2.5. Workshop

(1) Minutes of the Meeting

Minutes of Meeting on the Draft Final Report of Data Collection Survey on Disaster-resilient Feeder Ports and Logistics Network in the Republic of the Philippines

1. The study team for Data Collection Survey on Disaster-resilient Feeder Ports and Logistics Network in the Republic of the Philippines conducted by Japan International Cooperation Agency (hereinafter referred to as JICA) submitted the Draft Final Report of the survey to Department of Transportation and Communications (hereinafter referred to as DOTC) on November 9, 2015.

2. JICA study team explained the report at the following meetings:

   Meeting with DOTC and Philippine Ports Authority on November 10, 2015

   Workshop for Data Collection Survey on Disaster-resilient Feeder Ports and Logistics Network in the Republic of the Philippines on November 12, 2015

3. The participants of the both meetings acknowledged the contents of the presentations and accepted the Draft Final Report basically.

4. DOTC and the study team agreed that DOTC shall collect comments on the Draft Final Report from relevant agencies and convey them to us by December 4, 2015, and that the study team will prepare the Final Report reflecting the comments.

November 12, 2015

ENRICO C. FERRE	Tatsuyuki SHISHIDO
Chief Transportation Development Officer Water Transport Planning Division Department of Transportation & Communications	JICA study team leader, Data Collection Survey on Disaster-resilient Feeder Ports and Logistics Network in the Republic of the Philippines

(2) Attendance Sheet

Attendance Sheet

Venue: 16/F Unit166 Columbia Tower Ortigas Avenue, Mandaluyong City 1555 Philippines

Date: November 12, 2015

No.	Name	Organization/ Department	Position/ Title
1	ROLANDO T. RODOLFO	PPA	Acting Manager, SEMD
2	ALBERT T. TAYABAS	PPA	Envi. Specialist B
3	PATRICIO AMPARO	PPA	Principal Engineer
4	CHRISTOPHER YLAYA	PPA	Principal Engineer
5	SHIELA YECLA	DBM	BMS
6	ANDREW G. URSOLINO	DBM	SVBMS
7	PAUL IRENEO P. MONTANO	DILG	LGOO IV
8	RENE PACIENTE	DOST - PAG-ASA	AWSC
9	MAX PERALTA	DOST - PAG-ASA	AWSC
10	RACHELLE MARIE RABINO	DPWH	OJT-PPD/Planning Service (Engineering)
11	CHRISTINE J. TOLENTINO	DPWH	Econmist III
12	LIZA F. CAÑADA	OCD	Director
13	MYRABETH ALICIAS	OCD	CDO I
14	SANTIAGO O. TESTOR	DOTC	OIC, PMES
15	CORINA ISABEL C. ALCANTARA	DOTC- Office of the Undersecretary for Planning	Project Development Office

Attendance Sheet

Venue: 16/F Unit166 Columbia Tower Ortigas Avenue, Mandaluyong City 1555 Philippines

Date: November 12, 2015

No.	Name	Organization/ Department	Position/ Title
16	MILKY BABILONIA	DOTC- Office of the Undersecretary for Planning	Project Development Office
17	MARIEBEL DULAY	JICA Philippines	Program Officer
18	YOKO NISHIKI	JICA HQ	Country Officer
19	ENRICO FERRE	DOTC - WTPD	Chief
20	DENNIS M. ALBANO	DOTC - WTPD	Sr. TDO
21	ELENITA D. ASUNCION	DOTC - WTPD	Sr. TDO
22	BELINDA C. SALVOSA	DOTC - WTPD	Sr. CDO
23	HOMER DELA PAZ	DOTC - WTPD	Sr TDO
24	EMMA P. RIVERO	DOTC - WTPD	Sr. TDO
25	MANUEL LARDIZABAL	DOTC- WTPD	Sr. CDO
26	LOURDES PAGTALUNAN	DOTC- WTPD	Sr. CDO
27	MA. LOURDES T. PAGTALUNAN	DOTC - WTPD	Sr. CDO
28	FRANCISCO TAMPUS	DOTC - WTPD	
29	MYLA MEDINA	DOTC- WTPD	
30	MENCHIE BOGNALOS	DOTC- WTPD	

Attendance Sheet

Venue: 16/F Unit166 Columbia Tower Ortigas Avenue, Mandaluyong City 1555 Philippines

Date: November 12, 2015

No.	Name	Organization/ Department	Position/ Title
31	TATSUYUKI SHISHIDO	JICA Study Team	Team Leader
32	TAKASHI SHIMADA	JICA Study Team	
33	ISAO HINO	JICA Study Team	
34	KEN SAITO	JICA Study Team	
35	HIROKI KOHNO	JICA Study Team	
36	SUZANNE TORRES	JICA Study Team - Support Staff	
37	ERNESTO CRUZ	Science & Techonology Inc. JICA Study Team-Support Staff	
38			
40			
41			
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43			
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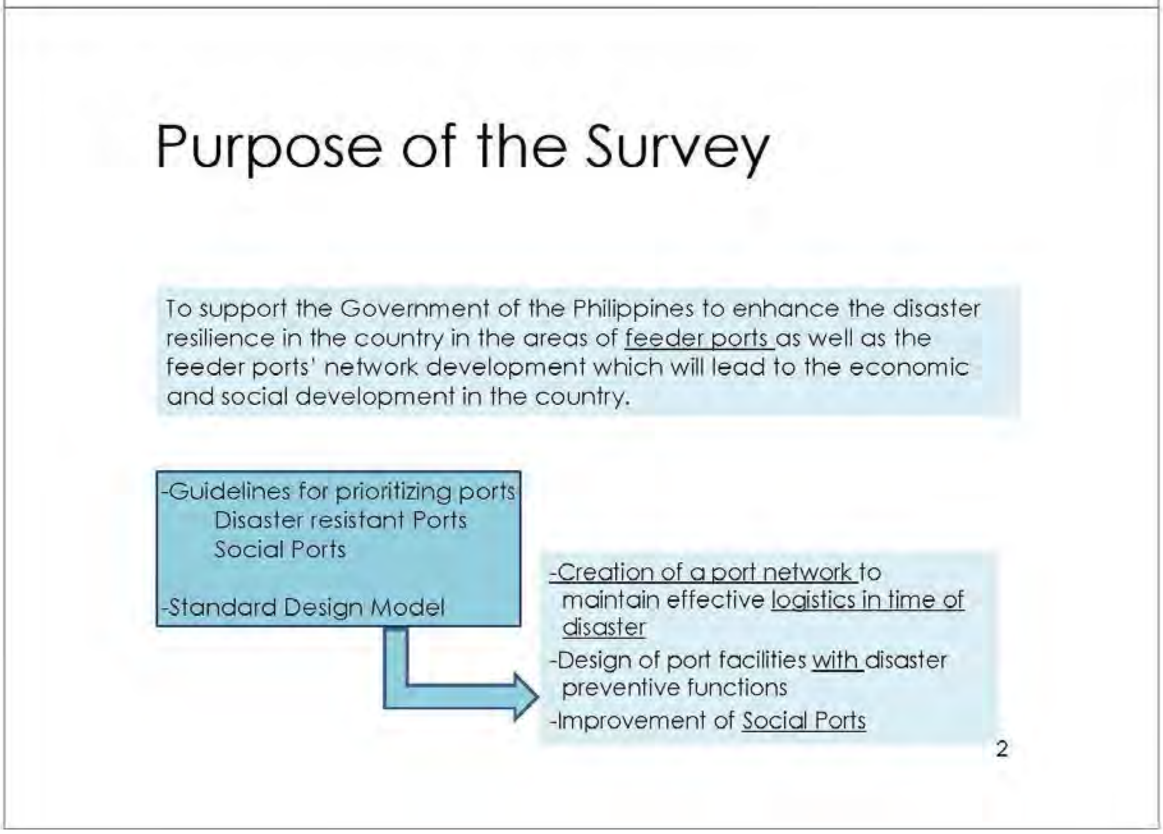
45			

(3) Presentation Materials

1) Outline of the Survey



Target Area/Site Survey

Leyte Province (Visited ports)
Tacloban, Ormoc, Izabel, Palompon, Hilongos, Baybay, Babatngon (Proposed site), Bato, Hindang (Development site)
Bohol Province (Visited ports)
Tagbilaran, Ubay, Tapal, Loay, Getafe, Clarin, Tubigon, Popoo , Dimiao , Guindulman, Loon
Iloilo Province (Visit port)
Iloilo, Estancia, Dumangas, Estancia (Fishing port), Culasi, Banate, Guimbal, Miagao

Visited Office
PMO/TMO of PPA, City or Municipality Offices etc.

3

Seminar/Meeting/Report

Meeting for Presentation of ICR (relevant agencies)
Aug. 5
Seminar (DOTC, PPA, LGU)
1st Seminar: August 17 -Japanese experience on disaster management of the port sector etc.
2nd Seminar: September 29 -Technical matters on findings at a midterm stage
Consultation meeting (relevant agencies)
Midterm Reporting: September 30 -Findings at a midterm stage
Workshop: November 12 -Explanation and Discussion on DFR
Report
DFR: November 12, 2015 -Explanation at Workshop
Comments by December 4
FR : January 2016 -Sent by JICA

4

Contents of DFR

5

Contents of DFR (Continued)

1. Objective and Background of the Project	
2. Implementation of the Study	2.1. Scope of the Study 2.2. Procedure of the Study and Relevant Agencies
3. Philippine Disaster Risk Reduction and Management	3.1. Hazard Exposure and Disaster Impacts in the Philippines8 3.2. Policy and System for Disaster Risk Reduction in the Philippines 3.3. Japan and JICA's assistance policy and achievements for the disaster prevention sector of the Philippines 3.4. Assistance of other donners
4. Ports in the Philippines	4.1. Transportation infrastructures 4.2. Current situation and issues on ports 4.3. Assistance from Japan and other countries related to ports in the Philippines
5. Port disaster in the Philippines	Port disaster
6. Japanese disaster prevention at ports and harbors	6.1. Political policy and countermeasures for disaster prevention at ports and harbors in Japan 6.2. Japan's technology and design standard related to the disaster resilient port

6

Contents of DFR (Continued)

7. Outline of Targeted Areas	7.1. Outlines and Infrastructures on Logistics in the Targeted Areas 7.2. Logistic Infrastructures in the Target Area
8. Assumption of Disaster	
9. Guidelines for Selection of Disaster Resilient Ports	9.1. Disaster Resilient Port 9.2. Ports in the Target Area 9.3. Criteria for Selection 9.4. Guidelines 9.5. Calculation of Level of Importance as Disaster Resilient Ports 9.6. Consideration in Appling Guidelines to Nationwide
10. Improvement of Social Services Access for People in Isolated Areas	10.1. Social Services Access for People in Isolated Areas 10.2. Current State and Issues of Social Port Development 10.3. Basic Concept of Social Port Development 10.4. Criteria for Screening Social Port 10.5. Screening Criteria and Guidelines

7

Contents of DFR

11. Standard Design Model for Disaster-resilient Port	11.1. Evaluation of Present Ports and Their Related Facilities in Target Areas 11.2. Standard Design Model for Disaster-resilient Ports 11.3. Rough Cost Estimate
12. Fund for Improvement of Disaster Resilient Ports	12.1. Budgetary System of the Government of the Philippines 12.2. Budget for Port Development 12.3. Funds for Disaster Risk Reduction and Management 12.4. Restoration of Damages by Disaster and Enhancement of Disaster Resilience of Port in Japan and Other countries 12.5. Consideration on Funds for Disaster Risk Reduction and Management
13. Contingency Planning and Organization	13.1. Logistics Plan for Disaster Response 13.2. Lead Cluster Agency for Logistics 13.3. Roles of Port Authority in the time of Disaster
Summary/Suggestion	

8

2) Application of Japanese Disaster Prevention Measures to the Philippines

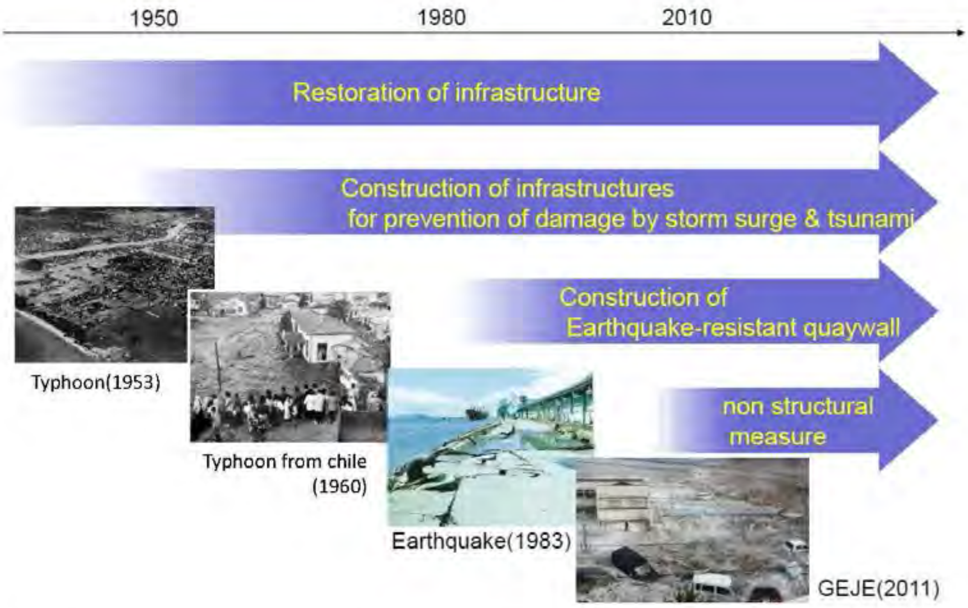
Data Collection Survey on Disaster-resilient Feeder Ports and Logistics Network in the Republic of Philippines

Application of Japanese disaster prevention measures to the Philippines

12 Nov. 2015
JICA Study Team

1

Lessons learned from the past disasters in Japan



Source: Ministry of Land Infrastructure and Tourism and Transport (MLIT)

2

Documents and Guidelines for ports in Japan

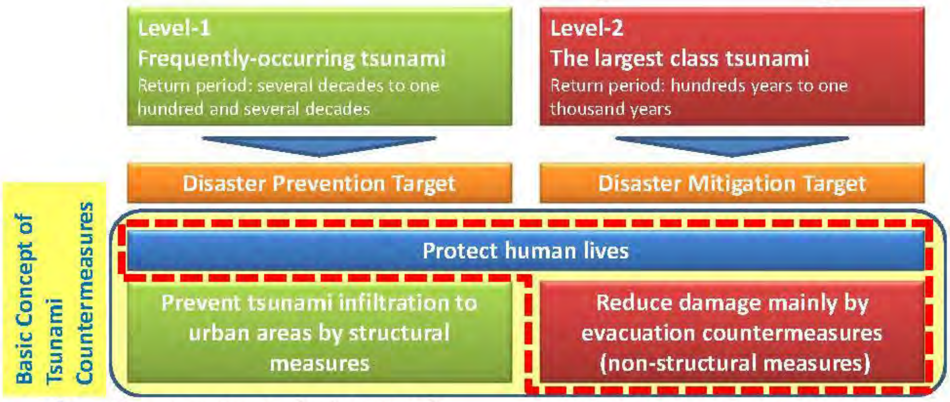
Disasters that Triggered Port and Harbor Policy		Disaster Management Guideline for Port and Harbor (MLIT)	Keywords Structural, Non-structural measures
1995	Great Hanshin-Awaji Earthquake (17 Jan.)	Basic Guideline for the Countermeasure Facilities against Large-Scale Earthquakes (Dec. 1996)	✓ Earthquake-resistant Quay Walls ✓ Open Space
2004	Indian Ocean Earthquake and Tsunami (26 Dec.)	Guideline for Ports Having High Resistance against Earthquakes (Mar. 2005)	✓ Storage Facilities for Emergency Relief Goods ✓ Emergency Transportation Roads ✓ Hazard Map ✓ Information Devices for Tsunami
2011	Great East Japan Earthquake (11 Mar.)	Guidelines for Countermeasures Against Earthquake and Tsunami Disasters (June 2012)	✓ Tenacious Structure ✓ High Earthquake-resistant Quay Walls ✓ Disaster-Tolerant Shipping Network
		Guideline for Business Continuity Plan (BCP) (Mar. 2014)	✓ Business Continuity Plan (BCP) ✓ Business Continuity Management (BCM)

Source: Study Team

3

(1) Countermeasures against earthquake and tsunami

Clarification of Disaster Prevention Level against Tsunami in Japan



Countermeasures against tsunami

- Breakwaters (Protective Facilities) are uncommon in the Philippines

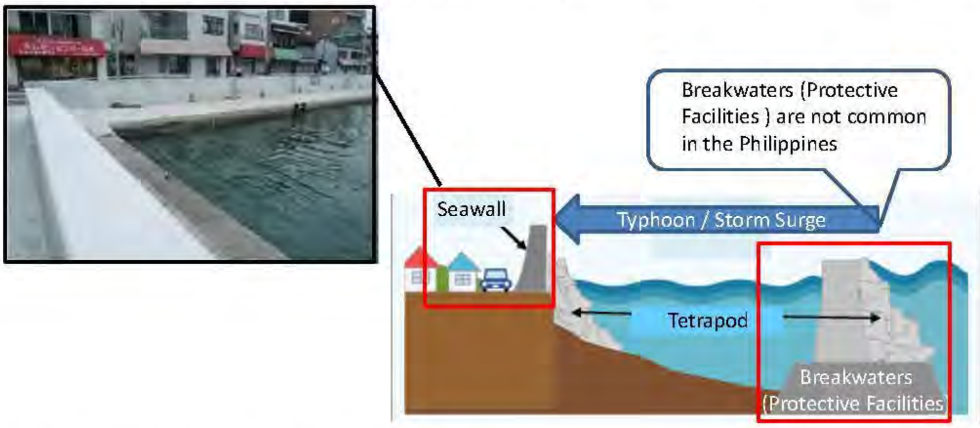
Countermeasures against earthquake

- High earthquake-resistant quay walls are considered inapplicable without protective facilities

Non-structural measures are more applicable against earthquake and tsunami

4

(2) Countermeasures against typhoon and storm surge



Countermeasures against typhoon

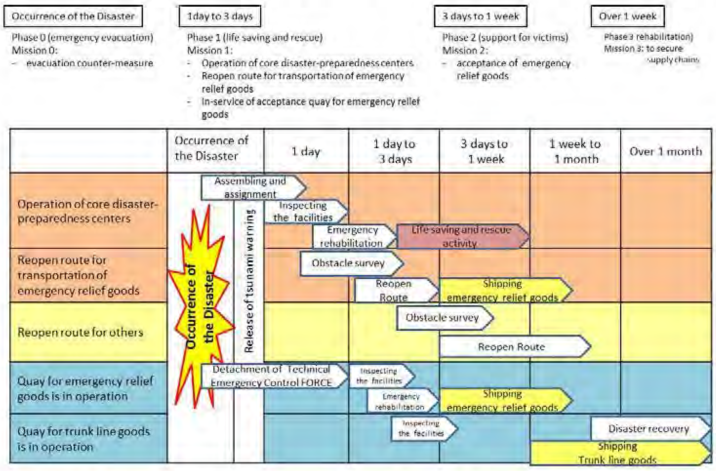
- Breakwaters (Protective Facilities) are uncommon in the Philippines

Countermeasures against storm surge

- Seawall is considered applicable to protect people living in coastal areas

5

(3) Port Business Continuity Plan (Port BCP)



