Department of Transportation and Communications (DOTC)

Data Collection Survey on Disaster-resilient Feeder Ports and Logistics Network in the Republic of the Philippines

Final Report

December 2015

Japan International Cooperation Agency (JICA)

The Overseas Coastal Area Development Institute of Japan

Oriental Consultants Global Co., Ltd.

Abbreviation List

Abbreviation	Description
ADB	Asian Development Bank
AFP	Armed Force of the Philippines
ALGU	Allocations for Local Government Units
ARMM	Autonomous Region in Muslim Mindanao
ASEAN	Association of South-East Asian Nations
BCDA	Bases Conversion and Development Authority
BCM	Business Continuity Management
BCP	Business Continuity Plan
BFP	Bureau of Fire Protection
CEZA	Cagayan Economic Zone Authority
CF	Calamity Fund
CFS	Container Freight Station
CIAC	Clark International Airport Corporation
CIIP	Comprehensive and Integrated Infrastructure Program
CPA	Cebu Port Authority
CY	Calendar Year
DA	Department of Agriculture
DBM	Department of Budget and Management
DepED	Department of Education
DILG	Department of the Interior and Local Government
DMAF	Disaster Management Assistance Fund
DND	Department of National Defense
DOF	Department of Finance
DOST	Department of Science and Technology
DOTC	Department of Transportation and Communications
DPWH	Department of Public Works and Highways
DRFI	Disaster Risk Finance and Insurance
DRM	Disaster Risk Management
DRRM	Disaster Risk Reduction Management
DRRMC	Disaster Risk Reduction Management Committee

Abbreviation	Description
DSWD	Department of Social Welfare and Development
DWT	Dead Weight Tonnage
EO	Executive Order
FOB	Free on Board
FY	Fiscal Year
GAA	General Appropriations Act
GC	Government Corporation
GI	Galvanized Iron
GIS	Geographic Information System
GOCC	Government-owned and Controlled Corporation
GSIS	Government Service Insurance System
IDRM	Integrated Disaster Risk Management
IRA	Internal Revenue Allotment
IWRM	Integrated Water Resource Management
JPY	Japanese Yen
LDRRMF	Local Disaster Risk Reduction and Management Fund
LGU	Local Government Units
MC	Memorandum Circular
MCIAA	Mactan Cebu International Airport Authority
MIAA	Manila International Airport Authority
MLIT	Ministry of Land, Infrastructure, Transport and Tourism
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
NAMRIA	National Mapping and Resource Information Authority
NDCC	National Disaster Coordinating Council
NDRP	National Disaster Responsible Plan
NDRRMC	National Disaster Risk Reduction and Management Committee
NDRRMF	National Disaster Risk Reduction and Management Framework
NDRRMP	National Disaster Risk Reduction and Management Plan
NEDA	National Economic and Development Authority
NFPDP	Nationwide Feeder Port Development Program
NOAH	Nationwide Operational Assessment for Hazard

Abbreviation	Description
NSO	National Statistics Office
OCD	Office of Civil Defense
ODA	Official Development Assistance
OP	Office of the President
OSEC	Office of the Senate Secretary
PAGASA	Philippine Atmospheric, Geophysical and Astronomical Services Administration
PCG	Philippine Coast Guard
PDP	Philippine Development Plan
PFDA	Philippines Fisheries Development Authority
PHIVOLCS	Philippine Institute of Volcanology and Seismology
PhP.	Philippine Peso
PIA	Philippine Information Agency
PIRA	Philippine Insurance and Reinsurers Association
PMO	Port Management Office
PNP	Philippine National Police
PPA	Philippine Port Authority
PPP	Public Private Partnership
QRF	Quick Response Fund
RAY	The Reconstruction Assistance on Yolanda
RORO	Roll-on/ roll-off
RPMA	Regional Ports Management Authority
RRTS	Road RORO Terminal System
SBMA	Subic Bay Metropolitan Authority
SNAP	Strategic National Action Plan
SPF	Special Purpose Fund
SRR	Search and Rescue Region
SRRFPDP	Social Reform Related Feeder Ports Development Project
SUC	State Universities and Colleges
TA	Technical Assistance
TMO	Terminal Management Office
UAP CRC	University of Asia and the Pacific, the Center for Research and Communication
UNDP	United Nations Development Programme

Abbreviation	Description
WEP	World Food Programme

Contents

List of Figures

List of Tables

1. Objective and Background of the Project

1.1. Background of the Project

The Government of the Philippines has been developing and rehabilitating feeder ports throughout the country under various domestic and international funded projects, planned and implemented by the Department of Transportation and Communications (DOTC); however, there still remains a list of feeder ports to be constructed/ rehabilitated in different regions. DOTC now needs a further list of feeder ports besides those listed within the Master Plan (M/P) formulated by JICA in 2000 through the "Social Reform Related Feeder Ports Development Project." In addition, they need to improve on the methodology by which they select and prioritize ports to be constructed/ rehabilitated by themselves.

Furthermore, the Philippines is one of the most disaster-prone countries in Southeast Asia. The disasters which occur almost every year bring enormous economic damage and human casualties. The issue on the acceleration of Disaster Risk Reduction and Management (DRRM) should be urgently addressed by the Government of the Philippines in order to increase preparedness/ resiliency against such disaster risks.

Under such circumstances, the Government of the Philippines enacted RA9729 (Climate Change Act) in 2009 and RA10121 (Disaster Risk Reduction and Management Act) in 2010, and has come to focus not only on disaster response but also on the comprehensive DRRM, including disaster risk mitigation and countermeasures against climate change. Furthermore, since Typhoon Yolanda hit the country in November 2013, the Government of the Philippines has been deepening the discussions regarding disaster risk financing, in addition to disaster risk reduction and management (including a risk pool for LGUs).

In the Philippines, especially after the large-scale earthquakes in Bohol and the super typhoon Yolanda in 2013, the significance of establishing a disaster-resilient safety network of feeder ports has been acknowledged in the light of ensuring a secure and smooth logistics even in time of disaster. Likewise, the importance of feeder ports with disaster resilient capacities has been understood widely, especially amongst the relevant Departments and agencies in the Government of the Philippines.

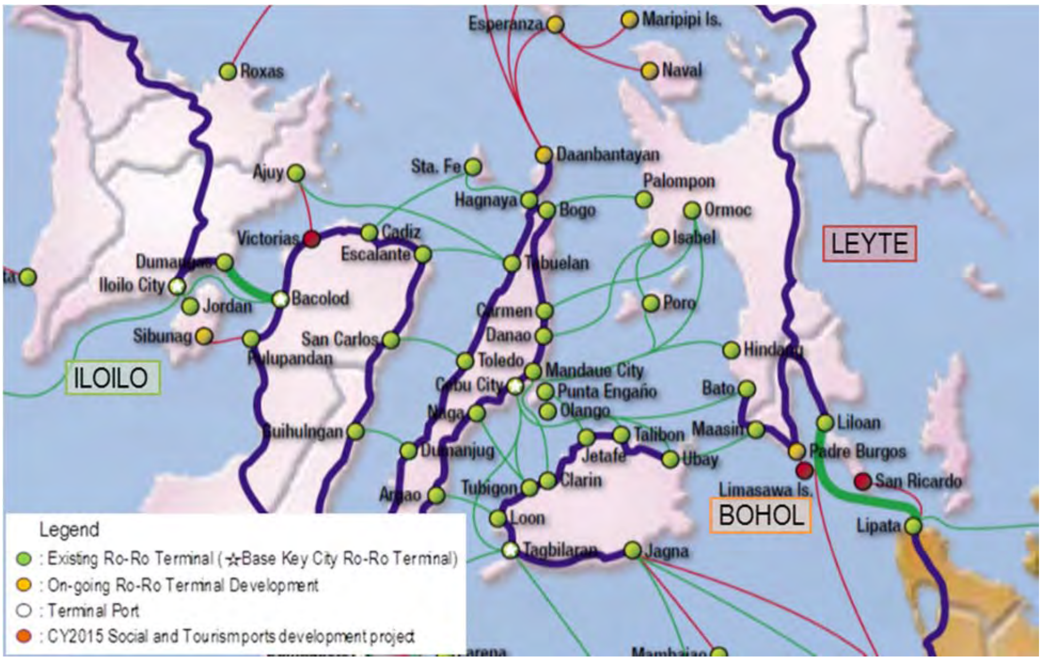
Taking into account the current situation, the Data Collection Survey on Disaster-resilient Feeder Ports and Logistics Networks (hereinafter referred as the "Survey") aims to support the Government of the Philippines to enhance the disaster resilience in the country by establishing guidance in the allocation of the Funds in the areas of feeder ports, as well as the feeder ports' network development which will lead to the economic and social development in the country.

2. Implementation of the Study

2.1. Scope of the Study

(1) Target area

The target area covers Iloilo, Bohol and Leyte in Visayas which were damaged by the Bohol Earthquake and Typhoon Yolanda as well as the Disaster Prone Areas indicated in the Philippines Development Plan.



Source: Study team

Figure 2.1-1 Map of Main Ports in the Target Area

Table 2.1-1 Main Ports in the Target Area

Province of Iloilo		Province of Bohol		Province of Layte	
Port	Management Body	Port	Management Body	Port	Management Body
Iloilo	PPA	Tagbilaran	PPA	Tacloban	PPA
Dumangas	PPA	Loon	PPA	Calubian	PPA
Ajuy	LGU	Tubigon	PPA	Palompon	PPA
Estancia	PPA	Clarin	DOTC	Isabel	PPA
		Jetafe	PPA	Ormoc	PPA
		Talibon	PPA	Baybay	PPA
		Ubay	PPA	Hilongos	PPA
		Popoo	PPA	Bato	Private

Source: Study team

(2) Types of Disaster

Disaster types which will be focused on during the survey are as below:

- earthquake / tsunami caused by earthquake
- typhoon / storm surge and high waves caused by typhoons

Level of disaster has been determined as follows.

Level of Disaster to be targeted

in the Data Collection Survey on Disaster Resilient Feeder Ports and Logistic Network (especially in formulating the standard model of disaster resilient ports)

Typhoon*	Earthquake*
Typhoon Yolanda (refer to the wind speed in Typhoon Yolanda)	Bohol Earthquake (refer to the PPA's design guideline formulated in 1995 (through support of JICA expert) which is applied in the current planning)

*winds (and storm surge) caused by typhoons, and tsunamis caused by earthquakes shall be considered in formulating the model

Source: JICA

Figure 2.1-2 Level of Disaster

2.2. Procedure of the Study and Relevant Authority

(1) Study Period

The period of the study is from July 9, 2015 to January 25, 2016.

(2) Study Team

The names and responsibilities of team members dispatched to the Philippines are shown in the Table below.

Table 2.2-1 Assignment of Team Members

Name	Responsibility
Tatsuyuki SHISHIDO	Team leader/ Port Disaster Prevention Policy
Takashi SHIMADA	Port Disaster Management Planning (1)
Ken SAITO	Port Disaster Management Planning (2)
Isao HINO	Port Design (1)
Masaaki GOSHIMA	Port Design (2)
Hiroki KOHNO	Assistance for Port Disaster Prevention Policy/ Coordination

Source: Study team

(3) Explanation of Reports to Relevant Agencies

The inception report and draft final report were explained to relevant agencies at the consultation meeting on September 30 and the workshop on November 12, 2015. Officials from DOTC, PPA, DILG, DPWH, DOF, DBM, NEDA, DOST, PAGASA, PHIVOLCS and OCD participated in the meeting. For the purpose of collecting detailed information and exchange of opinions, the study team also visited some agencies individually.

(4) Conference

Main activities undertaken by the study team in the Philippines are shown below.

Table 2.2-2 Conferences Undertaken by the Study Team

Conference	Date	Participating Agencies
Explanation of Inception Report	2015/8/5	DOTC, JICA, DBM, DILG, DOF, PPA, NEDA, PAGASA
1st Seminar	2015/8/17	DOTC, PPA
2nd Seminar	2015/9/29	DOTC, PPA, LGU (Banate (Iloilo), C.P. Garcia (Bohol), Hindang (Leyte))
Consultation Meeting	2015/9/30	DOTC, JICA, DBM, DILG, DOF, DPWH, NEDA, PHIVOLCS, PPA
Workshop	2015/11/12	DOTC, JICA, DBM, DILG, DPWH, OCD, PAGASA, PPA

Source: Study team

3. Disaster Risk Reduction and Management in the Philippines

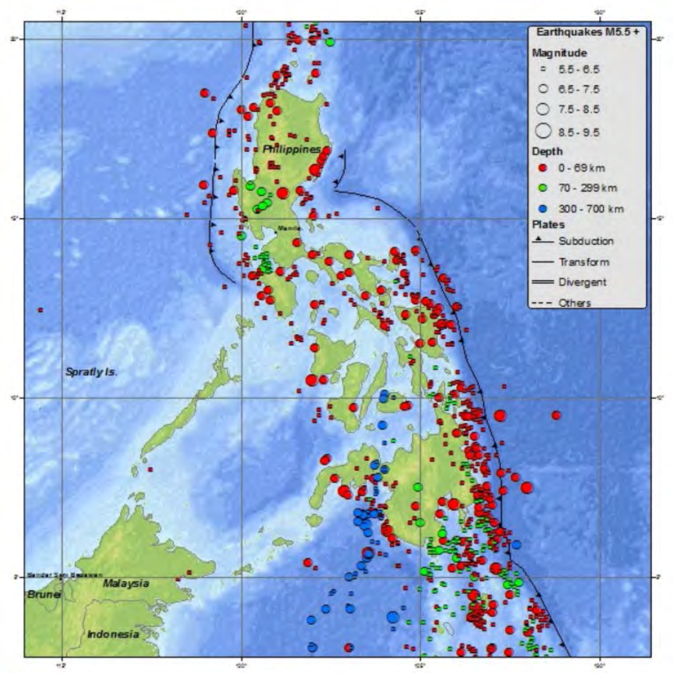
3.1. Hazard Exposure and Disaster Impacts in the Philippines

3.1.1. Earthquakes

The Philippines is an archipelago of over 7,000 islands and islets with a total land area of 300,000 square kilometers. Geologically, the archipelago is the product of accretionary wedges and volcanic eruptions resulting from the collision of the Philippine Sea, Pacific and Eurasian plates, as well as smaller platelets (Sulu, Celebes Sea) being forced northward by the large India-Australia plate. The plate motions are accompanied by earthquakes and volcanism. Due to the geological exposure, the country experiences 887 earthquakes on average per year, some of which proved to be damaging.

It is recommended that this is elaborated, maybe it is meant that since there were fewer people of little to no intention or technology of documenting the damaging events, the data recorded is partial. Two major damaging earthquakes have occurred in the Philippines in recent years – the 1976 Mindanao event, which killed approximately 6,000 and caused about USD 400 million in damage (in present value), and the 1990 Central Luzon event, which killed over 1,000 and caused damages of about USD 400 million (in present value).

In addition to shaking, earthquakes cause damage in other ways, the most significant of which are liquefaction, landslides, tsunami and fires following earthquakes. Liquefaction typically occurs in loose saturated sandy ground, in which the ground loses its strength of that ground due to strong ground motion. It was particularly damaging in Dagupan in the 1990 earthquake.



Source: United Sates Geological Survey

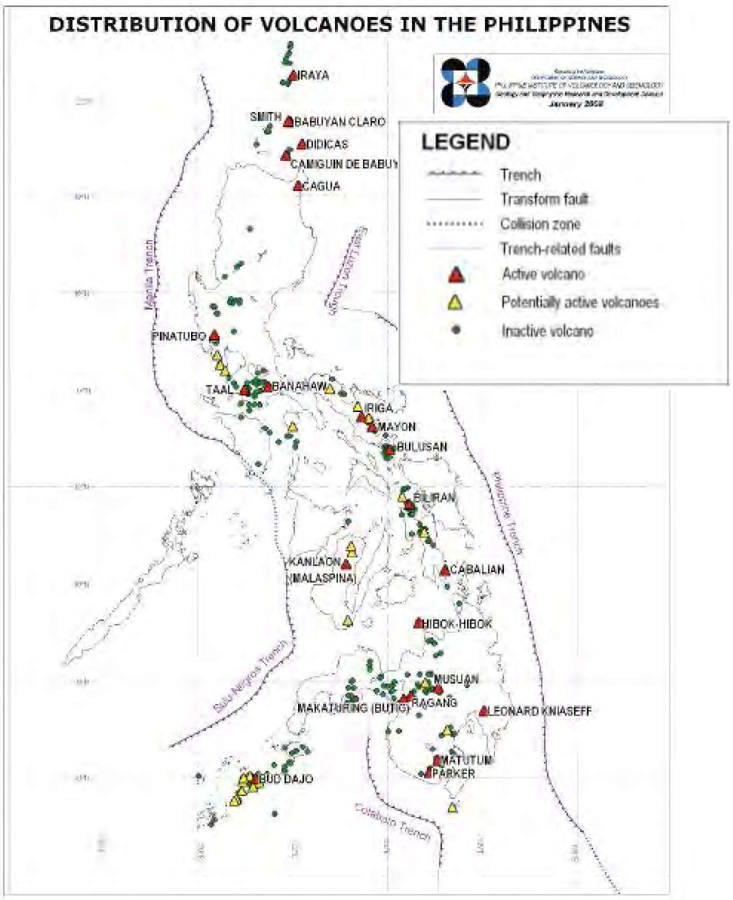
Figure 3.1-1 Earthquake in the Philippines 1990-2013

3.1.2. Volcanoes

Out of 220 volcanoes in the archipelago, 22 are classified as active. Simkin and Siebert (1994) document literally hundreds of historic eruptions - Mt. Mayon, for example, is indicated to have erupted 12 times in the 20th century alone. The most active volcanoes are probably Pinatubo, Taal, Mayon, Canlaon and Ragang. Currently, PHIVOLCS, who have the responsibility for monitoring volcanic activity, can currently monitor only six of the 22 active volcanoes for possible eruptions.

Volcanic eruptions are accompanied with a wide variety of destructive effects including release of magma, explosive effects, expulsion of large projectiles, pyroclastic flows (flow of hot molten material), ash fall, release of clouds of very hot gases, lahars, mudflows and ground shaking, to name the most common.

The Mount Pinatubo eruption in June 1991 was an example of how rapidly and destructively a volcano can erupt. That event was the second largest volcanic eruption in the century, and by far the largest eruption to affect a densely populated area. Fortunately PHIVOLCS had forecast the eruption, resulting in the saving of at least 5000 lives and USD 250 million. However, the eruptions have dramatically changed the face of central Luzon, and the impacts of the event continue to this day. About 200,000 people who evacuated to the lowlands surrounding Pinatubo have returned home but facing continuing threats from lahars that have already buried numerous communities. Rice paddies and sugar cane fields that were buried by lahars will be out of use for years. Other volcanoes, such as Mt. Mayon, are even more active, and surrounded by many communities at risk to lahars and other hazards



Source: PHIVOLCS

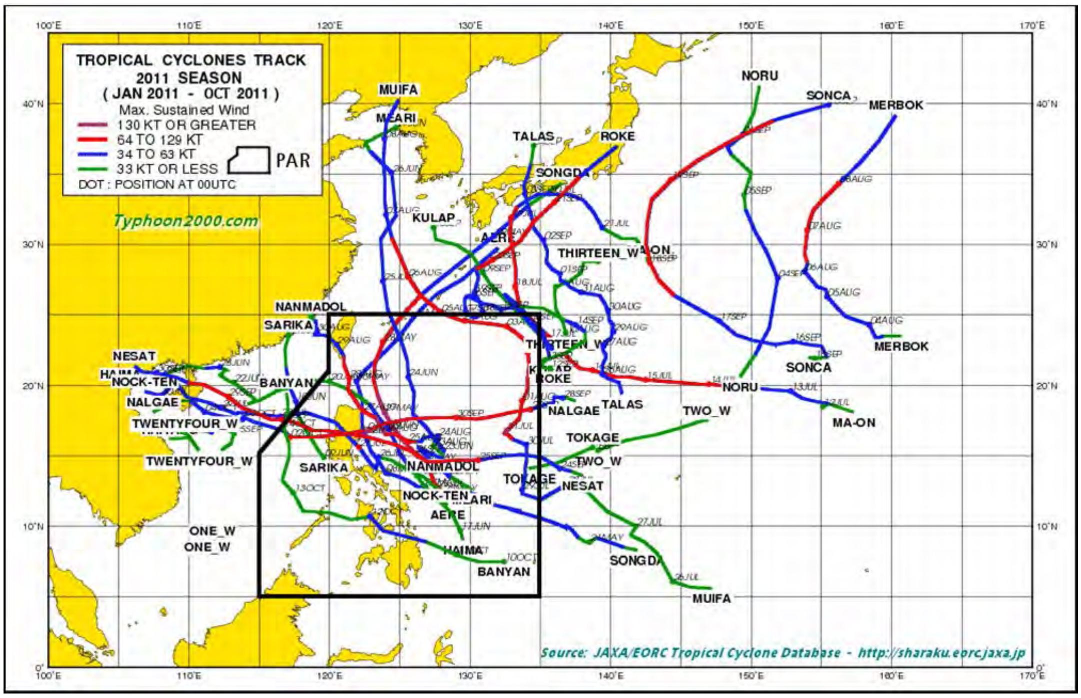
Figure 3.1-2 Distribution of Volcanoes

3.1.3. Tropical Cyclones

The climate of the Philippines is tropical and is strongly affected by monsoon (rain-bearing) winds, which blow from the southwest from approximately May to October and from the northeast from November to February, although there is considerable variations in the frequency and amount of precipitation across the archipelago. From June to December typhoons often strike the archipelago. Most of these storms come from the southeast, with their frequency generally increasing from south to north.

On average, about 20 typhoons occur annually, with the months of June to November averaging approximately 3 typhoon strikes per month. Luzon is significantly more at risk than more southern areas. Typhoons are heaviest in Samar, Leyte, eastern Quezon province, and the Batan Islands, and when accompanied by floods or high winds they may cause great loss of life and property. Mindanao is generally free from typhoons.

Typhoons have killed about 29,000 people in the country in the 20th century, including about 6000 in the 1991 typhoon. As Table 2 indicates, about 500 people are killed each year, and about P4 billion are lost due to tropical cyclones. In certain cases, a single event can kill as many as 6000, and cause P20 billion in damage. In addition to high winds, a major damaging element of tropical cyclones is storm surge.

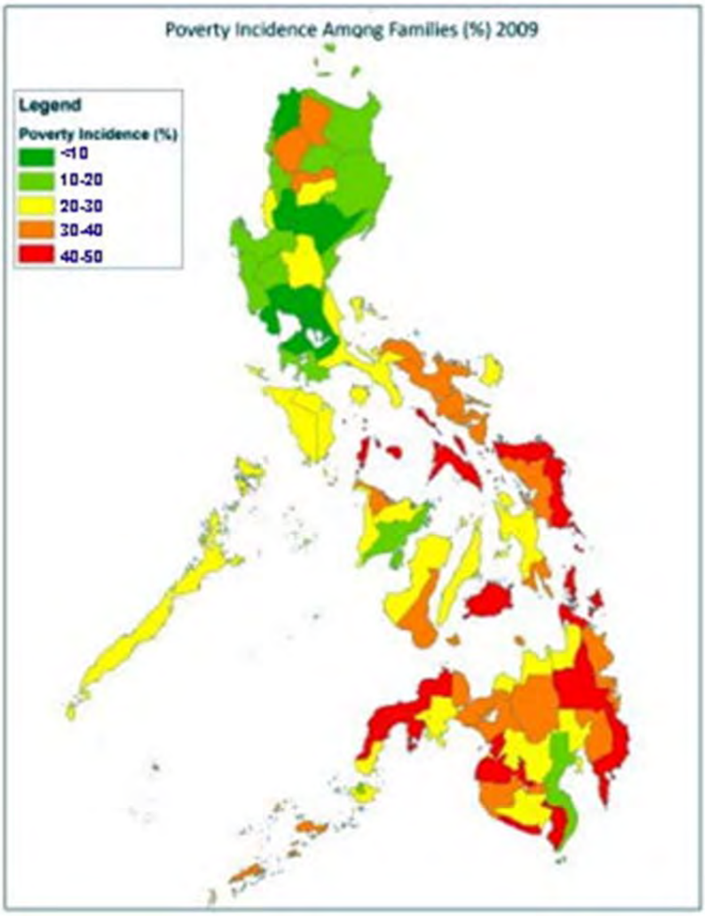


Source: JAXA/EORC

Figure 3.1-3 Tropical Cyclone Routes in 2011

3.1.4. Disaster and Poverty

In the case of the Philippines, linkages between poverty and vulnerability to natural hazards are clearly apparent. The poor families have forced many to live and work in high-risk areas, such as on shores or flanks of active volcanoes. Families may have little choice but to return to such areas post disaster even when resettlement options are available because of the importance of proximity to place of work. Disasters can be associated with negative spiral for poor people. In other words, they cannot recover from their poor conditions of life by typhoons attacked every year.

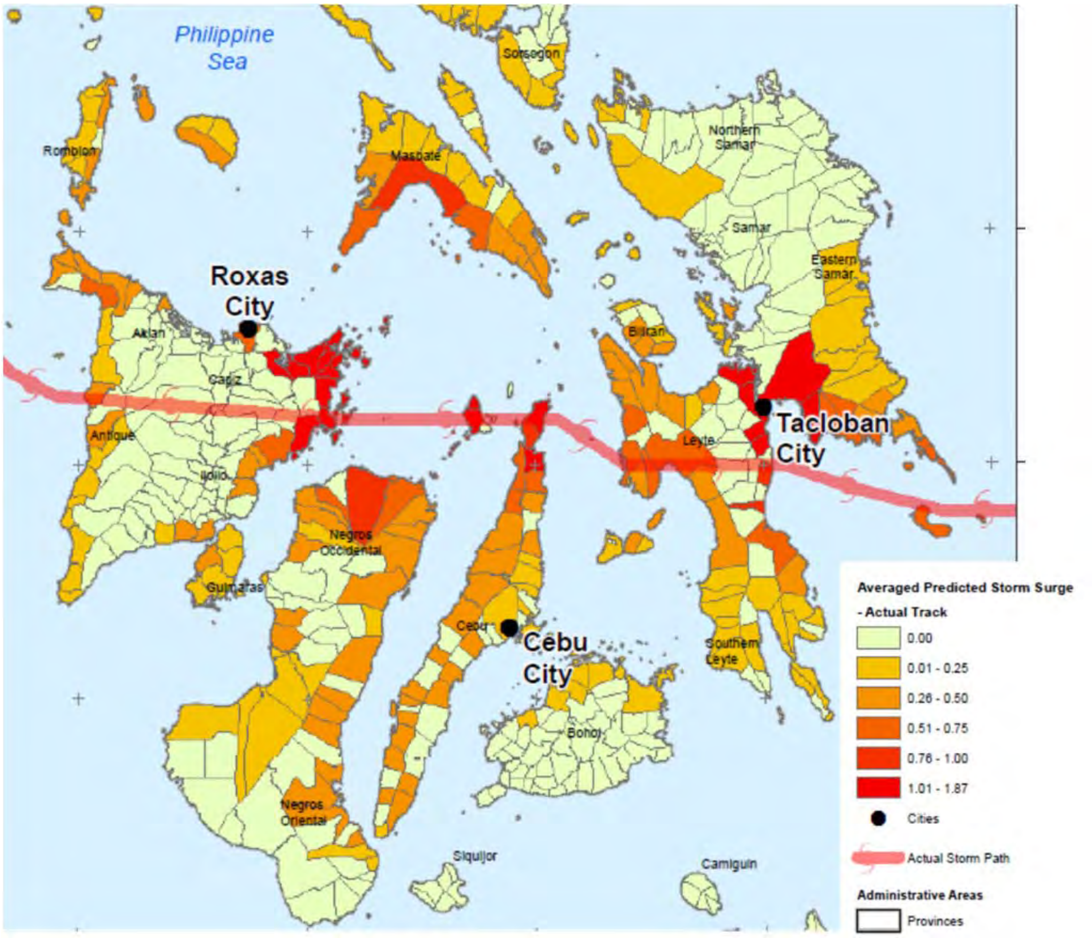


Source: NSO

Figure 3.1-4 Poverty Incidence (%) among Families in 2009

3.1.5. Typhoon Yolanda and Bohol Earthquake

(1) Outline of Typhoon Yolanda



Source: MapAction

Figure 3.1-5 Track of Typhoon Yolanda and height of storm surge

a) Basic Information

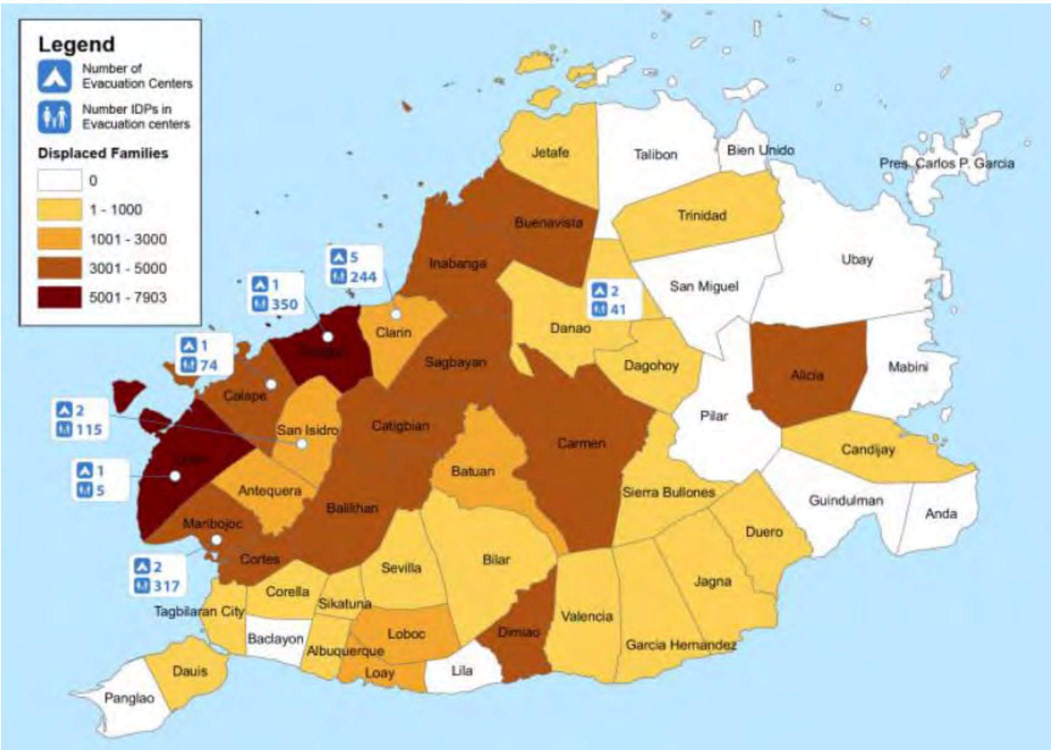
- Typhoon Yolanda formed in the seas near Truk Island on 4th November, 2013.
- The typhoon moved inland in the middle of the Philippines on the morning of 8th November, and the rainstorm and storm surge occurred.
- The typhoon moved across Leyte, Cebu and Panay Island, and throughout the South China Sea.
- Atmospheric pressure: 895hPa (as of 8th November, 2013)
- Maximum instantaneous wind speed: 90m/s (105m/s observation by the US armed forces)

b) Damage

- Deaths: 6,201, Victims of disaster: 16.8 million
- Evacuees: 4.1 million, Missing: 1,785
- Collapsed houses: 1.14 million houses, Amount of Damages: 39.8 billion pesos
- Damaged PPA ports: 23 ports,
- Special budget for emergency disaster recovery: 82 million pesos

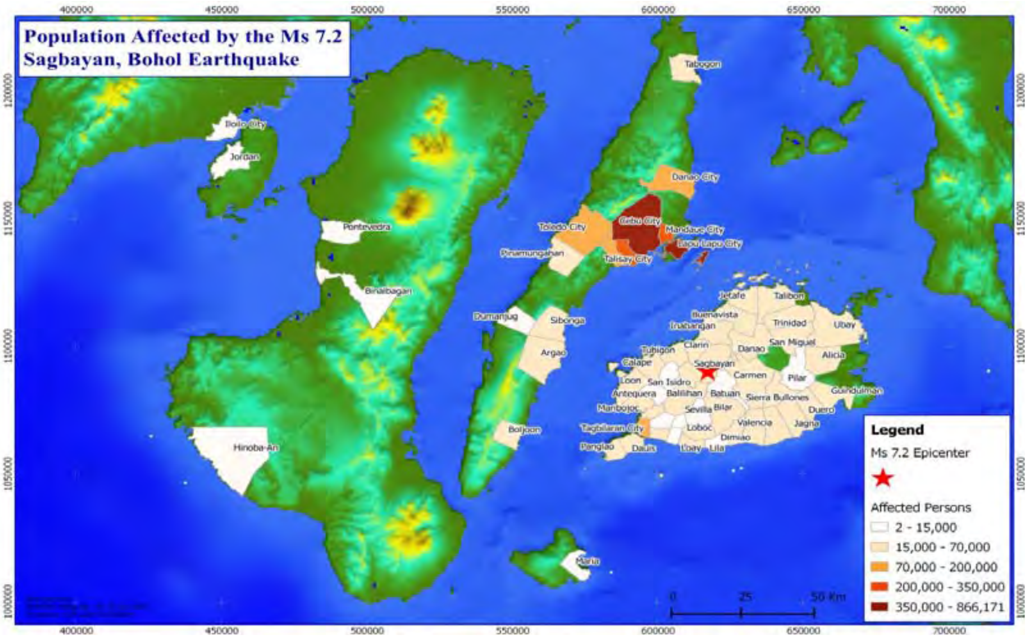
Source: 2014.1.14 NDRRMC “Sitrep No.92 re Effects of TY "YOLANDA
Joint Typhoon Warning Center (JTWC) Tropical Advisory Archive
Typhoon Haiyan (Yolanda)Predicted Storm Surgebased on Actualstorm OCHA

(2) Outline of Bohol Earthquake



Source: “The 2013 October 15 M7.2 Bohol Earthquake” issued by Quiapo Church Disaster Risk Reduction and Management Ministry

Figure 3.1-6 Number of evacuation centers and evacuees



Source: "The 2013 October 15 M7.2 Bohol Earthquake" issued by Quiapo Church Disaster Risk Reduction and Management Ministry

Figure 3.1-7 Classification of Affected Persons

a) Basic Information

- Date and time of occurrence: 15th October, 2013 at 8:12
- The strength of the earthquake: Magnitude 7.2
- Epicenter: Sagbayan, Bohol
- Depth: 12 km

b) Damage

- Deaths: 223, Victims of disaster: 3.2 million
- Evacuees: 8,550, Collapsed houses: 73 thousand houses
- Damaged PPA ports: 20 ports,
- Special budget for emergency disaster recovery: 50.9 million pesos

c) Others

- Past disasters in Bohol: An earthquake with a magnitude of 6.8 occurred on 8th February, 1990

Source: "The 2013 October 15 M7.2 Bohol Earthquake" issued by Quiapo Church Disaster Risk Reduction and Management Ministry

3.2. Policy and System for Disaster Risk Reduction in the Philippines

3.2.1. Current situation and issues of the Disaster Prevention Sector in the Philippines

The Philippines is a country prone to various natural disasters such as typhoons, storms, floods, landslides volcanic eruptions, and earthquakes. The repeated damage to infrastructures has a negative impact on economic activities. In addition, due to climate change, the risk of typhoons is expected to increase in the future.

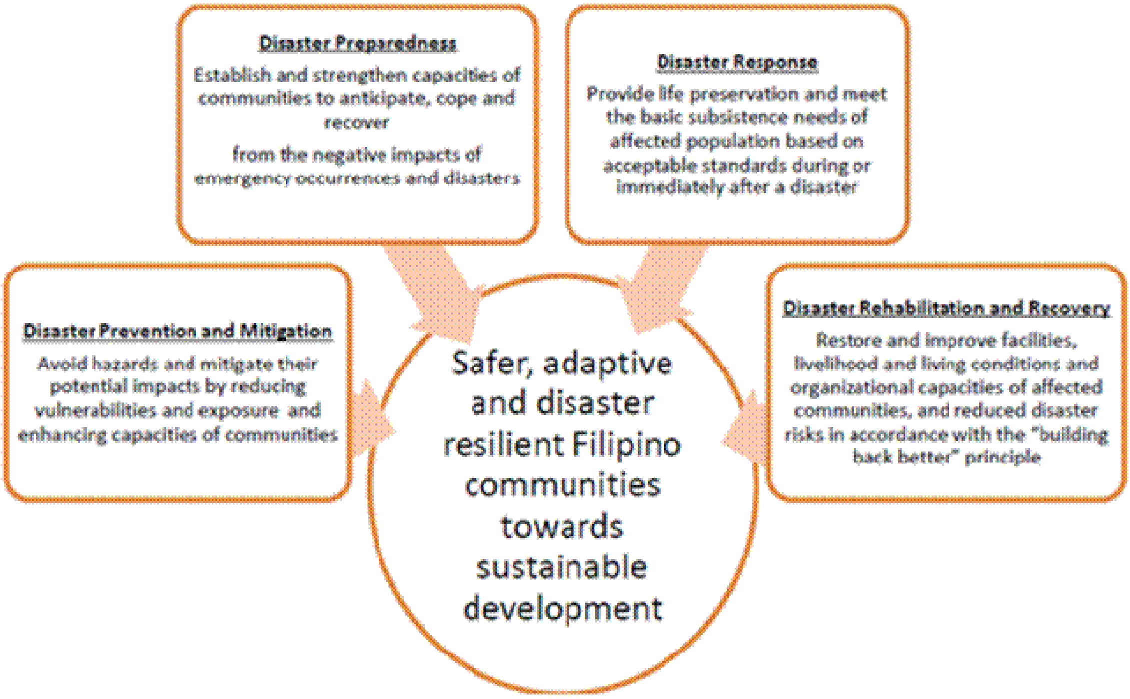
However, the Philippines does not have the underlying disaster management plan (known as a Disaster Prevention Basic Plan in Japan) for carrying out disaster management at the national level. The various disaster relevant government agencies conduct their activities independently without coordination. Emergency response activities, information dissemination and disaster response systems are not efficient in local agencies.

The government of the Philippines, after adopting the "Hyogo Framework for Action (2005-2015)" in the World Conference on Disaster Reduction in January 2005 by United Nations" , has been making effort to strengthen disaster management, e.g. to develop a strategic national action plan (SNAP) in accordance with the framework.

In particular, in May 2010, "Disaster Risk Reduction and Management Act (Republic Act No. 10121)" was enacted (DRRM Act), which covers comprehensive disaster risk management, including the prevention and mitigation, in addition to the conventional of disaster countermeasures. In order to implement disaster risk reduction and management (Disaster Risk Reduction and Management: DRRM), the basic framework of disaster prevention was laid out based on a new approach.

In the DRRM Act, the National Disaster Risk Reduction Management Council (NDRRMC) is the highest decision-making body on disaster management at the national level. In addition, to formulate the National Disaster Management Plan (National Disaster Risk Reduction and Management Plan: NDRRMP), the DRRM departments of local districts and at the local government level have been established.

Especially, under the DRRM Act, the Office of Civil Defense (OCD) is responsible for the secretariat of the NDRRMC, and being positioned as a central organization of DRRM activities. Before DRRM Act, the activities of OCD is a correspondence center after a disaster, and the other activities has been limited to such as the implementation of disaster prevention training by donors. However, after DRRM Act, OCD as the center of DRRM, is required to implement and promote the wide and variety range of DRRM activities including the prevention and mitigation, and become the center of what we will continue to implement.



Source: DRRM, OCD

Figure 3.2-1 Concept of DRRM

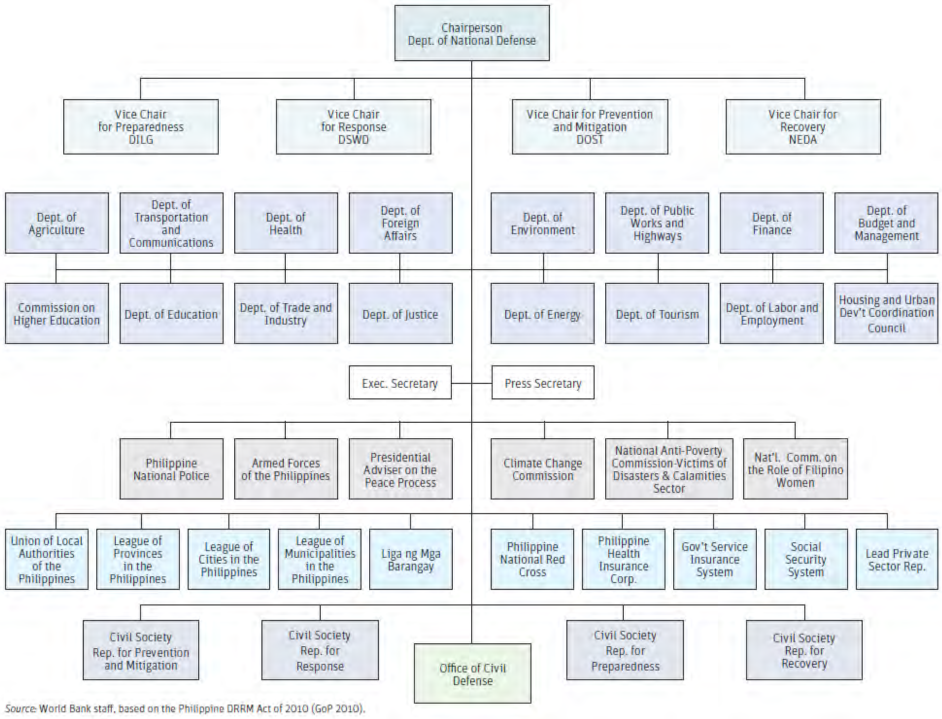
3.2.2. Philippine Disaster Act (RA10121)

(1) Outline of Disaster Act

Republic Act 10121 also known as "An Act Strengthening the Philippine Disaster Risk Reduction and Management System, Providing for the National Disaster Risk Reduction and Management Plan, Appropriating Funds, Therefore and Other Purposes" was passed and approved on May 27, 2010 after 21 years of revisions and refiling in the two legislative bodies. This new law, unlike the previous Presidential Decree P.D. 1566, is pro-active in giving importance to disaster mitigation and preparedness measures.

(2) National Disaster Risk Reduction and Management Council (Sec.5)

The National Council shall be headed by the Secretary of the Department of National Defense (DND) as Chairperson with the Secretary of the Department of the Interior and Local Government (DILG) as Vice Chairperson for Disaster Preparedness, the Secretary of the Department of Social Welfare and Development (DSWD) as Vice Chairperson for Disaster Response, the Secretary of the Department of Science and Technology (DOST) as Vice Chairperson for Disaster Prevention and Mitigation, and the Director-General of the National Economic and Development Authority (NEDA) as Vice Chairperson for Disaster Rehabilitation and Recovery.



Source: World Bank

Figure 3.2-2 Organization of NDRRMC

(3) Powers and Functions of the NDRRMC (Sec.6)

The National Council, being empowered with policy-making, coordination, integration, supervision, monitoring and evaluation functions, shall have the following responsibilities:

a) Develop a NDRRMF which shall provide for comprehensive, all-hazards, multi-sectoral, inter-agency and community-based approach to disaster risk reduction and management. The Framework shall serve as the principal guide to disaster risk reduction and management efforts in the country and shall be reviewed in five(5)-year intervals, or as may be deemed necessary, in order to ensure its relevance to the times;

b) Ensure that the NDRRMP is consistent with the NDRRMF;

c) Advise the President on the status of (disaster preparedness, prevention, mitigation, response and rehabilitation operations being undertaken by the government, CSOs, private sector, and volunteers; recommend to the President the declaration of a state of calamity in areas extensively damaged; and submit proposals to restore normalcy in the affected areas, to include calamity fund allocation;

d) Ensure a multi-stakeholder participation in the development, updating, and sharing of a Disaster Risk Reduction and Management Information System and

Geographic Information System-based national risk map as policy, planning and decision-making tools;

e) Establish a national early warning and emergency alert system to provide accurate and timely advice to national or local emergency response organizations and to the general public through diverse mass media to include digital and analog broadcast, cable, satellite television and radio, wireless communications, and landline communications;

f) Develop appropriate risk transfer mechanisms that shall guarantee social and economic protection and increase resiliency in the face of disaster;

(4) Disaster Risk Reduction and Management Organization at the Regional Level (Sec.10)

The current Regional Disaster Coordinating Councils shall henceforth be known as the Regional Disaster Risk Reduction and Management Councils (RDRRMCs) which shall coordinate, integrate, supervise, and evaluate the activities of the LDRRMCs. The RDRRMC shall be responsible in ensuring disaster sensitive regional development plans, and in case of emergencies shall convene the different regional line agencies and concerned institutions and authorities.

(5) Organization at the Local Government Level (Sec. 10, 11)

The existing Provincial, City, and Municipal Disaster Coordinating Councils shall henceforth be known as the Provincial, City, and Municipal Disaster Risk Reduction and Management Councils.

The Barangay Disaster Coordinating Councils shall cease to exist and its powers and functions shall henceforth be assumed by the existing Barangay Development Councils (BDCs) which shall serve as the LDRRMCs in every barangay.

(6) Declaration of State of Calamity (Sec. 16)

The National Council shall recommend to the President of the Philippines the declaration of a cluster of barangays, municipalities, cities, provinces, and regions under a state of calamity, and the lifting thereof, based on the criteria set by the National Council. The President’s declaration may warrant international humanitarian assistance as deemed necessary.

(7) Remedial Measures (Sec.17)

The declaration of a state of calamity shall make mandatory the immediate undertaking of the following remedial measures by the member-agencies concerned as defined in this Act:

a) Imposition of price ceiling on basic necessities and prime commodities by the President upon the recommendation of the implementing agency as provided for under Republic Act No. 7581, otherwise known as the “Price Act”, or the National Price Coordinating Council;

b) Monitoring, prevention and control by the Local Price Coordination Council of overpricing/profiteering and hoarding of prime commodities, medicines and petroleum products;

c) Programming/reprogramming of funds for the repair and safety upgrading of public infrastructures and facilities; and

d) Granting of no-interest loans by government financing or lending institutions to the most affected section of the population through their cooperatives or people's organizations.

(8) Mechanism for International Humanitarian Assistance (Sec.18)

a) The importation and donation of food, clothing, medicine and equipment for relief and recovery and other disaster management and recovery-related supplies are hereby authorized in accordance with Section 105 of the Tariff and Customs Code of the Philippines, as amended, and the prevailing provisions of the General Appropriations Act covering national internal revenue taxes and import duties of national and local government agencies; and

b) Importations and donations under this section shall be considered as importation by and/or donation to the NDRRMC, subject to the approval of the Office of the President.

3.2.3. NDRRM Framework and Plan

(1) NDRRM Framework

The National DRRM Framework (NDRRMF) emphasizes that in time, resources invested in disaster prevention, mitigation, preparedness and climate change adaptation will be more effective in attaining the goal of adaptive, disaster-resilient communities and sustainable development. The Framework shows that mitigating the potential impacts of existing disaster and climate risks, preventing hazards and small emergencies from becoming disasters, and being prepared for disasters, will substantially reduce loss of life and damage to social, economic and environmental assets. It also highlights the need for effective and coordinated humanitarian assistance and disaster response to save lives and protect the more vulnerable groups during and immediately after a disaster. This Framework serves as the principal guide to DRRM efforts in the country.

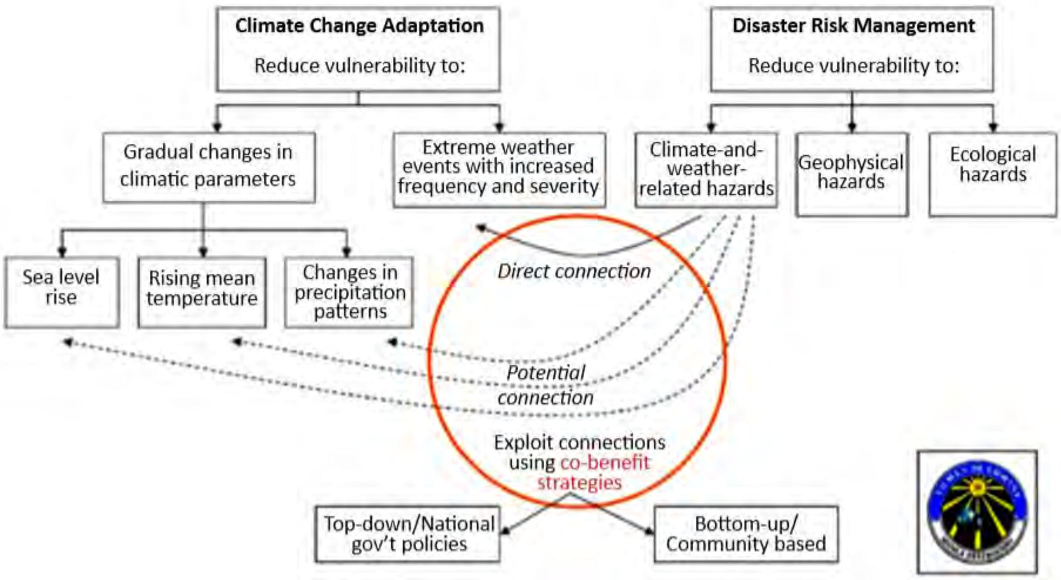
(2) NDRRM Planning

The NDRRM Plan (NDRRMP) covers four thematic areas, namely, (1) Disaster Prevention and Mitigation; (2) Disaster Preparedness; (3) Disaster Response; and (4) Disaster Rehabilitation and Recovery, which correspond to the structure of the National Disaster Risk Reduction and Management Council (NDRRMC). By law, the Office of Civil Defense formulates and implements the NDRRMP and ensures that the physical framework, social, economic and environmental plans of communities, cities, municipalities and provinces are consistent with such plan.

3.2.4. Climate Change Act (2009) and Action Plan

The Climate Change Act of 2009 is also known as Republic Act Number 9729 or the "Act Mainstreaming Climate Change into Government Policy Formulations and Creating the Climate Change Commission, highlights the synergistic action needed in dealing with the climate crisis and in reducing the risk of disasters associated with global climate change".

Throughout the law, the mandate is to address the vulnerability of local communities especially the most vulnerable sectors (the poor, women, and children) and adopts a gender sensitive, pro-children and pro-poor perspective. The law emphasizes the participation of all stakeholders including the government, local government units, non-government organizations, local communities, and others in responding to the adverse impacts of climate change. The state also recognizes that climate change and disaster risk reduction (DRR) are closely inter-related and seeks to integrate DRR into climate change programs and initiatives.



Source: Castillo, Charlotte Kendra G, 200

Figure 3.2-3 Conceptual Linkages of Climate Change Adaptation and Disaster Risk Management

3.3. Japan and JICA's assistance policy and achievements for the disaster prevention sector of the Philippines

The most important goal in the assistance policy of Japan for the government of the Republic of the Philippines (April 2012) is "To overcome vulnerability and to ensure the stability of living and production bases" and the yen loan is set forth for sudden natural disasters to do rapid emergency assistance and restoration works. According to the country analysis paper of JICA, it concludes that a key issue to overcome vulnerability is to reduce and manage the risk of natural disaster.

In recent years, Japan provided a loan for an urgent infrastructure restoration project following typhoon Ondoy-Pepeng in Sept. 2009 and implemented the "Disaster risk reduction and management capacity building project" for the capacity building of OCD (initiated in March 2012).

On November 8, 2013, typhoon Yolanda hit the Philippines, inflicting great damage to 36 provinces due to its record high wind speed of 87.5m/sec. JICA dispatched the Japan Disaster Relief (JDR) expert team to the Philippines from November 26, 2013, and collected information on the types of surveys required and emergency assistance for restoration of damages. As a result, San Pedro and San Pablo Bay and the south coast of Samar Island were determined to be the most heavily damaged and thus selected as model areas. The following sub-projects were given top priority: sub-project 1; to formulate the recovery and reconstruction plan for damaged facilities that could be applied to other afflicted areas, including the implementation of a pilot project and emergency recovery measures, and sub-project 2; to urgently repair the weather radar system of Samar island Giuan which is indispensable for meteorological observation of the Region.

The outline of the post disaster stand-by loan signed in 19th March, 2014 is shown below. The amount of agreement was 50 billion yen.

This project is to promote various policy actions related to disaster risk reduction and management in the Philippines, and at the same time, to support the rapid restoration after a disaster occurs, to enforce the capability for DRRM, and to contribute to the sustainable development of the Philippines by ensuring that funding can be made available to facilitate rapid recovery after a disaster occurs.

Table 3.3-1 Major Action Policy for DRRM

Item	Accomplished Action (2012)	Relevant Technical Cooperation Program (Target year2016)
To Formulate National DRRM Plan and to enforce the capacity of LGU	○ To formulate NDRRMP based on NDRRF ○ To start the formulation of NDRP(National Disaster Response Plan) : ○ To prepare the draft guide line to utilize DRRM Fund for LGU	○ To formulate DRRMP in the regional level (The capacity building Technical Assistance (TA) project for capacity building for DRRM 2012-2015, and Advisor for DRRM) ○ To formulate the draft of NDRP (ditto) ○ To formulate the draft guideline to utilize LGU Fund.(ditto)

Item	Accomplished Action (2012)	Relevant Technical Cooperation Program (Target year2016)
Introduction of Integrated Water resource Management (IWRM)	○To formulate the draft of IWRM and IRBM(Integrated River Basin Management)	○ To establish the system for IWRM (IWRM advisor) ○ To formulate IRBM in major rivers(ditto)
Information Management for DRRM	○ To start the Nationwide Operational Assessment for Hazard (NOAH) ○ To develop Flood Forecasting and Warning System(FFWS) at least in three major rivers	○ To complete 4 components in the 8 in NOAH* ○ To develop FFWS in the other major rivers (Comprehensive data management capacity building project for the flood forecasting and warning through-schematic construction of hydro-meteorological information system ,started2015)

Source: JICA post disaster stand-by loan 2014

＊Reference; Project NOAH (Nationwide Operational Assessment of Hazards)

Project NOAH is the Department of Science and Technology’s (DOST) response to the call of President Benigno S. Aquino III for more accurate, integrated, and responsive disaster prevention and mitigation system, especially in high-risk areas throughout the Philippines. The Project has the following components:

1) Distribution of Hydro Meteorological Devices
2) Disaster Risk Exposure Assessment for Mitigation
3) Enhancing Geohazards Mapping through LIDAR
4) Coastal Hazards and Storm Surge Assessment and Mitigation
5) Flood Information Network Project
6) Local Development of Doppler Radar Systems
7) Landslide Sensors Development Project
8) Weather Hazard Information Project Assistance

3.4. Assistance of other Donors

3.4.1. World Bank

World Bank provided US$500 million to restore the catastrophic damage caused by typhoon 30th (Haiyan) and dispatched international disaster experts. Technical assistance for drafting a resilient design standard to withstan7d storms with wind speeds of 250-280 km/h and large scale floods was also provided.

3.4.2. Asian Development Bank (ADB)

In ADB’s Long-term Strategic Framework (Strategy 2020), disaster emergency assistance is one of the three emphasized fields. ADB provided a record amount of US$ 900 million in aid to cope with the damage caused by typhoon Yolanda in the 2013.

ADB's "Operational Plan for Integrated Disaster Risk Management 2014-2020" (Hereinafter referred to as "IDRM Operational plan") is the integrity of the DEAP 2004 and this is the large scale support for ADB’s IDRM. This includes an excellent result in this field survey of ADB.

The purposes of IDRM operational plan are (a) to enhance the approach of IDRM, to support operational process regarding resilience for disaster and residual risk, to ensure a harmonized and systematic DRM approach, (b) to reduce the disaster risk, to rapidly respond to disasters and to upgrade the capacity of resources and (3) to enhance PPP and to mobilize private sectors for IDRM. This IDRM operational plan is the update of DEAP action plan 2008. More recently, ADB approaches disaster risk finance, which is a considerably new field.

3.4.3. UNDP and AusAID

United Nations Development Program (UNDP), the Australian Agency for International Development (AusAID) together with the Asian Development Bank (ADB), are supporting the creation of multi-hazard maps targeting provinces vulnerable to disaster. In addition, UNDP supports the Strategic National Plan (SNAP) with the EU, and supports disaster risk reduction in regional development plan. The World Bank carries out the management capacity building assistance for LGU and conducts a consultation relating to disaster risk financing with the Philippine government.

3.4.4. WFP

When Typhoon Yolanda hit the Philippines in 2013, catastrophic damage was brought. United Nations World Food Program (WFP) outfit food in sites to the people in the Philippines affected by the typhoon. More than 75 companies have provided assistance in cash or in goods / services.

Delivery company UPS has donated 25 million US dollars in goods transportation activities of UN/ WFP. UN/WEP has a mission to lead the goods transport to the affected areas by bundling a variety of support organizations. UPS, TNT, Agility, AP, Moller-Maersk are four companies that have signed a partnership with UN/WEP to form emergency transport teams with volunteer transport personnel and to provide services in the event of an emergency. The donation is devoted to this activity.

The private sector in the Philippines also offered emergency support to the government and the United Nations WFP. Ayala Corporation did a rapid assistance to affected areas and KFC Philippines did a donation in excess of the funds allocated by its parent company, Yum

4. Ports in the Philippines

4.1. Transportation infrastructures

4.1.1. Ports in the Philippines

The Philippines is made up of more than 7,000 large and small islands. Maritime transportation, thus, plays a very important role in transporting cargo and passengers from place to place within the country.

The Philippine Ports Authority (PPA) had been playing a fundamental role in developing, managing and administering all Philippine ports in a uniform manner since 1974, but this port management system underwent drastic changes in 1990. Since 1990, the Cebu Ports Authority (CPA), the Subic Bay Metropolitan Authority (SBMA), the PHIVIDEC Industrial Authority (PIA), the Cagayan Economic Zone Authority (CEZA), the Bases Conversion and Development Authority (BCDA), the Regional Port Management Authority (RPMA)-ARMM and local governments have been taking charge of port development and management in their own regions. PPA and CPA are under the umbrella of DOTC, but other relevant organizations are not. This kind of port administration system often leads to imbalanced and inefficient port development and management as a whole.

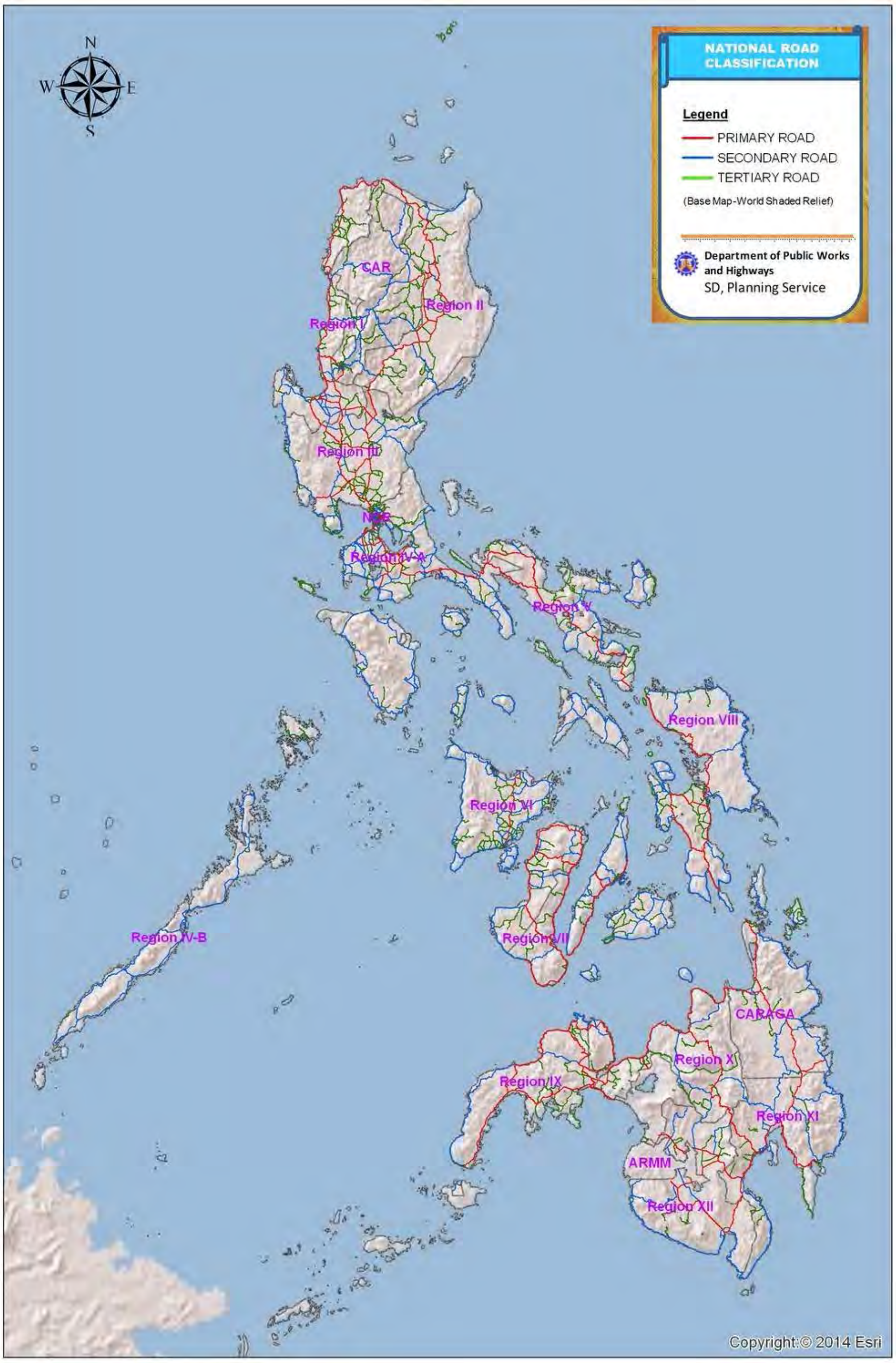
4.1.2. National road network in the Philippines

There are two types of roads in the Philippines. One is national road which is developed and managed by the government, and the other is local road by LGU.

Table 4.1-1 Type of National Road

Primary Road	Roads that connect cities of > 100,000 population.
Secondary Road	Other roads which complement the national arterial roads to provide access to main population and production centers of the country.
Tertiary Road	Other existing roads under DPWH which perform a local function.

Source: Road Data, DPWH web-site (copyright@2014Esri)



Source: DPWH ATLA2014
(http://www.dpwh.gov.ph/infrastructure/infra_stat/2014ATLAS/roads.htm)

Figure 4.1-1 National Road Network in the Philippines

4.1.3. Air transportation in the Philippines

There are currently 85 airports in the Philippines, including 10 international airports in Manila, Cebu, Subic, Clark, etc. Four of the international airports are operated by Manila International Airport

Authority (MIAA), Mactan Cebu International Airport Authority (MCIAA), Clark International Airport Corporation (CIAC) and Subic Bay Metropolitan Authority (SBMA). The remaining 81 airports, including six international airports are operated by the Civil Aviation Authority of the Philippines.

Source: Wikipedia (https://en.wikipedia.org/wiki/Alaminos_Airport)

Figure 4.1-2 Airports of the Philippines

4.2. Current situation and issues on ports

4.2.1. Port location

(1) Nation-wide ports

According to Table 4.2-1 , Ports in the Philippines are divided into two types: public ports and private ports. There are currently 1,612 public ports and 423 private ports. Public ports are administered by the central government or Local Government Units (LGU). On the other hand, private ports which are owned and operated by private companies are divided into two types: commercial ports which are meant for public use and private ports used exclusively used by a private firm. In addition, there are 421 fishing ports which are also used for logistics and passenger transportation besides fishing activities.

Table 4.2-1 Analysis Sheet of Ports in the Philippines

Body / Region	Base Port	Terminal Port [*1]	Local Port	PPDBs' Ports excluding Ports under RPMA	Private Port	Total	Fishing Port
	PPA/CPA /RPMA	PPA/CPA /RPMA	LGUs				
NCR	2	2	-		49	53	3
I	0	2	45	1 (BCDA)	11	59	17
II	0	1	38	1 (CEZA)	4	44	22
III	1	2	34	1 (SBMA)	17	55	16
IV-A	1	6	130	-	33	170	72
IV-B	2	10	134	-	19	165	
V	1	8	128	-	17	154	58
VI	2	12	114	-	41	169	49
VII	2	9	57	-	17	85	38
VII (CPA[*1])	1	41	23	-	71	136	
VIII	1	13	214	-	21	249	35
IX	1	5	64	-	16	86	21
X	3	8	59	1 (PIA)	33	104	16
XI	1	1	35	-	21	58	17
XII	1	2	19	-	13	35	8
XIII	2	10	201	-	29	242	31
ARMM [*2]	3	79	70	-	7	159	18
ARMM(PPA)	1	2	-	-	4	7	
Others [*3]	-	1	4	-	-	5	-
Total	25	214	1,369	4	423	2,035	421

Source: The Study on the Master Plan for the Strategic Development of the National Port System in the Philippines (2004.1)

2000 Quinquennial Inventory of Ports in December 1999 (NSCB) [Number s of Fishing Ports]

Note: PPA & CPA Ports are listed as of January 2003. LGUs Ports are as of March 2000.

Note: *1 indicates CPA Port. Terminal ports are called Out ports in CPA.,.

Note: *2 indicates port(s) under Regional Ports Management Authority in ARMM.

Terminal Ports are called Sub ports in RPMA. Some of ports are still under PPA's jurisdiction..

Note *3 Others means unidentified ports. There are no detailed data for these ports.

Note: Other Public Ports are under the jurisdiction of SBMA, BCDA, CEZA and PIA.

(2) Philippine Ports Authority (PPA)

Total cargo throughput and passengers of all PPA ports in 2014 are shown in Table 4.2-2 A total of 79.71 million tons of domestic cargo was handled in 2014 (inward: 41.75 million tons, outward: 37.96 million tons) while 135.00 million tons (import: 66.57 million tons, export: 68.42 million tons) of foreign cargo was handled.

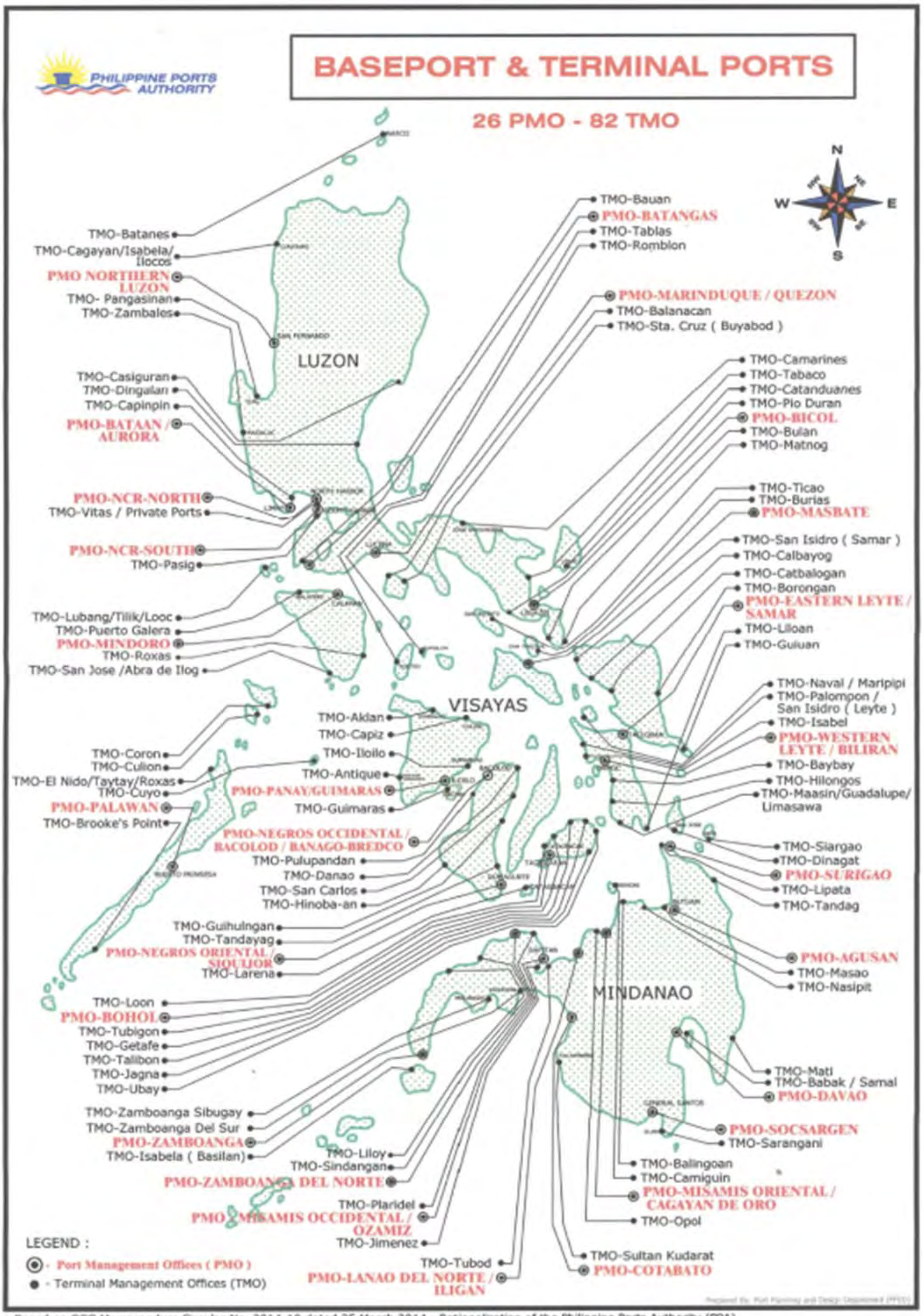
In addition, the number of passengers totaled 55.99 million (embarking: 27.24 million, disembarking: 28.75 million).

Table 4.2-2 Total Cargo Throughput and Number of Passengers at PPA Ports (CY2014)

CARGO & PASSENGER STATISTICS BY PDO/PORT MANAGEMENT OFFICE
AT BERTH AND ANCHORAGE
2014

PDO/PMO	CARGO THROUGHPUT (in metric tons)							PASSENGER TRAFFIC		
	Grand Total	DOMESTIC Total	DOMESTIC Inward	DOMESTIC Outward	FOREIGN Total	FOREIGN Import	FOREIGN Export	Total	Disem-barked	Embarked
PDO MANILA/NORLUZ	**78,991,167**	**25,957,113**	**10,306,091**	**15,651,022**	**53,034,054**	**41,402,602**	**11,631,452**	**1,189,587**	**591,781**	**597,806**
Manila - N. Harbor	22,304,714	17,530,556	7,163,509	10,367,047	4,774,158	4,704,330	69,828	1,162,574	578,325	584,249
Manila - S. Harbor	7,283,915	2,201,371	2,188,192	13,179	5,082,544	4,655,994	426,550	27,013	13,456	13,557
- M.I.C.T.	21,430,567	405,015	170,696	234,319	21,025,552	15,142,660	5,882,892	0	0	0
Limay	17,923,771	5,180,855	402,772	4,778,083	12,742,916	12,169,445	573,471	0	0	0
San Fernando	10,048,200	639,316	380,922	258,394	9,408,884	4,730,173	4,678,711	0	0	0
PDO SOUTHERN LUZON	**37,766,183**	**12,496,733**	**6,356,220**	**6,140,513**	**25,269,450**	**16,930,114**	**8,339,336**	**18,208,839**	**9,353,220**	**8,855,619**
Batangas	24,931,942	8,938,483	3,702,685	5,235,798	15,993,459	15,684,388	309,071	7,395,317	3,816,993	3,578,324
Calapan	325,399	325,399	215,636	109,763	0	0	0	5,802,152	3,091,188	2,710,964
Legazpi	2,153,164	1,624,111	1,108,940	515,171	529,053	330,828	198,225	4,614,138	2,238,460	2,375,678
Puerto Princesa	10,355,678	1,608,740	1,328,959	279,781	8,746,938	914,898	7,832,040	397,232	206,579	190,653
PDO VISAYAS	**28,055,341**	**19,865,878**	**12,399,625**	**7,466,253**	**8,189,463**	**1,877,975**	**6,311,488**	**19,892,400**	**10,383,937**	**9,508,463**
Dumaguete	1,733,819	1,629,495	816,906	812,589	104,324	45,471	58,853	3,823,359	2,000,014	1,823,345
Iloilo	9,820,302	4,338,253	3,618,434	719,819	5,482,049	747,379	4,734,670	2,927,106	1,528,139	1,398,967
Ormoc	2,990,065	2,013,122	1,121,323	891,799	976,943	616,987	359,956	2,721,166	1,435,107	1,286,059
Pulupandan	7,688,729	7,094,594	3,960,296	3,134,298	594,135	446,691	147,444	3,696,853	1,909,813	1,787,040
Tacloban	1,893,053	1,781,549	1,408,827	372,722	111,504	21,447	90,057	3,046,361	1,592,528	1,453,833
Tagbilaran	3,929,373	3,008,865	1,473,839	1,535,026	920,508	0	920,508	3,677,555	1,918,336	1,759,219
PDO NORTHERN MIND.	**51,488,113**	**11,714,246**	**6,031,383**	**5,682,863**	**39,773,867**	**2,929,892**	**36,843,975**	**9,846,305**	**5,001,623**	**4,844,682**
Cagayan de Oro	7,847,464	6,519,203	2,754,782	3,764,421	1,328,261	1,113,834	214,427	2,198,358	1,144,280	1,054,078
Iligan	2,265,129	1,429,012	688,765	740,247	836,117	736,742	99,375	2,763,095	1,363,688	1,399,407
Nasipit	4,742,824	1,402,037	848,450	553,587	3,340,787	0	3,340,787	269,150	131,890	137,260
Ozamiz	1,197,560	1,125,446	713,225	412,221	72,114	5,000	67,114	3,058,959	1,557,367	1,501,592
Surigao	35,435,136	1,238,548	1,026,161	212,387	34,196,588	1,074,316	33,122,272	1,556,743	804,398	752,345
PDO SOUTHERN MIND.	**18,404,465**	**9,675,634**	**6,658,477**	**3,017,157**	**8,728,831**	**3,430,628**	**5,298,203**	**6,852,898**	**3,415,780**	**3,437,118**
Cotabato	87,199	87,199	10,227	76,972	0	0	0	0	0	0
Dapitan	897,594	636,423	496,068	140,355	261,171	0	261,171	700,780	350,336	350,444
Davao	11,600,038	4,626,292	3,312,850	1,313,442	6,973,746	2,811,938	4,161,808	2,211,138	1,105,962	1,105,176
General Santos	3,020,572	1,754,542	1,157,618	596,924	1,266,030	489,925	776,105	0	0	0
Zamboanga	2,799,062	2,571,178	1,681,714	889,464	227,884	128,765	99,119	3,940,980	1,959,482	1,981,498
TOTAL	**214,705,269**	**79,709,604**	**41,751,796**	**37,957,808**	**134,995,665**	**66,571,211**	**68,424,454**	**55,990,029**	**28,746,341**	**27,243,688**

Source: PPA Annual Port Statistics Data CY2014



* Based on GCG Memorandum Circular No. 2014-10 dated 25 March 2014 - Rationalization of the Philippine Ports Authority (PPA)
* Based on Addendum to PPA Memorandum Order No. 36-2014 , Changes from Existing to New Nomenclature for Field and Head office units of PPA

Source: PPA

Figure 4.2-1 Location of PPA Ports (Base Port, Terminal Port)

(3) Cebu Ports Authority (CPA)

Total cargo throughput and passengers of all CPA ports in 2013 are shown in Table 4.2-3.

In 2014, the domestic cargo handling volume was 16.84 million tons (inward: 7.54 million tons, outward: 9.29 million tons) while foreign cargo totaled 5.52 million tons (import: 3.88 million tons, export: 1.65 million tons).

Total cargo throughput of all CPA ports (22.36 million ton) is about 10% of that of all PPA ports (214.70 million ton).

As for domestic cargo, the volume of outbound is slightly larger than that of inbound. In contrast, as for foreign cargo, the ratio of import and export is 7:3. There is a large gap between the two.

The number of passengers totaled 17.09 million (embarking: 8.42 million and disembarking: 8.67 million) which is slightly more than 30% of the passenger volume recorded in all PPA ports (55.90 million).

Table 4.2-3 Total Cargo Throughput and Number of Passenger at CPA Ports (CY2013)

CARGO THROUGHPUT(in metric tons)							PASSENGER TRAFIC		
Grand Total	DOMESTIC			FOREIGN			Total	Disembarking	Embarking
	Total	Inward	Outward	Total	Import	Export			
22,361,324	**16,837,854**	**7,543,793**	**9,294,061**	**5,523,470**	**3,876,212**	**1,647,258**	**17,090,205**	**8,673,043**	**8,417,162**

Source: Study team (Based upon data from PPA)

(4) Issues on port administration in the Philippines

The Philippine Ports Authority (PPA) had been responsible for administering, managing and controlling all Philippine ports until 1990. Since then, the Cebu Ports Authority (CPA), the Subic Bay Metropolitan Authority (SBMA), the Bases Conversion and Development Authority (BCDA), the Cagayan Economic Zone Authority (CEZA), and the Regional Port Management Authority (RPMA) have been established and each play roles in managing ports in their respective regions. Department of Transportation and Communications (DOTC) and LGU are responsible for the development and administration of other small regional ports. According to The master plan (2004), although overall administrative control of public ports should be carried out by DOTC, the legal authority to do so is lacking. The situation has not been changed yet.

