 39 Hung Yen province -> My Hao Hung Yen
VN0256			Vietnam	Hưng Yên	Yen My II Industrial Park	Vĩnh Hưng, tt. Yên Mỹ, Yên Mỹ Hung Yen province, Vietnam
VN0257			Vietnam	Hưng Yên	Minh Quang Industrial Park	QL 39 Hung Yen province
VN0258			Vietnam	Hưng Yên	Pho Noi B Industrial Park	QL 39, Pho Noi, Liêu Xá, Yên Mỹ Hung Yen province, Vietnam
VN0259			Vietnam	Hưng Yên	Phu Hung Industrial Zone	QL 39, Tiên Cầu, tt. Lương Bằng, Kim Động Hung Yen province, Vietnam
VN0260			Vietnam	Hưng Yên	Tan Tao AGRIMECO Energy Mechanic Industrial Park	QL 39 Hung Yen province
VN0261		**XXVN05**	Vietnam	Hải Dương	Dai An Industrial Park	TL 280, Thuận Thành, Bắc Ninh
VN0262			Vietnam	Hải Dương	Lai Cach Industrial Park	174 Nguyễn Lương Bằng, Hai Duong
VN0263			Vietnam	Hải Dương	Nam Sach Industrial Park	174 Nguyễn Lương Bằng, Hai Duong

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VN0264		**XXVN24**	Vietnam	Hải Dương	Phuc Dien Industrial Park	Phuc Dien Commune, Cam Giang District
VN0265			Vietnam	Hải Dương	Tân Trường Industrial Park	174 Nguyễn Lương Bằng, Hai Duong
VN0266			Vietnam	Hải Dương	Cong Hoa IP	AH 14, Lai Khê, Cộng Hòa, Kim Thanh District Hai Duong, Vietnam
VN0267			Vietnam	Hải Dương	Luong Dien-Cam Dien IP	174 Nguyễn Lương Bằng, Hai Duong
VN0268			Vietnam	Hải Dương	Tau Thuy-Lai Vu IP	174 Nguyễn Lương Bằng, Hai Duong
VN0269			Vietnam	Hải Dương	Viet Hoa-Kenmark IP	174 Nguyễn Lương Bằng, Hai Duong
VN0270			Vietnam	Hà Nam	Châu Sơn Industrial Park	Đường Phủ Lý - Kiện Khê, Châu Sơn, tp. Phủ Lý Ha Nam province, Vietnam
VN0271		**XXVN09**	Vietnam	Hà Nam	Đồng Văn II Industrial Park	AH 1, Đồng Văn, tt. Đồng Văn, Duy Tien District Ha Nam province, Vietnam
VN0272			Vietnam	Hà Nam	Dong Van IP	AH 1, Tiên Tân, Duy Tien District Ha Nam province, Vietnam
VN0273			Vietnam	Bắc Giang	Quang Châu Industrial Park	Đê, Bac Giang Bac Giang province
VN0274			Vietnam	Bắc Giang	Dinh Tram IZ (1st & 2 nd phases)	Đê, Bac Giang Bac Giang province
VN0275			Vietnam	Bắc Giang	Song Khe-Noi Hoang Industrial Park	AH 1, Yen Dung District Bac Giang province, Vietnam
VN0276			Vietnam	Bắc Giang	Viet Han Industrial Park	NO ADRESS
VN0277			Vietnam	Da Nang	Da Nang Aquatic Product Service Industrial Park	kiệt 408 Hoàng Diệu, Hòa Thuận Đông, Hải Châu Da Nang
VN0278		**XXVN04**	Vietnam	Da Nang	Da Nang Industrial Park	58 Nauyen Chi Thanh, Quan Hai Chau
VN0279		**XXVN10**	Vietnam	Da Nang	Hoa Cam Industrial Park	THAC GIAN, Thanh Khe Da Nang