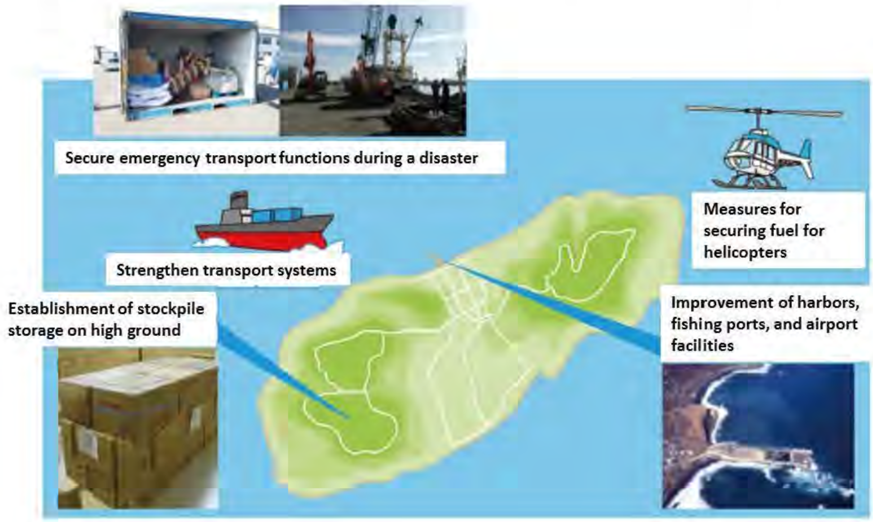
Port BCP is considered applicable for many kind of natural disasters, various critical events and unexpected changes to the operating environment

⇒ **A clear mission and expectations of stakeholders create a sense of ownership**

Source: Study Team (Created based upon data from MLIT)

6

(4) Establishing a stockpile of emergency relief goods and securing a transport system in a port area



Source: Tokyo metropolitan government

7

Recommendations

- To study past disasters and take necessary measures to mitigate future disasters
- To plan comprehensive disaster prevention by applying structural measures or non-structural measures
- To move forward under a phased approach with a combination of structural and non-structural measures

8

3) Guidelines for Selecting Disaster Resilient Ports

Department of Transportation and Communications (DOTC)

Japan International Cooperation Agency (JICA)

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

Guidelines for Selecting Disaster Resilient Ports

1. Procedures of Developing Disaster Resilient Ports
2. A disaster Resilient Port
3. Selection Criteria
4. Method of Calculation
5. Disaster Management at Disaster Resilient Ports
6. Application to Other Area

Draft Final Report
Nov. 2015

The Overseas Coastal Area Development Institute of Japan (OCDI)
Oriental Consultants Global (ORG)

1

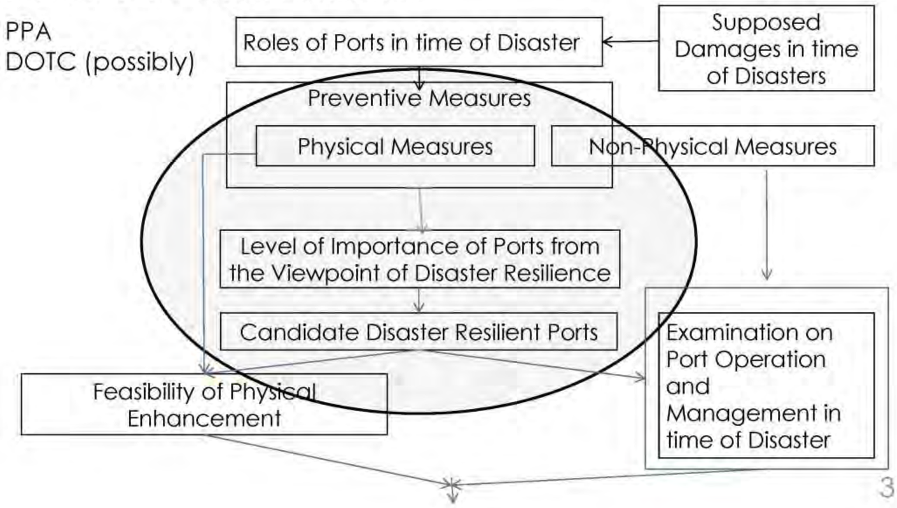
Guidelines

- Procedure for Development of Disaster Resilient Ports
- Estimation of Events caused by Hazard and Identification of Role of Ports
- Evaluation of Level of Importance
- Cooperation and Coordination among Stakeholders

2

Procedure for Development of Disaster Resilient Ports (continued)

In selecting disaster resilient ports, the overall procedures shown below shall be taken in to consideration.



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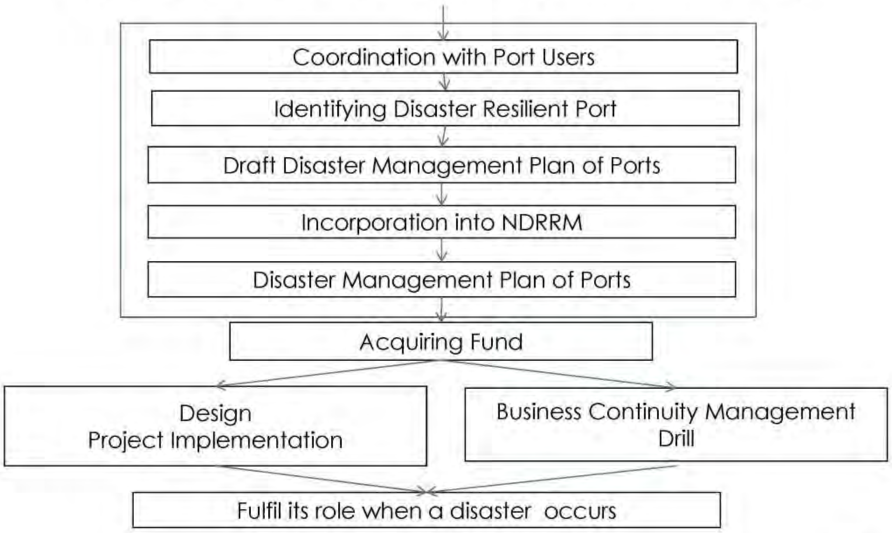
Procedure for Development of Disaster Resilient Ports (continued)



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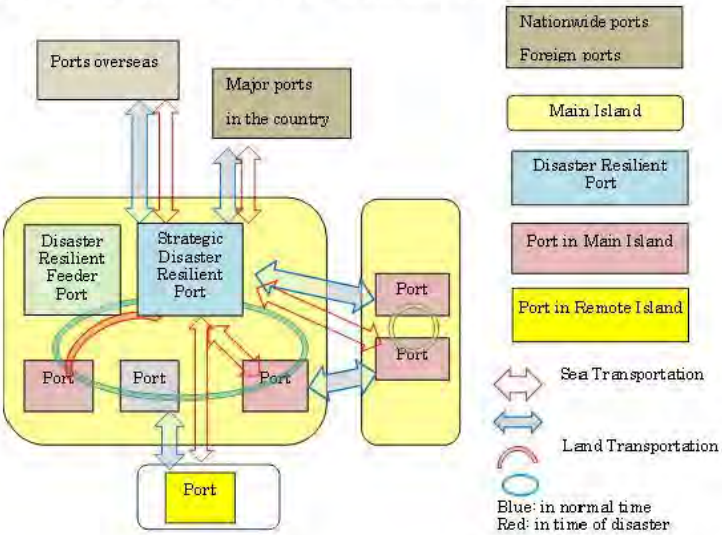
Disaster Resilient Port

A port which can:
- maintain minimum port function;
- contribute to form logistics networks; and
- support disaster management activities

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

5

Concept of Logistics Network and Disaster Resilient Port



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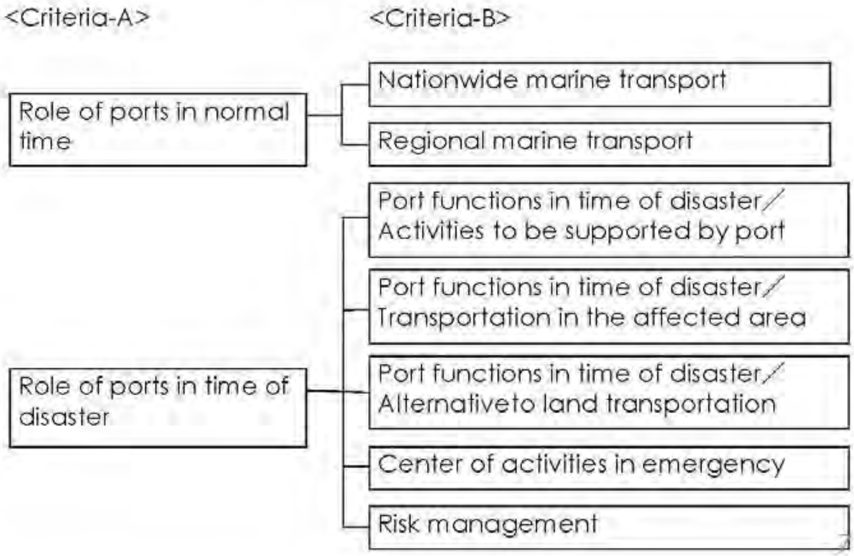
Selection Criteria



Formula of Calculation

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

- 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-A items for Normal Time
- J_i :Number of indicators items for Criteria-B (i)
- K :Number of Criteria-A items for Time of Disaster
- L_k :Number of indicators items for Criteria-B (k)

8

Indicators for Criteria Items

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

9

Weight Allocation

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

10

Disaster Resilient Ports

Iloilo Province

Port	Iloilo	Dumangas	Estancia	Guimbal
Score	8	4	5	3

Bohol Province

Port	Tagbilaran	Tubigon	Jagna	Ubay	Talibon	Tapal	Getafe	Loay
Score	6	5	5	5	4	5	3	3

Leyte Province

Port	Tacloban	Ormoc	Palompon	Hilongos	Baybay	San Isidro	Isabel	Bato*)
Score	7	6	5	5	5	4	3	3

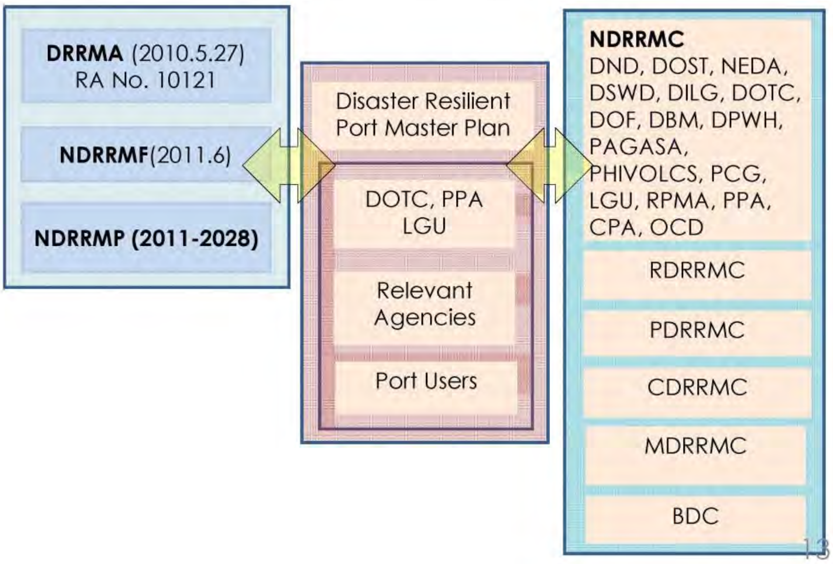
11

Measures to be taken at a Disaster Resilient Port

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

12

Framework on DRRM of the Government and the Port sector



13

A prepared guidelines

Basic descriptions are applicable to other areas:
- Role of disaster resilient port
- Procedures of the development of the port
- Criteria
- Viewpoints of selection of the ports
- Developing a disaster resilient port

The prepared guidelines:
- Based on the basic directions set up for the ports in Iloilo, Bohol and Leyte Provinces
- Including the locality of socio-economic conditions and characteristics and role of ports

14

Points to Attentions in Application of Guidelines to Other Areas

Basic directions of development of disaster resilient ports in the applied areas

considering

Location of ports Socio-economic conditions

Characteristics and role of ports

Allocating of weights for criteria items

Ranking data values for indicators

considering

Socio-economic conditions of the target area

Characteristics and role of the ports in the area

Quality of data to be used

15

4) Guidelines for Prioritizing Social Ports

Screening Flow and Criteria for Guideline on Social Ports Development

Nov. 12th, 2015
JICA Study Team for
Disaster –Resilient Feeder Ports
& Logistics Network

1

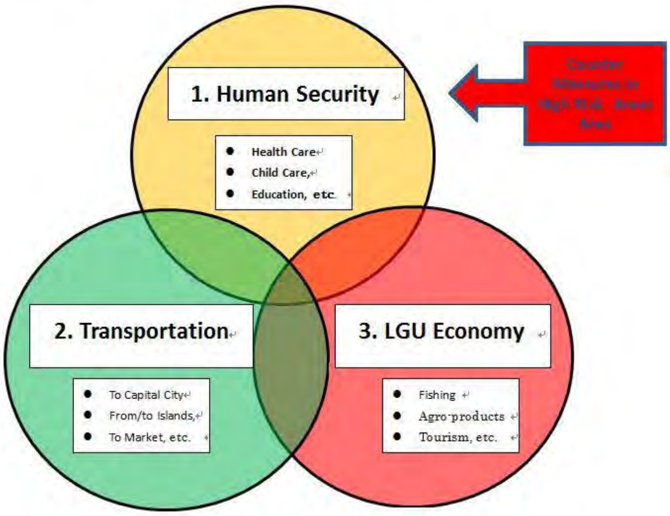
Table of Contents

1. Basic Concept of Social Ports
2. Screening Flow and Criteria for Guideline
3. Important Points for social port development and management
4. Application to Nationwide

2

1-1 Basic Concept of Social Ports

to support daily life and community



3

1-2 Screening Criteria based on Basic Concept of Social Ports

1. Human Security

a. Municipality Income Grade
b. Poverty Incidence
c. Distance from Province Capital

2. Transportation

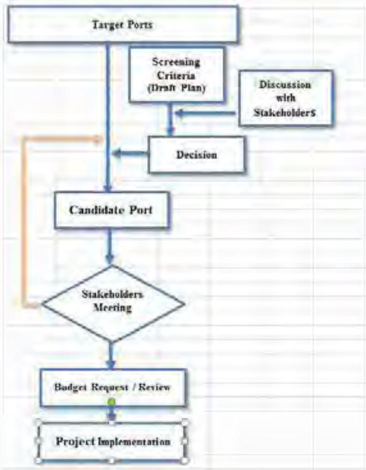
a. Connection to Island or Isolated Area
b. Distance from Neighboring Ports
c. Distance from National Highway

3. LGU Economy

a. Population of Municipality
b. Port Scale (Appropriate Site and Depth)

4

2-1 Screening Flow and Criteria for the Guideline



Preliminary Screening

- ✓ Discussion between Municipality and DOTC

Secondary Screening

Absolute Requirement

In high disaster risk areas, it is necessary to include preventive structural countermeasures

- ✓ DOTC Official Meeting
- ✓ Other Opinions from Relevant Authorities
- ✓ Provincial Development Committee

5

2-2 5 Criteria for Preliminary Screening

1. Municipalities with no port or only 1 port are given priority (but not over isolated islands).
2. Municipalities in which income class is 1st grade should be excluded.
3. Priority should be given to municipalities which have received no Investment by DOTC and PPA in the last 3 years excluding phased projects.
4. Priority is given to areas which have received no ODA investment in the past.
5. Municipalities in which poverty incidence exceeds 30% are given priority.

6

2-3
6 Secondary Criteria for Prioritizing Candidate Ports

1. Beneficiary Population (more than 25,000)
2. Distance to Neighboring Port (more than 10km)
3. Distance to NHW (more than 10 km)
4. Purpose of Investment (e.g., Connection to/ from Isolated Island)
5. Distance to Provincial Capital (more than 50km)
6. Port Scale (Appropriate site, more than 4m below MSL)

7

2-4
4 Absolute Requirements

1. Project site is not in a preserved/protected area (DENR definition) to ensure minimal impact to marine environment.
2. LGU has the right of way and land ownership of the project site
3. LGU will allocate a budget to operate and maintain the port
4. Community organization has been established for the port operation and maintenance (e.g. port manager, safety port fee, etc.).

8

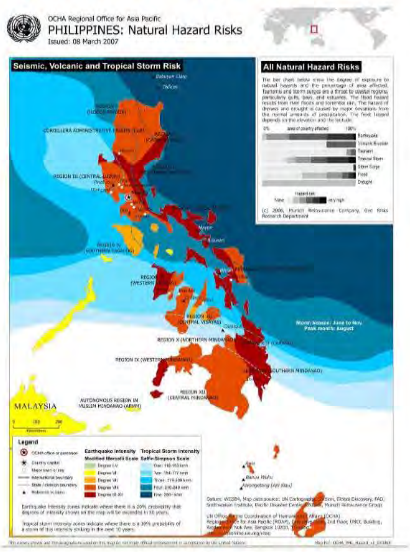
2- 5 Structural Countermeasures against Natural Disaster

- **Earthquake**
- Area that is in more than XI grade (dark red area) of Mercalli intensity
- Social Ports that have regular passenger or ferry services.

- **Typhoon**
- Area that wind speed might be more than 210km/h in Symptom Scale (blue and navy area)
- Social Ports that have regular passenger or ferry services.

9

2-6 Structural Countermeasures against Typhoons



10

3. Important Points for Social Port Development and Management

1. In principal, one social port is developed in one municipality. Careful analysis needs to be conducted if more than one port is to be developed.
2. High urbanized cities develop social ports by themselves.
3. Low income municipalities and high poverty areas are prioritized.
4. Ports connecting to islands are prioritized.
5. Social ports which have received investment from the Gov. and PPA in the past should be excluded, if they are not phased plan.
6. Port facility register book should be justified by PMB and facility owner .
7. The capability of LGU engineers should be upgraded for effective port development, maintenance and management.
8. Countermeasures should be considered for ports that have regular passenger and ferry services, in high disaster risk areas.
9. BCP is mandatory for disaster resilient social ports in high disaster risk areas.
10. The proposed guideline and criteria should be authorized by DOTC.

11

4. Application of the Guideline on Social Ports Nationwide

To apply this proposed guideline and criteria to social ports in nationwide, points below should be noted.

1. This method can be easily applied to social ports nationwide.
2. Criteria items do not need to be changed.
3. Criteria's upper limits should be reviewed region by region.

12

5) Standard Design Model

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

Results of Field Survey and Standard Design Model of Disaster Resilient Ports

1. Results of Site Survey
2. Design Conditions
3. Standard Design Model
4. Rough Cost Estimate

12 November 2015
JICA Survey Team

1

1-1 Summary of the Investigation of Port Facilities in Leyte Area

Port Facilities	Unit	TACLOBAN	PALOMPON	ISABEL	ORMOC	BAYBAY	HILONGOS	BATO	BABATUGON
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							
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	Roof, ceiling damage						
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			Roof, ceiling damage	Roof, ceiling damage		
Admin Bldg, etc	m^2	686 x 3 stories	166	104	281	58	58	None	None
Degree of damage		Totally Dameged	Roof, ceiling damage		PMO and othe bldg damaged				
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

2

1-1-1 Major Condition of the Structure 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.

1-2 Summary of the Investigation of Port Facilities in Bohol Area

Port Facilities	Unit	TAGBILARAN	UBAY	TUBIGON	CATAGBACAN	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		Pier blocks move 5cm	Totally damaged Pier removed				Stair landing damaged	
RORO Facilities	Unit	2	3	2	2	2	1	None	None	2
Degree of damage				Settlement by 30 cm	Totally damaged Ramp settled	Settlement by 30 cm				
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		Pavement & access road crack 20 to 30cm	Pavement crack 30 to 40cm					
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	Gate house settled					
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

1-2-1 Major Condition of the Structure and Damages in Bohol Area

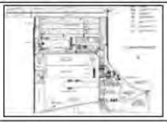
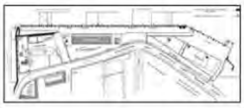
	Tagbilaran			Tubigon		Catagbacan (Loon)	Getafe
Damaged Conditions by Typhoon Yolanda	 PPA	 PPA	 PPA Survey Team	 PPA	 PPA	 PPA	
	(Top) Broken landside concrete piles of the Berths (IBRD funded) (Down) Broken Pile cap concrete for steel pipe pile (PPA funded)	Settlement and cracks of yards (40cm elevation gap)	Cracks on floor and structures of Administration and PTB abandoned.	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.

