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 Summary

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

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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.

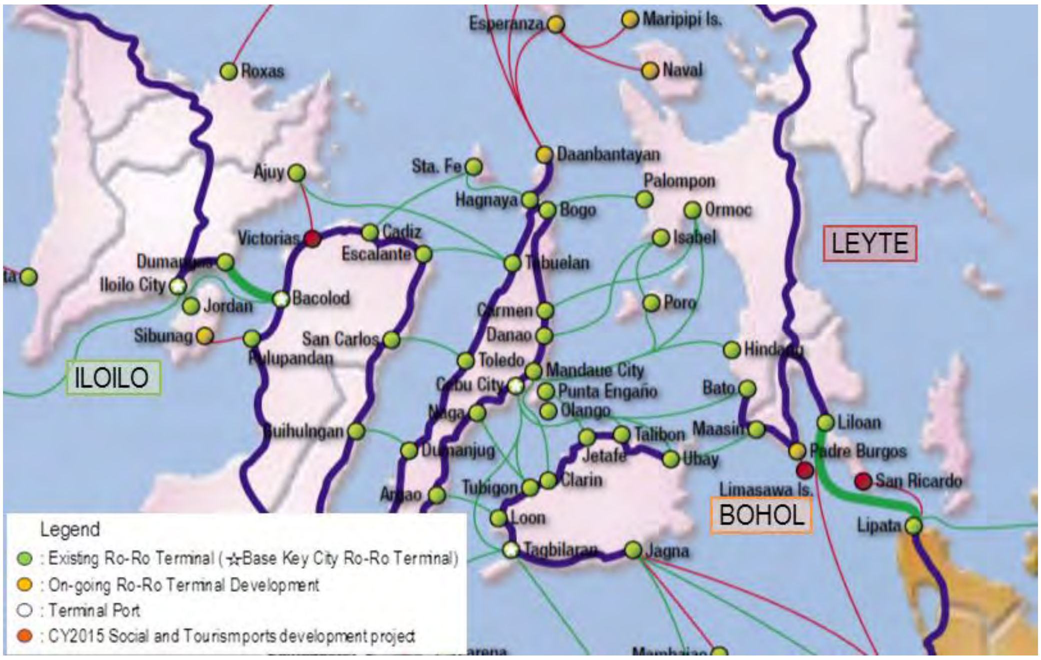
Taking into account the current situation, the Data Collection Survey on Disaster-resilient Feeder Ports and Logistics Networks (hereinafter referred as the "Survey") aims to support the Government of the Philippines to enhance the disaster resilience in the country by establishing guidance in the allocation 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 Map of Main Ports in the Target Area

(2) Types of Disaster

Disaster types which will be focused on during the survey are as shown 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 2-2 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.

(1) Conference

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

Table 2-1 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

(1) Natural Disaster

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 induce serious damage.

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.

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 within 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.

(2) Disaster and Poverty

In the case of the Philippines, linkages between poverty and vulnerability to natural hazards are clearly apparent. Poor families have been forced to live and work in high-risk areas, such as on shores or flanks of active volcanoes. Disasters can be associated with a negative spiral for poor people. In other words, they cannot get out of poverty by typhoons attacked every year.

(3) Outline of Typhoon Yolanda

Basic information and damage of Typhoon Yolanda is summarized below.

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, generating a rainstorm and storm surge.
- 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)

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

(4) Outline of Bohol Earthquake

Basic information and damage of Bohol Earthquake is summarized below.

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

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

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

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 efforts to strengthen disaster management, 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 prevention and mitigation measures, in addition to conventional 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.

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.

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.

Under the DRRM Act, the Office of Civil Defense (OCD) is responsible for the secretariat of the NDRRMC, and is 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.

In addition, 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.

3.3. Japan and JICA's assistance policy and achievements relevant to 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"; a yen loan is available for rapid emergency assistance and restoration works in the event of a sudden natural disaster. According to the country analysis paper of JICA, it concludes that a key issue to overcoming vulnerability is reducing and managing 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).

Following Typhoon Yolanda, 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 on 19th March, 2014 is shown below. The amount of the 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.

3.4. Assistance of other Donors

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 withstand storms with wind speeds of 250-280 km/h and large scale floods was also provided.

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 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. Excellent results in this field survey of ADB are reflected.

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.

United Nations World Food Program (WFP) outfit food in sites to the people in the Philippines affected by Typhoon Yolanda. More than 75 companies have provided assistance in cash or in goods / services.

4. Ports in the Philippines

4.1. Transportation infrastructures

(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.

(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, local road managed by LGUs. National roads are important from the viewpoint of logistics. In addition, there are three types of national ports: Primary Road, Secondary Road and Tertiary Road.

(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.

