DIRECTORATE GENERAL OF SEA TRANSPORTATION

ENVIRONMENTAL IMPACT ASSESSMENT REPORT OF NEW PORT DEVELOPMENT PROJECT IN EASTERN METROPOLITAN AREA (PATIMBAN)

FEBRUARY 2017

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1.1.1 Background, Objectives, and Benefits of the Project

1.1.1.1 Background

Important part of the sea transport is the port infrastructure, which serves oceangoing and coasting activities such as loading and unloading of various goods and passengers as a connecting point for marine and land traffics. Activities in ports may decide a high or low economic growth in a region.

Ports north of Greater Jakarta Metropolitan Area have an important and indispensable role to support the national economy. Especially, Tanjung Priok Port as one of such ports which serves the container transportation in the western part of Java Island, internationally and domestically. The above official decisions attach great importance to the urgency of Patimban Port development plan from the following views :

1. To reduce the logistic cost by building a new port near to the center of production (manufacturing);
2. To ease the land traffic congestion in the Jakarta Metropolitan area by shifting heavy freight traffic through Tanjung Priok Port;
3. To strengthen the resilience of the economy with providing a complemental port to Tanjung Priok Port.

To respond the issues above, Government of Indonesi (GOI), in this case, Ministry of Transportation conducts Comprehensive study as Pre-Feasibility Study and Feasibility Study that have produced technical feasibility and economic and financial shipping safety aspects and environmental carrying capacity. Pre-FS is carried out testting 6 alternative locations that lie in North coast of West Java as Cilamaya Port Replacement :

1. Tarumanegara, Bekasi
2. Pusakajaya, Karawang
3. Patimban, Subang

4. Eretan Beach, Indramayu
5. Balongan, Indramayu
6. Pelabuhan Cirebon

Pre - F / S has compared six (6) candidates from aspects of “Legal / Institutional regulations and restrictions”, “Benefits of Transportation / Logistics”, “Technical issues” and “Impacts on oil / gas facilities”. As the conclusion, Patimban in Subang Regency has been selected as the appropriate site to be a new port on the North Coast in West Java as shown in following table.

Table 1.1. Alternative Location Screening for New Port

Comparison Aspect	Tarumanegara Bekasi	Pusakajaya Karawang	Patimban Subang	Eretan Indramayu	Balongan Indramayu	Cirebon
Legal and Constitutional Aspect	**Proper**	**Proper**	**Proper**	**Not Proper**	**Most Proper**	**Most Proper**
	At Muara Gembong, residential status area.	Status has been assigned RIPN as main port.	Trestle under construction, status change are available.	Mangrove protection forest. Providing replacement was difficult.	Have the regional port, RIPN status has change available.	Have a truly port, land status acceptable.
Transportation Aspect	**Most Proper**	**Most Proper**	**Proper**	**Proper**	**Not Proper**	**Not Proper**
	High demand, but land access isn’t qualified	Base demand near by industrial location.	Increase of demand same as Cilamaya.	Eretan more far than Cilamaya site port.	Relativity low demand. Not proper industrial location.	Relativity low demand
Technical Aspect	**Not Proper**	**Most Proper**	**Most Proper**	**Not Proper**	**Proper**	**Not Proper**
	High sedimentation, high cost for maintenance.	Low sedimentation, low cost for dredging.	Low sedimentation, low cost for dredging.	High sedimentation, high cost for maintenance.	Low sedimentation, low cost for dredging.	Very long channel, high cost for dredging
Safety Shipping and Pertamina Pipe Against Aspect	**Not Proper**	**Not Proper**	**Proper**	**Proper**	**Not Proper**	**Not Proper**
	Have two pipe crossing, must move two part pipe crossing when dredging.	Have seven pipe crossing, at five pipe in 17 m depth, must move part pipe.	Three crossing pipe in -23 m depth and -30. Must not move three crossing pipe, but must be protected, base on quantitative risk assessment.	Must move Three platform in 5 km, need to deals clearance area base on IMO and Pertamina standards.	Must move pipe lines and have a clearance problems, base on IMO and Pertamina standards.	Salvaging is needed, for ammunition.
Social Impact Aspect	**Not Proper**	**Proper**	**Proper**	**Proper**	**Proper**	**Proper**
	Traffic jam in this location is same as Jakarta, so it not proper considered	Changes of land use community and local industry. Yet citizens can growth the local economic	Mayority is paddy field and fishpond, it can be make a changes of land used and growth of local economic of surrounding people	Development will make a change of land used and local industry so it can be growth of local economic	Impact of land usage and local community is small because regional port is in there	Impact of land usage and local community is small because regional port is in there

Source : FS New Port in North Beach of West Java

With the enactment of Patimban as planned of devlopment location a new port on the North Beach of West Java, has been supported by some regulations set by the Indonesia Government to accelerate the progress of the action plan development, such as :

- President Decree (Perpres) No. 3 Year 2016 : Accelerating the Implementation of the National Strategic Projects, Patimban Project to be “Development of New Seaport in West Java (North Beach).
- Presidential Decree (Perpres) No. 47 Year 2016 : Determination of the Patimban Port In Subang, West Java Province, As a National Strategic Projects.
- Minister of Economy Decree (Permenko) No. 12 Year 2015 about Preparation Acceleration of Infrastructure Priority.
- Minister of Transportation Regulation Republic of Indonesia No. 420 Year 2016 : Team Planning, Development and Operation Readiness Port Patimban, Subang, West Java Province.
- Ministry of Transportation Decree No. 475 Year 2016 : On Amendment Decree No. KP 420 2016 About Tim Planning, Development and Operation Readiness Port Patimban In Subang, West Java Province.

Considering the future road conditions and the upper limit of Tanjung Priok Port’s capacity, Directorate General of Sea Transportation (DGST) has made a policy on the demarcation of both port such as like :

- The hinterland of Patimban New Port is established in the northeast of West Java Province.
- The hinterland of Tanjung Priok Port is established in DKI Jakarta, Banten Province, and the Southwest of West Java Province

Figure 1.1. Hinterland of Tanjung Priok Port and Patimban New Port

Development of patimban new port will be parted in four stages of development, these are Phase I Stage 1 (2018-2019), Phase I Stage 2 (2020-2022), Phase II (2023-2026), and Phase III (2027-2036). But, in preparation of EIA Document, it will be limited in study of development of Phase I Stage 1 and Phase I Stage 2 only because detail planning is not able to develop at this time.

The back-up area development is conducted by Public Private Partnership (PPP) so detail design will be made by each invester. Hence, zoning plan is made for the back-up area and based on the zoning plan, environmental impact is assessed.

With the above prospects, DGST's F / S has forecasted the cargo demands such as containers and vehicles, which are main commodities of Patimban new port. it is forecasted that for Patimban New Port which will operate in Phase I Stage 1 (2019), will have 250.000 TEUs (Twenty-foot Equivalent Unit) Capacity and Demand 250.000 TEUs, and will also have large capacity of 7.500.000 TEUs when Development Stage (Phase III/ Year 2029) is completed with predicted demand as large as 5.096.000 TEUs.

While Car terminal will have 198.902 CBU (Completely Built-Up) capacity in early operation in 2019 with demand 101.788 CBU, and after entire stages have completed (Phase III/ year 2036) it is forecasted total demand for car terminal will be up to 455.990 CBU with terminal capacity up to 500.000 CBU. Figures of capacity demand and predicted capaity for container terminal and car terminal of Patimban New Port can be seen in figures below.