1-3 Summary of the Investigation of Port Facilities in Iloilo Area

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

Note: Blue: Medium damage, Green: Minor damage

1-3-1 Major Condition of the Structure and Damages in Iloilo Area

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

1-4 Summary of Bohol and Yolanda Disaster Rehabilitation Project for DOTC

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

1-5 Summary of Existing Structural Type of Berthing Facilities for Leyte, Bohol and Iloilo

	Pier				Sheet Pile Queywalls		Causeway
	Finger Pier	Open-type Wharves			Concrete Sheet Piles	Steel Sheet Piles	
		Concrete Piles	Steel Pipe Piles				
			Vertical & Raking Piles	Vertical Piles			
Type of Structure	Most piers in Philippines are supported by concrete piles.	Coupled raking piles are adopted for open-type wharves on concrete piles to resist the horizontal forces.	In case of deep water wharves and quay cranes on the deck, coupled raking piles may be required due to the large horizontal forces. In this study, the container wharf in Iloilo Port is the one for disaster resilient.	Vertical steel pipe piles are selected to resist the horizontal forces by vertical piles only. They have the feature of easier construction procedure than raked piles.	Concrete sheet piles are selected for the most cases of shallow water wharves in Philippines due to less anticorrosion treatment required. Anchor wall is selected for the most of anchor type.	In case of more than 10 m water depth, steel sheet piles and/or steel pipe piles are used instead of concrete sheet piles. Most of the anchors are steel pipe piles (vertical piles or coupled raking piles).	Small-scale wharf for shallow draft vessels
LEYTE (Total 9 ports)	Tacloban(15°), Ormoc(15°), Isabel(5°), Palompon(7°), Hirongos(N/C), Baybay(15°), Bato(0°, ramp 10°)	Tacloban, Palompon, Ormoc				Tacloban (Steel Pipe Sheet Pile)	Babatngon, Hindan (Suspension of causeway)
BOHOL (Total 10 ports)	Tagbilaran Passenger berths(10°), Catagbacan(15°), Ubay(15°), Tubigon(N/C), Talibon(N/C), Getafe (N/C)	Tagbilaran	Tagbilaran			RoRo ramp in Tagbilaran	Popoo, Guindulman (Existing), Dimiao, Carlin
ILOILO (Total 7 ports)	Dumangas(N/C), PPA Estancia(10°), Guimbal(N/C), Ajuy(5° to10°), DOTC Estancia N/C: Not Clear	Iloilo FSP (Fort San Pedro Terminal), Iloilo IRW (Iloilo River Wharf)	Iloilo ICPC (Iloilo Commercial Port Complex)	Iloilo ICPC (Iloilo Commercial Port Complex)	Old Iloilo FSP (Fort San Pedro Terminal), but now steel sheet pile in front	Iloilo FSP (Fort San Pedro Terminal)	DOTC Estancia, Banate,
Percentage	84%	18%	7%	4%	-	7%	-

1-6 Summary of Type and Area of Main Buildings for Disaster Resilient Six Ports

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

1-7-1 Evaluation of Existing Berthing Facilities for Survey Ports

	Description
A	Minor damage, 80 to 100% operational
B	Midium damage, 60 to 80% operational
C	Big damage, 40 to 60% operational
D	Not operational, less than 40% operational

	Tacloban	Palompon	Isabel	Ormoc	Baybay	Hilongos	Bato
Type	Pier	Open type wharf	Pier	Pier	Pier	Pier	Pier
Piles	PSC (40cm x 40cm)	RC (40cm x 40cm)	RC (40cm x 40cm)	RC (40cm x 40cm)	RC (40cm x 40cm), RC(45cm x 45cm)	RC	RC
Pile Angle	0 & 15	0 & 7	0 & 5	0 & 15	0 & 15	0 & ?	0 & ?
Slab & Beam	Slab: Precast type Beam (W50xH40cm) No damage	Partialy under repairing slab concrete	No damage	Beam (W40xH30cm) Partialy damaged Under repairing	Slab bottom is partialy damaged.	No damage	No damage
Retaining Wall	Conc, Sheet Piles	Conc, Sheet Piles	Concrete Walls	-	-	Concrete Walls	Concrete Walls
Condition	A	A	A	B	B	A	A
	No damage	No damage	Partialy damaged piles	Damaged slab	Damaged slab	No damage	No damage

	Tagbilaran	Ubay	Tubigon	Catabacan (Loon)	Getafe	Tapal
Type of Berth	Open type wharf	Pier	Pier	Pier	Pier	Pier
Piles	SPP φ60cm, RC40cm	RC (40cm x 40cm)	RC (40cm x 40cm)	PSC (45cm x 45cm)	RC (40cm x 40cm)	RC (40cm x 40cm)
Pile Angle	0 & 10	0 & 15	-	0 & 15	-	-
Slab & Beam	Pile caps are partially damaged.	Slab concrete is partially damaged due to hit by ship	Damaged by earthquakes	Most of the facilities are damaged by earthquakes		
Retaining Wall	Under constructing concrete walls due to damaged by earthquake	Conc. Sheet piles	Damaged by earthquakes	Causeway Under repair due to earthquake	Concrete Walls	
Other Facility	Pavement crack, building collapsed	-	ccess road crack	Gate house damaged	-	-
Soundness	B	B	B	D	B	A
	Seriously damaged	Partially damaged	Raking piles damaged	Seriously damaged	few piles broke	No damage

1-7-2 Evaluation of Existing Berthing Facilities for Survey Ports

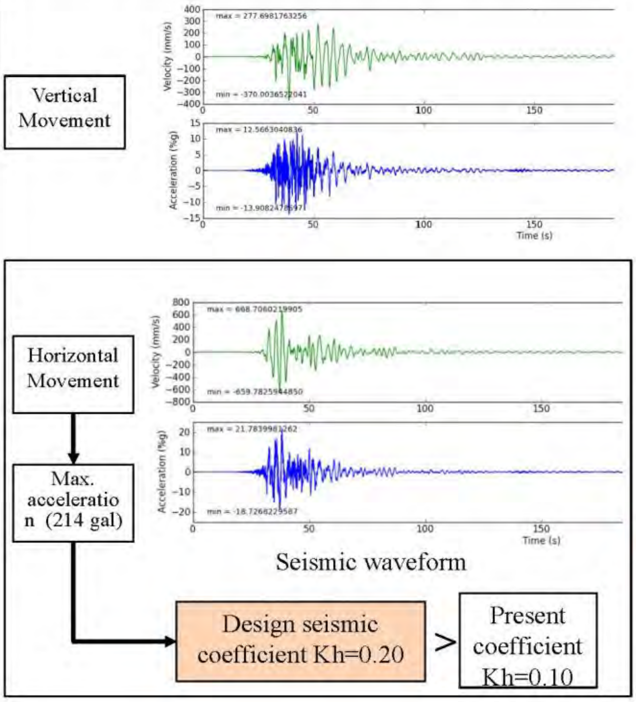
	Description
A	Minor damage, 80 to 100% operational
B	Midium damage, 60 to 80% operational
C	Big damage, 40 to 60% operational
D	Not operational, less than 40% operational

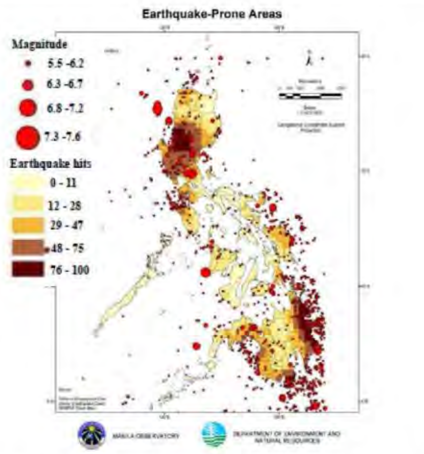
	Iloilo (Container)	Iloilo (Gen Cargo)	Iloilo (River Wharf)	Dumangas	Estancia (PPA)	Ajuy Culasi
Type	Open type wharf	Open type wharf	Open type wharf	Pier	Pier	Pier
Piles	SPP φ1020mm (IBRD) SPP φ500mm (PPA) RC (50cm x 50cm) (PPA)	RC (40cm x 40cm)	RC 40cm 45cm, PSC 40cm	RC (40cm x 40cm	RC (40cm x 40cm)	RC (40cm x 40cm)
Pile Angle	0 & 15 & 20	0 & ?			0 & 10	0 & 10
Slab & Beam	Crane rails on slab				Pile caps damaged by Yolanda are repaired.	No damage
Retaining Wall						L-shaped Conc. Walls
Condition	A	A	A	A	A	A
	No damage	No damage	No damage	No damage	No damage (Repaired)	No damage

2-1 Considerable Damages by Natural Phenomena for Disaster Resilient Ports

Natural Phenomena	External Force	Type of facility and damage	Design condition	Target facilities
Typhoon	Wind	Damage of port building (Roof, window, door)	wind speed 240kph of Yolanda	Buildings
	High wave	Damage of berthing facilities, revetment, causeway (movement, settlement, erosion, etc.)	No damage except minor damage in Estancia port	Estancia pier only
	Storm Surge	Damage of port building (flood, window, door, equipment)	Storm surge height (m) by OCD estimation for all provinces	Buildings
Earthquake	Seismic movement	Berthing facility and building (movement, settlement)	Ground acceleration and design seismic coefficient Kh=0.20	Berthing facility and Buildings
	Liquefaction	Ground settlement	No soil condition available	Backup area and Buildings
	Tsunami Inundation	Same as storm surge	Tsunami height (m) by OCD estimation for all provinces	Berthing facility and Buildings
	Tsunami Wave pressure	Damage of breakwater		

2-2 Design Condition of Earthquake (Bohol)





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

Big 10 Earthquake in the Philippine

2-3 Design Condition of Typhoon (Yolanda)

Track of Yolanda November 2013

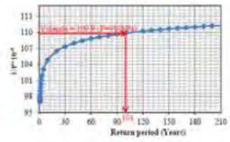
Wind speed of Yolanda (source PAGASA)

Based on the barograph, the lowest station pressure observed in Guiuan Station before the instrument was damaged by TY Yolanda was 910 hPa at 5:00AM, 08 November 2013. At this pressure, the equivalent **maximum sustained wind is 240kph**

Design wind speed 240kph > Present wind speed 200kph

ESTIMATED RETURN PRIOD BY PRESSURE

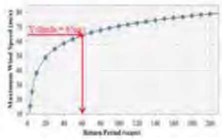
Year	Pressure (hPa)	Year	Pressure (hPa)	Year	Pressure (hPa)	Year	Pressure (hPa)	Year	Pressure (hPa)
1951	950	1966	974	1978	985	1990	945	2003	1000
1952	974	1967	988	1979	985	1991	1000	2004	1006
1954	980	1968	975	1980	1004	1993	975	2005	990
1957	1000	1969	955	1981	1004	1994	960	2006	975
1959	1006	1970	990	1982	940	1995	985	2007	1004
1962	990	1971	985	1984	940	1996	998	2008	1006
1963	1008	1972	975	1986	980	1999	1004	2011	1004
1964	920	1974	1000	1988	955	2000	998	2012	996
1965	1004	1977	998	1989	992	2001	996	2013	910



Return Period based on Pressure is 101 years

ESTIMATED RETURN PRIOD BY WIND SPEED

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



Return Period based on Wind Speed is 60 years

2-4 Estimated Storm Surge and Tsunami Height (m) based on the Historical Record (Source OCD Ready Project)

Bohol Area Storm Surge

Bohol Area Tsunami

Leyte Area Storm Surge

Leyte Area Tsunami

Iloilo Area Storm Surge

Iloilo Area Inundation

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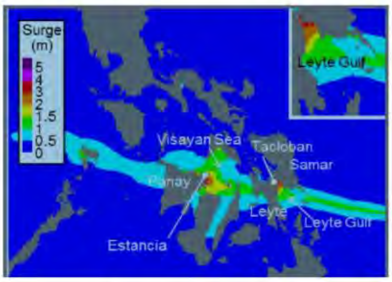
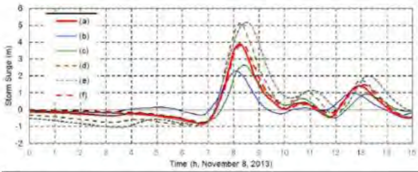
2-4-1 Survey Results of Estancia and Tacloban of Storm Surge of Yolanda

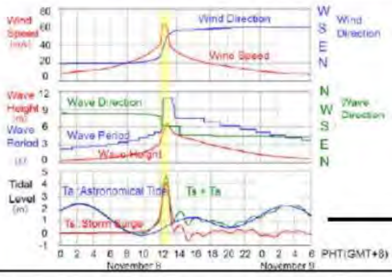


Height of Storm Surge by Yolanda



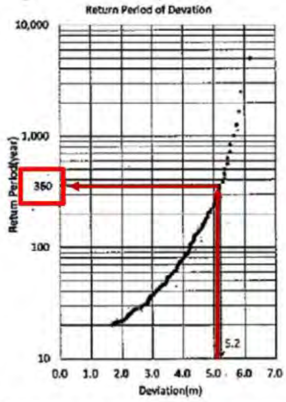
Simulation of Storm Surge at Tacloban

	Storm Surge by Yolanda	Design Storm Surge by OCD
Tacloban	4.00	3.42 (at Bgy. San Roque, Tanauan)
Estancia	4.00	3.86



Simulation with site survey data of wind speed, wave and Storm Surge at Estancia

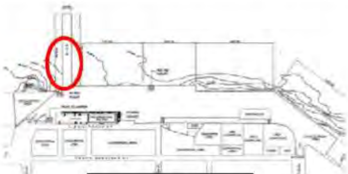
National Institute for land and infrastructure Management Japan



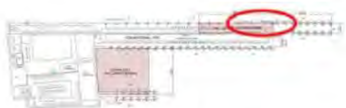
Estimated Return Period of Storm Surge by Yolanda

Professor, Eric C. Cruz D. Eng UP

3 Location of Disaster Resilient Port Facilities in Selected Six Ports



Tacloban



Ormoc

Tagbilaran

Tapal

Iloilo

:Location of Standard Design Model

Estancia

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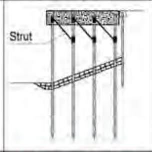
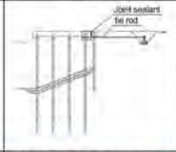
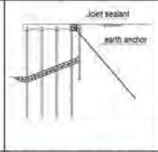
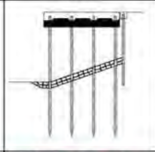
3-1-1 (1) Typical Sections of Standard Design Model of Pier for Earthquake

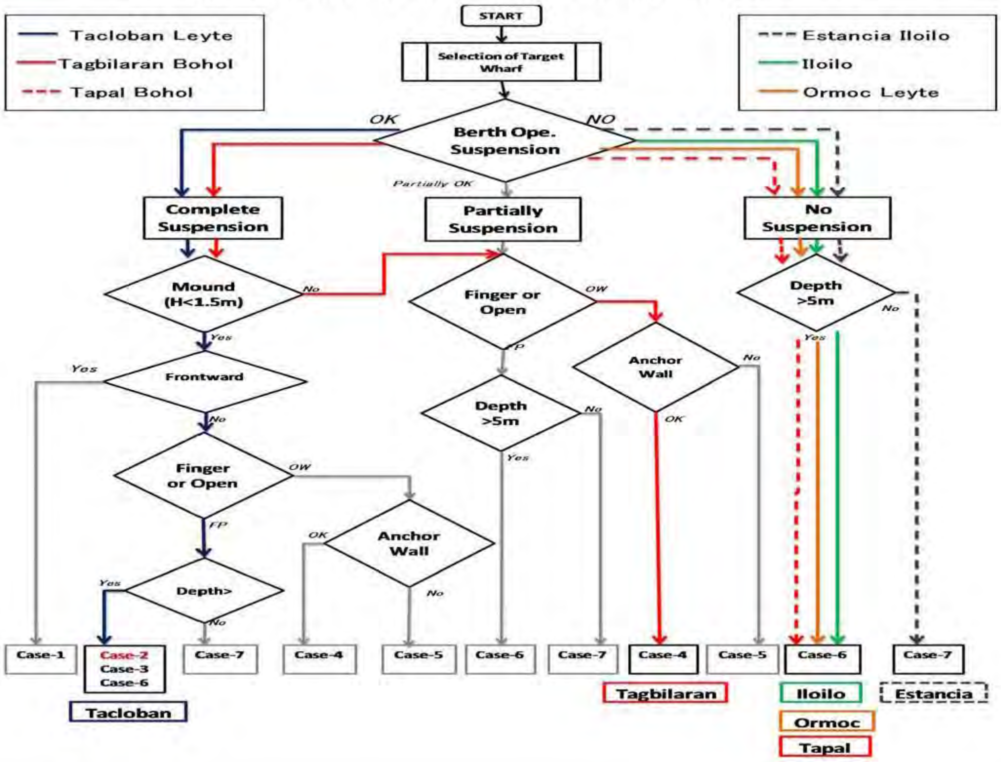
	Case-1	Case-2	Case-3	Case-4	Case-5	Case-6	Case-7
Method	Installation of Coupled Raking Piles in front of Berth line	Removal of Deck and Installation of Coupled Raking Piles	Removal of Deck and Installation of Submerged Struts	Installation of Tie Rod, Anchor Wall and Sealant	Installation of Ground Anchor 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.	·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	·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 to connect tie rod.	·Additional ground anchors resist against the seaward horizontal seismic forces. ·Retaining wall resists the landward horizontal seismic forces. ·Land side deck concrete is removed partially and ground anchors are installed.	·Additional submerged beams reinforce pile structure to resist against the horizontal seismic forces. ·Submerged steel beams are installed to the existing piles. ·Grouting mortar is injected between steel beam and pile.	·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
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 advisable for small size of berth.	·Berth utilization is totally stopped due to demolition and reconstruction of all concrete deck. ·Due to big equipment for construction, it is not advisable for small size of ber.	·Firm retaining wall structure is necessary behind the pier. ·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. ·The space for construction area of ground anchor is necessary. ·Berth utilization is partially possible due to the small construction area.	·Berth utilization during construction is possible due to no work on land. ·Special equipment/tool such as floater, Special experience ·It is applicable for large scale structure due to flexibility.	·Berth utilization during construction is possible due to no construction work on land. ·No special experience is necessary. ·It is applicable for small scale structure.
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 of 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 ·The dimensions of struts are adjusted by pile locations. ·Special engineering know-hows are required for installation of struts. ·Longesst construction period	· 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. ·Joint sealant is installed between deck concrete and coping of revetment.	·Special technical know-hows are required to install the submerged steel beams. ·The length of each beam are determined by the location of the existing piles. ·Special floater is necessary	·Large temporary stagings under water are required. ·Underwater concrete should be placed with securing the good quality of concrete. ·High-early-strength cement may use for earlier utilization.

Note : For all of type of above reinfocing structure, Environmental Performance Report and Management Plan (EPRMP) is required.