4.2. Current situation and issues on ports

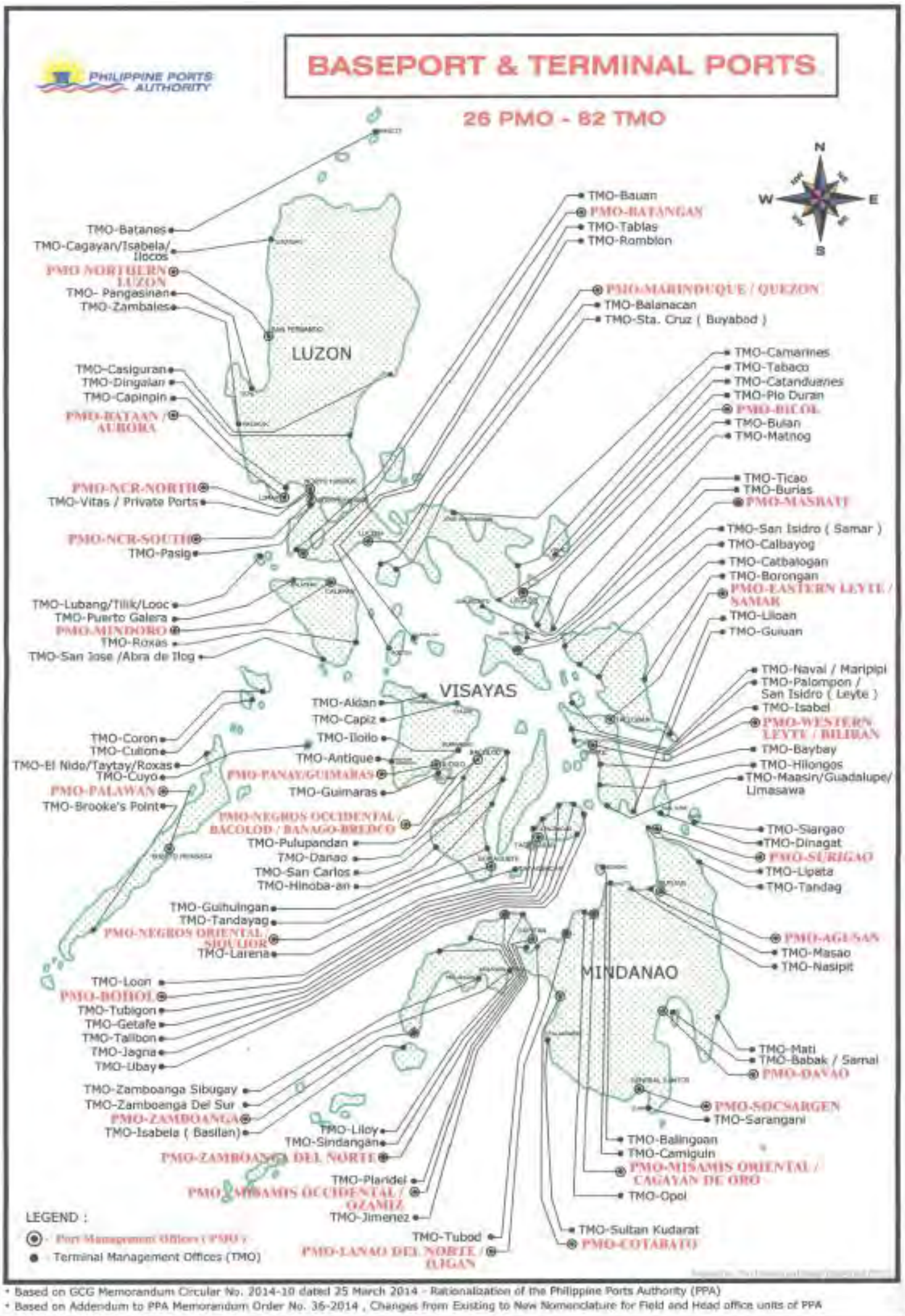
(1) Nation-wide ports

According to the master plan[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 by a private firm. In addition, there are 421 fishing ports which are also used for logistics and passenger transportation besides fishing activities.

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. 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.

Location of ports, developed and managed by PPA, is shown below.

[1] The Study on the Master Plan for the Strategic Development of the National Port System in the Philippines (2004) JICA



Source: PPA

Figure 4-1 Location of PPA Ports (Base Port, Terminal Port)

(2) Development and Operation/Management under Local Government Units

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 a Government Corporation (GC) or LGUs.

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

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

Table 4-1 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 Handling 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	

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)

5. Port disaster in the Philippines

(1) General Information and Restoration Status of Disaster in Target Areas

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 to buildings due to storm surges of the typhoon, while berthing facilities and buildings in Bohol province were damaged due to movement and liquefaction caused by the earthquake. The damages to port facilities caused by the typhoon in Iloilo province were very minor. Details of port facilities and major damages in Leyte and Bohol provinces are summarized in the following tables.

Table 5-1 Summary of the Port Facilities and Damages 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 5-2 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

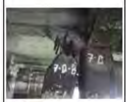
Table 5-3 Summary of the Port Facilities and Condition of Damage in Bohol Area

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 5-4 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

(2) Ports in times of disaster

The team was able to interview relevant parties concerning the damage inflicted by Typhoon Yolanda. The information obtained is described below.

● 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)

● 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.)

● 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 for 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)

6. Japanese disaster prevention at ports and harbors

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

(1) 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 consolidated into three points: “Strengthening of disaster prevention ability in ports”, “Securing maritime transport network and a backup system” and “Countermeasures for saving human lives and BCP”. In addition, a policy on disaster resilient ports was formulated.

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 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)	
Ref. 2 Manual for Disaster Prevention Inspections in Coastal Areas (Mar. 1997)	
Ref. 3 Proposal for Disaster Prevention at Ports and Harbors (July 2003)	
Ref. 4 Guideline for Ports Having High Resistance against Earthquakes (Mar. 2005)	
Ref. 5 Guideline for Countermeasures against Earthquakes and Tsunamis (June 2012)	
Ref. 6 Guideline for Port Business Continuity Plan (BCP) (Mar. 2014)	
(2) Documents published by Local Governments	
Ref. 7 Basic Guideline for Countermeasures against Large-Scale Earthquakes at Ports and Fishing Harbors (Nagasaki, Mar. 2006)	
Ref. 8 Disaster Prevention Plan in Remote Islands near Tokyo (Mar. 2015)	
(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	

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.

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).

(2) Design Standard for Port Structures

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

(3) 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. 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).

(4) 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.
The government of Japan plans to formulate port BCP at all international hub ports and major ports. The study team could not find such a country taking such an ambitious approach.

(5) 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. In addition, three or four days after a disaster occurs, an island area would likely face a shortage of relief supplies and fuel. Therefore, local governments have striven to improve the stockpile system, and to secure a power source for the transport of relief supplies.

(6) 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.

The MLIT and local governments have striven to steadily enhance disaster preparedness through a combination of structural and non-structural measures.

6.2. Application of Japanese disaster prevention measures to the Philippines

(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.

(2) Application of Japanese disaster prevention measures to the Philippines

The scientific knowledge related to earthquakes and typhoons has been increasing and port-related technologies to cope with natural disasters have become more advanced. It is necessary to review the contents of technical standards regularly in the Philippines and revise them as required. PPA should play a lead role in revising the standards in cooperation with the government, port users, research organizations, universities, etc. In addition, it is necessary to construct a framework for these technical standards; in this regard, the latest Japanese technical standards can serve as a useful reference for the Philippines.

(3) Systematic development of disaster resilient ports

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.

(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. The Philippines, a disaster-prone country, could introduce know-how against disasters which Japan has acquired over the years and take the necessary measures. In particular, 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

(1) Iloilo Province

Iloilo province has a total land area of 4,663.42 sq.km, and 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. Iloilo City has a total population of 424,619, the largest city of the province, where 20% of the population resides.

As to 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.

Table 7-1 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)

Main industries of Iloilo province are agriculture and fishing. Sugar and Sugarcane are exported to local and international. Aquatic foods are imported to Taiwan, Japan and Vietnam, Hong Kong.

(2) Bohol Province

Bohol province is the tenth largest island of the Philippines. Bohol province has a total land area of 4,117.26 sq.km. 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. Tagbilaran City is the largest city/ municipality in the province with share of 7.7%.

As to the distribution of the people classified by income class, 4th class dominates with 44%.

The main industry of Bohol province is agriculture, particularly the production of rice and maize. Fishing is thriving in the Camotes Sea.

(3) Leyte Province

Leyte province has a total land area of 4,663.42 sq.km. and 43 Cities/ Municipalities including Tacloban, Ormoc and Baybay. According to the census conducted in 2010, total population in Leyte province is 1,789,158. Tacloban City has a total population of 221,174, the largest city of the province, where 12.4% of the population resides.

As to the distribution of the people classified by income class, 1st class dominates with 34%. The 1st and 2nd classes account for 48% of the total.

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.

7.2. Logistic Infrastructures in the Target Area

(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.

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.

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 northwest.

(2) Ports

1) Iloilo

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.