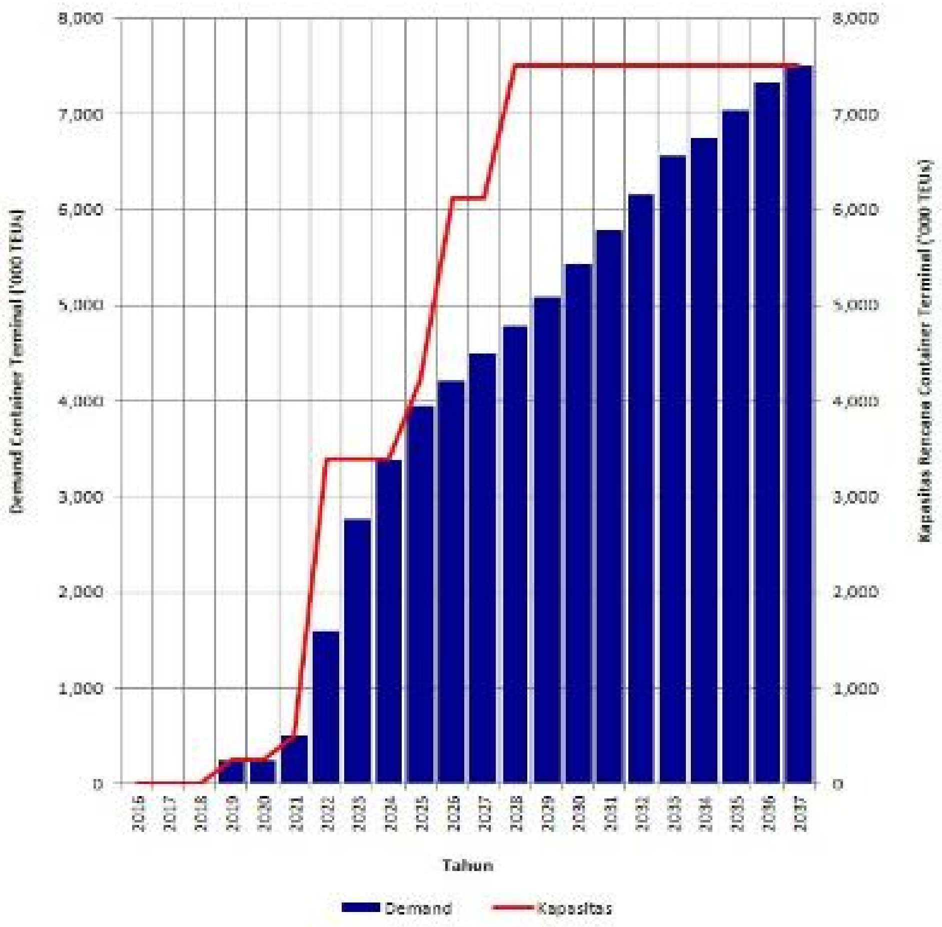


Figure 1.2. Demand Forecast in Container at Patimban New Port

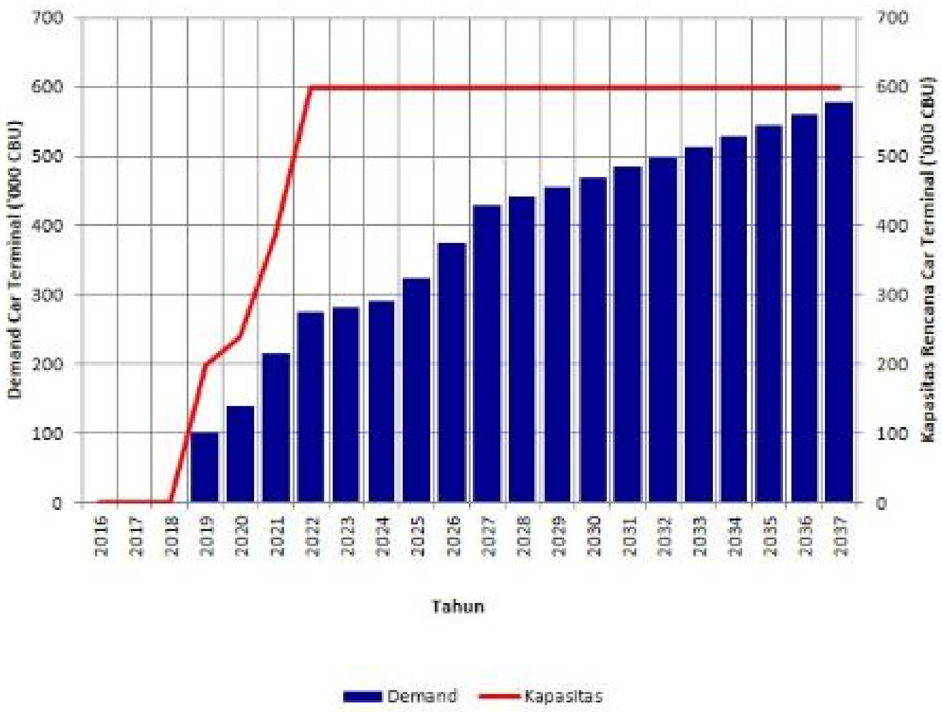


Figure 1.3. Demand Forecast in Vehicle at Patimban New Port

Patimban Port will be constructed as a large - scale and deep - sea international port, which will be categorized as a Major Port (Pelabuhan Utama). As main facilities, there are four (4) container terminals and one (1) car terminal. The whole facilities are expected to be completed in 2036 with the target cargo volume of 7.5 million TEUs and 500 thousand cars (CBU).

The Development of Patimban New Port includes in EIA mandatory criteria. Regarding the environmental protection laws and regulations, there are Law No. 32 in 2009 on the Protection and Management of the Environment, Government Regulation No 27 in 2012 on Environmental Permits, and Regulation of the Ministry of Environment No 05 in 2012 on Type of Business Plan and of Activity Requiring EIA. Therefore Ministry of Transportation will conduct only one type of Activity/Bussiness whose development and/or supervision authority is under one ministry, non-ministry government institution, provincial government unit, or city/regency government. Then in the study, single EIA (AMDAL) Approach is implemented.

As shown in **Table 1.2**, the dredging and dumping volume, length of jetty, length of breakwater, terminal (container yard) area and reclamation volume.

Table 1.2. Mandatory Criteria of EIA (Sea Port Category)

Category	Type of Business/Activities		Screening Criteria of AMDAL	Action Plan
Port	Dredging and Dumping	Capital Dredging	Volume >500.000 m3	26.050.000 m^3
		Dredging with Cutting Stone	>250.000 m3 or All	-
		Dumping	Volume >500.000 m3 or Area >5 Ha	23.750.000 m^3
	Port Facility	Jetty with sheet pile or open pile	Length >200 m or Area >6.000 m2	-
		Jetty with massive construction	All	6 *berth* with long of each *berth* is 840 m
		Break Water	Length >200 m	2.338 m
		Port infrastructure (terminal, warehouse, container yard, etc.)	Area >5 Ha	10 ha
		Floating facility	Ship >10.000 DWT	165,000 DWT (Maersk E Class)
	Reclamation		Area >25 Ha or Volume >500.000 m3	10.300.000 m^3

Note : $^{*)}$ = Government Regulation No. 5 year 2012 About Planning Activity and / or Mandatory Criteria of EIA

Patimban New Port will be classified as an international port. Thus, in accordance with the Regulation No. 08 in 2013 on Protocols of Assessment and Examination of Environmental Document and Enviroment Permit Issuance, for development of main port or Collecting Port, then the Authority of EIA Document Assessment is on Centre Commission of AMDAL Assessment of Ministry of Environment and Forestry.

1.1.1.2 Objectives and Benefits of the Project

Objectives

Objectives of Patimban New Port Project are as follows :

1. Building a supplemental port instead of Tanjung Priok which is reaching the upper limit of its capacity;
2. Coping with the demand growth of port cargoes such as containers and vehicles at an international port with international standards in West Java;
3. Easing the road traffic condition in order to shorten the delivery time, to save the logistics cost and to improve the energy efficiency;
4. Stimulating the economic growth and the development of industrial areas in the west of Java Island due to the facilitation of exports and imports;
5. Developing the economy of the surrounding area of Patimban New Port;
6. Creating job opportunities for the local community.

Benefits

Benefits from Patimban New Port project are as follows :

1. Overcoming a “bottleneck” of port infrastructure’s capacity, which will attract various investments and activities to West Java Province, among Subang Regency;
2. Providing an alternative port for port users, which will induce a competitive condition to Tanjung Priok for saving logistics cost and time;
3. Building and operating a large international port, which will bring job opportunities and an economic growth in surrounding areas.

1.1.2 EIA Preparation

1.1.2.1 Initiator and Responsible Person

Initiator	: Directorate General Sea Transportation, Ministry of Transportation
Address	: Jl. Medan Merdeka Barat No. 8 Gd Karya Lt. 15, Jakarta
Phone / Fax	: 021-3811308 Ext 4175
Responsible Person	: Director of Port, DGST, Ministry Of Transportation

1.1.2.2 Implementing of EIA Study

Implementing of EIA study is arranged by EIA team who formed by proponent.

Table 1.3. List of EIA Study Preparation Team of Patimban New Port Development

No	Organization	Position
1	Local Consultant	Team Leader
2	Local Consultant	Physic and Chemical Expert
3	Local Consultant	Social and Culture Expert
4	Local Consultant	Environmental Expert
5	Local Consultant	Biology Expert
6	Local Consultant	Transportation Expert

Table 1.4. List Interviewees / AMDAL Expert and Supporting Team

No	Organization	Position
1	Local Consultant	Speaker / Interviewees Port
2	Local Consultant	Hydro-Oceanography Expert
3	Local Consultant	Geology Expert
4	Local Consultant	Social, Economic, and Culture Expert
5	Local Consultant	Assistant of Social and Fisheries Expert
6	Local Consultant	Social, Economic, and Culture Expert
7	Local Consultant	Secretary Team
8	Local Consultant	Assisstant of Biology Expert

1.1.3 Description of Project Plan Which Will Be Examined

Patimban New Port will be a International level Container Loading-Unloading and Car Port. Plan of development of the port is one of biggest for Port Sector of Indonesia, because of owned cargo volume will be same as Tanjung Priok Port one, which is the biggest port in Indonesia. Plan of Development of Patimban new Port, consists of some development activities where ± 178 Ha Area will be used for Terminal Area Development, 15.38 Ha Area will be used for Road Access construction 8 km long, also ± 10 Ha will be used for back up area, from 356.23 Ha land acquired, will be built by DGST of Ministry of Transportation. Main location of development of Patimban new Port is Village of Patimban, Sub-District of Pusakanagara, Regency of Subang, with area boundaries as below :

North : Java Sea
South : Pantura National Road (Sub-District Pusakanagara and Pusakajaya)
East : Regency of Indramayu
West : Public owned lands in form of Fishponds and Paddy fields (Sub-District of Pusakanagara).

The entire location of project that covers back up area and road access, covers several Villages such as Villages of Patimban, Kalentambo, Gempol, Kotasari and Pusakaratu that include in Pusakanagara District, also Pusakajaya Village, Pusakajaya District.

Existing Condition of Port

Existing activities in the seaport location are some types of fishing activities in the sea, fishpond industry, and shipping traffic such as fishermen ships and fishing activity, and PT. Pertamina Hulu Energi (PHE) ONWJ oil and gas pipelines. While the description in the area which will be built existing seaport facilities are as follow:

Table 1.5. Existing Port Facility

Port Facility	Dimension
Causeway	356 m x 8 m
Trestle	573 m x 8 m

Patimban regional feeder seaport existing condition can be seen in this following figure. While the cross-sectional picture of this existing jetty can be seen in the appendix page.

Figure 1.4. Port Existing Condition

Back Up Area Existing Condition

Area that will be built in back up location is land owned by local residents, private sector, and village government. Existing condition of back up area land is dominated by fishponds and paddy fields, also there are some residences, trade activities such as minimarkets and shops, and home-scale industries such as salted fishes and shrimp paste.

Figure 1.5. Existing condition of Back Up Area

Existing Condition of Access Road

Land that will be built for Access Road is land that mostly acquired by Regency of Subang Government for development of Existing regional port, as long as 6 km and 30 m width, also there are lands owned by public inside. Existing condition of access road land is a trail, paddy field, residence before. Now, the acquired land condition is trail opening so people called it as tanah merah (red soil).