3-1-1 (2) Preliminary Evaluation for Economical, Operational and Technical Matters for Standard Design Model of Pier

	Case-1	Case-2	Case-3	Case-4	Case-5	Case-6	Case-7
Method	Installation of Coupled Raking Piles in front of Berthline	Removal of Deck and Installation of Coupled Raking Piles	Removal of Deck and Installation of Submerged Struts	Installation of Anchor Wall and Sealant	Installtion of Ground Anchor and Joint Sealant	Installtion of Submerged Steel Beams	Installtion of Reinforced Concrete Beams
Quality Control	1	1	7	1	5	7	1
Workability	3	4	7	1	2	5	6
Construction Period	2	6	7	3	3	1	5
Operation Suspension Period	5	6	7	4	3	1	1
Construction Cost	6 (1.00)	7 (1.03)	5 (0.75)	1 (0.32)	2 (0.39)	4 (0.70)	3 (0.61)
Evaluation	17	24	33	10	15	18	16
Rank	2	3	3	1	2	2	2

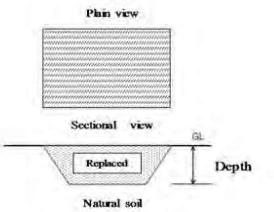
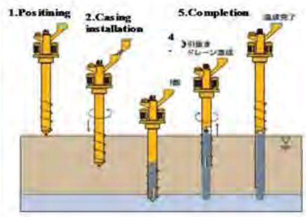
3-1-1 (3) Flowchart of the Standard Design Model of Pier



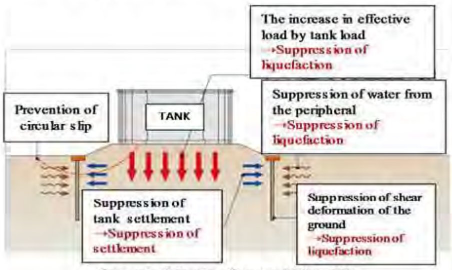
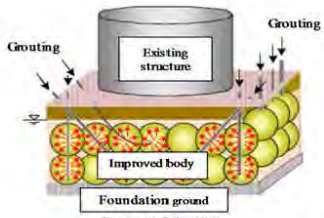
3-1-2 Standard Design Model of Buildings for Earthquake

	Reinforcement for columns, beams	External frame method
Summary	This method, paste the polyester of high-ductility material pillars and walls of existing buildings, the strength, a method of improving toughness, resistance to vert  Pillar in the reinforcement work Reinforcement work completed Reinforcement work Source: The Ministry of Education & Science " Seismic Retrofit Case Studies "	This method improves the seismic performance of the building by placing the structural frame to the external of the buildin  Reinforcement completion view Source: The Ministry of Education & Science " Seismic Retrofit Case Studies "
Advantages and disadvantages	During the construction period , building usage constraint will occur.	This method have no restriction to use during repairing period.
Construction period	Koka Aburahi Elementary School (Shiga JPN) Total floor area(㎡) 2,589 Construction period (day) 97 Non-working days(day) 44	Kino Higashi Elementary School(Hokkaido JPN) Total floor area(㎡) 4,055 Construction period (day) 140 Non-working days(day) 0
Cost	Total PHP 32,660,000	Total PHP 39,761,000
Selected Method	△	◎

3-2-1 Standard Design Model of Backup Area for Liquefaction

	Excavation & Replacement	Gravel drain method	Permeable grouting method
Summary	Method to be replaced with high quality soil by removing the soft soil . Occurrence difficult material of liquefaction , it replaces the target ground , for example, crushed stone .  Conceptual drawing	In this method , the crushed stone pillar that will be constructed into the ground , the excess pore water pressure that occurs during an earthquake to dissipate early , to prevent liquefaction. Construction procedure  Conceptual drawing (Source:Fudo Tetra HP)	This method is used for the countermeasure for liquefaction,and is also applicable under the existing structure.Inject a permanent type chemical grouting into sand grains, it will permeate into sand grains. And natural ground will be improved into the liquefaction resistance ground.  Conceptual drawing (Source: Penta-Ocean HP)
Track record	It is an economical method that has the oldest history. However excavated soil disposal problem, such as the problem of ensuring the quality of soil , in recent years it has been reduced to use.	・ Port facilities (quay back ground , etc.) ・ Foundation ground high standard embankment of grain silos (before embankment) ・ Housing foundation ground	・ Existing tank foundation ・ Bridge foundation ・ Building foundation ・ The back of the harbor seawall ・ Under the runway
Advantages and disadvantages	・ Soil disposal is necessary. ・ Not aplicable underneth existing buildings. ・ Not aplicable underneth existing runway & apron.	・ It is extremely small deformation of the surrounding ground due to construction,so it is suitable for installation in existing structures vicinity. ・ Not aplicable underneth existing buildings. ・ Not aplicable underneth existing runway & apron. ・ Surcharge loding is necessary after drain completion.	・ Applicable in narrow space. ・ For oblique injection is possible, it enales to improve the tank just below the ground from the surrounding. ・ Applicable under the run way ・ Vibration and noise control is not nessary. ・ Hard to apply to the high strata of the fine fraction content . ・ Special construction machinery is necessary.
Cost	Subtoal(PHP) PHP 161,719,000	Subtoal(PHP) PHP 265,938,000	Subtoal(PHP) PHP 172,500,000
Selected Method	△	△	◎

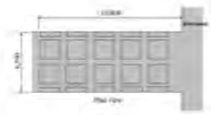
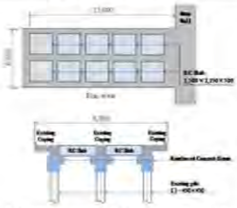
3-2-2 Standard Design Model of Building Foundation for Liquefaction

	Steel sheet pile ring method	Permeable grouting method
Summary	This method has been used in liquefaction countermeasures of the ground tank . It enables to suppress the occurrence of liquefaction of the ground with placing steel sheet piles in a circular cylindrical tank periphery to enclose the ground directly below the tank into a cylindrical shape.  Conceptual drawing (Source: Kajima HP)	This method is used for the countermeasure for liquefaction,and is also applicable under the existing structure.Inject a permanent type chemical grouting into sand grains, it will permeate into sand grains. And natural ground will be improved into the liquefaction resistance ground.  Conceptual drawing (Source: Japan Federation of Construction Contractors HP)
Track record	・ Existing tank foundation ・ Bridge foundation ・ Building foundation ・ Underground strucure (U/G utility conduit、 Sand basin , Buried pipe)	・ Existing tank foundation ・ Bridge foundation ・ Building foundation ・ The back of the harbor seawall ・ Under the Airport runway
Advantages and disadvantages	・ Special construction machinery is unnecessary. ・ Hard to apply in narrow space. ・ Vibration and noise control is nessary.	・ Applicable in narrow space. ・ For oblique injection is possible, it enales to improve the tank just below the ground from the surrounding . ・ Vibration and noise control is not nessary. ・ Hard to apply to the high strata of the fine fraction content . ・ Special construction machinery is necessary.
Cost	Subtoal(PHP) PHP 69,046,000	Subtoal(PHP) PHP 43,470,000
Selected Method	△	◎

3-2-3 Standard Design Model of Building Roof for Strong Wind

	Present roof structure	Strengthening of roof structure
Summary	 Existing condition of roof frame, purlin and roof material	 Roof truss, purlin, roof material are reinforced in order to stand the design wind speed of 240 kph.

3-2-4 Standard Design Model of Trestle for High Wave

	Present trestle	Pre-cast slab
Summary	 Beam and slab of existing trestle are cast in situ concrete structure	 Replacement of new pre-cast concrete slab to protect beams and piles for mitigating up-lift pressure

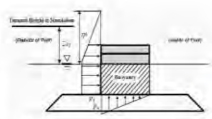
3-2-5 Standard Design Model for Storm Surge

	Tacloban	Olmoc	Tagbilaran	Tapal	Iloilo	Estancia
Expected Storm Surge (m)	4.00	2.97	2.69	2.23	3.49	3.86
Mean Sea Level (m)	0.45	1.05	0.85	0.85	0.95	0.95
Crown Height (m)	3.00	3.00	3.00	3.00	3.00	3.00
Storm Surge above Wharf (m)	1.45	1.02	0.54	0.08	1.44	1.81

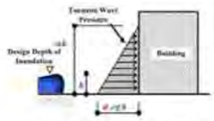
Storm surges height is between 0.08 and 1.81 m above wharf. Storm surge pressure is static and inundation. All materials can be transferred to the 2nd or 3rd floor before storm surge. The design model will not be established

3-2-6 Standard Design Model for Tsunami

	Tacloban	Olmoc	Tagbilaran	Tapal	Iloilo	Estancia
Expected Storm Surge (m)	4.00	3.00	2.90	3.46	5.00	-
Mean Sea Level (m)	0.45	1.05	0.85	0.85	0.95	-
Crown Height (m)	3.00	3.00	3.00	3.00	3.00	-
Storm Surge above Wharf (m)	1.45	1.05	0.75	1.31	2.95	-



Tsunami pressure for Marine structure



Tsunami pressure for Building structure

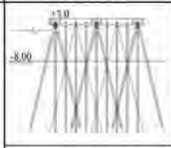
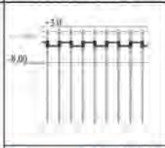
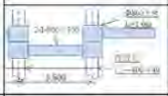
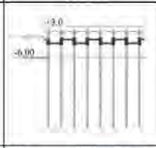
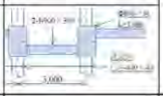
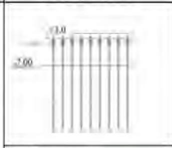
Uplift of Tsunami pressure

Based on the tsunami wave formula, tsunami height and pressure are 15 m and 15 ton/m^2 respectively in case of Iloilo. Application of design pressure for building and pier is not practical. Therefore, design model will not be established

3-2-7 Standard Design Model for Utilities

Facilities		TACLOBAN	ORMOC	TAGBILARAN	TAPAL	ILOILO (ICPC)	ESTANCIA
Utilities	Power Supply	Generator(143KW)	Generator (119KW)	Generator(93KW)	Generator (2KW)	Generator (122KW)	Generator (34KW)
	Water supply	Reservoir (102m^3)	Reservoir (85m^3)	Reservoir (66m^3)	Reservoir (2m^3)	Reservoir (87m^3)	Reservoir (24m^3)

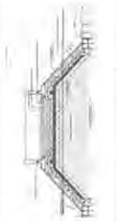
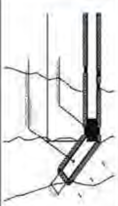
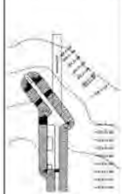
3-3 Summary of Standard Design Model for Target Ports

Facilities		TACLOBAN	ORMOC	TAGBILARAN	TAPAL	ILOILO (ICPC)	ESTANCIA
Berthing Facility (for earthquake)		 Additional steel pipe batter piles φ800mm, 6m etc	No reinforcing is necessary	 	 	No reinforcing is necessary	 
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/CFS	・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)

4 Summary of Rough Cost Estimates for Standard Design Model for Target Ports

Facilities		TACLOBAN	ORMOC	TAGBILARAN	TAPAL	ILOILO (ICPC)	ESTANCIA	Remarks
Quay wall		382,157,000	—	73,682,000	178,416,000	—	21,940,000	Earthquake resistance
		—	—	—	—	—	4,405,000	Storm surge resistance
Yard/Access road		2,250,000	31,500,000	47,250,000	9,000,000	85,500,000	9,000,000	Liquefaction resistance
Building	Administration / Office Building	59,126,000	13,342,000	—	2,220,000	48,285,000	12,510,000	Resistance to Typhoon /Earthquake /Liquefaction
	Warehouse /CFS	24,283,000	—	14,083,000	—	241,805,000	—	
	Passenger Terminal Building	—	60,391,000	26,533,000	—	—	12,510,000	
Other fasilities	Emergency disel generator	7,260,000	6,308,000	5,010,000	764,000	5,544,000	1,528,000	
	Emergency water pit	427,000	553,000	427,000	94,000	389,000	328,000	
Total (Pesos)		475,503,000	112,094,000	166,985,000	190,494,000	381,523,000	62,221,000	1,388,820,000

5 Summary of the Condition of Damage and Countermeasure of the Facilities for DOTC Ports

	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

Consideration of the Causeway against the Damages of Earthquake and Typhoon

Survey and Investigation stage

- Topographical and hydrographical survey
- Design wave estimate
- Soil investigation

Planning stage

- General plan of causeway shall not affect environmental impact specially erosion and deposit of the shoreline.
- Shape of the causeway shall be planned in order not to concentrate the incident waves

Design stage

- Armor stone size shall be decided based on the design wave height. concrete block instead of armor stone
- Slope of the causeway shall be 1:1.5 or 1:2.0. Layer of armor stone shall be more than two and provide horizontal berm.
- For liquefaction under the sea bed, sea bed soil shall be improved or crown height will be raised considering the future settlement.

END OF PRESENTATION

THANK YOU FOR YOUR ATTENTION

6) Fund Resources for Disaster Management of Ports

Department of Transportation and Communications (DOTC)

Japan International Cooperation Agency (JICA)

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

Financial Resources for Improvement of Disaster Resilient Ports

1. Budget of Social Ports by DOTC
2. Fund for DRRM
3. Rehabilitation of ports damaged by disasters
4. Cases of Japan
5. Suggestions

Draft Final Report
Nov. 2015

The Overseas Coastal Area Development Institute of Japan (OCDI)
Oriental Consultants Global (ORG)

1

Budget of Social Port Improvement Projects

The improvement of social ports: 2012 to 2016 (in thousand PhP)

Year	2012 1)	2013 1)	2014 1)	2015 2)	2016 2)
Budget	502,000	217,500	1,079,500	**1,631,453**	1,031,500
Number of Projects	82	9	44	**63**	37
Average	6,122	24,167	24,534	**25,896**	27,878

Source:1) Website of DOTC 2) WTPD

CIIP (in thousand PhP)

Various feeder/terminal port development which **includes LGU Ports, Social Ports and Eight (8) Tourism Ports**

2013	2014	**2105**	2016	2013-2016
217,000	856,000	**1,631,453**	2,150,700	**4,855,653**

2

Availability of Fund against Disaster

The availabilities of each fund depend on implementing bodies and the timing

Implementing body	Government	LGU	GOCC
Pre-disaster (Enforcement of port facilities)	**NDRRMF** **GA**	**NDRRMF** **LGU's Fund** **DMAF**	**NDRRMF** **GOCC's fund**
Post-disaster (Rehabilitation of damaged facilities)	**QRF** **NDRRMF**	**NDRRMF** **LGU's Fund** **DMAF**	**NDRRMF** **GOCC's fund** **Insurance**

NDRRMF: National Disaster Risk Reduction Management Fund
QRF: Quick Response Fund
DMAF: Disaster Management Assistance Fund
GAA: General Appropriation
GOCC: Government-owned and Controlled Corporation

3

Amount of NDRRMF and QRF

Total amount of NDRRMF in 2016:
more than **twice in 2015**

Yolanda Comprehensive rehabilitation and Recovery Plan was added.

Particulars (in million PhP)	2014	2015	2016
National Disaster Risk Reduction and Management Fund (NDRRMF)	7,500	14,000	**38,896**
National Disaster Risk Reduction and Management Program (Calamity Fund)		13,000	19,000
Peoples survival Fund		1,000	1,000
Yolanda Comprehensive rehabilitation and Recovery Plan		—	**18,896**
Quick Response Fund (QRF)	-	6,708	6,665

Source: Investing in the Right Priorities (The 2106 Budget Priorities Framework): DBM

4

Rehabilitation Projects of Ports

Rehabilitation projects for damages by Typhoon Yolanda

	Number of Ports	Project Cost (thousand PhP)	Average cost	Note
DOTC[1] (LGU)	**22**	**248,600**	11,300	**QRF**
	10	**81,000**	8,100	**NDRRMF**
PPA[2]	22	82,130	3,733	-
CPA[2]	1	23,450	23,450	-

1) DOTC, 2) **RAY (NEDA)**

Rehabilitation projects for damages by Bohol Earthquake

	Ports	Project Cost (million PhP)	Average	note
DOTC (LGU)	Guindalman, Inabanga, Baclayon, Mribojoc, Clarin, Buenavista	**79.4**	13.2	-
PPA	Tagbiralan, Tubigon, Jetafe, Catagbacan	**558.6**	139.4	**PPA Fund**

1) DOTC, 2) PPA

5

Financial Resources for Rehabilitation of Public Ports in Japan

Government subsidy

Subsidy ratio is high at **underdeveloped area**

Lower limit for a cost of one project

Subsidy ratio	**2/3:** the area other than below **4/5:** Hokkaido, Remote islands, Amami and Okinawa
Conditions for adoption	- **Local government** or its affiliated entities - Damage caused by freak of **nature** - Project cost necessary for the work at one place JPY **1,200 thousand** (Prefectures etc.) JPY **600 thousand** (Cities, towns or villages)

Act on National Government Defrayment for Reconstruction of Disaster-Stricken Public Facilities

6

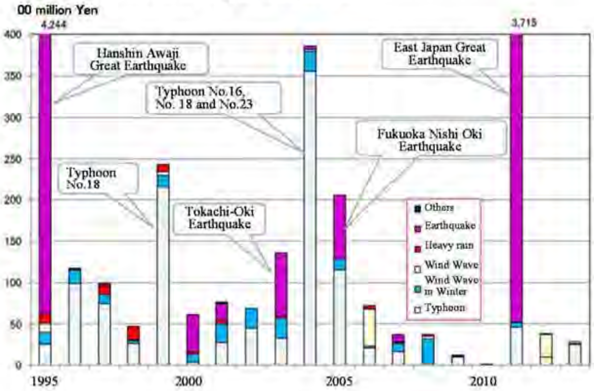
Annual Amount of Rehabilitation Projects of Ports in Japan

Remarkable Damage of Ports

Hanshin Awaji Great Earthquake in 1995: 424.4 Billion JPY

East Japan Great Earthquake in 2011: 371.5 billion JPY

Possibility of occurrence of a huge disaster



7

Financial Resources for Rehabilitation Projects of Kobe Port

Kobe City : subsidy under the existing acts

Kobe Port Terminal Corporation: subsidy based on **a new special act**

Burden of Kobe City by **Local Bond**

Redemption of the bond is appropriated by tax **allocations to local governments from the central government.**

Facilities	Scheme	Subsidy	Fund for Kobe City's Burden
Kobe City			
Public Infrastructure	Rehabilitation Project	**91.8%**	100% of burden is prepared by **Local Bond** for Rehabilitation Project (95% of redemption money is appropriated by **tax allocations to local governments**)
Rehabilitation with Improvement	Project related to disaster	81.9%	100% of burden is prepared by public project bond
Kobe Port Corporation			
container berth	**Special scheme**	**80%**	
Other facilities	**Special scheme**		*20 % of the cost is appropriated by **government non-interest loan**

8

Preventive Measures against Disaster on Ports in Japan

Measures for Enhancing Disaster Resistance on Ports

Construction of **earthquake resistant quays**

336 berths in 184 ports, return period: several hundred years

Development of disaster prevention **activity bases**

Earthquake resistant **International Container Terminal**

Raising Dikes

Budget for the projects of the comprehensive measures against a large scale earthquake

Year	2006	2007	2008	2009	2010
Project Cost in initial budget (billion JPY)	40.5	47.4	50.0	48.4	26.9

Source: Report of Review on Measures against Large-scale Earthquake on ports, 2012, MLIT
The amount includes the cost for corresponding to ordinary port improvement as well.

9

Examples of Insurance for Public Ports

Japan

- Damages of completed civil engineering infrastructures caused by natural hazards (not including earthquake)
- Not popular in the port sector

Chile

- Main ports are managed by financially independent port corporations
- Damages of port facilities by earthquake, tsunamis, storm surges, oil spill pollution, fires, terrors etc.

Iceland

- Iceland Catastrophe Insurance covers harbor installations owned by municipalities and the National Treasury
- Damages of port facilities by earthquakes, volcanic eruption, avalanches landslides and floods.

10

Financial Resources for Recover from Damage by Natural Disasters

Funds for rehabilitation projects has been prepared:
NDRRMF and QRF

Amount of fund
Increase of amount of these funds
Additional items for restoration against a huge disaster (in case of Typhoon Yolanda)

Ports under LGU
DOTC implements rehabilitation projects by the above funds

PPA Ports
PPA implements rehabilitation projects of port facilities damaged by Typhoon Yolanda and Bohol Earthquake by PPA corporate fund

11

Financial Resources for Preventive Measures against Disaster

Investment to preventive measures at pre-disaster stage
Not easy to appropriate the necessary budget to projects of preventive measures in general

A national consensus
In order to prepare necessary budget, a national consensus needs to be reached.

A comprehensive disaster reduction plan
- Necessity of preventive measures
- Effects of investment to preventive measures
- Location of disaster resilient ports
- Project costs etc.