4.2.2. Development and Operation/Management under Local Government Units

(1) Basic Framework

Almost all local ports managed and operated by LGUs are of a small-scale. In general, these local ports are developed by DOTC and are turned over to LGUs to operate and manage after completion. Local ports were developed by DPWH before 1992 but the responsibility was transferred to DOTC following organizational reforms. Since then, development of local ports has been implemented by DOTC with the local fund (Budget of the Government of Philippines) and assistance funds from foreign donors. The government of Japan has supported the development of such ports under the ODA loans projects of National Feeder Ports Development Projects/NFPDP (1987-1997) and Social Reform Related Feeder Port Development Project/SRRFPDP (1997-2008). There are some ports which LGUs develop with their own funds. PPA prepares a scheme of developing such local ports by its corporate fund corresponding to requests from Government Corporation (GC) or LGUs. (See Table 4.2-4)

Table 4.2-4 Development and Operation/ Maintenance of Local Ports

Development Body	Resource	Operation and Management
Developed by DOTC	Government Fund	LGU (Turnover from DOTC)
	Foreign Fund	
Developed by LGU	LGU Fund	LGU
PPA(corresponding to LGU’s request)	PPA Corporate Fund	LGU

Source: Study team

(2) Local Port Developed under Japanese Financial Assistance

1) Outline of the Projects

National Feeder Ports Development Projects (NFPDP) aimed to upgrade the living and industrial infrastructure in Region IV, VI and VII through improving accessibility to a regional center city from the remote areas where daily transportation heavily depends on water transportation by systematic development of the existing small local ports. Under the project, 27 ports were developed.

Social Reform Related Feeder Port Development Project (SRRFPDP) aimed to contribute to poverty reduction of farmers and fishermen in rural areas through promoting the activation of economic activities by improving port infrastructure including related buildings, facilities and access roads in isolated areas where communication methods with other areas are limited to only sea transportation. 34 ports were developed under the project. A chronological history of these projects is shown in Table 4.2-5.

Table 4.2-5 Short History of Development of Local Ports under Assistance of Japan

1982 –	-The study of Nationwide small-scale port development plan and prepared a master list of 150 ports -141 shortlisted ports among 300 long-listed ports. -Requests of assistance on 39 ports to ADB, 56 ports to OECF, 41 ports to USAID and 5 ports to KFW.
1988.01	Loan agreement of Nationwide Feeder Ports Development Program (NFPDP) Amount : JPY 2.9 billion Ports; 25 ports were targeted after appraisal (50 ports were requested) Executing agency: DPWH, Operation and maintenance: turned over to LGUs
1990.06	NFPDP consulting services (terminated in Feb. 1998) Design of 60 ports
1992	Transfer of the executing agency from DPWH to DOTC

1992.12	Start of construction works of NFPDP
1997.03	Loan agreement of Social Reforms related to Feeder Port Development Project (SRRFPDP) Amount : JPY 5.746 billion Ports: 35 ports
1997.10	Completion of Disbursement of NFPDP (planned completion 1995.05): JPY 2.046 billion (total cost: JPY 2.407 billion)
1998.02	Completion of 27 ports development in SRRFPDP
2008.12	Completion of the whole SRRFPDP projects (planned completion: 2003.05): Actual Amount: JPY 4.286 billion Ports: 34 ports

Source：Ex-Post Evaluation of Japanese ODA Loan Social Reform Related Feeder Ports Development Project, Ex- Evaluation report of Philippine national Feeder Ports Project, March.2003

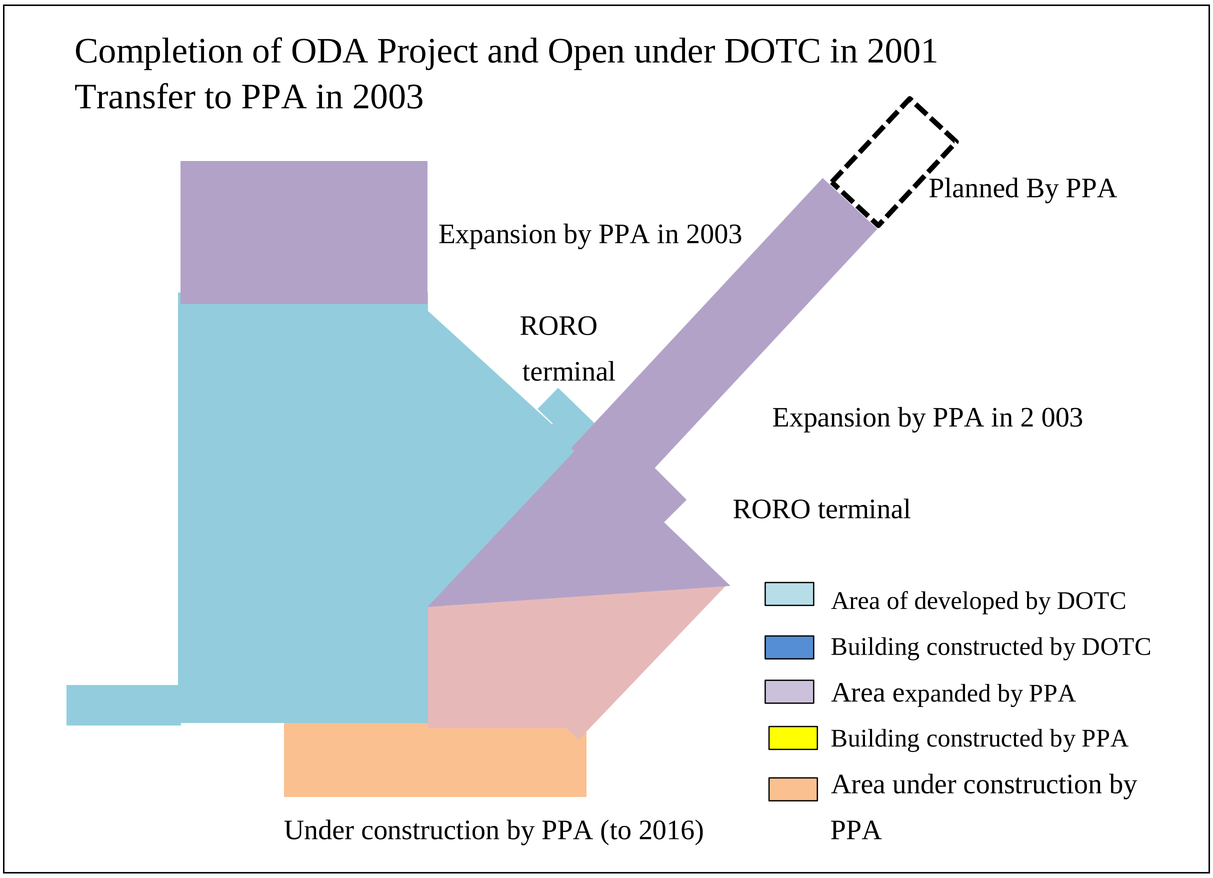
2) Basic Framework of Operation/Management

It was planned that feeder ports developed under NFPDP and SRRFPDP would be turned over to LGUs for operation/management after completion based on a Memorandum of Agreement (MOA) between DOTC and each LGU. An LGU is obligated to create a port management unit, provide adequate and regular appropriation, establish a port tariff and submit an annual performance report to DOTC. On the other hand, DOTC is obligated to establish and maintain a feedback mechanism to ensure that the port is operated and managed effectively by an LGU.

Among the NFPDP ports, four (4) ports of Ubay, Dumangas, Coron and El Nido were turned over to PPA and twenty three (23) ports were turned over to each LGU where the ports are located. On the other hand, construction works of SRRFPDP ports were divided into five (5) packages, 4 of which were completed in 2002 or 2003 and turned over to LGUs. The works of the fifth package were completed in 2008.

According to the DOTC, the ports of Real, Caramoan, Tamban, San Jose, Pasacao, Liminangcong, Roxas, Estancia, Culasi, Alabat, Atimonan, San Jacinto, Aroroy, Cataingan, Placer, San Sebastian and Mangingisda have been turned over officially to LGUs and each LGU established a port management unit and carries out port operation including collection of port charges. However, there are ports which were not operated according to the provisions of MOA or which have not been officially turned over yet.

Some ports which were turned over to PPA have since been expanded or rehabilitated by PPA. In case of the port of Dumangas, port facilities were constructed by DOTC and completed in 2001. The port was turned over to PPA in 2003 and PPA carried out expansion projects. In addition, PPA carried out the works of overlaying the pavement which was originally constructed by DOTC and is carrying out the expansion project at present (see Figure 4.2-2).



Study Team

Figure 4.2-2 Development and expansion of Dumangas Ports

In many ports, operation and management of the ports by LGUs has not been implemented as planned. There is a need to capacitate the LGUs on operation and management of the ports under LGUs. LGUs have to appropriate budget necessary for capacity buildings of the staff on operation and management of the port under the LGU. Against such a background, there is a plan for ports managed and operated by LGUs to be supervised by PPA or PFDA which have skilled staff and vast experience in the operation and management of ports or fishing ports.

Ports which were developed under NFPDP and SRRFPDP and the situations of turnover are shown in Table 4.2-6 and Table 4.2-7.

Table 4.2-6 Ports under NFPDP and Turnover

NSPDP ports	27	LGU(turnover) / Port Name
Ports to PPA	4	Ubay (Bohol), Dumangas (Iloilo), Coron (Palawan), El Nido (Palawan)
Ports to LGU	23	
Batangas	4	Calatagan, Lobo, Nasugbu, Tingloy
Iloilo	3	Banate, Estancia, Guimbal
Mindoro Occidental	2	Tayamaan, Sablayan
Mindoro Oriental	1	Roxas
Negros Occidental	1	Vito Sagay

	Palawan	5	Balabac, Macarascas, Roxas, San Vicente, Isugod
	Quezon	3	Mauban, Pitogo, San Andres
	Romblon	4	Looc, Azagra, San Agustin, Sta. Fe

Source: -Ex-Post Evaluation of Japanese ODA Loan NSPDP, JICA 2000
-Copy of Post Evaluation report, JICA 2008
-DOTC

Table 4.2-7 Ports under SRRFPDP and Turnover

SRRFPDP ports		34	LGU(turnover) / Port Name
Ports to PPA		3	Dumangas (Iloilo), Looc port,(Romblon) Roxas port (Palawan),
Ports to LGU under PPA [1)]		21	
	Camarines Sur	2	Caramoan port, San Jose port
	Quezon	5	Real port, Polillo port, Conception port, Banton port, Corcuera port
	Romblon	4	Said port, Conception port, Banton port, Corcuera port
	Palawan	3	Araceli port, Mangingisda port, Cuyo port
	Iloilo	1	Culasi port (Ajuy)
	Masbate	3	San Jacinto port, Aroroy port, Cataingan port]
	Bohol	1	Pitogo port
	Batanes	2	Sabtang port, Ivana port
	Surigao del Norte	1	Soccoro port
Ports to LGU under PFDA[2)]		10	
	Camarines Sur	2	Tamban port, Pasacao port
	Palawan	1	Liminancong port (Taytay)
	Iloilo	1	Estancia port
	Samar	1	San Sebastian port
	Surigao del Norte	1	Placer port
	Aurora	1	Dingalan port
	Mindro Oriental	1	Recodo port (Pinamalayan)
	Aklan	1	Buruanga
	Negros Occidental	1	Victorias port

1) Not finalized
2) Agreed on May 11, 2010 between DOTC and PDFA
Source: -Ex-Post Evaluation of Japanese ODA Loan Social Reform Related Feeder Ports Development Project, JICA 2013
-DOTC

3) Operation and Management by LGU under supervision by PPA

Obligations on DOTC, PPA and LGUs in the framework of operation and management of the ports by LGUs under supervision by PPA are shall be stipulated in MOAs. The administration and supervision of the ports, the ownership and monitoring of the LGUs' performance will be mentioned. It is thought that The MOA between PPA and LGUs shall be followed by the MOA between DOTC and PPA. LGUs shall operate and manage the ports according to the provisions of the MOA.

4) Operation and Management by LGUs under Supervision by PFDA

MOA on operation and management of ten (10) ports which are mainly used as a fishing port between DOTC and PFDA was signed on May 11 in 2010. Based on the MOA, PFDA is responsible for supervising and controlling LGUs in operation and management of these 10 ports. LGU shall operate and manage the fishing ports according to the provisions on the MOA.

4.2.3. Development of Major Ports

Financial cooperation provided by JICA in the past is summarized below.

Table 4.2-8 List of Assistance Projects by JICA

Project	Date of loan contract	Amount of yen loan (million yen)	Project Implementing body	Notes
Subic Bay Port Development Project	2000/08/31	16,450	Subic Bay Metropolitan Authority (SBMA)	Special yen loan
Mindanao Container Terminal Project	2000/04/07	8,266	Phividec Industrial Authority (PIA)	Special yen loan
Batangas Port Development Project (Phase II)	1998/09/10	14,555	Philippine Ports Authority (PPA)	
Batangas Port Development Project (Phase II) (E/S)	1997/03/18	876	PPA	
Batangas Port Development Project	1991/07/16	5,788	PPA	
Batangas Port Development Project	1988/01/27	192	PPA	
Port Cargo Handing Equipment Procurement Project (Phase II)	1988/01/27	2,478	PPA	
Development Project of the Port of Irene	1983/09/09	240	DPWH	
Wharf and Handling Facilities Component of Leyte Industrial Complex Development Project	1981/06/16	7,560	National Development Company (NDC)	
Port Cargo Handling Equipment Expansion Project	1980/06/20	1,540	PPA	

Source: Study Team (Based upon data from PPA)

4.3. Assistance from Japan and Other Countries Related to Ports in the Philippines

4.3.1. Development of feeder ports

Past assistance provided by JICA in the field of feeder port development is summarized below.

Table 4.3-1 List of Assistance Projects by JICA

Project	Date of loan contract	Amount of yen loan (million yen)	Project Implementing body	Notes
Social Reform Related Feeder Ports Development Project	1997/03/18	5,746	Department Transportation and Communication (DOTC)	
Nationwide Fishing Ports Project (Phase II)	1992/03/20	7,655	DOTC	
Nationwide Feeder Ports Development Program	1988/01/27	2,090	Department of Public Works and Highways (DPWH)	

Source: Study Team (Based upon data from PPA)

For the NFPDP, DPWH initially requested financial cooperation for 150 ports by dividing the area from Japan Government, Asia Development Bank (ADB) and World Bank (WB). However, ADB did not take part in the NFPDP due to emergency assistance for the great eruption of Mt. Pinatubo in 1991. In the aftermath, five ports were constructed by Kreditanstalt für Wienderaufbau (Germany). In addition, 50 ports which are requested to WB were taken over by U.S. Agency for International Development. Eventually, 22 of the 50 ports were constructed.

Table 4.3-2 Outline of Previous JICA Studies

Social Reform Related Feeder Ports Development Project (SRRFRDP) (OECF LOAN No. PH-P173) (Technical Assistance) (1997-2000)

Outline of Loan Agreement

Implementing Organization: DOTC
Date of Exchange of Notes: Mar. 1997 / Date of Loan Agreement: Mar. 1997
Final Disbursement Date: Dec. 2008
Loan Amount: ¥5,746 million / Loan Disbursed Amount: ¥4,286 million
Interest Rate: 2.7%, Repayment Period(Grace Period): 30 years (10 years)
Procurement: General Untied(Main, Consultant)

Source: JICA Ex- Post Evaluation Report on ODA Loan Projects

Nationwide Feeder Ports Development Program : NFPDP (1987.12)

Outline of Loan Agreement

Implementing Organization: DOTC
Date of Exchange of Notes: Dec. 1987 / Date of Loan Agreement: Jan. 1988
Final Disbursement Date: Oct. 1997
Loan Amount: ¥2,090 million / Loan Disbursed Amount: ¥2,046 million
Interest Rate: 3.0%, Repayment Period(Grace Period): 30 years (10 years)
Procurement: General Untied(Main), Japan Tied(Consultant)

Source: JICA Ex- Post Evaluation Report on ODA Loan Projects

4.3.2. Major Technical Cooperation

Major technical cooperation studies for development of ports provided by JICA in the past are summarized below.

Table 4.3-3 List of Assistance Project by JICA

Year	Study on Port development
1982	The study on the development project of the Port of Irene[1)]
1984	Feasibility Study on San Fernando Port development Project[2)]
1985	The study on the development project on the port of Batangas in the Republic of the Philippines[1)]
1987	Feasibility Study on the Manila South Port Rehabilitation Project[2)]
1992	The study on Nationwide Roll-on Roll-off Transport System Development[2)]
1994	The greater capital region integrated port development study in the Republic of the Philippines[1)]
1999	The study on the Subic Bay port master plan in the Republic of the Philippines[1)]
2002	The study on the Cebu integrated port development plan in the Republic of the Philippines[1)]
2004	**The study on the master plan for the strategic development of the national port system in the Republic of the Philippines (The Master Plan)** [1)]
2007	The Feasibility Study on the Development Road RO-RO Terminal System for Mobility Enhancement in the Republic of the Philippines[2)]
2010	The study on guidelines for assessing port development priorities including acceptable performance levels in ASEAN[1)]
2011	The study on project priorities to upgrade performance and capacity of ASEAN network ports[1)]
2013	The master plan and feasibility study on the establishment of an ASEAN roll-on/roll-off (RO-RO) shipping network and short sea shipping [1)]

Source: 1) JICA website
2) List of Past major Consulting Services: OCDI

The Master Plan for the Strategic Development of The National Port System in the Philippines is outlined below.

Table 4.3-4 Outline of Previous JICA Studies

The Study on the Master Plan for the Strategic Development of The National Port System in the Philippines (2004.1)

In order to improve the port development system in the Philippines, DOTC, as the entity responsible for formulating national port policy, must formulate a national port development plan, priority port development projects and an effective port investment plan of all relevant ports in the country. In fact, the Government of the Philippines (GOP) is also preparing the Medium-term National Development and Investment Plan for the period from 2004 to 2009. Accordingly, the port sector must formulate a National Port Development Plan in harmony with other transport modes. In view of the above reasons, GOP has officially requested the Government of Japan (GOJ) to implement the national port development strategy study in the Philippines with the target year 2024.

The objectives of the study was as below:

- To formulate the master plan for the strategic development of the national port system in the Philippines with the target year of 2024

- To formulate the initial five-year port development strategy for the identified priority ports with the target year of 2009
- To pursue technology transfer to the DOTC counterpart personnel in the course of the Study

The study summarized the following concrete strategies.

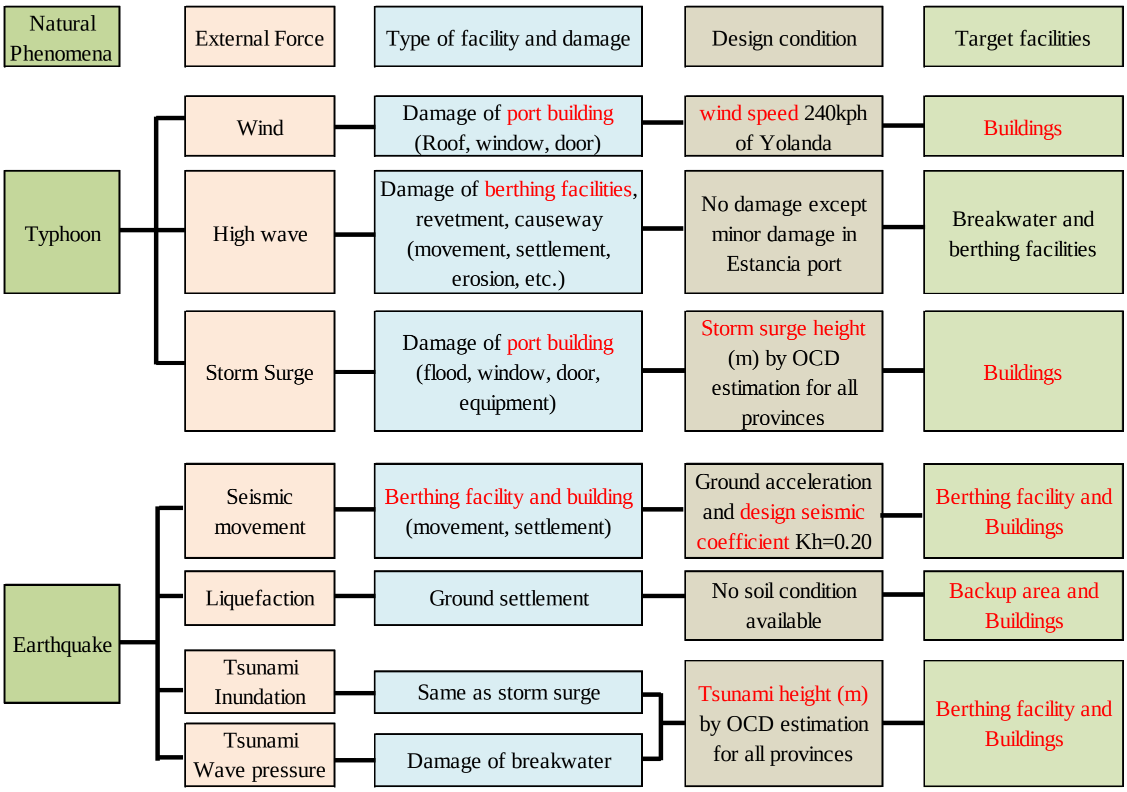
- Planning: Establishment of comprehensive nationwide port development plan coordinated with the plans of various port development bodies
- Management and operation: Modification of port administration as well as improvement of port management/operation
- Investment and financing: Establishment of investment strategies for various kinds of port development projects

Source: The Study on the Master Plan for the Strategic Development of The National Port System in the Philippines

5. Port disaster in the Philippines

5.1. Port disaster

The target disaster and subjected damage types, design conditions, and affected facilities in this survey are shown in the matrix chart below. The subjected facilities and necessary design conditions for target typhoons and earthquake disasters are shown in red



Source: Study team

Figure 5.1-1 Matrix Chart for Target Disaster and Facilities

Details and samples of damages for target disasters are shown as follows

5.1.1. Typhoon

(1) Damages Caused by Strong Wind

Generally speaking, no damage to civil structures and berthing facilities are caused by strong winds, while a lot of building structures have been affected by strong wind. Velocities in the right side of a typhoon's route are stronger and cause more damage than the other side. There were only damage to roofs in Palompon Port and

Source: NILIM No.816

Figure 5.1-2 Damage of Roof of PTB

some other ports by typhoon Yolanda. The photo shows damage to the roof of the passenger waiting room caused by strong wind by Yolanda in Lipata Port, located in the western part of Panay Island.

(2) Damage caused by high waves

A lot of damage occurs at seawall and wharf structures caused by high waves, which is different from strong winds. High waves cause no damage to building structures. There is less damage caused by high waves in the Philippines because almost all ports are constructed in the closed sea in which no generation of high waves occurs, or sheltered areas behind peninsulas or islands in order to avoid high waves from the open sea. Only the pier slab and a part of the revetment were damaged by high waves of typhoon Yolanda in Estancia Port. The photo shows the sample of the damage to the connection slab between the pier and retaining wall at Ohfunato port, Iwate Prefecture in Japan caused by high waves.

Source: Study team

Figure 5.1-3 Damage of Connection Slab by High Wave

(3) Damage caused by storm surges

A storm surge is a natural phenomenon of the tidal level in which the sea water level increases by low pressure setup, wind setup and wave setup. The facilities on land, especially buildings, are often damaged by storm surges. The photo shows the damage to the transit shed in Tacloban Port due to the storm surge of Typhoon Yolanda. There was also damage to buildings in some other ports due to inundation caused by storm surge.

Source: PPA

Figure 5.1-4 Damage of Wall by Storm Surge

5.1.2. Earthquake

(1) Damage caused by earthquakes (movement)

Damage due to earthquakes have been found in all kinds of port facilities (breakwaters, seawalls, mooring facilities, onshore facilities, other related facilities, cargo handling equipment etc.). The kinds of damage are movement of structures, overturning and settlement. Many serious damaged areas such as movement of pier, inclination、pavement cracks, slant of buildings, cracks, etc. were

Source: Study Team (Left), PPA (Right)

Figure 5.1-5 Damage of Wharf (left), Crack of Ground Floor of ADM

found at Tagbilaran Port and other ports after the Bohol earthquake. Photos show examples of wharf damage due to an earthquake at Kobe port in Japan and the 10cm wide crack which occurred on the floor of the administration building in Tagbilaran Port.

(2) Damage to yards caused by liquefaction

Damage from liquefaction often occurs in reclaimed land or loose sandy soil which leads to reduce bearing force and settlement due to the increase of pore water pressure. Damage to yards, hinterlands, access roads and building foundations were found at Catagbacan (Loon) Port and other ports. The photo is the settlement of the backup area caused by liquefaction at Catagbacan (Loon) Port.

Source: PPA

Figure 5.1-6 Damage of liquefaction

(3) Damage caused by tsunami

Damages caused by tsunami are often inundation of onshore facilities (building structures) due to the increase of sea level by tsunami, similar to storm surges. There was no tsunami and no damage because the epicenter was inland for the Bohol earthquake. The photo shows a snapshot of extreme tsunami overtopping toward the onshore side at Miyako City, Iwate Prefecture in Japan

Source: Study team

Figure 5.1-7 Tsunami Inundation in East Japan Earthquake

(4) Damage caused by tsunami pressure

There are subcritical and supercritical flows of tsunami wave pressure. A tsunami of a few meters in height generates a gentle subcritical flow with small wave pressure. However, a high tsunami creates a bigger wave pressure than a small tsunami because of high tsunami pressure and the supercritical flow made of free fall from the top of the tsunami height. The photo shows an example of overturning of a reinforced concrete building by a tsunami of supercritical flow at Onagawa Town, Miyagi Prefecture in Japan

Source: Study team

Figure 5.1-8 Damage by Tsunami Pressure

5.1.3. General Information and Restoration Status of Disaster Port Facilities

(1) Results of Present Condition Survey for Existing Port Facilities in Target Areas

This Survey summarizes the results of field surveys for a total of 24 ports consisting of eight ports in Leyte Province, nine ports in Bohol Province and seven ports in Iloilo Province, based on the Minutes of Discussion on Data Collection Survey on Disaster-resilient Feeder Ports and Logistic Network Between Japan International Agency (JICA) and the Department of Transportation and Communication (DOTC).

Port facilities in Leyte and Iloilo provinces were damaged by typhoon Yolanda in November 2013, and port facilities in Bohol province were damaged by Bohol earthquake in October 2013. Major damages of port facilities in Leyte province were buildings caused by storm surge of typhoon, and berthing facilities and buildings in Bohol province were damaged due to movement and liquefaction caused by earthquake. The damages of port facilities caused by typhoon in Iloilo province were very minor. Detailed port facilities and condition of damages for each province are summarized in the following tables.

Table 5.1-1 Summary of the Port Facilities and Condition of Damage in Leyte Area

Port Facilities	Unit	TACLOBAN	PALOMPON	ISABEL	ORMOC	BAYBAY	HILONGOS	BATO	BABATNGON
Cargo Berthing length (depth, m)	m	922 (10.0m)	235, (6.78 m)	84 (3.0 m)	793(5.91 m) 10 berths	428.2 (3.98 m) 5 berths	375 (3.19 m) 5 berths	150 3 berths	Causeway
Degree of damage		Flood only（Minor）							
RORO Facilities	Unit	2	1	None	3	1	2	1	None
Total port area	m^2	45,000	18,399	2,106	18,132	7,997	14,119	1,800	None
Working area	m^2	7,756	-	-	-	None	574	-	None
Open Storage	m^2	6,553	8,297	-	4,733	834	6,944	900	None
Warehouse or Transit shed	m^2	540.00	675	-	None	None	None	None	None
Degree of damage		Transit shed, small buldgs and 1 crane totally damaged（Serious）	Roof, ceiling damage（Medium）						
Marshalling Area	m^2	-	1,814	-	1,373	540	558	None	None
Vehicle Parking Areas	m^2	-	1,240	-	3,337, (61 vehicles)	45, (12 vehicles)	132	None	None
Passenger Terminal Building	m^2	-	150	None	1,412	315	271	None	None
Degree of damage			Roof, ceiling damage（Medium）			Roof, ceiling damage（Minor）	Roof, ceiling（Minor）		
Admin Bldg, etc	m^2	686 x 3 stories	166	104	281	58	58	None	None
Degree of damage		Totally Dameged	Roof, ceiling damage（Medium）		PMO and othe buldg damaged（Medium）				
Degree of total damage		**Serious damage**	Midium Damage	Very Minor	Midium Damage	Minor Damage	Minor Damage	Very Minor	None
Rehabilitated date, cost(mil. Peso)		2014/12/30, (25.9)	2015/3/31, (5.6)		2014/12/30, (4.0)	2014/3/14, (1.5)	2014/3/14, (2.1)		

Note: Red: Serious damage, Blue: Medium damage, Green: Minor damage

Source: Study team

Table 5.1-2 Major Condition of the Facilities and Damages in Leyte Area

	Tacloban Port			Ormoc Port
Damaged Conditions by Typhoon Yolanda	 PPA	 PPA	  PPA	
	Totally damaged warehouse by storm surge of typhoon Yolanda but the column structure was not damaged.	Inside view of Admn. Building after Typhoon. Windows doors furniture documents etc. were damaged and washed by storm surge but main building structure was not seriously damaged	Condition of the wharf after typhoon(left). Wharf structure was not damaged by storm surge and waves. Storm surge overflow the wharf and remaining debris. PCG vessel at the open space near entrance gate (right).	Only roofs of buildings were minor damaged. No damage for berthing facilities.
Rehabilitation	 Survey Team	 Survey Team	    Survey Team	  Survey Team
	Renovated Warehouse (Wall material change to CHB)	Renovated Admin. Building	It was not found the damage caused by typhoon during the investigation. Condition of the wharf deck and piles are basically sound. Open-type wharf is rehabilitating by mean of steel pipe sheet pile.	Landside concrete slabs have no beams and no deterioration. (Upper photo) Seaside concrete deck consists of small beams and slabs. Over topping concrete was placed on the existing deteriorated concrete slab.

Source: Study team

Table 5.1-3 Summary of the Port Facilities and Condition of Damage in Bohol Area

Port Facilities		Unit	TAGBILARAN	UBAY	TUBIGON	CATAGBACAN (Loon)	GETAFE	TAPAL	POPOO	Guindluman	JAGNA
Cargo Berthing length (dep		m	705.3 (8.0 m)	222.00 (3.0m)	396.00 (5.2m)	144.00 (4.00-6.00m)	46.5 (6.5 m)	36.00 (4.00m)	21.8 (1.5m)	66 (1.0 m)	153.00 (11.0m)
	Degree of damage		Edge of pier damaged (Medium)		Pier blocks move 5cm (Medium)	Totally damaged Pier removed				Stair landing damaged (Minor)	
RORO Facilities		Unit	2	3	2	2	2	1	None	None	2
	Degree of damage				Settlement by 30 cm (Medium)	Totally damaged Ramp settled	Settlement by 30 cm (Medium)				
Total port area		m^2	53,150	33,909	19,421	3,304	3,217	3,985	Cause way 222	2,400	7,309
Open Storage		m^2	5,688	19,873	2,813	441	600	1,725	None	Fish market	390
	Degree of damage		Pavement crack and elevation gap 40cm (Serious)		Pavement & access road crack 20 to 30cm (Medium)	Pavement crack 30 to 40cm (Serious)					
Warehouse or Transit shed		m^2	600	-	-	-	-	-	None	None	-
Working area		m^2	20,705	7,202	1,951	849	926	1,182	None	None	4,693
Vehicle Parking Areas		m^2	5,336	1,520	2,957	None	400	None	None	None	300
Passenger Terminal Buildin		m^2	623.4	210	1,472	None	None	30	100	None	240
	Degree of damage		Totally damaged								
ADM Building		m^2	760.2	120	68	60	60	30	None	None	Tran. Shed300
	Degree of damage		Totally damaged		Leaning 15 degrees (Medium)	Gate house settled (Serious)					
Degree of total damage			**Serious damage**	Very Minor	**Medium damage**	**Serious damage**	**Medium damage**	Very Minor	Very Minor	Damaged by Yolanda	Very Minor
Rehabilitated date, cost(mil. Peso)											

Note: Red: Serious damage, Blue: Medium damage, Green: Damage by typhoon Yolanda

Source: Study team

Table 5.1-4 Major Condition of the Facilities and Damages in Bohol Area

	Tagbilaran			Tubigon		Catagbacan (Loon)	Getafe
Damaged Conditions by Bohol Earthquake	 PPA	 PPA	 PPA/Survey Team	 PPA	 PPA	 PPA	
	(Top) Broken landside concrete piles of the Berths (IBRD funded) (Down) Broken Pile cap concrete for steel pipe pile (PPA funded)	Settlement and cracks of yards (40cm elevation gap)	Structures of Administration and PTB abandoned. Cracks on the floor of ADM building.	Broken concrete piles of the pier	Cracks on the pavement of open storage and access	The super structure of the cruise ship berth which moved outward. Cruise berth was demolished and removed.	Cracks on the pavement of open storage and access
Rehabilitation			 Survey Team	 Survey Team			 Survey Team
	No repair yet	Rehabilitated (Partially still under repair)	New PT Building (under construction)	Pavement are repaired but the piles of pier are not yet. Port Manager info: Ground level raise 1m at Catagbacan and settle 1m at Tubigon and Clarin.		No repair yet	Some raked piles at RORO ramp were broken. Asphalt was filled in the crack of pavement.

Source: Study team

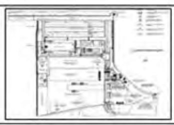
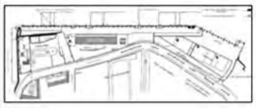
Table 5.1-5 Summary of the Port Facilities and Condition of Damage in Iloilo Area

Port Facilities	Unit	ILOILO			DUMANGAS	ESTANCIA (PPA)	ESTANCIA (Fish Port)	BANATE	GUIMBAL	CULASI
		ICPC (Container)	San Pedoro (General Cargo)	River Wharf						
Cargo Berthing length (depth, m)	m	526 (10.5 m)	634.3 (6.0 m)	980 (5.0 m)	108 (4.5 m, 6.0 m)	117 (6.0 m)	160	Causeway 300	39 (16.0 m)	33 (2.5 m)
Degree of damage						Pier slab damaged by uplift of wave （Medium）				
RORO Facilities	Unit	1	1	3	2	None	None	None	None	1
Total port area	m^2	222,000	35,976	-	Approx. 22,000	Approx. 8,000	Approx. 20,000	Approx. 1,000	Approx. 7,300	Approx. 2,500
Open Storage	m^2	86,192	3,800	-	-	4,490	-	None	None	None
Warehouse or Transit shed	m^2	CFS 7,500	-	-	None	None	Market hall 500	None	None	None
Degree of damage						Rock mound & pavement repair （Medium）	Flood up to roof （Minor）			
Marshalling Area	m^2	27,500	2,366	-	1,800	None	-	None	None	None
Vehicle Parking Areas	m^2	Equipment shed 525	None	-	Approx.. 2,000	None	-	None	None	None
Passenger Terminal Building	m^2	None	2,100	-	750	480	None	None	None	Approx.. 80
ADM buildg	m^2	-	-	-	60	48	-	None	None	None
Degree of total damage		Very Minor	Very Minor	Very Minor	Very Minor	Midium Damage	Minor Damage	Very Minor	Very Minor	Very Minor
Rehabilitated date, cost(mil. Peso)						2014/12/10, (7.0)				

Note: Blue: Medium damage, Green: Minor damage

Source: Study team

Table 5.1-6 Major Condition of the Facilities and Damages in Iloilo Area

	Iloilo		Dumangas	Estancia (PPA)	Estancia (LGU)
	ICPC (Container Cargo)	Fort San Pedro (Gen Cargo)			
Damaged Conditions by Typhoon Yolanda					
	Damage by Typhoon Yolanda is minor.		Damage by Typhoon Yolanda is minor.	Slab and piles at landside of approach pier were damaged by typhoon. Revetment near approach pier was eroded by typhoon. Storm surge up to window of ground floor. Damaged by oil leakage from grounded generator barge nearby.	Minor damage for berthing facilities but roof of market hall was damaged by storm surge by typhoon.
Rehabilitation					
	Concrete condition under the slab could not inspect due to wave conditions.	Relatively good condition except few concrete piles are damaged.	No inspection due to high tide	Slab and piles at landside of approach pier have been repaired. Revetment have been rehabilitated. (portion of white concrete) No structural damage for buildings.	Damage has been rehabilitated.

Source: Study team

Table 5.1-7 Summary of Bohol and Yolanda Disaster Rehabilitation Project by DOTC

	Bohol Rehabilitation						Yolanda Rehabilitation	
	Guindulman	Inabanga	Baclayon	Mribojoc	Clarin	Buenavista	Albuera Port (Leyte)	Banate Port (Iloilo)
Population	31,789	43,291	18,630	20,491	20,296	27,031	-	29,543
No. of Barangays	19	50	17	22	24	35	-	18
Source of Livelihood	Fish and Agri.	Fish and Agri.	Fishing and Farming	Fish and Agri.	-	-	-	Fish and Agri.
Handling cargo							-	Fish, shell, etc
Damaged facilities								
-Causeway	Erosion	Settlement	Erosion	Erosion	Erosion	Erosion	Erosion	Shoulder
-Landing facilities	Stair landing damaged	Settlement	-	-	-	-	Stair landing	Stair landing
Estimated cost for Rehabilitation (Mil. Peso)	19.3	33.8	6.2	12.7	5.5	1.9	7.9	3.0
Phot of Damage								

Source: Study team

5.1.4. Summary of Type of Port Structure

(1) Type of Quay Structure

Table 5.1-8 shows a summary of existing quay structures as information for selecting a structure type of a standard quay design model for the said 24 ports in three provinces. According to the table, there are two structure types such as steel sheet pile and pier types and the pier type is the majority of the structure and approximately 93% of the total structures. This Survey therefore applies the pier type in the standard design model.

Table 5.1-8 Summary of Existing Structural Type of Berthing Facilities for Target Area

	Pier				Sheet Pile Quay Wall		Causeway
	Finger Pier	Open-type Wharves			Concrete Sheet Piles	Steel Sheet Piles	
		Concrete Piles	Steel Pipe Piles				
			Vertical & Raking Piles	Vertical Piles			
Type of Structure	Most of piers in the Philippine are perpendicular to the shore line supported by concrete piles. Concrete coupled raking piles are provided to resist the horizontal forces of the pier.	Concrete deck is constructed on coupled raking piles for open-type wharves to resist the horizontal forces.	In case of deep water wharves and quay cranes on the deck, coupled raking piles may be required due to the large horizontal forces. Expansion wharf of ICPC is this case.	Vertical steel pipe piles are selected to resist the horizontal forces by vertical piles only due to easiness of construction. ICPC is this case.	Concrete sheet piles are selected for the most cases of shallow water wharves in Philippines due to less anticorrosion treatment required. Anchor wall is selected for the most of anchor type.	In case of more than 10 m water depth, steel sheet piles and/or steel pipe sheet piles are used instead of concrete sheet piles. Most of the anchors are steel pipe piles (vertical piles or coupled raking piles).	Small-scale wharf for shallow draft vessels
LEYTE (Total 8 ports)	Tacloban(5°), Ormoc(0°, 15°), Isabel(5°), Palompon (7°), Hilongos (N/C), Baybay (12°), Bato (0°, ramp 10°) N/C: Not Clear	Tacloban(15°), Palompon, Ormoc				Tacloban (Steel Pipe Sheet Pile, anchor wall)	Babatngon
BOHOL (Total 9 ports)	Tagbilaran Passenger berths(10°), Catagbacan(15°), Ubay(0°,15°), Tubigon（N/C）, Talibon（N/C）, Getafe（N/C）	Tagbilaran	Tagbilaran			RoRo ramp in Tagbilaran	Popoo, Guindulman, Clarin
ILOILO (Total 7 ports)	Dumangas（N/C）, PPA Estancia(10°）, Guimbal(N/C）, Ajuy(5° to10°）, DOTC Estancia N/C: Not Clear	Iloilo FSP (Fort San Pedro Terminal), Iloilo IRW (Iloilo River Wharf)	Iloilo ICPC (Iloilo Commercial Port Complex)	Iloilo ICPC (Iloilo Commercial Port Complex)	Old Iloilo FSP (Fort San Pedro Terminal), but now steel sheet pile in front	Iloilo FSP (Fort San Pedro Terminal)	DOTC Estancia, Banate,
Percentage	64%	18%	7%	4%	－	7%	-

Source: Study team

(2) Type of Building

Likewise, Table 5.1-9 shows a summary of existing building structures as information for selecting the structure type of a standard building design model for the said 24 ports in three provinces. According to the table, all the structural members are made of reinforced concrete, and the roofs are of concrete slab or steel corrugated steel plate.

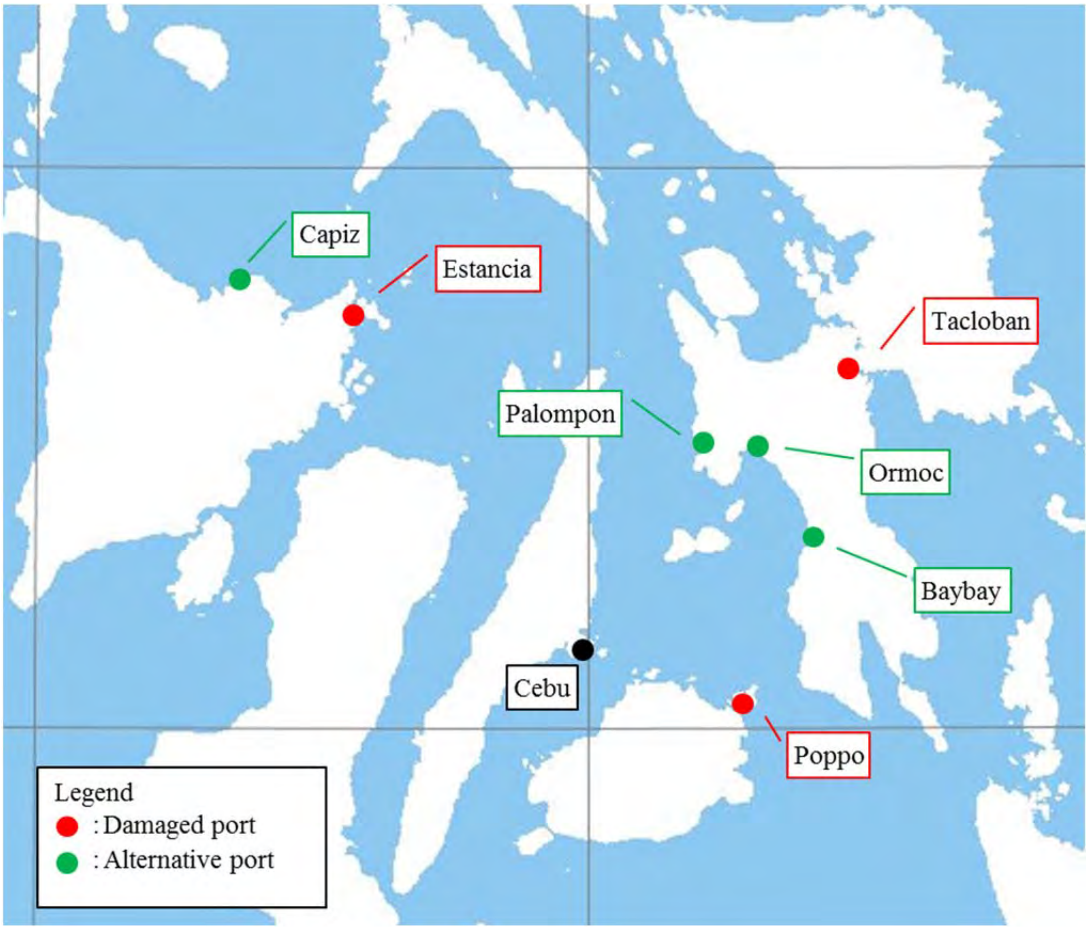
Table 5.1-9 Summary of Type and Area of Main Buildings for Target Ports

建物名	単位	TACLOBAN	ORMOC	TAGBILARAN	TAPAL	ILOILO (ICPC)	PPA ESTANCIA
Administration/ Office Building		RC Building w Roof Deck	RC Building w/ GI Roofing	Mixed Mat'ls w/ GI Roofing (Temporary)	RC Building w/ Roof Deck	RC Building w/ Roof Deck	RC Building w/ GI Roofing
		3 Storey	1 Storey	2 Storey	1 Storey	4 Storey	2 Storey
	m^2	686 x 3	281	261.45 x 2	30	435 x4	240 (2nd Flr. only)
CFS		なし	None	None	None	RC Building w/ GI Roofing	None
						1 Storey	
	m^2					7467.4	
Warehouse		RC Building w/ GI Roofing	None	RC Building w/ GI Roofing	None	RC Building w/ GI Roofing	None
		1 Storey		1 Storey		1 Storey	
		540		300		1027.8	
Passenger Terminal Building		None	RC Building w/ GI Roofing	RC Building w Roof Deck	None	None	RC Building w/ GI Roofing
			1 Storey	2 Storey			2 Storey
	m^2		1,412	397 x 2			240 (Grnd Flr. only)

Source: Study team

5.1.5. Ports and logistics in times of disaster

The team was able to interview relevant parties concerning the damage inflicted by Typhoon Yolanda. The information earned from them are described below.



Source: Study team

Figure 5.1-9 Port Location Map of the Damaged/ Alternative Ports

(1) Iloilo

- Estancia

The power barge which had been anchored in the waters adjacent to Estancia Port ran onto the backland due to the force of Typhoon Yolanda and oil from the barge subsequently leaked into the sea. As a result, Estancia Port was unavailable for ten months. During that time, Capiz Port, which is situated 70 kilometers away, substituted for Estancia Port. (Source: PPA TMO-Iloilo)

(2) Bohol

- Popoo

Although the area suffered little direct damage from Typhoon Yolanda, electricity supply from

Leyte was stopped for two months which inconvenienced residents. Moreover, a power generator could not be obtained due to shortage of stock. (Source: Brgy. Popoo, President Garcia Is.)

(3) Leyte

- Tacloban

RORO ship owned by a mining firm was the first vessel to assist in relief efforts. It transported heavy equipment to the affected area. (Source: City Engineering Office, City Government of Tacloban)

- Ormoc

The port operation was suspended for two days. 2-3,000 people were evacuated from eastern Leyte to Cebu city via this port. (Source: PPA PMO-WESTERN LEYTE/ BILIRAN)

- Palompon

While the port resumed operation two days after the attack; people remained without electricity in 7days. (Source: PPA TMO-Palompon)

- Baybay

While there was no serious damage to the port structure, people remained without electricity for a month. Relief goods were delivered from Cebu via this port to Tacloban city by land. (Source: Office of the City Mayor, City of Baybay)

5.1.6. Situation concerning logistics after Typhoon Yolanda

Extracts from "Secondary Data Review: Philippines Typhoon Yolanda, January 2014" by ACAPS (Assessment Capacities Project) is as follows.

(1) Impact on market prices

- Prices of food items have increased since (Typhoon) Yolanda and remain higher in most affected areas due to disruption in supply chains and increased costs of fuel and transport (MCNA 2013/12/20).
- Markets in Samar and Leyte were particularly affected, but less so in Panay and Cebu. The price of rice increased in Samar and Leyte (30% to 50%) and Panay and Cebu (10%) (MCNA 2013/12/20)[1].

(2) Manufacturers

- Transportation bottlenecks at national and regional levels are affecting normal deliveries due to prioritization of humanitarian aid in Manila, Cebu, Ormoc Mindanao and Sogod (WFP

[1] Multicluster Needs Assessment –MCNA. Final Report, Philippines Typhoon Haiyan

2013/12/10)[2].

- Canned food manufacturers are facing delays and shortages of tin due to congestions at the port (WFP 2013/12/10).

(3) Distributors

- Distributors suffered damage to their stocks and warehousing facilities and are facing delays in replenishment by manufacturers (due to delays in the ports bottlenecks), and have limited capacity for distribution due to damaged trucks (WFP 2013/12/10).

(4) Market specific findings for affected area

1) Panay (Iloilo)

- Roxas port and warehousing infrastructure sustained considerable damage; Iloilo (Port) is being used as an alternate entry point for goods. Most damaged stocks in Roxas were moved to Iloilo (Port), putting pressure on transportation resources (WFP 2013/12/10).
- Markets are functioning and well integrated, particularly along the northern coast of Panay from Aklan through Capiz and Iloilo where roads are well maintained. (WFP 2013/12/10).

2) Leyte

- Before (Typhoon) Yolanda, Tacloban City was the trade hub for Leyte and Southern Samar, supplying secondary markets in these provinces. These secondary markets are now acting as primary suppliers to small retailers in rural areas as well as sending good to Tacloban (WFP 2013/12/10).
- Like canned products, fresh produce and meat from Cebu and Mindanao are subject to congestions and delays at the port (WFP 2013/12/10).

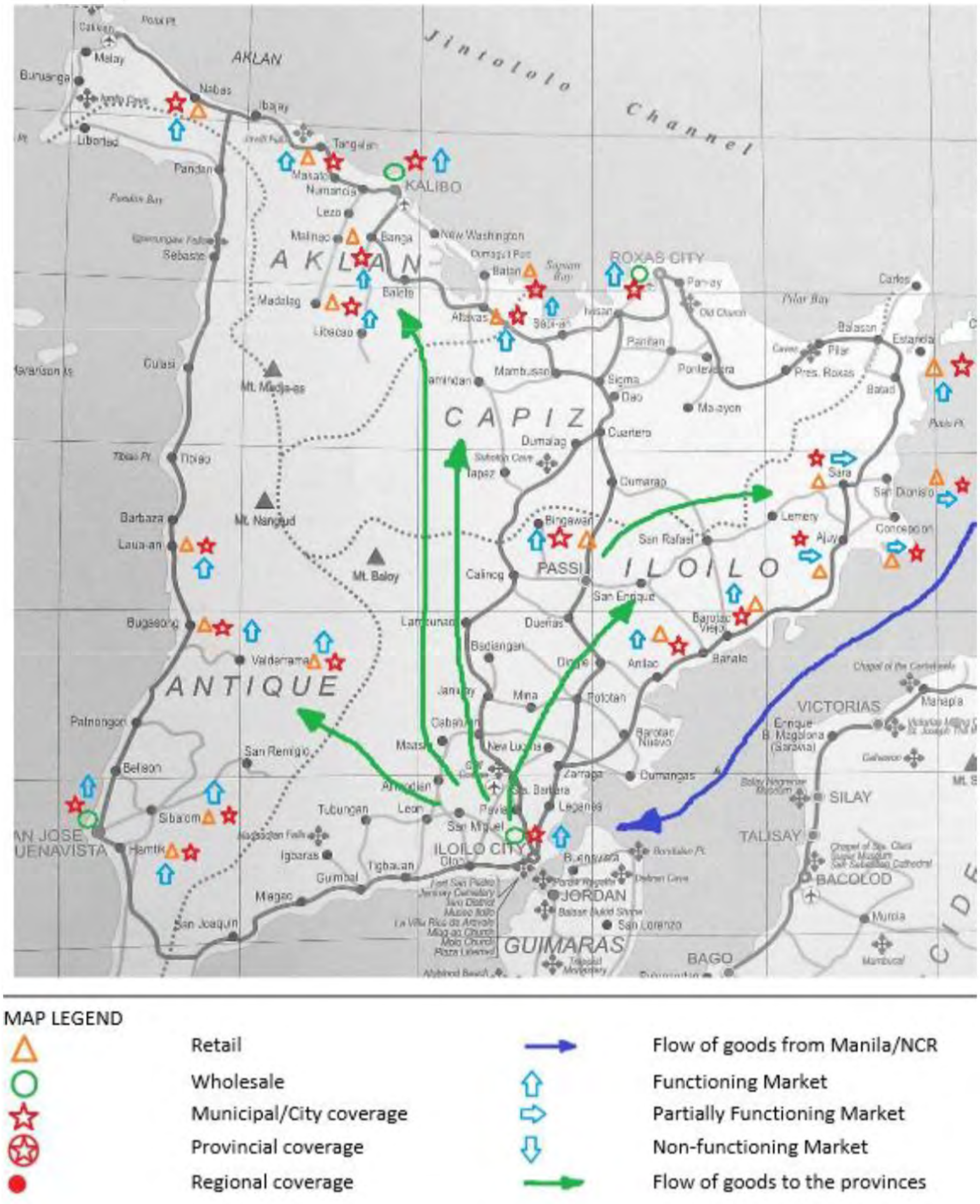
(5) Procurement of shelter material

- The large hardware store assessed in Ma-Ayon sourced materials from Roxas and Iloilo, while small retailers in the same municipality relied solely on suppliers in Roxas. Hardware stores in San Dionisio and Sara were supplied by wholesalers in Iloilo. Customers of these hardware stores were end users (hardware stores did not act as wholesalers for smaller markets). The two large retailers visited in Iloilo City source their materials from Manila or Cebu (IRC 2013/11/25)[3].
- Many stores have sold out hand tools, such as cross-cut saws, and have one to two week lead times to restock (IRC 2013/11/25).
- Retailers in Carigara and Jaro increased their prices due additional transport and fuel expenses for sending trucks to Ormoc. Mobile and landlines were not operational in Jaro and in parts of Ormoc

2 WFP(World Food Programme): Rapid Market Assessment
3 IRC(International Rescue Committee): Summary of a rapid Market Assessment

at the end of November, so Jaro retailers cannot make arrangements over the phone and had to visit personally (GOAL 2013/11/28)[4].

- At the end of November, Cebu manufacturers were struggling to meet demand and had run out of stock for umbrella nails and 8 foot CGI. It is unclear how long other stocks will last and several retailers are hoping to receive stock direct from manufacturers in Manila. Though, it is estimated that it will take two to three weeks for stock to arrive from Manila. Retailers have requested up to 100 crates of CGI (containing 500 to 700 pieces of CGI depending on length), however, manufacturers are only sending 25 to 30 as they cannot meet the full demand (GOAL 2013/11/28).



Source: ACAPS

Figure 5.1-10 Production and Market Flow Map for Galvanized Iron (GI) Sheet (Panay)

4 RAM Leyte (Rapid Assessment for Market Report)

6. Japanese disaster prevention at ports and harbors

6.1. Political policy and countermeasures for disaster prevention at ports and harbors in Japan

6.1.1. Overview

Japanese ports have experienced natural disasters such as single or complex events by earthquakes and tsunamis and storm surges.

Japan is an earthquake-prone country and large scale earthquakes have historically damaged ports. In 1995, the Great Hanshin Awaji earthquake inflicted the most damage to Japanese ports ever recorded; the port of Kobe, in particular, suffered heavy damage. Immediately after the earthquake, the port had to suspend its activities because almost all port facilities and the land were damaged by intense shakes and liquefaction.

Some earthquakes cause tsunamis which in the past have sometimes attacked ports. In addition, tsunamis generated by earthquakes in distant parts of the world have occasionally attacked ports in Japan. The Chilean earthquake in 1960 which had a magnitude of 9.5 generated a tsunami which crossed the Pacific Ocean at a velocity of more than 700 km/hour and reached Japanese ports (approx. 17,000 km away) one day later. The coastal areas including the ports were seriously damaged. A more recent example occurred on March 11, 2011, when the Great East Japan Earthquake generated tsunamis which inflicted serious damage to ports located in the Tohoku and North Kanto regions.

Japan is also affected by typhoons every year. Isewan Typhoon which attacked the middle region of Honshu Island resulted in unprecedented damage. The port of Nagoya experienced a high storm surge caused by the typhoon and many port facilities and vessels were damaged. Outflow of timber from timber storage ponds/yards in the port damaged facilities/buildings in the urban area.

Based on experience and lessons learned from these disasters, measures for effective disaster management have been adopted with the goal of creating disaster proof ports.

6.1.2. Policy for disaster prevention at ports and harbors in Japan

When damage to a port is incurred from a natural disaster, measures for prompt rehabilitation of damaged facilities are taken. In addition, preventive measures for minimizing damages from other disasters have been taken after analyzing the damages and causes of past disasters. The extensive damage which occurred at the port of Kobe due to the Great Hanshin Awaji earthquake was shocking to people in port circles. Based on the lessons learned from this and other disasters, the Ministry of Transport (at that time) formulated a policy on developing disaster resilient ports. The Ministry of Land, Infrastructure, Transport and Tourism has since formulated a policy for strengthening disaster resiliency of ports. The lessons learned from the East Japan Great Earthquake were summarized as shown below and a policy on disaster resilient ports was formulated

1) Strengthening of disaster prevention ability in ports

- Clarification of disaster prevention targets and disaster mitigation targets
- Strengthening of the information system for evacuation
- Introducing resilient structures
- Improvement of liquefaction evaluation method
- Disaster prevention base and earthquake resistant berths
- Necessity to strengthen cargo handling machineries against earthquakes and tsunamis

2) Securing maritime transport network and a backup system

- Strengthening core port facilities against earthquakes and tsunamis
- Countermeasures to secure navigation safety in bay areas
- Establishment of an extensive backup system among ports

3) Countermeasures for saving human lives and BCP

- Effective management of floodgate
- Improving the evacuation system
- Establishment of Business Continuity Plan (BCP) of Port

Local governments also formulate a policy/plan related to disaster resilient ports. Main documents related to disaster prevention measures of the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) and local governments are listed below.

Table 6.1-1 List of Documents Related to Disaster Prevention at Ports and Harbors in Japan

Key Points for Disaster Prevention	Keywords
(1) Documents published by MLIT	
Ref. 1 Basic Guideline for Countermeasure Facilities against Large-Scale Earthquakes (Dec. 1996)	
- Development of facilities against large-scale earthquakes	Earthquake-resistant quay walls, Harbor road, Open space,
Ref. 2 Manual for Disaster Prevention Inspections in Coastal Areas (Mar. 1997)	
Ref. 3 Proposal for Disaster Prevention at Ports and Harbors (July 2003)	
- Realization of safety function at ports and harbors - Realization of gateway and by-pass function at ports and harbors - Realization of open space at ports and harbors	Information communication system, Information network system of disaster preparedness, Port EDI, Earthquake-resistant quay walls, Countermeasures for deterioration of infrastructure facilities, Open space
Ref. 4 Guideline for Ports Having High Resistance against Earthquakes (Mar. 2005)	
- Enhancement of disaster preparedness centers - Enhancement of logistics bases - Enhancement of assistance for alternative	Earthquake-resistant quay walls, Storage facilities for emergency relief goods, Seismic isolation for quay crane, Emergency transport roads, Hazard map,

transportation - Increased protection against tsunami disaster	Distribution information devices for tsunami, Designation of evacuation routes, Emergency evacuation signs,
Ref. 5 Guideline for Countermeasures against Earthquakes and Tsunamis (June 2012)	
- Protection against tsunamis at ports and harbors - Enhancement of disaster response - Construction of disaster resilient maritime transport network	Seawall, Design tsunami water level, Tenacious structure, Earthquake-resistant quay walls, Disaster-tolerant shipping network
Ref. 6 Guideline for Port Business Continuity Plan (BCP) (Mar. 2014)	
i) Analysis and deliberation, ii) policy development, iii) Deliberation on response plan, iv) Port BCP, v) Management activity	Business Continuity Plan (BCP), Business Continuity Management (BCM), Port BCP
(2) Documents published by Local Governments	
Ref. 7 Basic Guideline for Countermeasures against Large-Scale Earthquakes at Ports and Fishing Harbors (Nagasaki, Mar. 2006)	
- Countermeasures for earthquakes at disaster resilient ports - Network construction in ports and fisher ports	Earthquake-resistant quay walls, Emergency transport roads, Database for related facilities
Ref. 8 Disaster Prevention Plan in Remote Islands near Tokyo (Mar. 2015)	
- Procedure to ensure prompt evacuation - Establishing a stockpile of emergency relief goods and securing a transport system	Scenario formulation and damage estimates, Tsunami evacuation facilities, Tsunami advisory sign, Hazard map, Raising coastal embankments, Improvement of quay walls for emergency transport
(3) Port Design Manuals for High Resistance against Disasters	
Ref. 9 Disaster Prevention/Mitigation and Projects for Ports and Harbors Restoration	
Ref.10 Action Plan for National Resilience 2014	
- Development of framework on obtaining and sharing information - Securing supply chain management (SCM)	Key performance indicators (KPI) ,Tsunami hazard map, Securement of emergency shipping route, Port BCP

Source: Study team

The policies are prepared based on the understanding that a port is expected to have functions of securing safety, playing a role as a gateway, providing by-passing routes and providing spaces for emergency activities in time of disaster. Each policy has been formulated based on the lessons learned from past disasters and by reflecting the socio-economic situation surrounding ports. Key measures proposed in the policies include the development of earthquake-resistant berths and earthquake-proof cranes, the improvement of open spaces, storage facilities for emergency goods, emergency transportation routes and outflow prevention facilities, and the establishment of a communication system and backup structures. Importance of preparing Port BCP is also introduced. In addition, the necessity of preparing hazard maps, designating evacuation routes, and installing communication tools and guideboards are adopted as measures to secure the safety of people who work at a port or live in close vicinity to a port.

Priority issues related to these policies have been changing based on lessons learned from recent disasters and socio-economic requirements for disaster prevention. Structural measures as well as high earthquake-resistant quay walls were promoted following the Great Hanshin-Awaji Earthquake in 1995(Ref.1). In December 2004, in response to the Indian Ocean Earthquake and Tsunami in 2004, the "Emergency Maintenance Program for High Earthquake-resistant Quay Walls" was established to maintain port functions and meet safety demands even in the event of a tsunami. Non-structural measures as well as a Damage Estimation Map and Port Business Continuity Plan (BCP) were standardized after the Great East Japan Earthquake in 2011(Ref.4), (Ref.6).

6.1.3. Design Standard for Port Structures

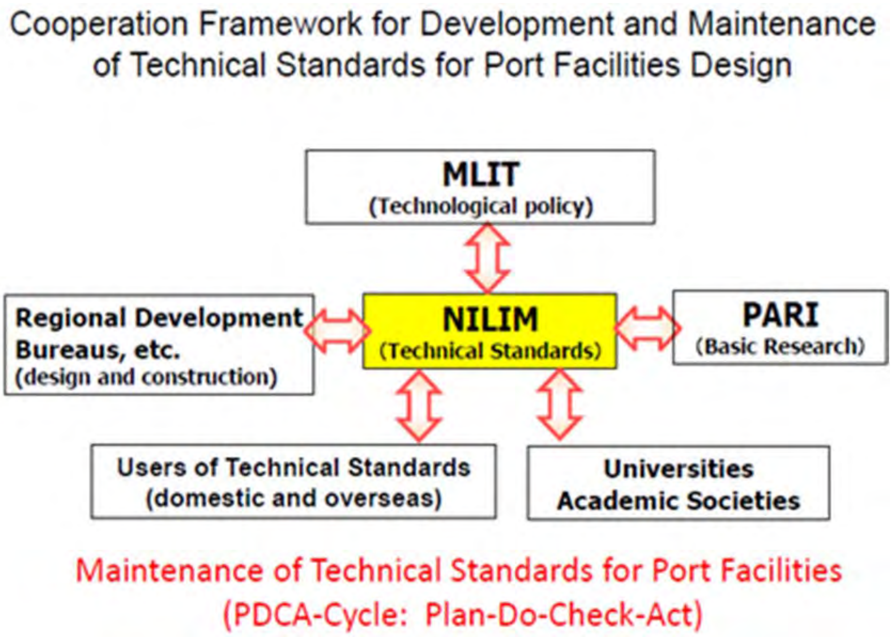
(1) Design Standard

The first version of technical standards of port facilities in Japan published in 1950. Since then, the standards have been revised several times and the latest one is version 4. (see Table 6.1-2) Design standards/procedures about high waves, storm surge and tsunamis are updated based on the results of analysis on disasters which gave damages to port facilities. Higher-accuracy design methods are proposed based on the advanced technology, the modification of standards has been carried out under cooperation among research institute which belongs to MLIT, research agencies, universities, port construction offices and port design or construction companies. (see Figure 6.1-1)

Table 6.1-2 History of Port Design Standards in Japan

Year	Design Standards
1979	Technical Standards and Commentaries for Port and Harbor Facilities in JAPAN (TSCPH)
1989	The 2nd Edition of TSCPH
1999	The 3rd Edition of TSCPH
2007	The 4th Edition of TSCPH

Source: National Institute for Land Infrastructure and Management JAPAN



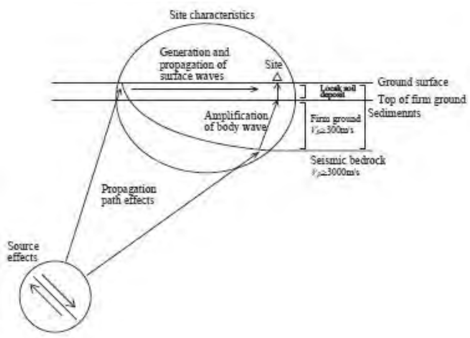
Source: National Institute for Land Infrastructure and Management JAPAN

Figure 6.1-1 Implementation Structure of Drafting Standards

(2) Concept of design procedure

1) Seismic design in Japan

Firstly, seismic design in Japan starts with calculating by the "movement", which is the design condition of the earthquake, then represents it by waveform of ground acceleration (gal). For each target port, waveform of the configured earthquake at the target location will be simulated from the epicenter to the top of firm ground sediments by computer software, then calculate the maximum waveform on the top of firm ground sediments. However, as for the analyzing process, not only the width of vibration but also the interval of vibration and the length of vibration are also considered (See Figure 6.1-2).

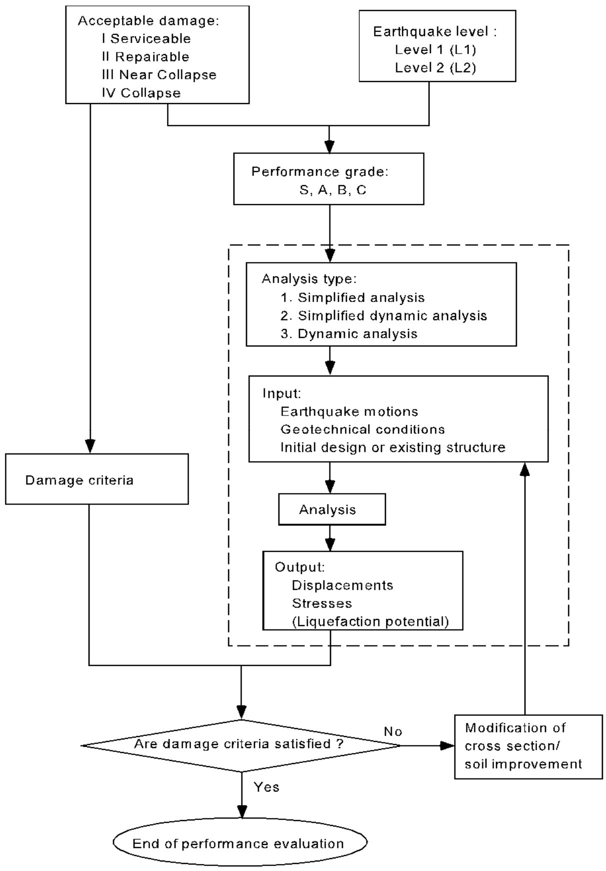


Source: Technical Standards Port & Harbor Japan

Figure 6.1-2 Propagation of Waveform

Then the seismic forces that affect the structure will be calculated based on the waveform on the top of firm ground sediments obtained by the analysis. Since the "affected vibration" is different depending on the type of structures, a calculation equation that takes into account the relationship of the vibration and structure type, a filter will be used to calculate the design seismic coefficient. If the actual acceleration data at the ground surface by seismography is obtained, seismic coefficient can be calculated based on the relation between acceleration and seismic coefficient.

Secondly, it is required to set a seismic level for the design of port facilities, either Level 1 for the facilities (requiring) a return period of 75 years occurrence probability of an earthquake, or Level 2 for the facilities assuring seismic structural stability and function of logistic access after certain earthquakes. The level 2 of ground motion was decided after considering the active fault, the earthquake directly above its epicenter and the maximum recorded earthquake and so on. The adequacy of the calculated results will be examined based on allowable deformation, and the criteria of performance verification for assumed damage level and duration of repair work for every port facility. The analysis diagram is shown in the figure on the right.



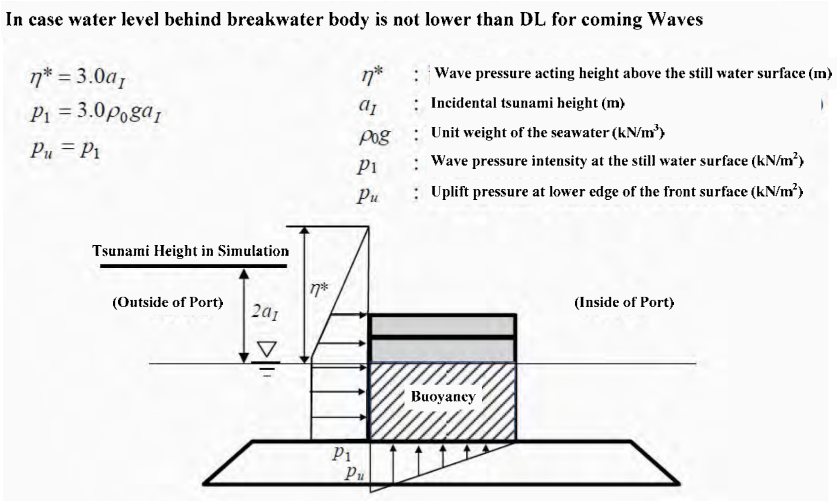
Source: No 46 Annual Report of Institute of Kyoto University

Figure 6.1-3 Analysis Diagram of Seismic Design

(3) Concept of tsunami wave pressure in Japan

1) Tsunami wave pressure acting on the marine structure

Tsunami wave pressure acting on a breakwater can be calculated from the following calculation formula:

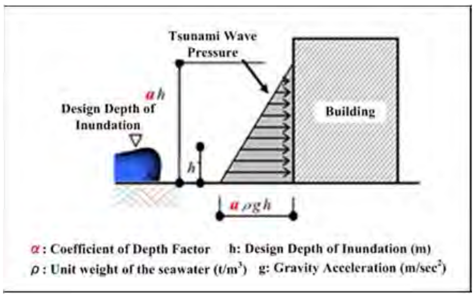


Source: Guideline of tsunami wave pressure for breakwater by MLIT

Figure 6.1-4 Tsunami Wave Pressure Diagram

2) Tsunami wave pressure acting on a tsunami building structure

Tsunami wave pressure acting on a tsunami evacuation building is calculated based on the presence or absence of a shield, the distance from a coast to an evacuation building, which has been proposed as follows:



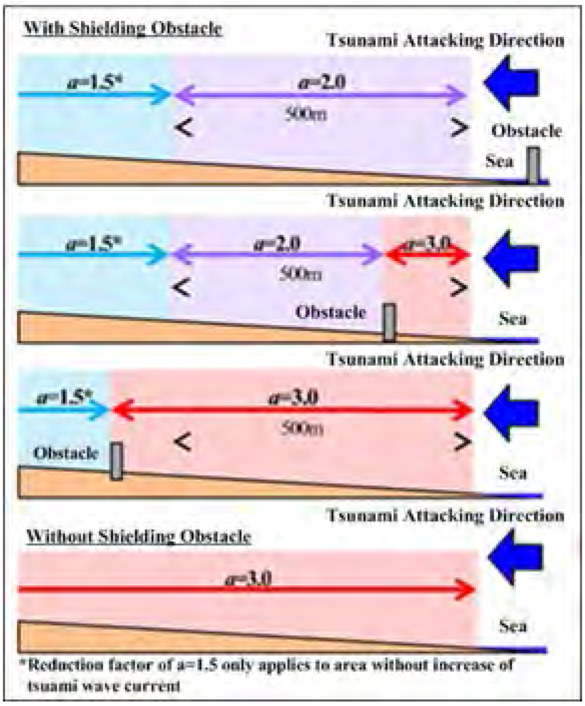
Source: Structural design of evacuation building for Tsunami

Figure 6.1-5 Tsunami Wave Pressure Diagram

Table 6.1-3 Depth Factor α

	With Shielding Obstacle		
	With		Without
Distance from River/Shore line	500m over	< 500m	No matter
Coefficient of Depth Factor α	1.5	2	3

Source: Structural design of evacuation building for Tsunami



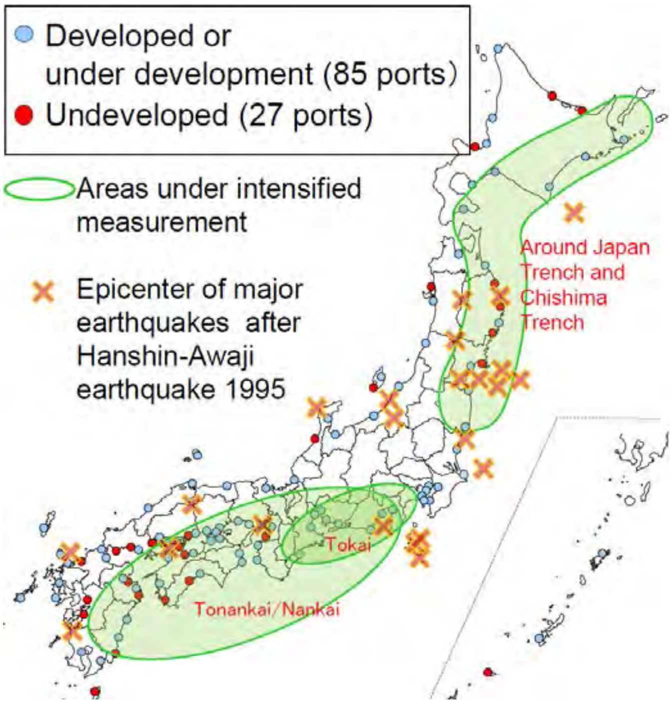
Source: Structural design of evacuation building for Tsunami

Figure 6.1-6 Depth Factor α's Relation to Distance from Shoreline

6.1.4. Plans for high earthquake-resistant quay walls

The MLIT promoted structural measures as well as high earthquake-resistant quay walls following the Great Hanshin-Awaji Earthquake in 1995. Improvement of high earthquake-resistant quay walls is planned at 336 berths throughout Japan.

High earthquake-resistant quay walls are berthing facilities for the purpose of conveying relief goods and ensuring economic activities in the event of a large scale earthquake; such quay walls have greater earthquake resistance than normal quay walls. Since MLIT established its "Improvement program for high earthquake-resistant quay walls" in 2006, 66% of the relevant infrastructure has been developed (as of April 2011).



Source: MLIT

Figure 6.1-7 Arrangement of high earthquake-resistant quay walls

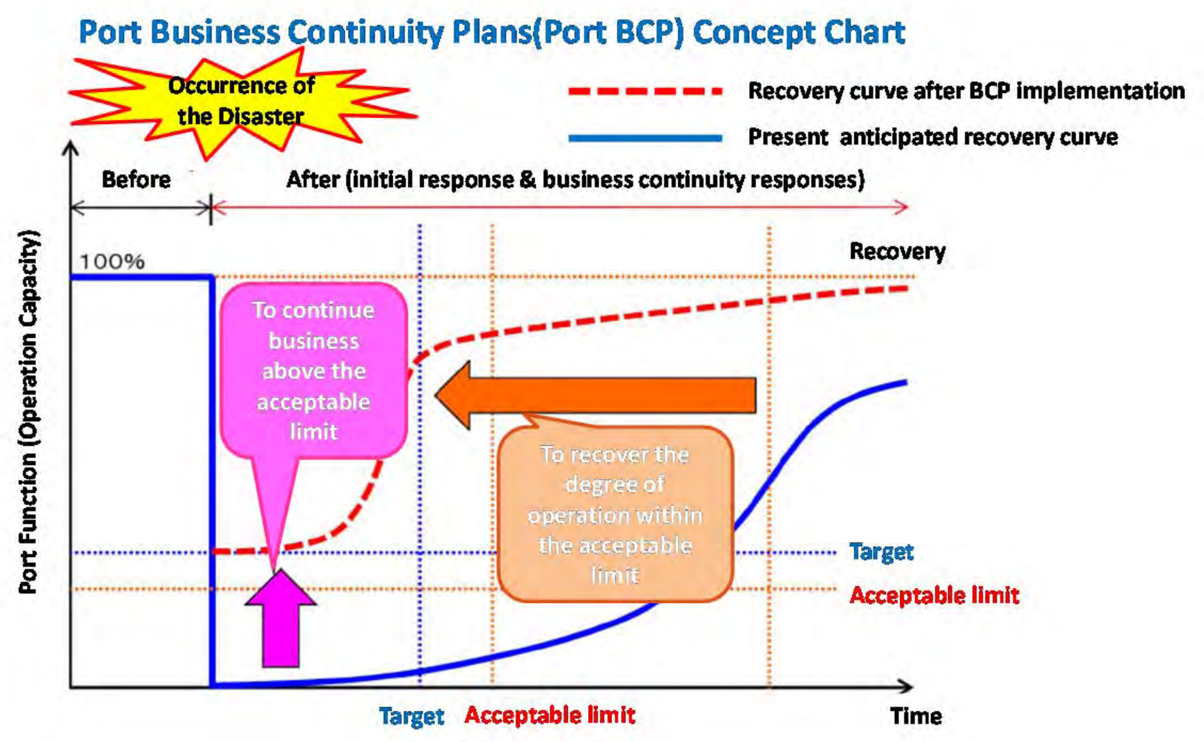
6.1.5. Role of ports in times of disasters by BCP

Port BCP, which is prepared by the port management body and related businesses, is recently attracting interest as a means to enable continuous service and early recovery in times of disasters.
For Port BCP, it is important to set targets for recovery function in case of critical events. The time required to recover port functions and to what degree port functions are restored are the key points (see Figure 6.1-8). Japanese Port BCP is formulated to cope with natural disasters which cause functional decline (earthquakes, tsunamis, typhoons and storm surges).