Figure 1.6. Existing Condition of Access Road

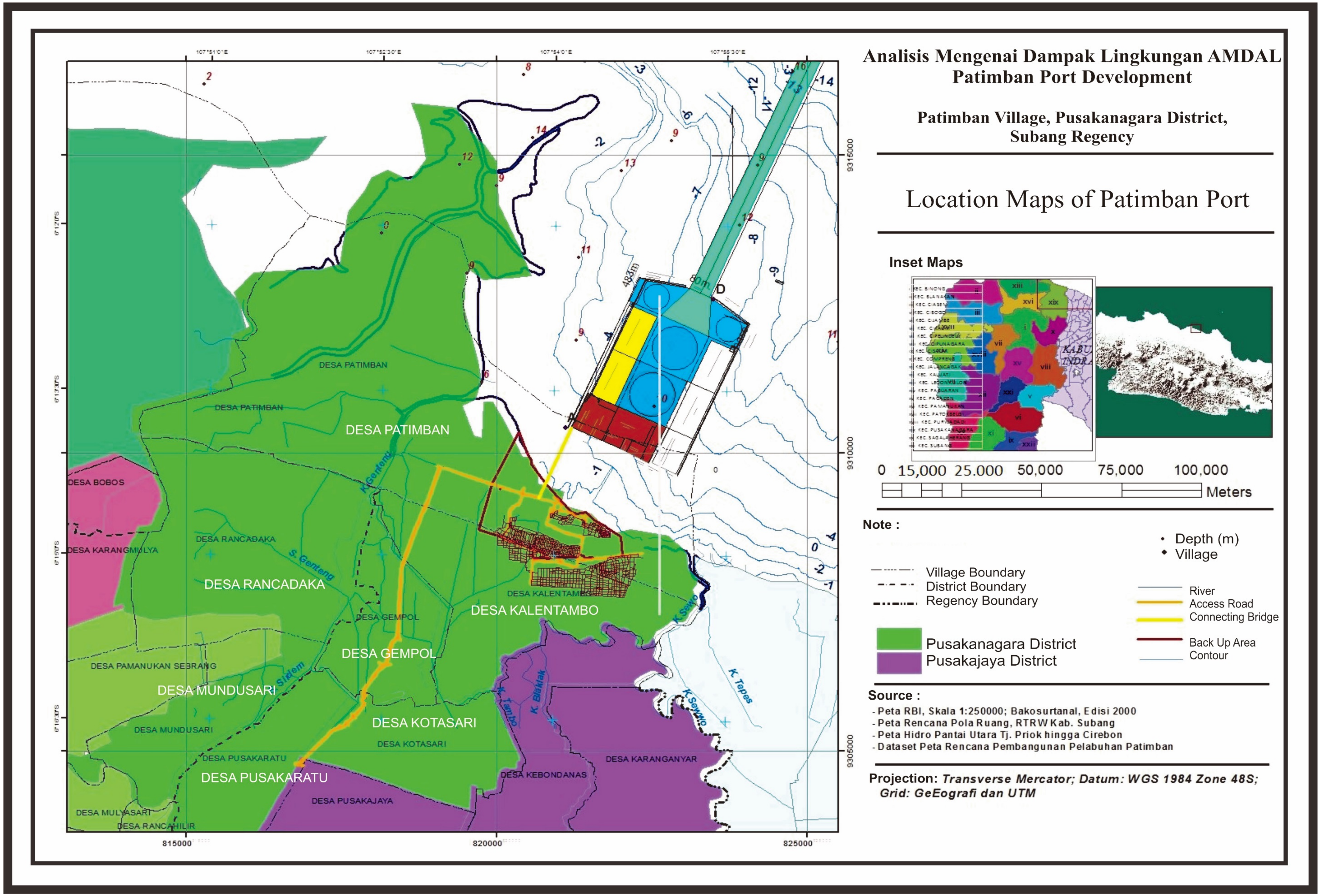


Figure 1.7. Patimban Sea Port Location

1.1.4 EIA Status Study

EIA study is made after feasibility study has conducted, but at same time with feasibility study and Master Plan of Port Study reviews. However study of detail design will be create soon after review of feasibility study has completed. In project location, there is existing Patimban Port with status as Regional Feeder Port.

1.1.5 Conformity with Spatial Plan (National/Regional/Master Plan of Port)

Conformity with Regency of Subang Spatial Plan

Patimban Port is located in Sub-District of Pusakanagara, Regency of Subang, based on Peraturan Daerah (Perda) Regency of Subang No. 3 year 2014 on Spatial Plan of Regency of Subang Year 2011-2031, project location includes in PKL Perkotaan Pusakanagara, where the functions of PKL Perkotaan Pusakanagara are :

1. as main Growth centre of regional
2. Central government of Sub-District
3. Centre of Service Trades, Centre of regional scale and inter-regional residences

Development of Patimban New Port Plan is expected will be centre of regional and national main growth. With this peroject, it will strengthen PKL Perkotaan Pusakanagara as regional centre of Main growth. Location of project, Patimban Village, is directed as location of Development of Patimban new Port as Feeder Port (Article 16 Perda No. 3 year 2014). In this times, Regulation Regional Spatial Plan has been observe again in parth of ravision phase to change Feeder Port area into a major Ports, by virtue of the Subang Regent Recommendation No. 511.43 / 1688 / Bapp, on November 25, 2016.

Based on map of spatial pattern of Subang Regency, location of project includes in wetland agriculture as local port plan/feeder port. With plan of development of Patimban New Port becomes international-scale Port, Spatial Plan of Regency of Subang is needed to be revisioned, so Patimban Port is able to become Main Port. And with recommendation letter from Subang Regent No 511.43/1688/bapp, Patimban Port development has been compliance and will be priority in change process of spatial plan of Subang Regency.

Conformity with West Java Province Spatial Plan

Based on Map of West Java Province Spatial Plan Year 2009-2029 (Perda of West java Province No. 22 year 2010 on Plan of Spatial Plan of West Java Province year 2009-2029) that location of the project is directed as Village residences, while based on direction of development area Allotment that the project plan includes in WP Purwakarta with development direction to develop food crop agriculture, agroindustry, non-pollutive and non-extractive manufacture industry, creative and multimedia industry, marine business that is highly competitive and export oriented. Subang Regency is directed to be supporting node to PKN Kawasan Perkotaan Bandung Raya, directed to be sustainable wetland agriculture, non-pollutive and non-extractive manufacture industry or not disrupt irrigation and water reserve and to not cause function change of paddy field lands, marine business, and non-metal mineral Mining.

While according to Spatial Sturcture of West Java Province, Patimban Port Location yet includes in Map pf Spatial Structure of West java Province, where plan of development of main port is still in Cilamaya. According to that, based on recommendation letter from West Java Governor No 550/5917/Dishub, that Patimban Port development will be integrated with region development plan and will be included from in West Java Spatial Plan by revised on Perda Provinsi Jawa Barat No. 22 tahun 2010, about West Java Spatial Plan Years 2009-2029. Therefore, revised of spatial plan is needed included Patimban Port development.

Conformity with RZWPPPK of West Java Province

Based on letters from Ministry of Agricultural and Spatial Planning / National Land Agency no. 40/200/1/2017, Patimban Port development has been included in Perda no 16 about Zonation Plan of Coastal Areas and small Island in West Java Province Years 2013-2029. Therefore, patimban Port development has been correct with RZWP3K , West Java Province.

Conformity with National Spatial Plan

Patimban Port has been appointed as National Strategic Project as in President Decree No. 47 year 2016 on Establishment of Patimban Port in Regency of Subang, West Java Province as National Strategic Project as stipulated in President Decree No. 3 Year 2016 on Acceleration of Implementation of National Strategic Project. Based on letters from Ministry of Agricultural and Spatial Planning / National Land Agency no. 40/200/1/2017, that Patimban port development has been acomodated with government regulation plan in no 26 Years 2008 about National Spatial Plan. Therefore, Patimban Port development has been conformed with National Spatial Plan.

Conformity with National Master Plan of Port and Master Plan of Port of Patimban

Based on Ministry of Transportation Decree No. KP 745 Year 2016 regarding Second Amendment of Ministry of Transportation Decree No. KP 414 Year 2013 on Establishment of National Port Master Plan, that the construction of Patimban Port located in Subang, West Java Province. Then, based on the Decree of the Ministry of Transportation No. 901 2016 About the National Ports Master Plan, Patimban Port designated as major Ports. The Terms of Reference Document prepared in accordance with the Port Development Plan of Patimban in Patimban Port Master Plan of West Java Province No. KP 87 Year 2017. Therefore Patimban Port development has been accordance with changes in National Masterplan and RIP Patimban that have been prepared.

Conformy with PIPPIB

Reviewed by Conservation Aspect, that is Indicative of New Permit Postponement that is released by Ministry of Environment and Forestry, Project Location does not include in region that is postponed its permit because not include in Map of Revision XI Sheet 1209, so Development of Patimban Plan has been conformed with the exist PIPPIB. Map of PIPPIB and Spatial Plan of Regency of Subang can be seen in following figure.