12

Financial Resources for Recover from Damages of PPA Ports

Suspension of port function caused by natural disaster will result in lost revenue of PPA and huge socio-economic loss of the Philippines
- Necessity of prompt recover of port function after disaster

Financial resources for rehabilitation projects
- PPA corporate fund (general rule)

Potential financial resources in case of a large-scale hazard which inflicts damage to such a degree that PPA cannot rehabilitate facilities using its own fund
- PPA corporate fund (general rule)
- Government fund (national interest)
- ODA fund (public requirements for prompt recovery)
- Insurance

13

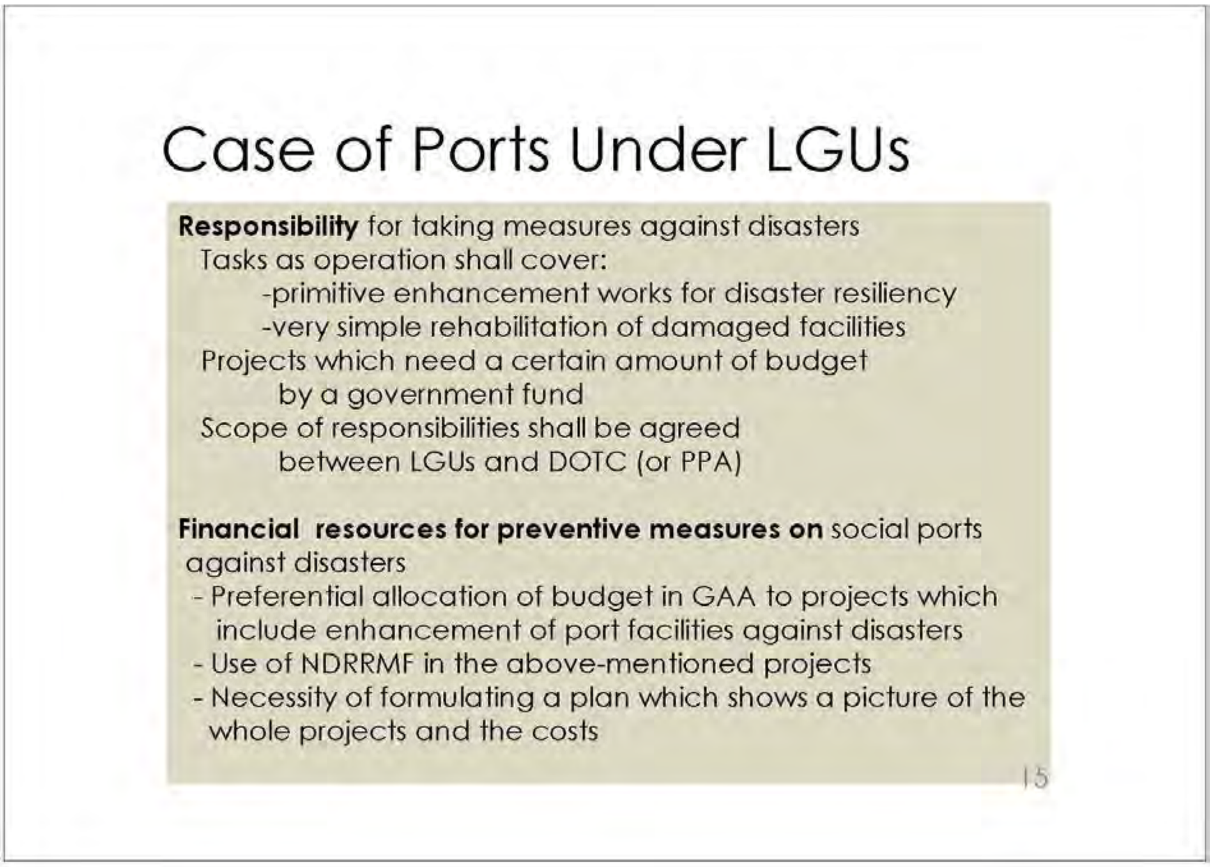
Financial Resources for Preventive Measures of PPA Ports

Close of ports caused by natural disaster will result in lost revenue of PPA and a huge socio-economic loss of the Philippines
- Necessity of **preventive measures** for maintaining port function in time of and post disaster

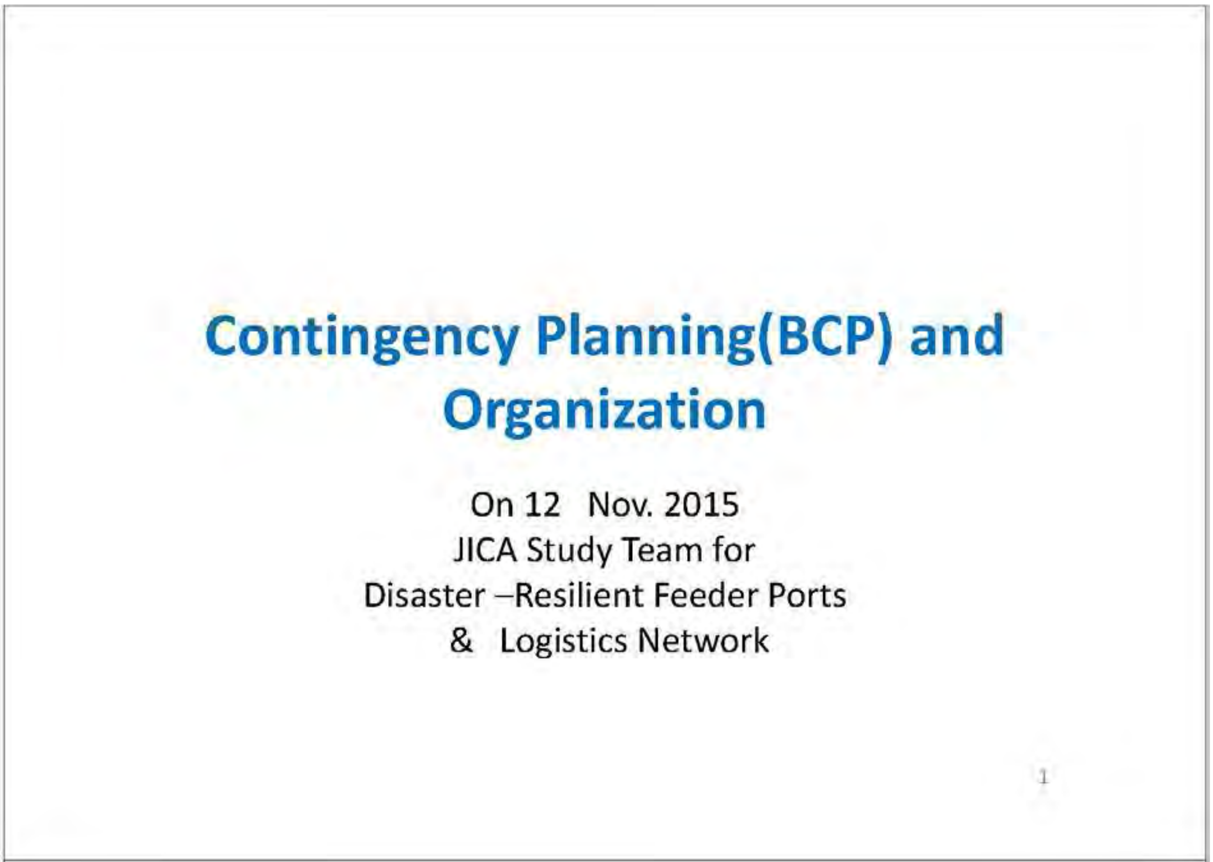
Potential financial resources for ensuring the disaster resiliency of main ports
- PPA corporate fund
- Government fund
- ODA fund

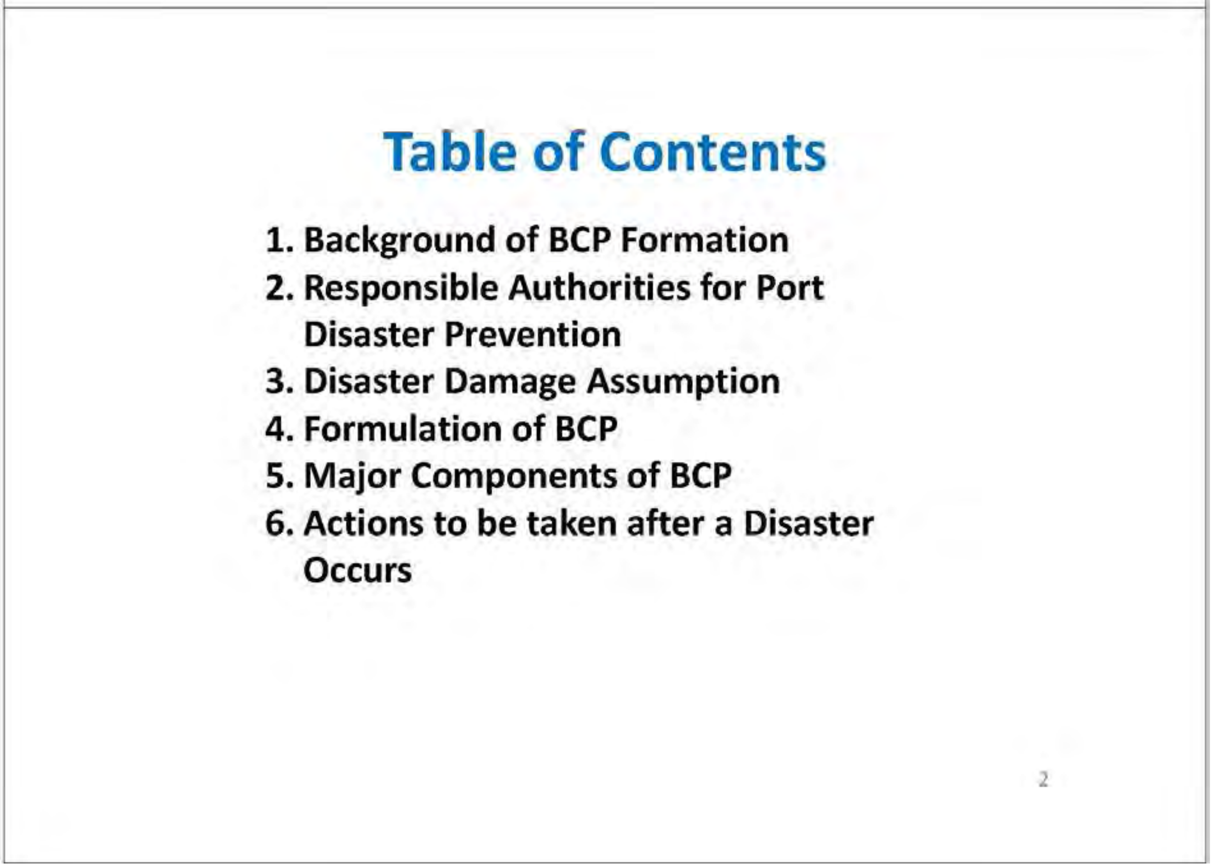
Disaster risk management
- Risk control by investments to preventive measures
- Risk finance including insurance or bond system

14


Case of Ports Under LGUs
Responsibility for taking measures against disasters
Tasks as operation shall cover:
-primitive enhancement works for disaster resiliency
-very simple rehabilitation of damaged facilities
Projects which need a certain amount of budget
by a government fund
Scope of responsibilities shall be agreed
between LGUs and DOTC (or PPA)
Financial resources for preventive measures on social ports
against disasters
- Preferential allocation of budget in GAA to projects which
include enhancement of port facilities against disasters
- Use of NDRRMF in the above-mentioned projects
- Necessity of formulating a plan which shows a picture of the
whole projects and the costs
15

7) Contingency Planning (BCP) and Organization





1.Background of BCP

(source; JICA team)

1. DOTC has no front line office at the site to respond in an emergency.
2. Port Facility Reinforcement requires a large budget. (10-20% increase in construction cost)
3. BCP is a mandatory requirement for disaster resilient ports.

3

2. Responsible Authorities for Port Disaster

1. PPA=Emergency Restoration＊ for PPA ports
2. LGU=Emergency Restoration of Social port and provincial access road
3. PCG=Port Water Area Clearance
4. DOTC, PPA= Full Restoration of Port
5. DPWH= Emergency Restoration national access road

*Emergency Restoration= Restoration for transportation of relief goods and supporting staff

4

3. Disaster Damage Assumption by DOTC, PPA and LGU (source; JICA team)

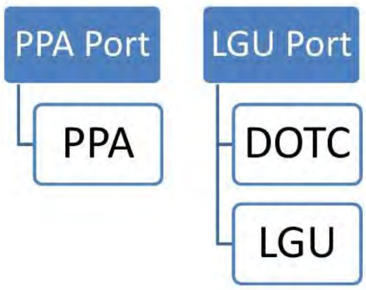
1. Disaster = Kinds of, Disaster Type, Scale, Season, time (e.g. typhoon, summer, night, 2days)
2. Utility(E, W, G) = Disconnect Duration(e.g. EL=1day, Water= 3days, GAS=7days)
3. Communication= Unavailable Period(Landline/Mobile phone, Satellite phone, Internet) (e.g. Mobile=1day, Land line=7days …)
4. Transportation=Road Damage Area, Flood Area (e.g. names of barangays)
5. Others= Duration of Storm Charge, Tsunami Number, Liquefaction Area, Wreckage in port (e.g. Second Tunami comes 2 hours after the first wave.)

5

4.Fomulation of BCP by DOTC, PPA and LGU

1.Basic Direction
(Disaster Assumption)
2.Implementation Organization and System
(responsible agency and relevant organization, Structure of Implementation organization)
3.Initial Response
(Information and Staff)
4.Emergency Restoration/ Alternative Measure
(transportation of relief goods and alternative port and road)
5.Preparation for Disaster (Stockpile)
6.Training / Drill
7. Review and Improvement

Responsible Agency for Port BCP



6

5. Major Components of BCP by DOTC, PPA and LGU (source; JICA team)

1. Assembling of Port Related Staffs (Public and Private)
2. Emergency Restoration for Port Facilities
3. Transportation of Relief Goods
4. Transportation of People from/to affected areas
5. Logistics Support for Private Companies