The government of Japan plans to formulate port BCP at all international hub ports and major ports. Currently, no other country has taken such an ambitious approach. For the Philippines, a disaster-prone island country like Japan, preparation of port BCP would be a useful measure for enhancing the disaster resiliency of ports.

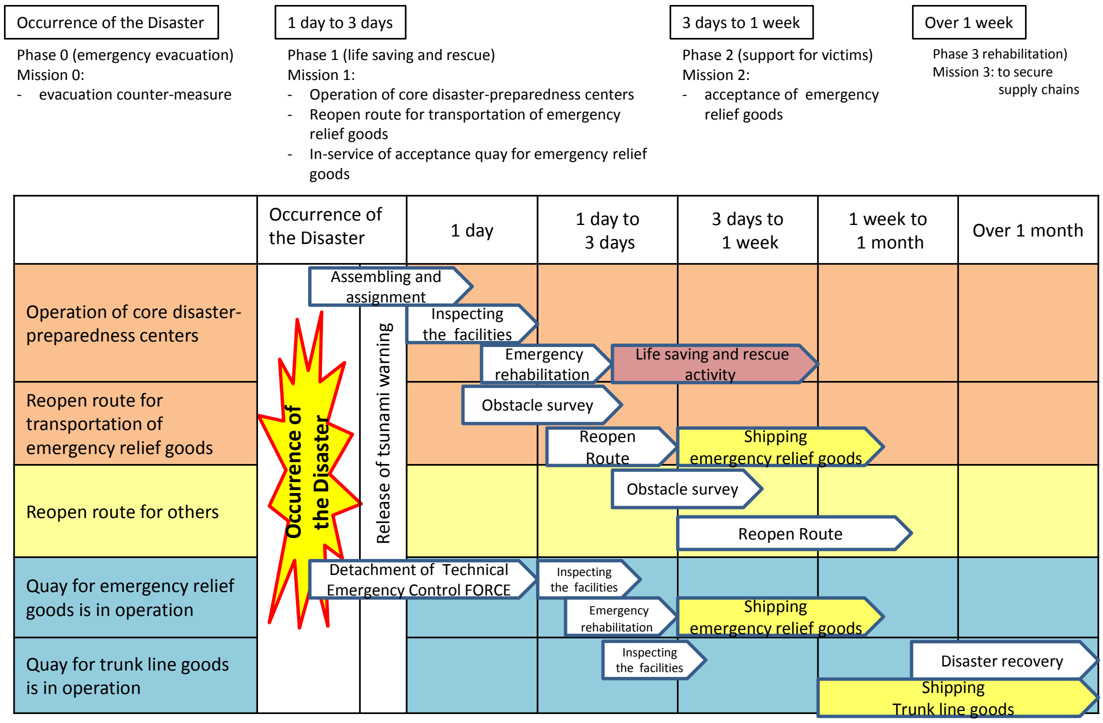
Port BCP is formulated after reaching a consensus among participants by way of a consultative meeting which is organized by the port manager. Relevant parties who play an active role at ports participate in the meeting.

Example of Port BCP is shown in Figure 6.1-9.



Source: Study Team (Based on data from MLIT)

Figure 6.1-8 Port Business Continuity Plan (Port BCP) Concept Chart



Source: Study Team (Based upon data from MLIT)

Figure 6.1-9 Aim of Port BCP and Assumed Schedule (Example)

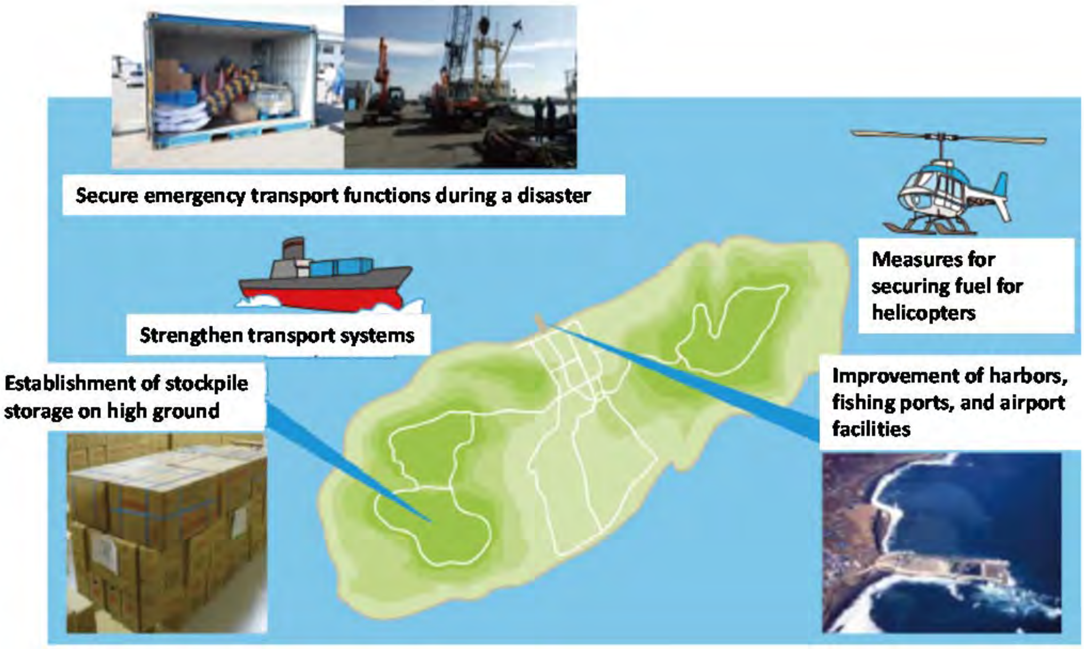
6.1.6. Formulation of emergency transportation and stockpile system for island areas

It is important to secure an emergency transportation system for the supply of relief goods to island areas. Improvement measures to secure transportation and strengthen network functions are shown in Figure 6.1-10.

In addition, three or four days after a disaster occurs, an island area would likely face a shortage of relief supplies and fuel. In the case of the Philippines, which is an island country similar to Japan, it is important to improve the stockpile system, and to secure a power source for the transport of relief supplies.

The following measures should be taken to improve the stockpile system and facilitate transport during times of disasters.

- Stock areas will be established in higher grounds where there are low risks of flooding
- Measures for securing fuel for helicopters essential to the transport of supplies will also be considered
- Enhanced transport system will be developed to fortify regular transports routes, by increasing the number of temporary shipments, chartering ships and other methods
- Ports, harbors and airports will be improved to help secure emergency transport functions in times of disaster



Source: Tokyo metropolitan government

Figure 6.1-10 Image of securing a stockpile and transport system for island areas

Source: Zensekiren

Figure 6.1-11 Oil Tank Container to be Loaded on the RORO Vessel

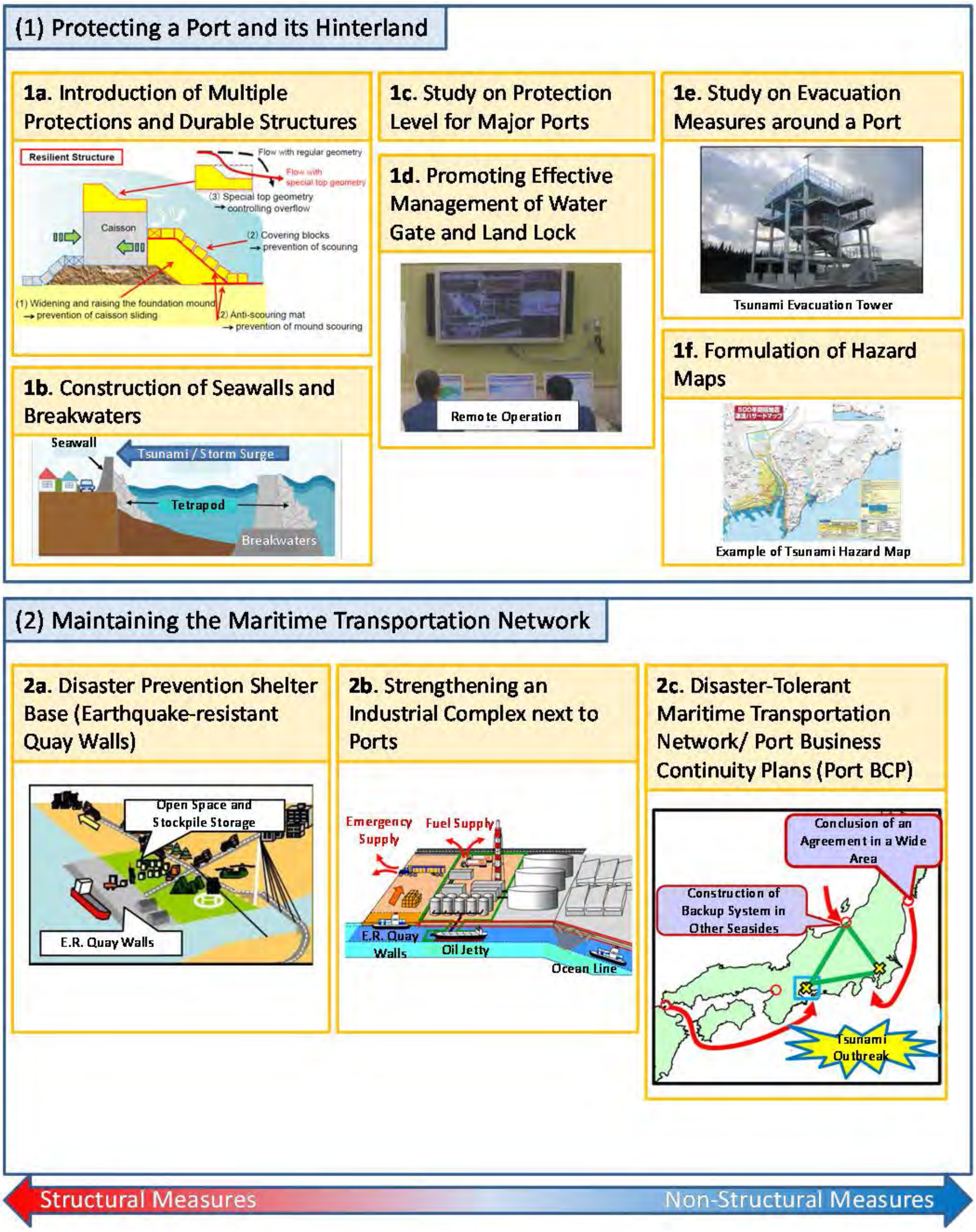
6.1.7. Disaster prevention at ports and harbors through a combination of structural and non-structural measures

It is necessary to take into consideration the need to protect the vicinity of the port and maintain the maritime transportation network in addition to protecting port facilities and port areas when discussing disaster resiliency of ports.

For securing safety in the vicinity of a port, improving port facilities and preparing a hazard map should be carried out in a unified manner. For maintaining maritime transportation, coordination with partner ports is necessary. It is increasingly important to take hard and soft measures together.

Source: Study team (Based upon data from MLIT.)

Figure 6.1-12 Clarification of Disaster Prevention Level against Tsunami



Source: Study team (Based upon data from MLIT)

Figure 6.1-13 Basic Policy of Disaster Prevention at Ports and Harbors

6.2. Application of Japanese disaster prevention measures to the Philippines

6.2.1. Formulation of a policy on enhancing disaster resiliency of ports

Ports in Japan have been frequently affected by large-scale natural disasters such as typhoons, earthquakes and tsunamis. Following such disasters, MILT studied the damages to ports, causes of the damages and socio-economic impacts in cooperation with relevant agencies and agencies. MLIT formulated basic policies for enhancing the disaster resiliency of ports in the light of the lessons learned from the experience of the disaster. Existing technical standards have also been revised as necessary while design methods have been improved and damaged port facilities rehabilitated. In addition, projects for fortifying port facilities against natural disasters were carried out systematically.

It is necessary for the port sector in the Philippines, a disaster-prone country similar to Japan, to take measures to mitigate future disasters. Therefore, the port sector in the Philippines needs to study past disasters, damages to ports, causes of the damages and socio-economic impacts and prepare a plan under which projects for enhancing disaster resiliency of ports are implemented systematically.

At that time, Japanese policy on enhancing the disaster resiliency of ports and implementation method of projects based on the policy may serve as useful references.

6.2.2. Application of Japanese disaster prevention measures to the Philippines

(1) Standard Design

Port facilities in the Philippines have been designed and implemented based on the Design Manual for Port and Harbor Facilities in The Philippine Ports Authority 1995.

Necessary modifications have been made after review of contents within a constant period in Japan as indicated Chapter 6.1.3.

The scientific knowledge for earthquakes and typhoons has been deeper and deeper with the times and technologies in the field of harbor have been progressing. It is necessary to review the contents of the technical standard regularly in the Philippines and it may be modified as required accordingly. PPA may take important role to modify the standard in cooperation with the government, agencies, research organizations, universities, standards of users. Not only the latest Japanese technical standard but also implementation structure for the technical standard is useful in the study of the technique standard in the Philippines.

(2) The study of earthquakes in the Philippines

Currently, the design calculation of an earthquake is made based on the seismic coefficient in the Philippines.

The calculation method of design seismic coefficient is as follows:

Design seismic coefficient = Regional seismic coefficient × Soil classification coefficient × Importance factor

- Regional seismic coefficient: 3 grades of 0.05, 0.10 and 0.15 are specified in the Philippines
- Soil classification coefficient: classified into 3 types of 0.80, 1.00, 1.20
- Importance factor: classified into 4 types of 1.5, 1.2, 1.0, 0.5

It is thought that the concept of an earthquake design method in consideration of the ground motion should be applied in the Philippines. However there are still many challenges for adopting the design method that takes into account the ground motion, such as lack of information (records of past earthquakes, the contents of the observed data, damage estimation, etc.), especially the seismometer location, the record of information and the soil investigations.

For example, in Japan regional seismic intensities have been set for 5 levels (0.15, 0.13, 0.12, 0.11, 0.08). As for the Philippines, it is thought that replacing the current 3 levels to 5 levels is possible by utilizing the existing earthquake record, volcanic information, and topographic information. Accordingly, it is possible to figure out an efficient solution which will help in mitigating the excess and deficiency of the countermeasure to increase the accuracy of earthquake occurrence prediction.

(3) Tsunami in the Philippines

According to Chapter 8 Assumption of Disaster, the estimated Tsunami height in the target area is from 2 to 5 meter particularly in Leyte area and maximum Tsunami height is 8.1m at Jagna port in Bohol. Tsunami wave pressure will depends on the subcritical and supercritical flows of tsunami as discussed in Chapter 5 Port Disaster in the Philippines.

Based on the Tsunami wave pressure formula, maximum wave pressure may reach 24t/m2 for Tsunami wave height of 8.1m at Jagna port and possible serious damage will occur.

It is very important to establish Tsunami disaster countermeasure in the Philippines in order to minimize the damage of port facilities. Not only measures to the port facilities but also the software for the evacuation of the people during Tsunami and other disasters are important to be considered and challenged.

6.2.3. Systematic development of disaster resilient ports

In the Philippines, there are many areas where livelihoods and industrial activities greatly depend on ports. People and industries will be seriously affected when a port is damaged by a disaster and thus it is required to develop disaster resilient ports. The investment cost to enhance port facilities against a large scale hazard can be prohibitively high. Therefore, it is necessary to develop such ports systematically based on an appropriate policy. As mentioned in 6.1.4, MLIT in Japan has a plan to construct 336 earthquake-resistant berths and is implementing the project in phases each year.

In the case of the Philippines, which is composed of many islands, it is particularly important that disaster resilient ports be developed according to a nationwide layout plan. The layout plan of earthquake-resistant berths and implementation methods in Japan can serve as useful references.

6.2.4. Application of advanced measures taken in Japan

Japanese policy on enhancement of disaster resiliency of ports has been evolving over the years to reflect the lessons learned from past disasters and the socio-economic conditions surrounding ports as shown in 6.1.2. The Philippines, a disaster-prone country, could introduce know-how against disasters which Japan has acquired over the years and take the necessary measures.

The significance of combining hard and soft measures as well as preparing a port BCP has been stressed in recent years in Japan. These measures may serve as a useful reference for enhancing the disaster resiliency of ports in the Philippines

7. Targeted Areas and Assumed Disasters

7.1. Outline of Logistic Infrastructures in the Targeted Areas

7.1.1. Visayas Region

Visayas region, located in the center of the Philippines and one of the dividing three blocks of the country, is an aggregation of islands between Luzon Island and Mindanao Island. The major city in this region is Cebu City, the second-largest metropolitan area in the Philippines.

There are 16 provinces in the Visayas region which is divided into 3 blocks.

Source: Wikipedia, https://en.wikipedia.org/wiki/Visayas

Figure 7.1-1 Visayas Region

Table 7.1-1 List of Provinces in Visayas Region

1. Western Visayas	2. Central Visayas	3. Eastern Visayas
Panay Island	Bohol Island	Leyte Island
Aklan	Bohol	Leyte
Antique	Cebu Island	Sothern Leyte
Capiz	Cebu	Samar Island
Iloilo	Siquijor Island	Eastern Samar
Guimaras	Siquijor	Northern Samar
Negros Island	Negros Island	Samar
Negros Occidental	Negros Oriental	Biliran

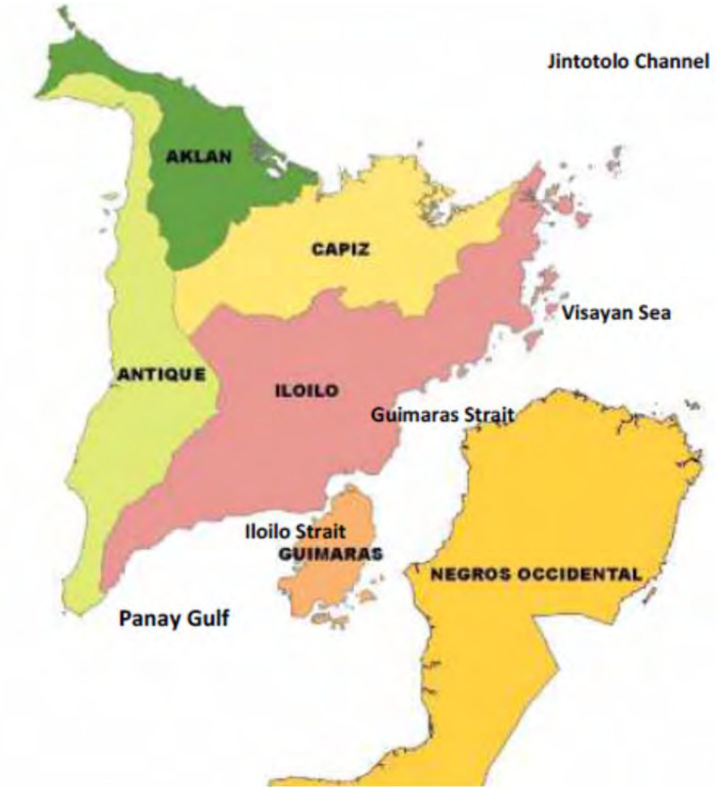
Source: Study team

7.1.2. Iloilo Province

(1) Location, Area and City/ Municipality

1) Location

Iloilo province lies to the south and northeast of Panay Island. The province is bounded by Capiz province and Jintotolo channel at the north side, Panay Gulf and Iloilo Strait at the south side, Visayan Sea and Guimaras Strait at the east side, Antique province at the west side.



Source: Province of Iloilo, Annual Provincial Profile 2014

Figure 7.1-2 Location Map of Iloilo Province

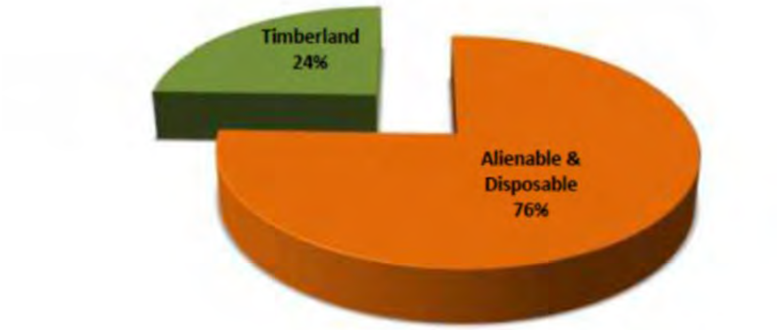
2) Area

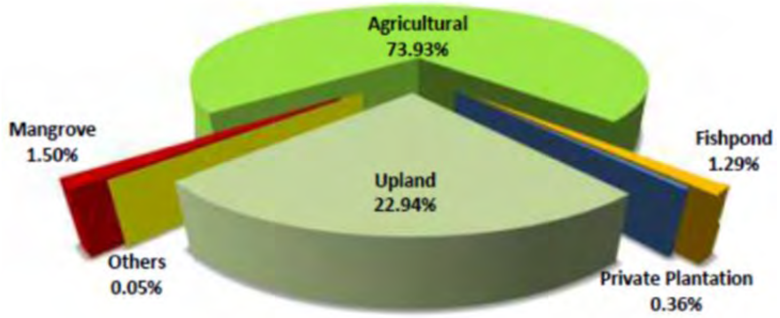
Iloilo province has a total land area of 4,663.42 sq.km., classified into the following:

Table 7.1-2 Distribution of the Land Use of Iloilo Province

Alienable/ Disposable Lands	Area(㎢)
Subtotal	3,253.47
Agricultural	3,447.44
Fishpond	57.08
Private Plantation	16.57
Others	2.38
Timberland	**Area(㎢)**
Subtotal	1,139.95
Upland	1,069.80
Mangrove	70.15
Total Area	**4,663.42**

Source: Province of Iloilo, Annual Provincial Profile 2014





Source Province of Iloilo, Annual Provincial Profile 2014

Figure 7.1-3 Distribution of the Land Use of Iloilo Province

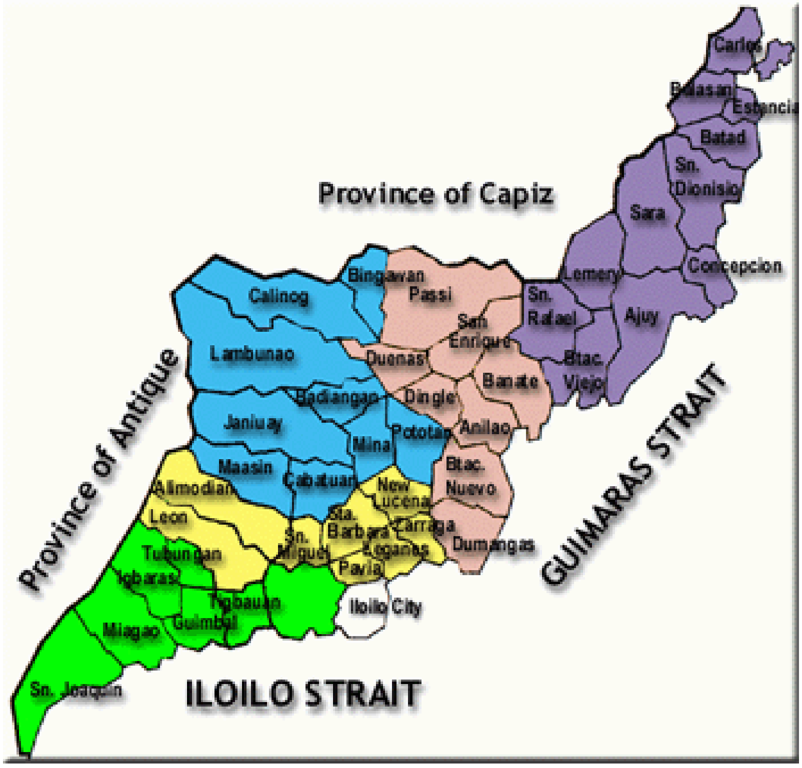
3) City/ Municipality

Iloilo province has 5 districts, comprised of municipalities and cities, as follows:

Table 7.1-3 Distribution of Cties/ Municipalities into 5 Districts

First District	Second District	Third District	Fourth District	Fifth District
Guimbal	Alimodian	Badiangan	Anilao	Ajuy
Igbaras	Leganes	Bingawan	Banate	Balasan
Miag-ao	Leon	Cabatuan	Btac. Nuevo	Batad
Oton	New Lucena	Calinog	Dingle	Btac. Viejo
San Joaquin	Pavia	Janiuay	Dueñas	Carles
Tigbauan	San Miguel	Lambunao	Dumangas	Concepcion
Tubungan	Sta. Barbara	Maasin	Passi City	Estancia
	Zarraga	Mina	San Enrique	Lemery
		Pototan		San Dionisio
				San Rafael
				Sara

Source: Province of Iloilo, Annual Provincial Profile 2014



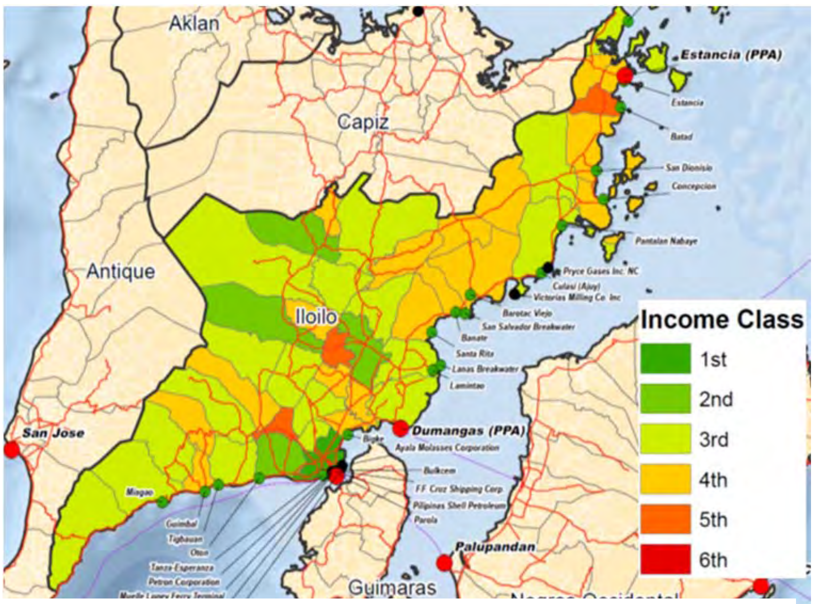
Source: Municipalities by district classification,
http://www.oocities.org/dost6/iloilo/municipalities.html

Figure 7.1-4 Distribution of 5 Districts in Iloilo Province

(2) Population, Income Class (City/ Municipality/ Barangay)

1) City/ Municipality

Iloilo Province is comprised of Iloilo city, which is the provincial capital, the city of Passi and 42 municipalities. The census conducted in 2010 reported that the total population of the province is 2,230,195. Following data shows the population distribution and income class in each city/ municipality.



Source: Study team, Based on GIS map of DPWH

Figure 7.1-5 Distribution of Income Class of Iloilo Province

Table 7.1-4 Income Class and Population of Cities/ Municipalities in Iloilo Province

Name	Income Class	City Class	District -2013	Population (as of May 1, 2010)
1. AJUY	2nd		5th	47,248
2. ALIMODIAN	3rd		2nd	37,484
3. ANILAO	4th		4th	27,486
4. BADIANGAN	4th		3rd	26,218
5. BALASAN	4th		5th	29,724
6. BANATE	4th		4th	29,543
7. BAROTAC NUEVO	2nd		4th	51,867
8. BAROTAC VIEJO	3rd		5th	41,470
9. BATAD	5th		5th	19,385
10. BINGAWAN	5th		3rd	13,432
11. CABATUAN	2nd		3rd	54,950
12. CALINOG	1st		3rd	54,430
13. CARLES	2nd		5th	62,690
14. CONCEPCION	3rd		5th	39,617
15. DINGLE	3rd		4th	43,290
16. DUE ㄥ AS	4th		4th	33,671
17. DUMANGAS	1st		4th	66,108
18. ESTANCIA	2nd		5th	42,666
19. GUIMBAL	4th		1st	32,325
20. IGBARAS	3rd		1st	31,347
21. ILOILO CITY (Capital)	1st	Highly Urbanized	lone	424,619
22. JANIUAY	1st		3rd	63,031
23. LAMBUNAO	1st		3rd	69,023
24. LEGANES	4th		2nd	29,438
25. LEMERY	4th		5th	27,441
26. LEON	2nd		2nd	47,522
27. MAASIN	3rd		3rd	35,069
28. MIAGAO	1st		1st	64,545
29. MINA	5th		3rd	21,785
30. NEW LUCENA	4th		2nd	22,174
31. OTON	1st		1st	82,572
32. CITY OF PASSI	4th	Component	4th	79,663
33. PAVIA	2nd		2nd	43,614
34. POTOTAN	1st		3rd	70,955
35. SAN DIONISIO	4th		5th	33,650
36. SAN ENRIQUE	3rd		4th	32,422
37. SAN JOAQUIN	2nd		1st	51,645
38. SAN MIGUEL	4th		2nd	25,013
39. SAN RAFAEL	5th		5th	14,655
40. SANTA BARBARA	2nd		2nd	55,472
41. SARA	2nd		5th	46,889
42. TIGBAUAN	2nd		1st	58,814
43. TUBUNGAN	4th		1st	21,540

Name	Income Class	City Class	District -2013	Population (as of May 1, 2010)
44. ZARRAGA	4th		2nd	23,693
Total				2,230,195

Source: Website of NSO, http://www.nscb.gov.ph/activestats/psgc/listprov.asp

Average annual income is classified for each province, city and municipality as shown below

Table 7.1-5 Classification of Income Class

Provinces

Class	Average Annual Income
First	P 450 M or more
Second	P 360 M or more but less than P 450 M
Third	P 270 M or more but less than P 360 M
Fourth	P 180 M or more but less than P 270 M
Fifth	P 90 M or more but less than P 180 M
Sixth	Below P 90 M

Cities

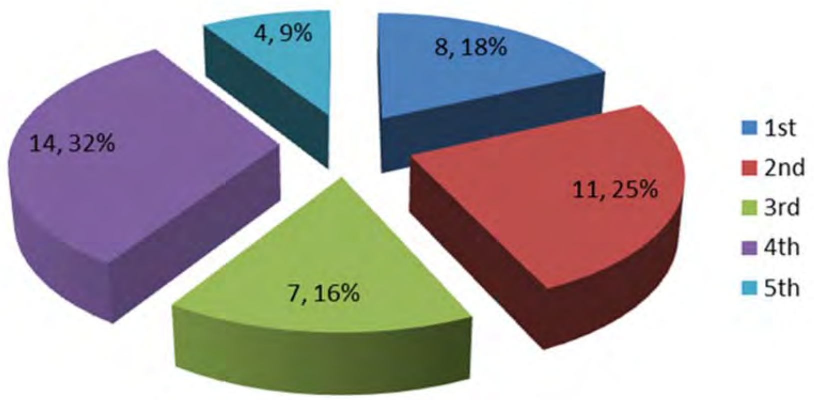
Class	Average Annual Income
First	P 400 M or more
Second	P 320 M or more but less than P 400 M
Third	P 240 M or more but less than P 320 M
Fourth	P 160 M or more but less than P 240 M
Fifth	P 80 M or more but less than P 160 M
Sixth	Below P 80 M

Municipalities

Class	Average Annual Income
First	P 55 M or more
Second	P 45 M or more but less than P 55 M
Third	P 35 M or more but less than P 45 M
Fourth	P 25 M or more but less than P 35 M
Fifth	P 15 M or more but less than P 25 M
Sixth	Below P 15 M

Source: http://www.nscb.gov.ph/activestats/psgc/articles/con_income.asp (Bsed on Department of Finance Department Order No.23-08 Effective July 29,2008)

According to the following figure, 4th class is dominant with 32% followed by 2nd class (25%) and 1st class (18%).

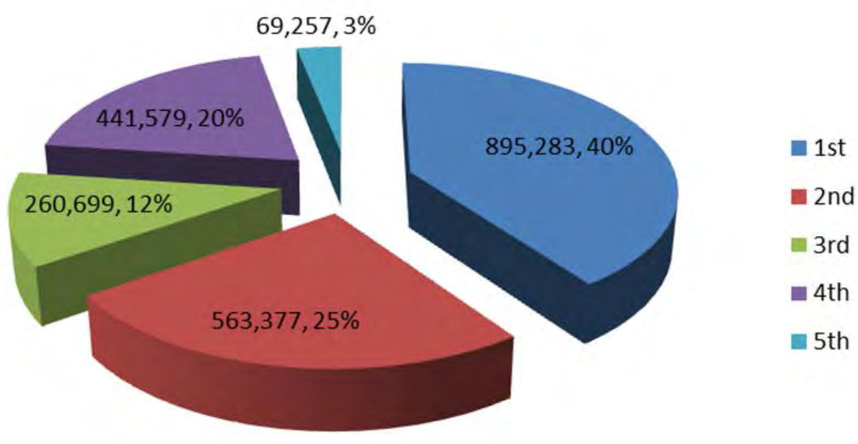


Source: Website of NSO, http://www.nscb.gov.ph/activestats/psgc/listprov.asp

Figure 7.1-6 Distribution of Income Class of Iloilo Province

Iloilo City has a total population of 424,619, the largest city of the province, where 20% of the population resides.

The following figure shows the population distribution according to income class. 1st class accounts for 40% of the total. The majority of the population falls within the 1st and 2nd classes. Thus, it can be understood that many industries including not only primary industries, but also secondary and tertiary ones are developed in the province..



Source: Website of NSO, http://www.nscb.gov.ph/activestats/psgc/listprov.asp

Figure 7.1-7 Distribution of People Classified by Income Class

2) Barangay

Iloilo province has 2 cities and 42 municipalities, which consists of 1,901 barangays. The largest barangay in the province is Calumpang in Iloilo city, which is the only barangay of more than 10,000 people (the population is 11,113). The smallest barangay is Roxas Village which has a population of only 93 people.

Table 7.1-6 Summary of Barangays in the Iloilo Province

No.	Municipality	No. of Brgy	Max. no. of population in one brgy.		Min. no. of population in one brgy.	
				name of the brgy.		name of the brgy.
1	AJUY	34	3,350	Poblacion	288	Agbobolo
2	ALIMODIAN	51	8,121	Poblacion	143	Pianda-an Norte
3	ANILAO	21	3,435	Dangula-an	538	Guipis
4	BADIANGAN	31	1,851	Poblacion(Badiangan)	269	Mapili Sanjo
5	BALASAN	23	2,304	Poblacion Sur	363	Dolores
6	BANATE	18	3,039	San Salvador	639	Dugwakan
7	BAROTAC NUEVO	29	3,416	Tabucan	495	Linao
8	BAROTAC VIEJO	26	5,228	Poblacion	671	Bugnay
9	BATAD	24	3,089	Binon-an	330	Banban
10	BINGAWAN	14	3,954	Poblacion	456	Tubod
11	CABATUAN	68	2,453	Tiring	176	Barangay 8
12	CALINOG	59	2,744	Alibunan	402	Malauinabot
13	CARLES	33	4,664	Bancal	415	Isla De Cana
14	CONCEPCION	25	4,797	Poblacion	307	Ni
15	DINGLE	33	2,323	Abangay	304	Ginalinan Viejo
16	DUEAS	47	2,043	Ponong Grande	159	Agutayan
17	DUMANGAS	45	2,627	Sulangan	185	Buenaflor Embarkadero
18	ESTANCIA	25	4,353	Botongan	380	Jolog
19	GUIMBAL	33	2,890	Igcocolo	155	Gotera
20	IGBARAS	46	1,788	Jovellar	144	Bugnay
21	ILOILO CITY	180	11,113	Calumpang	93	Roxas Village
22	JANIUAY	60	4,378	Jibolo	179	Crispin Salazar North
23	LAMBUNAO	73	3,682	Jayubo	134	Bogongbong
24	LEGANES	18	3,002	Poblacion	562	Camangay
25	LEMERY	31	2,544	Poblacion SE Zone	377	Dalipe
26	LEON	85	5,357	Poblacion	125	Coyugan Norte
27	MAASIN	50	1,724	Dagami	217	Miapa
28	MIAGO	119	2,786	Baybay Norte	119	Cadoldolan
29	MINA	22	1,883	Cabalabaguan	276	Nasirum
30	NEW LUCENA	21	2,989	Poblacion	206	General Delgado
31	OTON	37	6,148	Buray	466	Salngan
32	CITY OF PASSI	51	6,559	Poblacion Ilawod	276	Malag-it Peque
33	PAVIA	18	6,297	Balabag	1,048	Purok III
34	POTOTAN	50	3,684	Igang	233	Fundacion
35	SAN DIONISIO	29	3,209	Poblacion	197	Naborot
36	SAN ENRIQUE	28	2,206	Abaca	262	Cabugao Nuevo
37	SAN JOAQUIN	85	1,765	Santa Rita	161	Pantan
38	SAN MIGUEL	24	2,210	Santo Ni	277	Barangy 6
39	SAN RAFAEL	9	3,926	Poblacion	767	Aripdip
40	SANTA BARBARA	60	3,213	Barangay Zone VI	162	Omambog
41	SARA	42	2,202	Pasig	253	Batitao
42	TIGBAUUAN	52	3,077	Buyu-an	297	Bugasongan
43	TUBUNGAN	48	1,236	Igtuble	155	Borong
44	ZARRAGA	24	2,348	Ilawod Poblacion	252	Dawis Centro

Source: Website of NSO, http://www.nscb.gov.ph/activestats/psgc/listprov.asp

(3) Industry

Main industries of Iloilo province are agriculture and fishing. Sugar and Sugarcane are mainly produced by two firms listed in Table 7.1-7, which also export their products.

Table 7.1-7 Sugar and Sugarcane Production, Province of Iloilo: CY 2013

	Central Azucarera de San Antonio, Inc. (CASA)	URC Passi	Total
Raw Sugar Production L-kg	1,217,726.740	787,877.000	2,005,603.740
Cane Milled, Tons	662,685.049	434,548.800	1,097,233.849
Export Sugar "A', L-kg	121,777.600	78,794.600	200,572.200
Domestic Sugar "B", L-kg	998,534.220	646,052.380	1, 644,586.600
Molasses, Tons	30,283.534	16,145.800	46,429.334
No. of Planters / Producers	9,022	4,000	13,022

Note: L-kg. = 50 kg/bag

Source: Sugar Regulatory Administration in "Annual Provincial Profile 2014"

Table 7.1-8 shows export statistics of Iloilo province. In terms of "FOB[5] VALUE", Coal in Bulk is the largest, and exported to China, Thailand and India.

Aquatic foods are imported to Taiwan, Japan and Vietnam, Hong Kong. As for Europe, 2 kinds of food products are exported to Norway.

Table 7.1-8 Export Statistics (Value in USS in Millions), Province of Iloilo: 2013

COMMODITY	COUNTRY OF DESTINATION	VOLUME (kgs.) NON-BOI	FOB VALUE (US$) NON-BOI
Assorted Frozen Marine Products	Taiwan	356,478.08	11,477,008.20
	Vietnam	24,836.00	44,704.80
Cutfoliages	Japan	194,677,694.00	129,493.11
Instant Ginger Tea	Norway	627.00	7,379.00
Dried Shrimp Paste	Taiwan	3,900.00	2,340.00
Food Stuff	Hongkong	53.00	99.00
Virgin Coconut Oil	Norway	6,564.00	28,964.70
Coal in Bulk	Thailand	325,923,220.00	17,470,013.96
	India	108,350,613.00	4,767,426.96
	China	2,321,082,016.00	146,986,936.77
GRAND TOTAL		2,950,426,001.08	180,914,366.50

Source: Department of Trade & Industry, BOCS-Records

Source: Department of Trade & Industry, BOCS-Records in "Annual Provincial Profile 2014"

5 FOB: Free on Board

(4) Tourism

As part of the project entitled “UAP CRC paper and the PPP Center’s project roll out for 2011” funded by USAID/REID, the government of the Philippines and the private sector are jointly implementing tourism related facilities development.

Summary of main tourism-related projects are shown in Table 7.1-9.

Table 7.1-9 Summary of Main Tourism-related Projects

Project Type		Project Cost (inPhP)
Airport Development	New Bohol Airport	7.6 B
	New Legaspi (Daraga) Airport	3.2 B
	Privatization of Laguindingan Airport O& M	1.5 B
	Puerto Princesa Airport	4.4 B
	Busuanga Airport	0.225 B
	Tacloban Airport	1.121 B
	Kalibo Airport	0.179 B
	Siargao Airport	0.058 B
	Caticlan international Airport (Private)	2.507 B
	Dumaguete Airport	0.290 B
Seaport Development	Tubigon Port Development Project	0.02 B
	Balbagon Port	0.075 B
Land/Road Network	NAIA Expressway (Phase II)	10.6 B
Improvement	DaangHari – SLEX Link Road	1.6 B
	MRT/LRT Expansion Program: LRT 1 Private O & M	7.7 B
	NLEX – SLEX Connector (Unsolicited)	21.0 B
	LRT Line 2 East Extension Project	11.3 B
	LRT 1 South Extension project	70.0 B
	CALA Expressway – Manila Side Section	11.79 B
	Cebu North Coastal Road Project	2.696 B
	Bohol Circumferential Road Project	2.20 B
	Boracay Island Circumferential Road	0.06 B
Utilities	Boracay Water Utility Project (Private)	1.169 B
Private Sector Projects		3.676 B
TOTAL		**164.966**

Source: DOT, REID, Public – Private Partnership Center

Table 7.1-9 does not contain any projects in Iloilo province. However, development of Iloilo airport is listed in the "National Tourism Development Plan 2011-2016" which is going to develop secondary international airports of the country in order to enhance tourism industry.

Iloilo port, has an important plan of Ro-Ro facilities as a key point for marine transportation between Manila and Cebu, has an improvement plan of Ro-Ro facilities.

7.1.3. Bohol Province

(1) Location, Area and City/ Municipality

1) Location

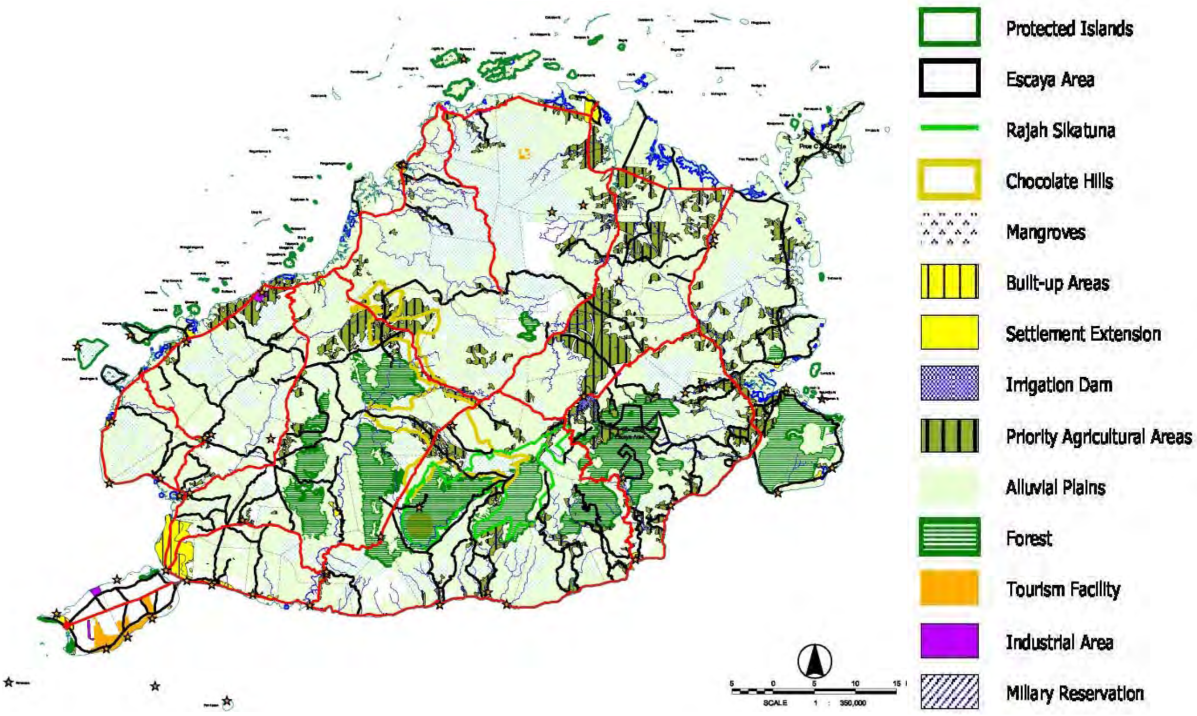
Bohol province is the tenth largest island of the Philippines. It is an oval-shaped island province located in Central Visyas. It is bounded by Cebu in the east; Bohol Strait in the west; Camotes Sea in the north; and Mindanao Sea in the south.

Source: https://en.wikipedia.org/wiki/Bohol#/media/File:Ph_locator_map_bohol.png

Figure 7.1-8 Location Map of Bohol Province

2) Area

Bohol is composed of a mainland and 81 offshore islands and islets with a coastline of approximately 654 kilometers. The coast is fairly regular and smooth and usually fringed with coral reefs. About 6,245 sq. kilometers of municipal waters contain minerals as well as abundant non-metallic minerals such as limestone, guano, high-grade silica and clay, among others. Seventy-three percent of the vegetation cover of Bohol is composed of grassland, coconut and forest. Out of this total land area of 4,117.26 sq. km, protected land constitutes about 21% .



Source: Official website of PPDO Bohol
http://www.ppdobohol.lgu.ph/maps/development-maps/land-use-map/

Figure 7.1-9 Distribution Map of Land Use of Bohol Province

3) City/ Municipality

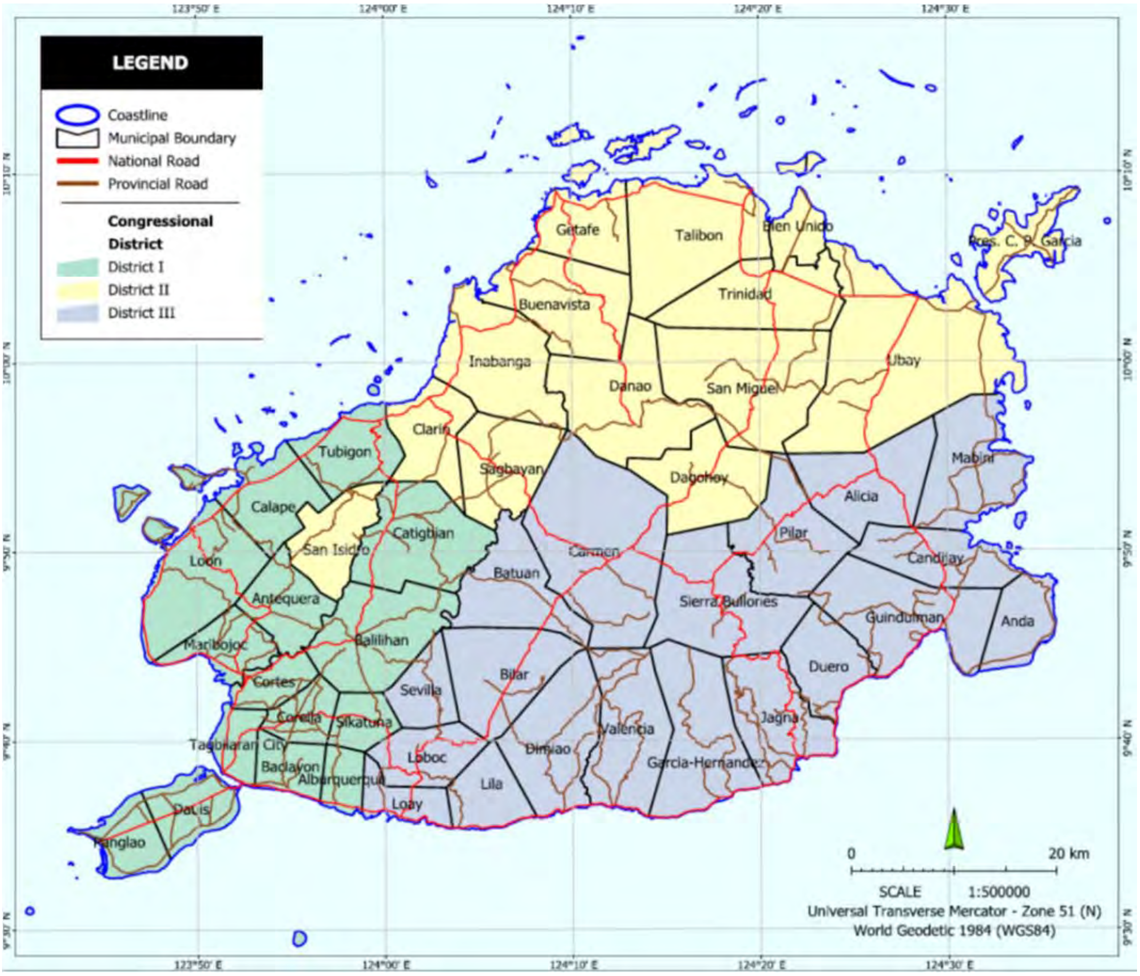
Bohol province has 3 districts, composed of a city and 47 municipalities as shown in Table 7.1-10.

Table 7.1-10 Distribution of City/ Municipalities into 3 Districts

First District	Second District	Third District
TUBIGON	TALIBON	CARMEN
LOON	UBAY	JAGNA
CALAPE	INABANGA	SIERRA BULLONES
TAGBILARAN CITY (Capital)	GETAFE	ALICIA
ANTEQUERA	TRINIDAD	BILAR
BACLAYON	BUENAVISTA	CANDIJAY
BALILIHAN	DANAO	DIMIAO
CATIGBIAN	PRES. CARLOS P. GARCIA (PITOGO)	DUERO
DAUIS	SAGBAYAN (BORJA)	GARCIA HERNANDEZ
MARIBOJOC	SAN MIGUEL	GUINDULMAN
PANGLAO	BIEN UNIDO	LOBOC
ALBURQUERQUE	CLARIN	MABINI
CORELLA	DAGOHOY	PILAR
CORTES	SAN ISIDRO	VALENCIA

First District	Second District	Third District
SIKATUNA		ANDA
		BATUAN
		LILA
		LOAY
		SEVILLA

Source: Website of NSO, http://www.nscb.gov.ph/activestats/psgc/listprov.asp



Source: Official website of PPDO Bohol
http://www.ppdobohol.lgu.ph/maps/basic-maps/bohol-districts-map/

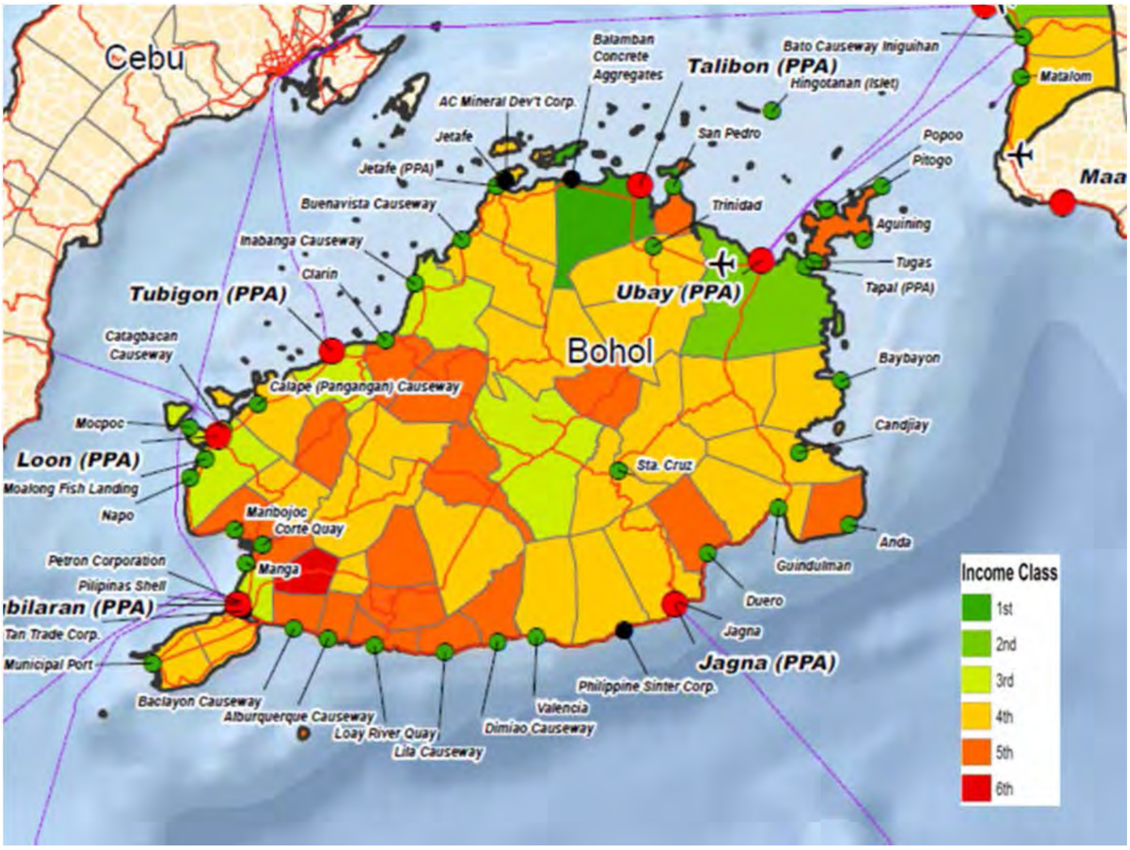
Figure 7.1-10 District Map of Bohol Province

(2) Population, Income Class (City/ Municipality/ Barangay)

1) City/ Municipality

Bohol province has Tagbilaran city, as the provincial capital and 47 other municipalities. The census conducted in 2010 reported that the total population of the province is 1,255,128.

Following figure and table show distribution and summary of income class and population in city/ municipalities.



Source: Study team, Based on GIS map of DPWH

Figure 7.1-11 Distribution of Income Class of Bohol Province

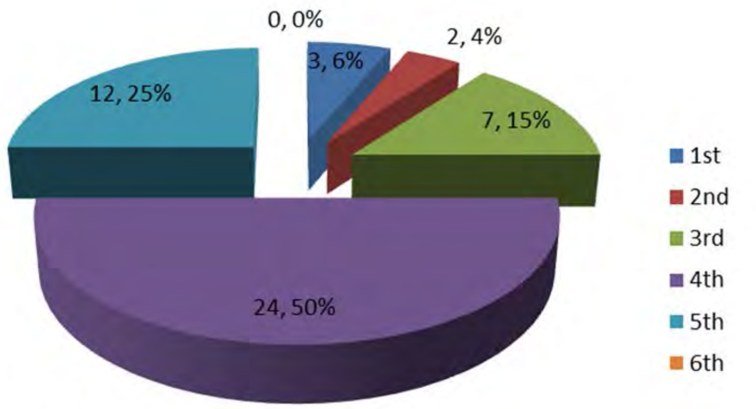
Table 7.1-11 Income Class and Population of Cities/ Municipalities in Bohol Province

Name	Income Class	City Class	District -2013	Population (as of May 1, 2010)
1. ALBURQUERQUE	5th		1st	9,921
2. ALICIA	4th		3rd	22,285
3. ANDA	5th		3rd	16,909
4. ANTEQUERA	4th		1st	14,481
5. BACLAYON	4th		1st	18,630
6. BALILIHAN	4th		1st	17,147
7. BATUAN	5th		3rd	12,431
8. BILAR	4th		3rd	17,098
9. BUENAVISTA	4th		2nd	27,031
10. CALAPE	3rd		1st	30,146
11. CANDIJAY	4th		3rd	29,043
12. CARMEN	2nd		3rd	43,579
13. CATIGBIAN	4th		1st	22,686
14. CLARIN	5th		2nd	20,296
15. CORELLA	5th		1st	7,699
16. CORTES	5th		1st	15,294
17. DAGOHOY	5th		2nd	18,868

Name	Income Class	City Class	District -2013	Population (as of May 1, 2010)
18. DANAO	4th		2nd	17,952
19. DAUIS	4th		1st	39,448
20. DIMIAO	4th		3rd	15,166
21. DUERO	4th		3rd	17,580
22. GARCIA HERNANDEZ	4th		3rd	23,038
23. GUINDULMAN	4th		3rd	31,789
24. INABANGA	3rd		2nd	43,291
25. JAGNA	3rd		3rd	32,566
26. GETAFE	3rd		2nd	27,788
27. LILA	5th		3rd	11,985
28. LOAY	5th		3rd	16,261
29. LOBOC	4th		3rd	16,312
30. LOON	2nd		1st	42,800
31. MABINI	4th		3rd	28,174
32. MARIBOJOC	4th		1st	20,491
33. PANGLAO	4th		1st	28,603
34. PILAR	4th		3rd	26,887
35. PRES. CARLOS P. GARCIA (PITOGO)	4th		2nd	23,287
36. SAGBAYAN (BORJA)	4th		2nd	20,091
37. SAN ISIDRO	5th		2nd	9,125
38. SAN MIGUEL	4th		2nd	23,574
39. SEVILLA	5th		3rd	10,443
40. SIERRA BULLONES	3rd		3rd	24,698
41. SIKATUNA	5th		1st	6,380
42. TAGBILARAN CITY (Capital)	3rd	Component	1st	96,792
43. TALIBON	1st		2nd	61,373
44. TRINIDAD	3rd		2nd	28,828
45. TUBIGON	1st		1st	44,902
46. UBAY	1st		2nd	68,578
47. VALENCIA	4th		3rd	27,586
48. BIEN UNIDO	4th		2nd	25,796
Total				1,255,128

Source: Website of NSO, http://www.nscb.gov.ph/activestats/psgc/listprov.asp

According to the following figure, 4th class is dominant with 50% share followed by 5th class (25%) and 3rd class (15%).

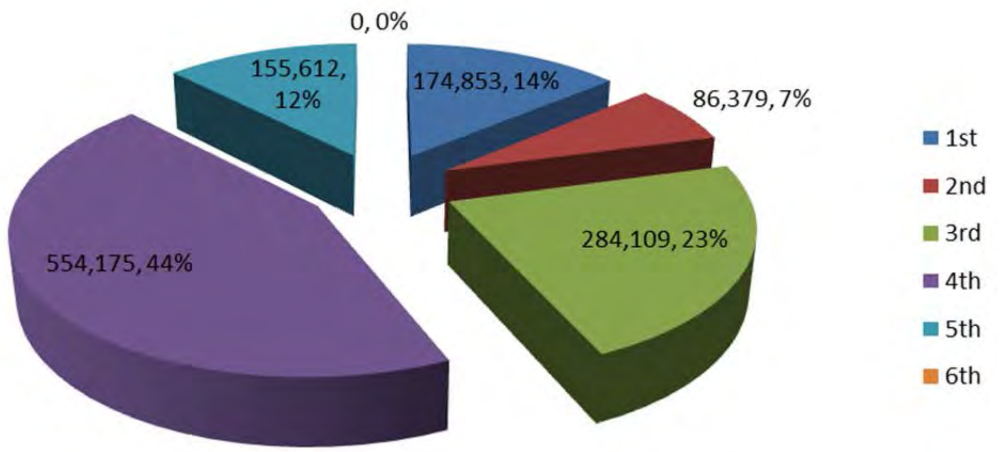


Source: Website of NSO, http://www.nscb.gov.ph/activestats/psgc/listprov.asp

Figure 7.1-12 Distribution of Income Class of Bohol Province

Tagbilaran City is the largest city/ municipality in the province with share of 7.7%.

The following figure shows that distribution of the people classified by income class. 4th class dominates with 44%, and total of 4th and 5th classes, are beyond overall majority.



Source: Website of NSO, http://www.nscb.gov.ph/activestats/psgc/listprov.asp

Figure 7.1-13 Distribution of People Classified by Income Class

2) Barangay

Bohol province is comprised of Bohol city and 47 municipalities, in which there a total of 1,109 barangays. The largest barangay in the province is Cogon of Tagbilaran city, which has 17,114 people. The smallest barangay is Tanawan of Loon municipality which has 110 people.

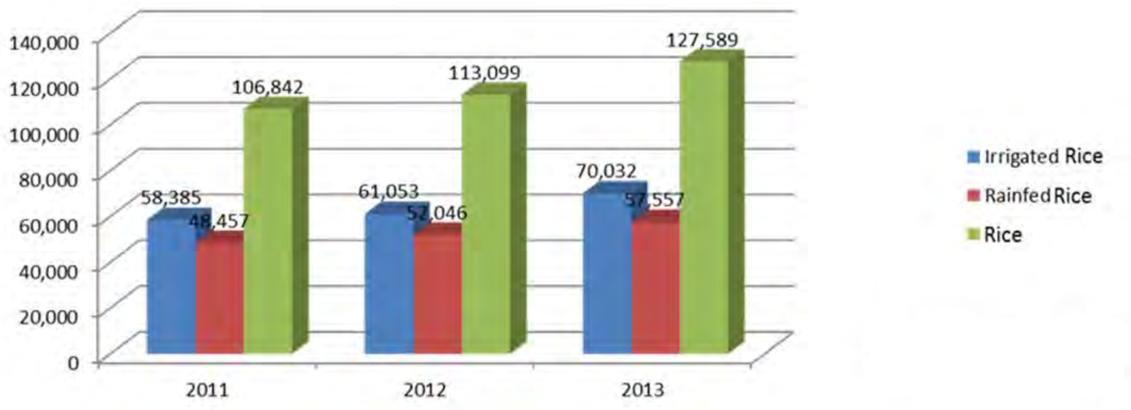
Table 7.1-12 Summary of Barangays in the Bohol Province

No.	Municipality	No. of Brgy.	Max. no. of population in one brgy.		Min. no. of population in one brgy.	
				name of the brgy.		name of the brgy.
1	ALBURQUERQUE	11	1,829	East Poblacion	526	San Agustin
2	ALICIA	15	4,064	Poblacion(Calingganay)	423	Cagongcagong
3	ANDA	16	2,297	Candabong	392	Almaria
4	ANTEQUERA	21	1,332	Poblacion	278	Quinapon-an
5	BACLAYON	17	1,905	Poblacion	395	Cambanac
6	BALILIHAN	31	1,094	Boctol	212	Boyog Norte
7	BATUAN	15	1,353	Poblacion Sur	437	Aloja
8	BILAR	19	1,638	Zamora	262	Bonifacio
9	BUENAVISTA	35	1,924	Eastern Cabul-an	241	Merryland
10	CALAPE	33	2,412	San Isidro	283	Canguha
11	CANDIJAY	21	3,344	Poblacion	435	Cambane
12	CARMEN	29	2,937	Poblacion Norte	543	El Salvador
13	CATIGBIAN	22	1,812	Causwagan Norte	277	Mahayag Sur
14	CLARIN	24	2,208	Nahawan	222	Caluwasan
15	CORELLA	8	1,327	Sambog	640	Pandol
16	CORTES	14	2,546	De la Paz	391	Monserrat
17	DAGOHOY	15	2,819	San Miguel	443	Villa Aurora
18	DANAO	17	3,296	Poblacion	150	Villa Anunciado
19	DAUIS	12	5,479	Ttolan	1,238	San Isidro
20	DIMIAO	35	960	Luyo	161	Bilisan
21	DUERO	21	1,736	Guinsularan	475	Madua Norte
22	GARCIA HENRNANDEZ	30	1,679	Manaba	194	Estaca
23	GUINDULMAN	19	3,150	Canhaway	747	Tabunok
24	INABANGA	50	2,826	Cuaming	260	Riverside
25	JAGNA	33	2,752	Canjulao	316	Laca
26	GAETAFE	24	2,371	Poblacion	418	Campao Occidental
27	LILA	18	1,163	Poblacion	214	Cayupo
28	LOAY	24	1,674	Villalimpia	217	Las Salinas Norte
29	LOBOC	28	1,387	Oy	218	Bonbon Lower
30	LOON	67	1,907	Cogon Norte	110	Tan-awan
31	MABINI	22	2,529	San Roque	658	Bulawan
32	MARIGOJOC	22	2,298	Poblacion	266	Lagtangon
33	PANGLAO	10	4,831	Poblacion	1,387	Lourdes
34	PILAR	21	2,806	Poblacion	410	Aurora
35	PRES, CARLOS P.GARCIA	23	2,700	Poblacion	197	Tilmobo
36	SAGBAYAN	24	3,945	Poblacion	290	San Vicente Sur
37	SAN ISIDRO	12	2,225	Poblacion	288	Baryong Daan
38	SAN MIGUEL	18	2,514	Poblacion	646	Garcia
39	SEVILLA	13	1,193	Magsaysay	592	Calinga-an
40	SIERRA BULLONES	22	2,763	Poblacion	314	Canta-ub
41	SIKATUNA	10	1,173	Cambuac Sur	368	Poblacion II
42	TAGBILARAN CITY	15	17,114	Cogon	1,531	Cabawan
43	TALIBON	25	5,789	San Jose	996	Sag
44	TRINIDAD	20	2,936	Poblacion	629	San Isidro
45	TUBIGON	34	2,821	Centro	486	Villanueva
46	UBAY	44	3,633	Poblacion	436	Los Angeles
47	VALENCIA	35	2,132	Canmanico	387	Pangi-an
48	BIEN UNIDO	15	3,082	Poblacion	843	Liberty

Source: Website of NSO, http://www.nscb.gov.ph/activestats/psgc/listprov.asp

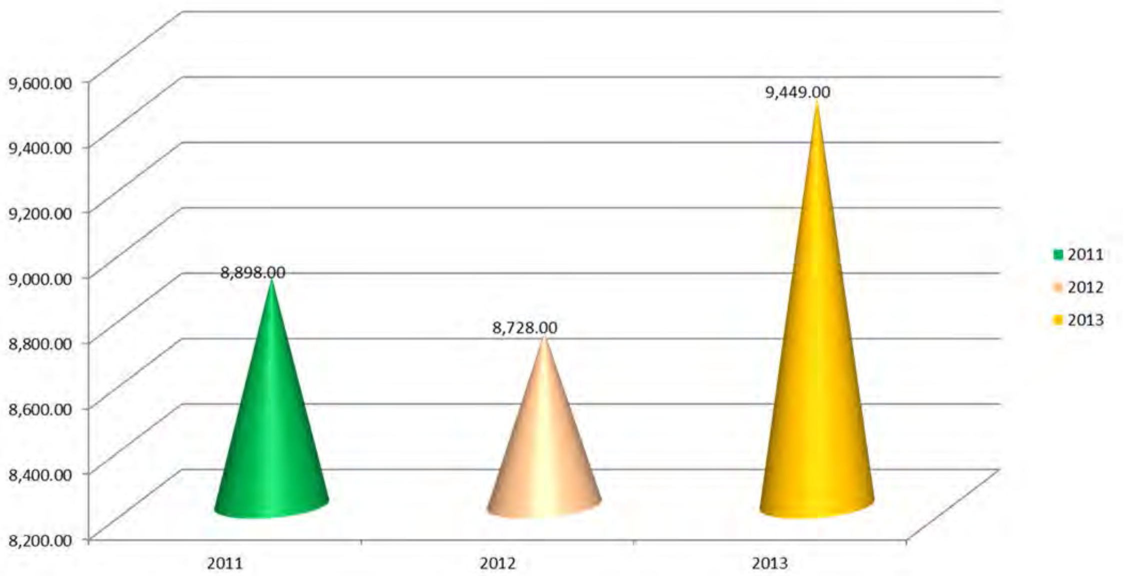
(3) Industry

The main industry of Bohol province is agriculture, particularly the production of rice and maize.



Source: State of the Province Address(SOPA) http://www.bohol.gov.ph/

Figure 7.1-14 Transition of Rice Production in Bohol Province



Source: State of the Province Address(SOPA) http://www.bohol.gov.ph/

Figure 7.1-15 Transition of Maize Production in Bohol Province

(4) Tourism

It is can be said that the government of the Philippines would like to promote tourism in Bohol as its budget for tourism in this province is greater than in other provinces(Refer to Table 7.1-9.) In "National Tourism Development Plan 2011-2016," Tagbilaran port is recognized as one of key ports of call for cruise ships from Manila and Cebu. Both natural and cultural aspects are taken into account in the tourism development plan. A large-scale shopping mall will also be constructed in the same time-frame.

"The official tourism website of the province of Bohol (http://tourism.bohol.gov.ph/)," which is promoting tourism in Bohol, was established with the assistance of JICA. According to Table 7.1-9, three projects are listed as Major Tourism Infrastructure Projects:

- New Bohol Airport 7.6 Billion PhP.
- Tubigon Port Development Project 0.02 Billion PhP.
- Bohol circumferential Road Project 2.2 Billion PhP.

7.1.4. Leyte Province

(1) Location, Area and City/ Municipality

1) Location

The Province of Leyte is one of the six provinces of Eastern Visayas Region in Central Philippines. Carigara Bay bound it on the north, San Juanico Strait and Leyte Gulf in the east, Visayas Sea and Ormoc Sea in the west, and the province of Southern Leyte in the south.

Source: Google search
https://www.google.co.jp/search?q=location+map+of+Leyte&biw=1680&bih=949&espv=2&tbm=isch&tbo=u&source=univ&sa=X&ved=0ahUKEwj5raW9nqvJAhVBTJQKHcESB88QsAQIGg&dpr=1#imgrc=c8MTMjyji_HWoM%3A

Figure 7.1-16 Location Map of Leyte Province

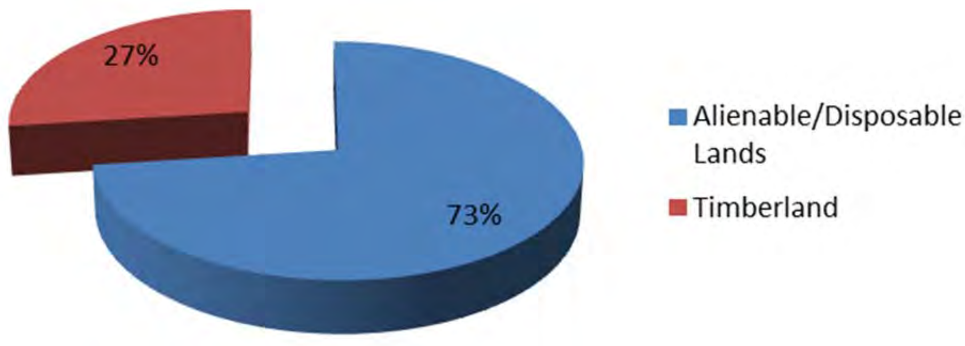
2) Area

Leyte province has a total land area of 4,663.42 sq.km., of which the land is classified as follows:

Table 7.1-13 Land Description and Area of Leyte Province

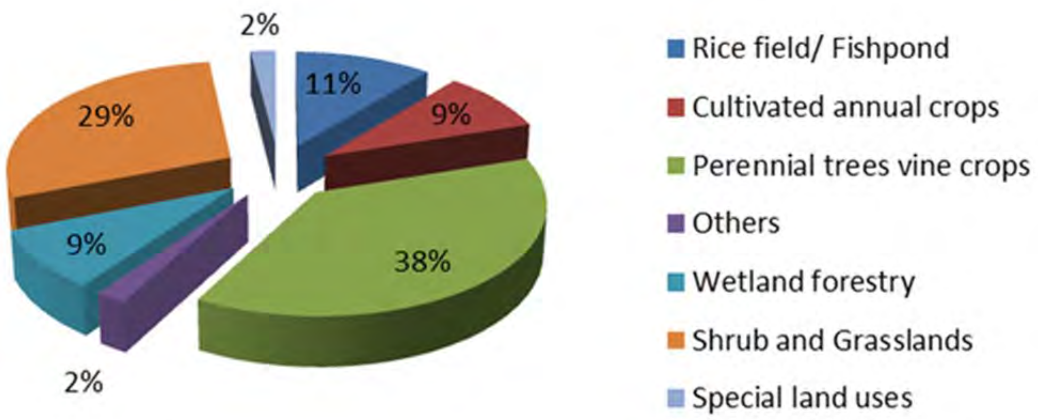
Description	Area(㎢)
Alienable/Disposable Lands	4,608.73
Timberland	1,704.60
Total Area	6,313.33

Source: Website of NSO, https://en.wikipedia.org/wiki/Leyte_(province)、http://darfu8.tripod.com/rp_leyte.htm



Source: Website of NSO, https://en.wikipedia.org/wiki/Leyte_(province)、http://darfu8.tripod.com/rp_leyte.htm

Figure 7.1-17 Profile of Land in Leyte Province



Source: Website of NSO, https://en.wikipedia.org/wiki/Leyte_(province)、http://darfu8.tripod.com/rp_leyte.htm

Figure 7.1-18 Distribution of Land Use of Leyte Province

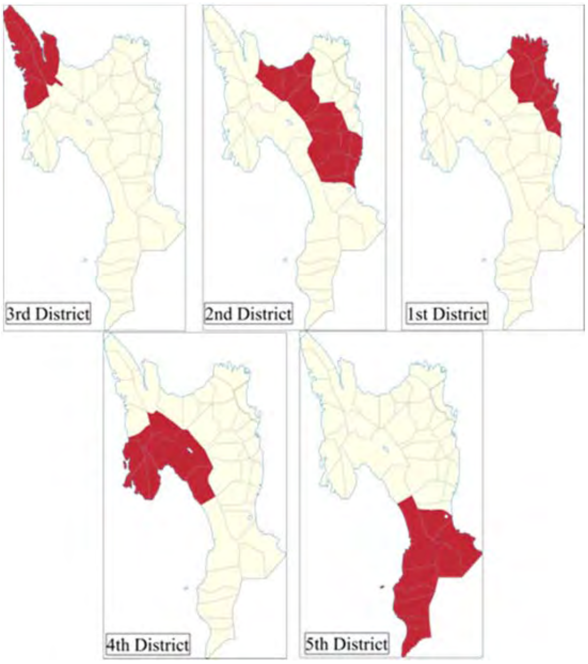
3) City/ Municipality

Leyte province has 5 districts, comprised of municipalities and cities, as follows.

Table 7.1-14 Summary of City/ Municipality by District in Leyte Province

First District	Second District	Third District	Fourth District	Fifth District
Tacloban City	Barugo	Calubian	Ormoc City	Baybay City
Alangalang	Burauen	Leyte	Albuera	Abuyog
Babatngon	Capoocan	San Isidro	Isabel	Bato
Palo	Carigara	Tabango	Kananga	Hilongos
San Miguel	Dagami	Villaba	Matag-ob	Hindang
Santa Fe	Dulag		Merida	Inopacan
Tanauan	Jaro		Palompon	Javiner
Tolosa	Julita			Mahaplag
	La Paz			Matalom
	MacArthur			
	Mayorga			
	Pastrana			
	Tabontabon			
	Tunga			

Source: https://en.wikipedia.org/wiki/Leyte_(province)



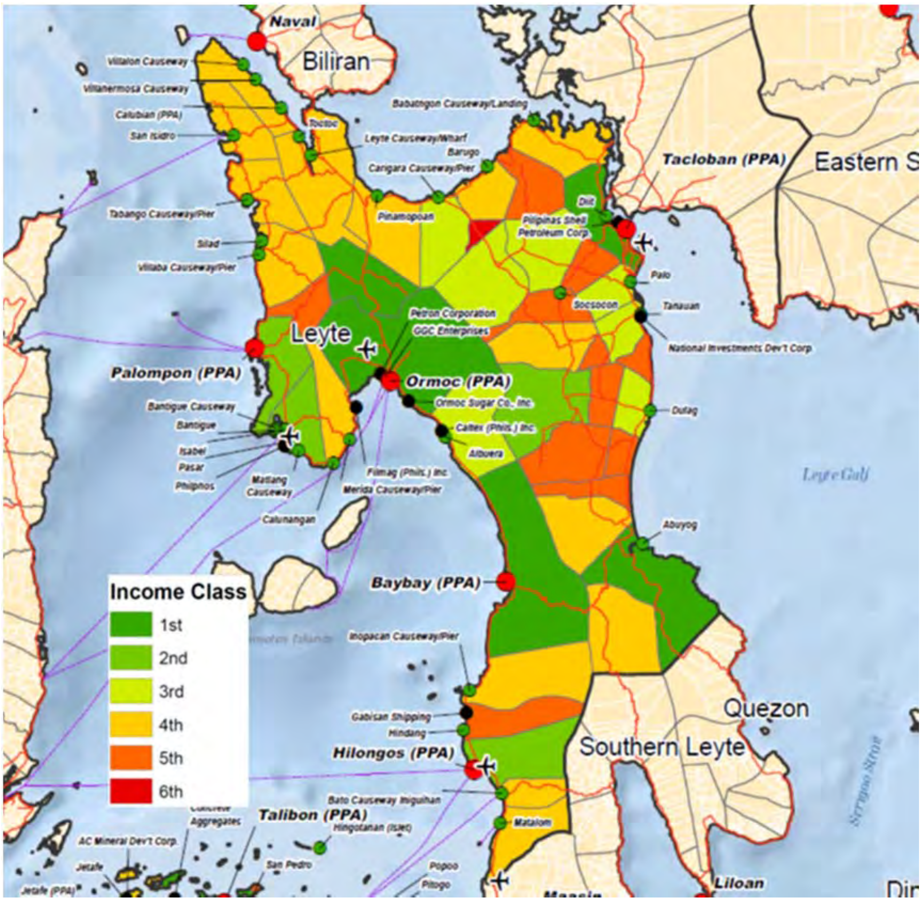
Source: https://en.wikipedia
https://en.wikipedia.org/wiki/Leyte_(province).org/wiki/Leyte_(province)

Figure 7.1-19 Distribution Map of District in Leyte Province

(2) Population, Income Class (City/ Municipality/ Barangay)

1) City/ Municipality

Leyte province has 43 Cities/ Municipalities including Tacloban, Ormoc and Baybay. According to the census conducted in 2010, total population in Leyte province is 1,789,158.