- Most of domestic cargo vessels enter into Iloilo Port. Together Iloilo and Dumangas Port account for 96% of total vessel calls.
- Most of foreign cargo vessels enter into Iloilo Port as well as the domestic ones.
- Iloilo Port handles more than 90% of the total domestic cargo throughput in the province.
- Iloilo Port handles almost 100% (99%) of the total foreign cargo throughput in the province.
- The volume of “Fuel and By-products” accounts for more than 90% of both domestic and foreign cargoes.
- Most of the passengers use Iloilo Port and Dumangas Port, which together account for 99% of total passengers.

2) Bohol

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.

- Number of domestic cargo vessels is dispersed in each port. In addition, the share of top four ports (Tubigon, Tagbilaran, Getafe, Ubay) account for more than 90% of total vessels.

- As for annual handling volume of domestic cargos, the share of Tagbilaran Port is more than 40% of the provincial total. Tagbilaran Port handles 11.2 times more cargo than Tubigon Port.
- 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).
- Most of the passengers use Tagbilaran Port and Tubigon Port. These two ports account for more than 70% of total passengers.

3) Leyte

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.

- A large number of domestic vessels enter into Ormoc Port, Bato Port and Hilongos Port.
- Most foreign vessels enter into private ports, while only a small number of vessels enter into Tacloban Port.
- As for annual handling volume of domestic cargoes, 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.
- Most foreign cargoes are handled by private ports. The share of Tacloban Port is only around 1% of the total.
- "Fuel and By-products" account for 15% of the total cargo volume, both domestic and foreign.
- Ormoc Port has the largest number of passengers.

4) Characteristics of Ports in the Target Area

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.

It can be observed that the larger population a municipality has, the greater number of ports it is likely to possess. According to Table 7-2, there are 142 public ports in the target area. Therefore, one port supports approximately 37,000 people.

Table 7-2 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

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.

The specification of ports and port facilities, which have logistics function in the target area, is described below.

Specification of disaster resilient ports

- There are one or two representative ports (BP)[2] 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)[3] in province: Iloilo x 68.6, Bohol x 11.2, Leyte x 6.9

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

(3) Land and sea transportation network

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

2 Base Port (BP) which the PMO (Port Management Office) has jurisdiction over under the category of PPA
3 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

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.

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. 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.

8. Assumption of Disaster

8.1. Target Disaster

(1) Typhoons

DOTC and JICA determined the target typhoon to be Typhoon Yolanda that hit the Visayas region in November 2013. The design wind speed was estimated to 240kph from the 910hPa pressure of the Typhoon Yolanda.

(2) Storm Surge

Based on the Ready Project[4] released by the Office of Civil Defense (OCD), 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.

(3) Earthquakes

The seismic intensity at the time of Bohol Earthquake obtained from PHIVOLCS 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.

(4) Tsunami

Based on 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 maximum tsunami height is 8m on the south coast. The tsunami height estimated in Iloilo City is 5m from the tsunami hazard map of Iloilo.

4 The main aim of this project is to address the problem of disaster risk management (DRM) at the local level.

9. Guidelines for Selection of Disaster Resilient Ports

9.1. Disaster Resilient Port

Important 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 as 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 play the following roles:

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

In consideration of the economic activities, the location of ports and the road network in the target area, the study is conducted based on the basic policy on disaster resilient ports which is shown below.

- 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.

9.2. Ports in the Target Area

The ports listed in the table below play a role in logistics of the area. They are mainly under PPA and almost all of 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.

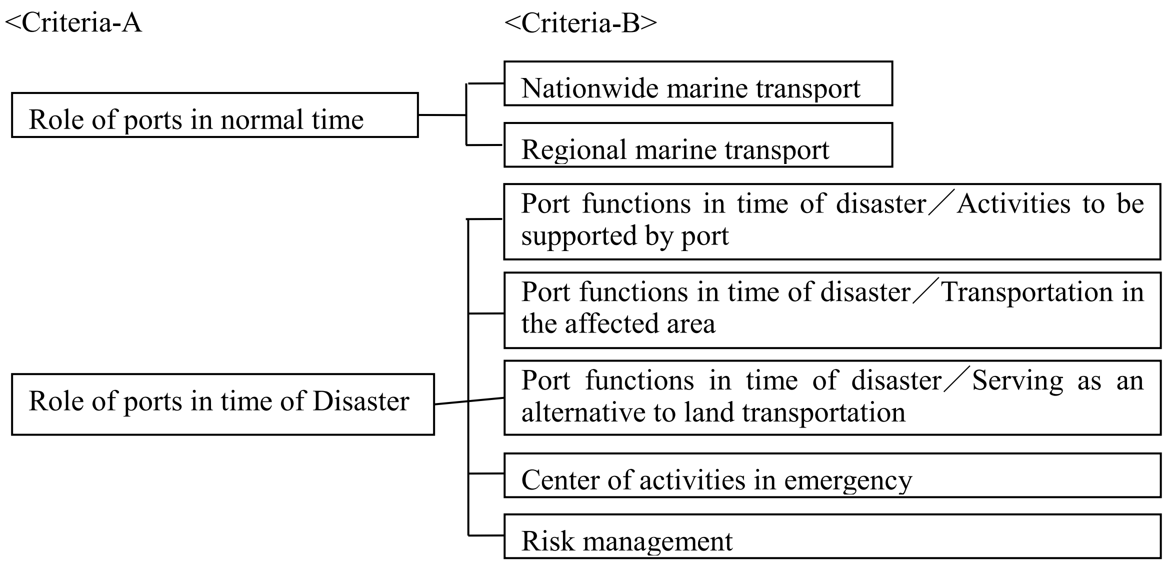
Table 9-1 Ports of Considerations

Iloilo Province
Iloilo Port, Dumangas Port, Estancia Port, Guimbal Port, Concepcion Port, Progreso Port, Culasi Port
Bohol Province
Tagbilaran Port, Tubigon Port, Jetafe Port, Tabilon Port, Ubay Port, Jagna Port, Tapal Port, Loay Port
Leyte Province
Tacloban Port, Ormoc Port, Palampon Port, San Isdro Port, Baybay port, Hlongos Port, Isabel Port, Bato Port

Source: Study team

9.3. Criteria for Selection

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 9-1)



Source: Study team

Figure 9-1 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 the Philippines 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.