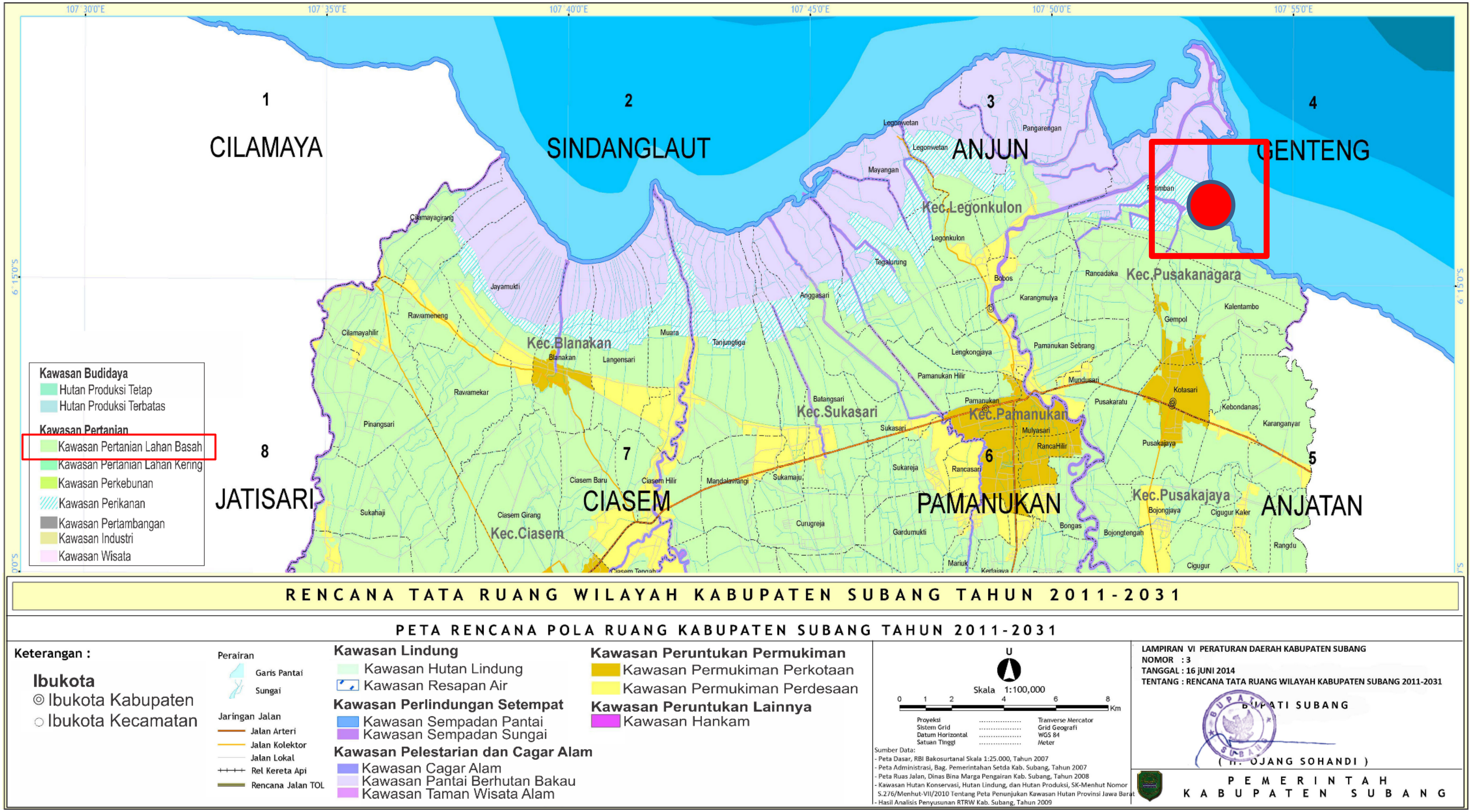


Figure 1.8. Spatial Plan Maps of Subang Regency, 2011 - 2031

Figure 1.9. Spatial Structure Plan Maps of Subang Regency, 2011 - 2031

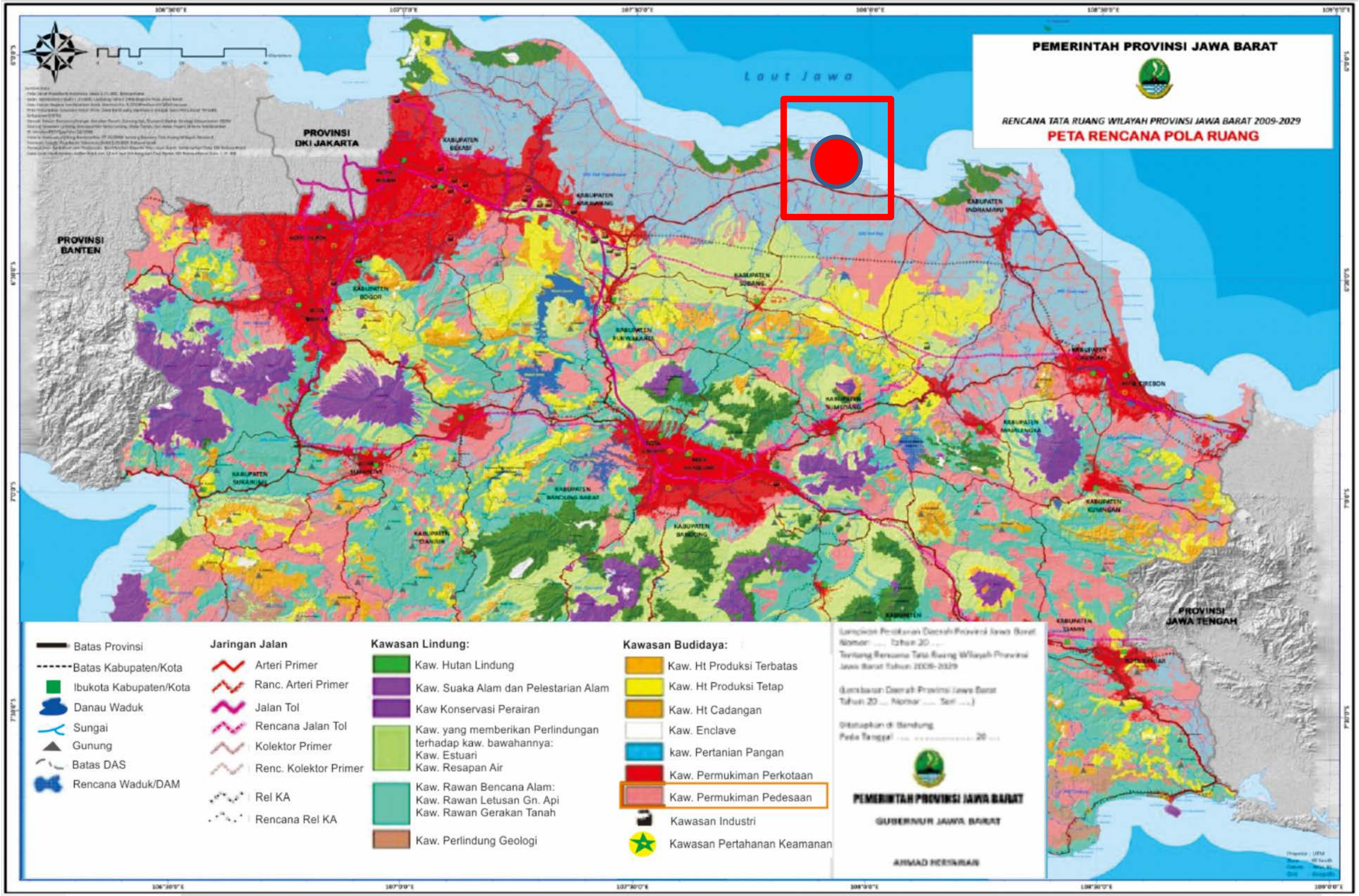


Figure 1.10. Spatial Structure Plan Maps of West Java, Year 2009

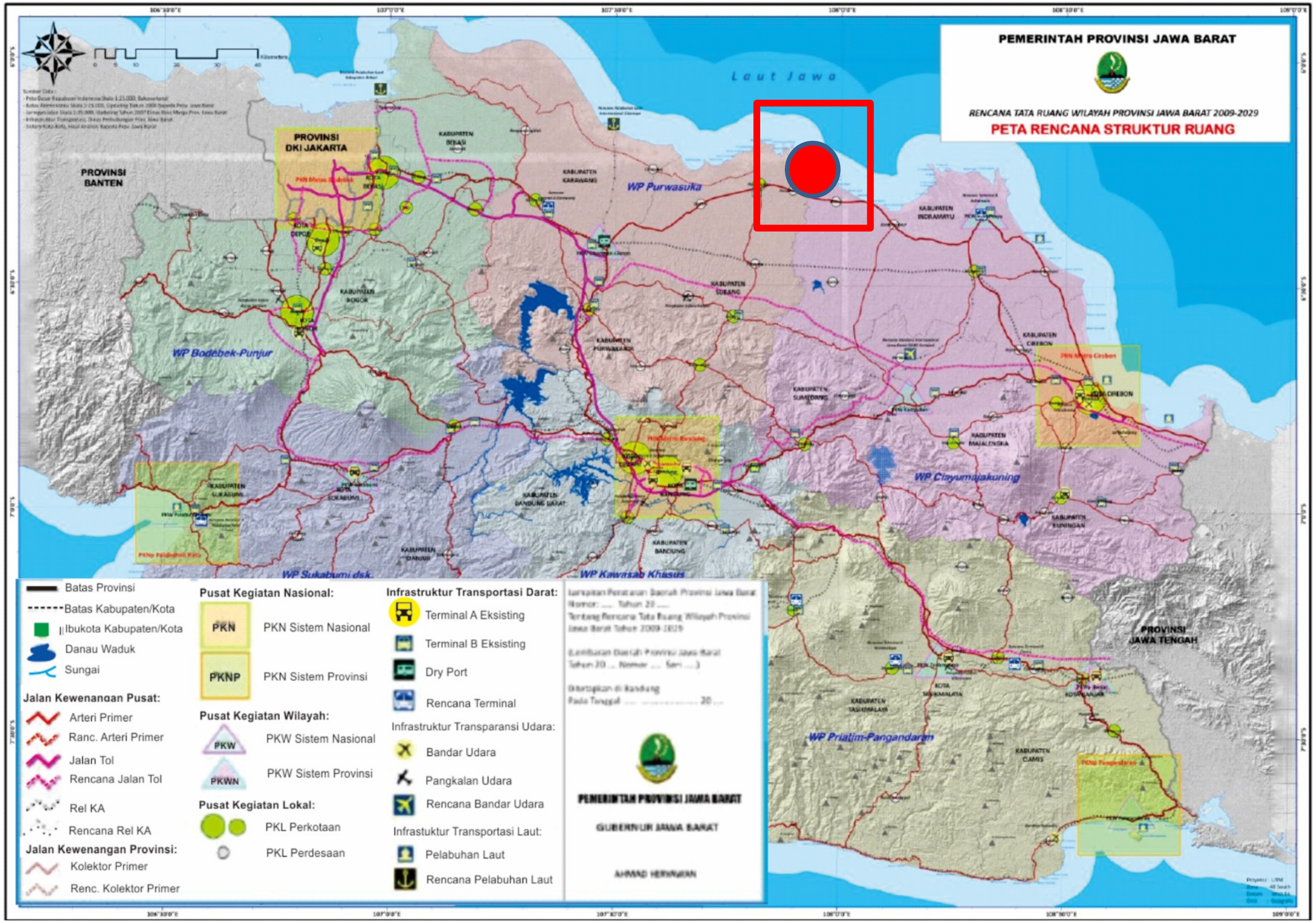


Figure 1.11. Spatial Plan Maps of West Java, Year 2009

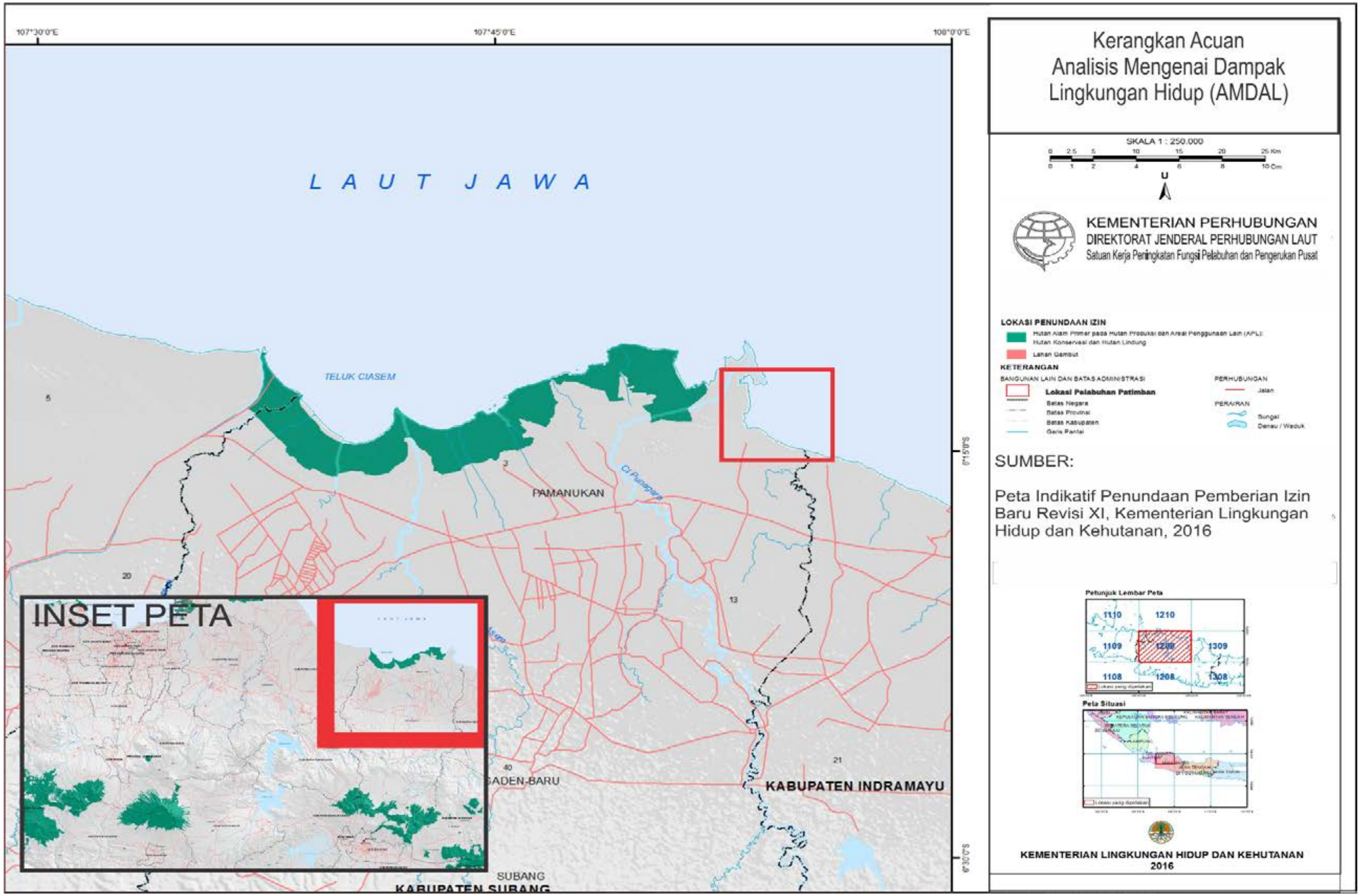


Figure 1.12. Patimban location Based on PIPPIB Maps

1.1.6 Components of Project Plan Cause Impact

1.1.6.1 Outline of Development of Patimban New Port Plan Based on Master Plan of Port of Patimban

Patimban seaport development plan consists of 4 development phases, Phase I stage 1 (2018-2019), Phase I stage 2 (2020 – 2022), Phase II (2023 – 2026), and Phase III (2027 – 2036). But the scope of the study in the document is only in development phase I stage 1 untill phase 1 stage 2. The details of development in the Phase I stage 1 – Phase I stage 2 are in these following table:

Table 1.6. Type of Each Phase Development Activity

Port Facility	Phase I Stage 1	Phase I Stage 2	Total	Note
Container Terminal 1 (*berth* 1) (*berth* 3)		40 ha (840m) (480m)	40 ha	(*) : Just only land preparation I, not build in Phase I
Container Terminal 2 (*berth* 2)	13 ha (300m x 35m)	27 ha (540m)	40 ha	
Car Terminal (*berth* 7)	9 ha (250m x 35m)	16 ha (440m)	25 ha	
Port Service Terminal (*berth* 8)		2 ha (330)	2 ha	
Ro Ro Ships Terminal Roro *berth*		5 ha (170m)	5 ha	
Inspection Area	3 ha		3 ha	
Truck Waiting Area	11 ha		11 ha	
Utility Area	17 ha		17 ha	
Port Office Area	5 ha	1 ha	6 ha	
Waaste Oil Treatment Area		2 ha	2 ha	
Railway Unloading Area*	3 ha	8 ha	11 ha	
Inner Road	5 ha	4 ha	9 ha	
Buffer Zon*e*	2 ha	5 ha	7 ha	
Total	**68 ha**	**110 ha**	**178 ha**	
Breakwater	2.338 m		2.338 m	
Seawall	4.680 m		4.680 m	
Revetment	1.736 m		1.736 m	
Shipping Line	Kedalaman -10 m Lebar 160 m	Kedalaman -14 m Lebar 280 m		
Back Up Area Facility	**Phase I Stage 1**	**Phase I Stage 2**	**Total**	**Note**
Area Publik (Fasum Fasos)	5 ha		5	Land acquisition for back up area is 356,23 ha
Area Utilitas	3 ha		3	
Outer Road		2 ha (3.800m x 5m)	2	
Total			**10 ha**	
Access Road Facility	**Phase I Stage 1**	**Phase I Stage 2**	**Total**	**Note**
Access Road (8.100m) Port Access Road Ring Road in Road	30 ha** (5.000m x 20m) (3.100m x 20m)		30**	(**) land is acquired from 5.000 m (to back up area) x 60 m for development in the future
Connecting Bridge	2,1 ha (1.000m x 20m)		2,1	
Extention Jetty		0,3 ha (350m x 8m)	0,3	

Source : Masterplan of Patimban, 2016; Basic Design, 2017

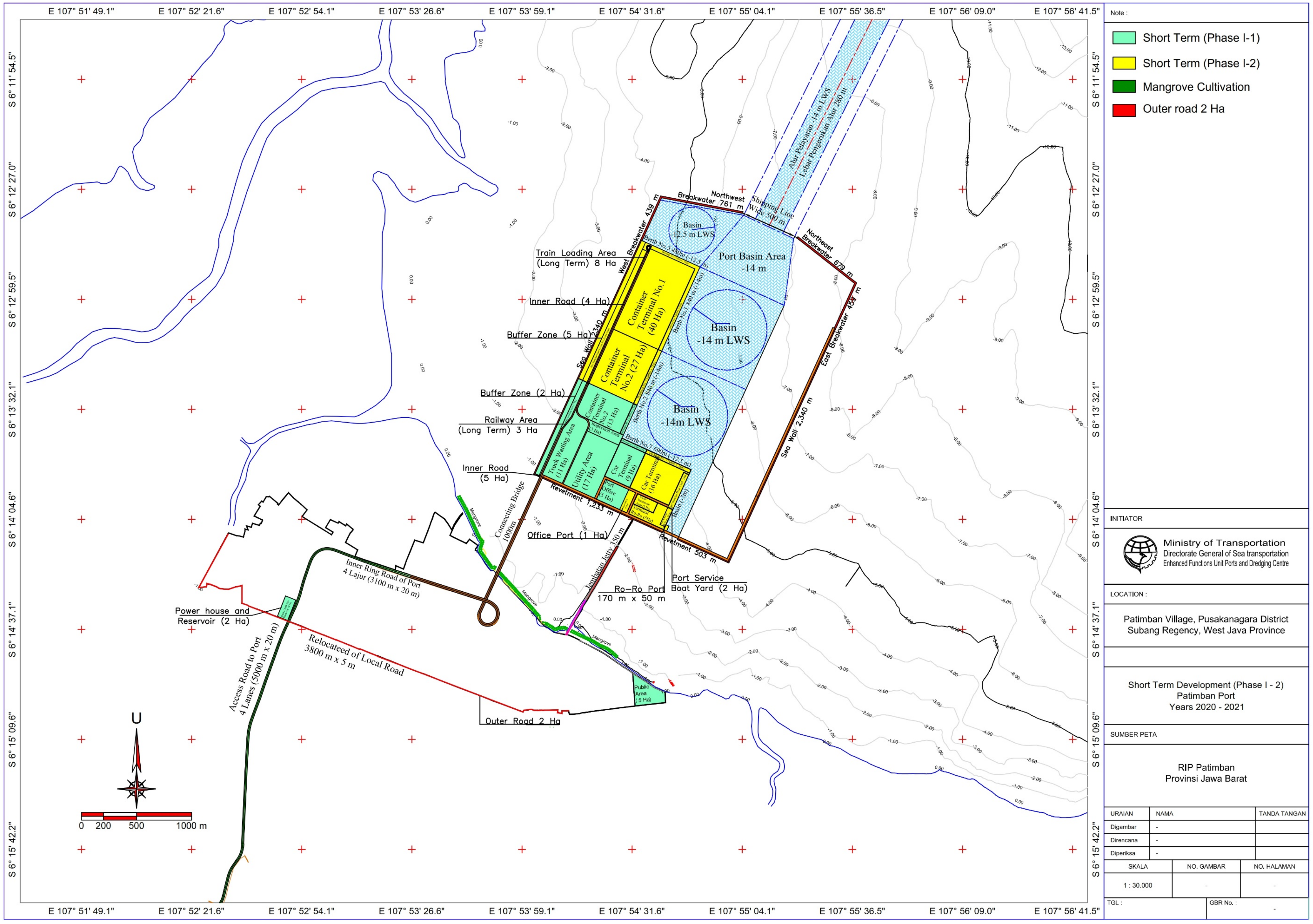