Source: Study team, Based on GIS map of DPWH

Figure 7.1-20 Distribution of Income Class in Leyte Province

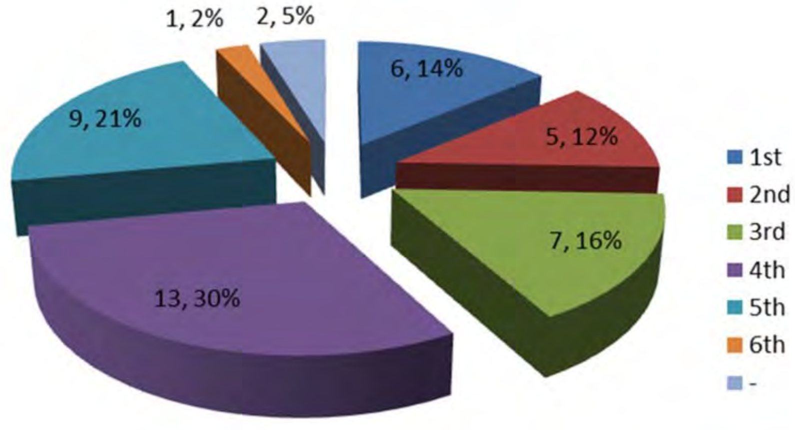
Table 7.1-15 Income Class and Population of City/ Municipality in Leyte Province

Name	Income Class	City Class	District -2013	Population (as of May 1, 2010)
1. ABUYOG	1st		5th	57,146
2. ALANGALANG	2nd		1st	46,411
3. ALBUERA	3rd		4th	40,553
4. BABATNGON	4th		1st	25,575
5. BARUGO	4th		2nd	30,092
6. BATO	4th		5th	35,610
7. CITY OF BAYBAY	-	Component	5th	102,841
8. BURAUEN	1st		2nd	48,853

Name	Income Class	City Class	District -2013	Population (as of May 1, 2010)
9. CALUBIAN	4th		3rd	29,619
10. CAPOOCAN	4th		2nd	29,834
11. CARIGARA	2nd		2nd	47,444
12. DAGAMI	3rd		2nd	31,490
13. DULAG	3rd		2nd	41,757
14. HILONGOS	2nd		5th	56,803
15. HINDANG	5th		5th	20,179
16. INOPACAN	4th		5th	19,904
17. ISABEL	1st		4th	43,593
18. JARO	3rd		2nd	39,577
19. JAVIER (BUGHO)	4th		5th	23,878
20. JULITA	5th		2nd	13,307
21. KANANGA	1st		4th	48,027
22. LA PAZ	5th		2nd	19,133
23. LEYTE	4th		3rd	37,505
24. MACARTHUR	-		2nd	18,724
25. MAHAPLAG	4th		5th	26,599
26. MATAG-OB	4th		4th	17,089
27. MATALOM	3rd		5th	31,097
28. MAYORGA	5th		2nd	14,694
29. MERIDA	5th		4th	27,224
30. ORMOC CITY	1st	Independent Component	4th	191,200
31. PALO	3rd		1st	62,727
32. PALOMPON	2nd		4th	54,163
33. PASTRANA	5th		2nd	16,649
34. SAN ISIDRO	4th		3rd	28,554
35. SAN MIGUEL	4th		1st	17,561
36. SANTA FE	5th		1st	17,427
37. TABANGO	4th		3rd	31,932
38. TABONTABON	5th		2nd	9,838
39. TACLOBAN CITY (Capital)	1st	Highly Urbanized	1st	221,174
40. TANAUAN	2nd		1st	50,119
41. TOLOSA	5th		1st	17,921
42. TUNGA	6th		2nd	6,516
43. VILLABA	3rd		3rd	38,819
Total				1,789,158

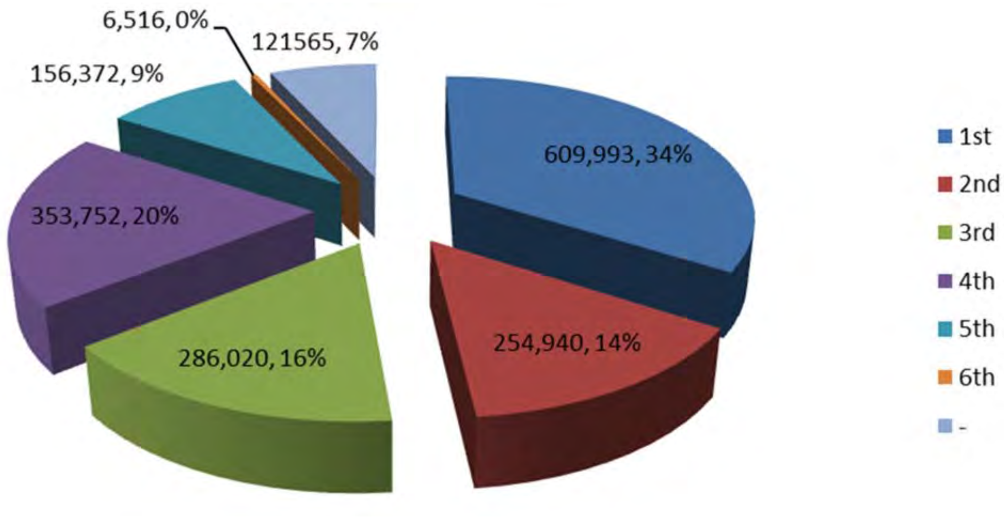
Source: Website of NSO, http://www.nscb.gov.ph/activestats/psgc/listprov.asp

According to Figure 7.1-21, 4th class dominates with 30% followed by 5th class(21%) and 3rd class(16%).



Source: Website of NSO, http://www.nscb.gov.ph/activestats/psgc/listprov.asp

Figure 7.1-21 Distribution of Income Class in Leyte Province



Source: Website of NSO, http://www.nscb.gov.ph/activestats/psgc/listprov.asp

Figure 7.1-22 Distribution of People Classified by Income Class

2) Barangay

As mentioned above, Leyte province has 3 cities and 40 municipalities which consists of 1,641 barangays in total. The largest barangay in the province is Barangay 88 of Tacloban city, which has a population of 9,806. The smallest barangay is Barangay 2 of Ormoc city which has a population of only 14 people.

Barangays in Leyte Province are summarized below.

Table 7.1-16 Summary of Barangays in the Leyte Province

No.	Municipality	No. of Brgy	Max. no. of population in one brgy.		Min. no. of population in one brgy.	
				name of the brgy.		name of the brgy.
1	ABUYOG	63	3,439	Balocawehay	235	Alangilan
2	ALANGALANG	54	2,005	Binongto-an	232	Bato
3	ALBUERA	16	8,524	Poblacion	628	Salvacion
4	BABATNGON	25	2,407	Poblacion District IV	382	Bacong
5	BARUGO	37	1,821	Minuhang	218	Hiagsam
6	BATO	32	3,110	Dawahon	246	Cabuana
7	CITY OF BAYBAY	92	3,744	Caridad	173	Lintaon
8	BURAUEN	77	2,483	Poblacion District III	155	Gitablan
9	CALUBIAN	53	1,171	Cristina	197	Pates
10	CAPOOCAN	21	4,207	Poblacion Zone II	243	Balugo
11	CARIGARA	49	2,850	Sawang	282	San Juan
12	DAGAMI	65	1,449	Patoc	21	Buenavista
13	DULAG	45	3,936	San Jose	252	Maricum
14	HILONGOS	51	2,961	Atabay	305	San Agustin
15	HINDANG	20	2,648	Pablacion 1	304	Katipunan
16	INOPACAN	20	2,751	Tinago	315	Macagoco
17	ISABEL	24	5,151	Santo Ni	373	Can-andan
18	JARO	46	2,371	District I	160	Alahag
19	JAVIER	28	1,779	Binulho	222	Guindapunan
20	JULTA	26	1,093	Santo Ni	166	Jurao
21	KANANGA	23	4,124	Rizal	423	San Ignacio
22	LA PAZ	35	1,494	Luneta	221	Cagngaran
23	LEYTE	30	5,115	Poblacion	207	Basud
24	MACARTHUR	31	1,192	Danao	110	San Vicente
25	MAHAPLAG	28	3,737	Poblacion	114	Magsuganao
26	MATAG-OB	21	1,860	San Vicente	260	Malazarte
27	MATALOM	30	2,276	Santa FE	280	Caningag
28	MAYORGA	16	1,135	Poblacion Zone 2	396	Camansi
29	MERIDA	22	3,881	Poblacion	462	Tubod
30	ORMOC CITY	110	9,403	Tambulilid	14	Barangay 2 (Poblacion)
31	PALO	33	5,504	Cuindapunan	373	Cabarasan Guti
32	PALOMPON	50	3,775	Mawawalo Poblacion	202	San Pablo
33	PASTRANA	29	1,020	Yapad	216	Capilla
34	SAN ISIDRO	19	2,647	Biasong	732	San Miguel
35	SAN MIGUEL	21	2,177	Libtong	240	Kinalumsan
36	SANTA FE	20	1,991	San Roque	416	San Miguelay
37	TABANGO	13	6,358	Poblacion	949	Butason II
38	TABONTABON	16	971	Mering	247	Cambucao
39	TACLOBAN CITY	138	9,806	Barangay 88	75	Barangay 15
40	TANAUAN	54	5,233	San Roque	249	Hilagpad
41	TOLOSA	15	2,236	Telegrafo	517	Cantariwis
42	TUNGA	8	1,023	Sant Ni	463	Banawang
43	VILLABA	35	3,075	Cagnocot	297	San Vicente

Source: Website of NSO, http://www.nscb.gov.ph/activestats/psgc/listprov.asp

(3) Industry

Main industry of Leyte province is agriculture. Fecund land yields a good harvest of hemp, copra and maize, rice and tobacco, bananas, papayas and pineapples.

(4) Tourism

Leyte is a showcase of rich history and culture set in an unspoiled environment of natural beauty and rustic elegance such as Lake Danao National Park, MacArthur Leyte Landing Memorial, Sto. Nino Shrine and Heritage Museum. According to Table 7.1-9, Tacloban airport development project which is listed as one of Main Tourism-related Projects is allotted with a budget of 11billion PhP..

In “National Tourism Development Plan 2011-2016,” road access and accommodation facilities are to be implemented for the promotion of maritime sports, such as diving.

7.2. Logistic Infrastructures in the Target Area

7.2.1. Roads

(1) Roads in Panay Island

Iloilo Province is located in the eastern part of Panay Island. Other than Iloilo Province, Capiz Province is located in the northeast part, Aklan Province in the northwestern part and Antique Province in the western part of the island. The road network is dense in the eastern part of the island. Capiz-Iloilo Road which is classified as a primary road runs from Iloilo City in the southeast and Roxas City of Aklan Province in the northeast of the island through the inland area.

Secondary roads run along coastal lines on the island. Iloilo-Antique Road connects Iloilo City with Capiz Province through the area of Antique Province along the west coastlines counterclockwise. On the other hand, Iloilo East Coast-Capiz Road runs from Iloilo City to Roxas City along the east coastlines clockwise. Roads to the west part of Aklan Province are located beyond Roxas City along the north coast lines. In the parts where Iloilo East Coast-Capiz Road moves away from the coastal lines, branch roads connecting the coastal areas exist. (See Figure 7.2-1)

All sections of the primary road are paved and almost all of the secondary roads are paved. It seems that physical conditions of main roads in Iloilo province are generally in good condition. (See Table 7.2-1)

According to average traffic volumes at observation points in the survey on 11th February in 2012 by DPWH, traffic volume of Iloilo-Antique Road is the highest among main roads along the coastal lines followed byroads between Iloilo City and Dumangas Municipal and Iloilo East Coast-Capiz Road. T. (See Table 7.2-2)

Legend

Red line:
Primary road

Blue Line:
Secondary Road

Green Line:
Tertiary Road

Brown line:
Provincial Boundary

Source: DPWH, http://www.dpwh.gov.ph/infrastructure/Road_Bridge/new_page_2.htm

Figure 7.2-1 Road Network in Panay Island

Table 7.2-1 Physical Condition of Roads in Panay Island

Iloilo Prov.	Paved Concrete	Paved Asphalt	Paved Total	Unpaved Gravel	Unpaved Earth	Unpaved Total	Grand Total
Primary	30.89	39.26	70.16	0.00	0.00	0.00	70.16
Secondary	185.98	204.57	390.54	0.27	0.00	0.27	290.74
Tertiary	329.70	84.89	414.59	53.71	0.23	53.94	468.53
Total	546.57	328.72	875.29	53.98	0.23	54.21	829.43

Source:2014 Data DPWH

Table 7.2-2 Traffic of Coastal Roads in Iloilo Province

	Road Name	Average Traffic
Coastal	Ajuy-Jamul-awon-Concepcion Rd	2,155
	Balasan-Carles Rd	2,564
	Barotac Nuevo-Dumangas-Dacutan Wharf Rd	3,400
	Concepcion-San Dionisio rd	884
	Iloilo City-Leganes-Dumangas Coastal Rd	4,557

	Road Name	Average Traffic
	Iloilo East Coast-Capiz Rd	4,164
	Iloilo East Coast-Estancia Wharf Rd	2,469
	Iloilo-Antique Rd	10,497
	Sara-Concepcion Rd	923
	Sn Dionisio-Capinang Rd	1,733
	Tiolas-Sinugbuhan Rd	867
Primary Inland	Iloilo Capiz (Old)	10,589
	Iloilo Capiz (New)	7,686

Source: DPWH Website

(2) Roads in Bohol Island

The whole part of Bohol Island belongs to Bohol Province. In Bohol Island, no primary road is located. A secondary road which takes a route of Clarin-Sagbayan-Carmen-Jagna crosses from the north to the south and another secondary road which connects between Loay and Trinidad through Carmen crosses from the east to the west of the island.

In addition, Tagbilaran North Road which takes a route along the western and northern coastlines and Tagbilaran East Road which takes a route along the southern coast and on the east side of the island connects Tagbilaran which is located in the southwest with Trinidad in the north east of the island run along the outer edge of the island. Tagbilaran East Road takes a route in an inland part of the east area (See Figure 7.2-2).

Almost all parts of these secondary roads are paved and more than 85 % of tertiary roads are also paved. It seems that main roads in the province are in good condition. (See Table 7.2-3)
According to average traffic volumes at observation points in the survey on 11th February in 2012 by DPWH, traffic volume of Tagbilaran North Road is higher than that of Tagbilaran East Road (See Table 7.2-4).

Legend
Red line:
Primary road
Blue Line:
Secondary Road
Green Line:
Tertiary Road
Brown line:
Provincial Boundary

Source: DPWH, http://www.dpwh.gov.ph/infrastructure/Road_Bridge/new_page_3.htm

Figure 7.2-2 Road Network in Bohol Island

Table 7.2-3 Physical Condition of Roads in Bohol Island

Bohol	Paved Concrete	Paved Asphalt	Paved Total	Unpaved Gravel	Unpaved Earth	Unpaved Total	Grand Total
Primary	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Secondary	354.85	71.29	426.14	2.46	0.00	2.46	428.60
Tertiary	183.36	48.98	232.33	31.19	0.00	31.19	263.52
Total	538.21	120.27	658.47	33.65	0.00	33.65	692.12

Source:2014 Data DPWH

Table 7.2-4 Traffic of Coastal Roads in Bohol Province

	Road Name	Average Traffic
Coastal	Panglao Island Circumferential Rd	6,350
	Tagbilaran East Rd (Tagbilaran-Jagna)	5,325
	Tagbilaran North Rd (Tagbilaran-Jetafe Sect)	10,680

Source: DPWH Website

(3) Roads in Leyte Island

Leyte province covers the majority of Leyte Island and Southern Leyte province is located in the southern part of the island. Daang Maharlika Road which is a part of the national axis of the Philippines runs along the east coast of the northern part and in the inland area of the southern part of the island to Southern Leyte Province. Palo- Carigara - Ormoc Road connects Ormoc City in the west coast with Tacloban City through the inland of northwest and Ormoc -Baybay-Southern Leyte Road extends from Ormoc City through the west coast to the junction to Daang Maharlika Road. These roads in the island are classified as primary roads.

In the west part of the island, secondary roads are located connecting the northern coastal area and the southern part of the province with Ormoc taking routes along the coastal lines. In addition, several tertiary roads are located around Tacloban City and in the northwests (See Figure 7.2-3).

All sections of the primary roads and almost all of the secondary roads are paved. The ratio of tertiary roads is about 80 % in the province. It seems that physical conditions of main roads in the island are good. (See Table 7.2-5)

According to average traffic volumes at observation points in the survey on 11th February in 2012 by DPWH, traffic volume of Palo-Carigara-Ormoc is the highest among main roads along the coastal lines Followed by Ormoc-Baybay-Southern Leyte Bdry Road and Palompon-Isabel-Merida-Ormoc Road. Those of Daang Maharlika and Tacloban-Baybay South Road are two to three times of that of Palo-Carigara-Ormoc Road (See Table 7.2-6).

Legend
Red line:
Primary road
Blue Line:
Secondary Road
Green Line:
Tertiary Road
Brown line:
Provincial Boundary

Source: DPWH, http://www.dpwh.gov.ph/infrastructure/Road_Bridge/new_page_4.htm

Figure 7.2-3 Road Network in Leyte Island

Table 7.2-5 Physical Conditions of Roads in Leyte Island

Leyte	Paved Concrete	Paved Asphalt	Paved Total	Unpaved Gravel	Unpaved Earth	Unpaved Total	Grand Total
Primary	174.63	101.30	275.94	0.00	0.00	0.00	275.94
Secondary	270.36	35.98	306.36	3.19	0.00	3.19	309.54
Tertiary	305.95	30.59	336.54	69.09	9.57	78.65	415.19
Total	750.94	167.87	918.84	72.28	9.57	81.84	1000.67

Source:2014 Data DPWH

Table 7.2-6 Traffic of Coastal Roads in Leyte Island

	Road Name	**Average Traffic**
Coastal	Bagahupi-Babatngon-Sta. Cruz-Barugo-Carigara Rd.	2,013
	Calubian Jct.-San Isidro-Tabango-Villaba-Palompon	1,207
	Lemon-Leyte-Biliran Rd	1,710

	Road Name	Average Traffic
	Ormoc-Baybay-Southern Leyte Bdry Rd	3,930
	Palo-Carigara-Ormoc Rd	4,168
	Palompon-Isabel-Merida-Ormoc Rd	2,688
	Sambulawan Jct-Calaguise-Calubian Rd	577
	Sn Isidro-Daja Rd	84
	Tabing-Kawayan-Sta Rosa-Lawis-Tabango Rd	77
	Villaba-Palompon Rd	1,332
Primary	Daang Maharlika (LT)	7,814
	Tacloban-Baybay South Rd	13,730

Source: DPWH Website

7.2.2. Ports

(1) Ports in the Target Area

Main ports in the target area (Iloilo, Bohol and Leyte Province) are outlined below.

As for candidate ports of disaster resilient feeder ports in the target area (see Chapter 9.5.4), utilization of ports and logistics network were grasped from the statistics, including number of vessels, cargo volume, and number of passengers.

PPA ports in which port statistics can be obtained are targeted.

The results of the analyses are as below:

a) Specification of disaster resilient ports

- There are one or two representative ports (BP)[6] in each province
- The share (BP) of total cargo throughput in each province is as follows: Iloilo 86.7%, Bohol 42.8%, Leyte 43.7%
- The cargo volume of each BP is much larger than total cargo volume of the other ports (TP, OGP)[7] in province: Iloilo x 68.6, Bohol x 11.2, Leyte x 6.9

b) Cargo flow of target area

- Many cargoes are biased toward inbound, especially from Cebu
- Many cargoes are concentrated at Iloilo port in Iloilo Province
- Bohol Province receive a large volume of Cement and Other General Cargo from Cebu

6 Base Port (BP) which the PMO (Port Management Office) has jurisdiction over under the category of PPA
7 Terminal Port (TP) which the PMO has jurisdiction over under the category of PPA
Other Government Port (OGP) which a local government has jurisdiction over under the category of PPA

- ➢ Ormoc Port and Tacloban Port handle a large proportion of cargo in Leyte Province

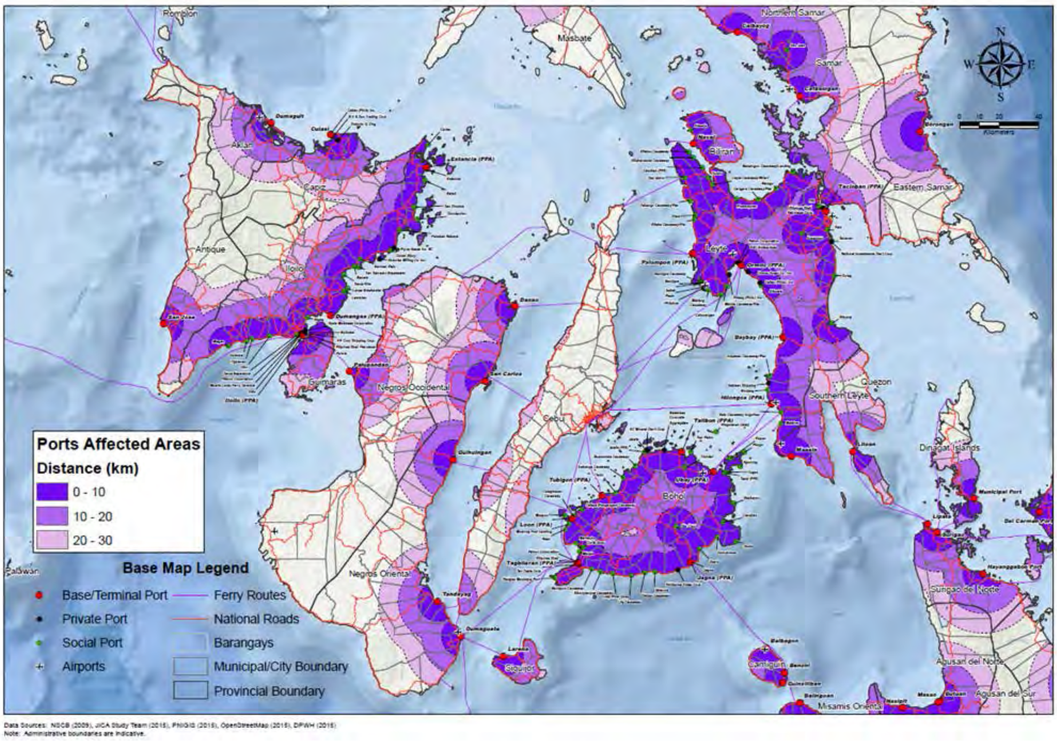
c) Handling of "Fuel and By-products"

- ➢ Fuel and By-products are unloaded at private ports (Priv.)[8]
- ➢ It occupies around 90% of imported volume at Iloilo Port

The usage of main ports in each province is described in the following section.

1) Ports Map

All the ports in the target areas are located within intervals of 10~20 km. With some exceptions, almost all the municipalities have at least one port. In some cases, other social or private ports exist despite there being a Base Port of PPA in the vicinity, and there are 3 ports within a 10 km radius. On the other hand, in the southern area of Iloilo province and vicinity of Baybay port in Leyte province, there are relatively few ports.



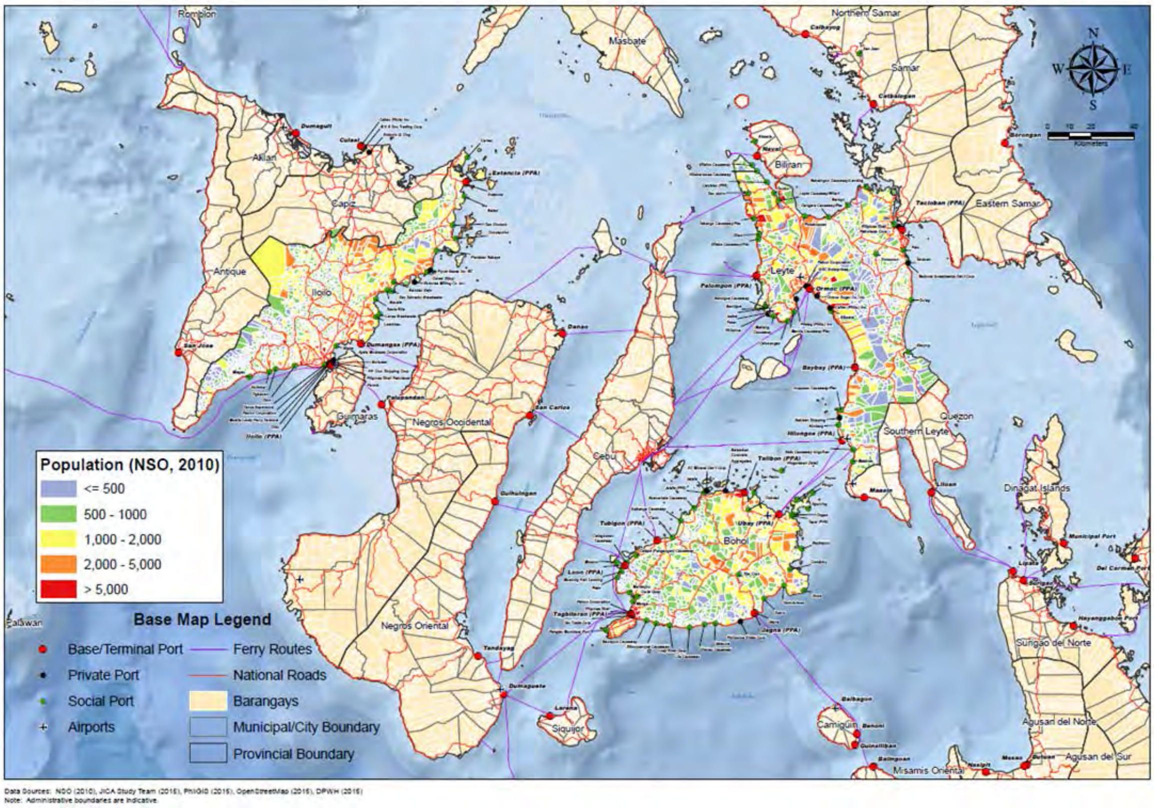
Source: Study team, Based on GIS map of DPWH

Figure 7.2-4 Ports Affected Areas

[8] Private Port (Priv.) which a private sector has jurisdiction over under the category of PPA

2) Population and Ports

It can be observed that the larger population a municipality has, the greater number of ports it is likely to possess. According to Table 10.6-1, there are 5,274,000 people and 142 public ports in the target area. Therefore, one port supports approximately 37,000 people.

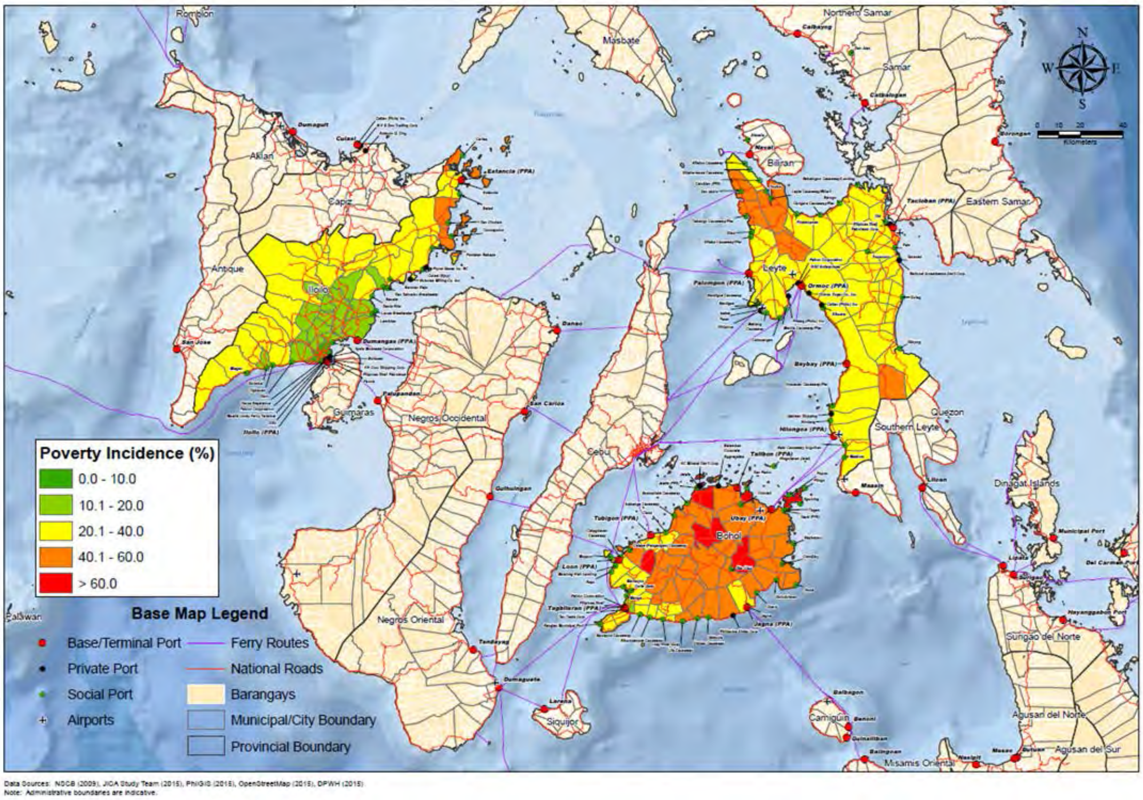


Source: Study team, Based on GIS map of DPWH

Figure 7.2-5 Distribution of Population in the Target Areas

3) Poverty Incidence and Ports

According to the following figure, Leyte and Iloilo province show high ratios of poverty incidence. One of the reasons is that these areas are prone to typhoons (Refer the first section in Chapter 3). However in Bohol, which is a remote island, the entire area has a high poverty incidence. People in Bohol generally make a living through fishing and tourism. The density of port distribution is relatively high compared with other areas.



Source: Study team, Based on GIS map of DPWH

Figure 7.2-6 Distribution of Poverty Incidence

(2) Iloilo Province

1) Existing Ports

In Iloilo province, Iloilo port is a Base Port managed by PPA, while Dumangas port and Estancia port are Terminal Ports. In addition, there are 21 social ports managed by LGUs and 10 private ports.

Location of ports in the province is shown in the following Figure.

Source: Study team, Based on GIS map of DPWH

Figure 7.2-7 Ports Location Map of Iloilo Province

2) Number of vessels

Number of annual domestic cargo vessels in the province is shown in the following Figure.

Most of the vessels enter into Iloilo Port. Together Iloilo and Dumangas Port account for 96% of total vessel calls.

Domestic (Inbound/Outbound)

	Name of Ports		RORO/Non RORO
1	Iloilo	BP	10,387
2	Dumangas	OGP	7,470
3	Estancia	TP	257
4	Bulk Cement	Priv.	150
5	Milagrosa	Priv.	138
	・・・・・・・・		
		Total	18,552

Source: Study team (Based upon data from PPA)
*hereinafter same as above

Figure 7.2-8 Number of Annual Vessels in the Province (Domestic, CY2014)

Number of annual foreign cargo vessels in the province is shown in the following Figure. Most of the vessels enter into Iloilo Port.

Foreign (Import/Export)

	Name of Ports		RORO/Non RORO
1	Iloilo	BP	73
2	Pryce Gas	Priv.	4
3	Petron	Priv.	3
		Total	80

Figure 7.2-9 Number of Annual Vessels in the Province (Foreign, CY2014)

a) Iloilo Port

Number of vessels for the past five years is shown in the following Figure.

Non RORO shows a decreasing trend. In addition, total together with RORO also has been slightly decreasing in recent years.

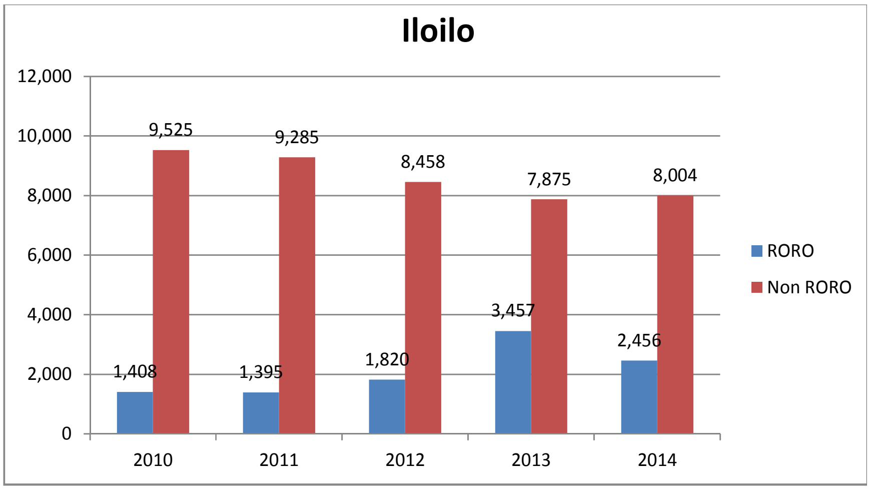


Figure 7.2-10 Number of Vessels for the Past Five Years (RORO, Non RORO)

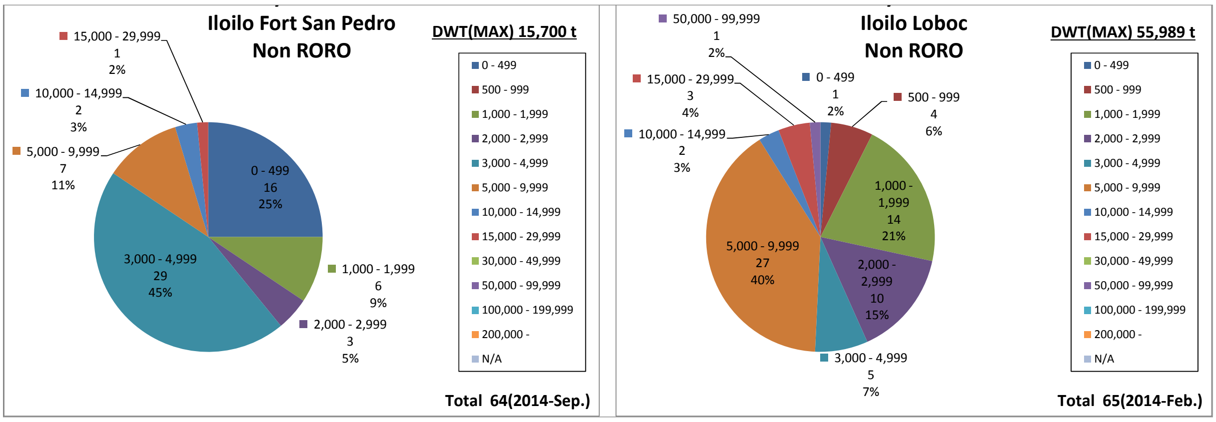
Number of monthly vessels by DWT[9] and draft[10] is shown in the following Figure.

The left is Fort San Pedro Pier and the right is Loboc Pier.

At Fort San Pedro Pier, Non RORO vessels ranging from 3,000 to 5,000 account for a significant share of the total.

At Loboc Pier, the majority of vessels range from 5,000 to 10,000 DWT.

In each case, the maximum draft is more than 6.0m and therefore these piers have deep sea water levels.



	Arrival	Departure
Draft(average)	4.76m	4.27m
Draft(max)	7.35m	7.30m

	Arrival	Departure
Draft(average)	4.88m	4.06m
Draft(max)	6.66m	6.70m

Figure 7.2-11 Number of Monthly Vessels by DWT and Draft (Domestic, Non RORO)

9 An abbreviation for dead weight tonnage, and in terms of maximum loading weight of cargos including its fuel

10 Vertical distance between the waterline and the bottom of the keel

b) Estancia Port

Number of vessels for the past five years is shown in the following Figure.

Although the number of vessels was more than 900 up to 2012, vessel number sharply drops to 257 in 2014.

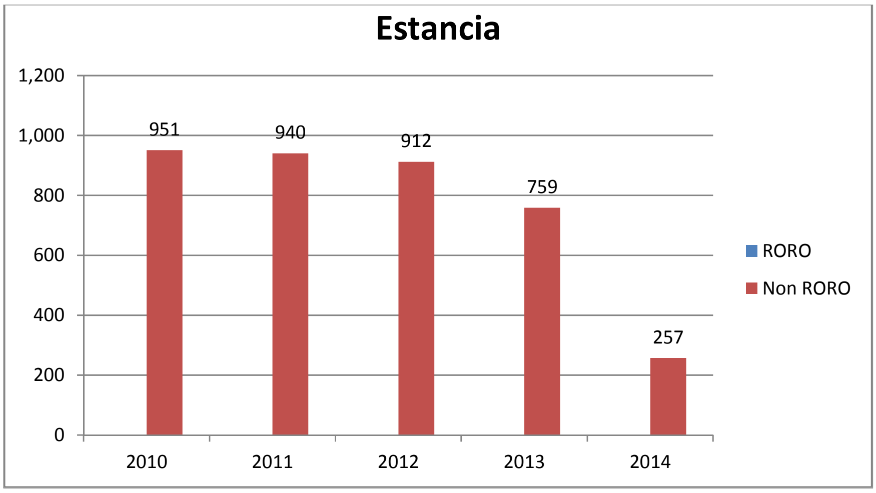
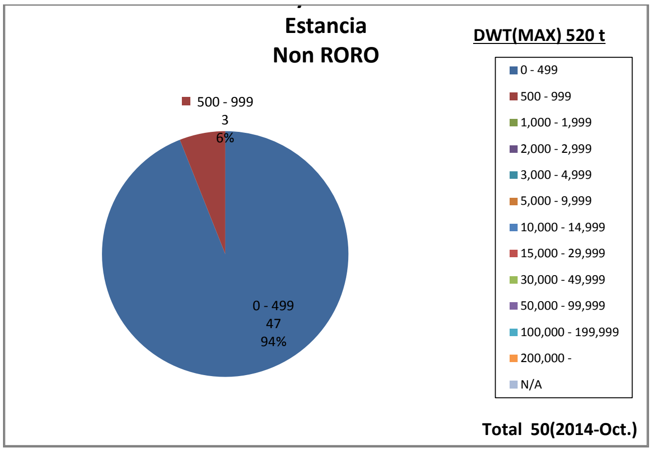


Figure 7.2-12 Number of Vessels for the Past Five Years (Non RORO)

Number of monthly vessels by DWT and draft is shown in the following Figure.

Non RORO vessels of less than 500 DWT account for more than 90% of the total. In addition, the maximum draft is 3.41m.



	Arrival	Departure
Draft(average)	2.43m	2.43m
Draft(max)	3.41m	3.41m

Figure 7.2-13 Number of Monthly Vessels by DWT and Draft (Domestic, Non RORO)

3) Total cargo throughput

Annual handling volume of domestic cargo in the province is shown in the following Figure. The share of Iloilo Port is more than 90% of the total cargo throughput in the province

Domestic (Inbound/Outbound)

	Name of Ports		Vol. of Cargo(m.t)
1	Iloilo	BP	2,621,697
2	Bulk Cement	Priv.	147,723
3	Petron	Priv.	127,002
4	Milagrosa	Priv.	48,539
5	Dumangas	OGP	38,199
	・・・・・・・・		
		Total	3,021,511

Figure 7.2-14 Total Cargo Throughput in the Province (Domestic, CY2014)

Annual handling volume of foreign cargo in the province is shown in the following Figure. The share of Iloilo Port is almost 100% (99%).

Foreign (Import/Export)

	Name of Ports		Vol. of Cargo(m.t)
1	Iloilo	BP	366,507
2	Pryce Gas	Priv.	3,201
3	Petron	Priv.	1,030
		Total	370,738

Figure 7.2-15 Total Cargo Throughput in the Province (Foreign, CY2014)

a) Iloilo Port

Total cargo throughput for the past five years is shown in the following Figure.

Handling volume has been on an increasing trend, recording approximately three million tons in 2014.

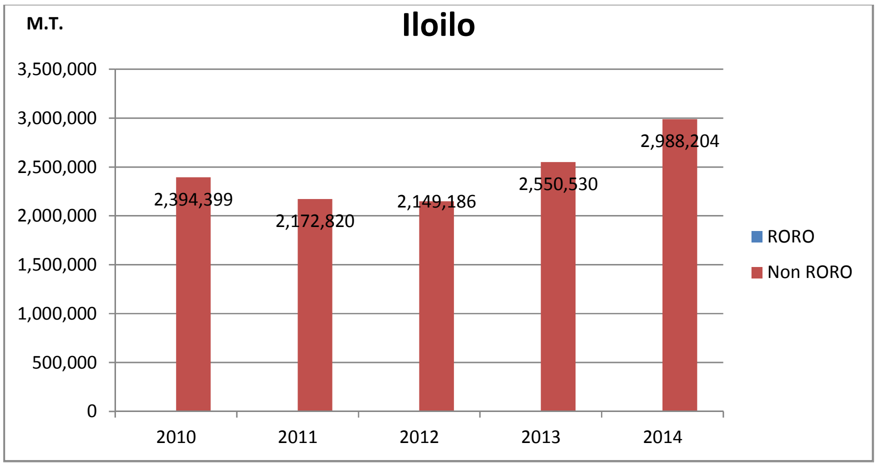


Figure 7.2-16 Total Cargo Throughput for the Past Five Years (Non RORO)

Monthly handling volume by each item at Fort San Pedro Pier is shown in the following Figure.

The left is Inbound and the right is Outbound.

In each case, the share of "Other General Cargo" accounts for a significant portion of total cargo

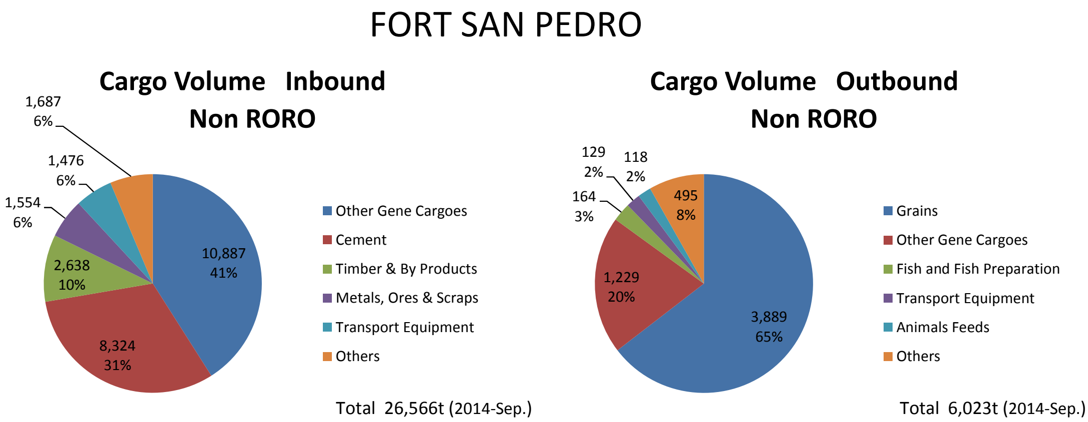


Figure 7.2-17 Monthly Handling Volume by Each Item (Domestic, Inbound/Outbound)

Monthly handling volume by each item at Loboc Pier is shown in the following Figure.

The left is Inbound and the right is Outbound.

In each case, the share of "Cement" is more than 50% of the total.

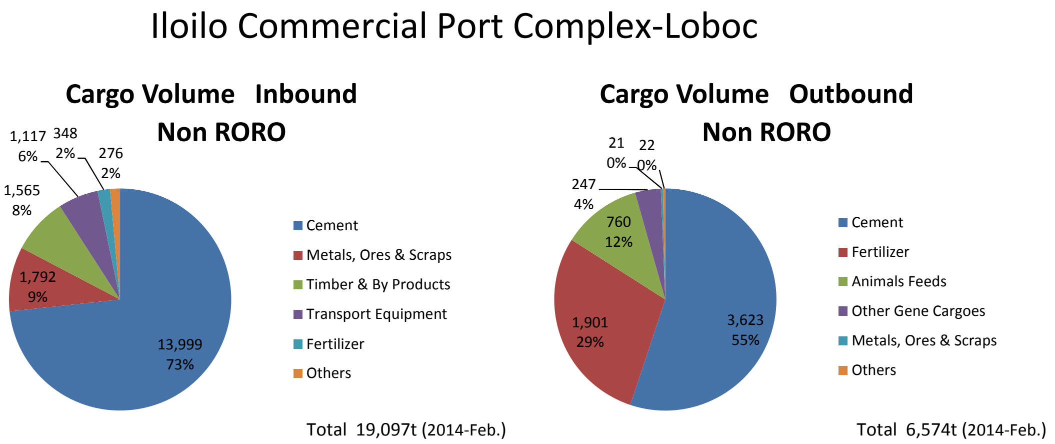


Figure 7.2-18 Monthly Handling Volume by Each Item (Domestic, Inbound/Outbound)

b) Estancia Port

Total cargo throughput for the past five years is shown in the following Figure.

Since peaking at 59,000 tons in 2012, the handling volume has been on a declining trend, recording only 17 thousand tons in 2014.

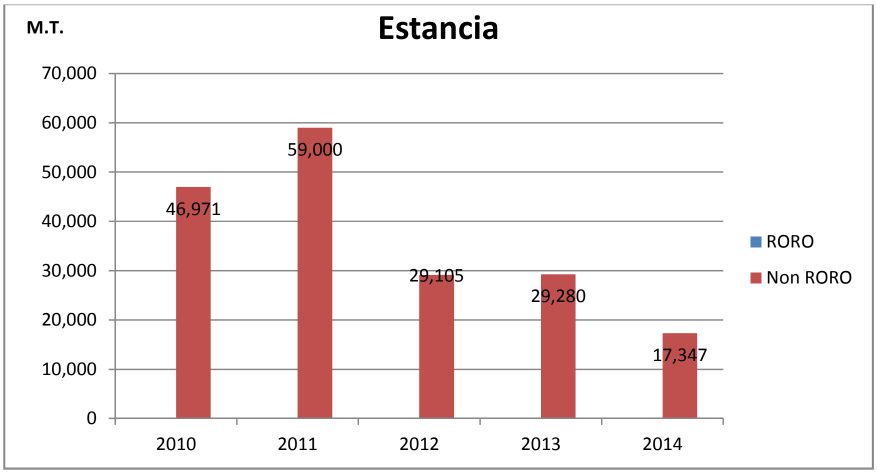


Figure 7.2-19 Total Cargo Throughput for the Past Five Years (Non RORO)

Monthly handling volume by each item is shown in the following Figure.

The left is Inbound and the right is Outbound.

Nearly 80% of inbound cargo is “Fish and Fish Preparation”. On the other hand, all of outbound cargo is “Molasses”.

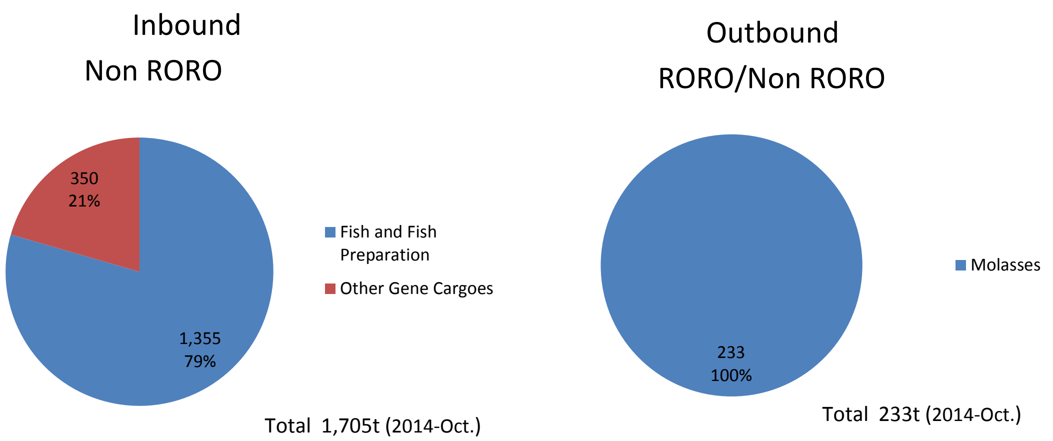


Figure 7.2-20 Monthly Handling Volume by Each Item (Domestic, Inbound/Outbound)

4) Ports of handling "Fuel and By-products" (Private Ports)

a) Iloilo Loboc, Pryse Gases (Priv.)

The share of "Fuel and By-products" of all cargoes, regarding number of vessels and handling volume are shown below.

The volume of "Fuel and By-products" is more than 90% of both domestic and foreign cargoes.

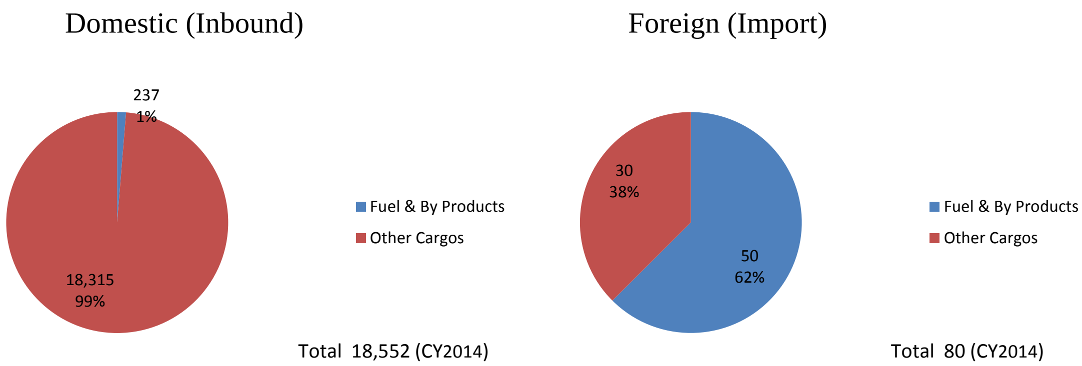


Figure 7.2-21 Number of Vessels Handling "Fuel and By-products" and others (Inbound, Import)

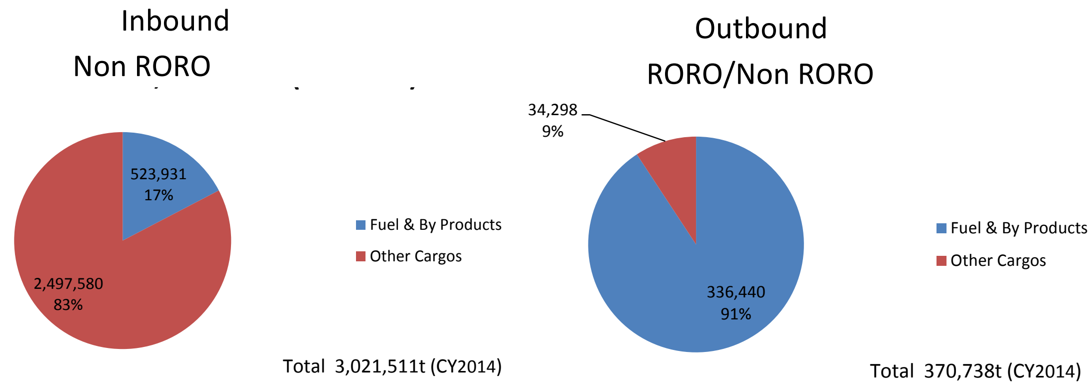


Figure 7.2-22 Monthly Handling Volume of "Fuel and By-products" and others (Inbound, Import)

5) Number of passengers

Number of annual passengers in the province is shown in the following Figure.

Most of the passengers use Iloilo Port and Dumangas Port, which together account for 99% of total passengers.

Disembarking/Embarking

	Name of Ports		No of Passengers
1	Iloilo	BP	1,676,308
2	Dumangas	OGP	1,060,644
3	Milagrosa	Priv.	23,075
		Total	2,760,027

Figure 7.2-23 Number of Annual Passengers in the Province (CY2014)

a) Iloilo Port

Number of passengers for the past five years is shown in the following Figure.

The total number of passengers has been stable at around 1.65 million in recent years.

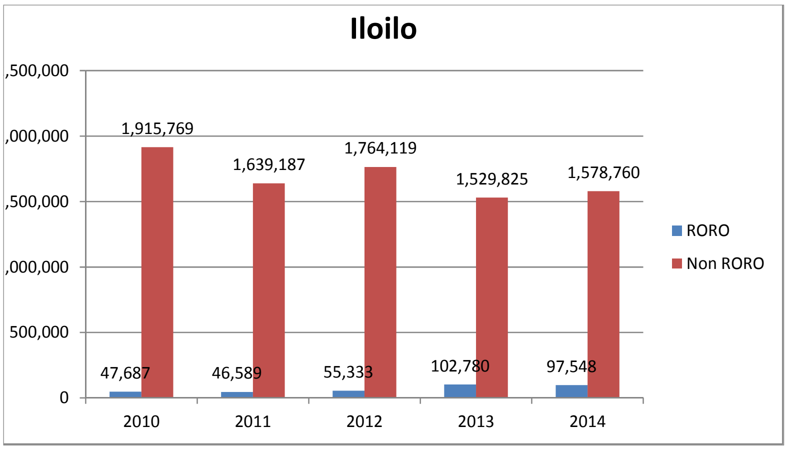


Figure 7.2-24 Number of Passengers for the Past Five Years (RORO, Non RORO)

(3) Bohol Province

1) Existing Ports

Base Port of Bohol province is Tagbilaran port which is managed by PPA, while there are 5 Terminal Ports. There are 68 social ports managed by LGUs and six private ports.

Location of the ports is shown in the following Figure.

Source: Study team

Figure 7.2-25 Port Location Map of Bohol Province

2) Number of vessels

Number of annual domestic cargo vessels in the province is shown in the following Figure.

Number of vessels is dispersed in each port. In addition, the share of top four ports account for more than 90% of total vessels.

Domestic (Inbound/Outbound)

	Name of Ports		RORO/Non RORO
1	Tubigon	TP	7,912
2	Tagbilaran	BP	7,331
3	Getafe	OGP	4,540
4	Ubay	TP	2,952
5	Talibon	TP	822
	········		
9	Tapal	OGP	90
10	Loay	OGP	6
		Total	24,761

Figure 7.2-26 Number of Annual Vessels in the Province (Domestic, CY2014)

Foreign (Import/Export)

	Name of Ports		RORO/Non RORO
1	Phil. Sinter	Priv.	47
2	Tagbilaran	BP	31
		Total	78

Figure 7.2-27 Number of Annual Vessels in the Province (Foreign, CY2014)

a) Tagbilaran Port

Number of vessels for the past five years is shown in the following Figure.

The number of Non RORO has remained at around five thousand vessels in recent years. On the other hand, RORO vessels increased 1.4 times over the level in 2014.

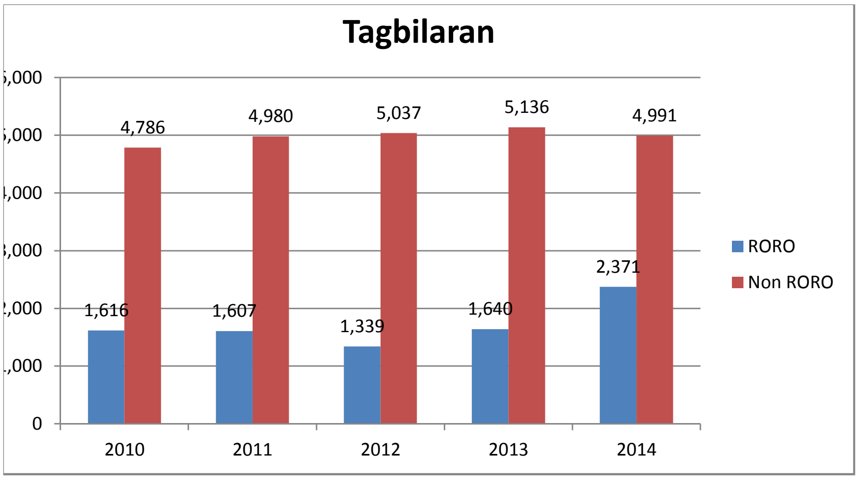


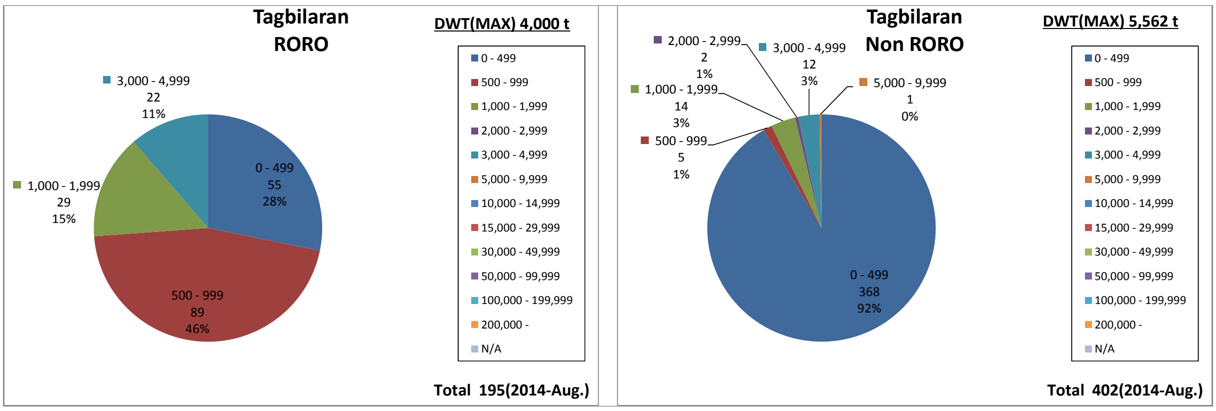
Figure 7.2-28 Number of Vessels for the Past Five Years (RORO, Non RORO)

Number of monthly vessels by DWT and draft is shown in the following Figure.

Non RORO vessels less than 500 DWT make up a significant share of the total.

The maximum draft is over 6.0m for Non RORO vessels and therefore the pier has deep sea water level.

In addition, the maximum draft of RORO vessels (9.0m) may possibly include some errors as the draft of a vessel named LITE FERRY 25 was recorded as 1.0m to 2.0m on another date.



	Arrival	Departure
Draft(average)	2.49m	2.37m
Draft(max)	9.00m*	4.40m

	Arrival	Departure
Draft(average)	1.86m	1.81m
Draft(max)	6.20m	7.00m

Figure 7.2-29 Number of Monthly Vessels by DWT and Draft (Domestic, Non RORO)

b) Tapal Port

Number of vessels for the past five years is shown in the following Figure.

Number of RORO varies widely from year to year. In contrast, Non RORO has been around 100, remaining almost flat in recent years.

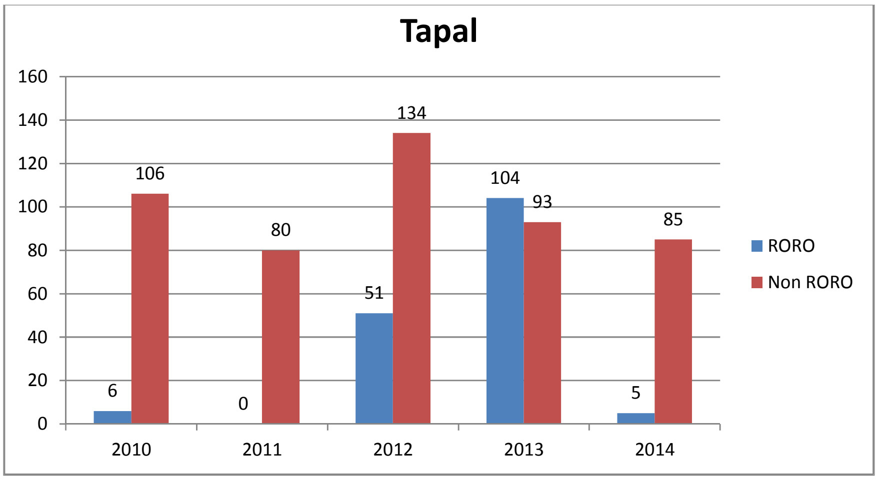
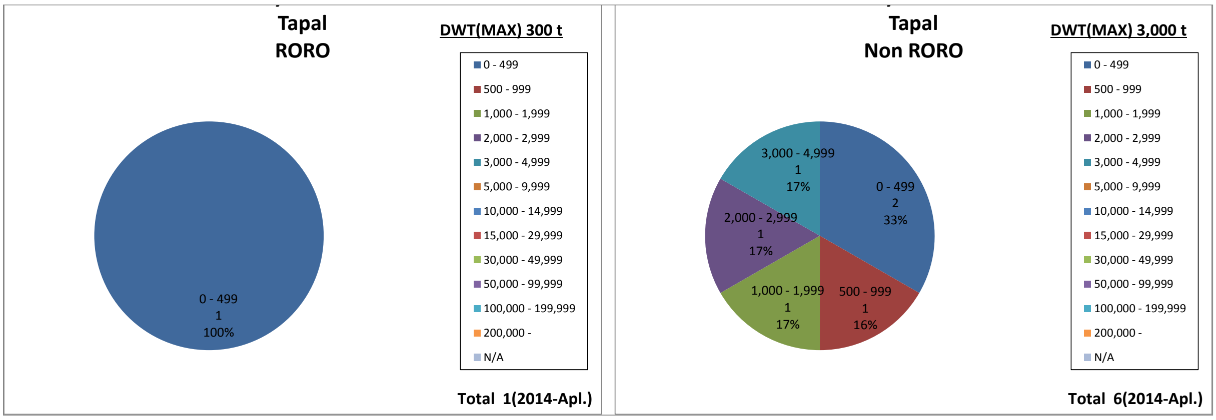


Figure 7.2-30 Number of vessels for the past five years (RORO, Non RORO)

Number of monthly vessels by DWT and draft is shown in the following Figure.

Although the number of vessels is small, the maximum size of Non RORO is 3,000 DWT (maximum draft 6.20m).



	Arrival	Departure
Draft(average)	2.00m	2.00m
Draft(max)	2.00m	2.00m

	Arrival	Departure
Draft(average)	3.75m	2.63m
Draft(max)	6.10m	4.40m

Figure 7.2-31 Number of Monthly Vessels by DWT and draft (Domestic, Non RORO)

3) Total cargo throughput

Annual handling volume of domestic cargo in the province is shown in the following Figure.

The share of Tagbilaran Port is more than 40% of the provincial total. Tagbilaran Port handles 11.2 times more cargo than Tubigon Port.

As shown in Figure 7.2-26 and Figure 7.2-32, Tapal Port handles more than 80 thousand tons of cargo (ranking 4th among 10 ports) even though the annual number of vessels is only 90 (ranking 9th among 10 ports).

Domestic (Inbound/Outbound)

	Name of Ports		Vol. of Cargo(m.t)
1	Tagbilaran	BP	1,286,778
2	Tubigon	TP	114,475
3	Ubay	TP	100,530
4	Tapal	OGP	80,608
5	Jagna	TP	74,452
	....		
		Total	3,008,883

Figure 7.2-32 Total Cargo Throughput in the Province (Domestic, CY2014)

Foreign (Import/Export)

	Name of Ports		Vol. of Cargo(m.t)
1	Phil. Sinter	Priv.	920,508
		Total	920,508

Figure 7.2-33 Total Cargo Throughput in the Province (Foreign, CY2014)

a) Tagbilaran Port

Total cargo throughput for the past five years is shown in the following Figure.

RORO has been around 400 thousand tons, remaining almost flat in recent years. On the other hand, Non RORO has increased 2.5 times in the past five years to 860 thousand tons in 2014.

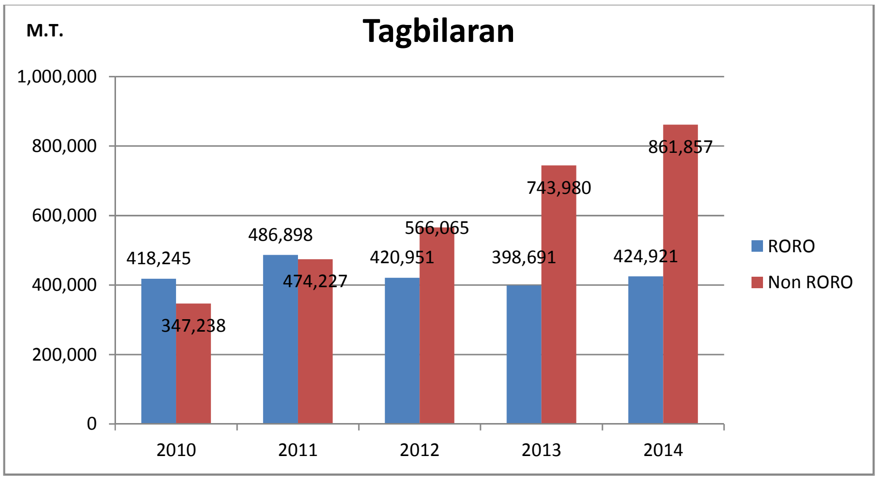


Figure 7.2-34 Total Cargo Throughput for the Past Five Years (RORO, Non RORO)

Monthly handling volume by each item is shown in the following Figure.

The left is Inbound and the right is Outbound.

In each case, the share of “Other General Cargo” makes up a significant portion of the total.

Among inbound cargoes, the share of ”Cement” makes up a significant portion of the total.

Among outbound cargoes, the share of “Bottled Cargoes” is more than 50% of the total.

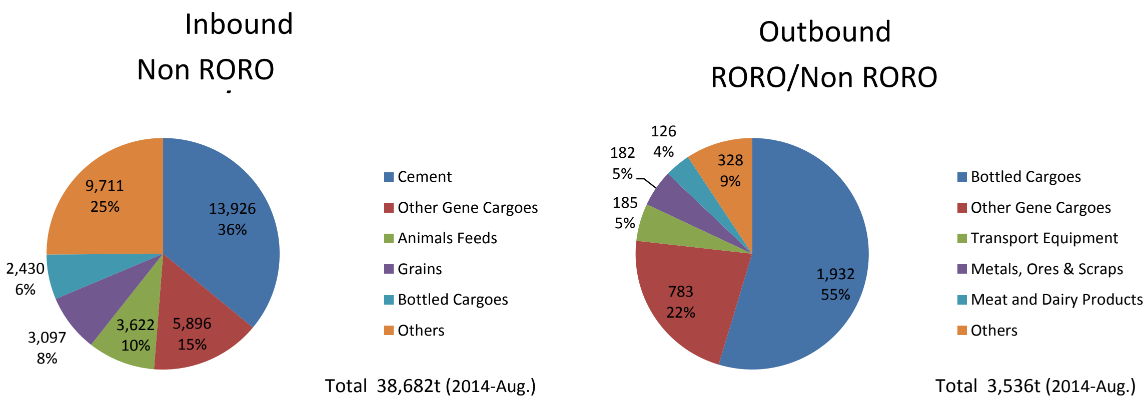


Figure 7.2-35 Monthly Handling Volume by Each Item (Domestic, Inbound/Outbound)

b) Tapal Port

Monthly handling volume by each item is shown in the following Figure.

Total cargo throughput of Non RORO has been around 100 thousand tons, remaining almost flat in recent years except for 2013 when cargo throughput reached 669 thousand tons.

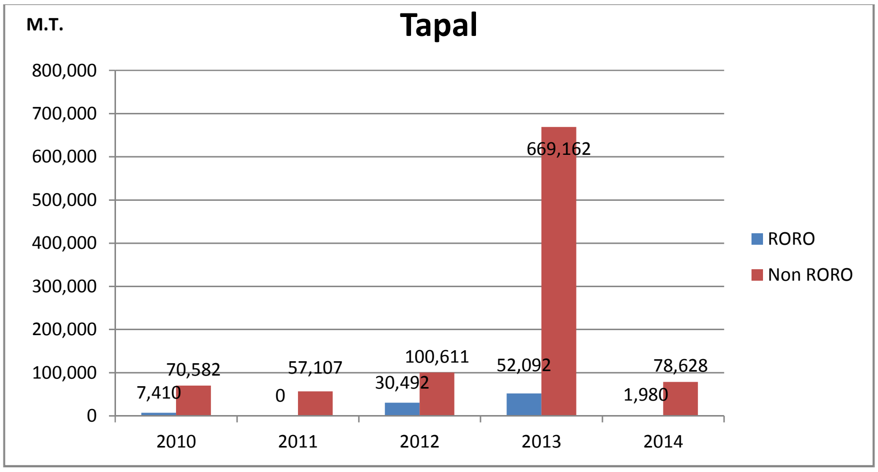


Figure 7.2-36 Total Cargo Throughput for the Past Five Years (RORO, Non RORO)

Monthly handling volume by each item is shown in the following Figure.

The left is Inbound and the right is Outbound.

Among inbound cargoes, “Other General Cargo” and “Grains” are almost split evenly among inbound cargo while”Coconut and Products” accounts for all outbound cargo.

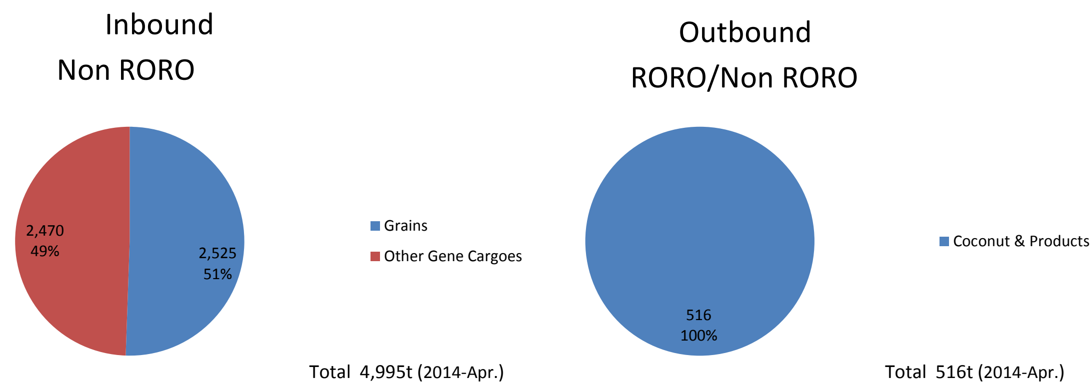


Figure 7.2-37 Monthly Handling Volume by Each Item (Domestic, Inbound/Outbound)

4) Number of passengers

Number of annual passengers in the province is shown in the following Figure.

Most of the passengers use Tagbilaran Port and Tubigon Port. These two ports account for more than 70% of total passengers.

Disembarking/Embarking

	Name of Ports		No of Passengers
1	Tagbilaran	BP	1,406,801
2	Tubigon	TP	1,312,182
3	Getafe	OGP	314,853
4	Ubay	TP	292,811
5	Jagna	TP	232,203
	....		
		Total	3,676,215

Figure 7.2-38 Number of Annual Passengers at Ports in the Province (CY2014)

a) Tagbilaran Port

Number of passengers for the past five years is shown in the following Figure.

The total number of passengers fell to 1.41 million in 2014 after peaking at 1.70 million in 2012.

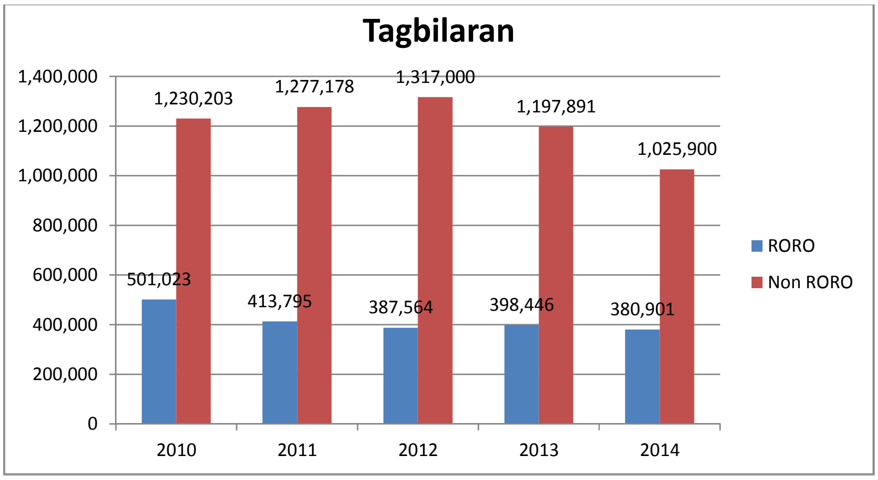


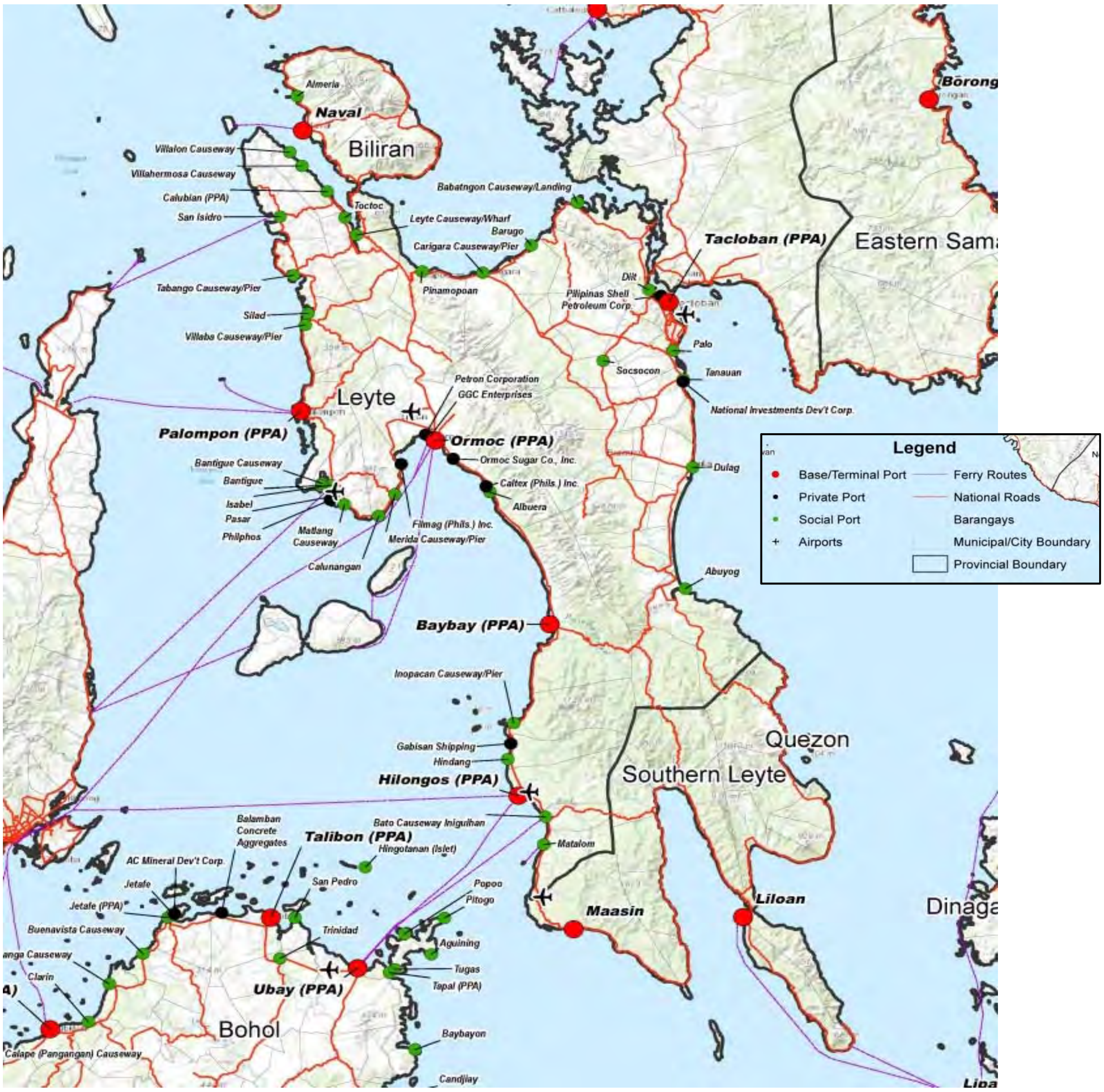
Figure 7.2-39 Number of Passengers for the Past Five Years (RORO, Non RORO)

(4) Leyte Province

1) Existing Ports

Leyte province has two "Base Ports" managed by PPA: Tacloban port and Ormoc port. Tacloban port is capable of handling international cargoes. There are 3 Terminal Ports: Palompon port, Hilongos port and Baybay port. In addition, there are 39 ports managed by LGUs and 10 private ports.