VN0280		**XXVN11**	Vietnam	Da Nang	Hoa Khanh Industrial Park	118 Nguyễn Lương Bằng, Hòa Khánh Bắc, Liên Chiểu, Đà Nẵng
VN0281			Vietnam	Da Nang	Hoa Khanh - expanded	kiệt 408 Hoàng Diệu, Hòa Thuận Đông, Hải Châu Da Nang
VN0282			Vietnam	Da Nang	Lien Chieu Industrial Park	AH 1, Hòa Hiệp Bắc, Liên Chiểu Da Nang, Vietnam
VN0283			Vietnam	Da Nang	Widen Hoa Khanh Industrial Park	kiệt 408 Hoàng Diệu, Hòa Thuận Đông, Hải Châu Da Nang
VN0284		**XXVN03**	Vietnam	Danang City	Da Nang Hi Tech Park	Da Nang Hi Tech Park, Hoa Lien Commune, Hoa Vang District
VN0285			Vietnam	Thua Thien Hue	Phú Bài Industrial Park	Lê Trọng Tấn, tt. Phú Bài, Hương Thủy Thua Thien-Hue, Vietnam
VN0286			Vietnam	Khanh Hoa	Bắc Cam Ranh Industrial Park	NO ADRESS
VN0287			Vietnam	Khanh Hoa	Nam Cam Ranh Industrial Park	50 Trần Phú, Lộc Thọ, Nha Trang Khánh Hoà, Vietnam
VN0288			Vietnam	Khanh Hoa	Ninh Thuy Industrial Park	1B, Ninh Thủy, tx. Ninh Hòa Khanh Hoa province, Vietnam
VN0289			Vietnam	Khanh Hoa	Suoi Dau Industrial Park	TL 654, Cam An Bắc, Cam Lâm Khanh Hoa province, Vietnam
VN0290			Vietnam	Khanh Hoa	Vạn Thắng Industrial Park	Hà Thanh, Vạn Thắng, Nha Trang Khánh Hoà, Vietnam
VN0291			Vietnam	Quang Ngai	Dung Quat Industrial Park	63 Nguyễn Du, Nghĩa Chánh, Quang Ngai Quảng Ngãi Province
VN0292			Vietnam	Quang Ngai	Pho Phong Industrial Park	AH132, Phổ Phong, Đức Phổ Quảng Ngãi Province, Vietnam
VN0293			Vietnam	Quang Ngai	Quang Phu Industrial Park	108 Hoàng Văn Thụ, Quảng Phú, Quang Ngai Quảng Ngãi Province, Vietnam
VN0294			Vietnam	Quang Ngai	Tam Anh Industrial Park	63 Nguyễn Du, Nghĩa Chánh, Quang Ngai Quảng Ngãi Province
VN0295			Vietnam	Quang Ngai	Tam Thang Industrial Park	63 Nguyễn Du, Nghĩa Chánh, Quang Ngai Quảng Ngãi Province
VN0296			Vietnam	Quang Ngai	Tinh Phong Industrial Park	AH 1, Tịnh Phong, Son Tinh District Quảng Ngãi Province, Vietnam
VN0297			Vietnam	Quang Nam	Dien Nam - Dien Ngoc Industrial Park	Đi biển Tam Thăng, Tam Thăng, tp. Tam Kỳ Quang Nam province

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VN0298			Vietnam	Quang Nam	Dong Que Son Industrial Park	Đi biển Tam Thăng, Tam Thăng, tp. Tam Kỳ Quang Nam province
VN0399			Vietnam	Quang Nam	Mechanical Chu Lai Truong Hai Industrial Park	Đi biển Tam Thăng, Tam Thăng, tp. Tam Kỳ Quang Nam province
VN0300			Vietnam	Quang Nam	North Chu Lai Industrial Park	Đi biển Tam Thăng, Tam Thăng, tp. Tam Kỳ Quang Nam province
VN0301			Vietnam	Quang Nam	Phu Xuan Industrial Park	35 Trần Phú, Tân Thạnh, Tam Ky Quang Nam province, Vietnam