Figure 1.13. Layout Patimban Port Development

1.1.6.2 Details of Development Activities which will be examined

Development plan of Patimban New Port will be examined in depth in EIA Document, covers Phase I Stage 1 and Phase I Stage 2, with Types of Activities as Below :

a. Construction of Terminal Area with 178 Ha Area, consist of:
   - Development Phase I Stage 1 (2018-2019) : 68 ha
   - Development Phase I Stage 2 (2020-2022) : 110 ha
b. Zoning plan of back up area is 10 ha, including 3 Ha for utility area, 2 Ha for Outer road, and 5 ha for public area; with total Land acquisition as vast as 356.23 Ha.
c. Construction of Access Road as long as 8,100m x 20m, Connecting Bridge 1,000 m x 20m, and Jetty Extention 35m x 8m.

In the future, back up area is still zoning plan, because of the consideration that the director general of sea transportation will cooperate with the private sector in back up area development so the details of design will be prepared and constructed by the private in the next phase. For the development phase I, after land acquisition, fencing activity will be held on all of back up area and access road locations. The purpose of fencing is to zone the area between seaport and public land, so it will not make public unrest between seaport party and public as the result of land use change. Even so, although fencing activity is carried but the manager will make access road and access bridge for public needed in the location.

In the Patimban seaport plan, it will use green port concept that will be developed by *Sydney Ports CoRporation*. Where the guideline is developed to improve environmental sustainability for the development of new port and to maintain the continuity of the environment from the existing seaport activity. The green port concept which is applied in this development plan is organizing container yard on the 20 m distances from outter wall to minimize horizontal pressure. Moreover, mangrove will be cultivated in the side part of back up area to look after marine and terestrial life existence and also to minimize abrasion and wind impacts.

Other than that, the advanced environmentally friendly technologies will be used in every construction method and structur, such as the use of dredging material to mix with cement for on shore facility development needed in order to minimize dumping volume. Moreover, steel sheet pile will be used for revetment construction which can minimize the fishing ground impact because of the use of slightly rock material.

Furthermore, the details of development schedule for each phase of development can be seen in the table 1.7.