Location of ports is shown below.



Source: Study team

Figure 7.2-40 Ports Location Map of Leyte Province

2) Number of vessels

Number of annual domestic cargo vessels in the province is shown in the following Figure.
A large number of the vessels enter into Ormoc Port, Bato Port and Hilongos Port.

Domestic (Inbound/Outbound)

	Name of Ports		RORO/Non RORO
1	Ormoc (ORM)	BP	5,630
2	Bato (ORM)	OGP	2,077
3	Hilongos (ORM)	TP	1,620
4	Palompon (ORM)	TP	849
5	Baybay (ORM)	TP	841
6	Hindang (ORM)	Priv.	822
7	Pingag Ro-Ro (ORM)	Priv.	701
8	Tacloban (TAC)	BP	577
	....		
		Total	14,475

PMO - Ormoc : ORM
PMO - Tacloban : TAC

Figure 7.2-41 Annual Number of Vessels in the Province (Domestic, CY2014)

Annual number of foreign cargo vessels in the province is shown in the following Figure.

Most of the vessels enter into private ports, while only a small number of vessels enter into Tacloban Port.

Foreign (Import/Export)

	Name of Ports		RORO/Non RORO
1	Pasar (ORM)	Priv.	65
2	Philphos (ORM)	Priv.	14
2	Petron (TAC)	Priv.	14
4	Pryce Gas (ORM)	Priv.	9
5	Shell Anibong (TAC)	Priv.	8
6	Tacloban (TAC)	BP	6
	....		
		Total	120

PMO - Ormoc : ORM
PMO - Tacloban : TAC

Figure 7.2-42 Number of Annual Vessels in the Province (Foreign, CY2014)

a) Tacloban Port

Number of vessels for the past five years is shown in the following Figure.
Number of Non RORO has been less than 600, remaining almost flat in recent years.

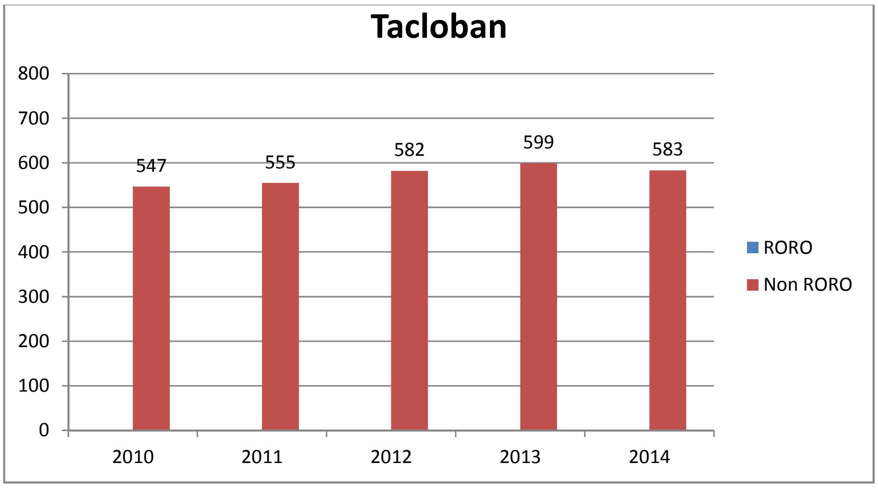
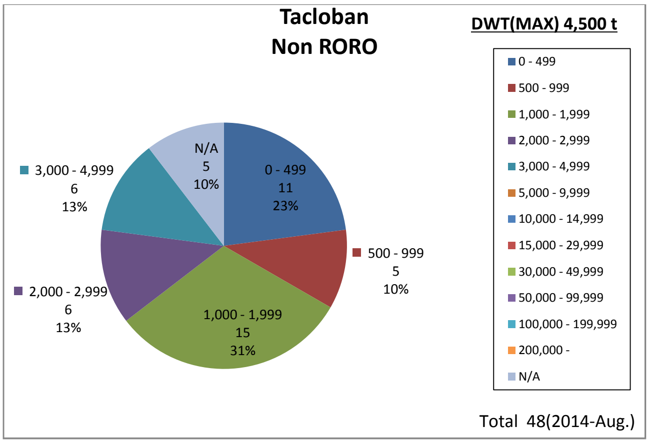


Figure 7.2-43 Number of Vessels for the Past Five Years (Non RORO)

Number of monthly vessels by DWT and draft are shown in the following Figure.

Sizes of Non RORO have broad distribution ranging from less than 500 DWT as well as from 3,000 less than 5,000 DWT.

Tacloban Port has a maximum draft of 11.0m, the deepest sea water level of all target ports in all of the three provinces.



	Arrival	Departure
Draft(average)	4.22m	2.98m
Draft(max)	11.00m	5.50m

Figure 7.2-44 Monthly Number of Vessels by DWT and Draft (Domestic, Non RORO)

b) Ormoc Port

Number of vessels for the past five years is shown in the following Figure.

Number of RORO has been around 900, remaining almost flat in recent years. On the other hand, Number of Non RORO has shown an increasing trend; in 2014, Non RORO vessels increased by 1.4 times over the previous year.

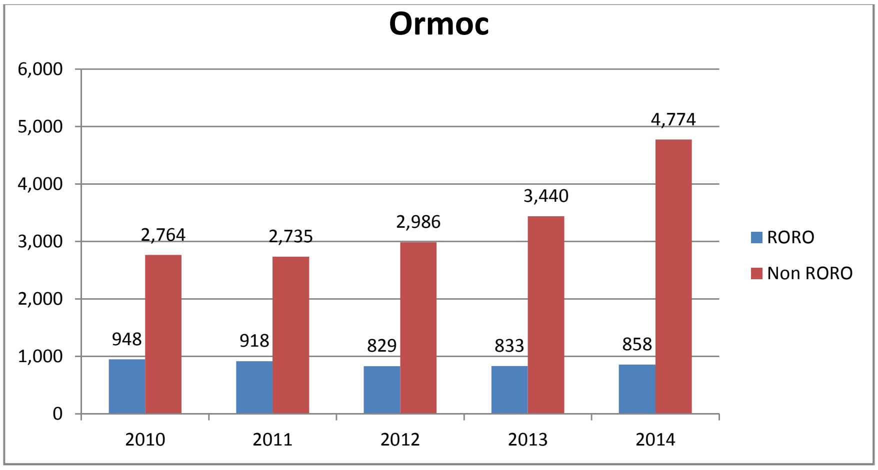
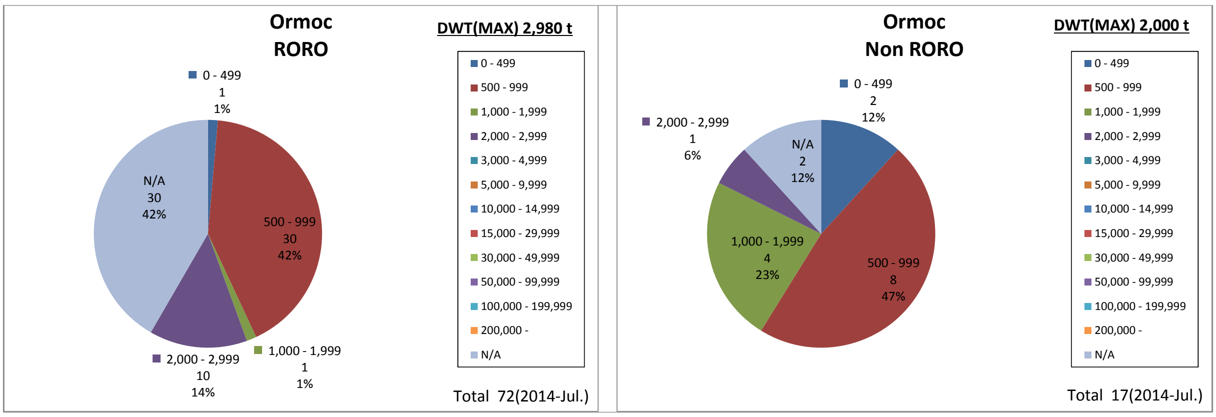


Figure 7.2-45 Number of Vessels for the Past Five Years (RORO, Non RORO)

Monthly number of vessels by DWT and draft are shown in the following Figure.

As for RORO and Non RORO, 500 DWG to less than 1,000 DWG make up a significant share of the total. The maximum draft is around 5.0m.



	Arrival	Departure
Draft(average)	3.53m	3.37m
Draft(max)	5.50m	5.00m

	Arrival	Departure
Draft(average)	3.16m	1.81m
Draft(max)	4.90m	4.20m

Figure 7.2-46 Monthly Number of Vessels by DWT and Draft (Domestic, RORO/Non RORO)

3) Total cargo throughput

Annual handling volume of domestic cargo in the province is shown in the following Figure.

The share of both Ormoc Port and Tacloban Port accounts for more than 40% of the total. These two ports handle 6.9 times more cargo than Bato Port.

Domestic (Inbound/Outbound)

	Name of Ports		Vol. of Cargo(m.t)
1	Tacloban (TAC)	BP	741,956
2	Ormoc (ORM)	BP	440,862
3	Pasar (ORM)	Priv.	348,156
4	Philphos (ORM)	Priv.	224,798
5	Bato (ORM)	OGP	171,045
	········		
		Total	2,708,238

PMO - Ormoc : ORM
PMO - Tacloban : TAC

Figure 7.2-47 Total Cargo Throughput in the Province (Domestic, CY2014)

Annual handling volume of domestic cargo in the province is shown in the following Figure.

Most of cargoes are handled by private ports. The share of Tacloban Port is only around 1% of the total.

Foreign (Import/Export)

	Name of Ports		Vol. of Cargo(m.t)
1	Pasar (ORM)	Priv.	820,625
2	Philphos (ORM)	Priv.	148,462
3	Tacloban Oil Mill (TAC)	Priv.	21,000
4	Tacloban (TAC)	BP	15,115
5	Pry Gas (ORM)	Priv.	7,856
	········		
		Total	1,019,390

PMO - Ormoc : ORM
PMO - Tacloban : TAC

Figure 7.2-48 Total Cargo Throughput in the Province (Foreign, CY2014)

a) Tacloban Port

Total cargo throughput for the past five years is shown in the following Figure.

Handling cargo volume of Non RORO has been on an increasing trend, exceeding 700 thousand tons in 2014.

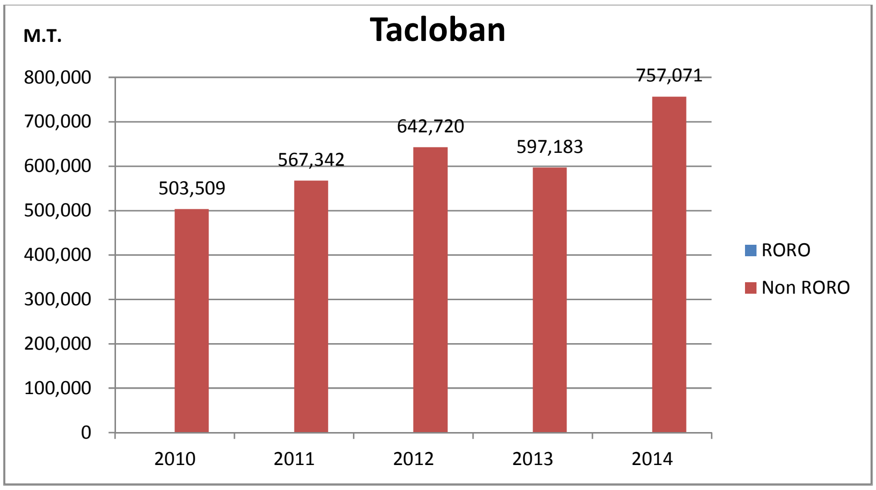


Figure 7.2-49 Total Cargo Throughput for the Past Five Years (Non RORO)

Monthly handling volume by each item at Tacloban Port is shown in the following Figure.

The left is Inbound and the right is Outbound.

Among inbound cargoes, the share of “Cement” makes up a significant portion of the total.

On the other hand, among outbound cargoes, the share of “Bottled Cargoes” is almost 100% (99%) of the total.

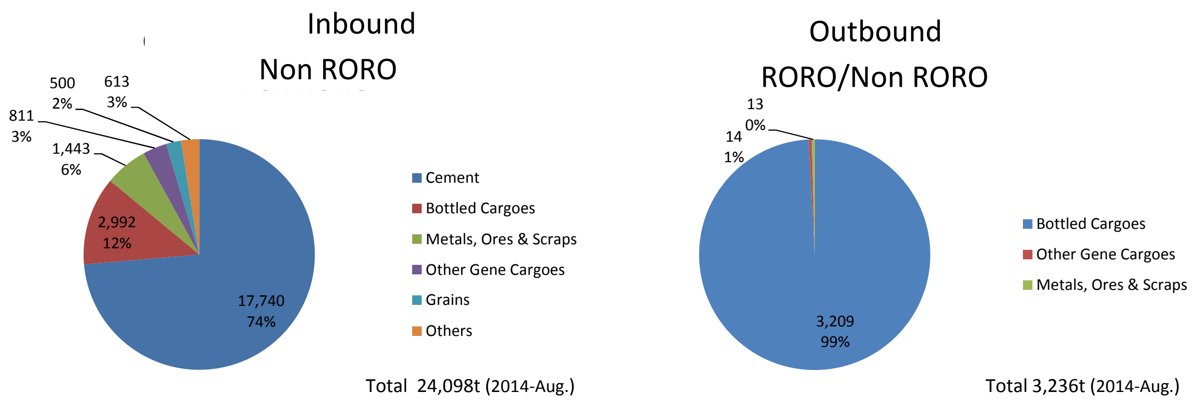


Figure 7.2-50 Monthly Handling Volume by Each Item (Domestic, Inbound/Outbound)

b) Ormoc Port

Total cargo throughput for the past five years is shown in the following Figure.

RORO has increased by 1.3 times in the past five years. The combined total of RORO and Non RORO exceeds 400 thousand tons.

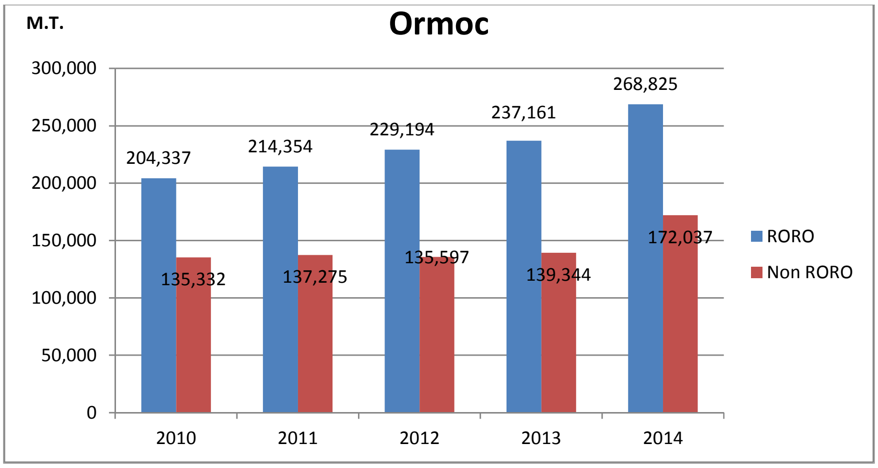


Figure 7.2-51 Total cargo Throughput for the Past Five Years (RORO, Non RORO)

Monthly handling volume by each item is shown in the following Figure.

The left is Inbound and the right is Outbound.

Among inbound and outbound cargoes, the share of "Cement" makes up a significant portion of the total.

In addition, there is large variety of items.

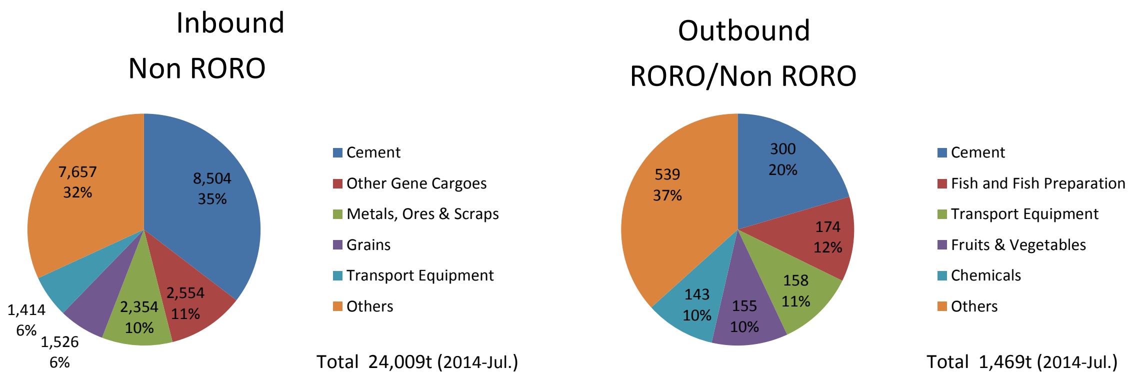


Figure 7.2-52 Monthly Handling Volume by Each Item (Domestic, Inbound/Outbound)

4) Ports handling "Fuel and By-products" (Private Ports)

a) Shell Anibong, Petron, Supreme Star Oil (Priv.)

The share of "Fuel and By-products" of all cargoes in terms of number of vessels and handling volume are shown below.

"Fuel and By-products" account for 15% of the total cargo volume, both domestic and foreign.

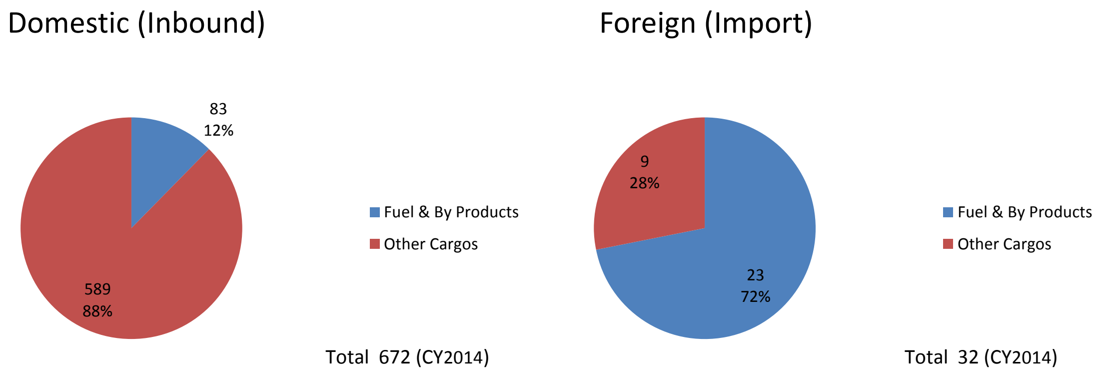


Figure 7.2-53 Number of Vessels Handling "Fuel and By-products" and others (Inbound, Import)

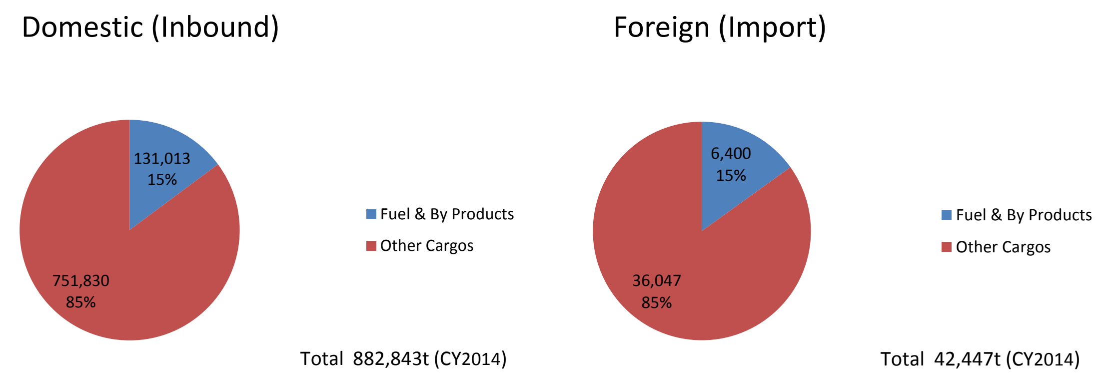


Figure 7.2-54 Monthly Handling Volume of "Fuel and By-products" and others (Inbound, Import)

5) Number of passengers

Number of annual passengers in the province is shown in the following Figure.
Ormoc Port has the largest number of passengers.

Disembarking/Embarking

	Name of Ports		No of Passengers
1	Ormoc (ORM)	BP	1,342,520
2	Hilongos (ORM)	TP	533,586
3	Bato (ORM)	OGP	295,343
4	Palompon (ORM)	TP	176,443
5	Baybay (ORM)	TP	169,016
	・・・・・・・・		
-	Tacloban (TAC)	BP	0
		Total	2,575,874

PMO - Ormoc : ORM
PMO - Tacloban : TAC

Figure 7.2-55 Number of Annual Passengers in the Province (CY2014)

a) Ormoc Port

Number of passengers for the past five years is shown in the following Figure.

The total number of passengers has been around 1.65 million, remaining almost flat in recent years.

Number of RORO has remained almost flat in recent years. By contrast, the number of Non RORO vessels has shown an increasing trend.

Total of passengers is 1.34 million in 2014, an increase of 1.4 times over the past five years.

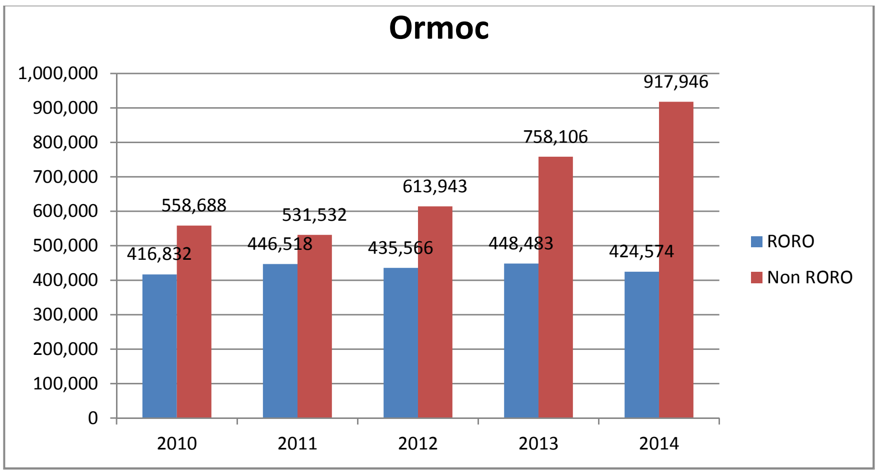


Figure 7.2-56 Number of Passengers in the Past Five Years (RORO, Non RORO)

7.2.3. Logistics network in target area

(1) Port of origin and destination

The results of the analyses are as below:

- Cebu is a significant logistics hub in Visayas
- Base Ports (Iloilo, Tagbilaran, Tacloban) in addition to Tapal Port (OGP) handle the cargo from extra-regional ports (e.g. Manila, Batangas)

a) Iloilo Port

Number of monthly vessels by ports of call at both piers is shown in the following Figure.

In each case, many vessels are engaged in services that link with Cebu.

In addition, some Non RORO vessels are in service between long-distance ports (e.g., Manila, Zamboanga).

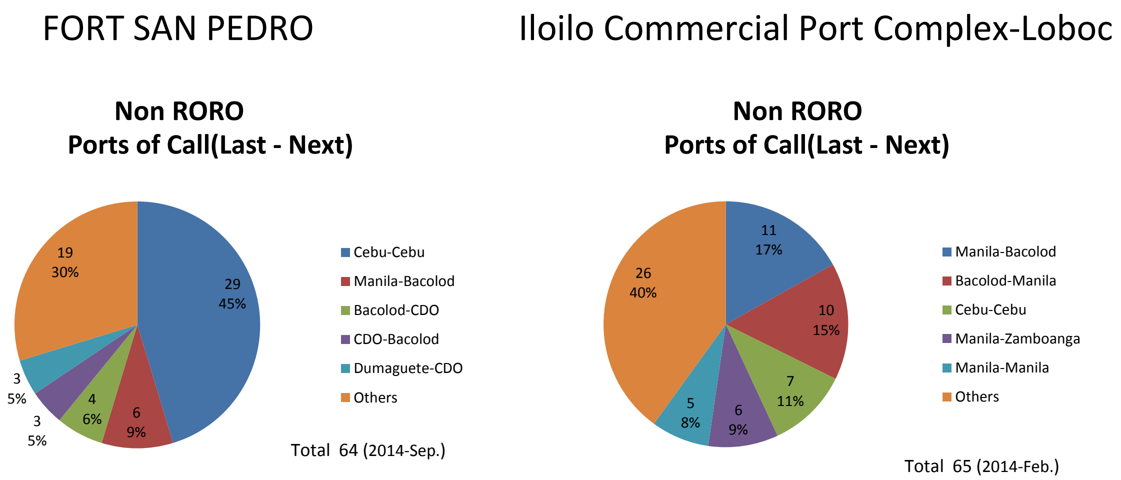


Figure 7.2-57 Number of Monthly Vessels by Ports of Call (Domestic)

b) Estancia Port

Number of monthly vessels by ports of call is shown in the following Figure.

Fisher crafts make up a significant portion of the total. In addition, the share of Visayan Sea area is 90%.

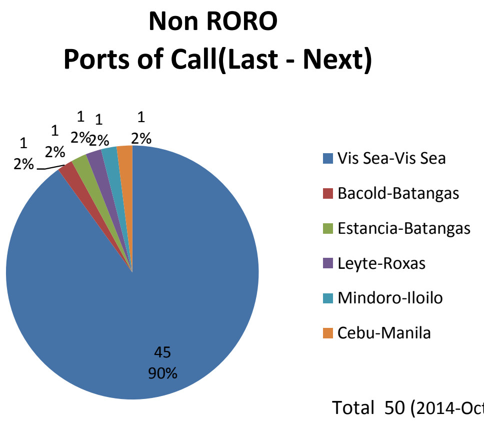


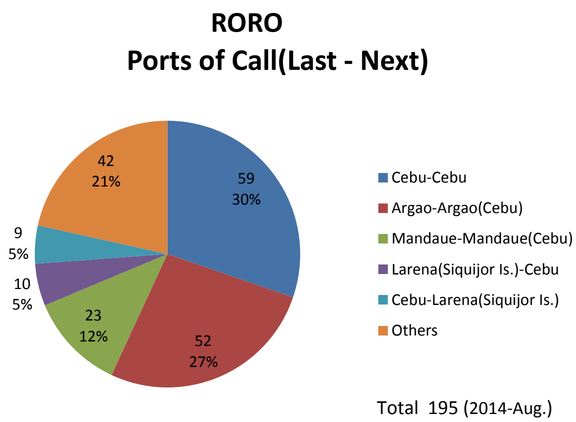
Figure 7.2-58 Number of Monthly Vessels by Ports of Call (Domestic)

c) Tagbilaran Port

Number of monthly vessels by ports of call is shown in the following Figure.

The left is RORO and the right is Non RORO.

In each case, approximately 80% of all vessels are engaged in services that link with Cebu.



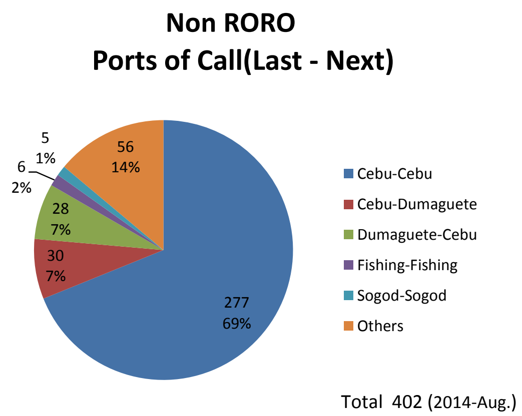
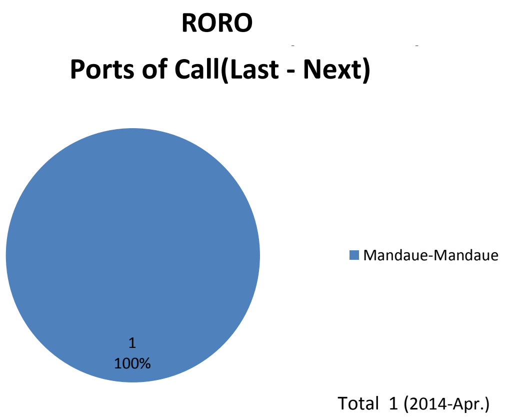


Figure 7.2-59 Number of Monthly Vessels by Ports of Call (Domestic, RORO/Non RORO)

d) Tapal Port

Number of monthly vessels by ports of call is shown in the following Figure.

Although the number of monthly vessels is small, Non RORO is engaged in services that link with Subic not only Cebu.



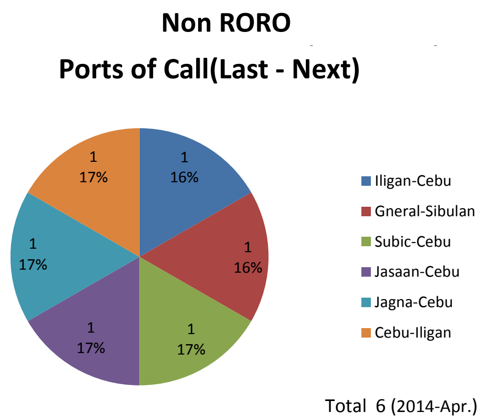


Figure 7.2-60 Number of Monthly Vessels by Ports of Call (Domestic, RORO/Non RORO)

e) Tacloban Port

Monthly number of vessels by ports of call is shown in the following Figure.

Nearly 40% of Non RORO are engaged in services that link with Cebu. On the other hand, nearly half of them are engaged in services that link with other ports.

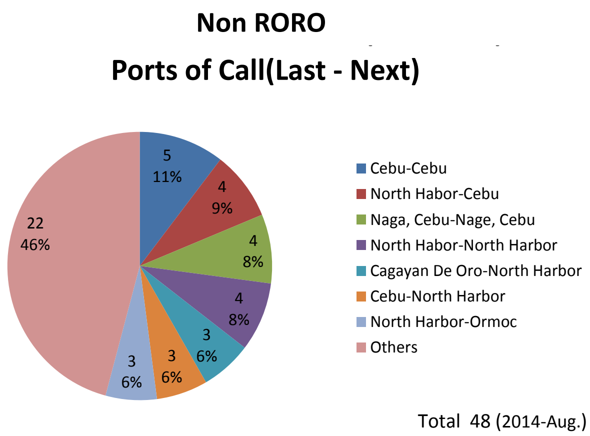
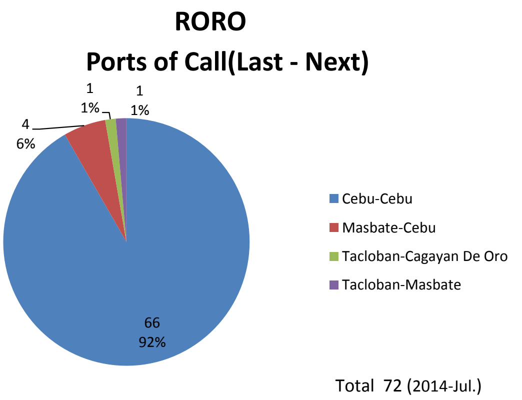


Figure 7.2-61 Number of Monthly Vessels by Ports of Call (Domestic)

f) Ormoc Port

Number of monthly vessels by ports of call is shown in the following Figure.

More than 90% (92%) of RORO are engaged in services that link with Cebu. In contrast, more than 40% (41%) of Non RORO are engaged in services that link with other ports



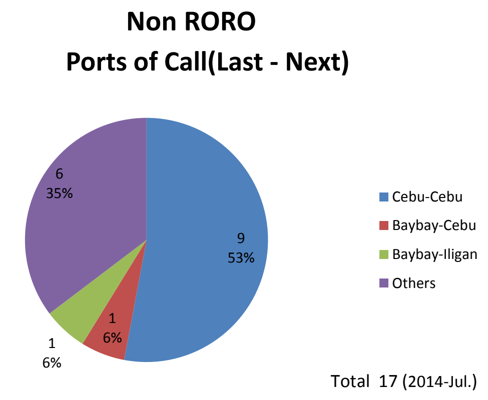


Figure 7.2-62 Monthly Number of Vessels by Ports of Call (Domestic, RORO/Non RORO)

(2) Strong Republic Nautical Highway (SRNH)

Visayas area, where Iloilo, Bohol and Leyte Province are located, is on the three Nautical Highways which form the backbone of the nationwide vehicle transport system in the Philippines. The SRNH has been expanded into the Western Nautical Highway through Iloilo Province, the Central Nautical Highway through Bohol Province, and the Eastern Nautical Highway through Leyte Province.

On the Western Nautical Highway, it is possible to travel from Roxas Port in Mindoro Island to Iloilo City via the sea route to Caticlan Port in Panay Island and the land route of National Highway No.503 (Secondary Road) and No.5 (Primary Road) in Panay Island, and then from Iloilo Port (Dumangas Port) it is possible to reach Negros Island. On the Central Nautical Highway, it is possible to travel from Cebu Port to Jagna Port in Bohol Island via the sea route to Tubigon Port and the land route of National Highway No.853 and No. 854 (Secondary Road) in Bohol Island, and then from Jagna Port it is possible to reach Cagayan de Oro City in Mindanao Island. On the Eastern Nautical Highway, it is possible to travel from Cataingan, Masbate to Naval, Biliran. Beyond this point, one will eventually be able to travel from Benit, San Ricardo, Southern Leyte to Surigao City.

Source: Department of Tourism (http://www.visitmyphilippines.com/)

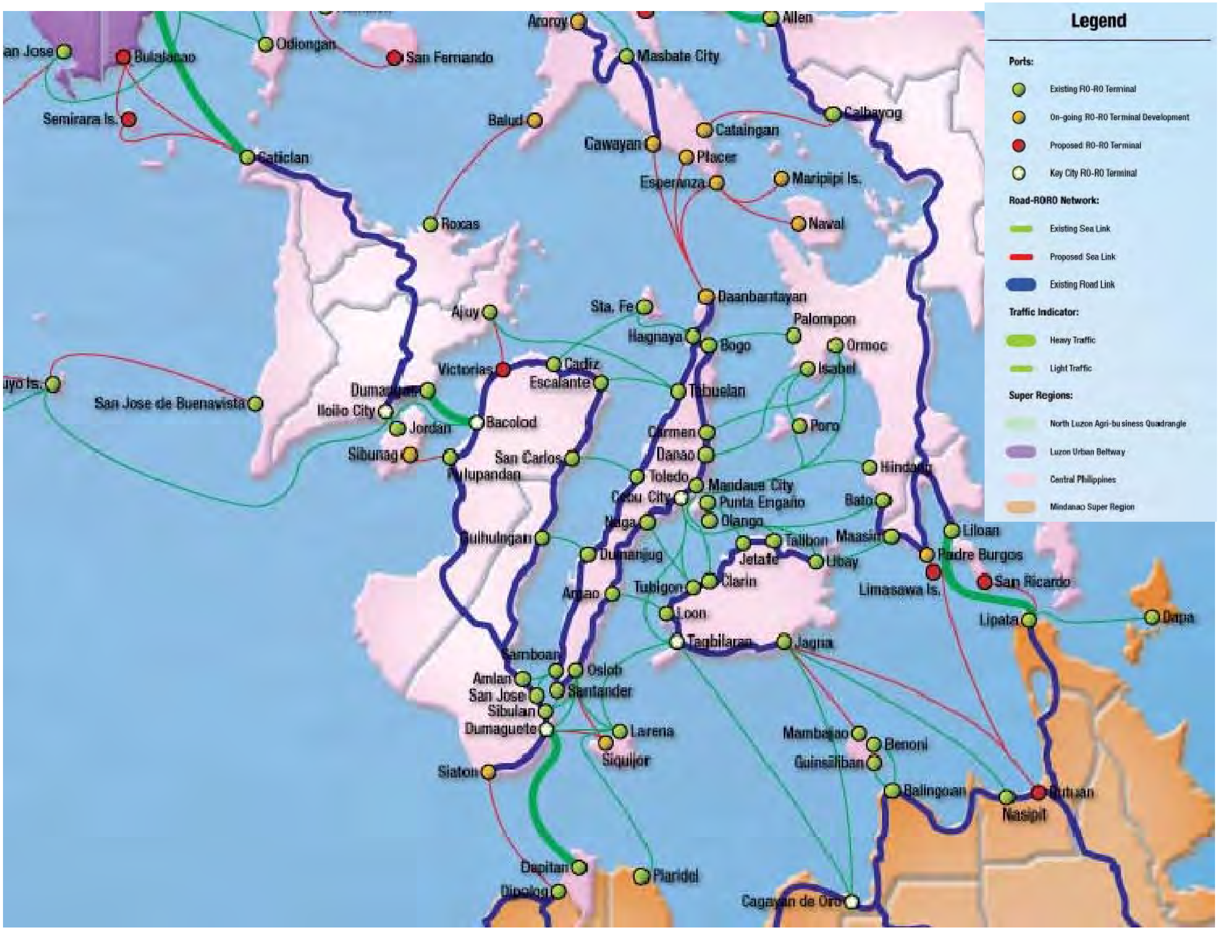
Figure 7.2-63 Route map of Strong Republic Nautical Highway

In conjunction with SRNH, maritime transport network is formed by domestic, foreign and RORO vessels as well as a road transport network in each island.

(3) RORO network

Handling volume of RORO is almost the same as that of Non RORO. Therefore, RORO and Non RORO support the logistics at the same level in each province.

RORO terminals and routes can be found on MARINA’s website (see below).



Source: The Strong Republic Nautical Highway, http://marina.gov.ph/srnh/srnh_main.html (A part of Visayan area)

Figure 7.2-64 RORO Route Map

As shown in the above figure, there are eight routes from five ports in Panay Island (including three routes from two ports in Iloilo Province), 15 routes from eight ports in Bohol Island and nine routes from seven ports (including seven routes from five ports in Leyte Province). In the target area, the RORO network consists of 25 routes in total. In addition, the Western Nautical Highway is partially formed from Caticlan to Roxas, Dumangas to Bacolod. The Central Nautical Highway is partially formed from Tubigon to Cebu, Jagna to Mambajao.

Table 7.2-7 Summary of Existing RORO Network in the Target Area

Island	RORO terminal	Partner port
Panay	**Caticlan (Aklan Prov)**	**Roxas(Or-Mindoro)** 3)
		Semirara Is. (Or-Mindro) 1)
		Busalacao (Or-Mindro) 1)
	Roxas (Capiz Prov)	Balud(Masubate)
	Ajuy	Tabuelan
		Victorias (Negros-Oc) 2)
	Dumangas	**Bacolod (Negros-Oc)** 3)
	San Jose de Buenavista (Antique Prov)	Cuyo Is. 2)
Bohol	Ubay	Massin(South Leyte)
		Cebu5)
	Talibon	Cebu5)
	Jetafe	Punta Engario(
	Carin	Toledo
	Tubigon	**Cebu** 4)
		Naga
	Loon	Argao (Cebu)
	Tagbilaran	Cebu
		Larena(Siquijor)
		Cagayan de Oro(Misamis-Or)
	Jagna	**Mambajao(Camiguin)** 2), 4)
		Cagayan de Oro (Misamis-Or)
		Nasipit(Misamis-Oc)
		Butuan(Misamis-Oc) 2)
Leyte	Palompon	Bogo (Cebu) 5)
	Isabel	Danao (Cebu)
		Poro(Is.)
	Ormoc	Curmen (Cebu)
		Toledo(Cebu)
	Hindang	Toledo (Cebu)
	Bato	Cebu5)
	Maasin (Southern Leyte)	Ubay
	Padre Burgos(Southern Leyte)1)	Butuan (Misamis-Or) 2)

1) on-going construction, 2) proposed, 3) Route on SRNH (Wester NH), 4) Route on SRNH (Central NH) 5) Port on Central NH

Source: MARINA web-site (http://marina.gov.ph/srnh/srnh_main.html)

(4) Freight to and from Bohol Island by maritime transport

All cargo of Bohol is transported via ports as shown below.

1) Current situation of RORO shipping service

Average number of monthly vessels by ports of call is summarized below.

Table 7.2-8 Summary of Average Number of Monthly Vessels by Ports of Call

Port	Partner Ports (PPA statistics)*	Call	Total	Data In 2014	MARINA (Dec.2013)
Tagbilaran	Cebu	59	195	Aug	Cebu
	Argao (Cebu)	52			-
	Mandaue (Cebu)	23			-
	Larena/Cebu	19			Larena (SiquijorIs.)
	Others	42			Cagayan de Oro(Misamis-Or)
Loon	-		-		Argao (Cebu)
Tubigon	Cebu	185	185		Cebu
					Naga
Clarin	-		-		Toledo
Jetafe	-		-		Punta Engario(
Talibon	Cebu	29	29		Cebu
Ubay	-		98		Massin(South Leyte)
	Cebu	35			Cebu
	Bato	62			-
	Iligan	1			-
Tapal	Manduae (Cebu)	1	1		-
Jagna	-		22		Mambajao* *(Camiguin)
	Cagayan de Oro	17			Cagayan de Oro (Misamis-Or)
	Nasipit	5			Nasipit(Misamis-Oc)
	-				Butuan**(Misamis-Oc)

Source: PPA statistics in 2014

2) Current situation of Non RORO shipping service

Table 7.2-9 Summary of Current Situation of Non RORO Shipping Service

Port	Long distance route	Shuttle Service	Others	Total
Tagbilaran Aug, 2014	-	Cebu (277) Cebu/Dumanget(58) Sogod(5)	Fishing(6) Others (56)	402
Loon	-	Cebu(39)	-	
Tubigon Jun. 2014	Polloc-Tubigon-Tagbilaran(1)	Cebu(466) Jimenez(1) Leyte(1)	-	469
Clarin Oct. 2014	-	Cebu(11) Sibula(1)	-	12
Getafe Aug. 2014	-	Cebu(377)	-	377
Talibon Mar. 2014	Cebu-Talibon-Isabel(2)	Cebu(39)	-	41
Ubay Apr. 2014	-	Bato(64) Hilongos(40) President(52)	-	156
Tapal Apr. 2014	General-Tapal-Sibulan(1) Subic-Tapal-Cebu(1) Jasaan-Tapal-Cebu(1) Jagna-Tapal-Cebu(1)	Iligan/Cebu(2)	-	6
Jagna Mar. 2014	-	Benoni(9) Tagoloan(5)	Others(14)	26
Total(7ports)				1,489

1) A case that the last port and the next port are different
2) A case the last port and the next port are same and the last port and the next port are the case of vice a versa
Source: PPA statistics in 2014

3) Cargo flow to and from Bohol Island

Average monthly handling volume of inbound cargo 61,251 ton of general cargo and 61,132 ton of bulk cargo, while that of outbound 6,877 ton of general cargo and 2,711 ton of bulk cargo.

The volume of inbound is much larger than that of outbound. Main inbound commodities are "Cement", "Animal feeds", "Fish and fish preparation" and "Other General Cargo". Main outbound commodity is "Coconuts & Products". On the other hand, "Transport Equipment" and "Other General Cargo" are traded from Getafe, Talibon and Ubay Port. Since these ports have Banacon Island, Jao Island and Lapinig Island, respectively at the back, these ports serve as supply bases of daily commodities for remote islands.

Table 7.2-10 3) Cargo flow to and from Bohol Island

Port	Inbound	Outbound
Tagbilaran Aug, 2014	**38,682 t** Cement, General Cargo, Animal food, Grains, Bottles cargoes **57,952 t (bulk)** Fuel & by-products, Crude Minerals	**3,536 t** Bottles Cargo, general Cargo, Transport Equipment **1,003t (bulk)** Coconut & products, Crude Minerals
Loon	-	-
Tubigon Jun. 2014	**5,827 t** Cement, metals etc., General cargo, Transport equipment **2,280 t (bulk)** Timber & by products, Crude minerals	**1,221 t** Grains, Coconuts & products **608 t (bulk)** Coconut & Products
Clarin Oct. 2014	**900 t (bulk)** Crude minerals	-
Getafe Aug. 2014	**59 t** General cargo	**70 t** Fruit & vegetable, General cargo
Talibon Mar. 2014	**608 t** Animal feeds, Cement, Fish and fish preparation, Meat and daily products, General cargo **836 t** Crude minerals	**240 t** Fruits and vegetables, Fish and fish preparation
Ubay Apr. 2014	**3,403 t** Cement, General cargo, Animals feeds	**1,090 t** Transport equipment, Animals feeds, Grains, General cargo
Tapal Apr. 2014	**4,995t** Grains, General cargo	**516t** Coconuts by products
Jagna Mar. 2014	**6,841 t** Cement, Grains, General cargo, Animal feeds	**204 t** General cargo, Abaca & products **1,100t (bulk)** Coconuts by products
Total (7ports)	**61,251 t** **61,132 t (bulk)**	**6,877 t** **2,711 t (bulk)**

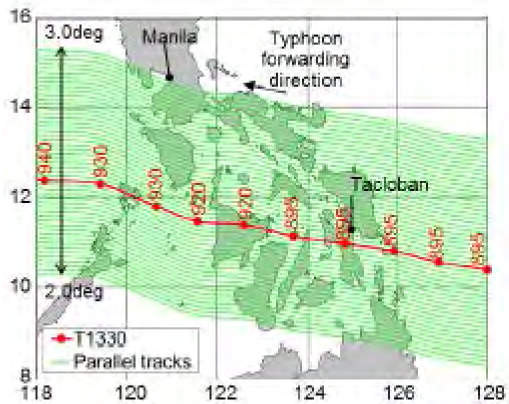
1: Commodities the amount of whose volumes shares approximately 75% are shown.
2: Month of average port activities of each port is selected.

8. Assumption of Disaster

8.1. Target Disaster

8.1.1. Typhoon

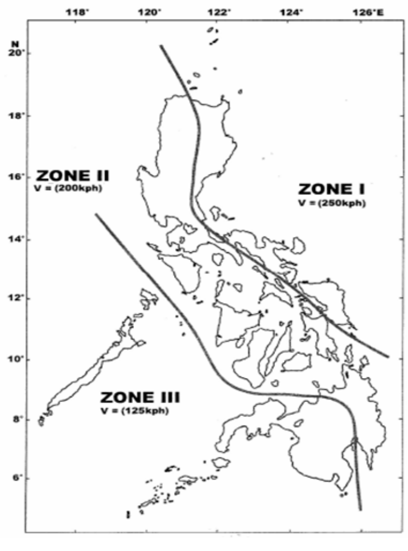
DOTC and JICA determined the target typhoon to be Typhoon Yolanda that hit the Visayas region in November 2013. According to PAGASA, because the Guiuan weather station at the southern end of Samar Island had been destroyed by strong winds and did not record data exceeding 160kph, the maximum wind speed was estimated to 240kph from the 910hPa pressure of the typhoon. Consequently in this study, the design wind speed is 240kph. It should be noted that the route of typhoon Yolanda is on the right figure.



Source: PAGASA

Figure 8.1-1 Route of Typhoon Yolanda

The design wind speed at all locations in the Philippines according to the 2010 revision of the National Structural Code of the Philippines (NSCP) is shown for reference. The design wind speed of the current target areas, i.e. Leyte, Bohol, Iloilo is 200kph, which is smaller than design wind speed of Yolanda. Moreover, the probability return period are 101years, and 60 years based on the calculation of barometric pressure and the calculation of a typhoon's wind speed, respectively.

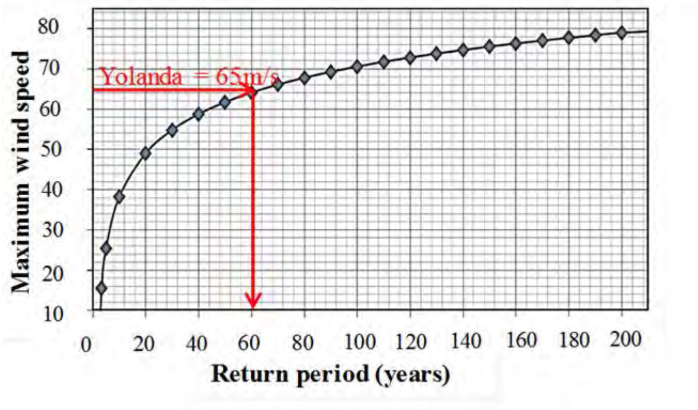


Source: NSCP

Figure 8.1-2 Design Wind Speed

ESTIMATED RETURN PERIOD BY WIND SPEED

Year	Wind speed (m/s)	Year	Wind speed (m/s)	Year	Wind speed (m/s)
1979	40	1988	28	2006	20
1982	18	1990	28	2008	40
1983	10	1993	20	2013	65
1984	50	1994	45		
1987	16	1998	19		

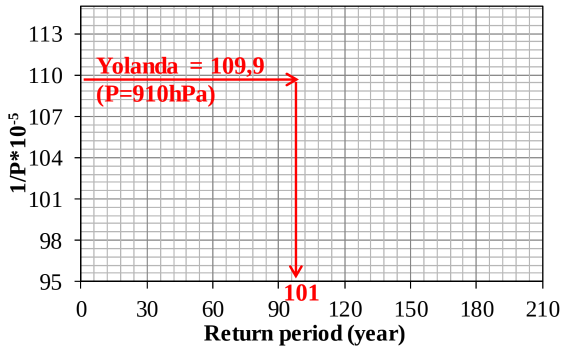


Source: Study team

Figure 8.1-3 Return Period based on Pressure

ESTIMATED RETURN PERIOD BY PRESSURE

Year	Pressure (hPa)	Year	Pressure (hPa)	Year	Pressure (hPa)	Year	Pressure (hPa)	Year	Pressure (hPa)
1951	950	1966	974	1978	985	1990	945	2003	1000
1952	974	1967	988	1979	965	1991	1000	2004	1006
1954	980	1968	975	1980	1004	1993	975	2005	990
1957	1000	1969	955	1981	1004	1994	960	2006	975
1959	1006	1970	990	1982	940	1995	985	2007	1004
1962	990	1971	985	1984	940	1996	998	2008	1006
1963	1006	1972	975	1986	980	1999	1004	2011	1004
1964	920	1974	1000	1988	955	2000	998	2012	996
1965	1004	1977	998	1989	992	2001	996	2013	910



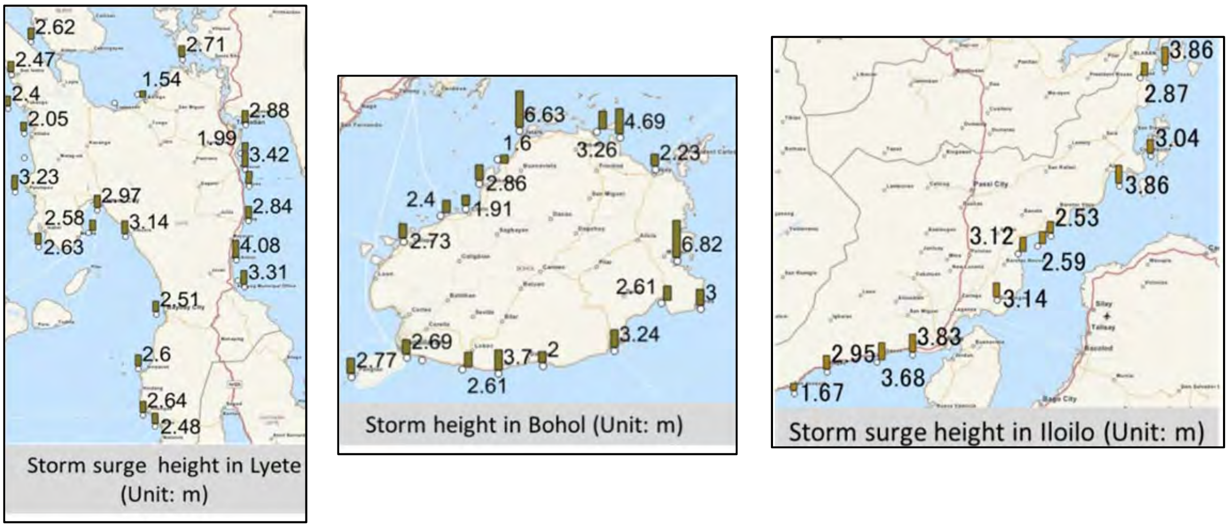
Source: Study team

Figure 8.1-4 Return Period based on Wind Speed

8.1.2. Storm Surge

(1) Estimation of storm surge height

Design storm surge heights of each province are decided based on the Ready Project released by the Office of Civil Defense (OCD) as in the below figures. The storm surge height of Leyte Pacific Ocean side has been predicted at about 2m ~ 4m, and 2m ~3m in the west bay. The predicted storm surge height for Bohol Province is about 2m~4m, however that of Getafe and Mabini is predicted to be larger than 6m. The storm surge height of Iloilo Province is estimated at about 2m~4m. The following pictures show the estimated storm surge height of each province.

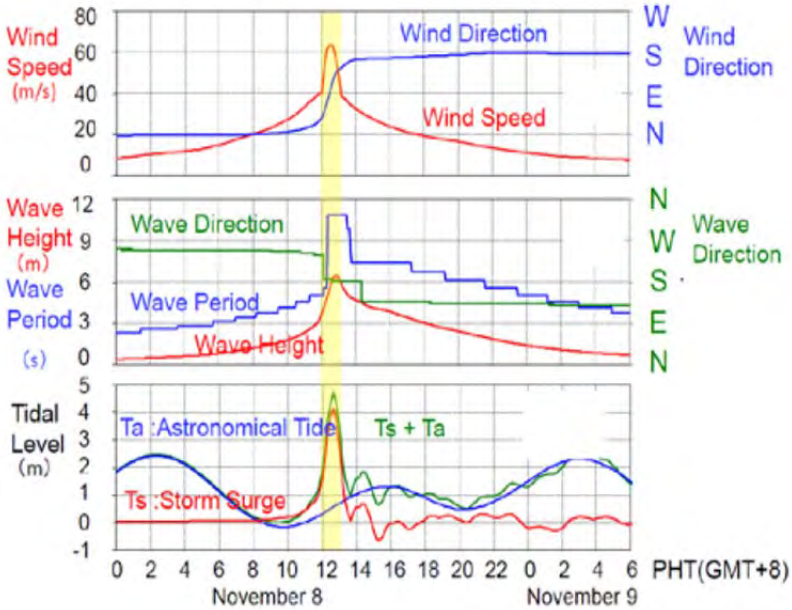


Source: OCD Ready Project 2015

Figure 8.1-5 Estimated Storm Surge for Targeted Area (Leyte, Bohol and Iloilo)

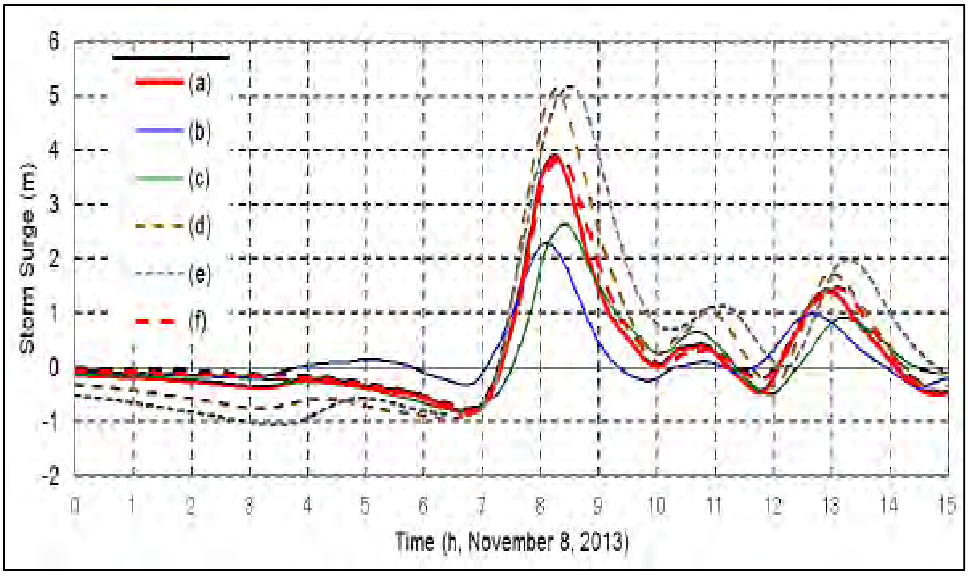
(2) Measured storm surge height

According to the report of damage at Philippine ports and port surrounding areas caused by Typhoon No. 1330 (Yolanda), i.e. the document No.816 published by the National Institute for Land and Infrastructure Management (NILIM) in March 2015, the storm surge height in Estancia and Tacloban Ports were as follows:



Source: Technical Note of NILIM

Figure 8.1-6 Storm Surge at Estancia

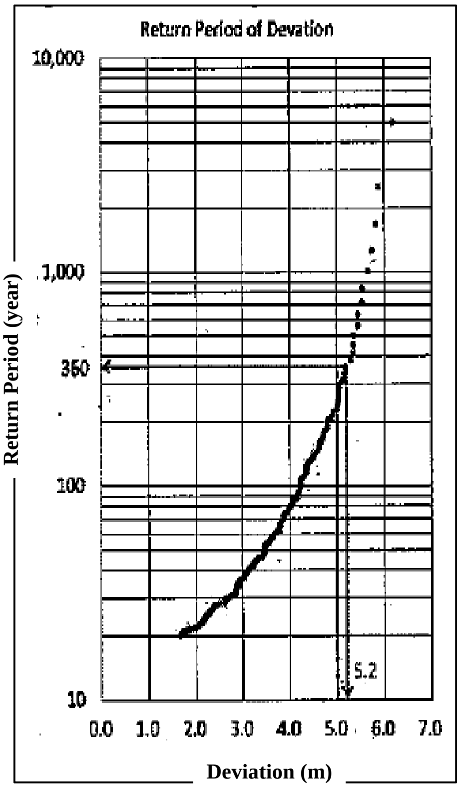


Source: Technical Note of NILIM

Figure 8.1-7 Storm Surge at Tacloban

According to the above graph Estancia and Tacloban have the same estimated storm surge height of 4m. In OCD Ready Project the storm surge heights of Estancia and Tacloban are 3.42m and 3.86m, respectively. It means they have the same order with the values reported by the National Institute for Land and Infrastructure Management. On the other hand according to PPA of the Tacloban PMO office, storm surge height by typhoon Yolanda at Tacloban Port reached 7m. These values shall be considered in the standard design model.

The return period of storm surges in Tacloban Port which was caused by typhoon Yolanda was examined in a simulative study of historical storm surges along Manila Bay-towards a Mitigation Strategy for Overtopping of Roxas Boulevard Seawall carried out by Eric C. Cruz, D. Eng. According to this study, the return period of the storm surge from typhoon Yolanda in Tacloban Port is estimated as 360 years.

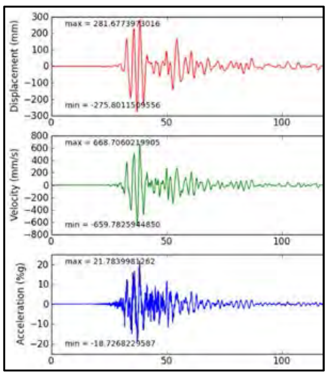


Source: Refer to left sub-clause

Figure 8.1-8 Return Period of Storm Surge at Typhoon Yolanda

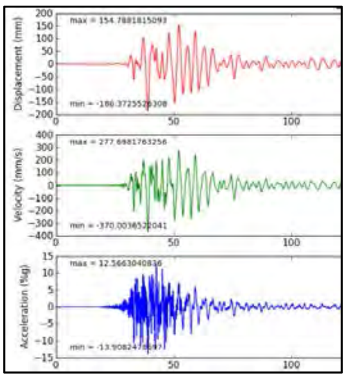
8.1.3. Earthquakes

The earthquake waveform of the Bohol earthquake was obtained from PHIVOLCS. The data indicates that the maximum horizontal acceleration of the earth's surface was 21.8g (%), and the vertical maximum acceleration of earth's surface was 12.6g (%).



Source: PHIVOLCS

Figure 8.1-9 Horizontal Vibration



Source: PHIVOLCS

Figure 8.1-10 Vertical Vibration

Design seismic intensity can be calculated based on the horizontal maximum ground acceleration of ground surface from the following:

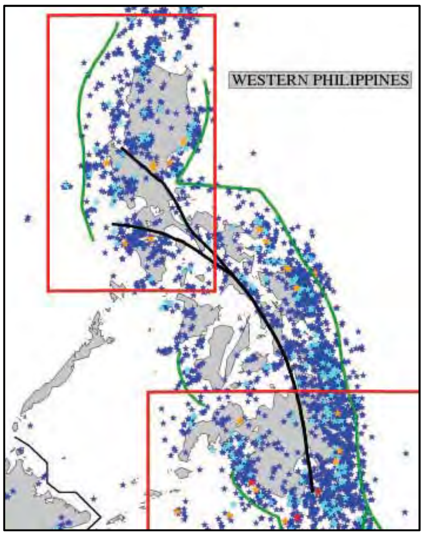
- In case $\alpha < 200$Gal
  $Kh=\alpha/g$
- In case $\alpha > 200$Gal
  $Kh=1/3 \text{ x } (\alpha/g)1/3$

Kh：Horizontal seismic intensity
A: Maximum ground acceleration in the ground surface (Gal)
g: Gravity acceleration (Gal)
$\alpha=21.8 \text{ x } 980 = 214$ gal
Kh= 0.20, hence design seismic intensity is 0.20.

Unlike in a feasibility study, the purpose of this survey is only to propose standard design models for disaster-resilient ports and to prepare rough cost estimates. Any modification to the Regional Seismic Coefficient should be made by the Government of the Philippines or implementing entities after comprehensively discussing costs, social/economic effects, etc. with concerned agencies.

The government of Japan plans to formulate port BCP at all international hub ports and major ports. No other than countries have adopt this approach to port BCP. For the Philippines, a disaster-prone island country like Japan, preparation of port BCP would be a useful measure for enhancing the disaster resiliency of ports' function.

The figure below shows earthquake predictions for the Philippines and the magnitude of past large earthquakes.



Source: PHILVOLCS

Figure 8.1-11 Earthquake 1963-2006

Table 8.1-1 Magnitude of Past Large Earthquake

	Magnitude	Origin	Location	Date
1	7.9	Tectonic	Moro Gulf	August 16, 1976
2	7.8	Tectonic	Luzon Island	July 16, 1990
3	7.5	Tectonic	Luzon Island	November 30, 1645
4	7.6	Tectonic	Mindanao	March 31, 1955
5	7.3	Tectonic	Casiguran, Aurora	August 2, 1968
6	7.2	Tectonic	Bohol & Cebu	October 15, 2013
7	7.1	Tectonic	Mindoro	November 15, 1994
8	6.7	Tectonic	Negros Oriental	February 6, 2012
9	8.3	Tectonic	Panay (Lady Caycay)	January 25, 1948
10	*Unknown*	Tectonic	Manila	June 19, 1665

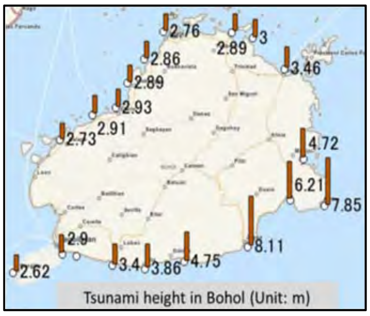
Source: Study Team

8.1.4. Tsunami

The following design tsunami height for each province is estimated based on the Ready Project, made public by the Office of Civil Defense (OCD). The estimated tsunami height on the Leyte Pacific Ocean side is 4m~ 5m, and in west bay it is 2m ~3m. The predicted tsunami height on the north coast of Bohol Province is about 3m and greater than 8m on the south coast. The predicted maximum tsunami wave height is 8.1m in Jagna. Because there is no predicted tsunami height from the Ready Project, the tsunami height of Iloilo is estimated from the tsunami hazard map of ILOILO. It is assumed that the tsunami height estimated in Iloilo City is 5m as the extent of the elevation of water inundation forecast is up to the 5m contour line. The expected tsunami height and flooded areas of each province are the following.

Source: OCD Ready Project 2015

Figure 8.1-12 Tsunami height in Leyte Area



Source: OCD Ready Project 2015

Figure 8.1-13 Tsunami height in Bohol Area

Source: OCD Ready Project 2015

Figure 8.1-14 Inundation height in Iloilo Area

9. Guidelines for Selection of Disaster Resilient Ports

9.1. Disaster Resilient Port

9.1.1. Role of Disaster Resilient Ports

When a large scale typhoon or earthquake attacks an area where ports are located, the ports and roads in the area might be seriously damaged and logistics in the area could become non-functional. It takes a long period of time to completely recover from a disaster. Therefore, ensuring the logistics even during restoration works is vital for supporting citizens and industries after a disaster. In addition, it is important to deliver emergency goods to the people in the affected areas in a timely manner in the wake of a disaster.

In order to recover from a disaster, all sectors must play their respective roles and cooperate with each other. Strategic ports should be resilient in the event of a large scale typhoon or earthquake in order to receive emergency goods transported from other areas including overseas. If damage is incurred, it is necessary to rehabilitate damaged port facilities as soon as possible.

It is desirable that all ports be resilient against disasters but the investment cost to enhance port facilities against a large scale hazard can be prohibitively high. Therefore, it is necessary to select which ports are to be resilient against disasters based on an appropriate policy. A disaster resilient port is defined below.

Disaster Resilient Port

A port which can:

maintain minimum port function;

contribute to form logistics networks; and

support disaster management activities

in case a natural disaster hits the port and/or its surrounding area.

A disaster resilient port plays an ordinary role as a port in normal times. When a disaster occurs it needs to maintain at least minimum port function to form logistics networks and ensure that supply goods reach affected areas.

In the event of a disaster, land transportation networks in the area could become crippled if the roads are damaged. If, however, ports in the area were not seriously destroyed, marine transportation route between a disaster resilient port and available ports in the area could be used as an alternative to road transportation (although certain restrictions on usage would apply). If the port through which goods to remote islands are transported is damaged, transportation of goods from a disaster resilient port could be possible.

In addition, emergency goods or rescue supplies from other areas including overseas could be transported to the people in the affected areas through a disaster resilient port. A disaster resilient port would be used as a center of rescue activities, a storage area for emergency goods and an evacuation space immediately after a disaster.

Roles of a disaster resilient port are summarized below.

To support livelihoods and industry in damaged areas by providing port service early
Livelihoods/industrial activity support function
To play a role as hub of cargo transportation and passenger traffic
Logistics function
To contribute in forming alternative routes when land transportation routes are damaged
Bypass function
To provide space for disaster management activities immediately after a disaster
Space-providing function

9.1.2. Basic Idea on Development of Disaster Resilient Port

The Philippines consist of many islands. Thirty one (31) provinces are located in Luzon Island whose area is approximately 110,000km2 and twenty one (21) provinces are in Mindanao Island whose area is approximately 9,800km 2. There are four (4) provinces in Panay Island, three (3) provinces in Samar Island, two (2) provinces in Negros Island, Mindoro Island and Leyte Island, and one (1) province in Palawan Island. The areas of these provinces range from 7,300 km2 to 13,000 km2. Another fifteen (15) provinces are located in the islands where the area is less than 5,000 km2 or in several small islands.

All goods for daily life and materials used or products produced by industries of the provinces which are located in the islands other than Luzon Island and Mindanao Island are transported through the ports located in the island. This means that when the ports are seriously damaged and not able to function, people’s lives and industrial activities in the province will be in great jeopardy.

On the other hand, administration on Disaster Risk Reduction and Management (DRRM) of Philippines has been designed by a hierarchy of the country, regional, provincial, city/municipality and barangay levels. The core level depends on the characteristics and scale of disaster but it is thought that the role of provincial governments is significant in DRRM because the government of Philippines takes a policy of decentralization and provinces have a function of linking a relation between the central government and LGUs.

In terms of the target areas, only Bohol province is located in Bohol Island but there are three other provinces in Panay Island and another province in Leyte Island. In consideration of the economic activities of Iloilo City and Tacloban City as well as the location of ports and the road network in the islands, the study is conducted based on the basic policy on disaster resilient ports which is shown below.

Basic Policy on Development of Disaster Resilient Ports in the Target Area

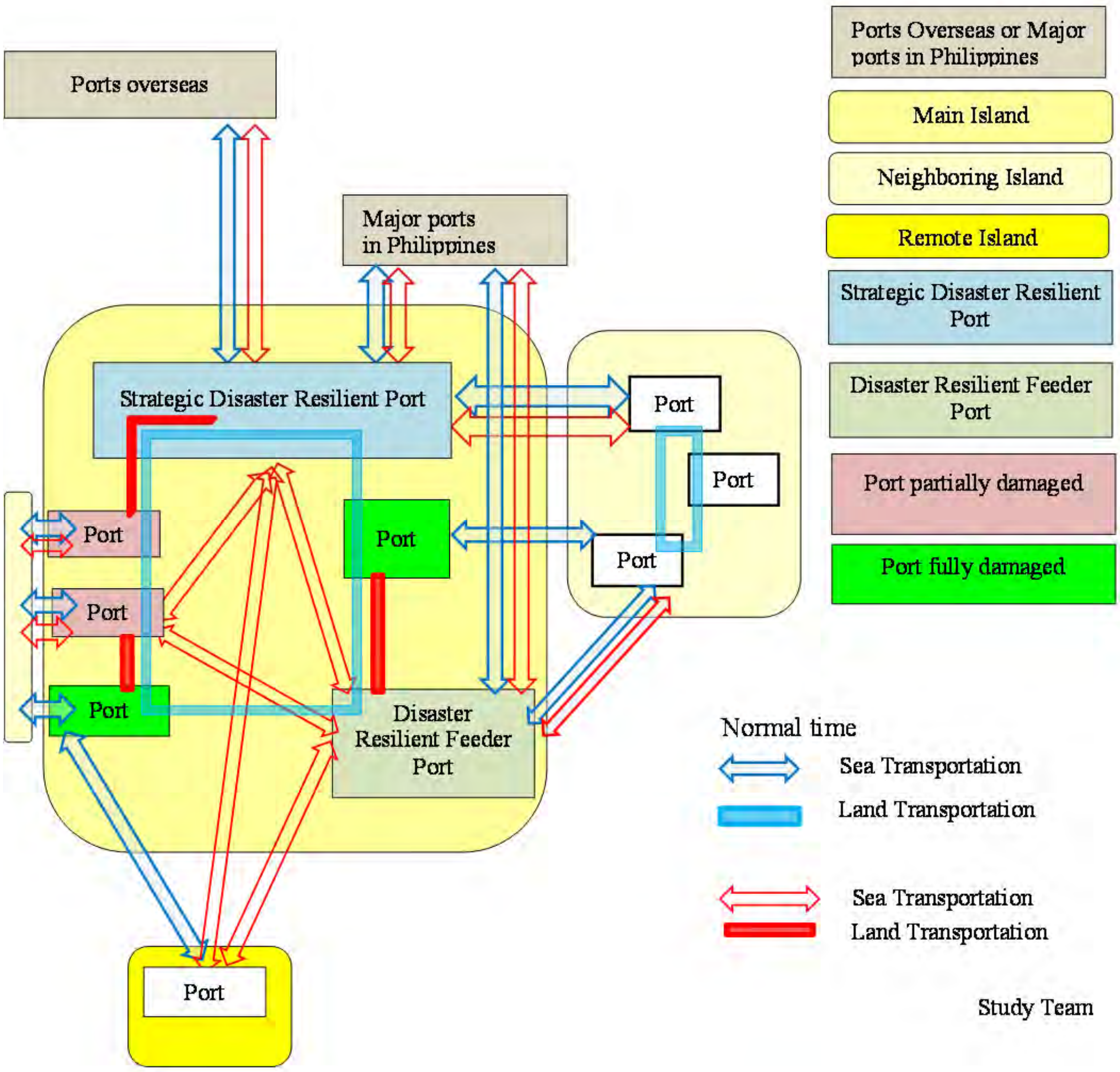
- One disaster resilient port shall be deployed in each province **<Strategic Disaster Resilient Port>**
- Port(s) other than the strategic disaster resilient port shall be enhanced against disasters according to importance from the viewpoint of disaster resilience. Number of ports shall

be decided considering population and economic activities in the Province. **<Disaster Resilient Feeder Port>**

- Small ports located along coastal lines and not damaged seriously may receive goods or persons transported by small boats from disaster resilient ports
- Relation to the ports in neighboring provinces shall be taken into consideration.

Source: Study team

The following figure shows the image of the disaster resilient port and network.



Source: Study team

Figure 9.1-1 Concept of Logistics Network and Disaster Resilient Port

9.2. Ports in the Target Area

There are approximately 150 ports of a variety of sizes in Iloilo provinces, Bohol Province and Leyte Province. Many of them are small ports which play a role as a base of daily activities of the local people and provide a limited function related to logistics.

Generally ports which have a certain level logistical functions are operated under well-organized management, port activities are monitored and port statistics are properly kept. However, almost all small ports in the target area are not operated appropriately. The ports listed in the table below are mainly under PPA and port statistics are compiled. Disaster resilient ports will be selected from among these ports. From the viewpoint of data acquisition, this is thought to be reasonable.

Table 9.2-1 Ports of Considerations

Province Port	Category by PPA[1)]	Classification in PPA Statistics [1)]
Iloilo Province		
Iloilo Port	PMO[2)] (Base Port)	Base Port
Dumangas Port	Under TMO[3)]	Other Government Port
Estancia Port	Under TMO	Terminal Port
Guimbal Port	Under TMO	Other Government Port
Concepcion Port	Under TMO	
Progreso Port	Under TMO	-
Culasi	Under TMO	-
Bohol Province		
Tagbilaran Port	PMO(Base Port)	Base Port
Tubigon Port	Under TMO	Terminal Port
Jetafe Port	Under TMO	Terminal Port
Talibon Port	Under TMO	Terminal Port
Ubay Port	Under TMO	Terminal Port
Jagna Port	Under TMO	Terminal Port
Tapal Port	Under TMO	Other Government Port
Loay Port	Under TMO	Other Government Port
Leyte Province		
Tacloban Port	PMO(Base Port)	Base Port
Ormoc Port	PMO(Base Port)	Base Port
Palompon Port	Under TMO	Terminal Port
San Isdro Port	Under TMO	Terminal Port
Baybay port	Under TMO	Terminal Port
Hlongos Port	Under TMO	Terminal Port
Isabel Port	Under TMO	Other Government Port
Bato Port	-	Other Government Port

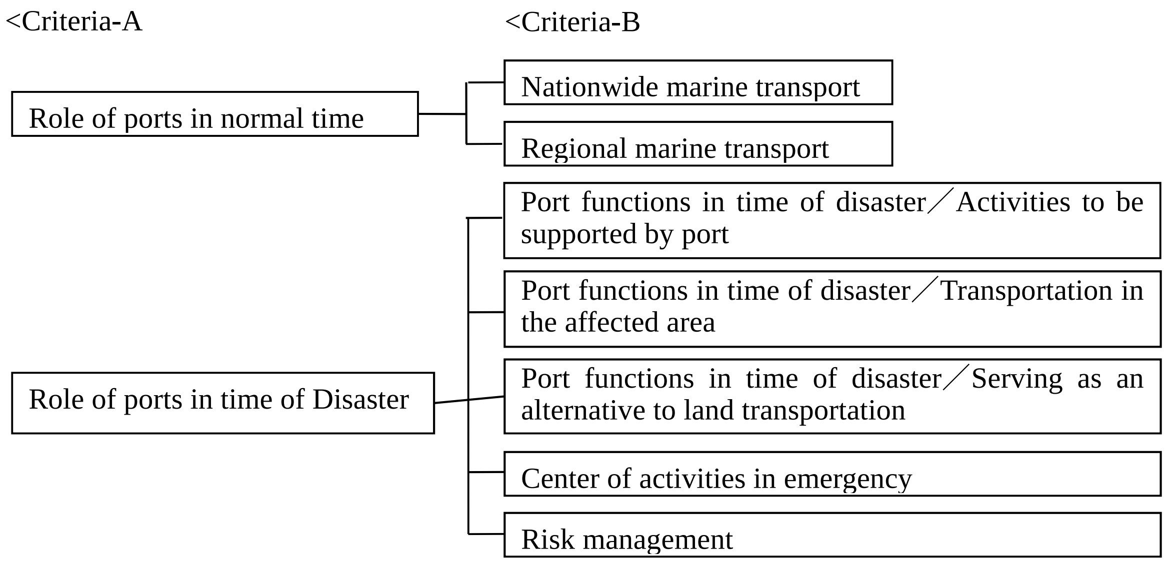
1) There is difference between Category by PPA and Classification in PPA Statistics
2) PMO: Port Management Office, 3) TMO: Terminal Management Office
Source: PPA material and PPA Statistics

9.3. Criteria for Selection

9.3.1. Items of Selection Criteria

A disaster resilient port is selected based on importance which is analyzed according to the role of a port in normal time and in time of disaster (Criteria-A) and port functions at both times (Criteria-B).