9.4. Guidelines

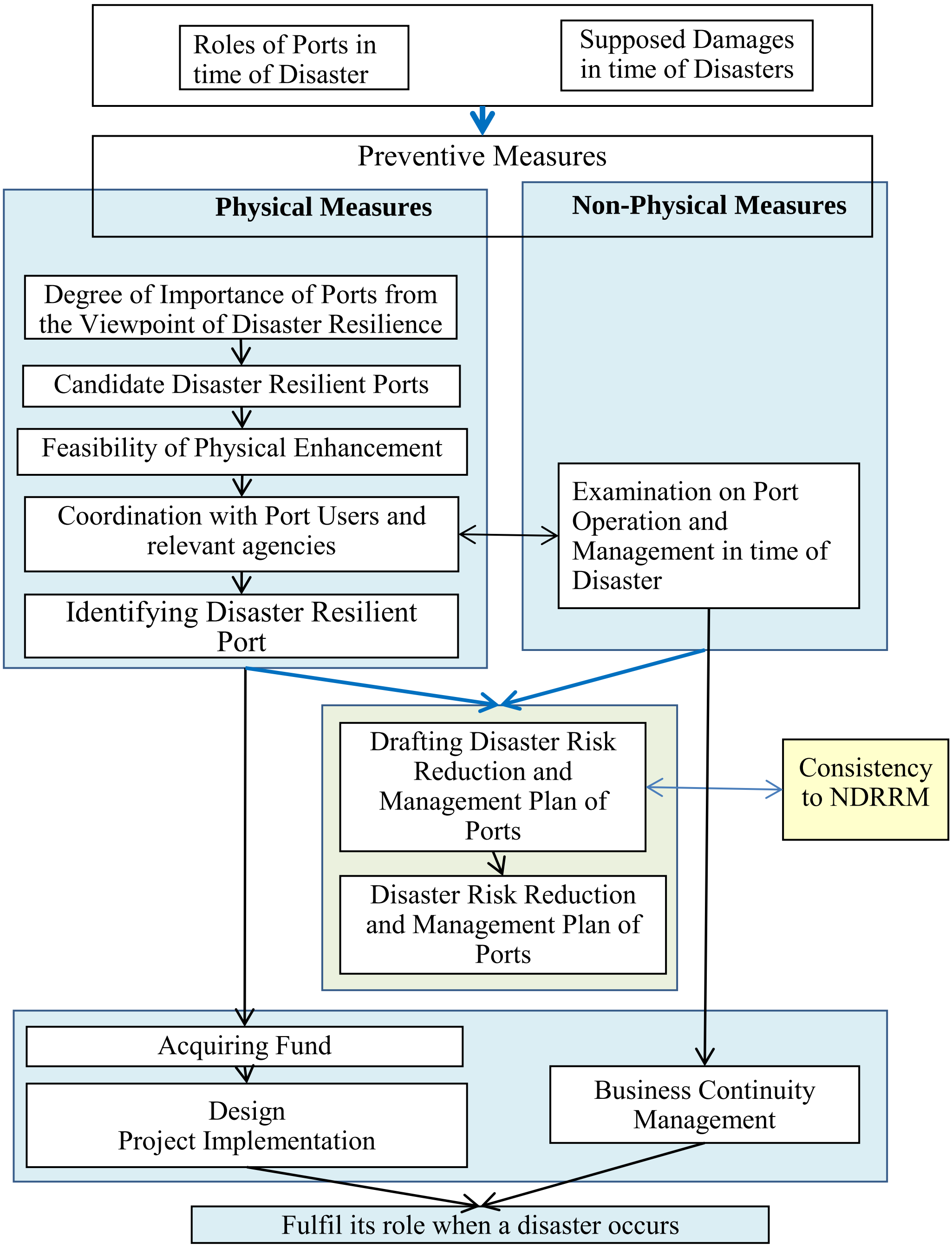
(1) Disaster Resilient Port

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 provides port facilities which are fortified against the external forces of 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 9-2 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 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 9-2 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. 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 calculating a port's degree of importance. The degree of importance is calculated according to the following steps. This parametric calculation method can be applied to 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)

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

The numerical results cannot always fully reflect the actual situation. Therefore it is necessary that the disaster resilient port 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 involves not only constructing port facilities which will not be damaged by a hazard, but also establishing a system which enables a port to function as a logistics center and support various kinds of activities in time of disaster.

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.

The system of DRRM has been built with a hierarchy such as 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.

9.5. Calculation of Level of Importance as Disaster Resilient Ports

Disaster resilient ports are selected among the ports in the provinces of Iloilo, Bohol and Leyte 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.

Weights for roles 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 functions of ports in time of disaster (Criteria-B), weights of 0.3, 0.35 and 0.35 are allocated almost evenly among port functions in time of disaster, center of activities in emergency and risk management respectively. In addition, the same weights (0.1) 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.

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

(1) Normal Time

Nationwide Maritime Transport Perspective:

Position in nationwide marine transportation (X11)

Regional Marine Transportation:

Role in regional marine transportation (X21)

(2) Time of Disaster

Port Functions in Time of Disaster/ Activities to be Supported by a Port:

Scale of social and economic activities in the hinterland area (Y11),
Scale of cargo volumes through a port (Y12)

Port functions in time of disaster/ Transportation in the affected area:

Maritime transportation across a wide area (Y21), Maritime transportation network in the region (Y22), Connectivity with land transportation (Y23)

Port functions in time of disaster/ Serving as an alternative to land transportation:

Location of ports (Y31), Traffic on the road behind a port (Y32)

Center of activities in emergency:

Capacity for receiving emergency goods (Y41), Space for activities (Y42),
Situation of port management (Y43), Communication with the disaster management center (Y44), Facilities of emergency activities (Y45)

Risk Management:

Risk level of hazard (Y51), Location of potential alternative ports (Y52), Redundancy (Y53)

Values of data are categorized into ranks considering the characteristics of data, local conditions and characteristics of a port etc. The value of ranks is used for calculation. In case all indicators mark the highest ranks, the score becomes 10 by making double the result of calculation by two (2).

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 9-2 Result of Calculation (Ports in Iloilo Province)

Iloilo	Dumangas	Estancia	Guimbal
8	5	6	3

Source: Study team

Table 9-3 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

Table 9-4 Result of Calculation (Ports in Bohol Province)

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

Source: Study team

Table 9-5 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

Table 9-6 Result of Calculation (Ports in Leyte Provinces)

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

Source: Study team

Table 9-7 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

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

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. It is desirable that Estancia Port and Roxas Port in Capiz Province 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. Tubigon port is inferior in terms of its location near Tagbilaran port. Regarding Jagna Port, a breakwater would be necessary to protect port facilities in order to cope with the expected tsunami height which would require an excessive investment. Ubay port 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 thus inferior in terms of engineering and financial aspects. Tapal port is located away from secondary road but on the route of main maritime transportation service by vessels from/to main ports. 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 highest 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.

10. Improvement of Social Services Access for People in Isolated Areas

10.1. Social Services Access for People in Isolated Areas

In remote areas, ports play very important roles in providing basic human needs. 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

(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.

(2) Insufficient maintenance

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.

(3) Unclear Responsibility of maintenance and improvement of port

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.

(4) Lack of Facility Inventory Book

Social port facilities are developed and maintained by DOTC, PPA, and LGUs but there is no inventory book which records the history of development. (PPA has their inventory book but it is not updated.)

(5) Lack of ability of LGU engineer

LGU engineers are mainly road and river specialists who lack sufficient knowledge on port engineering.