Table 1.7. Schedule Activities of Development of Patimban New Port

Source: JICA Survey Team

1.1.6.2.1 Land Requirement

Land Requirement for Development Phase I Stage 1 until Phase I Stage 2 that are planned will be used for Development Of Patimban New Port as below :

Table 1.8. Total Requirement of Land for Development of Patimban New Port Phase I Stage 1 – Phase I Stage 2

No	Land Usage	Total (ha)
Terminal Area		
1	Container Terminal	80
2	Car Terminal	25
3	Ro-Ro Terminal	5
4	Truck waiting Area	11
5	Utility Facility Area	17
6	Port Service Boat Terminal	2
7	Port Administration Area	6
8	Inspection Area	3
9	Waste Oil Treatment Facility	2
10	Future Railway	11
11	Inner Road	9
12	Buffer Zone	7
	Total	**178**
Back Up Area		
1	Public Area	5
2	Utility Area	3
3	Outer Road	2
	Total	**10**
Access Road		
1	Access Road 8100 m	30
2	Connecting Bridge 1000 m	2.1
3	Existing Jetty Extention 350 m	0.7
5000 m (up to back up area) x 60 m for land acquisition		

Total access road which will build is 8,100m x 20m with 30 ha. While, the land that will be acquired just only 5,000m x 60m with 15,38 ha, because 3,100m is include in back up area land acquisition with 356.23 ha.

1.1.6.2.2 Port Terminal

Construction plan of Patimban Port Area consists of construction of some types of Terminal and Construction of Supporting Infrastructures such as :

a. Container terminal
b. Vehicle terminal
c. Ro – ro ship terminal and ship repair terminal
d. Utility area
e. Inspection area
f. Truck waiting area
g. Railways area and other needs
h. Seaport office area

i. Waste management area
j. Inner Road
k. Breakwater
l. Seawall
m. Berth

a. Container Terminal

For development in Phase I Stage 1 until Phase 1 Stage2, container terminal which will be build is No 1 and No 2, with total area 40 ha. For dimension of container terminal are figure in following table.

Table 1.9. Dimension of Container Terminal

Container Terminal Dimension	Terminal No 1 (40 ha)	*Berth* No 1 depth (m)	-14
		Berth No 1 length (m)	840
		Berth No 3 depth (m)	-12,5
		Berth No 3 length (m)	480
		Back distance of terminal (m)	480
	Terminal No 2 (40 ha)	*Berth* No 2 depth (m)	-14
		Berth No 2 length (m)	840
		Back distance of terminal (m)	480

Source: RIP Patimban, 2016

b. Car Terminal

Vehicle terminal that willl be built is 1 unit on 25 Ha area with capacity of 3.500 CBU. Berth that will be built is berth no 7, with -12,5 m depth, 690 m x 35 m dimension. Vehicle terminal development activity will start in Phase I stage 1 on 9 Ha areas which is consist of outdoor parking area as much as 2 location which each capacity is 3.500 CBU, and then will be enlarged in phase I stage 2 on 16 Ha areas with the addition of outdoor parking area and workshop area, so the total area of vehicle terminal is 25 Ha.

Table 1.10. Dimension of Car Terminal

Dimension of Car Terminal	*Berth* No 3 depth (m)	-12,5
	Berth No 3 length (m)	690
	wide (m)	35

At this moment, there is special Ship that is designed for carrying vehicle. One of Shipping line that has the most Vehicle Carrier is NYK Line. Below, There are some plan specifications of Vehicle Carrier for Patimban Port.

Table 1.11. Types of Vehicle Carrier Ship

No	Name	DWT (Ton)	Capacity (Cars)	LOA (m)	B (m)	D (m)	Picture
1	*Gaia Leader*	21,286	7,000	200	32,3	8,6	
2	*CSAV Rio Grande*	12,315	5,000	183	32	7,9	
3	*Siem Dresden*	13,000	4,000	177	31	7,6	

Source: RIP Patimban, 2016

c. Ro-Ro Ship Terminal and Boat Service Terminal Port

Ro – ro ship (*Roll on Roll off*) terminal is planed to be built in the south terminal area in the Phase I stage 2. Ro – ro ship terminal will have length and width dimension 170 m x 50 m, with about -7 m depth. Ro – ro terminal will be adjacent to service ship terminal with 330 m length and -7 m depth.

Terminal Area for Ro-Ro Ship is 48.500 m^2. This area is divided into :

- Truck waiting yard : 40.000 m^2
- Apron : 8.500 m^2

Table 1.12. Dimension of Petroleum Terminal, Ro-Ro Ship Terminal, and Boat Service Port Terminal

Ro – Ro Ship Terminal (5 ha)	water depth (m)	-7
	length (m)	170
	distance of back terminal (m)	250
Port Service Terminal (2 ha)	Berth No 8 depth (m)	-7
	Berth No 8 length (m)	330
	distance of back terminal (m)	50

Source : RIP Patimban, 2016

d. Utility Area

Utility area will be placed in the back side of terminal, consists of various kind of activities compenents such as fire station, WWTP, gate, tank water, electricity transformer substation, parking lot, and security area, on the 17 Ha areas. This area will be built in Phase I stage 1.

e. Inspection Area

This area is inspection area for container and vehicle that will be transported by truck. It will be used 3 Ha areas and will be built at Phase I stage 1.

f. Truck waiting yard area

Trcuk waiting yard area will be built in seaport area at Phase I stage 1 on 11 Ha areas. Furthermore, this area is waiting lane for container and vehicle transporting truck which also there are gate and security area inside.

g. Trains Loading-unloading area and buffer zone

Railway area and buffer zone are prepared for long term development (out of Phase I). The area location is planned in the left side of terminal. At the Phase I stage 1 of development, land for train loading-unloading will be provided on 3 Ha areas, and at phase I stage 2 on 8 Ha areas, so the total area is 11 Ha. While for buffer zone, at the Phase I stage 1 will be provided 2 Ha areas and at Phase I stage 2 will be provided 5 Ha areas, so the total area for buffer zone is 7 Ha area.

h. Seaport Office Area

Seaport office area will be built in the part of terminal at Phase I stage 1 and Phase I stage 2 which total development area is 6 Ha. Inside the area, there are seaport authority office, immigration, mosque, navigation control tower building, commercial area (public parking lot, ATM centre, shopping centre, bussiness centre), information facility, gate, parking lot, and security area.

i. Waste management area (*Receiving Facility*)

Waste management area or *receiving facility* (RF) is planned to be built in the east part of the port on 2 Ha areas, which the location is adjacent to seaport office area. In accordance to regulation of Ministry of Environment No. 5 article 7 2009, Public seaport has to provide facility to acomodate the ships that is eqquiped by sludge tank (oil residue). That facility is for process the sludge or for temporary sludge storage.

Although other terms from the regulation above have to prepare oil cleaning water management facility from the tank or ship where the bulk cargo ship, chemical product, crude oil, or petroleum product ship are anchored, these terms are not applied in Patimban Seaport.

The sludge ship will be received by sludge collective ship which is located beside the ship, and then anchored in berth no. 8, then transferred to management facility through pipeline or tank truck.

For ballast water management, it will refer to *International Convention for the Control and Management of Ships Ballast Water and Sediments*.

j. Road (*Inner Road*)

Inner road will be built inside of terminal area with land needed for development phase I stage 1 is 5 Ha and Phase I stage 2 is 4 Ha, so the total of area needed for inner road is 9 Ha. Furthermore, the inner road layout can be seen in the picture 1.13.

k. *Breakwater*

Breakwater has function to protect port from waves that can harm port activities. Wave height design is arranged in facility condition time for 50 years, 100 years of re-periode, and less than 40% chance will repeat

Based on created plan, total length of breakwater is 2.338 m. with detail below :

* Northeast Breakwater	679 m
* Northwest Breakwater	761 m
* West Breakwater	439 m
* East Breakwater	459 m

For the location of breakwater that will be build are seen in following figure.