In normal times, functions related to nationwide marine transportation and regional marine transportation are adopted as items of criteria-B. In times of disaster, functions related to support for social and economic activities, transportation in the affected area and serving as an alternative to land transportation are adopted items of criteria-B. In addition, role of ports as a center of activities in emergency and disaster risk management are also considered and adopted as items of criteria-B. (See Figure 9.3-1)



Source: Study team

Figure 9.3-1 Selection Criteria

9.3.2. Criteria and Indicators

It is necessary to adopt proper indicators corresponding to each selection criteria. Considering the situation of the target area and availability of data, the following indicators were adopted.

For criteria-B on functions for roles of a port in normal time, the position of the port in Philippine is adopted as an indicator for nationwide marine transportation and characteristics of a RORO terminal is adopted as an indicator of regional maritime transportation.

For criteria-B on functions for roles of a port in time of disaster, the scale of socio-economic activities in the hinterland and scale of cargo volumes through a port have been adopted as indicators of activities to be supported by a port; maritime transportation across a wide area, maritime transportation network in the region and connectivity with land transportation are adopted as indicators of transportation in the affected area; and location of ports in the province and road traffic behind a port are adopted as indicators of alternative to land transportation.

Capacity for receiving emergency goods, space for activities, situation of port management, communication with the disaster management center and facilities of emergency activities are adopted as indicators of a center of activities in emergency. Risk level of hazard, location of potential alternative ports and redundancy are adopted as indicators of risk management.

The indicators criteria (B) are shown in Table 9.3-1.

Table 9.3-1 Criteria for Selection

Role of ports in normal time		<Indicator>
	Nationwide marine transport	Position in nationwide marine transport perspective
	Regional marine transportation	Role in regional marine transportation
Role of ports in time of disaster		<Indicator>
	Port functions in time of disaster/ Activities to be supported by a port	Scale of social and economic activities in the hinterland area
		Scale of cargo volumes through a port
	Port functions in time of disaster/ Transportation in the affected area	Maritime transportation across a wide area
		Maritime transportation network in the region
		Connectivity with land transportation
	Port functions in time of disaster/ Serving as an alternative to land transportation	Location of ports
		Traffic on the road behind a port
	Center of activities in emergency	Capacity for receiving emergency goods
		Space for activities
		Situation of port management
		Communication with the disaster management center
		Facilities of emergency activities
	Risk management	Risk level of hazard
		Location of potential alternative ports
		Redundancy

Source: Study team

9.4. Guidelines

1. Disaster Resilient Port

In port planning and design of port facilities, the marine conditions or external forces caused by earthquake and typhoons are taken into consideration. Therefore ports or port facilities have a certain level of strength against natural hazards. A disaster resilient port is a port which provides port facilities which are fortified against the external forces by larger typhoons or earthquakes than generally expected. The development of such fortified facilities entails a large investment cost. On the other hand, a large scale hazard does not happen frequently. It is necessary that the development of disaster resilient ports shall be determined based on a thorough study on possible disasters, the roles of the port in time of disaster and economic analysis.

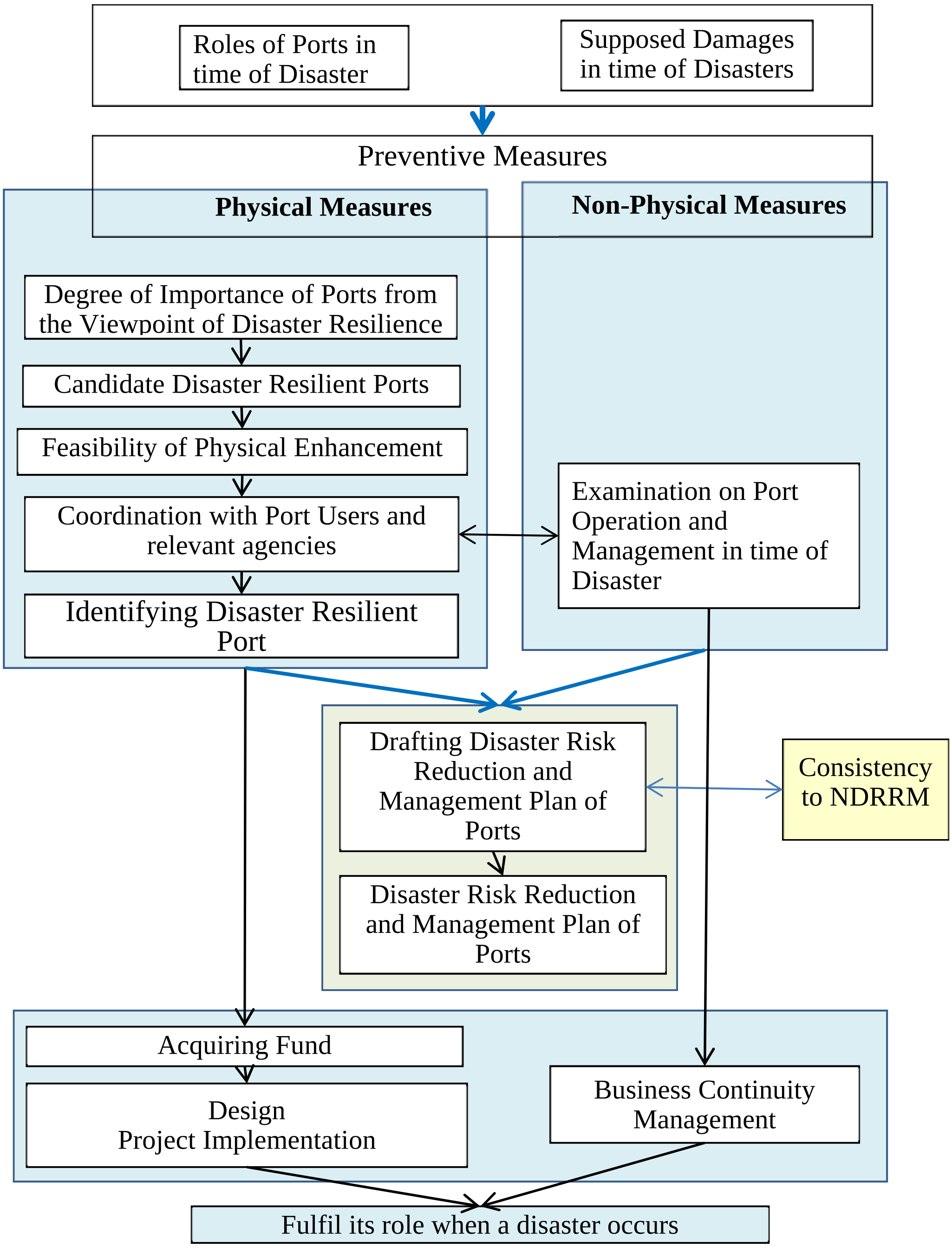
In general, disaster resilient ports are developed taking the procedure shown in Figure 0 1 into consideration. In selecting a disaster resilient port by applying the criteria, it is important to keep the overall flow shown in the figure in mind.

The hazards which often affect ports are typhoons, earthquakes and tsunamis. Such port facilities as wharves, yards and buildings may be destroyed or damaged by these hazards. A disaster resilient port provides enhanced port facilities which will not be damaged by assumed large scale hazards.

A disaster resilient port is developed from a viewpoint of preventive measures at the pre-disaster stage and thus it is necessary to recognize possible damages in time of disaster. Preventive measures for both physical and non-physical aspects shall be taken against such possible damages. The degree of importance of a port in disaster resilience shall be calculated based on the selection criteria considering the supposed disaster. Ports which have a high degree of importance are candidate ports and possible damages and counter measures shall be examined. Then, the adequacy as a disaster resilient port of these ports shall be examined from technical, economic and financial and natural or social environmental viewpoints. On the other hand, port operation in time of disaster requires cooperation from port users. Therefore, consultation with them is necessary for determining which ports should be selected as disaster resilient ports. Required reinforcement of port facilities at a disaster resilient port shall be implemented after acquired necessary budget.

The development of disaster resilient ports should be implemented systematically based on government policy. It is recommended that a nationwide master plan of disaster risk reduction and management of the port sector be formulated. The plan should be formulated with the cooperation of OCD in order to ensure consistency with NDRRMP.

The guidelines were drafted under the assumption that a Yolanda-class typhoon and Bohol-class earthquake could occur in the target area (the provinces of Iloilo, Bohol and Leyte).



Source: Study team

Figure 9.4-1 Procedure for Development of Disaster Resilient Port

2. Selection of Disaster Resilient Port

For ports in the target area, the degree of importance in disaster resilience is calculated. After accessing numerical results, disaster resilient ports are selected.

(1) Selection Criteria

Criteria-A: Roles of Ports in normal time

Roles of Ports in time of disaster

Criteria-B in normal time:	Nationwide maritime Transportastion
	Regional maritime transportation
Criteria-B in time of disaster:	Port functions in time of disaster / Activities to be supported by port
	Port functions in time of disaster / Transportation in the affected area
	Port functions in time of disaster / Serving as an alternative to land transportation
	Center of activities in emergency
	Risk management

(2) Calculation of the Degree of Importance

Considering local conditions, characteristics of ports, and framework for disaster risk reduction and management as well as quality of data, criteria will be weighted and values of data of for indicators will be ranked. The following formula is used for calculate a port's degree of importance.

The degree of importance is calculated according to the following steps:

Step 1: Allocation of weight of criteria –A: α and β

Step 2: Allocation of weight of criteria –B in normal time: γ1 and γ2.

Step 3: Allocation of weight of criteria ‐B in time of disaster: δ1、δ2、δ3、δ4、and δ5

Step 4: Ranking of data of each indicator: X and Y

Step 5: Calculation according to the formula

This parametric calculation method can be applied to the other areas which have different situations.

$$S = \alpha \times \left(\sum_{i=1}^{I} \gamma_i \times \left\{\left(\sum_{j=1}^{J_i} X_{ij}\right)/J_i\right\}\right) + \beta \times \left(\sum_{k=1}^{K} \delta_k \times \left\{\left(\sum_{l=1}^{L_k} Y_{kl}\right)/L_k\right\}\right)$$

S	:Score
α	:Weight for Normal Time
β	:Weight for Time of Disaster
γ_i	:Weight for Viewpoint(i) for Normal Time
δ_k	: Weight for Viewpoint (k) for Time of Disaster
X_{ij}	:Rank of data for indicator for Criteria-A (i) and Criteria-B (j)
Y_{kl}	:Rank of data for indicator for Criteria-A (k) and Criteria-B (l)
I	:Number of Criteria-B items for Normal Time
J_i	:Number of indicators items for Criteria-B (i)
K	:Number of Criteria-B items for Time of Disaster
L_k	:Number of indicators items for Criteria-B (k)

(3) Accessing Numerical Result

Because criteria shall indicate basic factors and indicators are adopted considering availability and restriction of data, the numerical results cannot always fully reflect the actual situation. Therefore it is necessary that the degree of importance shall be decided after the numerical results are reviewed and assessed from the engineering, economic and financial and natural and social environmental viewpoints.

3. Cooperation to and Coordination with Port Users and Relevant Agencies

The development of a disaster resilient port is not only to construct port facilities which would not be damaged by a hazard but also to establish a system for retaining the functions as a logistics center and supporting various kinds of activities at the port in time of disaster. Measures to be taken at a disaster resilient port are shown in Table 9.4-1.

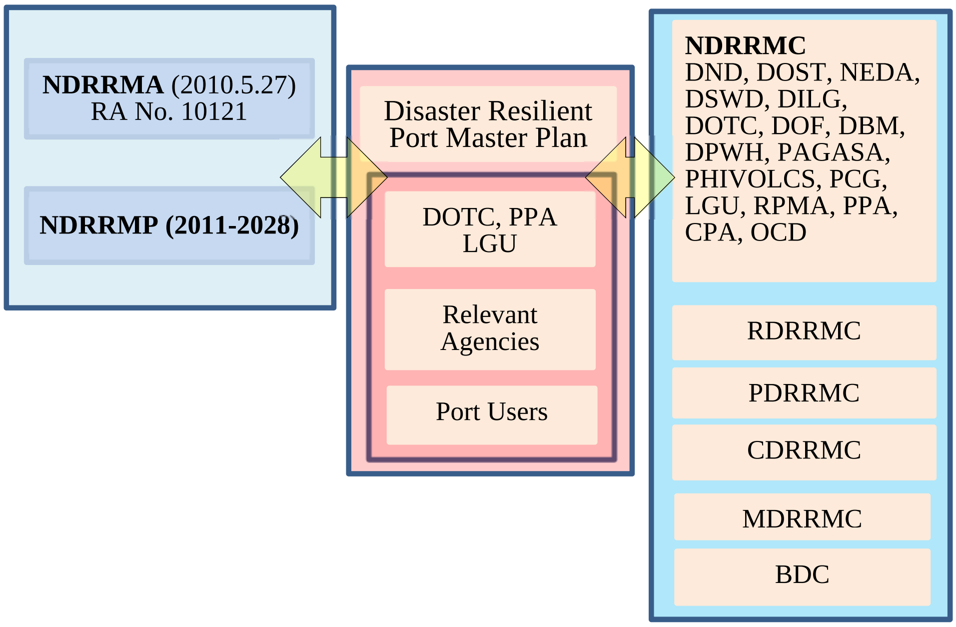
In order to ensure that the port fulfills its expected roles, cooperation among the port management body, port users and relevant agencies is necessary. In the recovery stage, coordination on methods or procedures of rehabilitation among concerned parties is also indispensable. Business continuity management is an effective means for realizing these aims.

Table 9.4-1 Measures to be taken at a Disaster Resilient Port

Pre-Disaster Phase	Immediately before and during Disaster Phase	Post Disaster Phase
Physical Measures		
- Disaster resilient port master planning - Construction of disaster resilient port facilities	- Temporary strengthening for approaching typhoon - Installation of facilities for emergency operation as necessary	-Procurement of facilities for provisional use of damaged facilities - Rehabilitation of damaged facilities
Non-physical		
- Disaster resilient port master Planning - Preparing management and operation system in emergency - Drill	- Preparation for approaching typhoon - Survey of damaged facilities - Port management and operation in emergency	- Port management and operation in the stage of provisional use - Preparing Restoration Plan

Source: Study team

The government of the Philippines has compiled a comprehensive plan for disaster risk reduction and management under RA10121-2010 (DRRMA). In addition, a nationwide system for disaster risk reduction and management has been established. The system has been built with a hierarchy of the central government, region, province, city, municipality and barangay levels. Disaster resilient ports fulfill their roles in compliance with the policy of the government, provinces and cities/municipalities. (See Figure 9.4-2)



Source: study team

Figure 9.4-2 Framework on DRRM of the Government and the Port sector

9.5. Calculation of Level of Importance as Disaster Resilient Ports

9.5.1. Preconditions

Disaster resilient ports are selected among the ports in the provinces of Iloilo, Bohol and Leyte which are listed in Table 9.2-1 based on the degree of importance of each port. One disaster resilient port and one disaster resilient feeder port are selected for each province taking geographical and socio-economic conditions into consideration.

9.5.2. Allocation of Criteria Weights

Degrees of importance of target ports were calculated in accordance with the selection criteria.

Weights for functions of ports (Criteria-A) are allocated as 0.1 in normal time and 0.9 in time of disaster considering that this study focuses on the relation between ports and disaster.

Weights for functions of ports in normal time (Criteria-B) are allocated as 0.7 on a nationwide viewpoint and 0.3 on a regional viewpoint focusing on the advantages of marine transportation over a long distance.

With regard to roles of ports in time of disaster (Criteria-B), weights are allocated almost evenly among port functions in time of disaster, center of activities in emergency and risk management. In addition, the same weights are allocated to activities to be supported by port, transportation in the affected area and alternatives to land transportation of port functions in time of disaster. As a result, the weights are allocated to each viewpoint as shown in Table 9.5-1.

Table 9.5-1 Weight Allocation

The role of a port in normal time	0.1	
	Nationwide transportation	0.7
	Regional marine transportation	0.3
Role of ports in time of disaster	0.9	
	Port functions in time of disaster/ Activities to be supported by a port	0.1
	Port functions in time of disaster/ Transportation in the affected area	0.1
	Port functions in time of disaster/ Serving as an alternative to land transportation	0.1
	Center of activities in emergency	0.35
	Risk management	0.35

Source: Study team

9.5.3. Data for Indicators

Data items which are thought to represent each indicator shall be selected considering availability and accessibility of data.

1. Normal Time

(1) Nationwide Maritime Transport Perspective

1) Position in nationwide marine transportation (X11)

Ports in Philippines are classified into gateway ports, important ports or regional ports according to The study on the Master Plan for the Strategic Development of the National Port System (Jan. 2004 JICA) . On the other hand, PAP classified PPA ports by itself. By reference to these classifications, the ports are classified into gateway ports (major windows of the country to the world), major ports (Important ports for domestic and/or international maritime transport), PPA base ports (other than the above), other PPA ports and LGU ports.

(2) Regional Marine Transportation

1) Role in regional marine transportation (X21)

In the report, RORO terminals are categorized into those on the route of SHRH or mobility enhancing terminal. The categories are used.

2. Time of Disaster

(1) Port Functions in Time of Disaster/ Activities to be Supported by a Port

1) Scale of social and economic activities in the hinterland area (Y11)

Population of the city/municipality in which a port is located is used to indicate the scale of social and economic activities in the hinterland area. Data on population can be obtained in statistics prepared by PSA.

2) Scale of cargo volumes through a port(Y12)

Total annual cargo volume of a port is used to indicate the scale of cargo volumes through a port. Data can be obtained in PPA port statistics.

(2) Port functions in time of disaster/ Transportation in the affected area

1) Maritime transportation across a wide area (Y21)

The port where vessels from/to main ports in Philippines call at in normal time will be used by such vessels in time of disaster and so the record of ship calls of such vessels is used as data to indicate maritime transportation across a wide area. Data can be obtained in PPA port statistics.

2) Maritime transportation network in the region (Y22)

RORO service network plays an important role in maritime transportation in the target area and so the service frequency of RORO vessels in a year is used as data to indicate the Maritime transportation network in the region. Data is able to be obtained in PPA port statistics.

3) Connectivity with land transportation (Y23)

Classification of roads into primary roads, secondary roads and tertiary roads by DPWH are basic information on conditions of roads in Philippines. For example, a port which is located near a primary road has good connectivity with land transportation. Accordingly, road classification by DPWH is used to indicate connectivity with land transportation. Data can be obtained from the web-site of DPWH (survey by DPWH February 11. 2012).

(3) Port functions in time of disaster/ Serving as an alternative to land transportation

1) Location of ports (Y31)

Scale of damage of ports depends on the scale of the disaster and the distance from the center of a typhoon or the epicenter of an earthquake. Ports whose port facilities are not damaged seriously can be used even in time of disaster; accordingly, the number of ports in the province is used to indicate the existence of available ports. Basic data can be obtained from the port inventory maintained by DOTC.

2) Traffic on the road behind a port (Y32)

The results of a road traffic survey conducted by DPWH can be used to grasp road traffic behind a port. Data can be obtained from the web-site of DPWH.

(4) Center of activities in emergency

1) Capacity for receiving emergency goods (Y41)

The size of vessels which a port can accommodate is an important factor for receiving emergency goods in time of disaster and thus the maximum depth of quays of a port is used to indicate the capacity for receiving emergency goods. Data can be obtained from leaflets of each port prepared by PPA or other agencies.

2) Space for activities (Y42)

A port premise is a certain scale of area under public control and thus the port premise area is used to indicate space for emergency activities. Data can be obtained from leaflets of each port prepared by PPA or other agencies.

3) Situation of port management (Y43)

Capacity and manpower for management in time of disaster depends on the organizational structure of a port management office such as headquarter, PMO or TMO. This data will be used to grasp the situation of port management.

4) Communication with the disaster management center (Y44)

In time of disaster, communication with relevant authorities is highly important. It is thought that the capability of communication depends on the level of councils in DRRM structure. Airports play an important role for making access to such authorities easy. In the target area, an airport is located at the capital city of the province which has to play a role as disaster management center in the area.

5) Facilities of emergency activities (Y45)

An administration office or warehouses in a port can be used for installation of equipment for communication, storage of rescue supplies or emergency goods or temporary evacuation in time of disaster. The existence of such buildings is used to identify facilities of emergency activities. Data can be obtained from leaflets of each port prepared by PPA or other agencies.

(5) Risk Management

1) Risk level of hazard (Y51)

Relevant authorities issue documents on the level of risks of typhoon, earthquake or tsunamis. They are used as data on risk levels of hazard.

2) Location of potential alternative ports (Y52)

When there are no other ports located within a certain range from a port, it is difficult to shift the role of the port to other ports in the event of need. Number of commercial ports in a certain range is used to identify the location of potential alternative ports.

3) Redundancy (Y53)

From a viewpoint of redundancy, it is better for a port which plays a supplementary role to a strategic disaster resilient port to be located at the area far from the strategic disaster resilient port. Distance from a representative port is used as data for an indicator of redundancy. Data is obtained by measuring the distance in a map.

The abovementioned indicators and data items are summarized in the following tables.

Table 9.5-2 Indicators and Data

1. Logistics in normal time		
(1) Nationwide marine transport perspective		Class of a port in the study on the Master Plan for the Strategic Development of the National Port System (Jan. 2004 JICA) or PPA Classification
(2) Regional marine transportation		Characteristics as RORO terminal in The study on the Master Plan for the Strategic Development of the National Port System (Jan. 2004 JICA)
2. Role of ports in time of disaster		
(1) Port functions in time of disaster/ Activities to be supported by a port		
	1) Scale of social and economic activities in the hinterland area	Population of the city/municipality where a port is located
	2) Scale of cargo volumes through a port	Annual cargo throughput
(2) Port functions in time of disaster/ Transportation in the affected area		
	1) Maritime transportation across a wide area	Sea route connecting with main ports
	2) Maritime transportation network in the region	Number of RORO ship call
	3) Connectivity with land transportation	Class of the road behind a port
(3) Port functions in time of disaster/ Serving as an alternative to land transportation		
	1) Location of ports	Number of ports in the province
	2) Traffic on the road behind a port	Road traffic behind a port
(4) Center of activities in emergency		
	1) Capacity for receiving emergency goods	Maximum depth of quays
	2) Space for activities	Area of a port
	3) Situation of port management	Port Management Body
	4) Communication with the disaster management center	Location of the management center
	5) Facilities of emergency activities	Existing buildings
(5) Risk management		
	1) Risk level of hazard	Occurrence Risk of typhoon, earthquake and tsunamis
	2) Location of potential alternative ports	Number of port in the vicinity
	3) Redundancy	Distance from a representative port

Source: Study team

Values of data are categorized into ranks considering the characteristics of data, local conditions and characteristics of a port etc. as shown in Table 9.5-3. The value of ranks is used for calculation. In case all indicators mark the highest ranks, the score becomes 10 by multiplied the result of calculation by two(2).

Table 9.5-3 Data Ranking

Indicator	Data
Class of a port/ /PPA Classification	Master Plan Study(2004), PPA Classification Gateway Port：5, Major port : 4, PPA Base port: 3, Other PPA port: 2, LGU port: 1
Characteristics as RORO terminal	Master Plan Study(2004) SNRH:5, Mobility: 3
Population of the city/municipality where a port is located	Population of municipality (2010) 200,000 and more: 5, 100,000－200,000: 4, 50,000－

Indicator	Data
	100,000: 3, 10,000－50,000: 2, 1－10,000: 1
Annual cargo throughput	Annual cargo throughput (2014) 1,000,000 and more: 5, 100,000－1,000,000: 4, 50,000-100,000: 3, 10,000－50,000: 2, 1－10,000: 1
Sea route connecting with main ports	Ship call in a month (2014) Plural calls: 5, One call: 3
Number of RORO ship call	Annual RORO Ship call Three calls per day: 5, two calls: 4, daily call: 3, every other day call: 2, call less than every other day: 1
Class of the road behind a port	Class of Road Primary road (Asia Higyway): 5,Primary Road: 4, Secondary Road: 3, Tertiary Road 2, Other Road: 1
Number of ports in the province	Number of ports in the Province 20 and more: 5, 10 to less than 20: 3, less than 10: 1
Traffic on the road behind a port	Average traffics of survey points on the coastal roads near the port 10,000 and more: 5, 5,000－10,000: 4, 2,000－5,000: 3, 1,000－2,000: 3, less than 1,000: 1
Maximum depth of quays	Maximum depth of berth 10 m and more: 5, 7.5－10: 4, 6.0－7.5: 3, 4.0－6.0: 2, less than 4.0: 1
Area of a port	Total area of the port 100,000 and more: 5, 10,000－100,000: 4, 5,000－10,000: 3, 1,000－5,000: 3, less than 1,000: 1
Port management body	Port management body PPA-HQ: 5, PPA-PMO: 4, PPA-TMO: 3, OGP: 2, LGU: 1
Location of the management center	Location of Hierarchy level NDRRMC: 5, RDRRMC: 4, PDRRMC: 3, CDRRMC: 2, MDRRMC: 1
Existing buildings	Buildings in the port area Administration Building and Other buildings: 5, Administration Building or Other buildings: 3
Occurrence risk of disasrer (ttyphoon, earthquake and tsunami)	Risk Level Typhoon: 5 to 1, Earthquake and Tsunami: 3 to 1
Number of port in the vicinity	Ports located within 50km None: 5, one : 3, two: 2 three and more: 1
Distance from a representative port	Distance(km) from the representative port in the province 100 km and more: 5, 50 -100,km:3, less than 50:1

Source: Study team

9.5.4. Calculation

The degree of importance can be calculated using the Calculation Table shown below. Data (rank) of X and Y shall be given based on the above-mentioned and calculations shall be carried out for each step using the equations in the table. An explanation of the formula and step of calculation in details is shown in the reference.

Table 9.5-4 Calculation Sheet

Name of Port					
Criteria-A/Criteria –B/Indicator	**Weight for Criteria-A**		**Weight for Criteria-B**		**Rank Value**
Score = Logistics + Disaster					
Nomal Time **=** 0.1 x (Sum of the two values below)	α	0.1			
Nationwide maritime transportation = 0.7 x (X_{11}) /1			γ_1	0.7	
Class of a port/ /PPA Classification					X_{11}
Regional maritime transportation = 0.3 x (X_{21}) /1			γ_2	0.3	
Characteristics as RORO terminal					X_{21}
Time of Disaster =0.9 x (Sum of the five values below)	β	0.9			
Activities in Area to be supported = 0.10 x (Y_{11} +Y_{12}) / 2			δ_1	0.10	
Population of the city/municipality					Y_{11}
Annual cargo throughput					Y_{12}
Transpotations in the affected area **=0.**10 x (Y_{21} +Y_{22}+Y_{22}) / 3			δ_2	0.10	
Sea route connecting with main ports					Y_{21}
Number of RORO ship call					Y_{22}
Class of the road behind a port					Y_{23}
Serving as an alternative to land transportation = 0.10 x (Y_{31} +Y_{32}) / 2			δ_3	0.10	
Number of ports in the province					Y_{31}
Traffic on the road behind a port					Y_{32}
Center of activities in emergency = 0.35 x (Y_{41} +Y_{42}+Y_{43}+Y_{44}+Y_{45}) / 5			δ_4	0.35	
Maximum depth of quays					Y_{41}
Area of aport					Y_{42}
Port management body					Y_{43}
Location of the management center					Y_{44}
Buildings in the port					Y_{45}
Risk management = 0.35 x (Y_{51} +Y_{52}+Y_{53}) / 3			δ_5	0.35	
Occurrence risk of disaster					Y_{51}
Number of port in the vicinity					Y_{52}
Distance from a representative port					Y_{53}

Source: Study team

9.5.5. Numerical Results

The rank values of indicators on each port in the provinces of Iloilo, Bohol and Leyte is shown in Table 9.5-5, Table 9.5-6, and Table 9.5-7. The degrees of importance of the ports area were calculated and the numerical results for the ports in these areas are shown in Figure 9.5-1, Figure 9.5-2, and Figure 9.5-3.

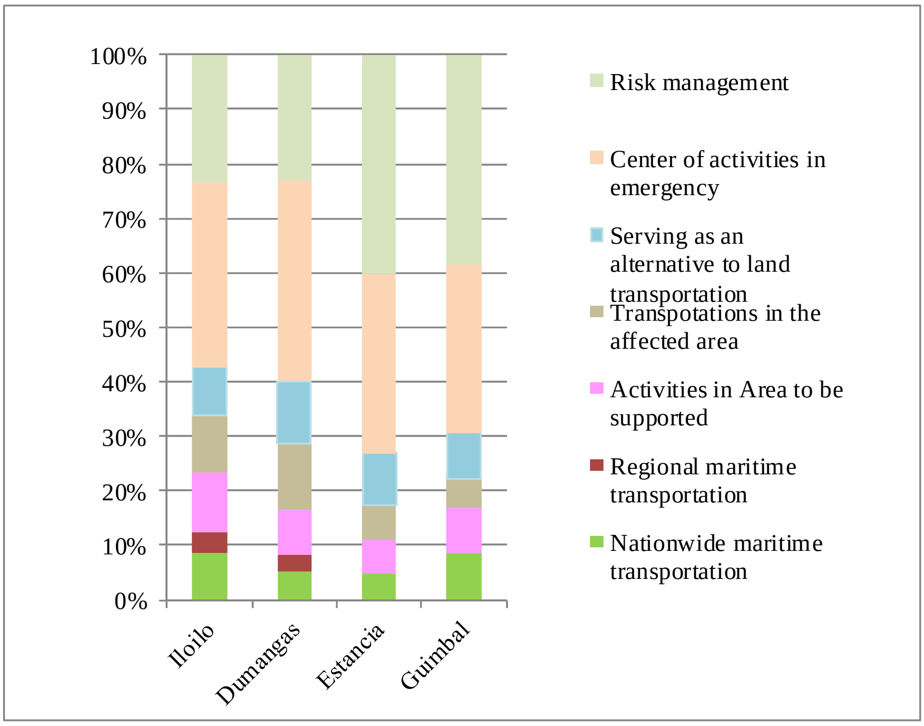
In Iloilo province, Iloilo port has the highest score followed by Estancia port. In Bohol Province, Tagbilaran port has the highest score followed by the ports of Tapal, Jagna, Ubay and Tubigon, which all earned the same score. In Leyte province Tacloban port has the highest score followed by Ormoc port.

Table 9.5-5 Calculation Table (Ports in Iloilo Province)

Name of Port			**Iloilo**	**Dumangas**	**Estancia**	**Guimbal**
Criteria-A/Criteria –B/Indicator	Weight		rank value	rank value	rank value	rank value
Score = Logistics + Disaster			4.06	2.74	2.87	1.63
Logistics = 0.1 x (Sum of the two values below)	α	0.1	5.00	2.30	1.40	1.40
Nationwide maritime transportation = 0.7 x (X11) /1	γ1	0.70	3.50	1.40	1.40	1.40
Class of a port/ /PPA Classification			5	2	2	2
Regional maritime transportation = 0.3 x (X21) /1	γ2	0.30	1.50	0.90	0.00	0.00
Characteristics as RORO terminal			5	3	0	0
Disaster =0.9 x (Sum of the five values below)	β	0.9	3.96	2.79	3.03	1.66
Activities in Area to be supported = 0.10 x (Y11 +Y12) / 2	δ1	0.10	0.50	0.25	0.20	0.15
Population of the city/municipality			5	3	2	1
Annual cargo throughput			5	2	2	2
Transpotations in the affected area = 0.10 x (Y21 +Y22+Y22) / 3	δ2	0.10	0.47	0.37	0.20	0.10
Sea route connecting with main ports			5	3	3	0
Number of RORO ship call			5	5	0	0
Class of the road behind a port			4	3	3	3
Serving as an alternative to land transportation = 0.10 x (Y31 +Y32) / 2	δ3	0.10	0.40	0.35	0.30	0.15
Number of ports in the province			3	3	3	3
Traffic on the road behind a port			5	4	3	0
Center of activities in emergency = 0.35 x (Y41 +Y42+Y43+Y44+Y45) / 5	δ4	0.35	1.54	1.12	1.05	0.56
Maximum depth of quays			5	3	3	5
Area of port			5	4	3	0
Port management			4	3	3	2
Location at disaster management center			3	1	1	1
Buildings in the port			5	5	5	0
Risk management = 0.35 x (Y51 +Y52+Y53) / 3	δ5	0.35	1.05	0.70	1.28	0.70
Occurrence risk of disaster			2	2	3	2
Number of port in the vicinity			2	3	3	3
Distance from a representative port			5	1	5	1

Source: Study team

Iloilo	Dumangas	Estancia	Guimbal
8	5	6	3



Source: Study team

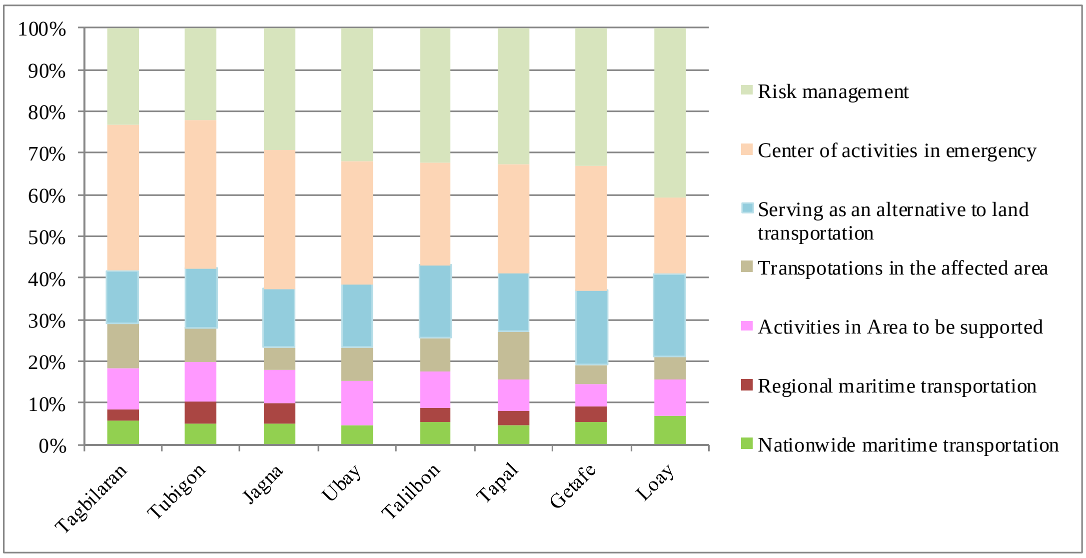
Figure 9.5-1 Numerical Result of Ports in Iloilo Province

Table 9.5-6 Calculation Table (Ports in Bohol Province)

Name of Port			Tagbilaran	Tubigon	Jagna	Ubay	Talilbon	Tapal	Getafe	Loay
Criteria-A/Criteria –B/Indicator	Weight		rank value	rank value	rank value	rank value	rank value	rank value	rank value	rank value
Score = Logistics + Disaster			3.60	2.84	2.86	2.97	2.59	2.89	2.53	2.06
Logistics = 0.1 x (Sum of the two values below)	α	0.1	3.00	2.90	2.90	1.40	2.30	2.30	2.30	1.40
Nationwide maritime transportation = 0.7 x (X11) /1	γ1	0.70	2.10	1.40	1.40	1.40	1.40	1.40	1.40	1.40
Class of a port/ /PPA Classification			3	2	2	2	2	2	2	2
Regional maritime transportation = 0.3 x (X21) /1	γ2	0.30	0.90	1.50	1.50	0.00	0.90	0.90	0.90	0.00
Characteristics as RORO terminal			3	5	5	0	3	3	3	0
Disaster =0.9 x (Sum of the five values below)	β	0.9	3.67	2.84	2.85	3.15	2.62	2.96	2.56	2.14
Activities in Area to be supported = 0.10 x (Y11 +Y12) / 2	δ1	0.10	0.40	0.30	0.25	0.35	0.25	0.25	0.15	0.20
Population of the city/municipality			3	2	2	3	3	3	2	3
Annual cargo throughput			5	4	3	4	2	2	1	1
Transpotations in the affected area = 0.10 x (Y21 +Y22+Y22) / 3	δ2	0.10	0.43	0.27	0.17	0.27	0.23	0.37	0.13	0.13
Sea route connecting with main ports			5	0	0	0	0	5	0	0
Number of RORO ship call			5	5	2	5	2	5	1	1
Class of the road behind a port			3	3	3	3	5	1	3	3
Serving as an alternative to land transportation = 0.10 x (Y31 +Y32) / 2	δ3	0.10	0.50	0.45	0.45	0.50	0.50	0.45	0.50	0.45
Number of ports in the province			5	5	5	5	5	5	5	5
Traffic on the road behind a port			5	4	4	5	5	4	5	4
Center of activities in emergency = 0.35 x (Y41 +Y42+Y43+Y44+Y45) / 5	δ4	0.35	1.40	1.12	1.05	0.98	0.70	0.84	0.84	0.42
Maximum depth of quays			4	3	5	1	2	2	3	1
Area of port			4	4	3	4	4	2	3	2
Port management			4	3	3	3	3	2	2	2
Location at disaster management center			3	1	1	1	1	1	1	1
Buildings in the port			5	5	3	5	0	5	3	0
Risk management = 0.35 x (Y51 +Y52+Y53) / 3	δ5	0.35	0.93	0.70	0.93	1.05	0.93	1.05	0.93	0.93
Occurrence risk of disaster			2	2	2	2	2	2	2	2
Number of port in the vicinity			1	1	3	2	1	2	3	3
Distance from a representative port			5	3	3	5	5	5	3	3

Source: Study team

Tagbilaran	Tubigon	Jagna	Ubay	Talilbon	Tapal	Getafe	Loay
7	6	6	6	5	6	5	4



Source: Study team

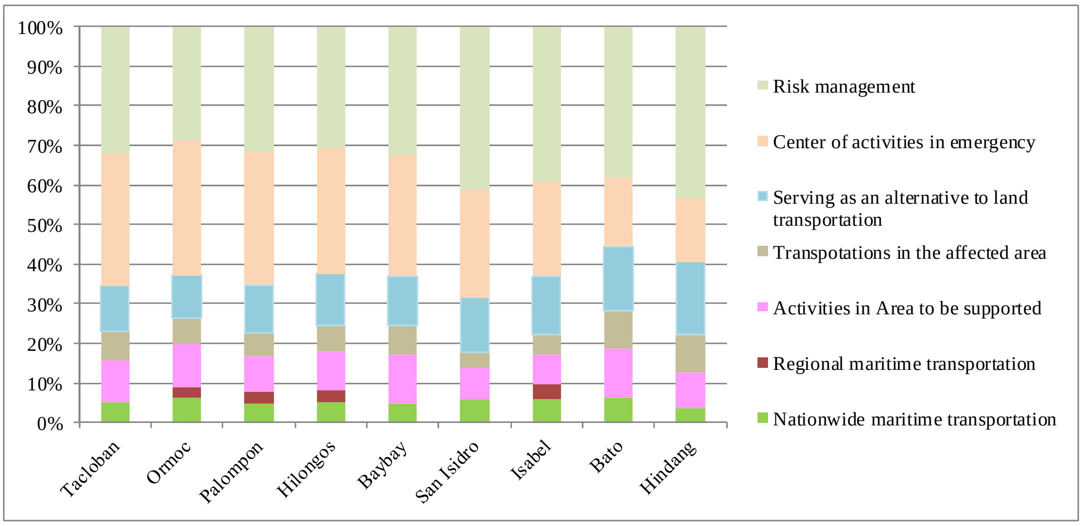
Figure 9.5-2 Numerical Result of Ports in Bohol Province

Table 9.5-7 Calculation Table (Ports in Leyte Provinces)

Name of Port			**Tacloban**	**Ormoc**	**Palompon**	**Hilongos**	**Baybay**	**San Isidro**	**Isabel**	**Bato**	**Hindang**
Criteria-A/Criteria –B/Indicator	Weight		rank value	rank value	rank value	rank value	rank value	rank value	rank value	rank value	rank value
Score = Logistics + Disaster			3.95	3.31	2.99	2.76	2.90	2.30	2.40	2.20	1.95
Logistics = 0.1 x (Sum of the two values below)	α	0.1	2.10	3.00	2.30	2.30	1.40	1.40	2.30	1.40	0.70
Nationwide maritime transportation = 0.7 x (X11) /1	γ1	0.70	2.10	2.10	1.40	1.40	1.40	1.40	1.40	1.40	0.70
Class of a port/ /PPA Classification			3	3	2	2	2	2	2	2	1
Regional maritime transportation = 0.3 x (X21) /1	γ2	0.30	0.00	0.90	0.90	0.90	0.00	0.00	0.90	0.00	0.00
Characteristics as RORO terminal			0	3	3	3	0	0	3	0	0
Disaster =0.9 x (Sum of the five values below)	β	0.9	4.15	3.34	3.07	2.81	3.06	2.40	2.41	2.29	2.08
Activities in Area to be supported = 0.10 x (Y11 +Y12) / 2	δ1	0.10	0.45	0.40	0.30	0.30	0.40	0.20	0.20	0.30	0.20
Population of the city/municipality			5	4	3	3	4	2	3	2	2
Annual cargo throughput			4	4	3	3	4	2	1	4	2
Transpotations in the affected area = 0.10 x (Y21 +Y22+Y22) / 3	δ2	0.10	0.33	0.23	0.20	0.20	0.23	0.10	0.13	0.23	0.20
Sea route connecting with main ports			5	0	0	0	0	0	0	0	0
Number of RORO ship call			0	3	3	3	3	0	1	4	3
Class of the road behind a port			5	4	3	3	4	3	3	3	3
Serving as an alternative to land transportation = 0.10 x (Y31 +Y32) / 2	δ3	0.10	0.50	0.40	0.40	0.40	0.40	0.35	0.40	0.40	0.40
Number of ports in the province			5	5	5	5	5	5	5	5	5
Traffic on the road behind a port			5	3	3	3	3	2	3	3	3
Center of activities in emergency = 0.35 x (Y41 +Y42+Y43+Y44+Y45) / 5	δ4	0.35	1.47	1.26	1.12	0.98	0.98	0.70	0.63	0.42	0.35
Maximum depth of quays			5	3	3	1	2	1	1	1	1
Area of port			4	4	4	4	3	2	2	2	2
Port management			4	4	3	3	3	3	2	2	1
Location at disaster management center			3	2	1	1	1	1	1	1	1
Buildings in the port			5	5	5	5	5	3	3	0	0
Risk management = 0.35 x (Y51 +Y52+Y53) / 3	δ5	0.35	1.40	1.05	1.05	0.93	1.05	1.05	1.05	0.93	0.93
Occurrence risk of disaster			2	2	2	2	3	2	2	2	2
Number of port in the vicinity			5	2	2	1	1	2	2	1	1
Distance from a representative port			5	5	5	5	5	5	5	5	5

Source: Study team

Tacloban	Ormoc	Palompon	Hilongos	Baybay	San Isidro	Isabel	Bato	Hindang
8	7	6	6	6	5	5	4	4



Source: Study team

Figure 9.5-3 Numerical Result of Ports in Leyte Province

9.5.6. Review of Numerical Results

The numerical results generally agree with commonsense. Accordingly, weights and data ranks which were set up for the calculation are deemed to be reasonable.

Strategic disaster resilient strategic ports and disaster resilient feeder ports are selected after assessing conditions of the ports which receive high scores from viewpoints of engineering, economic and financial or natural, social, environmental and locational aspects.,

In Iloilo Province, Iloilo Port received the highest score and Estancia Port received the second highest score.

Iloilo Port is located in the capital of the province and plays an important role in normal time. It is also expected to maintain its functions in times of disaster and also support emergency activities. Iloilo Port is selected as a strategic disaster resilient port in Iloilo province.

Estancia Port is inferior in terms of locational aspects compared with Dumangas port. However, it is expected to function as a core port in time of disaster because the northern part of Iloilo Province is a typhoon-prone area. Estancia Port is thus selected as a disaster resilient feeder port in Iloilo Province. The port could not be used for 10 months following the damage inflicted by Typhoon Yolanda due to an oil spill from a power generation barge which had been moored in waters adjacent to the port (however, the barge has since been removed). During that time, cargo from/to the hinterland of Estancia port was transported through Roxas port in Capiz Province which is 70 km away. It is desirable that the two ports share roles in time of disaster.

In Bohol Province, Tagbilaran Port received the highest score. The ports of Tapal, Jagna, Ubay and Tubigon received the second highest score. Tagbilaran Port is located in the capital of the province and plays an important role in normal time. It is also expected to maintain its functions in times of disaster and also support emergency activities. Tagbilaran Port is thus selected as a strategic disaster resilient port in Bohol province.

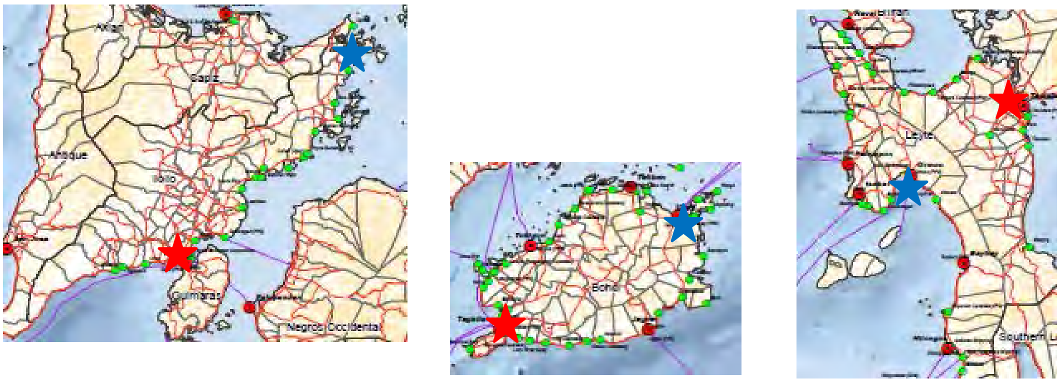
The ports of Tapal, Jagna, Ubay and Tubigon are assessed in terms of adequacy as a disaster resilient feeder port. Tubigon port is located near Tagbilaran port. Ideally, a disaster resilient feeder port should be located in a sufficient distance away from a strategic disaster resilient port. The port is inferior in terms of its location. Jagna Port has attractive points as a disaster resilient feeder port: it is located on one of the routes of SRNH and has sufficient water depth etc. However, a breakwater would be necessary to protect port facilities in order to cope with the expected tsunami height which would require an excessive investment. The port is inferior in terms of financial aspect. Ubay port is an important port located in the eastern part of the island. The port supports the lives of people in remote islands. However, it can accommodate only small vessels due to shallow waters. Capital and maintenance dredging for acquiring and keeping certain depth of port waters would be very costly. The port is inferior in terms of engineering and financial aspects. Although Tapal port is located away from secondary road, the port is located on the route of main maritime transportation service and vessels from/to Manila or Davao call at the port. In addition, the existing facility could be expanded and deepened for receiving larger vessels in time of disaster with only moderate investment. Based on the above, Tapal Port is selected as a disaster resilient feeder port in Bohol Province.

In Leyte Province, Tacloban Port received the heights score and Ormoc Port received the second highest score.

Tacloban Port is located in the capital of the province and plays an important role in normal time. It is also expected to maintain its functions in times of disaster and also support emergency activities. Tacloban Port is thus selected as a strategic disaster resilient port in Leyte province.

Considering that Tacloban port which is located on the east coast of the island is selected as a strategic disaster resilient port, it is reasonable to select Ormoc Port which is located on the west coast as a disaster resilient feeder port.

Province	Strategic Disaster Resilient Port	Candidate Disaster Resilient Feeder Port	Key points in assessing the numerical result
Iloilo	Iloilo	Estancia	Location
Bohol	Tagbilaran	Tubigon	Location
		Jagna,	Location
		Investment Cost	
		Ubay	Depth of waters
Leyte	Tacloban	Maintenance Dredging	



Source: Study team

Figure 9.5-4 Selected Disaster Resilient Ports

9.6. Consideration in Applying Guidelines to Nationwide

In the guidelines, characteristics of disaster resilient ports and procedures for the development of such ports are shown. In addition, the expected roles of ports in disaster management, the method of calculating importance based on criteria and necessity of coordination with relevant agencies and port users are described. Basic descriptions in the guidelines such as role of a disaster resilient port, procedures of the development of the port and viewpoints of selection of the ports are applicable to developing a disaster resilient port.

However, the guidelines are drafted based on the study on the ports in Iloilo, Bohol and Leyte Provinces. When the guidelines are applied to other areas, it is necessary to take into consideration the local features and ports in the area. Matters to be taken into consideration are shown as follow.

1. The area which disaster resilient ports shall cover

Provinces of Iloilo, Bohol and Leyte are located in islands of a particular size and the representative port in each island is located in the capital city of the provinces. Against such a background, deployment of disaster resilient ports is considered for each province.

The Philippines consist of many islands. Thirty one (31) provinces are located in Luzon Island whose area is approximately 110,000 km2 and twenty one (21) provinces are in Mindanao Island whose area is approximately 9,800km 2. There are four (4) provinces in Panay Island, three (3) provinces in Samar Island, two (2) provinces in Negros Island, Mindoro Island and Leyte Island, and one (1) province in Palawan Island. The areas of these provinces range from 7,300 km2 to 13,000 km2. Another fifteen (15) provinces are located in islands where the area is less than 5,000 km2 or in several small islands. Accordingly, the situation in islands of Luzon and Mindanao or provinces which consist of several small islands is different from the target provinces of the study. It is necessary to determine a basic framework on the development of disaster resilient ports considering the characteristics of such areas.

2. Weight Allocation and Data Ranking

In the study, weights for items of criteria were allocated and values of data to be used were ranked considering local conditions and characteristics of ports of the target provinces as well as the quality of data.

Data published by Philippines Statistics Authority, PPA and DPWH etc. is used in calculating the degree of importance. These data can be obtained for other areas. However, if more suitable data becomes available, it will be used. In addition, it is necessary that appropriate weights for items of criteria shall be allocated and data value shall be ranked according to the local conditions and characteristics of data to be used.

10. Improvement of Social Services Access for People in Isolated Areas

Before the introduction of additional new port category in chapter 10, and to understand deeply on the port category, the port category that was used in Ch. 9 is shown below;

Disaster Resilient Port: a port which contributes to the formation of a logistics network and which can maintain minimum port functions and support disaster management activities in case a natural disaster hits the port and/or its surrounding area. Disaster Resilient Ports have two categories: Strategic Disaster Resilient Ports and Disaster Resilient Feeder ports.

Strategic Disaster Resilient Port: one disaster resilient port shall be deployed in each province.

Disaster Resilient Feeder Port: port(s) other than the strategic disaster resilient port shall be enhanced against disasters according to importance from the viewpoint of disaster resilience. Number of ports shall be decided considering population and economic activities in the Province.

New Port Category that is used in Ch.10 is shown below;

Social Port: a port which supports the daily life of people in isolated areas such as remote islands and peninsula areas. Small ports located along coastlines may receive goods or persons transported by small boats from disaster resilient ports in times of disaster provided they are not seriously damaged.

Disaster Resilient Social Port: among social ports, port which exists in a high risk disaster area, provides regular passenger boat or Ro/Ro services, and has been reinforced against natural disasters is defined as a disaster resilient social port. In the event of a natural disaster, those ports contribute to secondary transportation of goods and passengers from a disaster resilient port.

10.1. Social Services Access for People in Isolated Areas

Remote islands and areas play an important role for the nation to conserve the exclusive economic sea zone, to utilize marine resources, and to preserve the natural environment.

It is very important to develop ports in remote islands and areas, taking advantage of geographic and natural characteristics, to improve the quality of life and welfare of people living there, and at the same time, to improve the national economy and welfare of all people in the country.

In those areas, ports play very important roles in providing basic human needs, such as right to live in dignity and security. This means that social ports play important roles for the people to access medical services, procurement of daily commodities, fishing activities, crop sales in the region, education, employment, administrative services etc..

10.2. Current State and Issues of Social Port Development

This topics was proposed and exchanged views totally 4 times in working group and seminar meeting and reached a common understandings.

(1) Inobservance of agreement

When DOTC turns over a social port to an LGU, they make an agreement regarding fare collection, safety management, and maintenance but there are some ports operated by LGUs that are not sufficiently fulfilling their obligations. According to the interviews outcome of undersecretary of DILG and a mayor of an island in Bohol mentioned that LGU frequently assigned a barangay captain as a port manger formally. The MOU between DOTC and LGU is unacted.

(2) Insufficient maintenance

LGU always prioritizes new infrastructure development and does not prepare a sufficient budget for maintenance of transport infrastructure, including social ports. Maintenance dredging is not conducted to maintain the necessary water depth. In extreme cases, ports have even been abandoned. Social port estate belongs to the central government (DOTC). Large scale facility improvement to repair damage from by waves should be done by the government but there is no clear stipulation on division of responsibilities in the contract. The reason is same as the above mentioned. In addition, the causeway in Banate of Iloilo province cannot be utilized in the case of low tide. It becomes too shallow to accommodate boats.

(3) Unclear Responsibility of maintenance and improvement of port

Property of social port facility belongs to the government. Improvement works for the facility damaged by waves should be done by the DOTC. Daily small repair and maintenance works should be done by LGU. But this border of improvement and maintenance is not clear. According to interview outcome of undersecretary, LGU prioritizes the new road development than port maintenance; because of the job responsible border with DOTC is not clear.

(4) Lack of Facility Inventory Book

According to the interviews outcome of the study team to relevant authorities, such as DOTC, PPA, LGU, (PPA has their inventory book but it is not updated.), social port facilities are developed and maintained by DOTC, PPA, and LGUs but there is no inventory book which records the history of development.

(5) Lack of ability of LGU engineer

LGU engineers are mainly road and river specialists who lack sufficient knowledge on port engineering. As mentioned above, Banate causeway in Iloilo was planned and designed by engineers of DPWH and LGU but this causeway cannot be utilized in the low tide because this is done by port engineer who has knowledge of organology and coast engineering.

(6) Duplication of port development

There is often a duplication of port development in the capital region by DOTC, PPA, and PFDA. In the case of Iloilo city, 10 ports are developed along the river.

10.3. Basic Concept of Social Port Development

Based on the explanation of social services written in the section 10.1, the basic concept for the social port development in isolated islands is shown below.

(1) To ensure Human Security

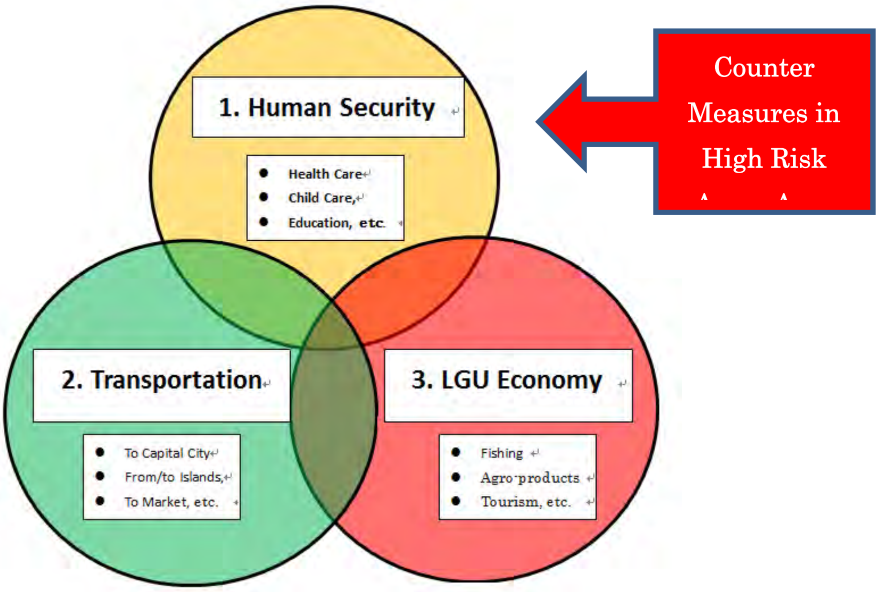
Protecting humans from various threats such as poverty, famine, infectious diseases, disaster, has become an important new concept of the international community. In areas where there is a high risk of disaster, preventive countermeasures are included in this concept. Disaster always provides negative cycle for poverty.

(2) To ensure means of transportation

Regional public transportation is a basic infrastructure for economic and social activities. Ensuring means of transportation by passenger ships in remote islands and areas is a particularly important issue.

(3) To establish livelihood

In remote islands and peninsula areas, it is difficult for residents to access urban services. Improvement of regular passenger ship services, access roads, and development telecommunication infrastructure are vital for easing geographical and natural restrictions of people in remote areas.



Source: Study team

Figure 10.3-1 Basic Concept of Social Port Development

10.4. Criteria for Screening Social Port

Selection of indicators should ensure the transparency and fairness of port selection. Therefore major indicators from official statistics and government documents that can be acquired easily are used and allocated to three (3) categories along with the concept for social port development. Selected indicators and reasons are explained below.

10.4.1. Human Security

(1) Municipality Income Grade

National Statistics Office (NSO) of the Philippines divides LGU revenue into six grades. Municipalities in the first grade have large populations and significant industrial activity and thus tax revenues are high. In such municipalities, airport and port facilities can be developed using their own budget.

(2) Poverty Incident

National statistics office of the Philippines calculates the poverty index of municipalities based on the income of residents. This index shows what percentage of people is living below the poverty line. Poverty reduction should be a key element of social port development. In the Philippines, poor people live in a port area as irregular settler and port development help their self-support.

(3) Distance from Capital City

The provincial capitals are home to prefectural governments, medical facilities, and higher educational institutions. All three provinces extend about 100 km from the capital cities. The person in a municipality far from the capital city has a difficulty in accessing qualified social services.

10.4.2. Transportation Means

(1) Connection to Remote Islands or Areas

People living in remote islands or areas face a disadvantage in terms of accessing social services. Priority should be given to the development of social ports which connect to remote islands or areas.

(2) Distance from Neighboring Port

From the viewpoint of fairness of budget allocation, it is necessary to postpone the development of new social ports if a neighboring port exists nearby.

(3) Distance from National Highway

People living in areas where a national highway has not been developed, face a disadvantage in terms of accessing social services. It is necessary to prioritize these areas in order to promote local port development.

10.4.3. LGU Economy

(1) Population of Municipality

In the case of development of a new social port, it is necessary that the population of the municipality where the port will be developed be sufficiently large to justify the investment.

(2) Port Scale

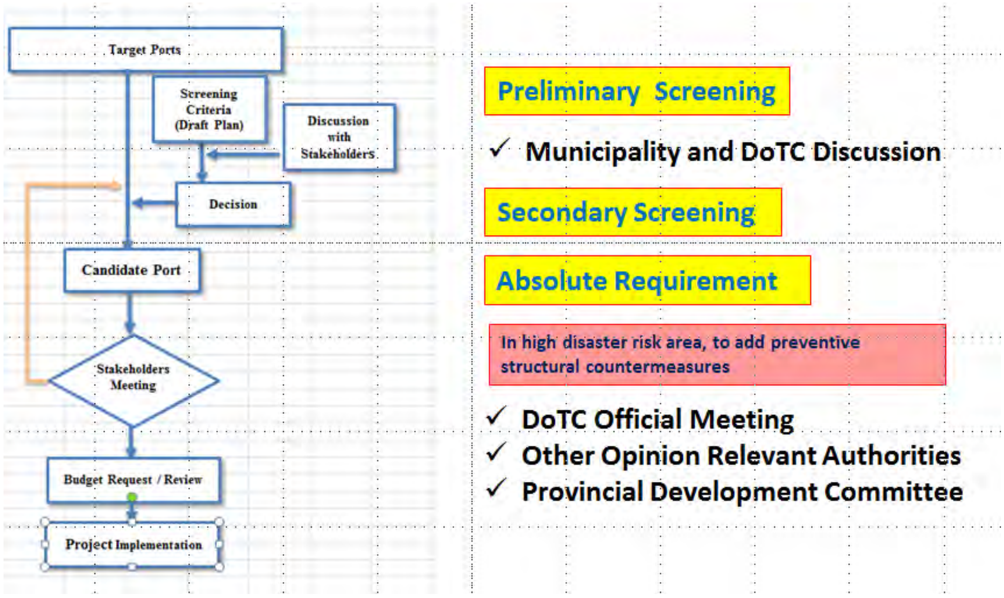
Social ports should show good performance for long periods. Moreover, the port should be able to accommodate large size vessels, which pay port dues, even if there is a tidal change. This contributes to the duration of port life. For this reason, priority should be given to ensuring that a social port has an adequate water depth that can be maintained over a long period of time. Appropriate disaster prevention measures are also necessary for social ports in high disaster risk areas.

10.5. Screening Criteria and Guidelines

10.5.1. Flow of Guideline

The guideline for screening of social ports is composed of two parts. The first step of the screening can be done mechanically using the statistical tables of the government statistics office. In the second step, by using more detailed site information, second candidate ports are screened. Finally, using the absolute requirement criteria, final candidate ports are selected as the budget request port.

Social ports to be developed were previously selected based on request from LGUs or politicians but have no sufficient criteria to determine justifiable candidate ports. However, using the proposed guideline and criteria, candidate ports can be determined in a fair manner. This proposed guideline and screening criteria should be agreed between the DOTC and DILG.



Source: Study team

Figure 10.5-1 Screening Flow and Guideline

10.5.2. Primary Screening Criteria

The primary selection criteria shall be as follows.

1) Municipality which has 0 or 1 port is prioritized excluding isolated island.

2) Municipality in which income class is 1st grade should be excluded.

3) Poverty incidence exceeds 30% (determined from the distribution of indicator in the target area)

4) No Investment by DOTC and PPA during latest 3 years excluding phased projects. (Half of 6 years administration period is used)

5) No ODA investment in the past (in principle) (Equality of opportunity)

10.5.3. Secondary Screening Criteria

Based on the latest National Bureau of Statistics office data, DPWH GIS map, LGU site data, the secondary selection criteria shall be as follows.

1) Beneficiary Population exceeds 25,000 (determined by the population distribution of target area)
2) Distance to Neighboring Port exceeds 10 km (2 hours by tricycle)
3) Distance to NHW exceeds10 km (2 hours by tricycle)
4) Purpose of Investment (i.e. Connection to/ from Isolated Island)
5) Distance to Provincial Capital exceeds 50 km (Half of approximate province length)
6) Port Scale (Appropriate site, more than 4m depth below MSL (Boat can accommodate in low tide)

10.5.4. Absolute Requirements

To finalize candidate ports, check absolute Requirement shown below.

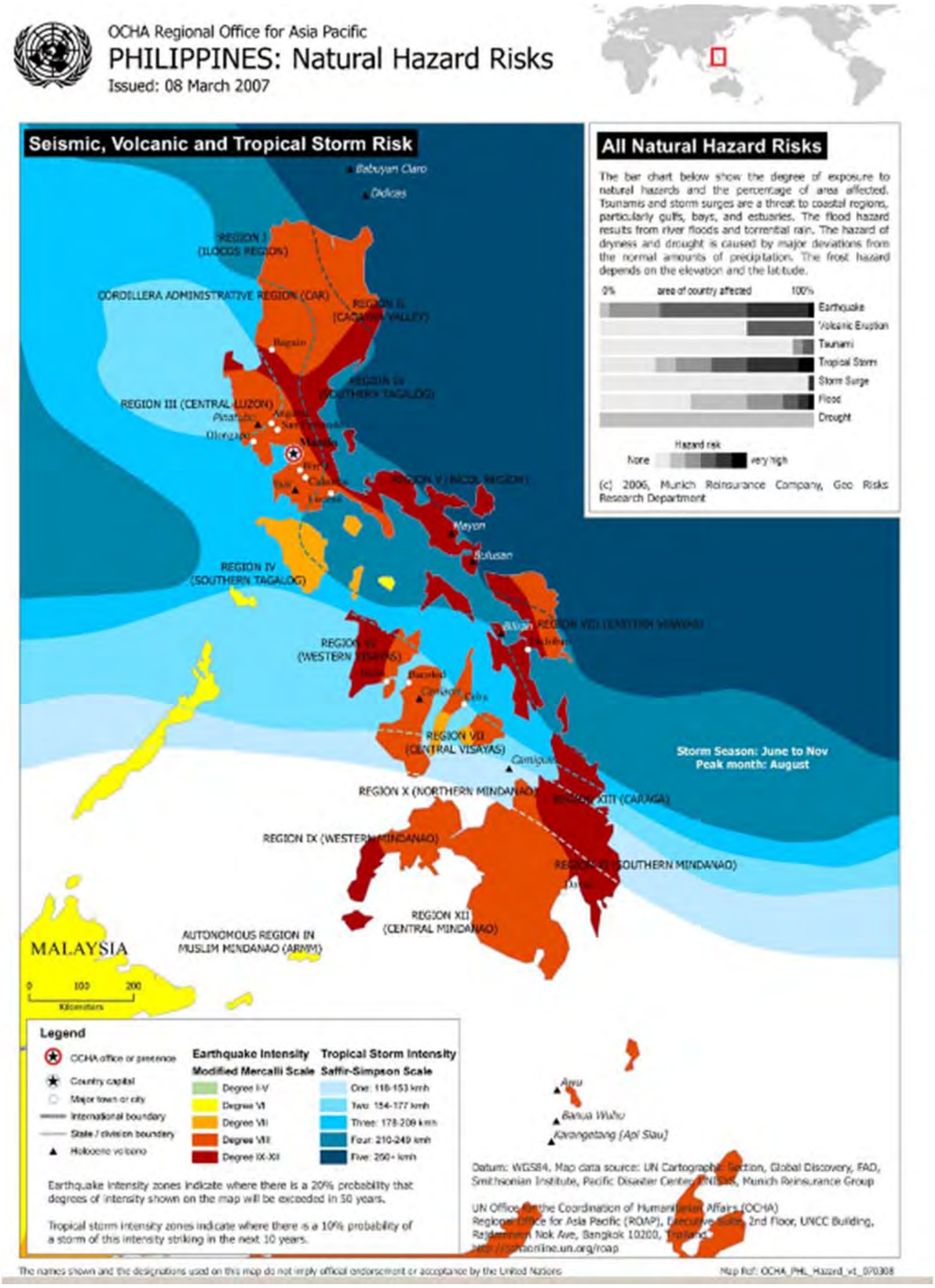
1) Project site is not in a preserved/ protected area (DENR definition) to ensure minimal impact to marine environment.
2) LGU has the right of way and land ownership of the project site
3) LGU commits to allocate budget to operate and maintain the port
4) Community organization has been established for the port operation and maintenance (e.g. port manager, safety port fee, etc.).

10.5.5. Disaster Counter Measure and Formulation of BCP in Social Port

Social ports in high disaster areas that have regular services of passenger boat or ferry should take preventive countermeasures for port facilities. High disaster areas are defined below.

1) Typhoon: Areas where wind speeds might exceed 210 km/h by Symptom Scale
2) Earthquake: Areas where earthquake with a magnitude that exceeds the 9th grade on Mercalli Scale, might occur in 50-year period. Disaster high risk areas are shown in the map below.

In disaster resilient social ports, port BCP should be mandatory. Details are described in chapter 13.



Source: OCHA Asia and Pacific Office

Figure 10.5-2 High Disaster Areas in the Philippines

10.6. Screening for Social Ports in the Target Area

10.6.1. Public Ports in the Target Area

There are 142 public ports in Iloilo, Bohol, and Leyte provinces but more than half of them, 74 ports, are found in Bohol province. Along the coastline of Bohol province and average of 2.55 ports are developed per municipality

Source: Study team

Figure 10.6-1 Port in Target Area

Table 10.6-1 Port in Target Area

Classification	Symbol	Iloilo Prov.	Bohol Prov.	Leyte Prov.	Total
Population 2010 (,000)		2,230	1,255	1,789	5,274
Private		10	6	10	26
Base / Terminal		3	6	5	14
Social		21	68	39	128
Public Total		24	74	44	142
port/50,000		(0.53)	(2.95)	(1.23)	(1.35)
Municipality In the Coast Port/M		18 (1.33)	29 (2.55)	32 (1.38)	89 (1.59)

Source: Study team

Before the screening, Excel table composed of items shown below should be prepared. The screening is conducted based on preliminary and secondary criteria. Distances to neighboring port and national highways are confirmed using the port positon map. Water depth and absolute requirements should be confirmed based on LGU information.

Table 10.6-2 Port List and Data for Screening

Name of Port / Company	Location (Municipality)	NSPDP 1)	SRRFPD P2)	Local Fund 3)	Rehab DOTC	Rehab PPA	O&M	Population of Municipality		Income classification of Municipality	Poverty Incidence of Municipality (2012)
								(2000)	Racio	(2010)	

Source: Study team

Table 10.6-3 Port List and Data for Screening (e.g. Bohol)

Name of Port / Company	Location (Municipality)	NSPDP1)	SRRFPD P2)	Local Fund3)	Rehab DOTC	RehabPPA	O&M	Classification (PPA)	Throughput (2014)4)	RO/RO Ramp (2001)	Port Management Boty	Income classification of Province / City	Name of Municipality	Population of Municipality		Income classification of Municipality	Poverty Incidence of Municipality (2012)	Whether the port has RO/RO Ramp (2001)
														(2010)	Racio	(2010)		
Tagbilaran (PPA)	Tagbilaran City						PPA	BP	1,286,778	Yes	PPA	3rd	Tagbilaran City	96,792	25%	1st	7.9	Yes
Catagbacan (PPA)	Loon					B-EQ	PPA	TP		Yes	PPA	1st	Loon	42,800	-5%	1st	22.0	Yes
Tubigon (PPA)	Tubigon					B-EQ	PPA	TP	114,475	Yes	PPA	1st	Tubigon	44,902	11%	1st	26.7	Yes
Jetafe (PPA)	Jetafe					B-EQ	PPA	OGP	3,161	Yes	LGU	1st	Jetafe	27,788	4%	2nd	43.5	Yes
Talibon (PPA)	Talibon					B-EQ	PPA	TP	13,770	Yes	PPA	1st	Talibon	61,373	13%	2nd	36.4	Yes
Ubay (PPA)	Ubay	1997					PPA	TP	100,530	Yes	LGU	1st	Ubay	68,578	15%	2nd	39.6	No
Jagna (PPA)	Jagna					B-EQ	PPA	TP	74,452	No	PPA	1st	Jagna	32,566	6%	3rd	19.6	No
Loon(PPA)	Loon					YLD	PPA				PPA	1st	Loon	42,800	-5%	1st	22.0	
Bien Unido	Bien Unido			2012			LGU					1st	Bien Unido	25,796	16%	2nd	48.8	
Panglao	Panglao						LGU			No	LGU	1st	Panglao	28,603	34%	1st	16.4	No
Panglao Municipal Po	Panglao						LGU			No	LGU	1st	Panglao	28,603	34%	1st	16.4	No
Manga	Tagbilaran City						LGU			No	LGU	3rd	Tagbilaran City	96,792	25%	1st	7.9	No
Corte Quay	Cortes						LGU			No	LGU	1st	Cortes	15,294	20%	1st	15.9	No
Maribojoc	Maribojoc						LGU			No	LGU	1st	Maribojoc	20,491	22%	1st	17.3	No
Catagbacan Causeway	Loon						LGU			No	LGU	1st	Loon	42,800	-5%	1st	22.0	No
Mocpoc	Loon						LGU			No	LGU	1st	Loon	42,800	-5%	1st	22.0	No
Napo	Loon						LGU			No	LGU	1st	Loon	42,800	-5%	1st	22.0	No
Moalong Fish Landin	Loon						LGU			No	LGU	1st	Loon	42,800	-5%	1st	22.0	No
Calape (Pangangan) C	Calape			2014			LGU			No	LGU	1st	Calape	30,146	8%	1st	25.4	No
Clarin	Clarin			2012			LGU		6,889	Yes	LGU	1st	Clarin	20,296	13%	2nd	26.4	Yes
Inabanga Causeway	Inabanga						LGU			No	LGU	1st	Inabanga	43,291	6%	2nd	34.7	No
Buenavista Causeway	Buenavista						LGU			No	LGU	1st	Buenavista	27,031	4%	2nd	45.5	No
Sta. Cruz	Sierra Bullones						LGU			No	LGU	1st	Sierra Bullones	24,698	-3%	3rd	35.1	No
Jetafe	Jetafe						LGU			No	LGU	1st	Jetafe	27,788	4%	2nd	43.5	No
Trinidad	Trinidad						LGU			No	LGU	1st	Trinidad	28,828	12%	2nd	39.7	No
Hingotanan (Islet)	Bien Unido						LGU			No	LGU	1st	Bien Unido	25,796	16%	2nd	48.8	No
San Pedro	Bien Unido					YLD	LGU			No	LGU	1st	Bien Unido	25,796	16%	2nd	48.8	No
Tapal (Ubay)	Ubay						LGU	OGP	80,608	No	PPA	1st	Ubay	68,578	15%	2nd	39.6	Yes
Aguining	Pres. Carlos Garcia						LGU	TP		No	LGU	1st	Pres. Carlos Garcia	23,287	12%	2nd	51.8	No
Tugas	Pres. Carlos Garcia						LGU			No	LGU	1st	Pres. Carlos Garcia	23,287	12%	2nd	51.8	No
Pitogo	Pres. Carlos Garcia		2008				LGU			No	LGU	1st	Pres. Carlos Garcia	23,287	12%	2nd	51.8	No
Popoo	Pres. Carlos Garcia			2015			LGU			No	LGU	1st	Pres. Carlos Garcia	23,287	12%	2nd	51.8	No
Baybayon	Mabini						LGU			No	LGU	1st	Mabini	28,174	3%	3rd	46.8	No
Candijay	Candijay						LGU			No	LGU	1st	Candijay	29,043	-4%	3rd	34.5	No
Anda	Anda						LGU			No	LGU	1st	Anda	16,909	-5%	3rd	30.9	No
Guindulman	Guindulman						LGU			No	LGU	1st	Guindulman	31,789	9%	3rd	30.3	No
Jagna	Jagna						LGU			No	LGU	1st	Jagna	32,566	6%	3rd	19.6	No
Valencia	Valencia						LGU			No	LGU	1st	Valencia	27,586	13%	3rd	28.5	No
Dimiao Causeway	Dimiao			2012			LGU			No	LGU	1st	Dimiao	15,166	7%	3rd	30.6	No
Lila Causeway	Lila						LGU			No	LGU	1st	Lila	11,985	16%	3rd	19.6	No
Loay River Quay	Loay						LGU		1,185	No	LGU	1st	Loay	16,261	13%	3rd	19.3	No
Alburquerque Causew	Alburquerque						LGU			No	LGU	1st	Alburquerque	9,921	14%	1st	15.9	No
Baclayon Causeway	Baclayon						LGU			No	LGU	1st	Baclayon	18,630	24%	1st	15.1	No
Duero	Duero			2014			LGU			No	LGU	1st	Duero	17,580	7%	3rd	29.6	No

Source: Study team

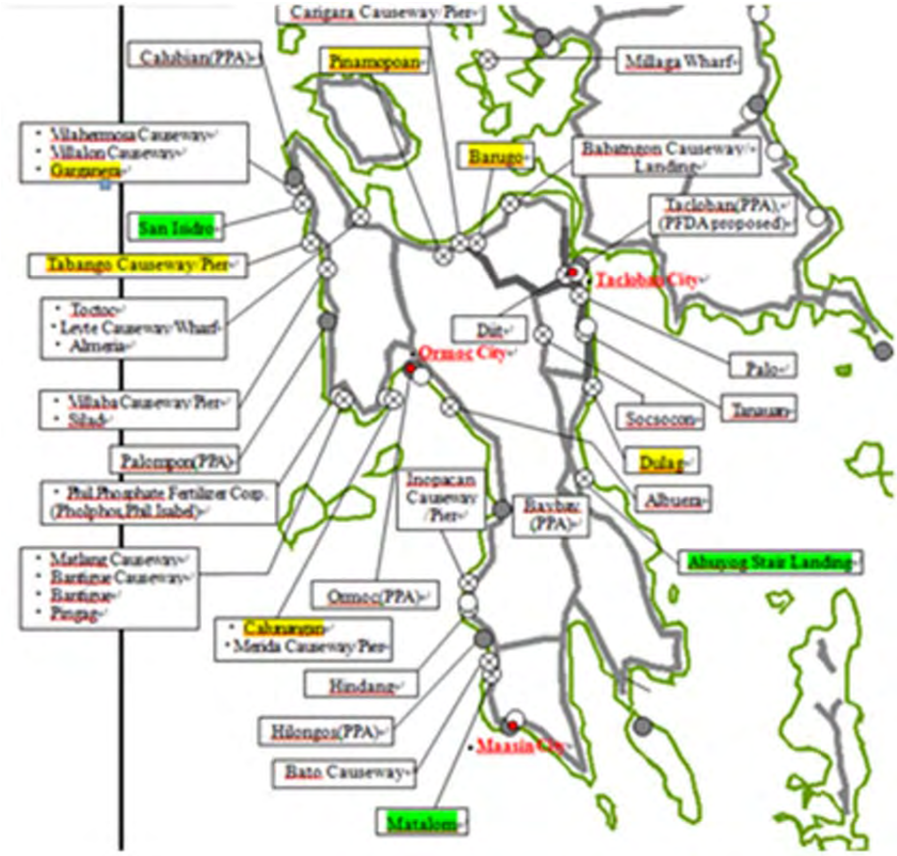
10.6.2. Screening Result for Leyte Province

Candidate ports are screened based on the first and the second screening criteria and the guideline. The result is shown in the table below. The first selected ports (9) are shown in black, and the second selected ports (3) are shown in red. Disaster countermeasures should also be considered for ports which have regular passenger or ferry service.