7

6. Actions to be taken by PPA and LGU after a Disaster Occurs (Source; JICA team)

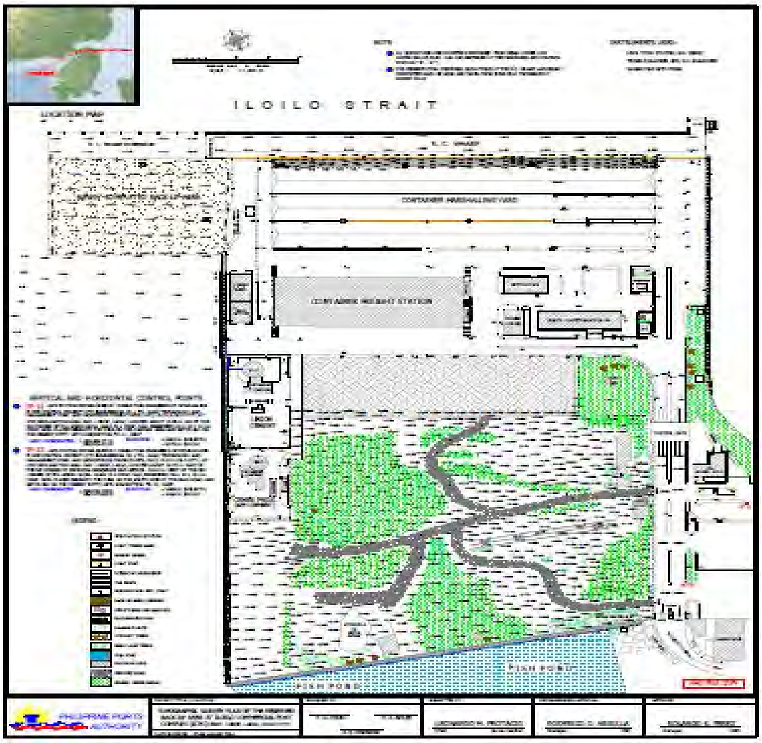
8

3. Results of Site Survey

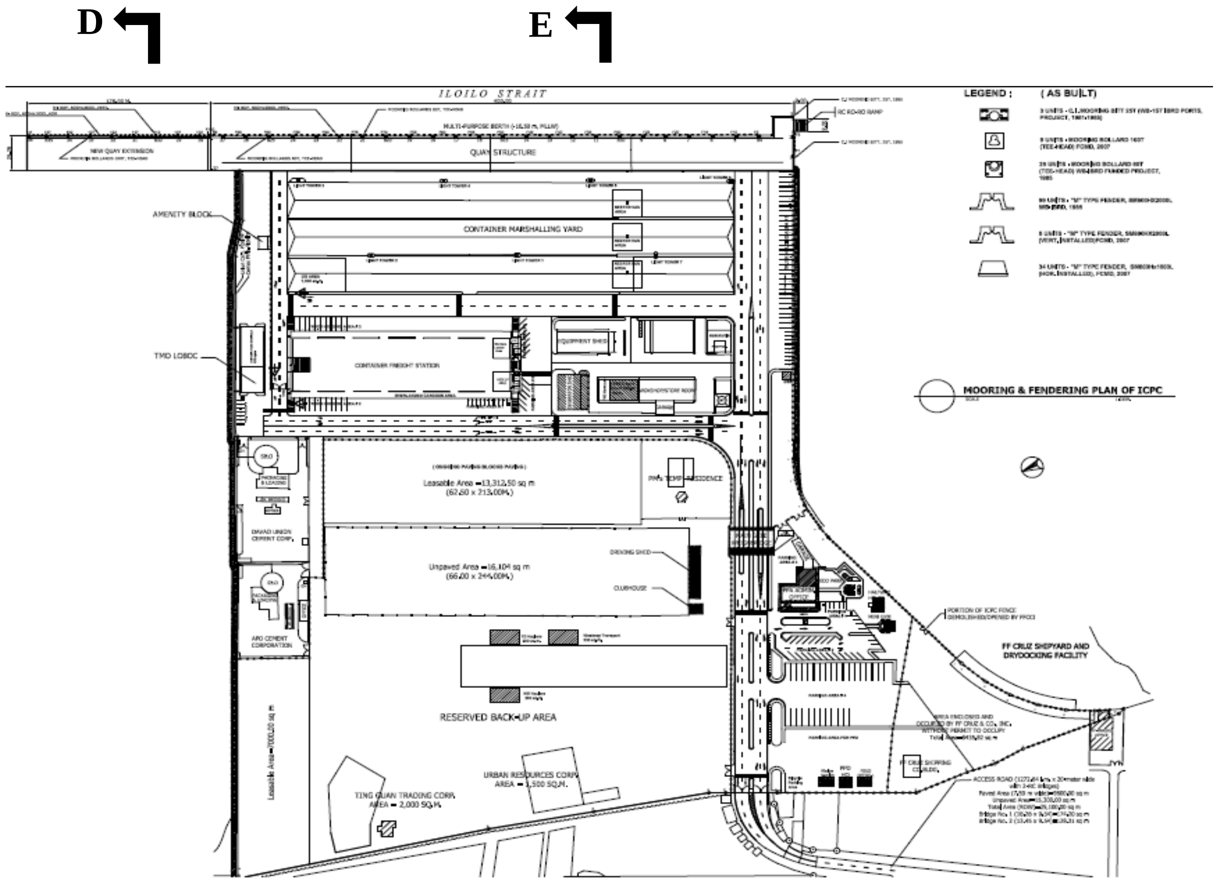
3.1. Iloilo Province

3.1.1. Iloilo Port

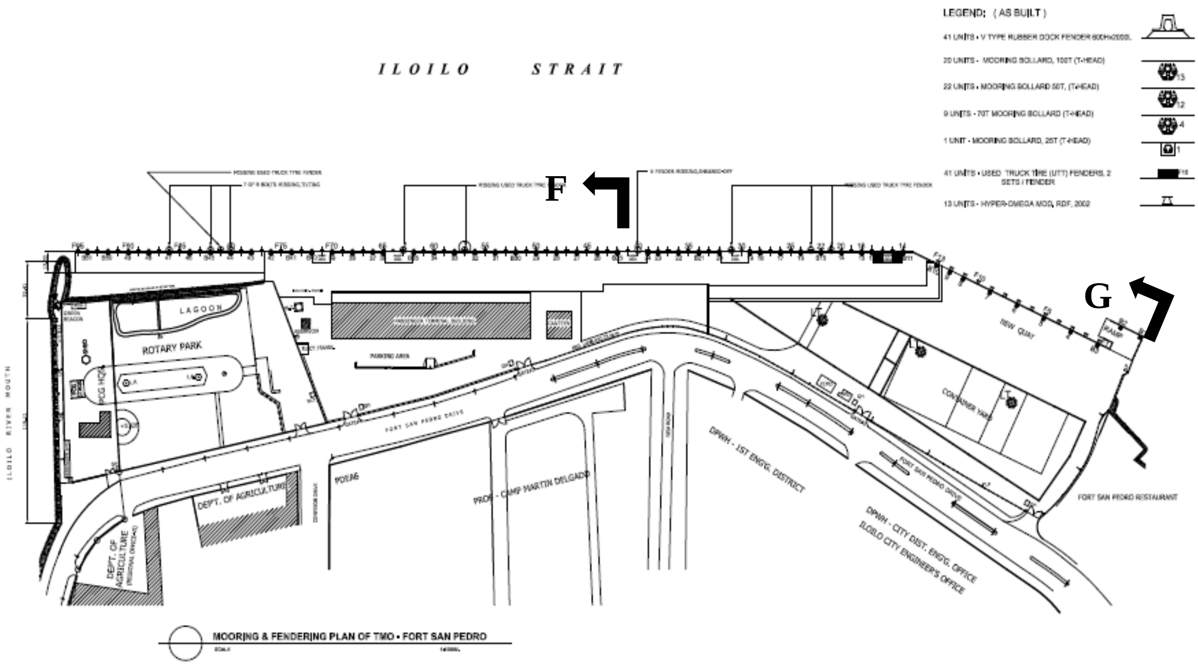
Location Map



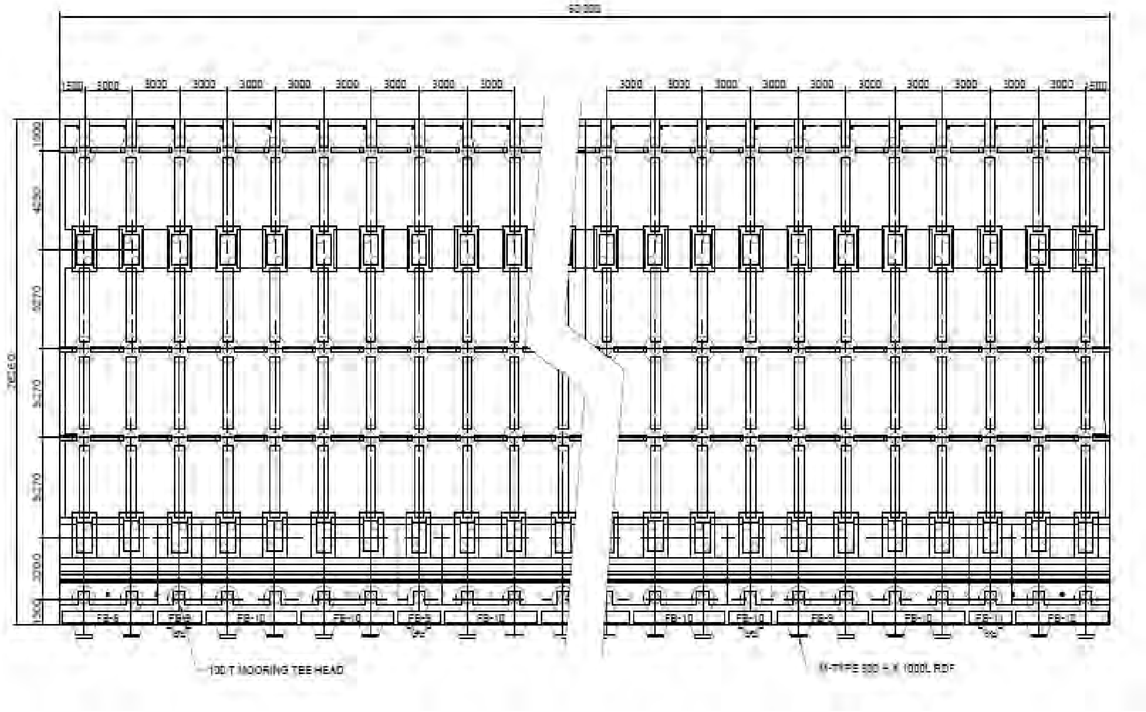
PLAN of Container Berth



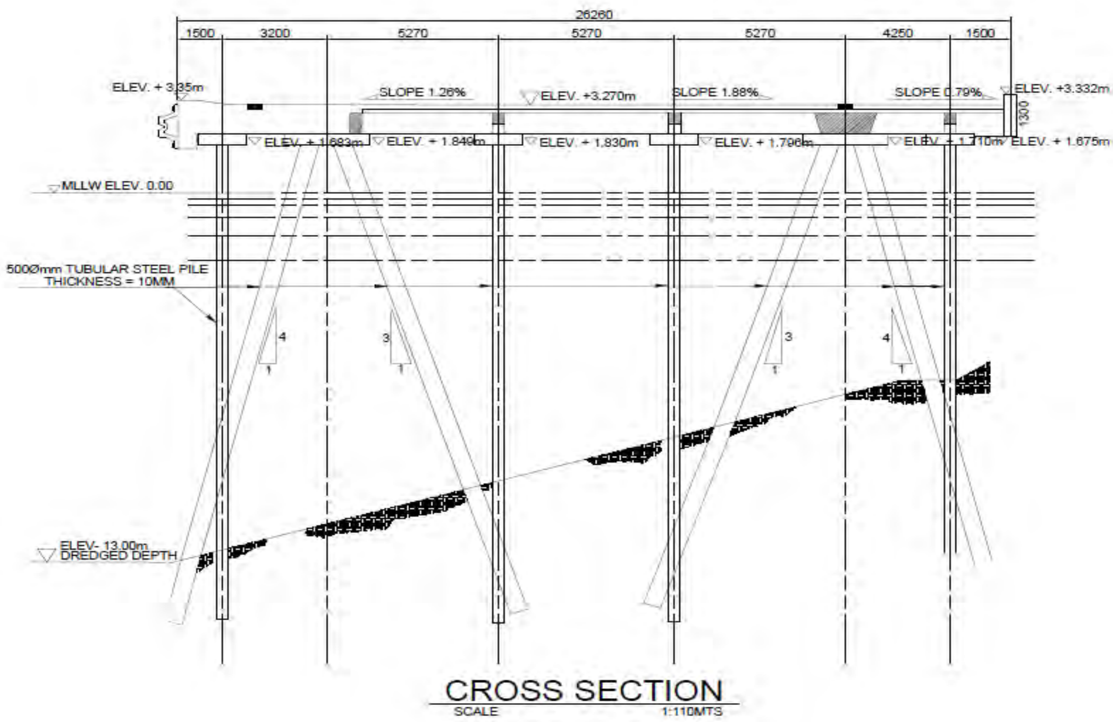
PLAN of Container Berth



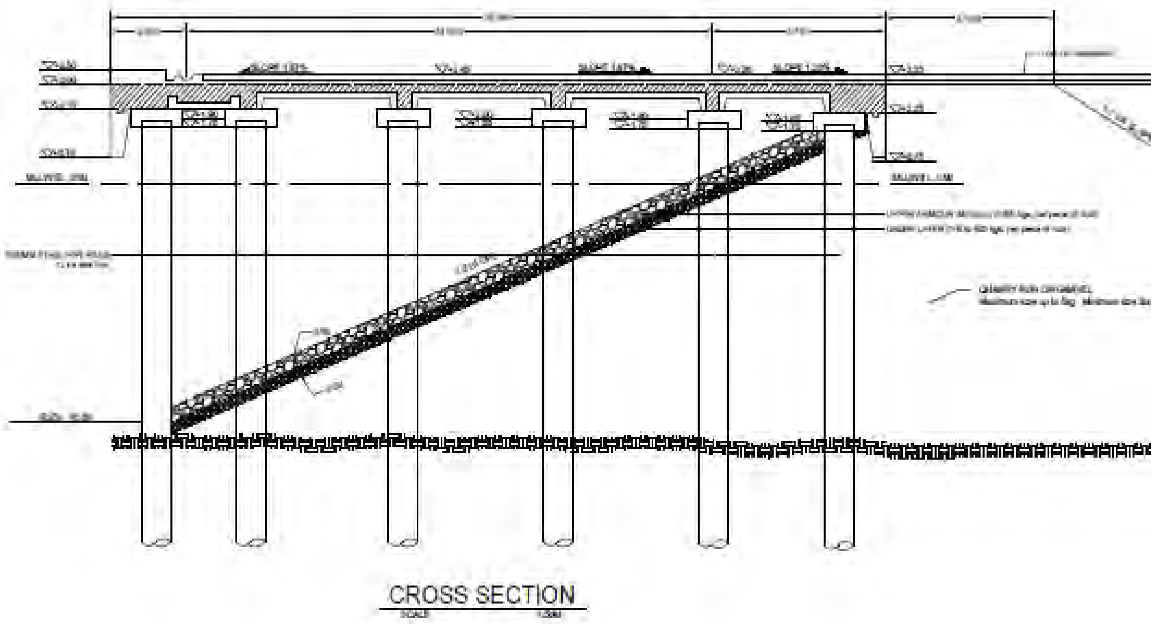
PLAN of General Cargo Berth



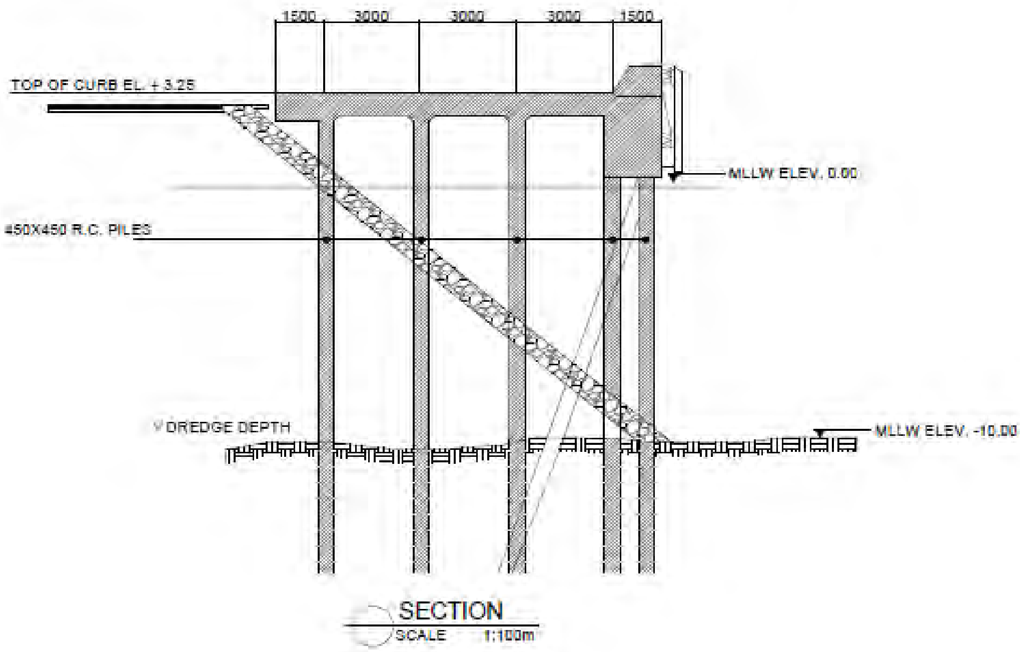
PLAN at SECTION D



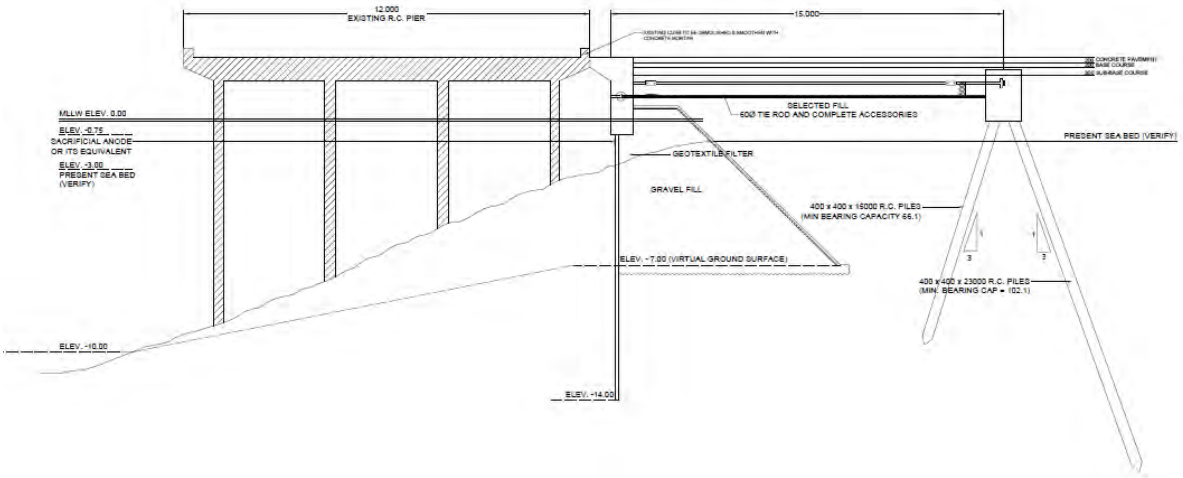
SECTION D



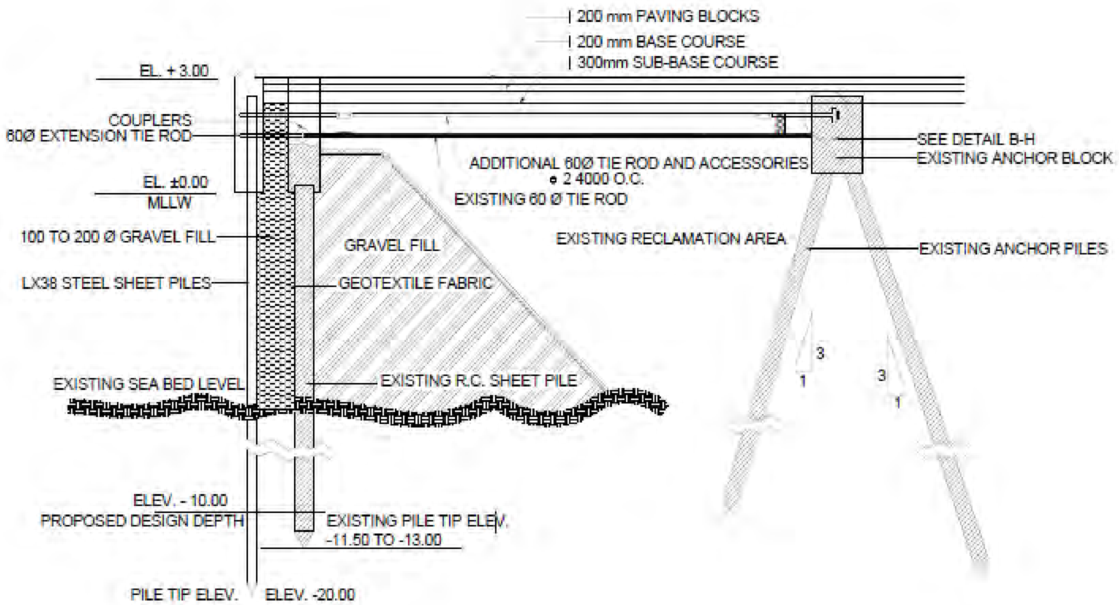
PLAN and SECTION E



PLAN and SECTION F



PLAN and SECTION F



SECTION G

Figure No.2
Existing ICPC Wharf

Figure No.3
ICPC open storage Area.

Figure No.4
ICPC existing wharf.

Figure No.5
Ongoing Piling works for wharf extension.

Figure No.6
Offshore view of the ongoing wharf extension.

Figure No.7
PPA Iloilo Admin Office

Figure No.8
Container Freight Station (CFS)