(6) Duplication of port development

There is often a duplication of port development in the capital region by DOTC, PPA, and PFDA.

10.3. Basic Concept of Social Port Development

The basic concept for the social port development in isolated islands is shown below.

(1) To ensure Human Security

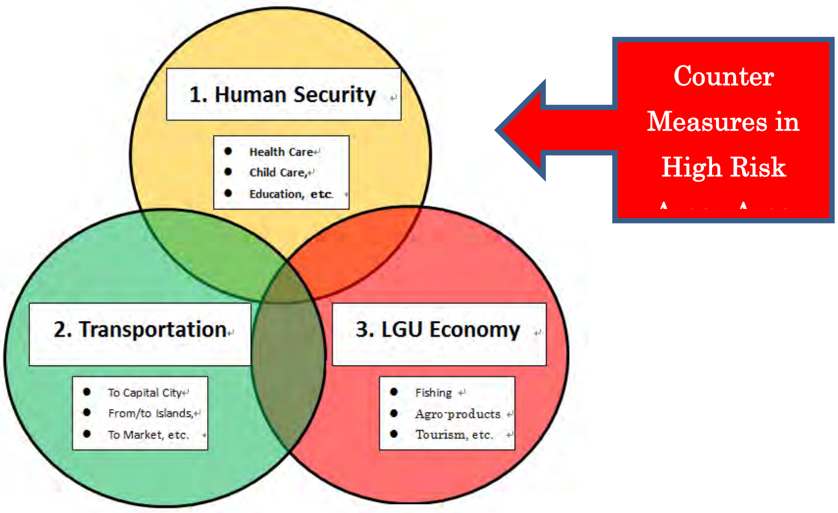
Protecting humans from various threats such as poverty, famine, infectious diseases, disaster, has become an important new concept of the international community. In areas where there is a high risk of disaster, preventive countermeasures are included in this concept. Disaster always provides negative 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 10-1 Basic Concept of Social Port Development

10.4. Criteria for Screening Social Ports

(1) Human Security

i) 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.

ii) Poverty Incident

National statistics office of the Philippines calculates the poverty index of municipalities based on the income of residents. Poverty reduction should be a key element of social port development. In the Philippines, informal settlers are often found in port areas. Port development can improve their quality of life.

iii) 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.

(2) Transportation Means

i) 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.

ii) 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.

iii) 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.

(3) LGU Economy

i) 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.

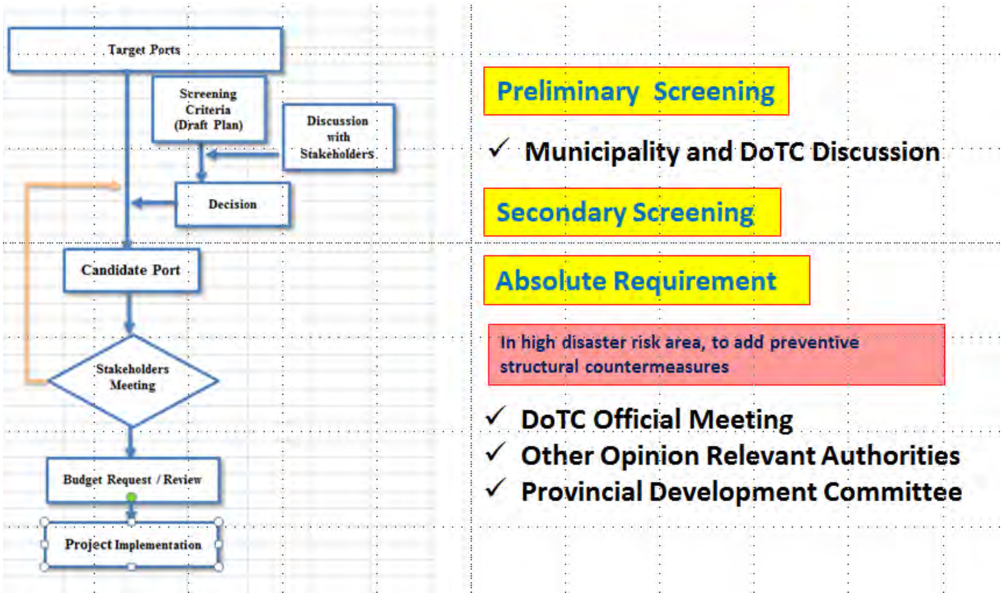
ii) Port Scale

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.

10.5. Screening Criteria and Guidelines

(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.



Source: Study team

Figure 10-2 Screening Flow and Guideline

(2) Primary Screening Criteria

The primary selection criteria shall be as follows.

(i) Municipality which has 0 or 1 port is prioritized excluding isolated island.
(ii) Municipality in which income class is 1st grade should be excluded.
(iii) Poverty incidence exceeds 30% (determined from the distribution of indicator in the target area)

(iv) No Investment by DOTC and PPA during latest 3 years excluding phased projects. (Half of 6 years administration period is used)
(v) No ODA investment in the past (in principle) (Equality of opportunity)

(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.
(i) Beneficiary Population exceeds 25,000 (determined by the population distribution of target area)
(ii) Distance to Neighboring Port exceeds 10 km (2 hours by tricycle)
(iii) Distance to NHW exceeds10 km (2 hours by tricycle)
(iv) Port Scale (Appropriate site, more than 4m depth below MSL (Boat can accommodate in low tide)

(4) Absolute Requirements

To finalize candidate ports, check absolute Requirement shown below.
(i) Project site is not in a preserved/ protected area (DENR definition) to ensure minimal impact to marine environment.
(ii) LGU has the right of way and land ownership of the project site
(iii) LGU commits to allocate budget to operate and maintain the port
(iv) Community organization has been established for the port operation and maintenance (e.g. port manager, safety port fee, etc.).

(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.
(i) Typhoon: Areas where wind speeds might exceed 210 km/h by Symptom Scale
(ii) 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.

10.6. Screening for Social 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.

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 10-1 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

(1) 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 with underline. Disaster countermeasures should also be considered for ports which have regular passenger or ferry service.

Table 10-2 Selected Ports in Leyte Province

Port	City/ Municipality
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

(2) 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 with underline.

Table 10-3 Selected Ports in Bohol Province

Port	City/Municipality
Inabanga Causeway	Inabanga
Buenavista Causeway	Buenavista
Trinidad	Trinidad
Tugas	Pres. Carlos Garcia
Baybayon	Mabini
Candijay	Candijay
Anda	Anda
Guindulman	Guindulman

Source: Study team

(3) 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 with underline.

Table 10-4 Selected Ports in Bohol Province

Port	City/Municipality
Carles	Carles
Batad	Batad
San Dionisio	San Dionisio

Source: Study team

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, criteria limit should be reviewed and revised when necessary.