Table 10.6-4 Selected Ports in Leyte Province

Garganera	Calubian
Pinamopoan	Capoocan
Barugo	Barugo
Dulag	Dulag
Abuyog Stair Landing	Abuyog
San Isidro	San Isidro
Tabango Causeway/Pier	Tabango
Calunangan	Merida
Matalom	Matalom

Source: Study team



Source: Study team

Figure 10.6-2 Selected Ports in Leyte

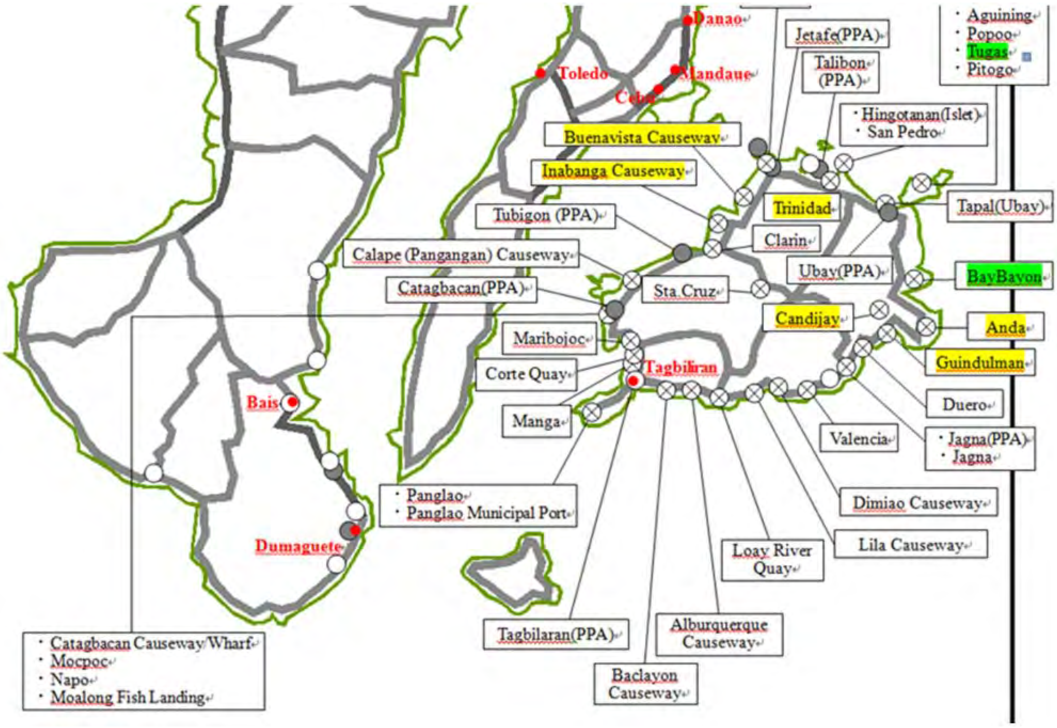
10.6.3. Screening Result for Bohol Province

Candidate ports are screened based on the first and the second screening criteria and the guideline. The result is shown in the table below. The first selected ports (8) are shown in black, and the second selected ports (2) are shown in red.

Table 10.6-5 Selected Ports in Bohol Province

Inabanga Causeway	Inabanga
Buenavista Causeway	Buenavista
Trinidad	Trinidad
Tugas	Pres. Carlos Garcia
Baybayon	Mabini
Candijay	Candijay
Anda	Anda
Guindulman	Guindulman

Source: Study team



Source: Study team

Figure 10.6-3 Selected Ports in Bohol

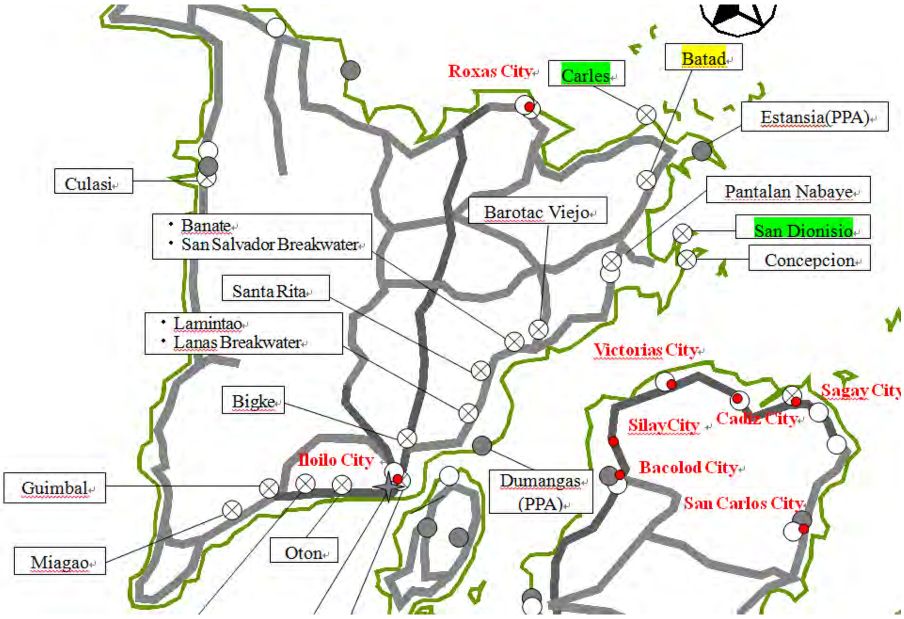
10.6.4. Screening Result for Iloilo Province

Candidate ports are screened based on the first and the second screening criteria and the guideline. The result is shown in the table below. The first selected ports (3) are shown in black, and the second selected ports (2) are shown in red.

Table 10.6-6 Selected Ports in Bohol Province

Carles	Carles
Batad	Batad
San Dionisio	San Dionisio

Source: Study team



Source: Study team

Figure 10.6-4 Selected Ports in Iloilo

10.7. Application of the Guideline to Social Ports Nationwide

This guideline can be applied to ports nationwide. First, positon information of social ports should be plotted on the GIS map of DPWH. Data on city, municipality and barangay basis is then entered in the Excel table. Finally, by referring to the map, Excel data should be screened based on each criteria limit. To apply this proposed guideline and criteria to social ports nationwide, points below should be noted. Criteria limit should be frequently reviewed and revised when necessary.

11. Standard Design Model for Disaster-resilient Port

11.1. Evaluation of Present Ports and Their Related Facilities in Target Areas

Structural soundness surveys for ports and their related facilities are evaluated with four classifications defined in Table 11.1-1, based on the degree of deterioration and the results of actual surveys as well as original design concept. Although existing buildings in Tacloban Port were damaged by typhoon Yolanda, the restoration is already completed which is categorized as "A". Ormoc Port is under repair for damaged concrete slabs of the existing pier. Tagbilaran Port in Bohol Province is classified as "A" because the damaged roofing of existing buildings is under recondition. However, Loon Port has damage on its existing pier which is to be reconstructed, and the reclamation area was damaged by liquefaction (the pier is to be reconstructed), which is accordingly classified as "D". Estancia Port in Iloilo Province could obtain "A" since the damaged concrete slabs were already restored.

Table 11.1-1 Evaluation Criteria of Soundness

	Description
A	Minor damage, 80 to 100% operational
B	Midium damage, 60 to 80% operational
C	Big damage, 40 to 60% operational
D	Not operational, less than 40% operational

Source: Study Team

Table 11.1-2 Evaluation of Current Port and Related Facilities in Leyte Area

	Tacloban	Palompon	Isabel	Ormoc	Baybay	Hilongos	Bato
Type of Berth	Pier	Open type wharf	Pier	Pier	Pier	Pier	Pier
Piles	PSC (40cm x 40cm)	RC (40cm x 40cm)	RC (40cm x 40cm)	RC (40cm x 40cm)	RC (40cm x 40cm), RC(45cm x 45cm)	RC	RC
Pile Angle	0 & 5	0 & 7	0 & 5	0 & 15	0 & 15	-	-
Slab & Beam	Slab: Precast type Beam: (W50xH40cm) No damage	Partialy under repairing slab concrete	No damage	Beam (W40xH30cm) Partialy damaged Under repairing	Slab bottom is partialy damaged.	No damage	No damage
Retaining Wall	Conc. Sheet Piles	Conc. Sheet Piles	Concrete Walls	-	-	Concrete Walls	Concrete Walls
Other Facility	ADM, Warehouse Repaired	Damage of roof	-	Damage of roof	-	-	-
Soundness	A	A	A	B	B	A	A
	Damaged but repaired	Minor damage	No damage	Damaged slab	Damaged slab	No damage	No damage

Source: Study team

Table 11.1-3 Evaluation of Current Port and Related Facilities in Bohol Area

	Tagbilaran	Ubay	Tubigon	Catagbacan (Loon)	Getafe	Tapal
Type of Berth	Open type wharf	Pier	Pier	Pier	Pier	Pier
Piles	SPP φ50cm, RC40cm	RC (40cm x 40cm)	RC (40cm x 40cm)	PSC (45cm x 45cm)	RC (40cm x 40cm)	RC (40cm x 40cm)
Pile Angle	0 & 10	0 & 15	-	0 & 15	-	-
Slab & Beam	Pile caps are partially damaged.	Slab concrete is partially damaged due to hit by ship	Damaged by earthquakes	Most of the facilities are damaged by earthquakes.		
Retaining Wall	Under constructing concrete walls due to damaged by earthquake	Conc. Sheet piles	Damaged by earthquakes	Causeway Under repair due to earthquake	Concrete Walls	
Other Facility	Pavement crack, building collapsed	-	Access road cracks	Gate house damaged	-	-
Soundness	B	B	B	D	B	A
	Seriously damaged	Partially damaged	Raking piles damaged	Seriously damaged	A few piles broken	No damage

Source: Study team

Table 11.1-4 Evaluation of Current Port and Related Facilities in Iloilo Area

	Iloilo (ICPC)	Iloilo (FSP)	Iloilo (River Wharf)	Dumangas	Estancia (PPA)	Ajuy Culasi
Type of Berth	Open type wharf	Open type wharf	Open type wharf	Pier	Pier	Pier
Piles	SPP φ1020mm (IBRD) SPP φ500mm (PPA) RC (50cm x 50cm) (PPA)	RC (40cm x 40cm)	RC 40cm 45cm, PSC 40cm	RC (40cm x 40cm)	RC (40cm x 40cm)	RC (40cm x 40cm)
Pile Angle	0 & 15 & 20	-			0 & 10	0 & 10
Slab & Beam	Crane rails on slab				Damaged pile caps repaired	No damage
Retaining Wall						L-shaped Conc. Walls
Other Facility	-	-	-	-	Revetment Repaired	-
Soundness	A	A	A	A	A	A
	No damage	No damage	No damage	No damage	Damage repaired	No damage

Source: Study team

11.2. Summary of Type of Port Structure

11.2.1. Type of Quay Structure

Table 11.2-1 shows a summary of existing quay structures as information for selecting a structure type of a standard quay design model for the said 24 ports in three provinces. According to the table, there are two structure types such as steel sheet pile and pier types and the pier type is the majority of the structure and approximately 93% of the total structures. This Survey therefore applies the pier type in the standard design model.

Table 11.2-1 Summary of Existing Structural Type of Berthing Facilities for Target Area

	Pier				Sheet Pile Quay Wall		Causeway
	Finger Pier	Open-type Wharves			Concrete Sheet Piles	Steel Sheet Piles	
		Concrete Piles	Steel Pipe Piles				
			Vertical & Raking Piles	Vertical Piles			
Type of Structure	Most of piers in the Philippine are perpendicular to the shore line supported by concrete piles. Concrete coupled raking piles are provided to resist the horizontal forces of the pier.	Concrete deck is constructed on coupled raking piles for open-type wharves to resist the horizontal forces.	In case of deep water wharves and quay cranes on the deck, coupled raking piles may be required due to the large horizontal forces. Expansion wharf of ICPC is this case.	Vertical steel pipe piles are selected to resist the horizontal forces by vertical piles only due to easiness of construction. ICPC is this case.	Concrete sheet piles are selected for the most cases of shallow water wharves in Philippines due to less anticorrosion treatment required. Anchor wall is selected for the most of anchor type.	In case of more than 10 m water depth, steel sheet piles and/or steel pipe sheet piles are used instead of concrete sheet piles. Most of the anchors are steel pipe piles (vertical piles or coupled raking piles).	Small-scale wharf for shallow draft vessels
LEYTE (Total 8 ports)	Tacloban(5°), Ormoc(0°, 15°), Isabel(5°), Palompon (7°), Hilongos (N/C), Baybay (12°), Bato (0°, ramp 10°) N/C: Not Clear	Tacloban(15°), Palompon, Ormoc				Tacloban (Steel Pipe Sheet Pile, anchor wall)	Babatngon
BOHOL (Total 9 ports)	Tagbilaran Passenger berths(10°), Catagbacan(15°), Ubay(0°,15°), Tubigon (N/C), Talibon(N/C), Getafe(N/C)	Tagbilaran	Tagbilaran			RoRo ramp in Tagbilaran	Popoo, Guindulman, Clarin
ILOILO (Total 7 ports)	Dumangas(N/C), PPA Estancia(10°), Guimbal(N/C), Ajuy(5° to10°), DOTC Estancia N/C: Not Clear	Iloilo FSP (Fort San Pedro Terminal), Iloilo IRW (Iloilo River Wharf)	Iloilo ICPC (Iloilo Commercial Port Complex)	Iloilo ICPC (Iloilo Commercial Port Complex)	Old Iloilo FSP (Fort San Pedro Terminal), but now steel sheet pile in front	Iloilo FSP (Fort San Pedro Terminal)	DOTC Estancia, Banate,
Percentage	64%	18%	7%	4%	–	7%	-

Source: Study team

11.2.2. Type of Building

Likewise, Table 11.2-2 shows a summary of existing building structures as information for selecting the structure type of a standard building design model for the said 24 ports in three provinces. According to the table, all the structural members are made of reinforced concrete, and the roofs are of concrete slab or steel corrugated steel plate.

Table 11.2-2 Summary of Type and Area of Main Buildings for Target Ports

Name of Building	unit	TACLOBAN	ORMOC	TAGBILARAN	TAPAL	ILOILO (ICPC)	PPA ESTANCIA
Administration/ Office Building		RC Building w Roof Deck	RC Building w/ GI Roofing	Mixed Mat'ls w/ GI Roofing (Temporary)	RC Building w/ Roof Deck	RC Building w/ Roof Deck	RC Building w/ GI Roofing
		3 Storey	1 Storey	2 Storey	1 Storey	4 Storey	2 Storey
	m^2	686 x 3	281	261.45 x 2	30	435 x4	240 (2nd Flr. only)
CFS		None	None	None	None	RC Building w/ GI Roofing	None
						1 Storey	
	m^2					7467.4	
Warehouse		RC Building w/ GI Roofing	None	RC Building w/ GI Roofing	None	RC Building w/ GI Roofing	None
		1 Storey		1 Storey		1 Storey	
		540		300		1027.8	
Passenger Terminal Building		None	RC Building w/ GI Roofing	RC Building w Roof Deck	None	None	RC Building w/ GI Roofing
			1 Storey	2 Storey			2 Storey
	m^2		1,412	397 x 2			240 (Grnd Flr. only)

Source: Study team

11.3. Standard Design Model for Disaster-resilient Ports

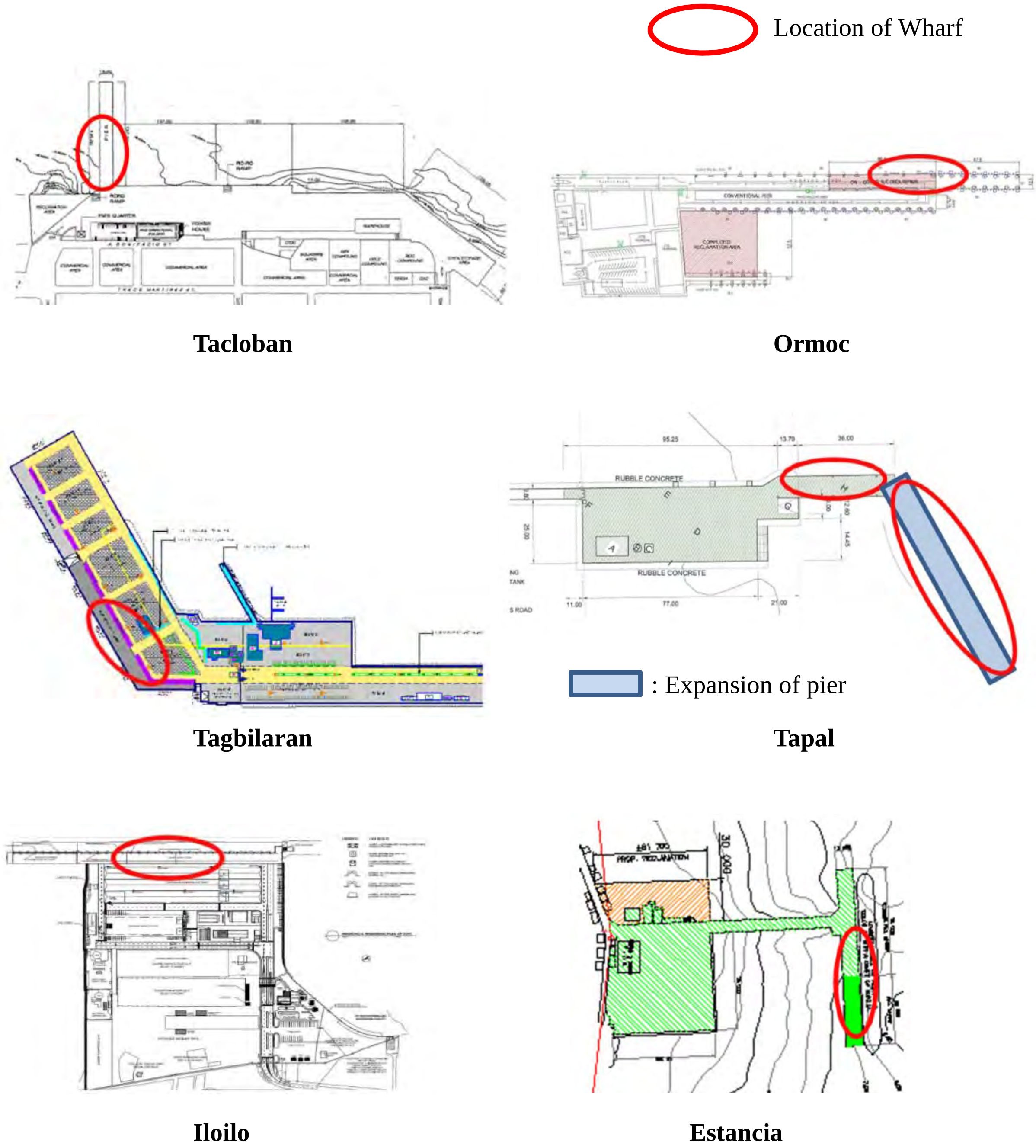
11.3.1. Standard Design Model for Quay Facilities

The Survey Team executed an examination of the standard quay design model for Tacloban, Ormoc, Tagbilaran, Tapal, Iloilo, Estancia Ports which were selected in Chapter 8.

It is emphasized that the Standard Design Model of disaster-resilient ports should be ultimately be decided by the government. This guideline might apply to only the important facility of selected port for disaster management.

(1) Existing Layout Plans for the Selected 6 Ports

The existing layout plans for each selected port are shown in Figure 11.3-1.



Source: Study Team

Figure 11.3-1 Selected Disaster-resilient Ports

11.3.2. Standard Design Model for Earthquake

(1) Quay Facilities

1) Conditions for Selection of Quay Location of Standard Design Model

The selection of a quay location of standard design model is determined in consideration of the priority of the following conditions, but not limited to depending on the particular conditions of each port:

- Maximum quay depth for each port: Apply maximum depth of the quay without depth restriction to accommodate relief supply ships after a disaster, but a 6m depth which should be minimal in the selection of a standard design model.
- Convenience of quay: Select the quay that will be nearest to the hinterland and port area with easier access
- Liquefaction: Select the quay that will have the least possibility for the occurrence of liquefaction at the yard behind the quay and access from the hinterland
- Hinterland: Secure certain warehouses and open storage areas at the hinterland for tentatively storing relief supplies

2) Standard Design Model

As mentioned in Sub-chapter 11.2.1, the standard design model is applied to the pier type as selected upon its examination. Table 11.3-2 presents a summary of seven cases of the structural reinforcement method to be applied to the existing quay facilities for the target site area.

3) Pre-evaluation of Standard Design Model

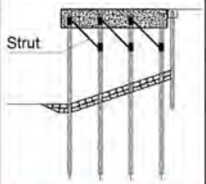
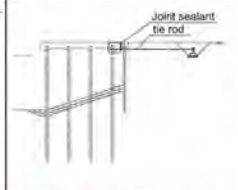
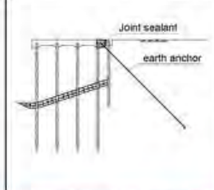
To determine the priority of the seven cases of the standard design model in the case of the selection of several feasible models during the selecting process, it is necessary to examine the advantages and disadvantages of the seven cases. The rough construction cost, workability, construction period, etc. were taken into account for evaluation. The result of the evaluation is shown in Table 11.3-1. The smaller evaluation value means the higher priority design model among cases.

Table 11.3-1 Preliminary Evaluation of Standard Design Model

	Case-1	Case-2	Case-3	Case-4	Case-5	Case-6	Case-7
Method	Installation of Coupled Raking Piles in front of Berthline	Removal of Deck and Installation of Coupled Raking Piles	Removal of Deck and Installation of Submerged Struts	Installation of Anchor Wall and Sealant	Installation of Ground Anchor and Joint Sealant	Installation of Submerged Steel Beams	Installation of Reinforced Concrete Beams
Quality Control	1	1	7	1	5	7	1
Workability	3	4	7	1	2	5	6
Construction Period	2	6	7	3	3	1	5
Operation Suspension Period	5	6	7	4	3	1	1
Construction Cost	6 (1.00)	7 (1.03)	5 (0.75)	1 (0.32)	2 (0.39)	4 (0.70)	3 (0.61)
Evaluation	17	24	33	10	15	18	16

Source: Study team

Table 11.3-2 Summary of Seven Cases for Standard Design Model for Earthquake

	Case-1	Case-2	Case-3	Case-4	Case-5	Case-6	Case-7
Method	**Installation of Coupled Raking Piles in front of Berth line**	**Removal of Deck and Installation of Coupled Raking Piles**	**Removal of Deck and Installation of Submerged Struts**	**Installation of Tie Rod, Anchor Wall and Sealant**	**Installation of Ground Anchor and Joint Sealant**	**Installation of Submerged Steel Beams**	**Installation of Reinforced Concrete Beams**
Typical Section							
General Descriptions	･Additional raking piles resist against the horizontal seismic forces. ･Raking piles and coping concrete are installed in front of the existing berth. ･The berth line is shifted seawards.	･Additional raking piles resist against the horizontal seismic forces. ･Existing deck concrete is removed partially. ･Coupled raking piles are installed between the existing piles. ･Removed area is to be reinforced and rehabilitated.	･Additional strut structure resist against the horizontal seismic forces. ･Submerged struts are installed onto the existing piles after removal of all deck concrete. ･Grouting mortar is injected between struts and piles to be integrated firmly. ･After setting struts, new deck concrete is reconstructed.	･Additional anchors with tie rods resist against the seaward horizontal seismic forces. ･Retaining wall resists the landward horizontal seismic forces through joint sealant. ･Land side deck concrete is removed partially and tie rods are installed to connect between deck and anchor wall. ･After installation of anchor, deck concrete is rehabilitated.	･Additional ground anchors resist against the seaward horizontal seismic forces. ･Retaining wall resists the landward horizontal seismic forces through joint sealant. ･Land side deck concrete is removed partially and ground anchors are installed. ･Deck concrete is rehabilitated after installation of ground anchors.	･Additional submerged beams reinforce pile structure to resist against the horizontal seismic forces. ･Submerged steel beams are installed to connect the existing piles each other. ･Grouting mortar is injected between steel beam and pile to be fixed firmly.	･Additional reinforced concrete beams reduce the stress of the existing piles and increase the resistances against the horizontal seismic forces. ･Concrete beams are constructed underneath the existing concrete beams.
Special Consideration for Reinforcing	･Berth utilization is totally stopped due to construction of new concrete deck. ･Due to big equipment for construction, it is not recommendable for small size of berth (depth and length).	･Berth utilization is totally stopped due to demolition and reconstruction of the center of concrete deck. ･Due to big equipment for construction, it is not recommendable for small size of berth (depth and length).	･Berth utilization is totally stopped due to demolition and reconstruction of all concrete deck. ･Due to big equipment for construction, it is not recommendable for small size of berth (depth and length).	･Firm retaining wall structure is necessary behind the pier to resist horizontal seismic force. ･The space for construction area of anchor wall with tie rod is necessary. ･Berth utilization is partially possible due to the construction area behind the pier.	･Firm retaining wall structure is necessary behind the pier to resist horizontal seismic force. ･The space for construction area of ground anchor on the pier is necessary. ･Berth utilization is partially possible due to the small construction area on concrete deck.	･Berth utilization during construction is possible due to no construction work on land. ･Special equipment/tool such as floater, Special experience is necessary. ･It is applicable for large scale structure due to flexibility of large size of beam.	･Berth utilization during construction is possible due to no construction work on land. ･Due to simple structure made of concrete and rebar, no special experience is necessary. ･It is applicable for small scale structure only due to additional beam under the concrete deck.
Main Materials	･Steel pipe piles have more workable than PC piles. ･Steel pipe piles are driven with 20-25 degrees of slope.	･Steel pipe piles have more workable than PC piles. ･Steel pipe piles are driven with 20-25 degrees of slope.	･Submerged struts are fabricated in the suitable factory. ･Grouting mortar is necessary.	･Tie rods are available in the Philippine.	･Ground anchors are to be imported from foreign countries.	･Submerged steel beams are fabricated in the suitable factory. ･Grouting mortar is necessary.	･Rebars and concrete only
Quality Control	･No special skill is necessary.	･No special skill is necessary.	･Special experience for installation is required to construct submerged struts.	･No special skill is necessary.	･Special experience is required to construct ground anchors.	･Special experience is required to construct submerged beams.	･No special skill is necessary.
Workability	･Floating piling barge is required to drive raking piles. ･No special skilled works is needed.	･A special stage to install and drive raking pile is set on the deck. ･Normal construction methods are adopted except above stage. ･No offshore equipment is required.	･Demolition of all deck concrete is required. ･The dimensions of struts are adjusted by measuring the existing pile locations. ･Special engineering know-hows are required for installation of struts. ･Many kinds of works are to be carried out and construction period will be the longest.	･ Basically all works are onshore. ･ The deck side of tie wire should be fixed firmly with deck concrete to retain the horizontal forces. ･ Joint sealant is installed between deck concrete and coping of revetment.	･ Basically all works are onshore. ･ Drilling equipment is required to set the ground anchor into bearing layer. ･ The deck side of ground anchor should be fixed firmly with deck concrete to retain the horizontal forces. ･ Joint sealant is installed between deck concrete and coping of revetment.	･Special technical know-hows are required to install the submerged steel beams below the deck concrete. ･The length of each beam are determined by the location of the existing piles. ･Most of works are carried out under water. ･Special floater is necessary to install submerged beam.	･Large temporary stagings under water are required because most of works should be carried out under the pier. ･Underwater concrete should be placed with securing the good quality of concrete. ･High-early-strength cement may use for earlier utilization of the berth after concrete placing.

Source: Survey Team

Note : For all of type of above reinfocing structure, Environmental Performance Report and Management Plan (EPRMP) is required.

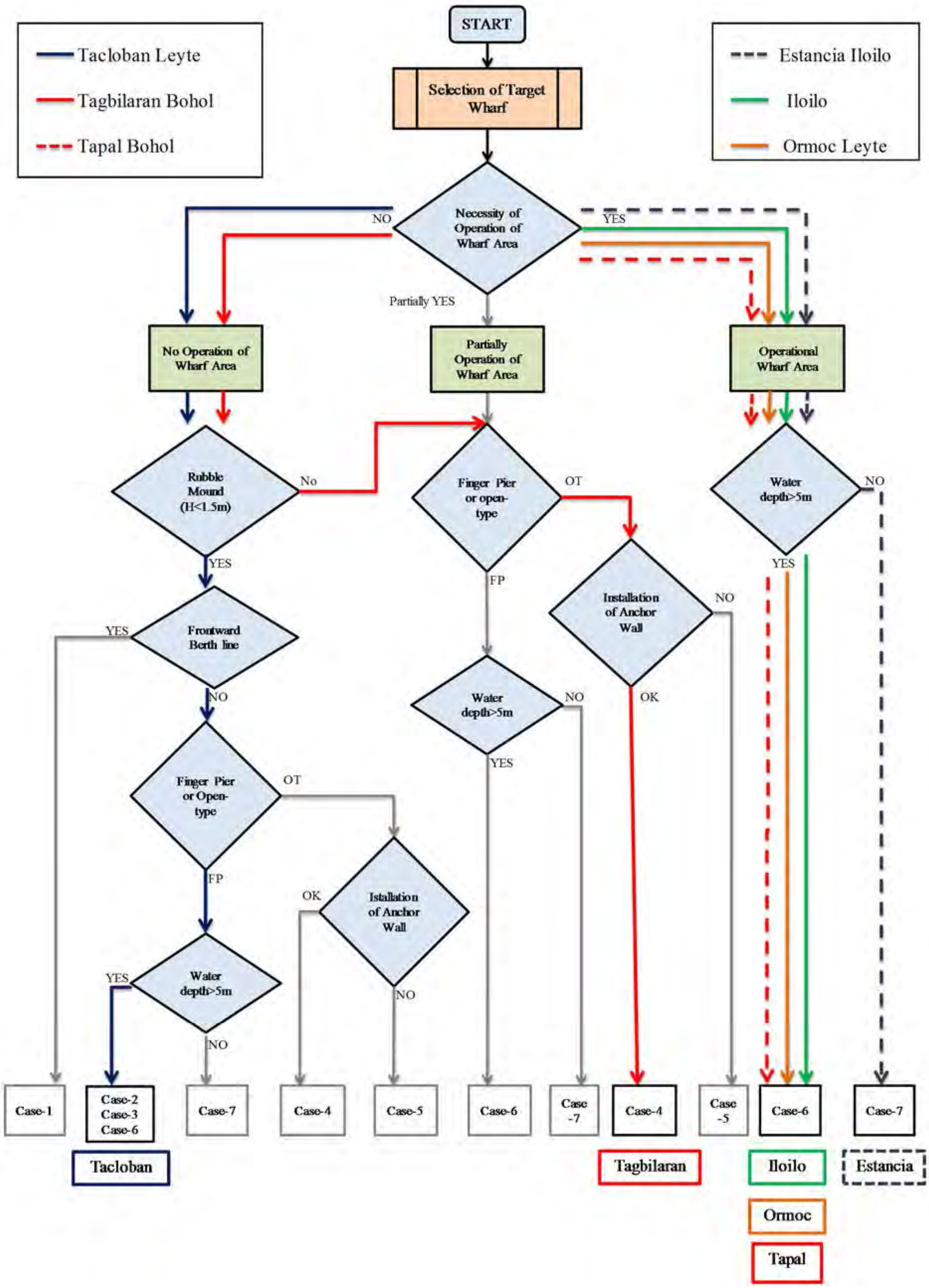
4) Selection of Standard Design Model

The case number of the optimal model for six ports was selected from the following flow chart as shown in Figure 11.3-2. The applicable cases for each port are mentioned below.

Case 4: Tagbilaran Port

Case6：Iloilo Port, Ormoc Port, and Tapal Port

Case2：Tacloban Port (although cases two, three and six are applicable for this port in Figure 11.3-2, case six are most suitable as evaluated in Table 11.1-2. Case six is already selected for Iloilo, Ormoc, and Tapal Ports, and case two is selected for Tacloban Port as the second priority to make various examinations.



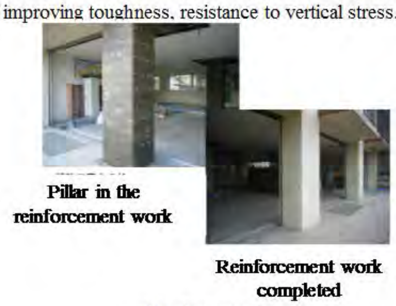
Source: Study team

Figure 11.3-2 Flowchart for the Selection of Standard Design Model

(2) Building Facilities

In general, there are two seismic structural strengthening methods for building facilities such as the reinforcement method of existing column and beam, and the external frame construction method. In this study, the latter is selected taking into account the serviceable condition during construction, and repair cost.

Table 11.3-3 Strengthening Method of the Building against Earthquake

	Reinforcement for columns, beams	External frame method
Summary	This method, paste the polyester of high-ductility material pillars and walls of existing buildings, the strength, a method of improving toughness, resistance to vertical stress.  Reinforcement work Source: The Ministry of Education & Science " Seismic Retrofit Case Studies "	This method improves the seismic performance of the building by placing the framework to the external of the building.  Reinforcement completion view Source: The Ministry of Education & Science " Seismic Retrofit Case Studies "
Advantages and disadvantages	During the construction period , building usage constraint will occur.	This method have no restriction to use during repairing period.
Construction period	Koka Aburahi Elementary School (Shiga JPN) Total floor area(㎡) 2,589 Construction period (day) 97 Non-working days(day) 44	Kino Higashi Elementary School(Hokkaido JPN) Total floor area(㎡) 4,055 Construction period (day) 140 Non-working days(day) 0
Cost	TACLOBAN ADM Office BLD Total floor area(㎡) 2,058 U/R(PHP) PHP 15,870 Total PHP 32,660,000	TACLOBAN ADM Office BLD Total floor area(㎡) 2,058 U/R(PHP) PHP 19,320 Total PHP 39,761,000
Selected Method	△	◎

Source: Study team

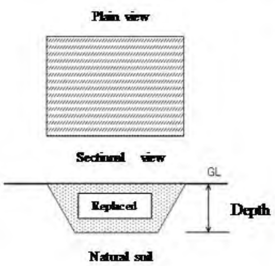
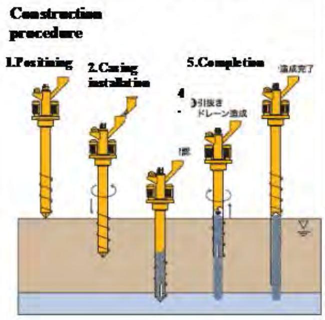
11.3.3. Standard Design Model for Liquefaction

The targets for the standard design model for liquefaction are the backup area including the yard and service road within the port area and the foundations of existing building facilities.

(1) Liquefaction Countermeasure for the Backup Area including Yard and Service Road

As a liquefaction countermeasure for yard and service road, it is assumed that there are three optional methods, such as the replacement method, the gravel drain method and the permeable grouting method. To consider the disposal of excavated materials, materials for pre-loading, and on-going operation, the permeable grouting method is adopted accordingly.

Table 11.3-4 Strengthening Method of Backup Area against Liquefaction

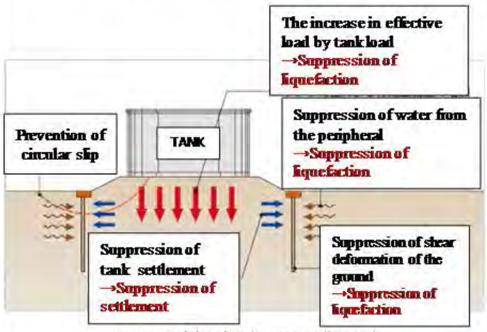
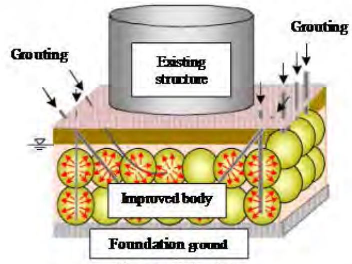
	Excavation & Replacement	Gravel drain method	Permeable grouting method
Summary	Method to be replaced with high quality soil by removing the soft soil . Occurrence difficult material of liquefaction , it replaces the target ground , for example, crushed stone .  Conceptual drawing	In this method , the crushed stone pillar that will be constructed into the ground , the excess pore water pressure that occurs during an earthquake to dissipate early , to prevent liquefaction .  Conceptual drawing (Source:Fudo Tetra HP)	This method is used for the countermeasure for liquefaction,and is also applicable under the existing structure.Inject a permanent type chemical grouting into sand grains, it will permeate into sand grains. And natural ground will be improved into the liquefaction resistance ground.  Conceptual drawing (Source: Penta-Ocean HP)
Case Study	It is an economical method that has the oldest history. However excavated soil disposal problem, such as the problem of ensuring the quality of soil , in recent years it has been reduced to use.	・ Port facilities (quay back ground , etc.) ・ Foundation ground high standard embankment of grain silos (before embankment) ・ Housing foundation ground	・ Existing tank foundation ・ Bridge foundation ・ Building foundation ・ The back of the harbor seawall ・ Under the runway
Advantages and disadvantages	・ Soil disposal is necessary. ・ Not aplicable underneth existing buildings. ・ Not aplicable underneth existing runway & apron.	・ It is extremely small deformation of the surrounding ground due to construction,so it is suitable for installation in existing structures vicinity. ・ Not aplicable underneth existing buildings. ・ Not aplicable underneth existing runway &	・ Applicable in narrow space. ・ For oblique injection is possible, it enables to improve the tank just below the ground from the surrounding. ・ Applicable under the run way ・ Vibration and noise control is not nessary. ・ Hard to apply to the high strata of the fine fraction
Cost	Improvent area：L50m×W50m×H15m Improve volume（m2） 56,250 Unit rate（PHP/m2） PHP 2,875 Subtoal(PHP) PHP 161,719,000	Area：L50m×W50m、pile length=15m@1.2m Improve length（m） 31,250 Unit rate（PHP/m） PHP 5,750 Surcharge loading PHP 2,760 Subtoal(PHP) PHP 265,938,000	Improvent area：L50m×W50m×H6m Improve volume（m2） 15,000 Unit rate（PHP/m2） PHP 11,500 Subtoal(PHP) PHP 172,500,000
Selected Method	△	△	◎

Source: Study team

(2) Liquefaction Countermeasure for Foundations of Existing Building Facilities

As for the liquefaction countermeasures for foundations of existing building facilities, it is assumed that there is the steel sheet pile ring method and the permeable grouting method. In consideration of the vibration generated during construction and cost impact, the latter is adopted accordingly. Outlines of each method are exhibited in Table 11.3-5.

Table 11.3-5 Strengthening Method of Existing Buildings against Liquefaction

	Steel sheet pile ring method	Permeable grouting method
Summary	This method has been used in liquefaction countermeasures of the ground tank . It enables to suppress the occurrence of liquefaction of the ground with placing steel sheet piles in a circular cylindrical tank periphery to enclose the ground directly below the tank into a cylindrical shape.  Conceptual drawing (Source: Kajima HP)	This method is used for the countermeasure for liquefaction,and is also applicable under the existing structure.Inject a permanent type chemical grouting into sand grains, it will permeate into sand grains. And natural ground will be improved into the liquefaction resistance ground.  Conceptual drawing (Source: Japan Federation of Construction Contractors HP)
Case Study	· Existing tank foundation · Bridge foundation · Building foundation · Underground strucure (U/G utility conduit、Sand basin , Buried pipe)	· Existing tank foundation · Bridge foundation · Building foundation · The back of the harbor seawall · Under the Airport runway
Advantages and disadvantages	· Special construction machinery is unnecessary. · Hard to apply in narrow space. · Vibration and noise control is nessary.	· Applicable in narrow space. · For oblique injection is possible, it enales to improve the tank just below the ground from the surrounding . · Vibration and noise control is not nessary. · Hard to apply to the high strata of the fine fraction content . · Special construction machinery is necessary.
Cost	Area 65m×25m Sheet pile L=15m Material cost(Sheet pile)(PHP) PHP 61,134,000 Construction cost (Sheet pile)(PHP) PHP 5,842,000 Coping concrete(PHP) PHP 2,070,000 Subtoal(PHP) PHP 69,046,000	Improvent area：L45m×D14m×H6m Improve volume (m2) 3,780 Unit rate (PHP/m2) PHP 11,500 Subtoal(PHP) PHP 43,470,000
Selected Method	△	◎

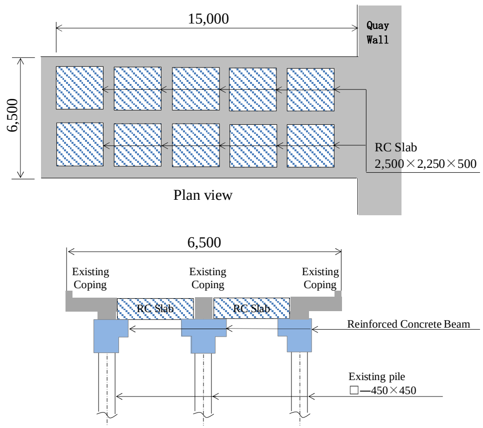
Source: Study team

11.3.4. Standard Design Model for Extreme Wind during Typhoon

It seems that the damage sustained by strong winds during typhoon Yolanda was only the roofing of the existing building facilities. In case of buildings in port facilities, the roofing was made of concrete slab or GI sheet. Only the GI sheet was damaged by the typhoon. It is difficult to change GI sheets into new concrete slab, because of the lack of strength in the existing structural members. Therefore, the Survey Team suggests the new installation of durable steel roofing materials including roofing material, roof beams and their fixtures with improvement to its method after the removal of the existing damaged GI sheet, and the application of glass shatter-resistant film to existing windows for preventing damage to be made by strong wind.

11.3.5. Standard Design Model for High Waves Attacked during Typhoon

It is confirmed that Estancia Port was only damaged by high waves generated by typhoon Yolanda, even the damage by high waves is less common in the Philippines. The actual damage to Estancia Port seems to be limited to the extent of the connection between the existing trestle and quay. The Survey Team proposes replacement to a new pre-cast concrete slab, which will be a method to protect beams and piles for mitigating up-lift pressure by the removal of the pre-cast slabs during typhoons. Recovery of the moved slabs is to be smoothly replaced by the new one that was fabricated beforehand in a short time. The outline of the method is presented in Figure 11.3-3.



Source: Study team

Figure 11.3-3 Standard Design Model for High Wave in Estancia

11.3.6. Standard Design Model for Storm Surge during Typhoon

Table 11.3-6 shows the calculated storm surge elevation at the quay for each target port based on the estimated storm surge elevations provided by OCD. It was confirmed that the quay and other civil facilities were not damaged, but the building facilities were only damaged by a storm surge during typhoon Yolanda.

Table 11.3-6 Estimated Storm Surge and its Height above Wharf

	Tacloban	Ormoc	Tagbilaran	Tapal	Iloilo	Estancia
Expected Storm Surge (m)	4.00	2.97	2.69	2.23	3.49	3.86
Mean Sea Level (m)	0.45	1.05	0.85	0.85	0.95	0.95
Crown Height (m)	3.00	3.00	3.00	3.00	3.00	3.00
Storm Surge above Wharf (m)	1.45	1.02	0.54	0.08	1.44	1.81

Source: Study team

As seen above, the table implies that the estimated storm surges for each port ranges from 2.2 to

4.0 m, and a distribution of storm surges between 0.1 and 1.8 m on each quay. The location of the building facilities are most likely far from each quay line with the elevations more than 50cm from those of the quay. The action of water movement from the storm surge is static and its disaster type is basically of inundation. There was a record of 7m high inundation during typhoon Yolanda in Tacloban port. It is possible to estimate the elevation of a storm surge, the design model will not be so established, because important instruments, documents and equipment installed /stored on the 1st floor can be transferred to the 2nd or 3rd floor to prevent damage caused by a storm surge.

11.3.7. Standard Design Model for Tsunami

Table 11.3-7 shows the calculated tsunami elevation at the quay for each target port based on estimated tsunami elevations provided by OCD. According to the field survey, it was confirmed that there was no occurrence of tsunami for the target sites since the seismic center was inland of Bohol Island.

Table 11.3-7 Estimated Tsunami Height and its Height above Wharf

	Tacloban	Ormoc	Tagbilaran	Tapal	Iloilo	Estancia
Expected Storm Surge (m)	4.00	3.00	2.90	3.46	5.00	-
Mean Sea Level（m）	0.45	1.05	0.85	0.85	0.95	-
Crown Height（m）	3.00	3.00	3.00	3.00	3.00	-
Storm Surge above Wharf（m）	1.45	1.05	0.75	1.31	2.95	-

Source: Study team

As seen above, the table presents the estimated tsunami wave heights for each port in the range between 2.9 to 5.0 m, and a distribution of tsunami height between 0.8 and 3.0 m on each quay. Estancia Port was considered as having no occurrence of tsunami due to no inundation anticipated. It seems that the disaster of tsunami is only inundation at the subcritical flow, having an estimated 0.75 to 2.95m tsunami height which is the same static action of a storm surge. But in the case of supercritical flow e.g. case of Iloilo, the tsunami height is estimated as 15 m (3times of 5 m) and tsunami wave pressure reaching 15 ton/m2 based on the tsunami wave pressure formula. As the wave pressure is a different order from the design external force of building structures and its application is not practical. The uplift tsunami wave pressure acting on the pier from the bottom of slab is same as tsunami pressure of 15 ton/m2 and its application is not practical as well. It is therefore assumed that the design model for pier and building for tsunami will not be established.

Japan has learned many things from past tsunami disasters. At present, there are two conceptual measures for tsunami attack such as a tsunami shelter building and tower as described in Figure 11.3-4 and Figure 11.3-5. Evacuation tower is designed to prevent the strong tsunami pressure.

Source: MLIT

Figure 11.3-4 Building Model against Tsunami

Source: MLIT

Figure 11.3-5 Evacuation Tower against Tsunami

11.3.8. Standard Design Model for Port Related Facilities

In order to establish disaster resilient port facilities, not only main facility such as berth, backup area, building, etc., but also following supporting facilities are also necessary. For power and water supply, emergency standby generators and water reservoirs are provided for each port.

Table 11.3-8 Standard Design Model for Port Related Facilities

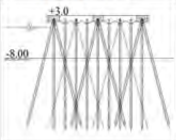
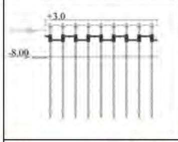
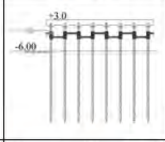
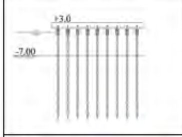
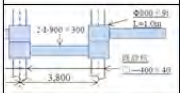
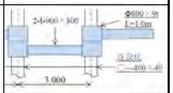
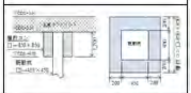
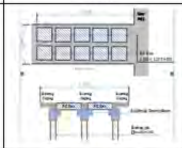
Facilities		TACLOBAN	ORMOC	TAGBILARAN	TAPAL	ILOILO (ICPC)	ESTANCIA
Utilities	Power Supply	Generator(143KW)	Generator (119KW)	Generator(93KW)	Generator (2KW)	Generator (122KW)	Generator (34KW)
	Water supply	Reservoir (102m^3)	Reservoir (85m^3)	Reservoir (66m^3)	Reservoir (2m^3)	Reservoir (87m^3)	Reservoir (24m^3)

Source: Study team

11.3.9. Summary of Standard Design Model for Target Ports

Based on the above, all necessary standard design models for all target ports are summarized in the table below.

Table 11.3-9 Summary of Standard Design Models for Target Ports

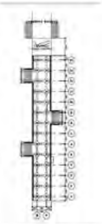
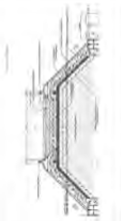
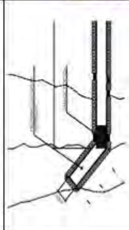
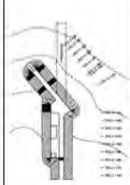
Facilities		TACLOBAN	ORMOC	TAGBILARAN	TAPAL	ILOILO (ICPC)	ESTANCIA
Berthing Facility (for earthquake)			No reinforcing is necessary			No reinforcing is necessary	
		Additional steel pipe batter piles φ800mm, 6m ctc					
		Reinforcing pier length: 160m		Reinforcing pier length: 160m	Reinforcing pier length: 35m and new pier 150m		Reinforcing pier length: 110m
Trestle (for High wave)		-	-	-	-	-	
Yard and Access Road (for liquefaction)		Permeable grouting (1,500m^2)	Permeable grouting (2,100m^2)	Permeable grouting (3,150m^2)	Permeable grouting (600m^2)	Permeable grouting (5,700m^2)	Permeable grouting(600m^2)
Buildings (for earthquake, liquefaction and wind)	Administration Bldg.	・External frame ・Permeable grouting ・Roof material change	・External frame ・Permeable grouting ・Roof material change	-	・External frame ・Permeable grouting ・Roof material change	・External frame ・Permeable grouting ・Roof material change	・External frame ・Permeable grouting ・Roof material change
	Warehouse	・External frame ・Permeable grouting ・Roof material change	-	・External frame ・Permeable grouting ・Roof material change	-	・External frame ・Permeable grouting ・Roof material change	-
	PTB	-	・External frame ・Permeable grouting ・Roof material change	・External frame ・Permeable grouting ・Roof material change	-	-	・External frame ・Permeable grouting ・Roof material change
Utilities	Power Supply	Generator(143KW)	Generator (119KW)	Generator(93KW)	Generator (2KW)	Generator (122KW)	Generator (34KW)
	Water supply	Reservoir (102m^3)	Reservoir (85m^3)	Reservoir (66m^3)	Reservoir (2m^3)	Reservoir (87m^3)	Reservoir (24m^3)

Source: Study team

11.3.10. Consideration for the Damages of DOTC Ports by Bohol Earthquake and Typhoon Yolanda

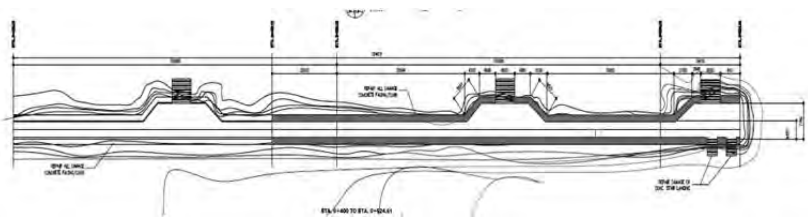
DOTC ports in Leyte, Bohol and Iloilo provinces were damaged by Bohol earthquake and typhoon Yolanda. Based on the Bohol and Yolanda rehabilitation project prepared by DOTC, a disaster of six ports in Bohol Island and one port in Leyte and Iloilo Island respectively are reported as shown Table 11.3-10. Plan, section, photos of damage, estimated cost for rehabilitation, reasons of damage and countermeasures for rehabilitation are summarized in the table. The damages of Inabanga, Guindulman and Maribojoc are serious and it is assumed that the causeway was first damaged by earthquake and the damages were extended by washing out or scouring of the filling material and seabed.

Table 11.3-10 Summary of the Condition of Damage and Countermeasure of the Facilities

	Bohol Rehabilitation						Yolanda Rehabilitation	
	Guindulman	Inabanga	Baclayon	Maribojoc	Clarin	Buenavista	Albuera Port (Leyte)	Banate Port (Iloilo)
Estimated cost for Rehabilitation (Mil. Peso)	19.3	33.8	6.2	12.7	5.5	1.9	7.9	3.0
Phot of Damage								
Proposed Plan of Rehabilitation								
Main Damage	Tip of causeway damaged and erosion	Settlement of causeway	Erosion	Settlement of causeway	Settlement of causeway	Pavement of causeway damage	Totally eroded	Top concrete damage
Degree of damage	Midium damage	Serious damage	Midium damage	Midium damage	Small damage	Minor damage	Small damage	Small damage
Countermeasure	Armor stone at the tip of causeway 1.5 times than standard area	-Additional filling of causeway -Repair of berth	-Replace of core material -Additional Armor stone	-Replace of core material -Additional Armor stone	-Additional filling of causeway -Repair of berth	-Repair of pavement -Additional Armor stone	-Re-construction	-Repair of top concrete

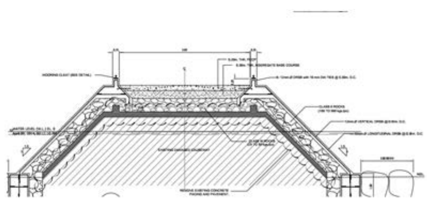
Source: DOTC and Study team

Followings are the typical plan and section of the causeway.



Source: Study team

Figure 11.3-6 Plan of Causeway (Banate Port)



Source: Study team

Figure 11.3-7 Typical Cross Section of Causeway (Inabanga Port)

In order to prevent the disaster of the causeway by earthquake and typhoon, the following will be considered for new construction, rehabilitation or repair of the causeway for each stage.

1) Survey and Investigation stage

- Topographical and hydrographical survey
- Design wave estimate
- Soil investigation

2) Planning stage

- General plan of causeway shall not affect environmental impact specially erosion and deposit of the shoreline.
- Shape of the causeway shall be planned in order not to concentrate the incident waves.

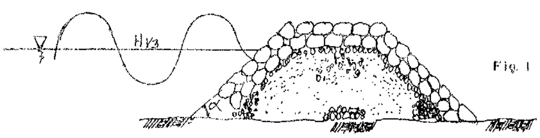
3) Design stage

- Armor stone size shall be decided based on the design wave height. If the procurement of large size of armor stone is difficult or not economical, producing of concrete block instead of armor stone is recommended. Calculation formula of armor stone is specified in PPA design manual as below.

1) The weight of rubble or concrete blocks covering the slope surface of a structure receiving the action of wave force may be calculated by formula (1).

$$W = \frac{\gamma_r \cdot H^3}{K_D \left(\frac{\gamma r}{W_o} - 1 \right)^3 \cot \alpha} \quad (1)$$

where W: Minimum weight of rubble or concrete block (tf)
γr: Unit weight of rubble in air (tf/m^3)
Wo: Unit weight of sea water 1.03, tf/m^3)
α: Angle of the slope to horizontal plane (degrees)
H: Wave height (m)
K_D: Stability coefficient determined by the armoring material and damage rate.



Source: PPA

Figure 11.3-8 Calculation Formula of Armor Stone

- Size of the armor stone at the area of breaking waves shall be increased in order to be stable against the waves.
- Slope of the causeway shall be minimum 1:1.5 and it is recommendable 1:2.0. Layer of

armor stone of the slope shall be more than two. Horizontal berm shall be provided on the toe of slope.

- Size of the armor stones within 20 meters from the tip of causeway shall be 1.5 times bigger than standard area. (Refer to damage of Guindulman)
- In order to prevent the settlement at the toe of armor stone, filter cloth shall be provided.
- Core material shall be stone. Filter stone shall be provided between armor stone and core stone. (Refer to Maribojoc, Baclayon, Clarin)
- Thickness of the top concrete/pavement shall be minimum 200mm. (refer to Buenavista)
- If there is possibility of the liquefaction under the sea bed, sea bed soil shall be improved by appropriate method in order to prevent the settlement. (Refer to Inabanga and Clarin) If soil improvement is not practical or realistic, crown height will be raised considering the future settlement.

11.4. Rough Cost Estimate

Table 11.4-1 presents a summary of rough cost estimate for the port facilities based on the standard design model in application of the latest unit prices specified by PPA and DPWH, the construction prices in Japan etc. It should be noted that the estimated cost does not include the cost of restoration, the cost of countermeasure for deterioration, and the cost of functional strengthening for the existing facilities. The estimated cost of Tapal includes not only reinforcing structure of 35m length of existing pier but also 150m of new pier extension. The breakdown of the rough cost estimates are attached in Appendices. The maintenance costs of the reinforcing structures for the port facilities are estimated 2 to 3 percent of the construction cost of each structure.

Table 11.4-1 Rough Cost Estimate for Standard Design Model for the Target Ports

Facilities		TACLOBAN	ORMOC	TAGBILARAN	TAPAL	ILOILO (ICPC)	ESTANCIA	Remarks
Berthing facilities		PHP 69,497,000	—	PHP 56,717,000	PHP 243,604,000	—	PHP 14,020,000	Earthquake resistance
		—	—	—	—	—	PHP 3,723,000	High wave resistance
Yard/Access road		PHP 20,250,000	PHP 15,750,000	PHP 54,000,000	PHP 12,375,000	PHP 42,750,000	PHP 9,000,000	Liquefaction resistance
Building	Administration / Office Building	PHP 59,126,000	PHP 13,341,000	—	PHP 2,220,000	PHP 48,285,000	PHP 21,420,000	Resistance to Strong wind /Earthquake /Liquefaction
	Warehouse	PHP 12,521,000	—	PHP 7,252,000	—	PHP 22,446,000	—	
	Passenger Terminal Building	—	PHP 60,391,000	PHP 26,532,000	—	—	—	
Other facilities	Emergency diesel generator	PHP 7,260,000	PHP 5,544,000	PHP 5,544,000	PHP 764,000	PHP 5,544,000	PHP 3,222,000	
	Emergency water pit	PHP 427,000	PHP 553,000	PHP 427,000	PHP 94,000	PHP 389,000	PHP 328,000	
Total (Pesos)		PHP 169,081,000	PHP 95,579,000	PHP 150,472,000	PHP 259,057,000	PHP 119,414,000	PHP 51,713,000	PHP 845,316,000

Source: Study team

12. Fund for Improvement of Disaster Resilient Ports

12.1. Budgetary System of the Government of the Philippines

12.1.1. Basic Framework

Budget of the government of the Philippines consists of New General Appropriations and Automatic Appropriations. The budget of governmental departments, agencies, councils and commissions belongs to the former. The budget for support to Government Corporations, allocation to Local Government Units (other than automatic appropriations) and disaster risk reduction and management also belong to it. The budget is compiled by Department Budgetary Management (DBM) through assessing proposals from departments and other relevant organizations and decided after approval of Congress every year. The latter does not require periodic action by Congress and nor require legislation for annual appropriations. Internal Revenue Allotment (IRA), Dept service–Interest payment, Retirement and Life Insurance Premiums, Net Lending and Tax Expenditure Fund are included.

The New General Appropriations in 2015 totaled 1,862,824,653 thousand PhP while Automatic Appropriations totaled 866,231,428 thousand PhP. Unprogrammed Appropriations totaled 123,056,081 PhP. Unprogrammed Appropriations can only be used when there are windfall revenues in excess of the government's revenue program for the year. (See Table 12.1-1) Budget breakdowns are shown in Table 12.1-2 and Table 12.1-3.

Table 12.1-1 Budget in FY2015

Total (unit: thousand PhP)		2,606,000,000
	NEW General appropriations	1,862,824,653
	Automatic Appropriations	866,231,428
	Unprogrammed Appropriations	123,056,081

Source: DBM

Table 12.1-2 Breakdown of Budget in FY2015

(In billion PhP)	2014	2015	Growth rate
Department	1,235.2	1,421,2	15.1 %
Special Purpose Funds	1,029.6	1,184.8	15.1 %
Grand Total	2,264.6	2,606.0	15.1 %
Unprogrammed Fund	139.9	123.1	-12.0%

Source: Peoples Budget 2015, April 2015, Department of Budget and Management

Table 12.1-3 Breakdown of Automatic Appropriations in FY2015

Items	Amount (in thousand PhP)	Share
Internal Revenue Allotment	389,860,429	45.0%
Debt Service-Interest Payment	372,863,000	43.0%
Retirement and Life Insurance Premiums	30,149,491	3.5%
Not Lending	26,500,000	3.1%
Grant Proceeds	140,902	0.0%
Tax Expenditure Fund	25,475,000	2.9%
Special Accounts in the General Fund	21,242,275	2.5%
Pension of Ex-Presidents/Wives	331	0.0%
Total	866,231,428	100%

Source: DBM

The strategic objective of the department is described in Volume 1 of the General Appropriations Act (GAA) which includes numerical targets. The amount of the budget is described in Volume II. The amount is divided into two items of programs and project(s). The item of Programs consists of General Administration and Support (Expenditure for general administrative tasks) and Operation (Expenditure for operation under policy) and that of Project(s) is divided into Locally Funded Project and Foreign Assisted Project(s). Breakdown amounts of expenditures of each item are shown by personal service, maintenance and other operating expenditure, financial expense.

Process of drafting a budget for the next year begins in January; the budget is submitted to the Congress in July. The budget of 2015 was drafted and submitted to the Congress as follows:

DBM issued a budget call for the next year in January 2014; National government agencies (GA) submitted the form of Actual Obligation and Current Year Appropriation to DBM after consultation with Regional Development Councils - Civil Society Organizations - Other Stakeholders in March; GA also submitted FY 2015 Budget Proposal to DBM at the end of March. DBM carried our technical hearings with agencies and reviewed the proposals in April and May. Through deliberation in the Development Budget Coordination Committee (DBCC), FY2015 proposed Budget was presented to the President and the Cabinet in June. Then, confirmation letters were sent to agencies. National Expenditure Program (NEP), Budget of Expenditures and Sources of Financing (BESF) Tables, Staffing Summary, Budget Message, Details of Programs/Projects and Organizational Performance Indicator Framework (OPIF) Book were finalized in July. Finally, the budget was submitted by the President to Congress at the end of July.

A two-stage budgeting schedule has been taken with respect to the 2016 budget. Budget call was issued in January and forward estimates were formulated in February. Ceiling and Budget Priorities Framework were issued in March. Based on it, GA submitted the proposal until April to DBM. Finally the budget was submitted to Congress at the end of July. The budgeting schedule for FY 2015 is shown in Table 12.1-4

Table 12.1-4 Budgeting schedule for FY 2016

Activity	Date
1. Issuance of Budget Call	January 28, 2015
2. Budget Forum i. DBM Officials and Staff ii. National Government Agencies iii. Corporate Budget Forum	 February 10, 2015 February 11-17, 2015 February 18, 2015
3. DBM-RO/Agency ROs Budget Forum on the FY 2016 National Budget	February 12, 2015
4. Consultations of Agencies' On-going Programs and Projects with: - Regional Development Councils - Civil Society Organizations - Other Stakeholders under the bottom-up budgeting	January - February, 2015
5. Submission of B.P. Form No. 201 A, B, C – Past Year's Actual Obligation and Current Year Appropriation (thru OSBP)	February 2015 January to February
6. Formulation of Forward Estimates (Hard Budget Ceiling)	2015 February 9 to 27, 2015
7. Technical Budget Hearings with Agencies (Forward Estimates)	March 2 to 6, 2015
8. DBM Budget Review	March 9 - 10, 2015
9. Sending of Confirmation Letters to Agencies	March 17 to 19, 2015
10. Presentation to the President and the Cabinet and approval of the FY 2016 Hard Budget Ceiling of Department/Agency/Special Purpose Funds	March 20, 2015
11. Issuance of Ceiling and Budget Priorities Framework	March 23, 2015
12. Budget Forum i. National Government Agencies Batch 1 Batch 2 ii. Corporate Budget Forum	March 24, 2015
13. RDC Consultation/Dialogue with Selected Agency Central Offices	March 25, 2015
14. Deadline of Submission (thru OSBPS) of FY 2016 Budget Proposals (New Spending Proposals and Hard Budget Ceiling)	March 26 to April 1, 2015 April 27, 2015
15. Technical Budget Hearing on New Spending Proposals	May 4 to 22, 2015
16. DBM Budget Review	June 1 to 12, 2015
17. Sending of Confirmation Letters to Agencies of the Total Budget Levels	June 15 to 16, 2015
18. Presentation to the President and the Cabinet and approval of the FY 2016 Proposed Budget Levels of Department/Agency/Special Purpose Funds	June 22, 2015
19. Finalization of National Expenditure Program (NEP), Budget of Expenditures and Sources of Financing (BESF) Tables, Staffing Summary, Budget Message	June 24 to July 3, 2015
20. Printing of FY 2016 Budget Documents	July 6 to 22, 2015
21. Submission of the FY 2016 Budget Documents to the President	July 23, 2015
22. Submission of the President's Budget to Congress	July 28, 2015

Source：National Budget Call Fiscal year 2016, January 28, 2015 DBM

12.1.2. Special Purpose Funds

Special Purpose Funds (SPFs) are appropriated in GAA for specific purposes. Most SPFs are presented in the GAA in detail, such as Budgetary Support to Government Corporations which is disaggregated per recipient and program or project. Meanwhile, some SPFs, like the Calamity Fund, are lump sum in nature as the specific programs or projects to be funded are only identified during budget execution.

1,184.8 Billion PhP was appropriated in 2015 fiscal year: IRA is 32.9%; Miscellaneous Personnel Benefits Fund and Pension and Gratuity Fund accounted for about 10%, respectively. NDRRMF is about 1.2%. (See Table 12.1-5)

Table 12.1-5 Special Purpose Funds

(In billion PhP unless otherwise stated)	2014 GAA	2015 GAA	Growth Rate
SPECIAL PURPOSE FUNDS (SPFs)	**1,029.6**	**1,184.8**	**15.1%**
A. Disaggregated SPFs (New GAA)	**232.2**	**321.8**	**38.6%**
Budgetary Support to Government Corporations (BSGC)	47.2	63.8	35.2%
Allocations to Local Government Units (ALGU)–MMDA	2.3	2.2	-4.3%
DepEd–School Building Fund	1.0	—	-100.0%
Feasibility Studies Fund	400 1)	—	-100.0%
E-Government Fund	2.5	1.0	-60.0%
International Commitments Fund	4.8	10.7	122.9%
Miscellaneous Personnel Benefits Fund	53.5	117.4	119.4%
Pension and Gratuity Fund	120.5	126.7	5.1%
B. Lump Sum SPFs (New GAA)	**51.3**	**48.3**	**-5.8%**
National Disaster Risk Reduction and Management Fund	13.0	14.0	7.7%
Contingent Fund	1.0	2.0	100.0%
Rehabilitation and Reconstruction Program	20.0	1.0	-95.0%
ALGU–Special Shares & Others	17.3	31.3	80.9%
C. Automatic Appropriations	**747.0**	**816.0**	**9.2%**
BSGC–Special Accounts in the General Fund	1.0	1.3	30.0%
ALGU–Internal Revenue Allotment	341.5	389.9	14.2%
Net Lending	25.0	26.5	6.0%
Tax Expenditure Fund	26.9	25.5	-5.2%
Interest Payments	352.7	372.9	5.7%

1) in million
Source: Peoples Budget 2015, April 2015, Department of Budget and Management

12.1.3. Allocations for Local Government Units

The total subsidy given to LGUs by the national government refers to Allocations for Local Government Units: ALGU). It consists of the mandated share in the revenue collections arising from: 1) the automatically appropriated formula based share of all LGUs from national internal revenue collections pursuant to the Local Government Code (R.A. 7160); and 2) the special shares of selected LGUs to specific laws. The amount is IRA is 422,944 million PhP.

IRA, 389,860 million PhP in 2015, accounts for more than 90% of ALGU and also for 45 % of the amount of automatic appropriations. The amount of 40 % of the estimated national internal revenue taxes will be released to each Province, City, Municipality or Barangay according to numerical results calculated by the prepared formula based on the level of LGU, population and area etc.

LGUs have to use IRA according to the following rules which is described in the FY 2015 Internal revenue Allotment (IRA) Level and Other Local Budget Preparation matters by DBM.

- LGU shall first cover the cost of providing thereof particularly those developed by DOH, DSWD, DOA and DENR as well as other agencies of the National Government before applying the same for other purpose.

- LGU shall appropriate in its annual budget no less than 20% of its annual IRA for development projects.
- Not less than 5% of the estimated revenue of LGUs from regular sources shall be set aside as the Local Disaster Risk Reduction and Management Fund.

The amounts of released IRA by the level of LGUs are shown in Table 11-6. The amounts per province, city, municipality and barangay on average are 1,123 million PhP, 619 million PhP, 89 million PhP, and 1.8 hundred ten thousand PhP respectively. In case of Iloilo province, income from IRA is 1,408 million PhP which accounts for 81.4 % of total income (1,731,045,058.05 PhP) in FY2013 (see Table 12.1-7).

Table 12.1-6 Release to LGUs by Level of LGU

Level of LGU	Number of LGUs	Share Equivalent to the Cost of Developed Functions/City-Funded Hospital, as of 31 December 1992	Share Determined on the Basis of section 285 of RA No.7160	Total IRA Shares (in PhP)
Provinces	81	88,178,326,872	2,845,490,826	91,023,817,698
Cities	144	88,178,326,872	1,028,782,874	89,207,109,746
Municipalities	1,478	130,350,570,160	2,602,125,420	132,952,695,580
Barangays	41,889	76,676,805,976	-	76,676,805,976
Total	45,592	383,384,029,880	6,476,399,120	389,860,429,000

Source: FY 2015 Internal Revenue Allotment (IRA) Level and Other Local Budget Preparation matters (Local Budget Memorandum), July 1, 2014, DBM

Table 12.1-7 Income of Iloilo Province (For the period ending December 31,2013)

Income In PhP	General Fund	Special Education Fund	Total
Service Income	23,390,363.19		23,390,363.19
Business Income	48,998,675.17		48,998,675.17
Other Income	1,484,647,706.95	610,106.39	1,485,257,813.34
(Internal Revenue Allotment)	(1,408,785,600.00)		(1,408,785,600.00)
National Income	592,771.15		592,771.15
Local Taxes	91,544,430.71	81,261,004.49	172,805,435.20
Total	1,649,173,947.00	81,871,110.88	1,649,173,947.00

Source: 2014 Provincial Profile: Province of Iloilo

12.1.4. Budget of DOTC

Budget of DOTC in 2015 consists of those for Office of the Secretary, Civil Aeronautics Board, Maritime Industry Authority, Office of Transportation Cooperatives, Office for Transportation Security, Philippine Coast guard and Toll Regulatory Board and the total amount is 52,874,342 thousand PhP. (See Table 12.1-8) This amount ranks 10th among departments.

In addition to this budget, 2,819,997 thousand PhP for Light Rail Authority and 546,860 thousand PhP for Philippine National Railway which are GOCCs under DOTC are appropriated in GAA.

Table 12.1-8 Budget of DOTC in FY2015

Total Amount for Department Transportation and Communications (in thousand PhP)	52,874,342
Office of the Secretary	45,845,422
Civil Aeronautics Board	68,032
Maritime Industry Authority	1,155,605
Office of Transportation Cooperatives	17,784
Office for Transportation Security	52,997
Philippine Coast guard	5,607,980
Toll Regulatory Board	26,522

Source: Summary of FY 2015 New Appropriations, Official gazette

The total budget in FY 2015 of the Office of the Secretary of DOTC is 45,945,422 thousand PhP which is composed of 6,541,184 thousand PhP for the Program budget and 39,404,238 thousand PhP for the Project budget. (See Table 12.1-9)

Table 12.1-9 Breakdown of Budget of Office of Secretary of DOTC (FY2015)

(in thousand PhP)	Personnel Services	Maintenance and Other Operating Expenses	Financial Expenses	Capital Outlays	Total
Program					
General Administration and Support	546,919	1,142,736	5,575,	1,419,168	3,114,398
Operations	738,296	2,666,871	0	21,619	3,426,786
MFO01 Transport Policy Service	62,424	56,699		457	119,580
MFO02 Motor Vehicle Registration and Driver's Licensing Regulatory Services	345,205	740,632		801	1,086,638
MFO03 Regulation of Public Transport Services	111,676	171,601		15,101	298,378
MFO04 Rail Transport Passenger Services	218,991	1,697,939		5,260	1,922,190
Total (Program)	1,285,215	3,809,607	5,575,	1,440,787	6,541,184
Project					
Locally-Funded Project(s)		7,122,544		21,764,940	28,887,484
Foreign Assisted Project(s)				10,516,754	10,516,754
Total (project)		7,122,544		32,281,694	39,404,238
Total	1,285,215	10,932,151	5,575	33,722,481	45,945,422

Source: Summary of FY 2015 New Appropriations, Official gazette

12.2. Budget for Port Development

12.2.1. Basic Idea on Fund for Development and Operation of Ports

Ports in the Philippines are developed by the funds of the central government, GOCCs such as PPA, LGUs and private companies. The development by the fund of central government targets small public ports which play a role as a social infrastructure for the local people. DOTC prepares the proposal for the budget for appropriation. GOCCs develop their ports by their own funds and LGUs develop ports by their own fund including the budget allocated from the central government. In case of PPP projects, private fund is used for developing public port facilities. Some projects are implemented by the fund from foreign donors. Private ports are developed by private funds.

Costs for port operation shall be funded by revenue from port operation in principle. PPA operates all ports under PPA by the PPA corporate fund. The ports which are developed by DOTC shall be turned over to a LGU and the LGU shall operate the port by the LGU’s fund including collected port charges. Ports which are developed by PPA corresponding to the request from LGUs also shall be operated by the LGU’s fund.

12.2.2. Government Budget for Improvement of Ports

(1) Budget of FY2015

DOTC is responsible for the development of social ports using local fund and proposes necessary budget to DBM every year. Project costs for the development of social ports are recorded in the sub-item of Ports, Lighthouses and Harbors of Non Road Transportation in the item of Locally-Funded Project(s) of DOTC’s Budget in GAA. (See Table 12.2-1)The amount in FY 2015 is 1,631,453,000 PhP for 63 ports (see Table 12.2-2).

WTPD prepares a budget plan for the development of ports in the following year based on requests from LGUs, recommendations of regional development councils and proposals of others and submits a proposal to DBM. According to WTPD, the ports to be proposed shall be included National Port Master Plan or proposed subject to a feasibility study by DOTC/PPA/CPA. In addition, conditions on sheltered location, right-of-way, locational relation to neighboring ports, population served, income, agricultural potential, cargo throughput, passenger movements, road access, impact to marine environment and social impact to the community are considered to select social ports.

There are a variety of project sizes in the budget. Six ports have budgets exceeding 50 million PhP while 45 ports have budgets ranging from 10 million PhP to 50 million PhP. Small size projects of 2.5 million PhP are also included. The average project cost per port is approximately 25 million PhP.

The projects are divided into two groups in a document of DOTC; one is the improvement of social ports and the other is that of tourism ports. Among 63 projects, 54 projects are categorized into social ports and 8 projects into tourism ports. The total budget of the former projects is 1,298,453 PhP and that of the latter is 275,000 PhP. Three projects are not categorized into these groups.

Implementation bodies of each project are described in the documents of DOTC. Seven (7) projects will be carried out by DOTC and fifty six (56) projects by PPA. Because DOTC does not deploy branch offices at project sites and does not have enough capacity to implement these projects, DOTC asked PPA to implement 56 projects on behalf of DOTC.