VN0302			Vietnam	Quang Nam	Tam Hiep Industrial Park	AH 1, Tam Hiệp, Nui Thanh District Quang Nam province, Vietnam
VN0303			Vietnam	Quang Nam	Thuan Yen Industrial Park	Đi biển Tam Thăng, Tam Thăng, tp. Tam Kỳ Quang Nam province, Vietnam
VN0304			Vietnam	Binh Dinh	Hoa Hoi Industrial Park	632, Phu My District Binh Dinh province, Vietnam
VN0305			Vietnam	Binh Dinh	Long My Industrial Park	NO ADRESS
VN0306			Vietnam	Binh Dinh	Nhon Hoa Industrial Park	630, Hoai An District Binh Dinh province, Vietnam
VN0307			Vietnam	Binh Dinh	Nhon Hoi A Industrial Park	608 Trần Hưng Đạo, tp. Quy Nhơn Binh Dinh province
VN0308			Vietnam	Binh Dinh	Nhon Hoi B Industrial Park	608 Trần Hưng Đạo, tp. Quy Nhơn Binh Dinh province
VN0309			Vietnam	Binh Dinh	Nhon Hoi C Industrial Park	608 Trần Hưng Đạo, tp. Quy Nhơn Binh Dinh province
VN0310			Vietnam	Binh Dinh	Phu Tai Industrial Park	Quốc lộ 1D, Quang Trung, tp. Quy Nhơn Binh Dinh province, Vietnam
VN0311			Vietnam	Phu Yen	An Phu Industrial Park	AH 1, An Phú, tp. Tuy Hòa Phu Yen province, Vietnam
VN0312			Vietnam	Phu Yen	Dong Bac Song Cau Industrial Park	Mậu Thân, Phường 9, tp. Tuy Hòa Phu Yen province, Vietnam
VN0313			Vietnam	Phu Yen	Hoa Hiep Industrial Park	AH 1, Hòa Hiệp, Xuân Thịnh, tx. Sông Cầu Phu Yen province, Vietnam
VN0314			Vietnam	Gia Lai	Tra Da Industrial Park	Nguyễn Xí, Trà Đa, tp. Pleiku Gia Lai province, Vietnam
VN0315			Vietnam	Dak Nong	Tam Thang Industrial Park	446 Nguyễn Tất Thành, Tâm Thắng, Cu Jut District Dak Nong, Vietnam
VN0316			Vietnam	Dak Lak	Hòa Phú Industrial Park	AH17, Hòa Phú, Buon Ma Thuot Dak Lak province, Vietnam
VN0317			Vietnam	Hà Giang	Binh Vang Industrial Park	QL2, Phương Thiện, Ha Giang Vietnam
VN0318			Vietnam	Tuyên Quang	Long Binh An Industrial Park	Đinh Tiên Hoàng, Tân Quang, tp. Tuyên Quang Tuyen Quang, Vietnam
VN0319			Vietnam	Bắc Kạn	Thanh Binh Industrial Park	Cầu, Thanh Bình, Chợ Mới Bac Kan province, Vietnam
VN0320			Vietnam	Thái Nguyên	Song Cong Industrial Park	đường Thắng Lợi, Lương Châu, tx. Sông Công Thai Nguyen province, Vietnam
VN0321			Vietnam	Phú Thọ	Thuy Van Industrial Park	Đồng Rạc, Ngọc Đồng, Yên Lập Phu Tho province
VN0322			Vietnam	Phú Thọ	Trung Ha Industrial Park	Đồng Rạc, Ngọc Đồng, Yên Lập Phu Tho province
VN0323			Vietnam	Hòa Bình	Luong Son Industrial Park	AH 13, Lâm Sơn, Lương Sơn Hoa Binh, Vietnam
VN0324			Vietnam	Thái Binh	Phuc Khanh Industrial Park	458 TL 223, Đề Thám, Thai Binh Thai Binh province, Vietnam