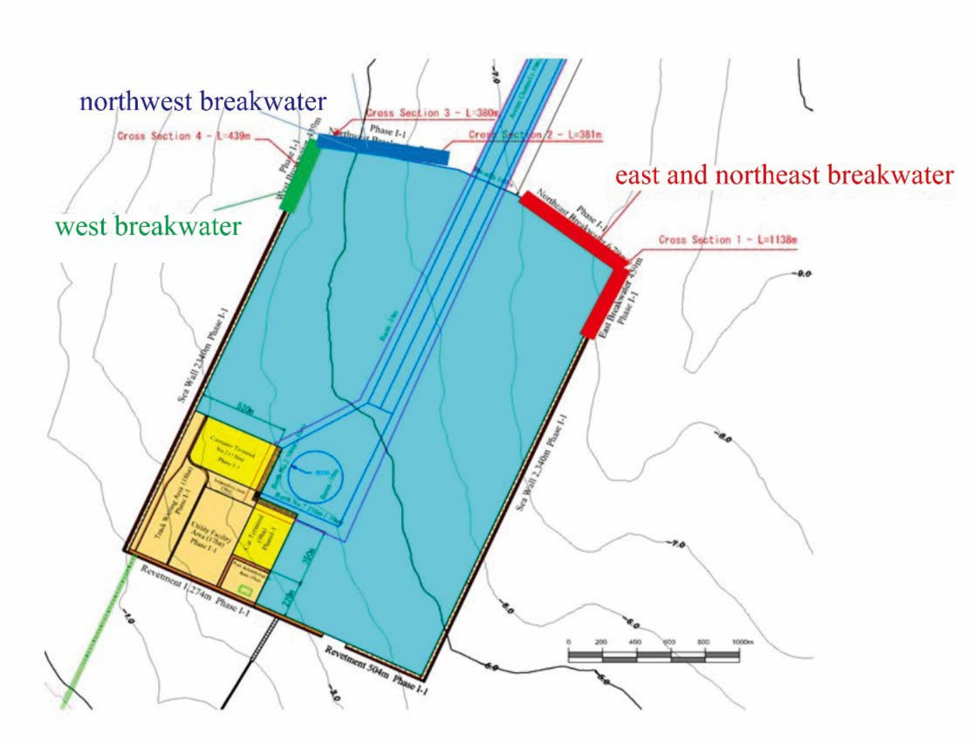


Figure 1.14. Breakwater Location

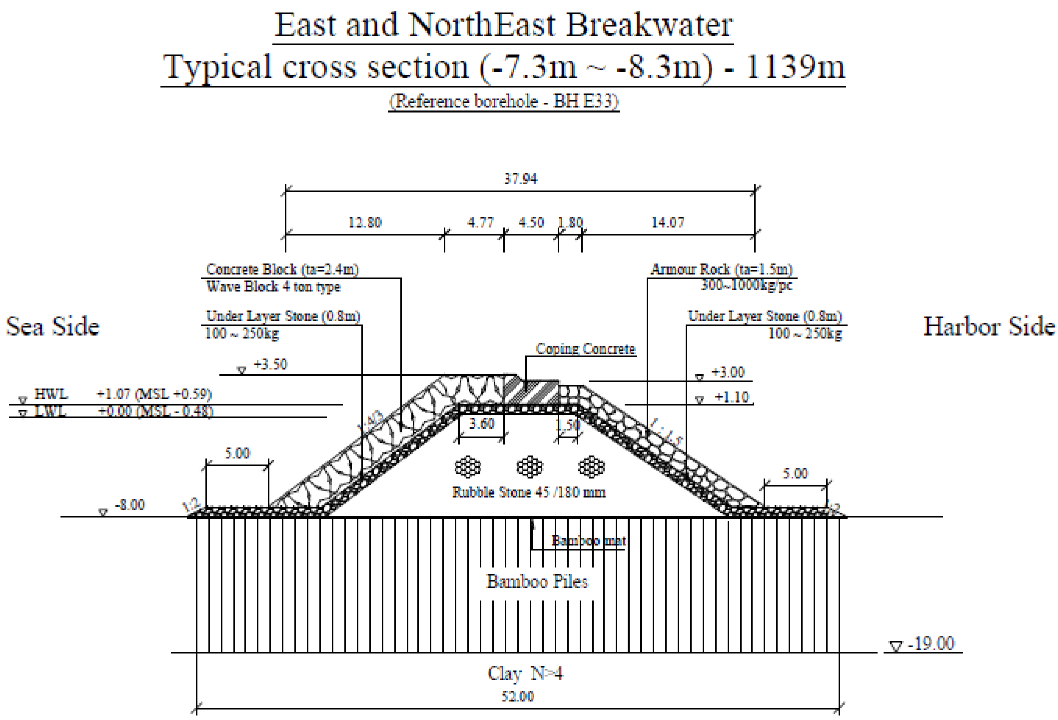


Figure 1.15. Typicall Section of Breakwater

l. *Revetment / Seawall*

Seawall contruction will be built in the side part of Seaport with total length 6.416 m. Seawall dimension can be seen in this following table.

Table 1.13. Seawall Plan Design in Patimban Port

Wall Direction	Run ID	Length (m)	Depth (m CD)	Reference Borehole	Sheet pile wall		Spun pile supports		
					Type	Length(m)	D (m)	Length (m)	Interval (m)
West	W1	1380	-2,5 ~ 4,0	T2-1	SP 800	26,0	NA	NA	NA
	W2	600	-2,5 ~ 3,5	T2-7	PC 600	25,0	600	30.0	1,5
	W3	360	-1,0 ~ 1,5	W25	PC 600	16,0	NA	NA	NA
East	E1	755	-4,5 ~ -6,0	E35	PC 600	23,0	600	22.0	1
	E2	1585	-6,0 ~ -8,0	E35	SP 800	26,0	NA	NA	NA
Total		**4.680**							

Source : JICA Survey Team

Table 1.14. Revetment Plan Design in Patimban Port

Wall Direction	Run ID	Length (m)	Depth (m CD)	Reference Borehole	Sheet pile wall		Spun pile supports		
					Type	Length(m)	D (m)	Length (m)	Interval (m)
South	S1	604	-1,0 ~ 2,5	W25	PC 600	16,0	NA	NA	NA
	S2	629	-2,5 ~ 3,5	E36	PC 600	18,5	600	20.0	2
	S3	503	-3,5 ~ 4,5	E36	PC 600	20,5	600	20.0	1,5
Total		**1.736**							

Source : JICA Survey Team

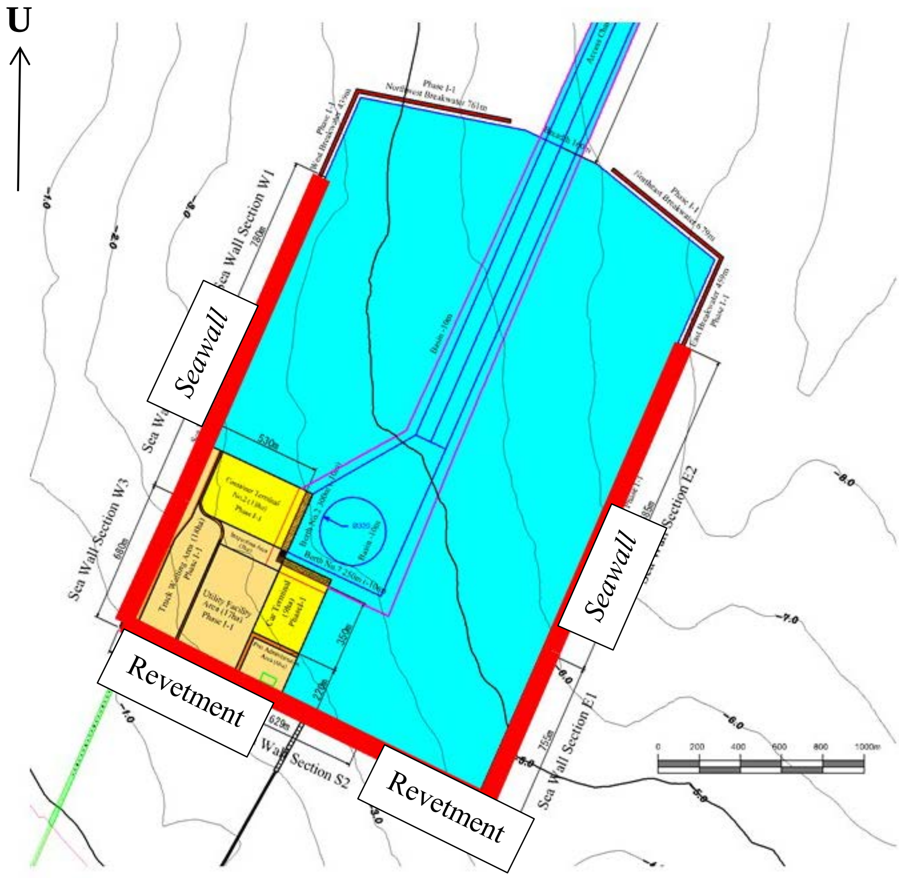


Figure 1.16. Seawall and Revetment Plan Location (Red Color)

Seawall and revetment dimension which will be build can be seen in following figure.

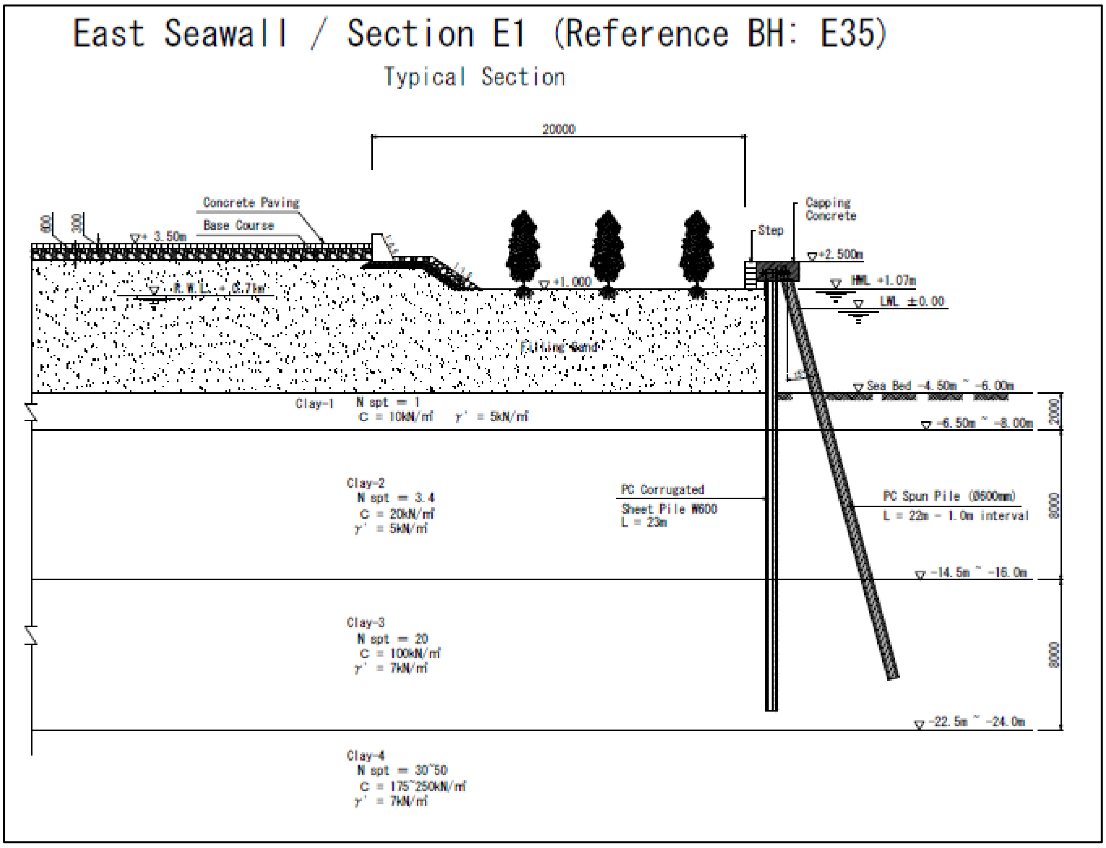


Figure 1.17. Typicall Cross Section of Seawall

m. *Berth*

Berth development for Patimban Seaport terminal is planned to be built as much as 6 units for all phase I, with different form and location according to terminal needed. Berth size that will be built is :

Table 1.15. Berth Type and Size

Facility	Description	Unit	Length	Depth
Berth No 1	Container	m	840	-14 m CD
Berth No 2	Container	m	540	-14 m CD
Berth No 3	Container	m	480	-12,5 m CD
Berth No 7	Car	m	60	-12,5 m CD
Berth No 8	Service Ship	m	330	-7 m CD
Berth Ro Ro	Ro Ro	m	170	-7 m CD

Source : JICA Survey Team

Typical cross section and container berth plan (No 1 – 2) and vehicle berth (No 7) can bee seen in the following figure :