3.1.2. PORT OF ILOILO - RIVER WHARF

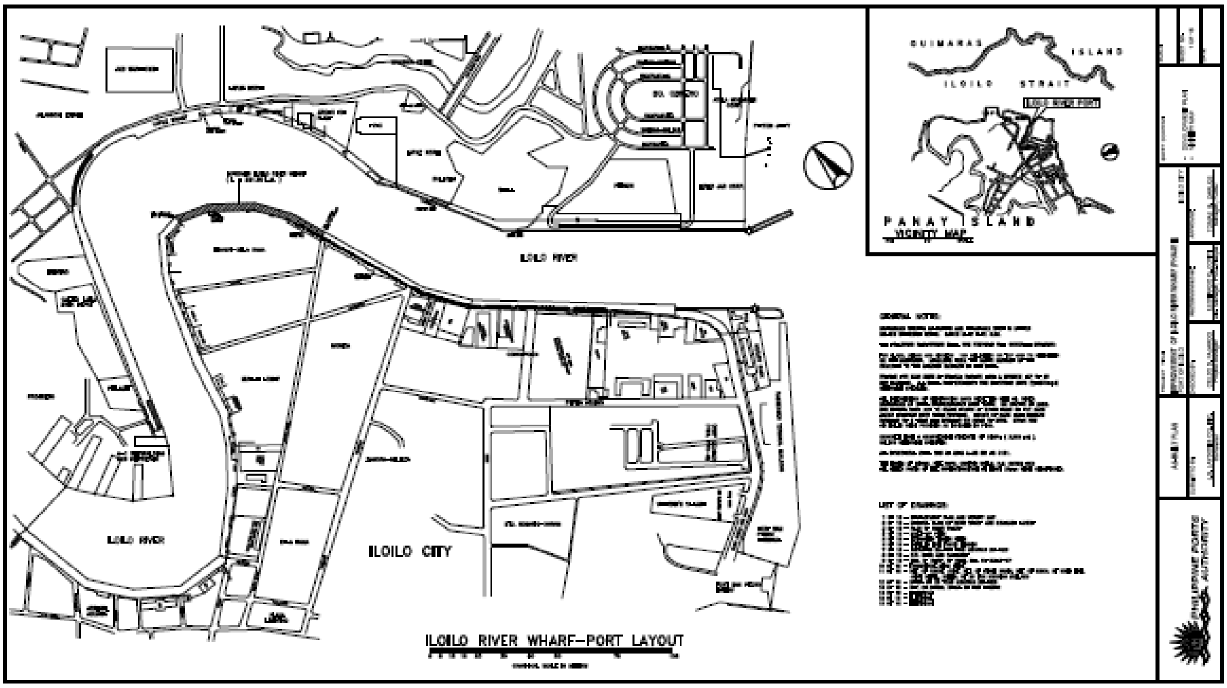


Figure No.1-a

Port Layout of Iloilo River wharf

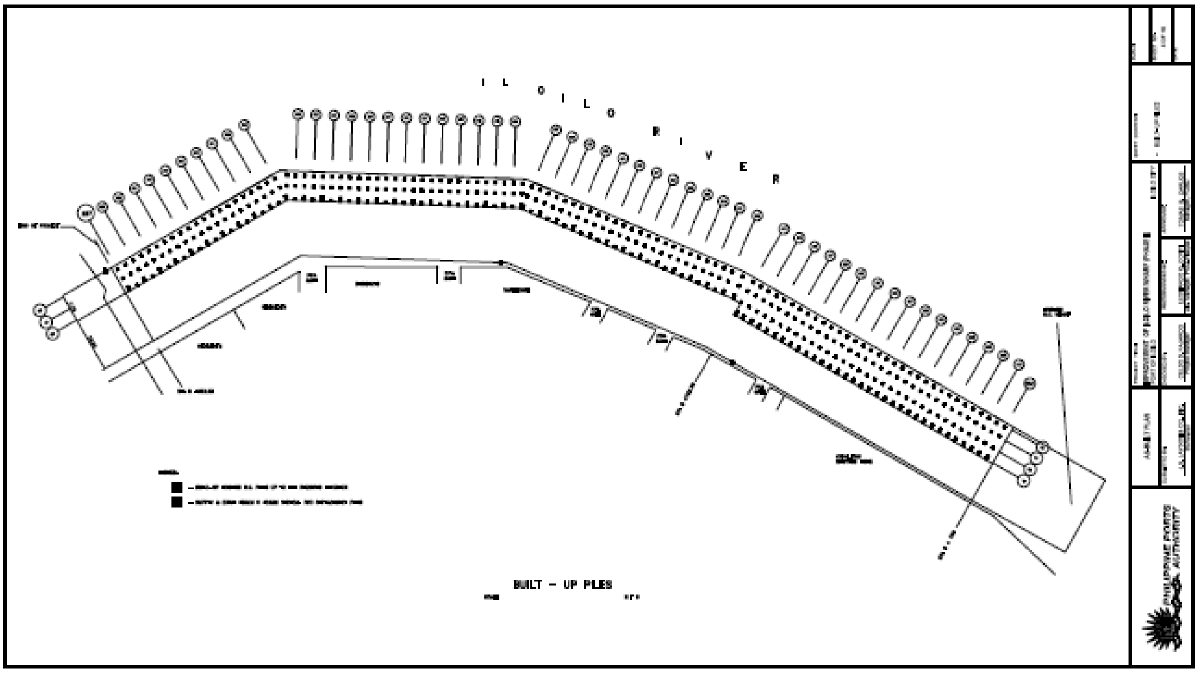


Figure No.1-b

Plan of Built-Up Piles

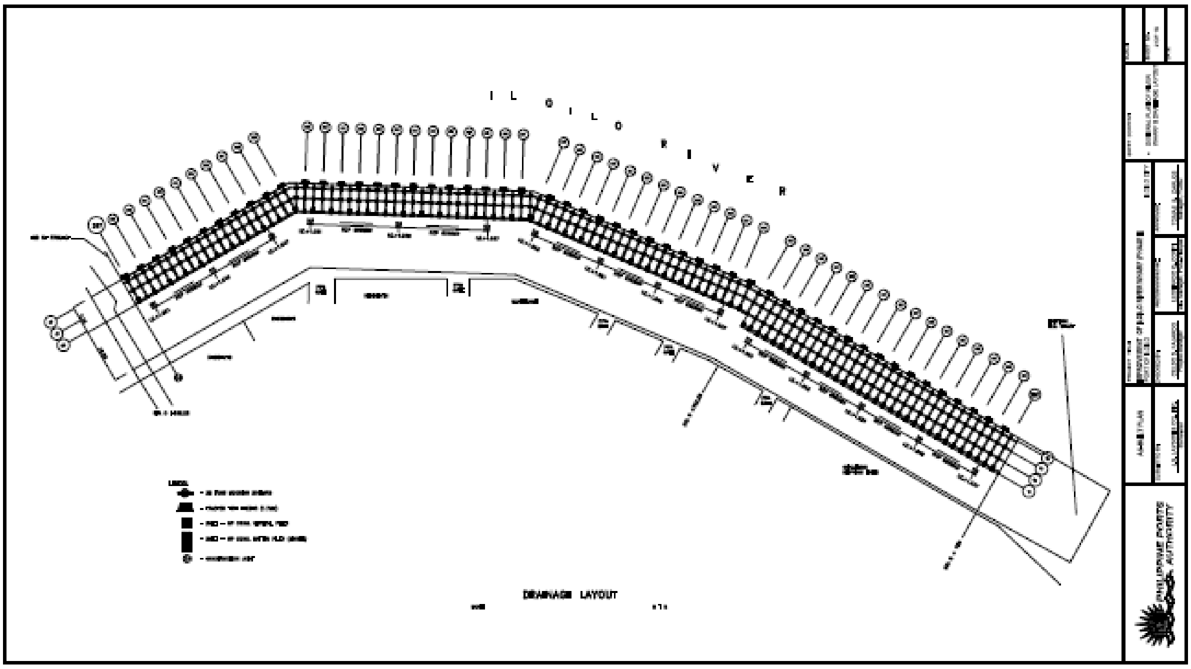


Figure No.1-c

Drainage Layout

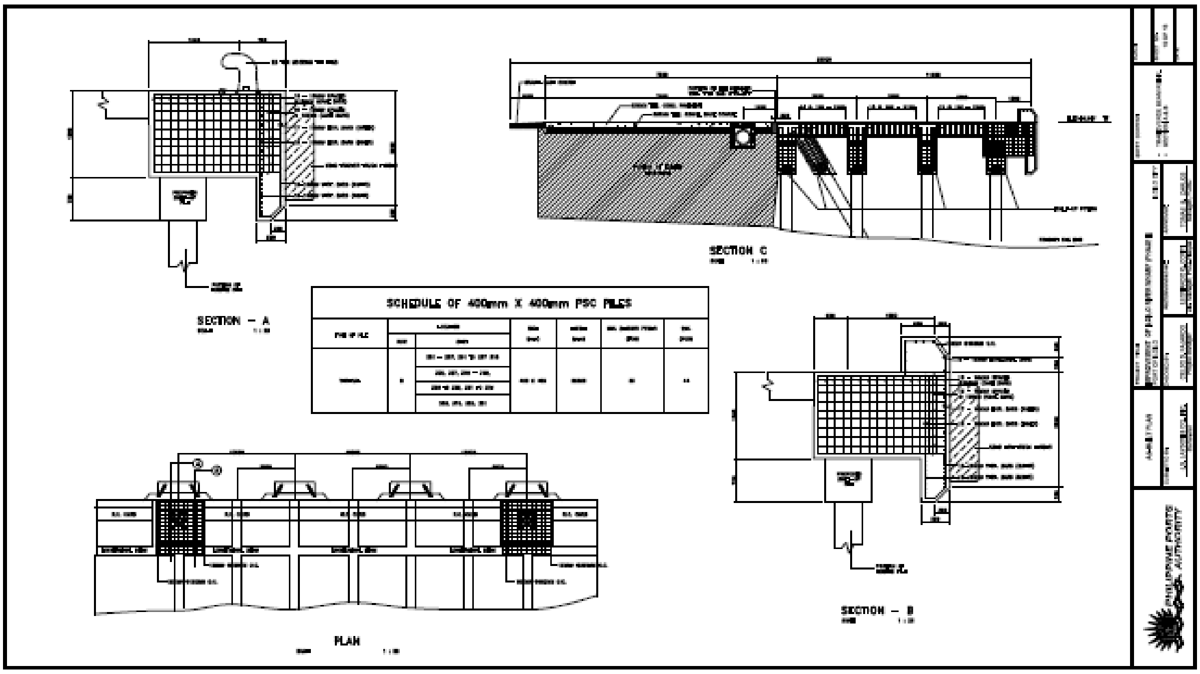


Figure No.1-d

Details

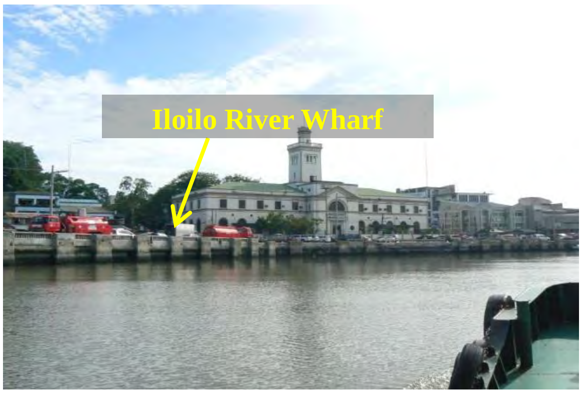


Figure No.2
Existing River Wharf.

Figure No.3
Existing River Wharf

Figure No.4

Figures shows the Berthing Facilities at Iloilo river port.

Figure No.5

Existing Wharf at Iloilo River Wharf

Figure No.6

Fast craft berth at Iloilo river wharf.

Figure No.7

Fast craft berth at Iloilo river wharf.

3.1.3. Dumangas Port

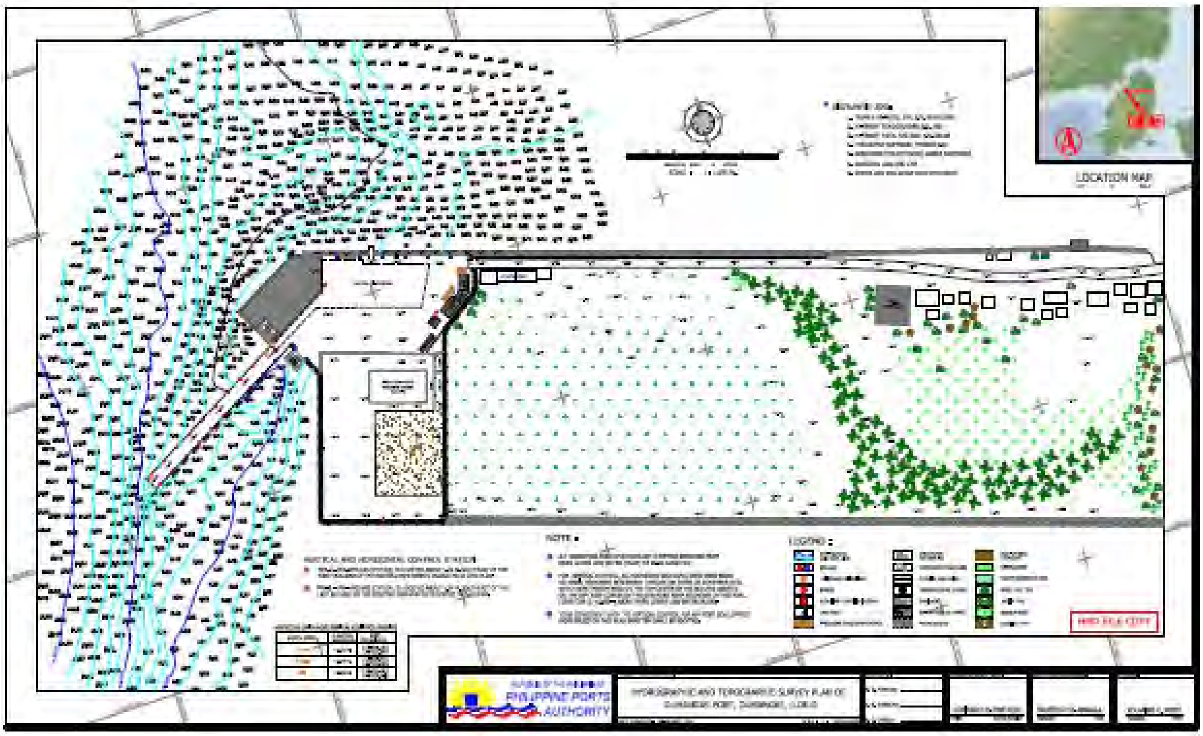


Figure No.1-a

Existing Port Layout and Hydrographic Plan

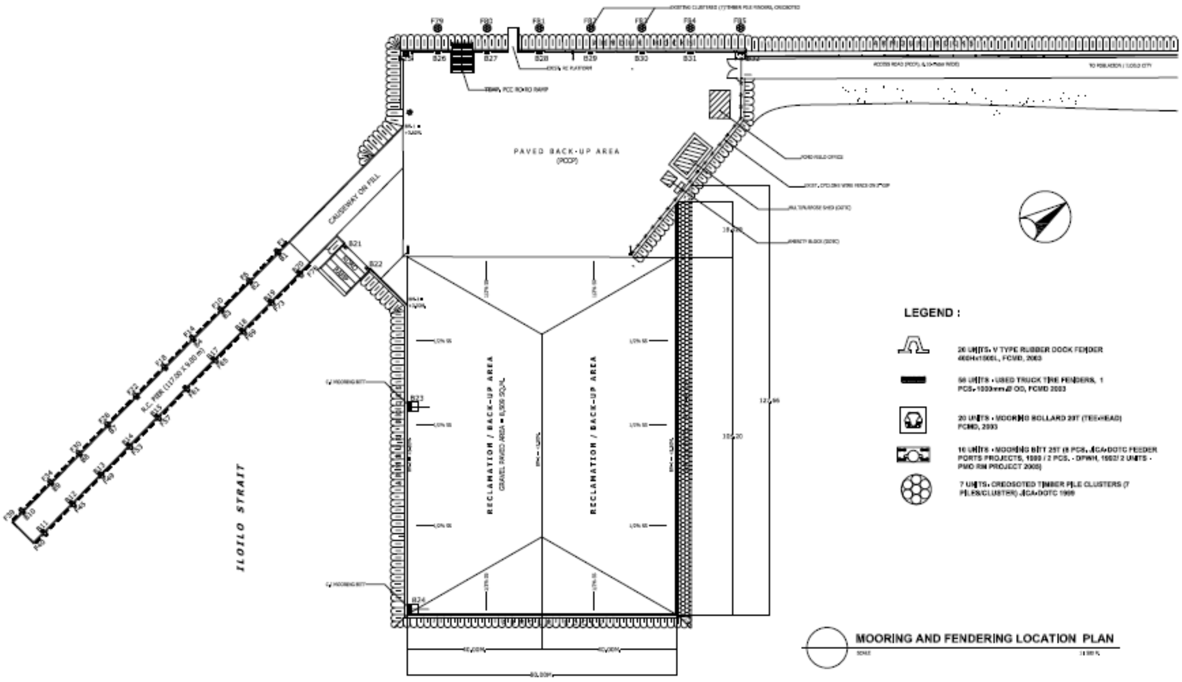


Figure No.1-b

Existing Port Layout

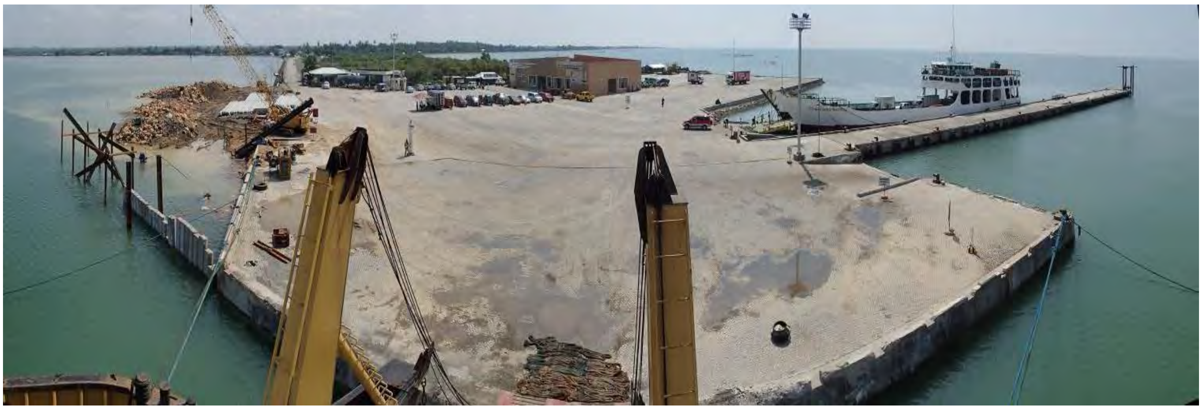


Figure No.2 Panoramic View of Dumangas Port

Figure No.3
Existing RC Pier

Figure No.4
Existing RC Pier deck slab.

Figure No.5
The existing pier with used truck tires as fender.

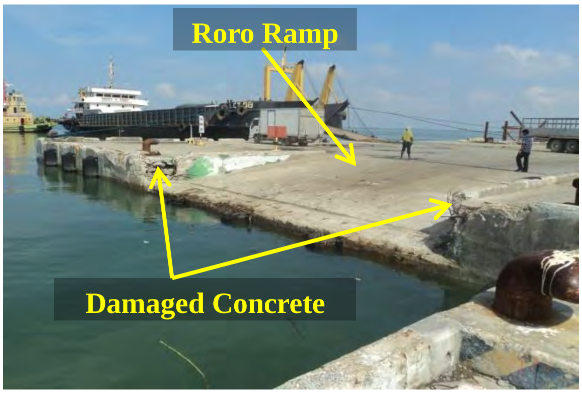


Figure No.6
RoRo Ramp at the Southwest side of the Pier.

Figure No.7
Passenger Terminal Building

Figure No.8
Back up area.

Figure No.9
Sheet Piling works/Ongoing reclamation.

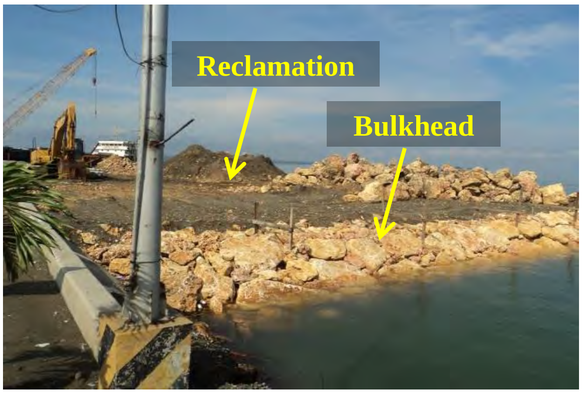


Figure No.10
Bulkhead for ongoing reclamation.

3.1.4. Estancia Port (PPA)

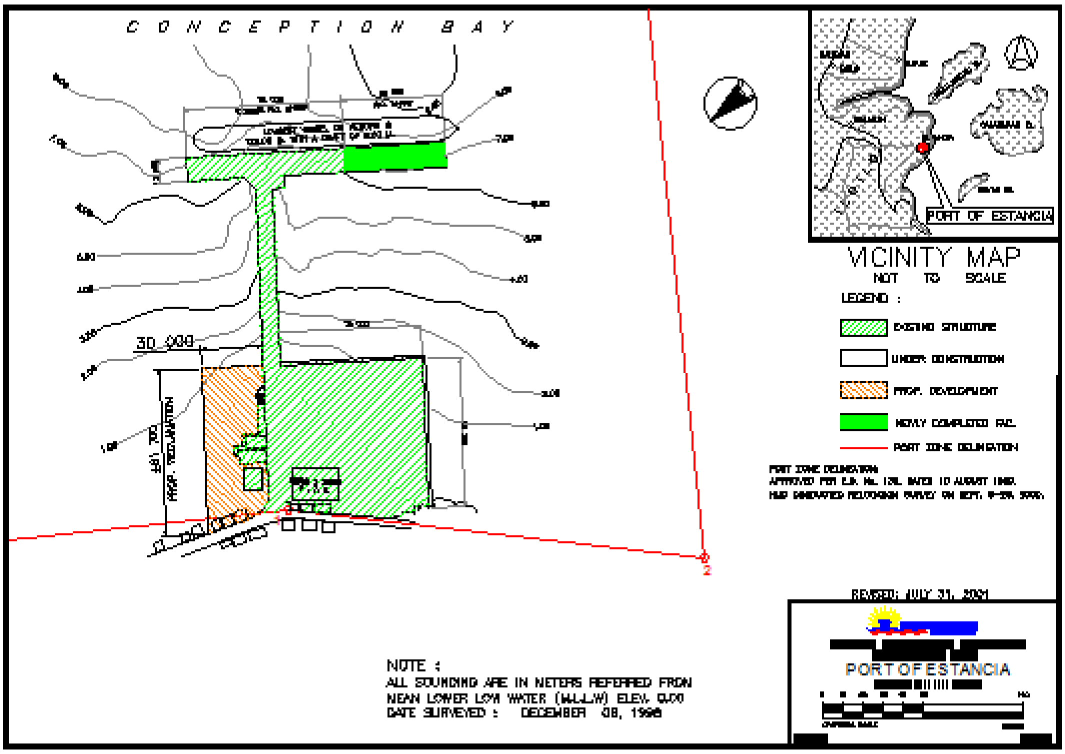


Figure No.1 Port Layout

Figure No.2
Access Trestle

Figure No.3
Port Berthing Facilities

Figure No.4
Bulkhead wall connecting RC Pier/ Trestle.

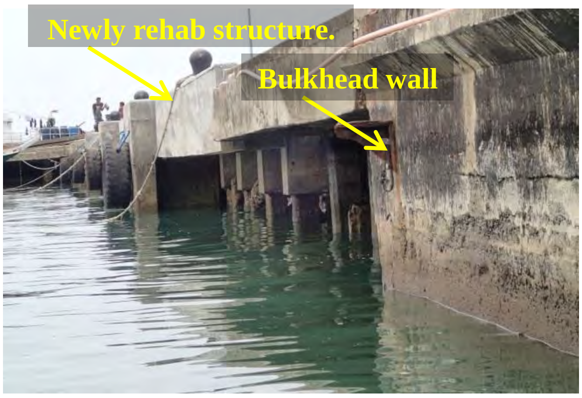


Figure No.5
Figure shows portion of the newly rehab structure.

Figure No.6
Newly Rehabilitated Pier/Trestle.

Figure No.7
Portion of the old RC Pier with structural damages visible.

Figure No.8
RC Piles on the existing RC Pier.

Figure No.9
Bulkhead/Grouted Riprap at the north side of the port.

Figure No.10
Bulkhead wall at the right side of the port.

Figure No.11
Back up area in front of PTB.

Figure No.12
Back up area in front of PTB.

Figure No.13
Back up area at the right corner of PTB Building.