ID	Short List	LongList	COUNTRY	PROVINCE	PARK NAME	ADDRESS
VN0325			Vietnam	Thái Bình	Nguyen Duc Canh Industrial Park	NO ADRESS
VN0326			Vietnam	Thái Bình	Gia Le Industrial Park	458 TL 223, Đề Thám, Thai Binh Thai Binh province
VN0327			Vietnam	Thái Bình	Tien Hai Industrial Park	458 TL 223, Đề Thám, Thai Binh Thai Binh province
VN0328			Vietnam	Thái Bình	Cau Nghin Industrial Park	cầu Nghìn, tt. An Bài, Quynh Phu District Thai Binh province, Vietnam
VN0329			Vietnam	Thái Bình	Song Tra Industrial Park	NO ADRESS
VN0330			Vietnam	Nam Định	Hoa Xa Industrial Park	Ngõ 6 Năng Tĩnh, Năng Tĩnh, Nam Dinh Nam Dinh province
VN0331			Vietnam	Nam Định	My Trung Industrial Park	Đê sông Hồng, làng Hữu Bị A, Mỹ Trung, Mỹ Lộc Nam Dinh province, Vietnam
VN0332			Vietnam	Nam Định	Bao Minh Industrial Park	Ngõ 6 Năng Tĩnh, Năng Tĩnh, Nam Dinh Nam Dinh province
VN0333			Vietnam	Ninh Bình	Ninh Phuc Industrial Park (1st, 2nd phase & expansion)	NO ADRESS
VN0334			Vietnam	Ninh Bình	Khanh Phu Industrial Park	QL 10, Yên Vệ, Khánh Phú, Yen Khanh District Ninh Binh province, Vietnam
VN0335			Vietnam	Ninh Bình	Gian Khau Industrial Park	NO ADRESS
VN0336			Vietnam	Thanh Hoa	Le Mon IZ	Đỗ Huy Cư, Lễ Môn, Đông Hải, tp. Thanh Hoá Thanh Hoa province, Vietnam
VN0337			Vietnam	Nghe An	Bac Vinh IZ	125 Le Hong Phong, Trường Thi, Vinh Nghe An, Vietnam
VN0338			Vietnam	Nghe An	Nam Cam IZ (phase 1)	QL 7, Pù Mát, Lạng Khê, Con Cuong District Nghe An, Vietnam
VN0339			Vietnam	Nghe An	Hoang Mai IZ	AH 1, tt. Hoàng Mai, Quynh Luu District Nghe An, Vietnam
VN0340			Vietnam	Ha Tinh	Vung Ang I IZ	106 Phan Đình Phùng, Tân Giang, tp. Hà Tĩnh Hà Tĩnh, Vietnam
VN0341			Vietnam	Quang Binh	Hon La IZ 1st phase	565, Phong Nha-Ke Bang National Park, Tân Trạch, Bo Trach District Quang Binh province
VN0342			Vietnam	Quang Binh	Notth Western Dong Hoi IZ	565, Phong Nha-Ke Bang National Park, Tân Trạch, Bo Trach District Quang Binh province
VN0343			Vietnam	Quang Tri	Nam Dong Ha IZ	Lương Khánh Thiện, Phường 5, Quang Tri Quang Tri province, Vietnam
VN0344			Vietnam	Kon Tum	Sao Mai (Phase 1) IZ	300 Trần Hưng Đạo, Quyết Thắng, Kon Tum Kon Tum province, Vietnam
VN0345			Vietnam	Lam Dong	Loc Son IZ	Tố Hữu, Lộc Sơn, tp. Bảo Lộc Lam Dong province, Vietnam
VN0346			Vietnam	Ninh Thuan	Du Long Industrial Park	39 Thống Nhất, Đài Sơn, Phan Rang Ninh Thuan province, Vietnam
VN0347		**XXVN03**	Vietnam	Danang City	Da Nang Hi Tech Park	Da Nang city