11. Standard Design Model for Disaster-resilient Port

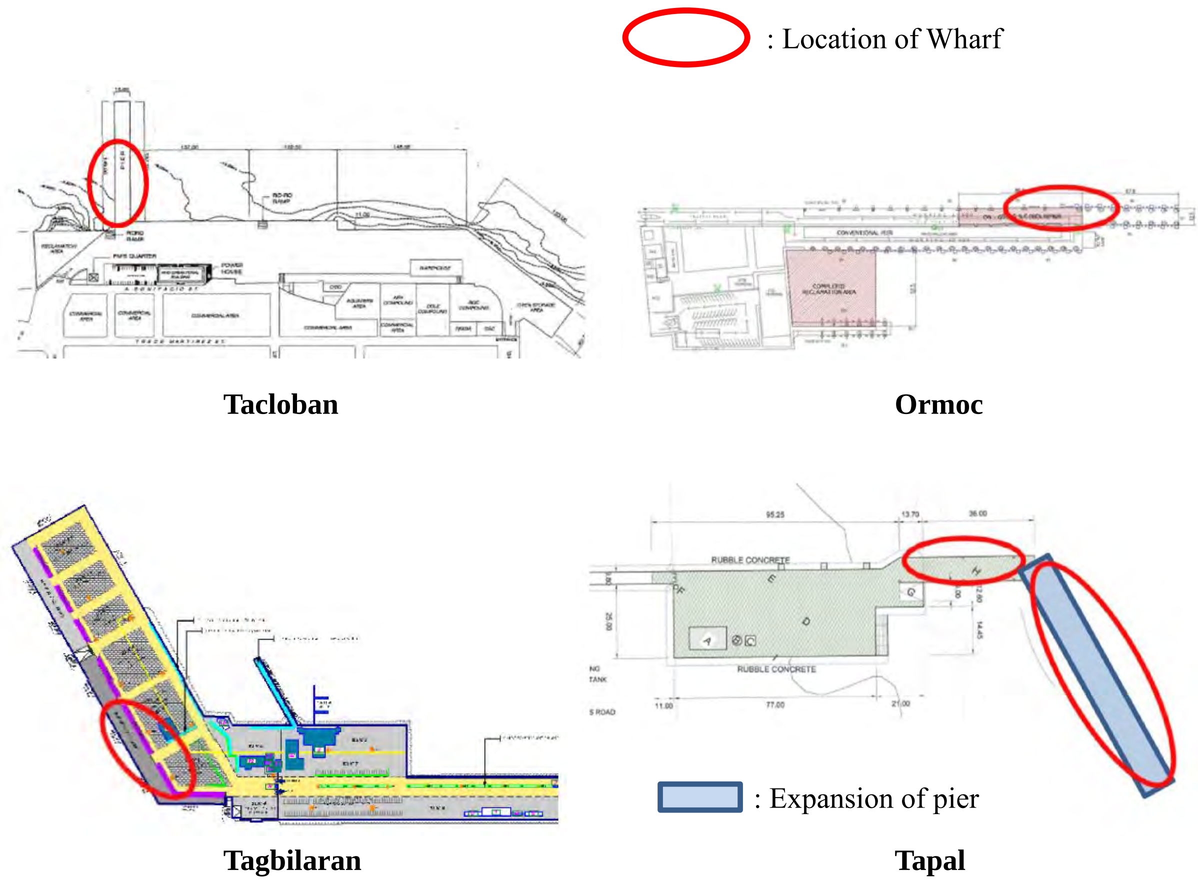
11.1. Standard Design Model for Disaster-resilient Ports

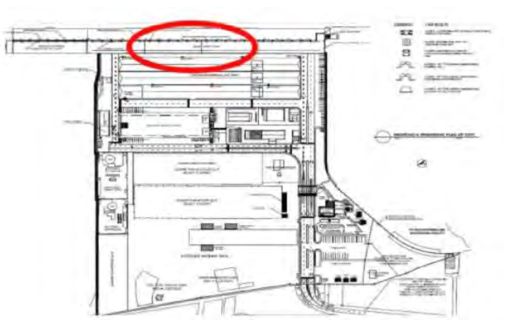
(1) Standard Design Model for Quay Facilities

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 9.

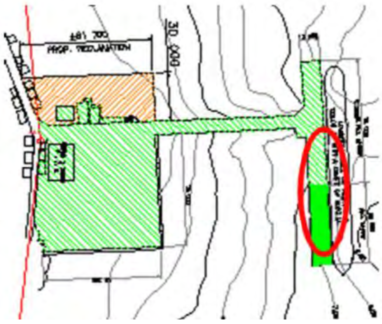
It is emphasized that the Standard Design Model of disaster-resilient ports should be ultimately be decided by the government. This guideline might apply to only the important facility of selected port for disaster management.

The existing layout plans for each selected port are shown in Figure 11-1.





Iloilo



Estancia

Source: Study Team

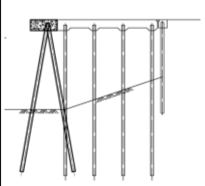
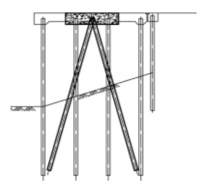
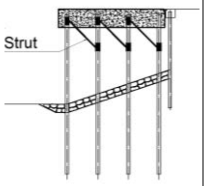
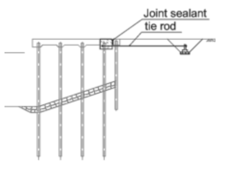
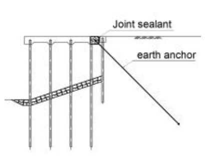
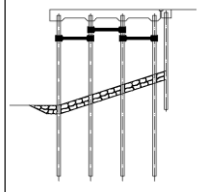
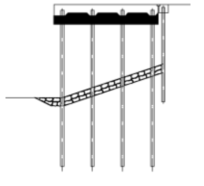
Figure 11-1 Selected Disaster-resilient Ports

(2) Standard Design Model for Earthquake

1) Quay Facilities

According to the structural type and location of the berthing facilities, 90% of the total structures are pier type. Therefore, standard design model is examined for pier type structure only. Table 11-1 presents a summary of seven cases of the structural reinforcement method to be applied to the existing quay facilities for the target six site areas.