Figure No.14
PTB at Ground Flr. and PPA Admin @ 2nd Flr.

Figure No.15
Inside the PTB at Ground Floor

3.1.5. Estancia Port (Fishport)

Figure No.1
Existing RC Pier

Figure No.2
Left side of the Rock causeway facing on shore.

Figure No.3
Right side of the Rock causeway facing on shore.

Figure No.4
Right side of the Pier facing offshore.

Figure No.5
Auction/Market Hall

Figure No.6
Auction/Market Hall

Figure No.7
LGU Port Office

Figure No.8
Port Passenger Terminal building.

3.1.6. Ajuy Port,

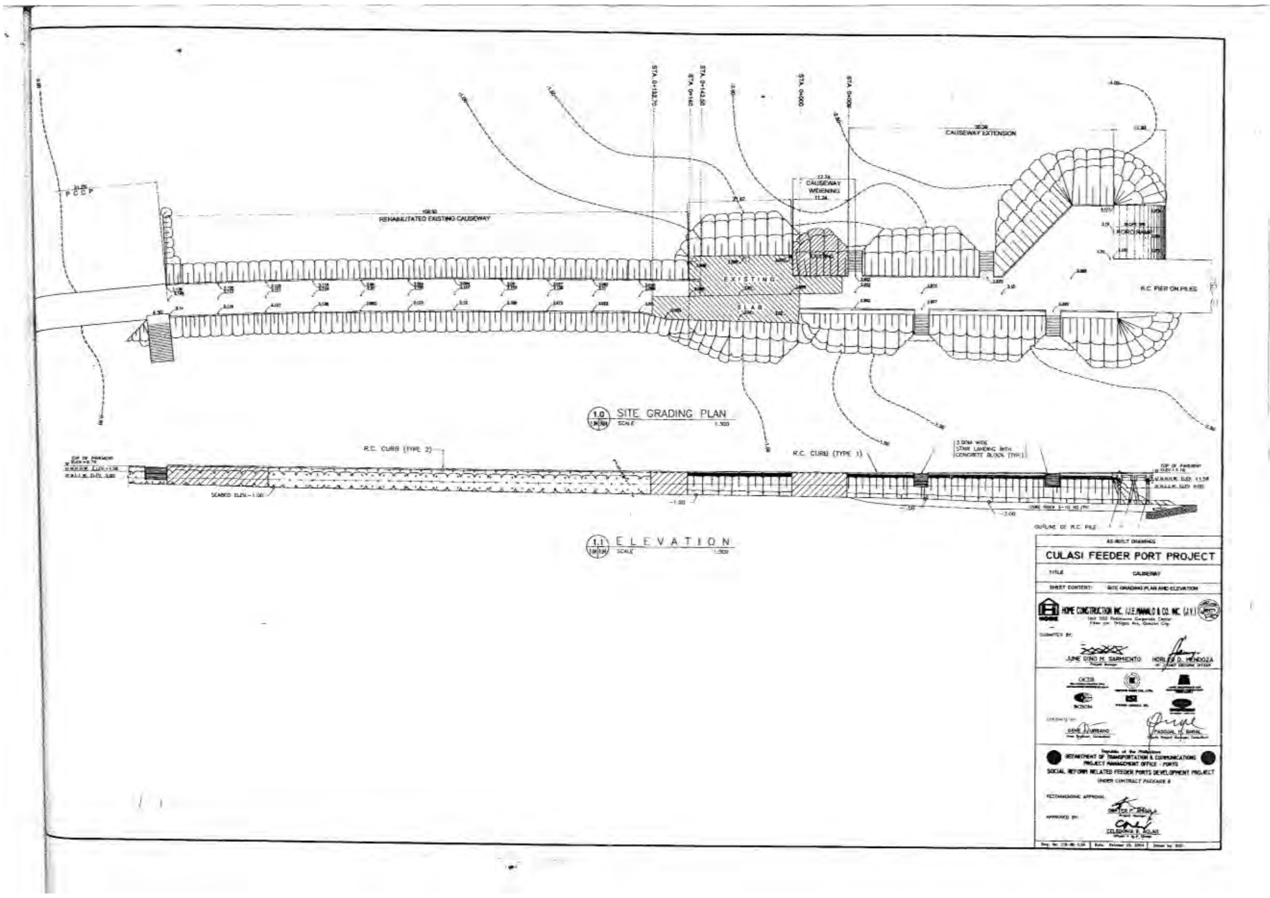


Figure No.1

Existing Port Layout

Figure No.2
Left Side of the RC pier.

Figure No.3
Right side of the Rock Causeway.

Figure No.4
Left side of the Rock Causeway.

Figure No.5
Concrete pavement shows in good condition.

Figure No.6
Right side facing onshore.

Figure No.7
Left side facing onshore.

Figure No.8
Motorized Banca/Pump boat landing Area.

3.1.7. PORT OF BANATE

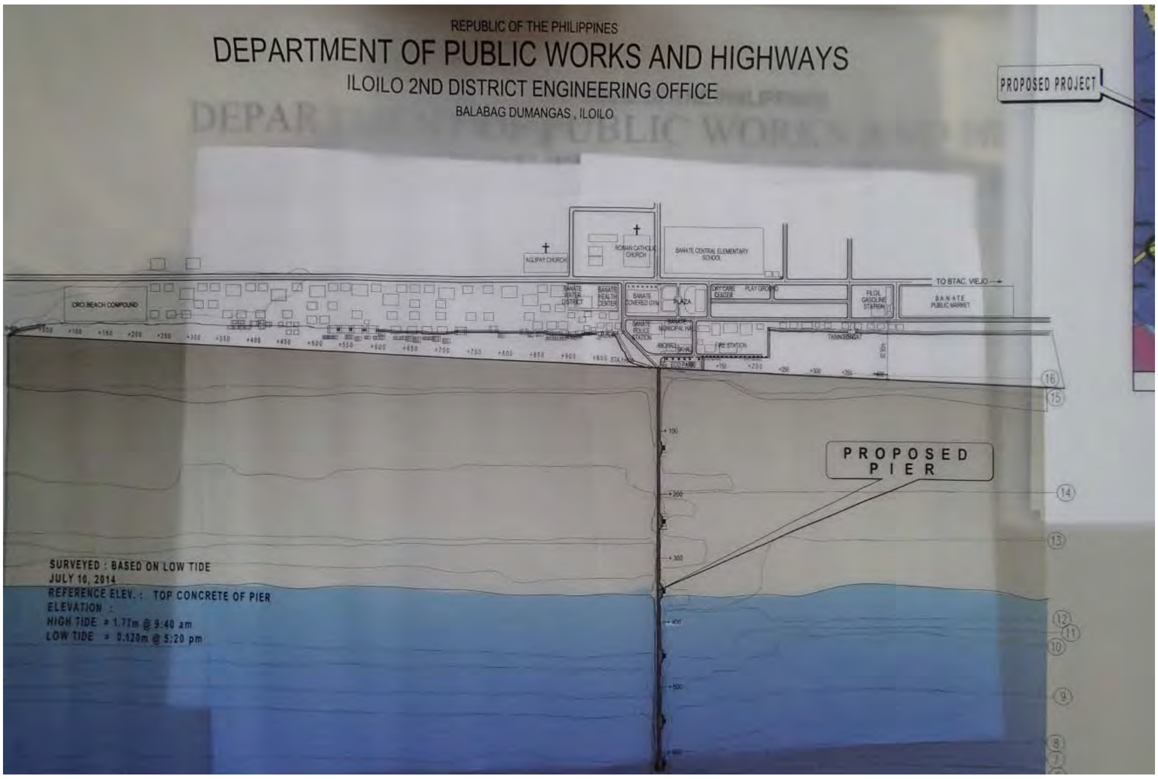


Figure No.1

Existing Port Layout

Figure No.2
Existing Causeway

Figure No.3
A shallow harbor at the tip of the Causeway. The Figure shows the left side of the port.

	
Figure No.4 The Rock causeway showing the right side of the port.	**Figure No.5** Photo was taken facing onshore.

3.1.8. Guimbal Port

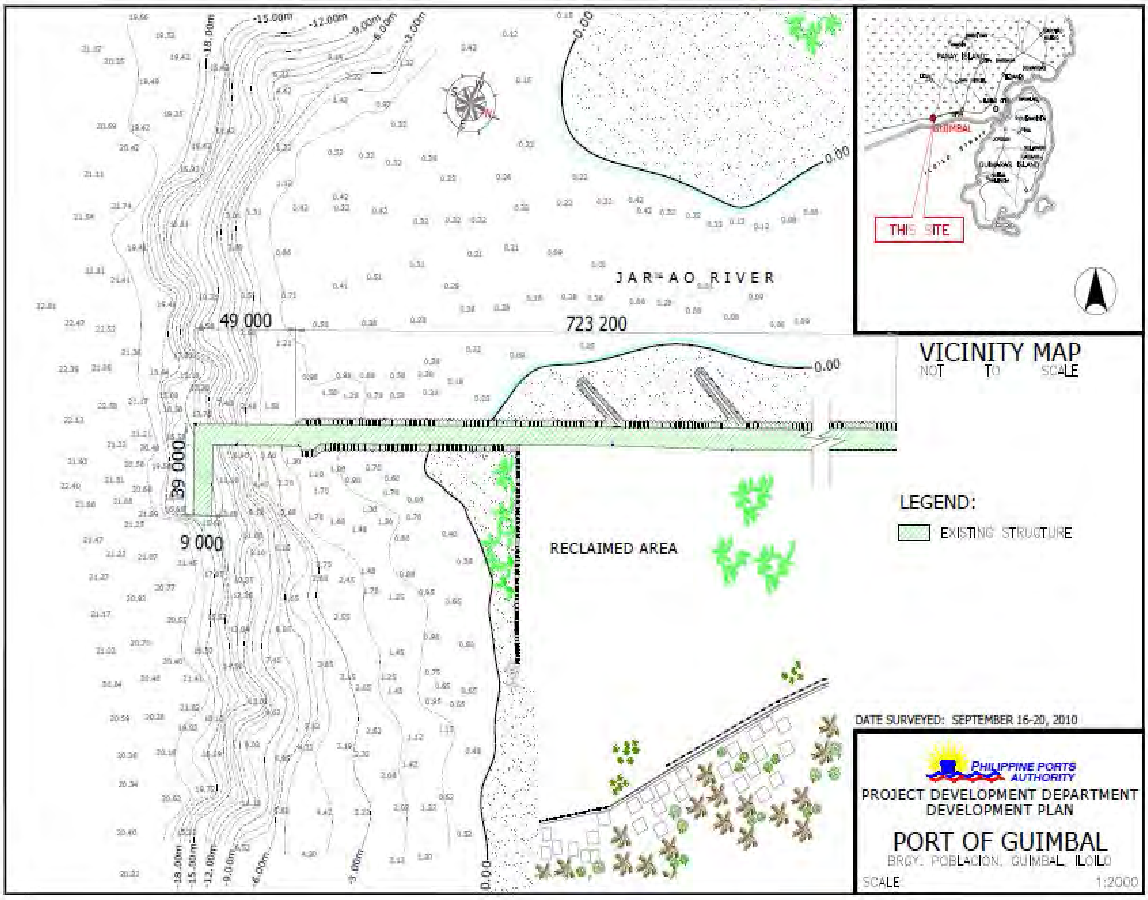


Figure No.1

Port Layout of Guimbal Port

Figure No.2
Existing RC Wharf

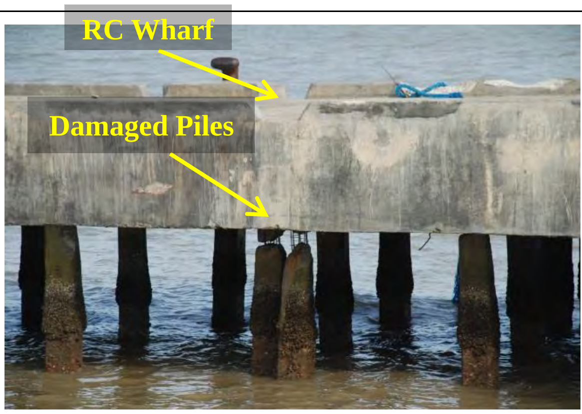


Figure No.3
Damaged RC Piles under RC Wharf.

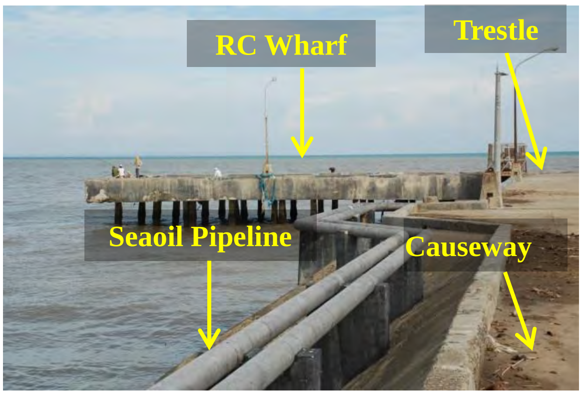


Figure No.4
Port facility showing Seaoil Pipeline.

Figure No.5
Existing Causeway and RC Trestle.

Figure No.6
Condition of RC Piles foundation of RC Trestle.

Figure No.7
Existing RC Wharf.

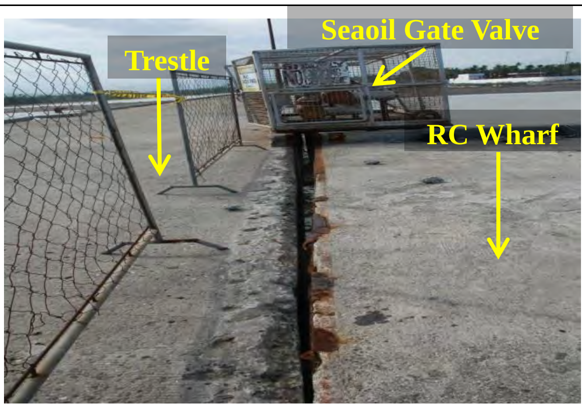


Figure No.8
Gap between RC Trestle and RC Wharf was due to Earthquake in Oct. 2013.

Figure No.9
Misalignment was caused by Oct. 2013, 7.2 magnitude Earthquake.

Figure No.10
Misaligned Berth.

Figure No.11
Seaoil Pipeline along the Causeway and Trestle.

Figure No.12
Figure shows the location of Guimbal Port, Seaoil depot and Municipal Fish Port.

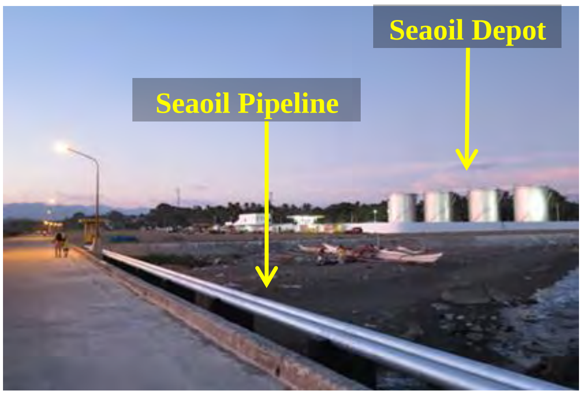


Figure No.13
Figure shows Seaoil Pipeline installed from the Depot along the causeway and trestle up to the Gate valve.

Figure No.14
Figure shows the Municipal Fish Port of Guimbal

Figure No.15
Shore line between Guimbal Port and the Municipal fish Port.

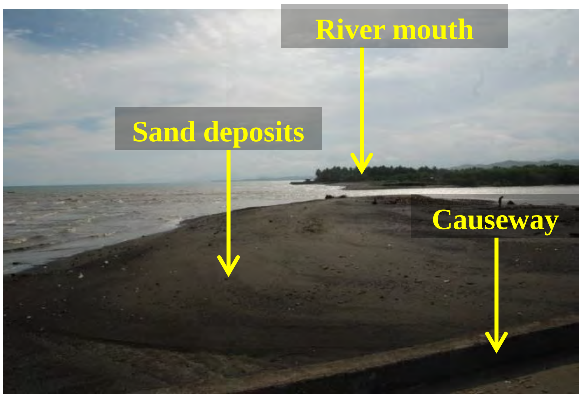


Figure No.16
Sand deposits at the river mouth of Jar-ao river.

Figure No.17
Figure shows Jar-ao river and the access road to the port.

3.1.9. Miag-ao Port

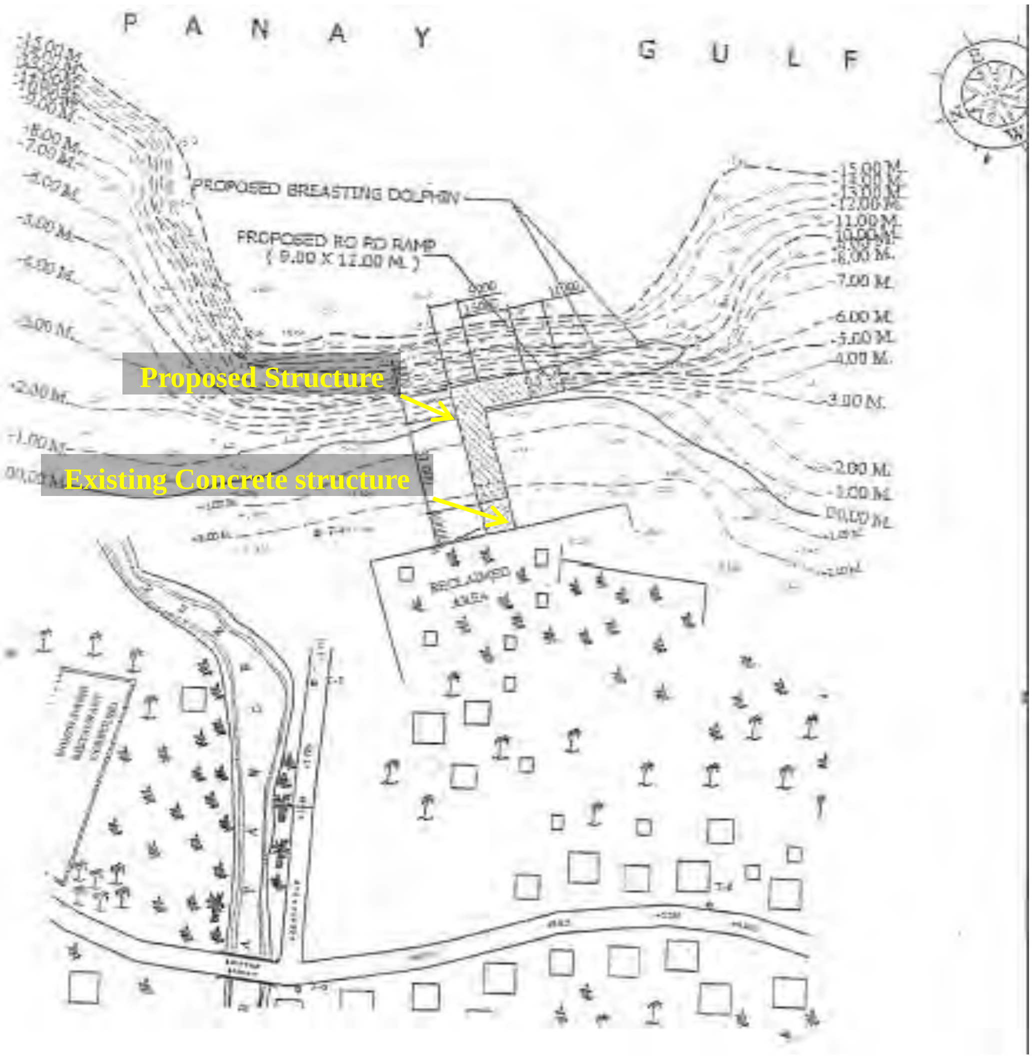


Figure No.1

Proposed Development Plan

Figure No.2

According to LGU Miag-ao the structure was constructed by DPWH during Pres. Marcos time and was suspended after 1986 EDSA revolution.

Figure No.3

Existing Concrete structure on RC pile.

Figure No.4

Fishing Vessel loading crushed ice at Miag-ao port.

Figure No.5

Beach area at the right side of Maig-ao port.

Figure No.6

Vessel anchored at harbor area of Miag-ao port.

Figure No.7

Anchored Fishing Vessels.