Table 12.2-1 Budget of Port Development in FY2015

DOTC (in PhP)	45,945,422,000
Program	6,541,184,000
Project	39,404,238,000
Foreign assisted Project(s)	10,516, 754,000
Locally-Funded Project(s)	28,887,484,,000
Non Road Transportation	20,573,070,000
Ports, Lighthouses and Harbors	1,631,453,000

Source: DOTC

Table 12.2-2 Ports to be improved in FY2015 and Budget of each port

Region No	Project Description	Location	Program Amount (in Million)	To be Implemented by:	Remarks
II					
CAGAYAN					
1	PORT OF CALAYAN	Nagsidel, Calayan, Cagayan	35.000	PPA	Social Port
BATANES					
2	PORT OF ITBAYAT	Itbayat, Batanes	45.000	PPA	Social Port
3	PORT OF CHAVAYAN	Sabtang, Batanes	36.000	PPA	Social Port
ISABELA					
4	PORT OF MACONACON	Maconacon, Isabela	40.000	PPA	Social Port
IV-A					
QUEZON					
5	PORT OF BURDEOS	Burdeos, Quezon	33.824	PPA	Social Port
6	PORT OF PATNANUNGAN	Patnanungan, Quezon	10.000	PPA	Social Port
7	PORT OF JOMALIG	Jomalig, Quezon	10.000	PPA	Social Port
8	PORT OF POLILLO	Polillo, Quezon	10.000	PPA	Tourism Port
IV-B					
PALAWAN					
9	PORT OF DUMARAN	Dumaran, Palawan	44.224	PPA	Social Port
10	PORT OF BATARAZA	Taratak, Bataraza, Palawan	44.000	PPA	Social Port
11	PORT OF BUSUANGA	Busuanga, Palawan	20.000	PPA	Tourism Port
MARINDUQUE					
12	PORT OF MANIWAYA	Maniwaya, Sta. Cruz, Marinduque	10.000	PPA	Tourism Port
ROMBLON					
13	PORT OF CALATRAVA	Calatrava, Romblon	40.000	PPA	Social Port
OCCIDENTAL MINDORO					
14	PORT OF CAMINAWIT	San Jose, Occidental Mindoro	60.000	PPA	Tourism Port
OCCIDENTAL MINDORO					
15	PORT OF LUBANG	Lubang, Occidental Mindoro	0.400	PPA	Social Port
V					
CAMARINES SUR					

Region No	Project Description	Location	Program Amount (in Million)	To be Implemented by:	Remarks
16	PORT OF SIRUMA	Siruma, Camarines Sur	46.824	PPA	Social Port
17	PORT OF SAN VICENTE	Caramoan, Camarines Sur	25.000	PPA	Tourism Port
18	PORT OF CODON		40.000	PPA	Tourism Port
	Codon, Catanduanes	Codon, Catanduanes			
	FISH LANDING WHARF	FISH LANDING WHARF	10.000	PPA	Social Port
	Bato, Catanduanes	Bato, Catanduanes			
	FISH LANDING WHARF	FISH LANDING WHARF	10.000	PPA	Social Port
	Gigmoto, Catanduanes	Gigmoto, Catanduanes			
ALBAY					
19	PORT OF BATAN	Batan, Albay	20.000	PPA	Social Port
20	PORT OF RAPU-RAPU	Rapu-Rapu, Albay	30.000	PPA	Social Port
21	PORT OF MILAGROS	Milagros, Masbate (Main Island)	50.000	PPA	Social Port
VI					
ILOILO					
22	PORT OF ESTANCIA	Estancia, Iloilo	50.000	PPA	Tourism Port
AKLAN					
23	PORT OF MANOC-MANOC	Malay, Aklan	60.000	PPA	Tourism Port
CAPIZ					
24	PONTEVEDRA RIVERLANDINGS(a).	Brgy. Lantangan	2.500	PPA	Social Port
25	PONTEVEDRA RIVERLANDINGS(b).	Brgy. Intongcan	2.500	PPA	Social Port
26	PONTEVEDRA RIVERLANDINGS(c).	Brgy. San Pedro	2.500	PPA	Social Port
27	PONTEVEDRA RIVERLANDINGS(d).	Brgy. Bailan	2.500	PPA	Social Port
28	PONTEVEDRA RIVERLANDINGS(e).	Brgy. Solo	2.500	PPA	Social Port
29	PONTEVEDRA RIVERLANDINGS(f).	Brgy. Tacas	2.500	PPA	Social Port
30	PONTEVEDRA RIVERLANDINGS(g).	Brgy. Binuntucan	2.500	PPA	Social Port
31	PONTEVEDRA MUNICIPAL WHARF	Pontevedra, Capiz	10.000	PPA	Social Port
32	PORT OF PAWA	Pawa, Capiz	7.500	PPA	Social Port
33	PORT OF PILAR	Pilar, Capiz	15.000	PPA	Social Port
GUIMARAS					
34	DEVELOPMENT OF BUENAVISTA WHARF	Buenavista, Guimaras	10.000	PPA	Social Port
VII					
BOHOL					
35	PORT OF POPOO	Pres. C. P. Garcia, Bohol	20.000	PPA	Social Port
CEBU					
36	PORT OF PILAR	Pilar, Camotes Island, Cebu	40.000	DOTC	Social Port
37	PORT OF MALAPASCUA	Daanbantayan, Cebu	22.664	DOTC	Social Port
38	PORT OF LANGUB	Guintacan Island, Cebu	14.124	DOTC	Social Port
39	PORT OF MAYA	Maya, Cebu	40.000	DOTC	Social Port
VIII					
NORTHERN SAMAR					
40	PORT OF LAOANG	Laoang, Northern Samar	53.764	PPA	Social Port
41	PORT OF SAN ANTONIO	San Antonio, Northern Samar	35.000	PPA	Social Port
SAMAR					
42	BRGY. MABUHAY WHARF	Almagro, Samar	10.000	PPA	Social Port
43	BRGY. MARASBARAS	Almagro, Samar	10.000	PPA	Social Port

Region No		Project Description	Location	Program Amount (in Million)	To be Implemented by:	Remarks
		WHARF				
	SOUTHERN LEYTE					
	44	PORT OF PADRE BURGOS	Padre Burgos, Southern Leyte	43.844	PPA	Social Port
	45	PORT OF SAN FRANCISCO	San Francisco, Southern Leyte	35.000	PPA	Social Port
IX						
	ZAMBOANGA DEL SUR					
	46	PORT OF OLUTANGA	Olutanga, Zamboanga del Sur	27.424	PPA	Social Port
X						
	CAMIGUIN					
	47	PORT OF BENONI	Benoni, Camiguin	35.000	PPA	Social Port
XI						
	DAVAO DEL NORTE					
	48	PORT OF KAPUTIAN	Samal Island, Davao del Norte	20.000	PPA	Social Port
	49	PORT OF STA. CRUZ	Talicud Island, Sta. Cruz, Davao del Norte	30.000	PPA	Social Port
XIII						
	SURIGAO DEL NORTE					
	50	PORT OF PILAR	Pilar, Surigao del Norte	30.224	PPA	Social Port
	51	PORT OF SAN BENITO	Siargao Island, Surigao del Norte	30.000	PPA	Social Port
	52	PORT OF DINAGAT	Escolta, Surigao del Norte	40.000	PPA	Social Port
	53	PORT OF CAMBAS-AC	Brgy. Cambas-Ac, Surigao del Norte	5.000	PPA	Social Port
	54	PORT OF HALIAN	Brgy. Halian, del Carmen,	5.000	PPA	Social Port
	55	PORT OF CONSOLACION	Brgy. Consolacion, Dapa AND Surigao del Norte	10.000	PPA	Social Port
	DINAGAT ISLANDS					
	56	PORT OF LORETO	Loreto, Dinagat Islands	62.529	PPA	Social Port
ARMM						
	TAWI-TAWI					
	57	PORT OF TAGANAK	Turtle Islands, Tawi-Tawi	38.608	DOTC	Social Port
	58	PORT OF LANGUYAN	Languyan, Tawi-Tawi	25.000	DOTC	Social Port
	59	PORT OF BATO-BATO	Bato-Bato, Tawi-Tawi	10.000	DOTC	Social Port
	SULU					
	60	PORT OF PARANG	Parang, Sulu	40.000	DOTC	Social Port
OTHER PROJECTS						
	61	CENTRAL SPINE RORO		50.000	DOTC	
	62	MINDANAO LOGISTICS NETWORK		2.000	DOTC	
	63	CONST., REHAB. AND IMPROVEMENT OF OTHER TRANSPORTATION AND COMMUNICATION INFRASTRUCTURE - PORTS AND HARBORS		6.000	DOTC	
TOTAL				1,631.453		

Source: DOTC

(2) Comprehensive and Integrated Infrastructure Program

Development projects of infrastructures in the Philippines shall be consistent with the Philippine Development Plan (PDP) and be incorporated in the Comprehensive and Integrated Infrastructure Program (CIIP). The PDP pointed out that a major shortcoming of the sector is the absence of an integrated and well-coordinated national transport plan that will guide the prioritized funding and implementation of transport projects, as well as the physical planning and inter-modality of transport infrastructure. The lack of integration between national and local government plans and programs / projects is also a major problem. As a result, gaps in transport networks remain and the low capacity and quality of infrastructure facilities are not improved. PDP says that the capacity of LGUs to finance and manage local projects is insufficient, particularly for roads, and there is a lack of national government funds to maintain the existing national transport infrastructure base. This is true for the ports which are operated and managed by LGUs. In order to solve such problems, it is required to promote to improve transport infrastructures and formulate a nationwide comprehensive transport plan and reform the institutions as necessary.

CIIP has an important role in terms of integration and coordination among various sectors. The CIIP aims to provide a picture of investments in public infrastructure to be used as basis for infrastructure planning, programming, budgeting, monitoring and policy development. It contains public infrastructure projects funded by the Government through sources such as ODA loans, General Appropriations Act (GAA), Corporate Budget, PPPs/JVs, and those funded purely by the private sector (i.e., private-led energy projects, among others). It is prepared by NEDA based on the plans and projects of relevant departments, agencies, GOCCs etc. DBM confirms that the projects proposed from each department are listed in CIIP in assessing the proposal.

"Various feeder/terminal port development which includes LGU Ports, Social Ports and Eight (8) Tourism Ports" is included in CIIP (2013-2016 and beyond). In the project, port facilities will be constructed, rehabilitated or expanded in order to support LGU initiatives, tourism industry and communities in remote islands/barangays. Through implementation of the project, it is expected to improve transport linkages & efficiency to link production and consumption markets and for tourism accessibility. The necessary cost is estimated as 4,855,653 thousand PhP in four years from 2013 to 2016 (See Table 12.2-3). When the amount described in CIIP is not appropriated in an annual budget, the shortage is moved to the following years. Total necessary budget will not be allocated during the period of the plan because the proposed budget for FY2016 is less than the amount of 2016 in CIIP.

Table 12.2-3 Project Outlines of Various Feeder/ Terminal Port Developments in CIIP

<table>
<tr><td colspan="6">Program / Project Title</td></tr>
<tr><td></td><td colspan="5">Various feeder/terminal port development which includes LGU Ports, Social Ports and Eight (8) Tourism Ports</td></tr>
<tr><td colspan="6">Program/Project Description</td></tr>
<tr><td></td><td colspan="5">Construction / rehabilitation / expansion of port facilities in support to LGU Initiatives, tourism industry and support to communities in remote islands/barangays</td></tr>
<tr><td colspan="6">Project Output / Deliverables</td></tr>
<tr><td></td><td colspan="5">Development of LGU, tourism and social port facilities nationwide</td></tr>
<tr><td colspan="6">Project Outcome</td></tr>
<tr><td></td><td colspan="5">Improve transport linkages & efficient FY to link production and consumption markets and for tourism accessibility</td></tr>
<tr><td colspan="6">Completed</td></tr>
<tr><td></td><td colspan="5">2014-2016</td></tr>
<tr><td colspan="6">Investment Targets (in thousand PhP)</td></tr>
<tr><td rowspan="2"></td><td>2013</td><td>2014</td><td>2105</td><td>2016</td><td>2013-2016</td></tr>
<tr><td>217,000</td><td>856,000</td><td>1,631,453</td><td>2,150,700</td><td>4,855,653.00</td></tr>
<tr><td colspan="6">Total Project Cost (in thousand PhP)</td></tr>
<tr><td colspan="2"></td><td colspan="4">4,855,653.00</td></tr>
</table>

Status of Project Preparation/ Implementation	
	Ongoing construction of FY 2014 projects. Funds under FY 2015 is for survey and plan preparation. Yearly activity in support to national and LGU initiatives

Source: Comprehensive and Integrated Infrastructure Program (CIIP)

(3) Scale of budget in recent years

Budget of projects and number of ports which were or will be developed by local fund is shown in Table 12.2-4. Although the budget in 2013 and 2016 decreased from the previous year, an increasing tendency is observed. The average project size in the budget is approximately 20 million PhP.

According to DBM, low progress rate of works under the budget in 2012 resulted in a lower budget in 2013. The budget needs to be used in a year in principle but it may be allowed to use it the following year by taking necessary procedures.

Table 12.2-4 Annual Budget of Port Development by DOTC (2012-2016)

Year (thousand PhP)	2012 1)	2013 1)	2014 1)	2015 2)	2016 2)
Budget	502,000	217,500	1,079,500	1,631,453	1,031,500
Number of Projects	82	9	44	63	37
Average	6,122	24,167	24,534	25,896	27,878

Source:1) Website of DOTC 2) Water Transportation Planning Division (WTPD)

12.2.3. PPA port budget

(1) Maintenance and management resources

PPA is a financially independent organization and no national budget is appropriated. In accordance with the provision of EXECUTIVE ORDER NO.159 dated April 13, 1987, PPA shall use exclusively all revenues of the PPA generated from the administration of its port or port-oriented services and from whatever sources for the operations of the PPA as well as for the maintenance, improvement and development of its port facilities and shall be responsible for the planning, detailed engineering, construction, expansion, rehabilitation and capital dredging of all ports under its port system.

PPA develops, manages, operates and maintains all ports under PPA by operational revenue. Total revenue of 2013 is 11,068.97 million PhP of which 9, 994.47 million PhP was generated by port operation. On the other hand, expenditure is 5,894.72 million PhP. As a result, net income is 5,174.25 million PhP and after-tax profit is 3702.18 million PhP in 2013. Net income in 2012 is 4,218.58 million PhP. PPA shows a good financial performance. (See Table 12.2-5)

Table 12.2-5 PPA's Financial Situation

(In Million PhP)	2013 Actual	2013 Target	Inc/(Dec) Amount	Inc/(Dec) %	2012	Inc/(Dec) Amount	Inc/(Dec) %
Gross Revenue	11,068.97	10,559.74	509.23	4.82	9,297.86	1,771.11	19.05
Port Revenue	9,994.47	10,459.74	(465.27)	-4.45	9,147.74	846.73	9.26
FMI	122.50	100.00	22.50	22.50	150.12	(27.62)	-18.40
One-Time Lump Sum Fee	952.00	-	952.00	-	-	952.00	-
Expenses	5,894.72	6,466.93	(572.21)	-8.85	5,079.28	815.44	16.05
Operating	6,270.51	6,843.92	(573.41)	-8.38	5,849.36	421.15	7.20
Non-operating	(375.79)	(376.99)	1.20	-0.32	(770.08)	394.29	-51.20
Net Income	5,174.25	4,092.81	1,081.44	26.42	4,218.58	955.67	22.65
Income Tax	1,472.07	1,227.84	244.23	19.89	1,060.56	411.51	38.80
Net Income After Tax	**3,702.18**	**2,864.97**	**837.21**	**29.22**	**3,158.02**	**544.16**	**17.23**

Source: PPA annual Report 2013

(2) Development of Ports for LGUs by PPA Fund

PPA may carry out the development of local ports under LGUs or government companies (GC) corresponding to requests from LGUs or GC. The scheme is stipulated in PPA Administrative Order No. 06-2013 "AMENDMENT to PPA ADMINISTRATION ORDER NO.05-2007 (Revised Guidelines on the Transfer of the Management of PPA Ports to Local Government Units (LGUs) and Government Corporations (GCs)). Projects shall be implemented based on a Memorandum of Agreement (MOA) between both sides.

The AO stipulated the conditions which the project shall satisfy: availability of PPA funds and resources appropriated for the said purpose; Port development plans submitted by LGU or GC have been favorably recommended by the PDO (PDO no longer exists following organizational reform of PPA) and PMO holding jurisdiction over the port and approved integrated into the PPA Plans and Programs; Port development project is located within the delineated port zone and is intended for provision of vessel, cargo and passenger related to service; and LGU or GC has faithfully complied with all of its responsibilities as stipulated in the MOA, including port upkeep, repair and maintenance. When LGU or GC operate and manage the port which was developed under this scheme, 50 % of port revenues generated in port operation shall be remitted to PPA as the supervision fee. In addition, a monthly report of revenues shall be submitted to PPA.

The provisions on area of management, operation and maintenance, port revenue, supervision fee, separate operating unit, upkeep, repair and maintenance, insurance, minimum cargo handling equipment/gears, port development, rate and charges, permit to operate cargo handling and other port related services, ownership and etc. are indicated in a sample form of an MOA. For example, responsibility for maintenance belongs to the LGU or GO while ownership of the port remains with PPA. In addition, the criteria for performance evaluation review which consists of thirty (30) items from viewpoints of organization and management, operations and finance are prepared. Measures for ensuring appropriate management and reliable operation including collection of charge are arranged.

12.3. Funds for Disaster Risk Reduction and Management

12.3.1. Budget for Disaster Risk Reduction and Management

(1) Resources and Institutions

There are two budget resources related to Disaster Risk Reduction and Management: National Disaster Risk Reduction Management Fund (NDRRMF) and Quick Response Fund (QRF).

The former was previously known as the Calamity Fund (CF). It is a lump sum fund appropriated under the General Appropriations Act (GAA) to cover aid, relief, and rehabilitation services to communities/areas affected by man-made and natural calamities, repair and reconstruction of permanent structures, including capital expenditures for pre-disaster operations, rehabilitation and other related activities.

Before the fund can be released, the approval by the Office of the President (OP) is necessary. The National Disaster and Risk Reduction and Management Council (NDRRMC) is responsible for giving the President advice and endorses Calamity Fund requests to the OP for approval. Once approved, DBM releases full cash requirements to National Government Agencies (NGAs) and GOCCs and 50% of the cash requirement to LGUs. LGUs receive the balance of their cash requirement after submitting fund utilization/ project implementation reports to the DBM and NDRRMC).(see Table 12.3-1).

The latter is built-in budgetary allocations that represent pre-disaster or standby funds for agencies in order to immediately assist areas stricken by catastrophes and crises. It does not require the recommendation of the NDRRMC or the approval of the OP to trigger the use and release of funds. When the QRF gets depleted, the agency may request for replenishment with a request to the DBM and to be approved by the Office of the President. (See Table 12.3-2)

Table 12.3-1 Outline of NDRRMF

NDRRMF National Disaster Risk Reduction and Management Fund	
	-Lump sum fund to cover aid, relief, and rehabilitation services to communities/areas affected by calamities, repair and reconstruction of permanent structures, including capital expenditures for pre-disaster operations, rehabilitation and other related activities. -Approval of the Office of the President (OP) based on Recommendation of the National Disaster and Risk Reduction and Management Council (NDRRMC) -“Yolanda Comprehensive Rehabilitation and recovery Plan” is added in 2016
Agencies involved	
	The National Disaster and Risk Reduction and Management Council (NDRRMC) -The highest policy-making, coordinating, and supervising body at the national level -Responsible for in giving the President advice on the status of disaster preparedness, prevention, mitigation, response and rehabilitation operations -Recommendation to the President the declaration of a state of calamity in areas -Submission of proposals to restore normalcy in affected areas to include calamity fund allocation

	Office of Civil Defense (OCD) -Operating arm and secretariat of the National Disaster Risk Reduction and Management Council. -Coordinating the activities and functions of the various government agencies and instrumentalities, private institutions and civic organizations The Office of the President (OP) -Approval of fund requests The Department of Budget and Management (DBM) -Issuance of the Special Allotment Release Order (SARO) and Notice of Cash Allocation (NCA) to the appropriate implementing agency or LGU.

Source: Investing in the Right Priorities (The 2016 Budget Priorities Framework): DBM, Website of DBM http://www.dbm.gov.ph/?page_id=8427#Nature

Table 12.3-2 Outline of QRF

QRF	Quick Response Fund
	-Built-in budgetary allocations that represent pre-disaster or standby funds for agencies in order to immediately assist areas stricken by catastrophes and crises. -The built-in QRFs to ensure immediate action during calamities

Source: 1) Investing in the Right Priorities (The 2016 Budget Priorities Framework): DBM
2) Website of DBM http://www.dbm.gov.ph/?page_id=8427#Nature

Regarding LGUs' fund for Disaster Risk Reduction and Management, the rules that not less than 5% of the estimated revenue of LGUs from regular sources shall be set aside as the Local Disaster Risk Reduction and Management Fund in the document by DBM for releasing IRA.

In addition to them, Policy Governing Board in Municipal Development Fund Office (MDFO-PGB) created the Disaster Management Assistance Fund (DMAF). It aims at financing support to mitigation and prevention, response and relief, and recovery and rehabilitation initiatives to LGUs. Loan conditions depend on eligible subject and category of LGUs. (See Table 12.3-3)

Table 12.3-3 Disaster Management Assistance Fund/ DMAF

<table>
<tr><th>Fund Category</th><th>LGU</th><th>Interest Rate</th><th>Repayment Period</th></tr>
<tr><td rowspan="2">Early warning systems, emergency vehicles, reforestation, DRM-related capacity-building, mass transportation vehicle, emergency tools and slope stabilization and river control subprojects</td><td>Provinces</td><td>3-5%</td><td rowspan="2">15 years with 3 years grace period on principal</td></tr>
<tr><td>Municipalities</td><td>3%</td></tr>
<tr><td rowspan="3">Basic community needs such as food, water, clothing, temporary shelter, medicine, emergency supplies, tools, and equipment.</td><td>Provinces</td><td rowspan="3">0%</td><td rowspan="3">3 years with no grace period on principal</td></tr>
<tr><td>Cities</td></tr>
<tr><td>Municipalities</td></tr>
<tr><td rowspan="3">Repair and reconstruction of critical facilities; procurement of heavy equipment for maintenance and repair of roads and critical facilities; resettlement of low-cost permanent shelters; recovery facilities such as small-scale livelihood programs/projects, counseling, capacity building/ training, etc.)</td><td>Provinces</td><td>3-5%</td><td rowspan="3">15 years with 3 years grace period on principal</td></tr>
<tr><td>Cities</td><td>4-5%</td></tr>
<tr><td>Municipalities</td><td>3%</td></tr>
</table>

Source: http://www.mdfo.gov.ph/#

(2) Scale and Release of NDRRMF and QRF

Scale of NDRRMF and QRF in FY2016 is 38,896 million PhP and 6,665 million PhP as shown in Table 11-18. The amount of NDRRMF is more than twice that of the previous year. This is due to the fact that Yolanda Comprehensive rehabilitation and Recovery Plan has been added. QRF is almost the same scale as the previous year.

Table 12.3-4 Scale of NDRRMF and QRF

Particulars (in million PhP)	2015	2016
National Disaster Risk Reduction and Management Fund	14,000	38,896
National Disaster Risk Reduction and Management Program (Calamity Fund)	13,000	19,000
Peoples survival Fund	1,000	1,000
Yolanda Comprehensive rehabilitation and Recovery Plan	—	18,896
Quick Response Fund	6,708	6,665

Source: Investing in the Right Priorities (The 2106 Budget Priorities Framework): DBM

Annual budgets and released amounts of CF and QRF in the five years from 2009 to 2013 are shown in Table 11-19. Both of the budgets and released amounts of CF show an increasing tendency. CF in 2013 is 1.73 times in 2009 on a released amount basis and 3.75 times on an original budget basis. In 2009, 2010 and 2011, the released amount of CF is larger than the original budget. The released amount of QRF in 2012 is 4.4 times that in 2009..

Table 12.3-5 Tendencies of CF and QRF

(In PhP)	2009	2010	2011	2012	2013
Calamity Fund	4,303,516,293	3,750,000,000	6,000,000,000	7,500,000,000	7,500,000,000
Original Appropriation	2,000,000,000	2,000,000,000	5,000,000,000	7,500,000,000	7,500,000,000
Augmentation	2,303,516,293	1,750,000,000	1,000,000,000	0	0
Less: Release	4,303,516,293	2,989,709,460	5,920,906,910	6,538,450,000	7,450,424,702
Less: Earmarked amount		—	—	—	3,604,960
Less: Amount with release document under preparation	—	—	—	—	—
Fund Balance	0	760,290,540	79,093,090	961,550,000	159,413,779
Quick Response Fund	597,500,000	645,000,000	1,787,986,466	2,645,000,000	0

1/ For FY2009, 2010 and 2011 QRF allocations were sourced from the Calamity Fund
2/ Starting FY 2012, QRF allocations were lodged against respective budgets of Departments
3/ a. Relief and rehabilitation programs/projects for Zamboanga City (Php3,604,982,960)
Source: Calamity and Quick Response Funds Old, Basic Information on the Calamity Fund (CF) and Quick Response Fund (QRF):DBM

During the past five years from 2009 to 2013, DND, DOTC, DSWD, DOH, DA, DPWH, DILG, SUCs, LGU, GOCCs, DepED and DOST used CF. DSWD and DPWH used CF every year and the amount which these two departments used exceeds 85% of the total amount. LGUs also used CF every year. (See Table 12.3-6).

During the five years from 2009 to 2013, DSWD, DPWH, DND, DA and DepED used QRF. DPWH and DND used every year. According to DBM's recent document, QRF is appropriated to

DOH and DOTC. (See Table 12.3-7).

Table 12.3-6 Usage Conditions of CF

(In PhP)	2009	2010	2011	2012	2013
DND	285,970,000	557,900,000	825,486,466		8,000,000
DOTC	2,171,003				
DSWD	387,500,000	1,247,500,000	1,611,800,000	876,971,739	3,466,166,169
DOH	243,500,000				500,000,000
DA	8,000,000		1,610,911,000		
DPWH	1,004,300,000	716,060,990	1,361,357,139	4,715,500,651	2,976,576,027
DILG	1,706,793,900				467,732,486
SUCs	20,800,000				
LGU	644,481,390	272,408,470	144,352,305	649,826,990	31,950,000
GOCC		195,840,000			
DepED			217,000,000	296,150,620	
DOST			150,000,000		
Total	4,303,516,293	2,989,709,460	5,920,906,910	6,538,450,000	7,450,424,682

Source: Disaster Management Practices in the Philippines: An Assessment: Commission on Audit

Table 12.3-7 Usage Conditions of QRF

(In PhP)	2009	2010	2011	2012	2013
DPWH	80,000,000			550,000,000	600,000,000
DSWD	287,500,000	287,500,000	962,500,000	662,500,000	662,500,000
DND	230,000,000	357,500,000	825,486,466	882,500,000	882,500,000
DepED				550,000,000	550,000,000
DA					1,000,000,000
Total	597,500,000	645,000,000	1,787,986,466	2,645,000,000	3,695,000,000

Source: Disaster Management Practices in the Philippines: An Assessment: Commission on Audit

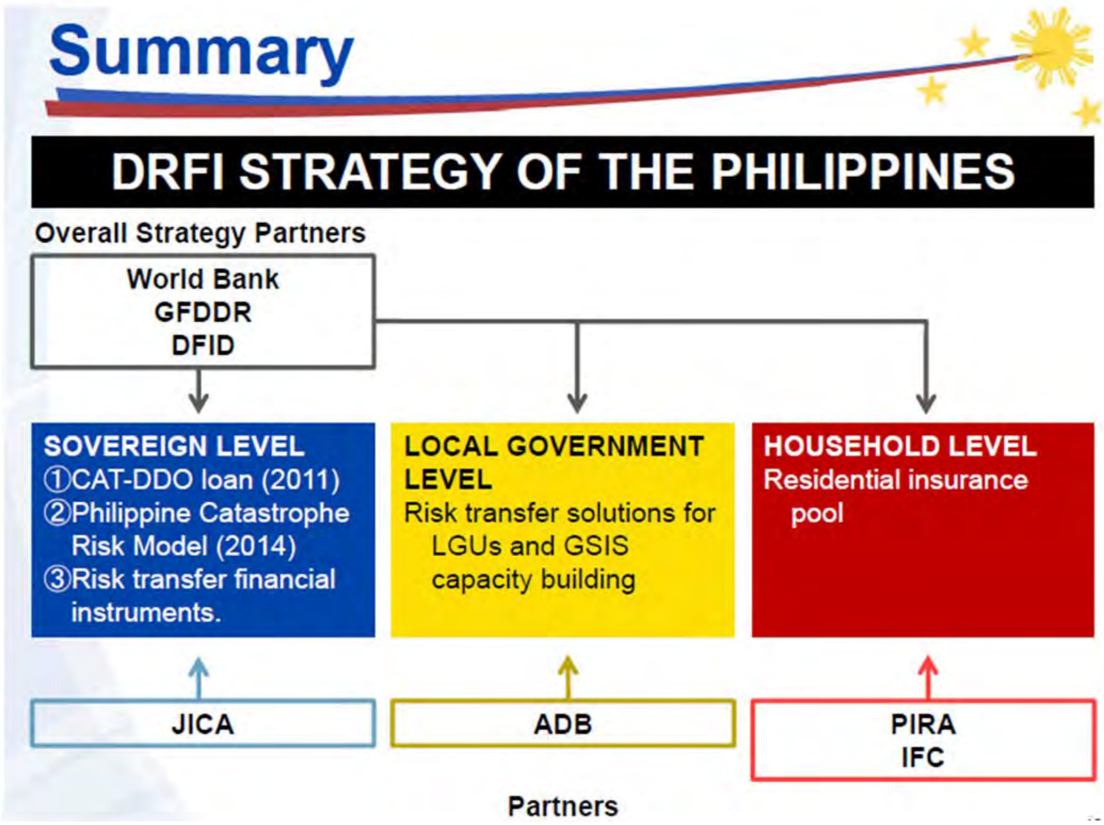
(3) Efforts on Risk Finance by DOF

DOF has been tackling the theme on Disaster Risk Finance and Insurance (DRFI) at the sovereign level, local government level and household level in order to sustain economic growth by protecting gains from natural disaster shocks and reducing the impact on the poorest and most vulnerable people. Regarding sovereign level, the study on strengthening institutional capacity, mainstreaming disaster risk management into development planning and management of the government's fiscal exposure to natural hazard impacts was conducted aiming to enhance the capacity of the Government of the Philippines to manage the impact of natural disasters. In the study, Philippine Catastrophe Risk Model which includes historical database for natural disasters, geo-referenced catalogue of all national government assets, disaster risk model which will generate economic loss values for potential disaster events and assistance in developing a risk transfer instrument was developed. The model is used in determining the government's contingent liabilities in the face of disasters and providing foundation in designing risk transfer instruments. In addition to the study, risk transfer instruments have been being developed by World Bank. The technical details of a parametric insurance policy were developed and options and structures to properly utilize the insurance feature are being explored.

Regarding Local Government Level, the pilot of an LGU catastrophe pool to provide LGUs (city and province level) with immediate liquidity after extreme disaster events are considered. GSIS is developing its capacity to be able to provide parametric insurance policies in line with this initiative.

Regarding Household Level, Philippine Insurers and Reinsurers Association (PIRA) tackles conceptualizing a potential residential insurance pool by providing disaster risk coverage together with the Insurance Commission. The pool is intended to increase resilience of households against extreme natural disasters. In addition, institutions for supporting the above are studied.

DOF has been tackling these themes in cooperation with the World Bank, JICA and relevant agencies. Basic framework of DOF's efforts is shown in Figure 12.3-1.



Source: PHILIPPINES DISASTER RISK FINANCING-Step Forward for Building Disaster Resilience in the Philippines: Emerging Strategies for Disaster Risk Reduction and Financing, Roberto B. Tan, 17 March 2015 | Sendai, Japan

Figure 12.3-1 DOF's Efforts on Risk Finance

12.3.2. Disaster prevention and disaster recovery on Ports

(1) Basic idea

There are two kinds of physical measures against disasters: preventive measures in the pre-disaster stage; and measures to recover functions of ports in the post-disaster stage.

For measures in the pre-disaster stage, major port facilities are reinforced or disaster resistant facilities that will not be destroyed in time of disaster are constructed. For measures in the post-disaster stage, damaged facilities are rehabilitated or alternate facilities are constructed as soon as possible. In addition, facilities which were not damaged seriously are used under certain restrictions until rehabilitation projects are completed. In such a case, temporary reinforcement may be required.

Responsibility for taking such measures belongs to owners of the facilities in principle. Ports in the Philippines are owned by the government (DOTC), GOCCs (PPA etc.), LGUs and Private companies. Several kinds of funds are available in taking measures in the pre-or post-disaster stage as shown in Table 12.3-8. PPA is one of the GOCCs but it will not use these funds because PPA is financially independent from the government.

Table 12.3-8 Available Fund for DRRM by Facility Owner

	Government-owned facilities	LGU-owned facilities	GOCC-owned facilities
Pre-disaster (Enforcement of port facilities against disaster)	NDRRMF GAA	NDRRMF LGU's Fund DMAF	NDRRMF GOCC's fund
Post-disaster (Rehabilitation of damaged facilities)	QRF NDRRMF,	NDRRMF, LGU's Fund DMAF	NDRRMF GOCC's fund Insurance

Source: Study team

(2) Damage of Ports by Typhoon Yolanda Bohol Earthquake and Rehabilitation

Typhoon Yolanda which damaged the central region of the Philippines on November 8, 2013 inflicted heavy damage across a wide area. Many ports were also damaged. NEDA published a report named the Reconstruction Assistance on Yolanda (RAY) which details the Government's strategic plan to guide the recovery and reconstruction of the economy, lives, and livelihoods in the affected areas on December 16, 2014. The monetary damage to ports is estimated as PhP515.6 million PhP. RAY says that while the PPA ports were partially damaged, the lighter structures of the municipal ports were severely damaged and not operational.

Damages to each port are shown in another document of NEDA. According to this document, the number of ports operated by LGUs and supervised by DOTC is 44 in three provinces and the damage is estimated as 394 million PhP. The number of ports under PPA is 32 in 10 provinces and the damage is estimated as 82.13 million PhP. A port under CPA was damaged and the damage is estimated as 23.45 million PhP. (See Table 12.3-9)

Table 12.3-9 Ports Damaged by Typhoon Yolanda

DOTC 44 ports		394	million PhP
	LEYTE 15	139	VILLABA, BABATNGON, BARUGO, CAPOOCAN, CARIGARA, MERIDA, ISABEL, ALBUERA, PALOMPON, PALO, TOLOSA, TANAUAN, DULAG, MACARTHUR, ABUYOG,
	WESTERN SAMAR 16	122	BASEY, MARABUT, ZUMARRAGA, BRGY. MUALBUAL. ZUMARRAGA, TALALORA, BRGY. INDEPENDENCIA, TALALORA, STA RITA, BRGY. CANSAGANAY, DARAM, BRGY. GUINTAMPILAN, DARAM, BRGY. CANDUGUE, DARAM, BRGY. BACHAO, DARAM, BRGY. CALAWAN-AN, DARAM, CATBALOGAN PORT, CALBIGA, SAN SEBASTIAN, PINABACDAO,
	EASTERN SAMAR 13	133	LAWAAN, BALANGGIGA, GIPORLOS, QUINAPONDAN, SALCEDO, GUIUAN, EASTERN SAMAR, GEN. MACARTHUR, HERNANI, MAYDOLONG, BALANGKAYAN, DOLORES, LLORENTE,
PPA (32 ports)		82.13	million Peso
	Aklan (2)	8.27	Port of Dumaguit New Washington, Port of Caticlan Malay
	Antique (2)	11.80	Port of Lipata Culasi, Port of San Jose de Buenavista
	Biliran (1)	0.13	Port of Naval
	Capiz (1)	0.39	Port of Culasi Roxas City
	Iloilo (2)	6.50	Iloilo ICPC, Port of Estancia
	Leyte (5)	46.59	Tacloban Port (Base Port), Ormoc Port (Base Port), Port of Baybay, Port of Hilongos, Port of Palompon
	Negros Occidental(3)	0.45	Pulupandan Port (Base Port), Port of Danao Escalante, Port of San Carlos
	Southern Leyte (1)	0.94	Port of Maasin
	Bohol (1)	3.20	Port of Matnog, Sorsogon
	Palawan (4)	4.27	Port of Coron Palawan, Port of Culion, Port of Cuyo, Port of El Nido Palawan
CPA 1 port		23.45	million PhP
	Cebu	23.45	Port of Sta. Fe

Source: NEDA

DOTC is planning to implement rehabilitation projects at 32 ports (or places) as shown in Table 11-24. The total required budget to carry out the projects is 329.6 million PhP which is approximately 20％of the budget for port improvement by DOTC in GAA 2015. The cost of the Quinapondan port rehabilitation project is 50 million PhP which is the highest among rehabilitation projects, while rehabilitation works in Daram port cost only 2.6 million PhP for five small projects. The average amount required for rehabilitation works is 10 million PhP per port.

Among the budget appropriated in QRF, 248,600 thousand PhP is used for twenty two (22) projects (50,000 PhP for one project has not yet been fixed.) Ten (10) other projects whose cost is 81,000 thousand PhP are planned to be implemented by the budget from NDRRMF which has not yet been finalized. Project Management Service (PMS) of DOTC is in charge of design, cost estimation and tendering of these projects. To expedite projects, a negotiation process was applied to select contractors; however, finalizing contracts has been time-consuming.

PPA has implemented rehabilitation projects of PPA ports using its corporate fund. According to PPA, PPA takes out insurance of Government Service Insurance System (GSIS) on its assets other than lands but there is no record GSIS funds have been used for rehabilitation projects.

Table 12.3-10 Rehabilitation of Facilities Damaged by Typhoon Yolanda by DOTC

	Municipality	Project	Cost thousand PhP	1)
1	Banate	Banate Municipal Port Rehabilitation Project	3,000	Q
2	Balangkayan	Balangkayan Port Rehabilitation Project	35,000	Q
3	General Macarthur	General MacArthur Port Rehabilitation Project	10,000	Q
4	Hernani	Hernani Port Rehabilitation Project	6,000	Q
5	Llorente	Llorente Port Rehabilitation Project	11,000	Q
6	Talalora	Talalora Port Rehabilitation Project	15,000	Q
7	Dolores	Repair of Dolores Port	12,000	Q
8	Catbalogan	Repair of Catbalogan Port	15,000	Q
9	Zumarraga	Repair of Poblacion Port, Zumarraga	15,000	Q
10	Albuera	Albuera Port Rehabilitation Project	10,000	Q
11	Balangiga	Brgy. Bacjao Balangiga Port Rehabilitation Project	10,000	Q
12	Maydolong	Maydolong Port Rehabilitation Project	22,000	Q
13	Daram	Bakhaw Port, Daram Rehabilitation Project	2,600	Q
14		Calawan-an Port, Daram Rehabilitation Project		Q
15		Candugue Port, Daram Rehabilitation Project		Q
16		Cansaganay Port, Daram Rehabilitation Project		Q
17		Guintampilan Port, Daram Rehabilitaiton Project		Q
18	Marabut	Marabut Port (Poblacion) Rehabilitaiton Project	10,000	Q
19		Brgy. Pinalanga, Marabut Port Rehabilitation Project	5,000	Q
20		Brgy. San Roque, Marabut Port Rehabilitation Project	12,000	Q
21		Brgy. Veloso, Marabut Port Rehabilitation Project	5,000	Q
22	Merida	Merida Port Rehabilitation Project	7,000	R
23	Giporlos	Giporlos Port Rehabilitation Project	12,000	R
24	Lawaan	Lawaan Port (Poblacion) Rehabilitation Project	11,000	R
25		Lawaan Port (Brgy. Maslog) Rehabilitation Project	13,000	R
26		Lawaan Port (Brgy. Bitaog) Rehabilitation Project	-	R
27	Basey	Brgy. Amandayhan Port, Basey Rehabilitation Project	12,500	R
28		Basey Port (Poblacion) Rehabilitation Project	7,500	R
29		Brgy. San Antonio Port, Basey Rehabilitation Project		R
30	Sta. Rita	Sta Rita Rehabilitation Project	12,000	R
31	Zumarraga	Repair of Mualbual Port, Zumarraga	6,000	R
32	Quinapondan	Quinapondan Port Rehabilitation Project	50,000	q
	Total		329,600	

Note 1) Fund: Q/ QRF 2014 funded, q/QRF unfunded, R/NDRRMF unfunded,
Source: PMS/DOTC

Regarding rehabilitation projects of facilities damaged by the Bohol earthquake, DOTC estimated rehabilitation costs of the ports of Guindalman, Inabanga, Baclayon, Maribojoc, Clarin and Buenavista. Total cost is 79.4 million PhP. (See Table 12.3-11) In addition, PPA implemented projects in the ports of Tagbilaran, Tubigon, Jetafe and Catagbacan. The total cost is 558 million PhP. (See Table 12.3-12)

Table 12.3-11 Cost of Rehabilitation for Facilities Damaged by Bohol Earthquake by DOTC

Guindalman	Inabanga	Baclayon	Maribojoc	Clarin	Buenavista	Total(million PhP)
19.3	33.8	6.2	12.7	5.5	1.9	79.4

Source: DOTC

Table 12.3-12 PPA's Rehabilitation Projects for Damaged Facilities by Bohol Earthquake

Ports	Amount (PhP)	Fund
Tagbilaran, Tubigon, Jetafe, Catagbacan	558,635,602.70	PPA Corporate fund

Source: PPA

12.4. Restoration of Damages by Disaster and Enhancement of Disaster Resilience of Port in Japan and Other countries

12.4.1. Restoration of Damaged port facilities in Japan

(1) Institution of Restoration Projects

When public infrastructures were damaged by natural disasters, the restorations of damaged facilities were implemented by using the budget of the Central Government under the provisions of the Act on National Government Defrayment for Reconstruction of Disaster-Stricken Public Facilities which aims to make restorations from the disaster as soon as possible and ensure common welfare.

The act stipulates the subsidy of the government to local public bodies for restoration works by the local public bodies and the share between the government and local public bodies for restoration works by the government. The framework of rehabilitation project of damaged port facilities is shown in Table 12.4-1.

The act covers a rehabilitation project in order to recover the situation before the disaster occurred in principle. If it is difficult to recover the situation before the disaster occurred by rehabilitating the facility, an alternative facility which provides the same function as the damaged facility could be constructed. In addition, the project of rehabilitation and improvement of the damaged facility could be carried out under the act and another relevant act based on the plan prepared in order for a group of public facilities including the damaged facility not to be damaged by another disaster again.

Table 12.4-1 Framework of Port Rehabilitation Project by Local Public Entity (Japan)

Implementation Body	Local government
Facilities	Port facilities and shore protection facilities
Subsidy	Two third(2/3) at the area other than below four fifth (4/5) at Hokkaido, Remote islands, Amami and Okinawa
Conditions for adoption	1. Rehabilitation of port facilities or shore protection facilities which Local government or its affiliated entities have responsibilities to maintain 2. Damage caused by freak of nature such as strong wind, flood, storm surge and earthquake etc. 3. Project cost necessary for the work at one place JPY 1,200 thousand (Prefectures or ordinance-designated cities) JPY 600 thousand (Cities, towns or villages)
Project period	Within three years including the year of disaster

Source: Study team

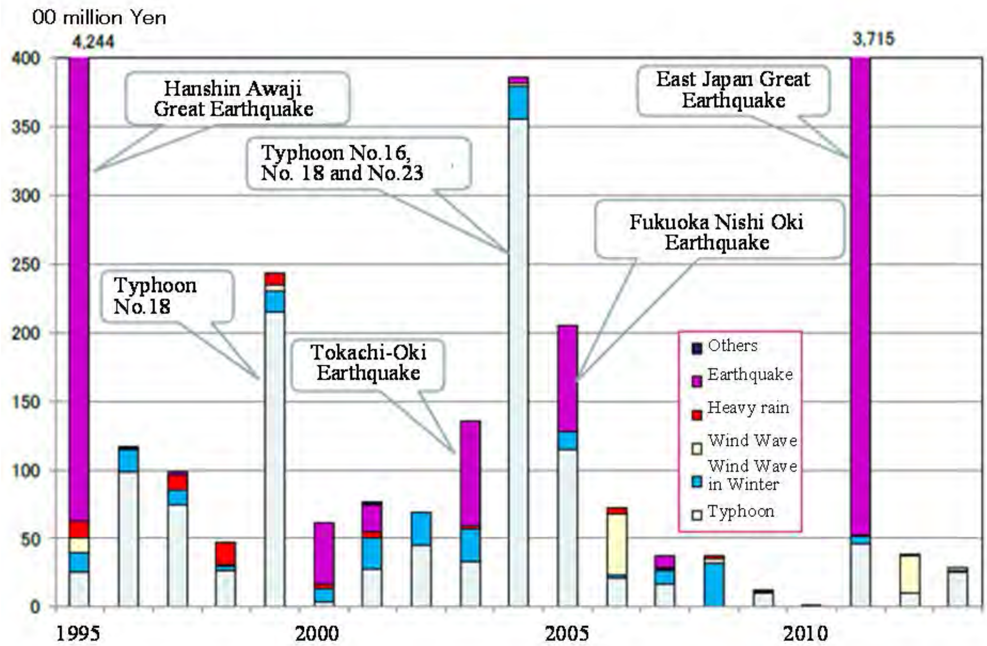
Budget for rehabilitation projects under the system is appropriated as a stand-by budget. When a disaster occurs, the necessary amount is released based on the result of the survey by the designated government officials of MLIT. Amounts of original budgets and funds released from 2006 to 2010 are shown in Table 12.4-2. JPY 1,250 million is prepared as the initial annual budget and an additional budget is prepared when the cost for rehabilitation projects exceeded it.

Table 12.4-2 Original Budgets and Released Amount for Rehabilitation Projects of Ports

(in million JPY)	FY2006	FY2007	FY2008	FY2009	FY2010
Original Appropriation	1,250	1,250	1,250	1,250	1,250
Final Amount	7,274	3,875	3,680	1,239	377

Source : Ministry of Land, Infrastructure, Transport and Tourism

Amounts released for rehabilitation projects of ports from 1995 to 2013 by cause of disaster are shown in Figure 12.4-1. Rehabilitation works of facilities damaged by typhoons have been carried out every year although total amounts fluctuated by year. Cost of rehabilitation works in 1995 when the Great Hanshin-Awaji Earthquake occurred and those in 2011 when the Great East Japan Earthquake occurred are extremely large.



Source: Key points of Rehabilitation Projects of Port facilities damaged by Disaster: Feb. 5, 2104, Katsuji Yoshikura MLIT

Figure 12.4-1 Amounts released for rehabilitation projects of ports by cause of disaster

(2) Disaster Prevention Measures

Ports were planned and port facilities were designed and constructed taking into consideration marine conditions or land tremors in time of a certain level of typhoon or earthquake in general. From such a viewpoint, all ports and port facilities have disaster resilience. However, a larger hazard or events which were not assumed in planning or design may occur in time of disaster. Port facilities in Japan have been affected by several large scale hazards such as the Ise-wan Typhoon, the Great Hanshin-Awaji Earthquake and the Great East Japan Earthquake etc.

Based on the experience of the damages caused by the hazards, several measures such as the improvement of design standards or the development of design methods have been taken from a preventive viewpoint against possible disasters. The Ministry of Infrastructure, Land, Transport and Tourism (MLIT) has promoted the construction earthquake resistant quays, the development of disaster prevention activity bases, the improvement of strengthened international container terminals and raising dikes. According to a basic plan released by MLIT in 2003, 336 berths in 184 ports will have sufficient earthquake resistance to withstand the strength corresponding to an earthquake whose return period is several hundred years. The required costs for the improvement are appropriated in the general budget. MLIT allocates a certain amount of budget to the project year by year. According to a report of MILT, the budget for the projects of the comprehensive measures against a large scale earthquake from 2006 to 2010 is more than 40 billion JPY per year as shown in Table 12.4-3. The amount includes the cost for corresponding to ordinary port improvement as well.

Table 12.4-3 Budgets for Comprehensive Measures against Large Scale Earthquakes in Ports

Year	2006	2007	2008	2009	2010
Project Cost in initial budget (billion JPY)	40.5	47.4	50.0	48.4	26.9

Source: Report of Review on Measures against Large-scale Earthquake on ports, 2012, MLIT

(3) Issues on Financial Resources of Disaster Prevention and Restoration

In Japan, public port facilities are constructed and belong to the central government or local public bodies. When such public port facilities are destroyed or damaged by a natural disaster, the cost of the rehabilitation works are shared by the government and the local public bodies under the Act on National Government Defrayment for reconstruction of Disaster-Stricken Public Facilities. The reasons why the government provides financial support to local public bodies for rehabilitation of the facilities under local public bodies are that public infrastructures are required to be rehabilitated as soon as possible and that the costs generally exceed the financial capacity of local public bodies.

Hansin–Awaji Great Earthquake caused serious damages to many public infrastructures. Container terminals of Kobe Port were also seriously damaged. The damage of Kobe Port Terminal Corporation which owned and operated the container terminals was estimated as 141 Billion JPY. It had to implement the rehabilitation works by its own fund because the corporation was not included in the organizations which could be subsidized by the government under the Act. However, it was impossible for the corporation to implement the rehabilitation only by its own fund. Therefore, the Japanese government enacted a new special act under which 80% of the total costs for container terminal rehabilitation projects to be completed within two years could be subsidized by the government. This case demonstrates the importance of preparing a rehabilitation budget in disaster management on ports. Funds used for the restoration of Kobe port are shown in Table 12.4-4.

Table 12.4-4 Funds for Restoration of Kobe Port

	Facilities	Applied Scheme	Subsidy	Fund for Kobe City’s Burden
Kobe City				
	Public Infrastructure	Rehabilitation Project	91.8%	100% of burden is prepared by Local Bond for Rehabilitation Project (95% of redemption money is appropriated by tax allocations to local governments)
	Rehabilitation with Improvement	Project related to disaster	81.9%	100% of burden is prepared by public project bond
	Green Area	Operation Guidelines(MOT)1)	50.0%	100% of burden is prepared by Local Bond for Rehabilitation Project (95% of redemption money is appropriated by tax allocations to local governments)
	Cargo handling Equipment	Delivery Guideline(MOT)1)	50.0%	50% of burden is appropriated from release of general fund (tax allocations to local governments) 50% of burden is appropriated from Local Public Enterprise’s Rehabilitation bond
	Supporting facilities	Local Public Enterprise’s	-	50% of burden is appropriated from release of general fund (tax allocations to local

		Rehabilitation Project		governments) 50% of burden is appropriated from Local Public Enterprise's Rehabilitation bond
	Port Welfare Facilities	General Self-finance Project	-	General self-finance rehabilitation project bond(tax allocations to local governments)
Kobe Port Corporation 2)				
	Quay of container berth	Special scheme	80%	
	Other facilities	Special scheme		*20 % of the cost is appropriated by government non-interest loan

1) Documents by Port and harbors Bureau MOT(1999.2.28)
2)Act on Special Financial Assistance and Supports for Hanshin-Awaji Great Disaster (1999.3.1)
Source: Archive of Restoration of Kobe Port (2001.5): Port Improvement Bureau, Kobe City

Two viewpoints of risk control and risk finance are required in considering disaster risk management. Risk control corresponds to a viewpoint on preventive investments for reduction of disaster loss in a pre-disaster phase. Ports are planned and port facilities are designed under the conditions of a certain level of hazards. The development of earthquake resistance quays aims to develop reinforced facilities against more severe natural hazard... On the other hand, risk finance corresponds to a viewpoint of dispersion of disaster loss and share of the burden. Although it is generally accepted that public funds should be used to compensate for the loss of public infrastructures due to disasters, the system of Civil Engineering Completed Risks Insurance is prepared.

It is necessary to carry out disaster risk management by combining these two viewpoints appropriately, especially for the ports which are managed on a financially independent basis or introduce a privatizing scheme in port management and operation. Civil Engineering Completed Risks Insurance covers damages of completed civil engineering infrastructures caused by natural hazards. Port facilities are included in the covered facilities so far the railway sector has been main user of this insurance system. One of the problems is that damages caused by earthquakes and movement of wave-dissipating blocks are not covered. The high premiums and long time required before insurance money is released are also pointed out as problems.

12.4.2. Cases in Other Countries

(1) Chile

The act on modernization of Public Ports was enacted in 1997 in Chile. According to the act, EMPORCH that was a state corporation which covered 10 main public ports was divided into ten (10) corporations and privatized. At present, the main 10 ports are managed by individual port corporations.

The corporations are financially independent from the government and costs of restoration of damaged facilities by disasters need to be prepared by themselves. When the Valparaiso Earthquake occurred in 1985, the corporations took out an insurance policy. The insurance covers damages of port facilities under the corporations caused by hazards such as earthquake, tsunamis, storm surges, oil spill pollution, fires, terrors etc. Ten port corporations made a joint contract with an insurance company. The period of a contract is 18 months. Adoption of a cat bond is considered because some damages have not been insured.

(2) Iceland

The system of Iceland Catastrophe Insurance is introduced in Natural Catastrophes Insurance, A diversity of Systems, 2008: CONCORCIO DE COMPENSACION SEGUROS. It covers harbor installations owned by municipalities and the National Treasury. The followings are extracted from it focusing insurance for public infrastructures.

Under the Iceland natural disaster insurance system, the owner of homes and commercial buildings must have coverage against certain disaster hazards. The natural perils included in the system are earthquakes, volcanic eruption, avalanches landslides and floods. The following Infrastructures, generally not covered against fire, are insured directly with the Iceland Catastrophe Insurance (ICI): Geothermal heating systems; waterworks and sewage systems owned by municipalities or the National Treasury; harbor installations owned by municipalities and the National Treasury; Permanent bridge of 50 m or longer; Electronic installations including publicly owned distribution systems, dams and transformer facilities; Publicly-owned telephone systems; and communications networks and ski lifts.

The premium for such infrastructures is 0.2 per thousand. Liability of compensation for each event is limited to 10 per thousand of the total insured capital at the time of the loss event. Should the total payable claims exceed that amount, all claims are reduced in proportion.

12.5. Consideration on Funds for Disaster Risk Reduction and Management

In the Philippines, fund for disaster risk reduction and management in pre- and post- disaster stages has been established (NDRRMF). Fund for quick response in the event of a disaster has also been prepared (QRF). The size of both funds has been increasing in recent years. A new fund was added to NDRRMF to carry out restoration works following Typhoon Yolanda. Rehabilitation projects of damaged port facilities which belong to the central government are implemented by these funds.

PPA is a financially independent organization and the cost necessary for rehabilitation of port facilities damaged by natural disasters needs to be prepared by itself. According to PPA, although PPA insures its facilities (land is excluded), PPA did not use the insurance benefit for rehabilitation of facilities damaged by Typhoon Yolanda and Bohol Earthquake. This means that damage of PPA ports by Typhoon Yolanda and by Bohol earthquake did not exceed the financial capacity of PPA. It is possible that a large-scale hazard which inflicts damage to such a degree that PPA cannot rehabilitate facilities using its own funds could occur. According to DOF, there is an institution under which PPA could use the government fund for rehabilitation of PPA port in the case of a large scale disaster. PPA ports shall be recovered promptly by using the government fund, ODA fund or insurance as necessary.

The socio-economic damage in area affected by a disaster may be widespread and long standing in general. In the Philippines which consist of many islands, there many areas in which socio-economic activities would cease if port functions were to be suspended. This means that preventive measures against disasters are required at major ports which support the country or regions.

Although the institution for funding measures in a pre-disaster stage is established, it is not easy in general to appropriate the necessary budget to projects of preventive measures such as reinforcing port facilities based on the standard design model recommended in the study. In order to prepare the necessary budget for preventive measures, a national consensus needs to be reached. In this regard, a comprehensive disaster reduction plan which shows the necessity and effects of preventive measures at ports. Location of disaster resilient ports and required project costs is useful.

PPA needs to study disaster management both in terms of risk control and risk finance from a port management viewpoint. It is necessary to also study on insurance or bond system. Considering that suspension of port functions in major ports such as Manila Port, Cebu Port or Davao port would result in a huge socio-economic loss for the Philippines, the government fund or ODA fund shall be prepared for ensuring the disaster resiliency of these ports as necessary.

In general, an LGU is responsible for maintenance of the port under the LGU. Some primitive enhancement works of disaster resiliency or very simple rehabilitation works after a disaster are considered to be included in such maintenance. It is necessary that the scope of responsibility for enhancement of disaster resiliency or rehabilitation of facilities damaged by natural disasters between LGUs and DOTC or PPA shall be made clear taking into consideration the financial and technical capacity of LGUs.

It is suggested that a budget of the item of ports lighthouses and harbors in GAA shall be allocated preferentially to ports which disaster prevention-enforced facilities or NDRRMF shall be used for improving the said ports in order to promote a policy on disaster risk reduction of social ports.

13. Contingency Planning and Organization

13.1. Logistics Plan for Disaster Response

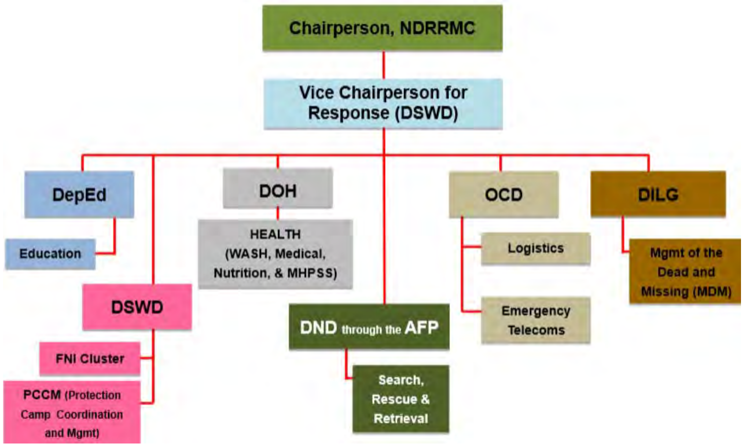
13.1.1. Hydro-Metrological Hazards Cluster

NDRP is the Philippine Government's response to hydro -meteorological hazards. It is the first of a "per hazard type" of response plan on the national level. Similar NDRPs for seismic and tsunami disasters and other considerable natural disaster(s) are to be prepared, and this NDRP for hydro-meteorological hazards will also be revised/updated accordingly by the OCD in partnership with the DSWD.

The NDRP adopts the Cluster Approach espoused by the then National Disaster Coordinating Council in 2008. NDCC Memorandum Circular (MC) no.12 series of 2008 aimed in harmonizing the efforts of the international humanitarian agencies of the United Nations with the identified agencies of the Philippine National Government in providing assistance to the affected population during disasters.

a) Early Recovery, after long deliberations of the participants considered as part of the Recovery and Rehabilitation.
b) Logistics and Emergency Telecommunication Cluster were divided into two separate clusters.
c) The Agriculture Cluster was not activated as the lead Agency is still determining the need for the cluster.
d) Clusters for Search, Rescue and Retrieval (SRR) and Management of the Dead and Missing (MDM) were created.

The eight Response Clusters each have their own Lead Agency. All operations of the response clusters are based at the NDRRMC Operations Center where focal persons of each member agency are assigned on a daily schedule.



Source: OCD

Figure 13.1-1 Organizational Structure of the Response Clusters

13.1.2. Logistics Cluster

The Logistics Cluster aims to provide an efficient and effective logistics coordinating structure that will harmonize the activities of all clusters and encourage regular info-sharing among all stakeholders and other partners. The Cluster also formulates, updates, implements and monitors logistical policies, plans, programs and procedures that will harmonize the activities of each cluster. The Logistics Cluster through coordination, monitoring, identification and deployment cover the following:

a) Transportation (emergency road network, land, sea and air)
b) This includes road clearing and provision of equipment and machines (and its required fuel)
c) Inventories (consolidation of resources available among partners and cluster members)
d) Tracking of deployed items

The Logistics Cluster is headed by the Office of Civil Defense (OCD) and the member agencies are Department of Social Welfare and Development (DSWD), Department of the Interior and Local Government (DILG), Philippine National Police (PNP), Bureau of Fire Protection (BFP), Armed Forces of the Philippines (AFP), Philippine Coast Guard (PCG), Department of Foreign Affairs (DFA), National Food Authority (NFA), Mines and Geosciences Bureau (MGB), Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA), Department of Public Works and Highways (DPWH), Philippine Ports Authority (PPA), Department of Transportation and Communication (DOTC), Civil Aviation Authority of the Philippines (CAAP), airport authorities, railway corporations, World Food Vision (WFP), International Organization for Migration (IOM), Corporate Network for Disaster Response (CNDR) and other organizations acknowledged by the NDRRMC.

13.1.3. Operation

(1) Transportation

a) Cluster member agencies (AFP, PNP, PCG, DPWH, BFP, MMDA, PRC, and the identified HCT partners) will provide the Cluster lead with a list of available assets and their prepared Cargo loading plan (flight and ship schedule, available load capacity).

b) Requesting agency shall submit to the cluster lead a written request indicating detailed items with corresponding specifications (weight, dimension) including the name and contact numbers of the receiving party.

c) Prioritization shall be determined by the Cluster Lead based on the requirement in the affected area and/or based on the result of initial assessments and requests from the LGUs.

d) It shall be the prime responsibility of the requesting party to secure and accompany their goods until its transport.

(2) Warehousing:

a) The Cluster members shall provide the Cluster Lead with a list of available warehouses and its load capacity for the use of the Cluster during Disaster.

b) The Cluster will coordinate all available warehouses for use of all DRMMC members for prepositioning and augmentation of needed resources during disaster.

13.2. Lead Cluster Agency for Logistics

13.2.1. Department of Transportation and Communication (DOTC)

(1) Pre-Disaster

a) Confirmation of Train Service Suspension: DOTC together with MRT and LRT corporations shall confirm Train Service Suspension and report it to DRRMC-OpCens.

b) Confirmation of Status of NLEX and SLEX Traffic Flow: DOTC together with PNCC shall confirm status of NLEX and SLEX Traffic Flow and report it to DRRMC-OpCens.

c) Coordinate supporting activities of national and local governmental entities, and voluntary organizations for the provision of civil transportation when required.

(2) During Disaster

a) Shall comprehensively and proactively implement emergency transport by utilizing all means by land, sea and air through coordination by NRDRRMC (OCD).

b) Shall coordinate and implement, as required, emergency-related response functions to be performed under the power of DOTC, including the prioritization and/or allocation of civil transportation capacity, air and marine traffic control for search and rescue, hazardous material containment response, and damage assessment.

(3) Post Disaster

a) Shall ensure the priority usage of hauling and delivery means for transport of such goods to affected areas.
b) Shall closely and mutually implement effective emergency rehabilitation for transportation facilities, such as Airports which are damaged by disaster together with airport managing bodies (MIAA and other airport offices)
c) Shall be responsible for promptly assessing and collecting information on railway damage including LRT/MRT, and report it to NDRRMC and lower related DRMMCs, and request urgent rehabilitation to railway corporations.
d) Shall provide technical assistance to any government entities in determining the most viable transportation networks to, from, and within the disaster area, as well as alternate means to move people and goods within the area affected by the disaster.

13.2.2. Philippine Ports Authority (PPA)

a) Shall report to DRRMCs and remove obstacles from their managing area in association with PCG, if marine vessel navigation is decided unsafe due by ship wreckage and floating debris/objects.
b) Shall provide urgent rehabilitation activities, when needed.

13.2.3. Philippine Coast Guard (PCG)

(1) Pre-Disaster Phase

a) Alert all PCG Districts/Stations/Detachments and floating units in the possible area of disaster.
b) Alert/activate Deployable Response Groups (DRGs) with their equipment.
c) Coordinate with DRRMC.

(2) During Disaster Phase

a) PCG shall contribute to emergency transportation by operating their vessels and aircraft based on needs and requests from DRRMC and affected Local Governments.

(3) Post-Disaster Phase

a) Shall support the urgent rehabilitation activities such as removing obstacles, transporting, relocating residents, and transporting basic commodities needed under emergency in coordination with DRRMCs.

b) Provide assets for clearing operation of sediments or any hazard to ensure safe navigation within coastal areas and passage ways.

c) Shall conduct search and retrieval operations if necessary- for SRR

d) Shall evaluate and assess the effectiveness and sufficiency of deployed assets during the emergency response.

e) Shall evaluate the concept of operations if it needs improvements or rectification.

f) Coordinate with NDRRMC and LGU prior pull-out of deployed/utilized assets.

13.3. Roles of Port Authority in the time of Disaster

DOTC does not have port-related organizations in the region. DOTC has only PMUs to implement specified projects in regional areas. In the case of disaster, there is no staff to take part in regional DRRM consul. The disaster information accumulated from offices of airport, PPA and PCG flows into DOTC HQ through the HQ of each organization. In DOTC, there is an assistant secretary for DRRM and he is in charge of disaster information management.

Emergency restoration for damaged port facilities should the responsibilities of LGUs and PPA offices. DPWH offices are responsible for the emergency restoration of national highways which provide access to ports. PCGs offices are responsible for clearing water areas in order to access ports. DOTC should work closely with those related authorities. Roles and responsibilities of DOTC, PPA, LGUs are described below.

13.3.1. Disaster Damage Assumption

To examine BCP in the case of disaster, it is necessary to assume the damages by typhoon and earthquake at both the port and surrounding area.

Table 13.3-1 Assumption of Disaster and Damage

Damage by Typhoon and Earthquake	
Disaster	Kinds of, Disaster Type, Scale, Season, time
Electricity	Blackout Duration
Communication	Unavailable Period(Landline/Mobile phone, Satellite phone, Internet)
Transportation	Road Damage Area, Flood Area
Others	Duration of Storm Surge, Tunami Number, Liquefaction Area, Wreckage in port

Source: Study team

13.3.2. Formulation of BCP

The BCP is a document which details the management plan in the case of a natural disaster to ensure that minimum required functions are maintained. Port BCP is formulated and approved by a port authority and a users' committee.

The concept of BCP is defined below.

(1) BCP (Business Continuity Plan)

BCP sets out how the port will maintain its required minimum functions in the event of a disaster; it includes a risk analysis and methods to cope with disasters. Even if important functions are temporarily interrupted due to a disaster, the BCP indicates how those functions can be recovered in a short period of time.

(2) BCM (Business Continuity Management)

In addition to BCP, BCM includes the activities in ordinary time that sustain the minimum required functions of a port. This includes concrete countermeasure plan from the time of contingency and management activity to an ordinary time

(3) BCP for Port

In BCP for port, a concrete countermeasure plan from the time of contingency and management activity to an ordinary time are written. The purpose of the BCP is to ensure that minimum required functions are maintained even in the event of a disaster.

Compared to an ordinary port, the construction cost of a disaster resilient port is 10-20% higher. To ensure that functions are maintained the time of a disaster, Port BCP should be mandatory for disaster resilient ports including social ports that have been reinforced. DOTC has no front offices in ports, DOTC and LGU should prepare BCP for disaster resilient social port, and PPA, as a matter of course, should prepare BCP for their disaster resilient ports. Components of port BCP are shown below.

1. **Basic Direction**
2. **Implementation Organization and System**
3. **Initial Response**
4. **Emergency Restoration/ Alternative Measure**
5. **Preparation for Disaster (Stockpile)**
6. **Training / Drill**
7. **Review and Improvement**

Source: Study team

Figure 13.3-1 Items of BCP for Port

13.3.3. Assembly of Port Related Staffs

Personnel of relevant organizations should do the following:

a) Check damage to office building
b) Check the availability of telecommunication

Port Authority or LGU and DOTC should set up DRRM council and take part in a logistics team.

13.3.4. Emergency Restoration for Port Facilities

Port is a logistics base in normal time and should support relief activities during a disaster. However, in the wake of a typhoon or earthquake, it is assumed that some part of port facilities, such as wharf, yard, apron, and access road, might be damaged. Important facilities required for transport of relief goods should be urgently restored.

Facilities that are only slightly damaged should be given priority when conducting restoration works. At the same time, access road should be repaired if necessary. If there is a possibility of a tsunami, there is a danger that stored cargo could flow out to sea and thus countermeasure should be prepared in advance

13.3.5. Transportation of Relief Good

In the case of large-scale typhoon or earthquake, relief goods will need to be transported from an outside area. If there are multiple transport means available, relief goods can reach evacuation sites more quickly. Preparation of vessel and trucks for transportation of relief goods also should be considered.

13.3.6. Evacuation of People via Ports

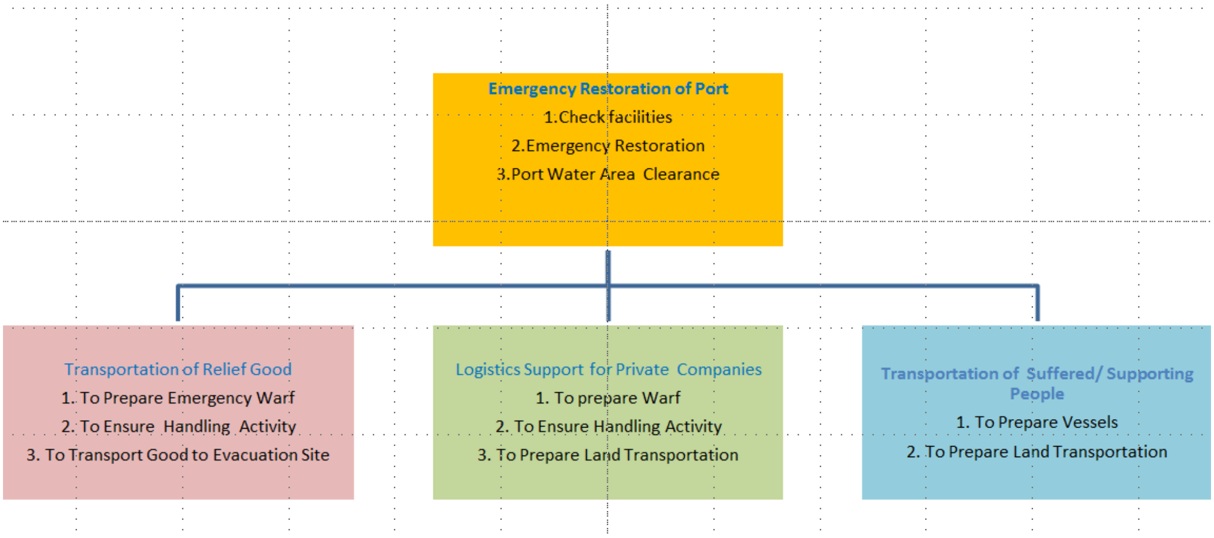
In the case of a large-scale typhoon or earthquake, roads may become damaged and impassable. Ports which are not damaged may be able to assist in transporting people in affected areas to safety. Emergency passenger transport should be set up from neighbor ports that are not damaged.

13.3.7. Logistics Support for Private Companies

The Philippines is an island county and port is a key for logistics in a long time. Nowadays, ports are more important for international logistics. Almost goods used in the Philippines are imported through ports.

If porta are unusable during a long time, factories around ports cannot continue their operations and business. Land transportation and substitutional port can be considered though it is not efficient and needs more cost.

Ports that are not damaged seriously are required for logistics function for private companies. Port Authority should also developing a BCP for private companies.



Source: Study team

Figure 13.3-2 Activities after Disaster Occurrence by PPA and LGU

14. Summary of Findings and Recommendations

Based on this survey, recommendations on application of Japanese experience to the port sector of the Philippines (Chapter 6), use of the guidelines for selection of disaster resilient ports (Chapter 10), use of guidelines for selection of social ports (Chapter 10), standard design model (Chapter 11), funding for the improvement of disaster resilient ports (Chapter 12), and contingency planning and organizations including operation and management of LGU ports (Chapter 13 and Chapter 4) are summarized below.

(1) Application of Experience of Japan to Disaster Management

Port facilities in the Philippines were designed based on the design standards of PPA which include provisions on earthquake resistance in general. The existing port facilities designed according to the standards have earthquake-resilient functions. However, the standards were prepared 30 years ago. On the other hand, there is no policy which indicates the basic direction of the development of disaster resilient ports. As a result, ports could not serve as logistics centers or as places for disaster management activities in time of disaster. After a disaster, damaged facilities have been rehabilitated but the damage caused by the disaster has not been analyzed well. Experience acquired from past disasters remains unutilized.

Ports in Japan have been frequently affected by large-scale natural hazards such as typhoons, earthquakes and tsunamis. Following such disasters, MILT, port management bodies, research institutes related to ports studied the hazard, damages of ports and socio-economic impacts. Necessary measures against further disasters have been taken in the light of the lessons learned from past experiences. For example, review of technical standards, improvement of design methods and reinforcement of port facilities as well as planning disaster resilient ports and comprehensive disaster preventive measures by physical and non-physical measures have been taken. Policies, technologies and measures on disaster management have been refined based on experience with disasters.

The port sector of the Philippines has not established a systematic framework on enhancing disaster resiliency of ports. The Philippines, which is a disaster-prone country similar to Japan, could adopt the measures described in Chapter 6 from viewpoints of policy/planning, engineering, construction of facilities, and management and operation. It is recommended to tackle the following hard and soft measures by making reference to the experience of Japan.

(i) Formulation of a basic policy and a plan on the enhancement of disaster resiliency of ports.
DOTC and PPA could clarify the role of the port sector in the case of disaster, formulate a disaster resilient port deployment plan and secure the necessary budget.

(ii) Reviewing the design standards based on the experience acquired from past disasters.
PPA could revise the port design standard taking into account the damage of port facilities by disasters in the past, state-of-the-art technology on port disaster prevention, the socio-economic situation.

(iii) Systematic development of disaster resilient ports
DOTC and PPA could develop disaster resilient ports based on the national development plan in a planned manner.

(iv) Formulation of port BCP
DOTC, PPA and LGU could formulate BCP of disaster resilient port in collaboration with relevant private sectors, ensure the minimum port function, and make efforts for emergency rehabilitation of ports and areas damaged by disaster.

(2) Systematic Improvement of Disaster Resilient Ports

In port planning and design of port facilities, the marine conditions or external forces caused by earthquakes and typhoons are taken into consideration. However, all ports cannot be constructed to withstand the strength of large scale natural hazards. Therefore, it is necessary to prioritize ports according to their importance in disaster management and to construct disaster resilient ports in a systematic manner.

The port sector in the Philippines is in an early phase of recognizing the need to enhance the disaster resiliency of ports. Port-related people need to understand the significance of logistics networks from/to ports and the role of ports in time of disaster. In addition, disaster resilient ports need to be developed. It is necessary to develop disaster resilient port facilities systematically under a national policy including a budget plan because construction costs are higher than in the case of regular port facilities.

Based on this situation, the concept of disaster resilient ports and the general flow for developing disaster resilient ports are shown in the guidelines. Selection criteria and calculation method for selecting disaster resilient ports are also introduced. In addition, the importance of coordination with port users and relevant agencies and maintaining consistency with government policy on disaster risk reduction and management for effective utilizing of the port are described.

A method for calculating degrees of importance is adopted in order to be able to understand requirements as disaster resilient ports and characteristics from the viewpoint of disaster management. A weighting system can be applied based on the target area or points meriting special considerations.

In line with the guidelines prepared in this study, importance of ports in the Philippines shall be evaluated from the viewpoint of disaster risk reduction and management and projects shall be implemented in a systematic manner. Financial planning will also be carried out.

(3) Development and operation of social ports

The Philippines is an island country composed of many islands and ports are important infrastructure for supporting the lives of citizens. With the exception of capital areas and capital cities in provinces, poverty indicators in rural areas are very high and social ports in those areas play a key role in supporting the lives of poor people in those areas.

It is important to develop ports in remote islands and peninsula areas, taking advantage of geographic and natural characteristics, to improve the quality of life and welfare of people living there, and at the same time, to improve the national economy and welfare of all people in the country.

Social ports have been developed based on requests of LGUs and politicians but to ensure fairness and transparency, a new guideline for screening and selection of social ports is proposed in this report.

The basic concept for social port development in isolated areas is predicated on 3 pillars, i.e., (1) To ensure human security, (2) To ensure means of transport, and (3) To support industry. It is proposed that ports to be developed are selected using criteria such as (a) Relevant official statistics, (b) budget allotment in the past, (c) distance from provincial capital city, neighboring port, national highway, (d) access to island and (e) essential conditions.

In addition, it is proposed that social ports located in high risk disaster areas which provide regular passenger boat or ferry services should be reinforced against natural disasters.

(4) Development of Disaster Resilient Port Facilities

Standard model designs in this study show models of physical measures of reinforcement for disaster resilient port facilities. They are made use of in designing reinforced port facilities as a preventive measure in the pre-disaster stage.

Policy on developing disaster resilient port facilities should be established. Under the policy, the existing port facilities shall be reinforced and new facilities should be designed and constructed by referring to standard design models.

(5) Acquiring Necessary Budget for Disaster Risk Reduction and Management

In the Philippines, fund for disaster risk reduction and management in pre- and post- disaster have been established: NDRRMF and QRF. For Ports under LGU, DOTC implements rehabilitation projects by these funds. PPA implements rehabilitation projects of port facilities by its corporate fund.

It is generally difficult to appropriate the necessary budget for projects involving preventive measures. It is necessary to make efforts for reaching a national consensus through explanation based on a comprehensive port disaster risk reduction and management plan which shows the necessity and effects of preventive measures at ports.

In order to recover port functions at PPA ports promptly after a large scale disaster, use of government fund, ODA fund and insurance, in addition to PPA own fund, shall be considered. Use of these funds for enhancement of disaster resiliency of the ports shall be considered. PPA shall study disaster risk management from both viewpoints of risk control by investments to preventive measures and risk finance including insurance or bond system.

Regarding financial resources for preventive measures on social ports, it is recommended that DOTC preferentially allocates funds to projects which include enhancement of port facilities against disasters in GAA and studies the use of NDRRMF for such projects.

(6) Improvement of Operation and Management of Ports under DOTC, PPA and LGUs

Several problems are identified in the operation and management of ports under LGUs. Sound operation and management is required for not only providing good services to port users but also for appropriate use of government funds and effective management of government property.

Most basic matter is grasping the present situation of port facilities and the usage conditions systematically. In this regard, a port inventory book in which has the latest and reliable information is indispensable.

When the operation and management of a port is turned over to a LGU, it is necessary that the scope of responsibility for maintenance is made clear. In addition, capacity development of LGU's officials in port operation and management is required.

(7) Preparation of Contingency plan

A port is a logistics base in normal time and should support relief activities during a disaster. However, in the wake of a typhoon or earthquake, it is assumed that some part of port faculties, such as wharf, yard, apron, and access road, might be damaged accordingly. Important facilities required for transport of relief goods and/or passengers to/from affected areas, should be restored urgently.

Facilities that are only slightly damaged should be given priority when considering restoration works. At the same time, access roads should be repaired as required. If there is a possibility of a tsunami, there is a danger that stored cargo could flow out to sea and thus countermeasures should be prepared in advance.

The purpose of the BCP is to ensure that minimum required functions are maintained even in the event of a disaster. Construction costs for creating disaster resilient port facility are 10-20% higher than in the case of regular port facilities. BCP should be mandatory for disaster resilient ports including the social ports which have been reinforced accordingly. DOTC, LGU and PPA could prepare BCP for their disaster resilient social ports and disaster resilient ports.