Table 11-1 Summary of Seven Cases for Standard Design Model for Earthquake

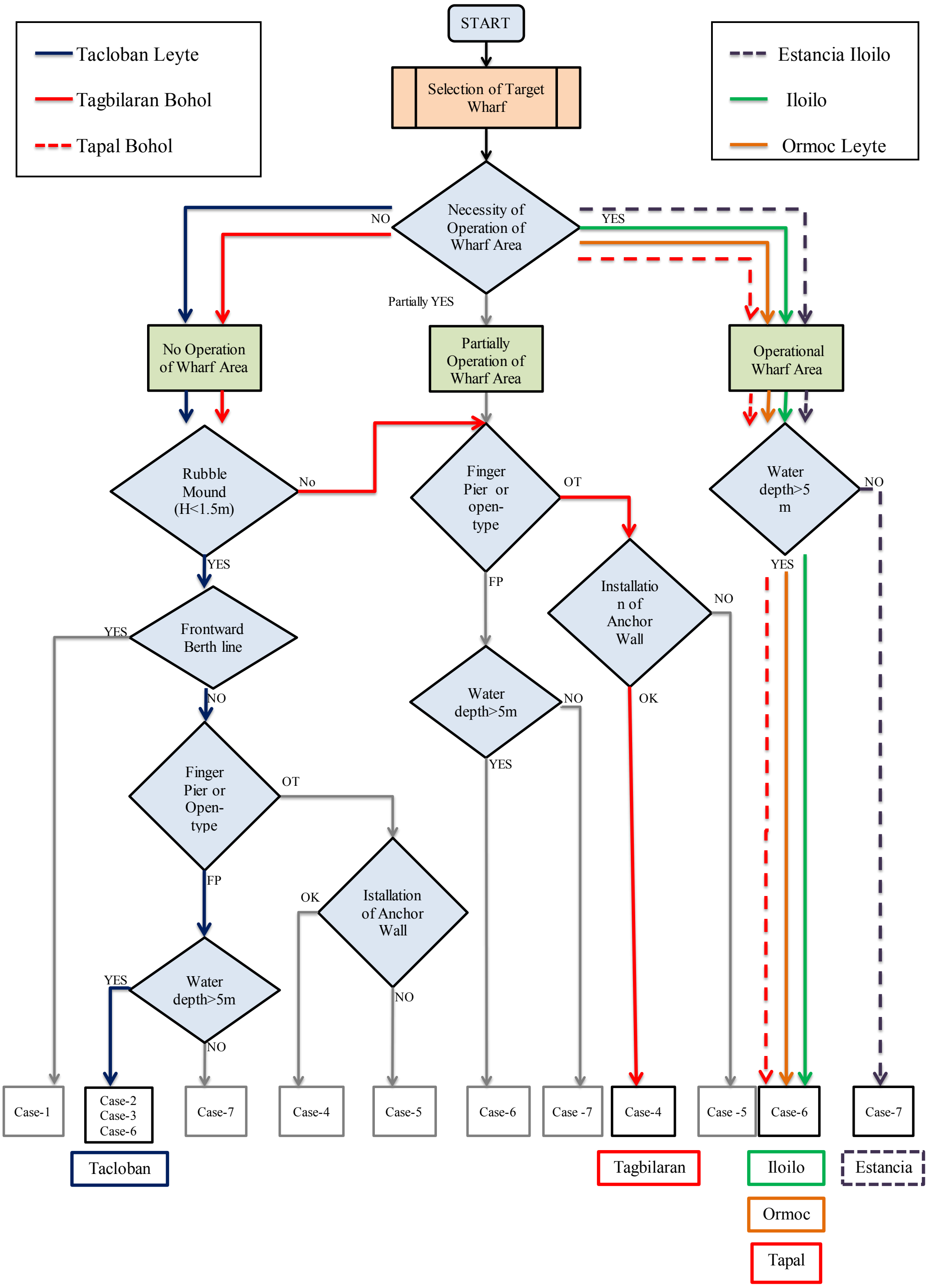
	Case-1	Case-2	Case-3	Case-4	Case-5	Case-6	Case-7
Method	**Installation of Coupled Raking Piles in front of Berth line**	**Removal of Deck and Installation of Coupled Raking Piles**	**Removal of Deck and Installation of Submerged Struts**	**Installation of Tie Rod, Anchor Wall and Sealant**	**Installation 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.

2) 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 11-2. The applicable cases for each port are mentioned in the flowchart.



Source: Study team

Figure 11-2 Flowchart for the Selection of Standard Design Model

3) 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.

(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.

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.

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.

(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. 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 is proposed, and the application of glass shatter-resistant film to proposed.

(5) Standard Design Model for High Waves Attacked during Typhoon

Estancia Port was only damaged by high waves generated by typhoon Yolanda. The Replacement to a new pre-cast concrete slab is proposed for standard design model.

(6) Standard Design Model for Storm Surge during Typhoon

The estimated storm surges for each port ranges from 0.1 and 1.8 m on each quay. 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.

(7) Standard Design Model for Tsunami

The estimated tsunami wave height for each port is estimated in the range between 0.8 and 3.0 m on each quay. The tsunami height of Iloilo is estimated as 3 m and tsunami wave pressure reaching 9 ton/m2. The design model for tsunami will not be established as its application is not practical.

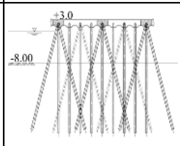
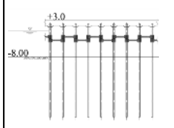
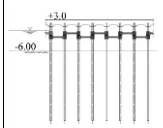
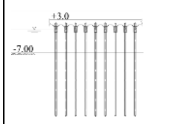
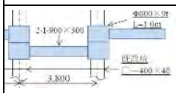
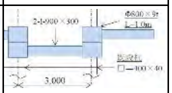
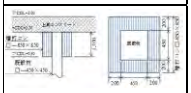
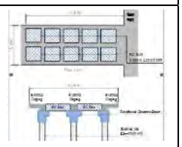
(8) Standard Design Model for Port Related Facilities

In order to establish disaster resilient port facilities, emergency standby generators and water reservoirs are provided for each port.

(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 11-2 Summary of Standard Design Models for Target Ports

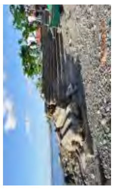
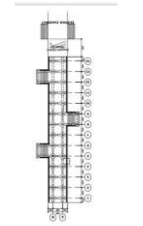
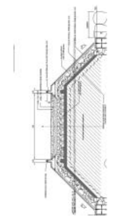
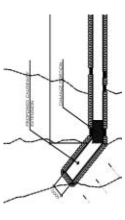
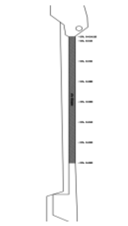
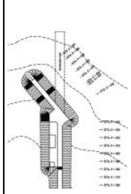
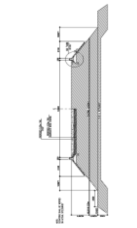
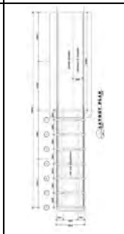
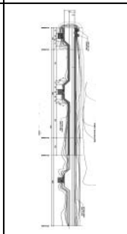
Facilities		TACLOBAN	ORMOC	TAGBILARAN	TAPAL	ILOILO (ICPC)	ESTANCIA
Berthing Facility (for earthquake)			No reinforcing is necessary			No reinforcing is necessary	
		Additional steel pipe batter piles φ800mm, 6m ctc					
		Reinforcing pier length: 160m		Reinforcing pier length: 160m	Reinforcing pier length: 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

(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 as shown table below.

Table 11-3 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 errosion	Settlement of causeway	Errosion	Settlement of causeway	Settlement of causeway	Pavement of causeway damage	Totally erroded	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

In order to prevent the disaster of the causeway by earthquake and typhoon, the confirmation of natural condition, planning to minimize the environmental impact and the design based on the appropriate design standard in the survey, planning and design stage.

11.2. Rough Cost Estimate

Rough cost estimate for the port facilities is shown table below 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.

Table 11-4 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

Budget of the government of the Philippines consists of New General Appropriations and Automatic Appropriations. The former 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.

The New General Appropriations (GAA) 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.. Special Purpose Funds (SPFs) are appropriated in GAA for specific purposes. 1,184.8 Billion PhP was appropriated in 2015. The total subsidy given to LGUs by the national government refers to Allocations for Local Government Units (ALGU). Its amount is 422,944 million PhP in 2015.

The budget of DOTC in 2015 is 52,874,342 thousand PhP. 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.

12.2. Budget for Port Development

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.

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. The amount in FY 2015 is 1,631,453,000 PhP for 63 ports. The average project cost per port is approximately 25 million PhP.

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's Net income in 2013 is 5,174.25 million PhP and after-tax profit is 3702.18 million PhP. Net income in 2012 is 4,218.58 million PhP. PPA shows a good financial performance.

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.

12.3. Funds for Disaster Risk Reduction and Management

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 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. 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. Scale of NDRRMF and QRF in FY2016 is planned as 38,896 million PhP and 6,665 million PhP.

Regarding LGUs' fund for Disaster Risk Reduction and Management, 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. 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.

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. DOF has been tackling these themes in cooperation with the World Bank, JICA and relevant agencies.

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. Responsibility for taking such measures belongs to owners of the facilities in principle. Ports in the Philippines are owned by DOTC, GOCCs (PPA etc.) and LGUs have to appropriate necessary budget for such measures. 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.

12.4. Restoration of Damages by Disaster and Enhancement of Disaster Resilience of Port in Japan and Other countries

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. 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. It is important to prepare a rehabilitation budget in disaster management especially in case of a large scale disaster and special financial supports from the government have been provided,

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 function of higher disaster resiliency is added to important port facilities such as international container terminals.

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. Risk finance corresponds to a viewpoint of dispersion of disaster loss and share of the burden. 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.

The port corporations in Chile which are financially independent from the government have taken out an insurance policy. In Iceland, harbor installations owned by municipalities and the National Treasury have to be insured with Iceland Catastrophe Insurance.

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.

The socio-economic damage in areas affected by a disaster may be widespread and long standing in general. In the Philippines which consist of many islands, there are 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. 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 is a financially independent organization and the cost necessary for rehabilitation of port facilities damaged by natural disasters needs to be prepared by itself. Accordingly, PPA needs to study disaster management both in terms of risk control and risk finance from a port management viewpoint. Considering that suspension of port functions in major ports 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 ports lighthouses and harbors budget in GAA shall be allocated preferentially to ports with disaster prevention-enforced facilities or NDRRMF shall be used for improving the said ports in order to improve the disaster resilient functions of social ports.

13. Contingency Planning and Organization

13.1. Logistics Plan for Disaster Response

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. The NDRP adopts the Cluster Approach espoused by the then National Disaster Coordinating Council in 2008.

13.2. Lead Cluster Agency for Logistics

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.

(1) Department of Transportation and Communication (DOTC)

(i) Confirmation of Train Service Suspension: DOTC together with MRT and LRT corporations shall confirm Train Service Suspension and report it to DRRMC-OpCens.
(ii) 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.
(iii) 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).

(2) Philippine Ports Authority (PPA)

Shall provide urgent port rehabilitation activities, when needed.

(3) Philippine Coast Guard (PCG)

(i) PCG shall contribute to emergency transportation by operating their vessels and aircraft based on needs and requests from DRRMC and affected Local Governments.
(ii) Shall support the urgent rehabilitation activities such as removing obstacles, transporting, relocating residents, and transporting basic commodities needed under emergency in coordination with DRRMCs.
(iii) Provide assets for clearing operation of sediments or any hazard to ensure safe navigation within coastal areas and passage ways.
(iv) Shall conduct search and retrieval operations if necessary- for SRR

13.3. Roles of Port Authority in the time of Disaster

DOTC does not have port-related organizations in the region. Emergency restoration for damaged port facilities should be 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.

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 13-1 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

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.

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.

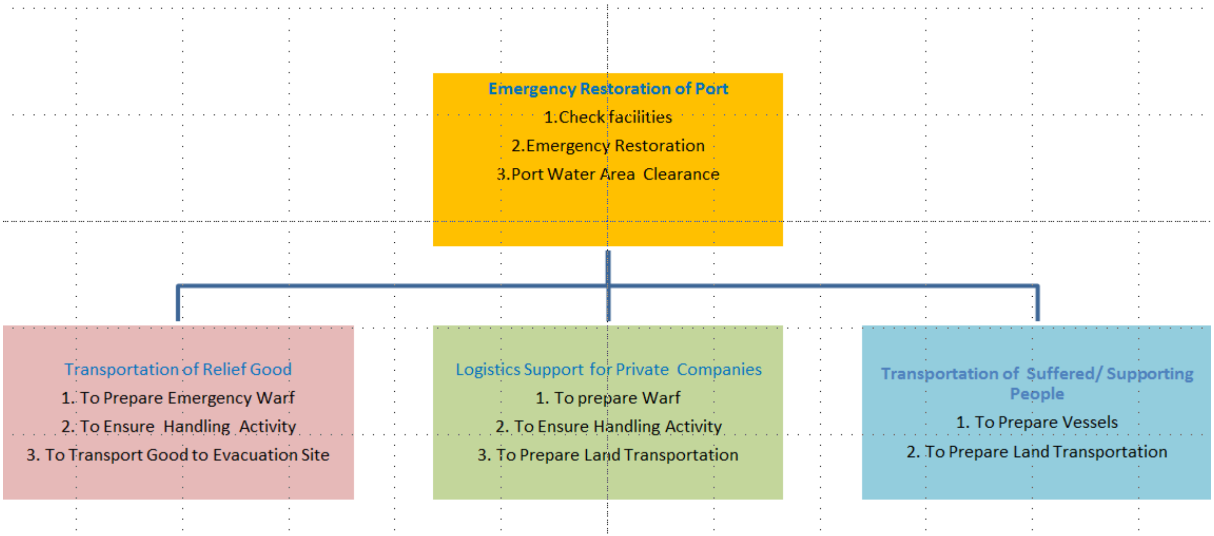
Compared to an ordinary port, the construction cost of a disaster resilient port is 10-20% higher. To ensure that functions are maintained in the time of a disaster, Port BCP should be mandatory for disaster resilient ports including social ports that have been reinforced. DOTC has no front offices in ports, DOTC and LGU should prepare BCP for disaster resilient social ports, and PPA 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 13-1 Items of BCP for Port

Ports that are not damaged seriously are required by private companies for logistics purpose. Port Authority should also develop a BCP for private companies.



Source: Study team

Figure 13-2 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.