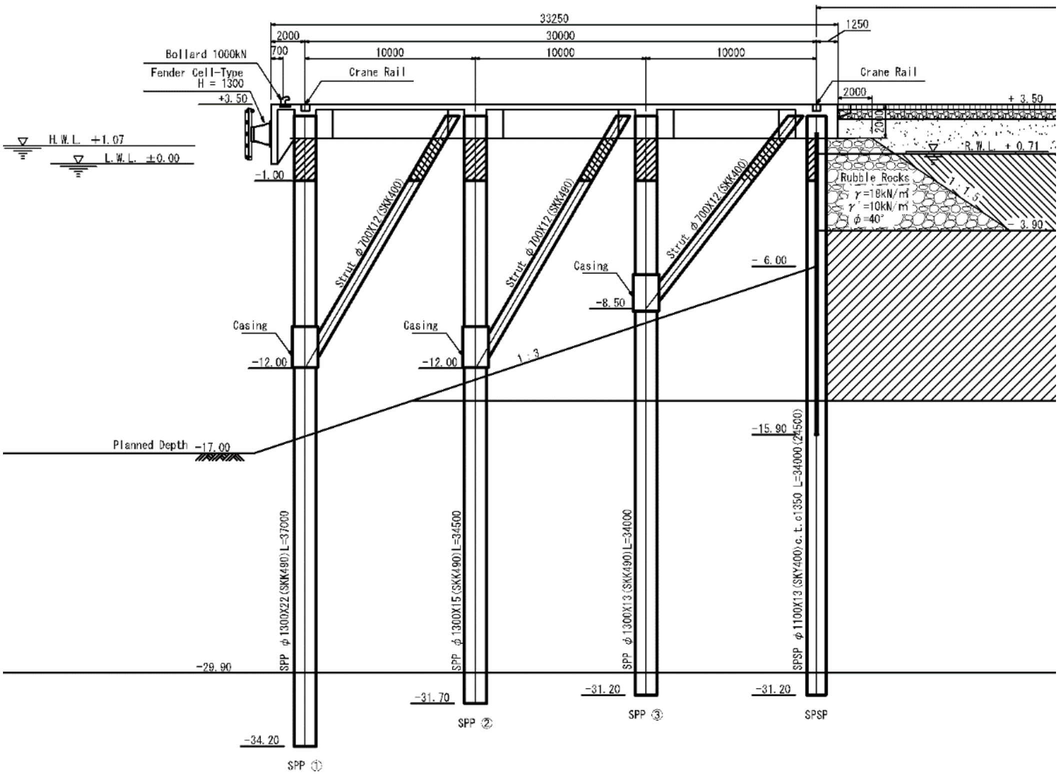


Figure 1.18. Typical Cross Section from Berth Container

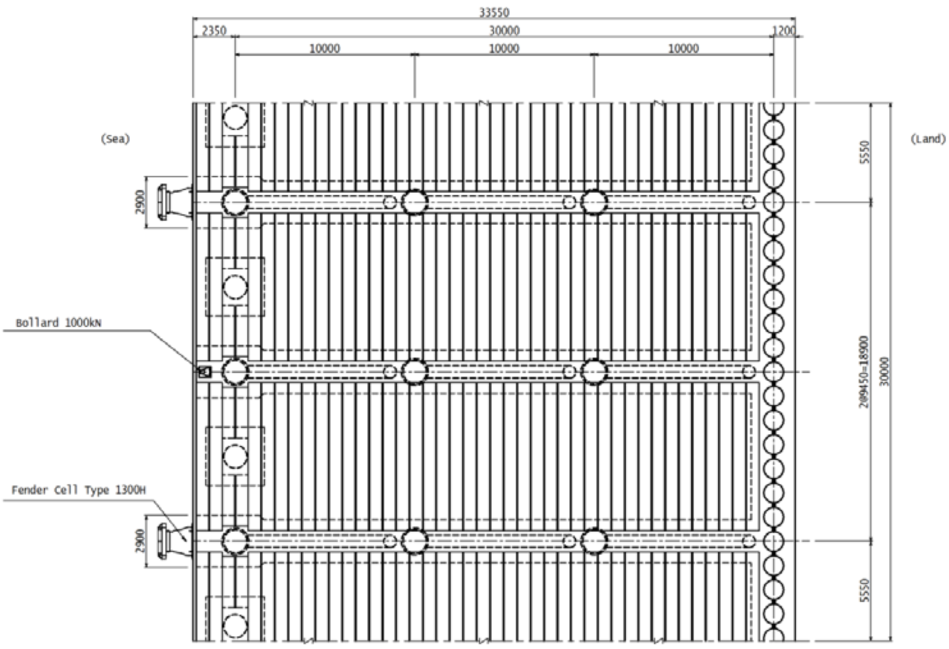


Figure 1.19. Typicall Berth Container Plan

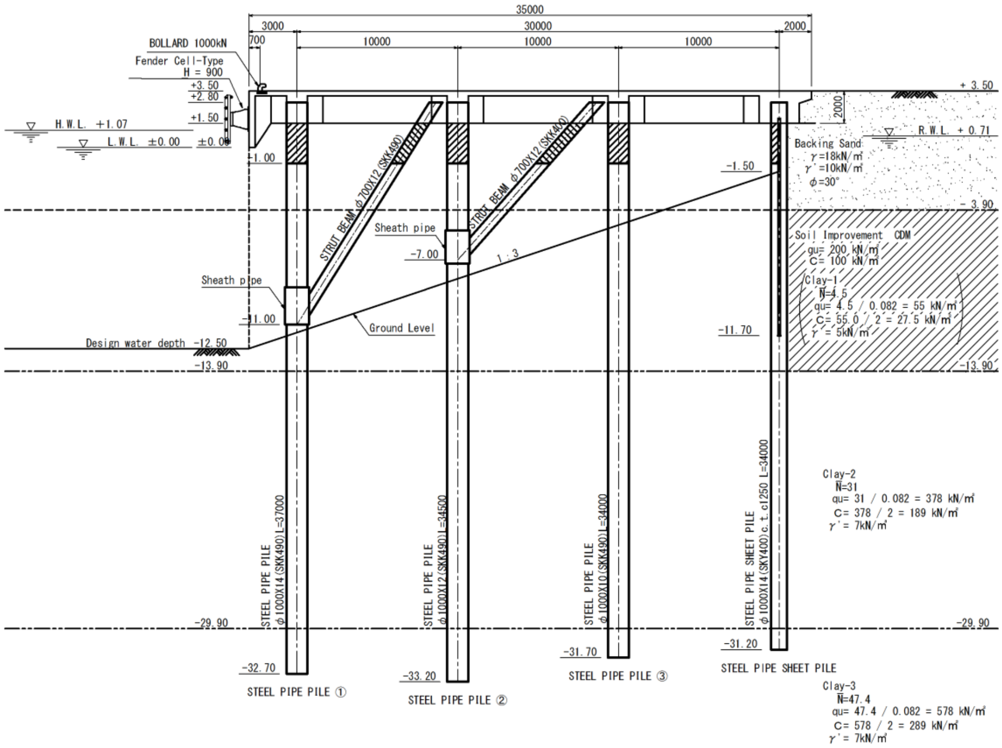


Figure 1.20. Typical Cross Section from Car Terminal Berth

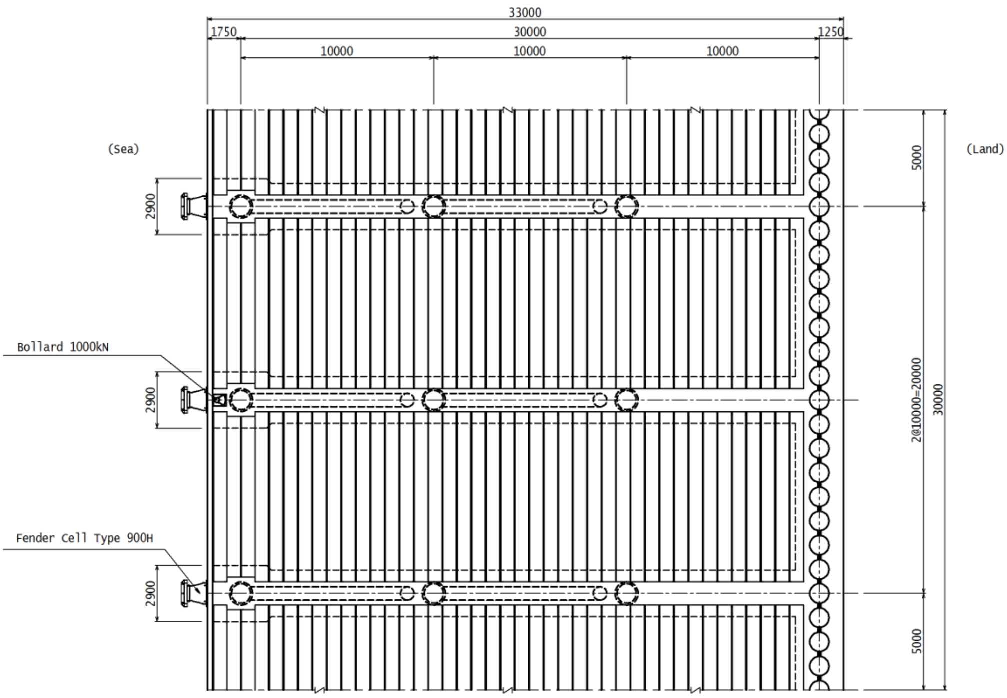


Figure 1.21. Typical from Car Terminal Berth Plan

Sailing Line Plan

Sailing line is used for direct ships that will go to port basin. It will be built in 17 m depth and 500 m width, with effective wide for sailing is 380 m width, so it possible to accommodate the biggest ship with Ultra Large Container Ships (ULCS) type with 13,000 TEU's Capacity. But, in the development Phase I stage 1, the depth of the channel is -10m, with the dredging channel width is 160m, and at the Phase I stage 2, the depth will be increase to -14 m with the dredging width is 280 m.

Data of Installation According to Pertamina's Map

In order to avoid problems in the construction of Patimban New Port sailing channel, it required to know PT.Pertamina's pipe installation data. Maps from Ministry of Energy and Mineral Resources and Maps from Dishidros show the location of oil platforms installation in North Beach West Java. Beside of both maps, there is also a map belong to PT PHE ONWJ, as operator that has the biggest number of platforms in North Beach West Java. Based on bahimetri map, Patimban New Port sailing channel has intersect with 3 (three) pipe lanes of Pertamina PHE ONWJ, which are 2 (two) pipes in -37 m depth, and 1 (one) pipe in -23 m depth. But, after hidro-oceanography survey, those pipe are in -25 m depth (1 pipe) and -40,3 m depth (2 pipes). Condition of those intersected pipe are not buried in the ground.

Because the data about pipe thickness that is intersected with sailing channel are surely unknown, so corrotion assumption that is used in analysis is 3 mm. It conclude that risk possibility of the pipe to the ship is on ALARP condition (yellow border), so it doesn't need protection or modification of the pipe.The following table shows the classification of risk to the color code.

Table 1.16. Classification of Risk to the Color Code

Zone	Line	Threat ID	Hazardeous Event	Probability Of Failure		Consequence Of Failure		Risk Rank	RM ID
				Probability	Score	Downtime	Score		
Patimban	16" FFA-UPRO	T-1	Minor Damage	1.35E10-4	3	0	1	3	T-1.1.1
		T-1	Local Denting	6.22 E-05	2	1	2	2	T-1.1.2
		T-1	Leakage	6.22 E-05	2	2	3	3	T-1.1.3
		T-1	Rupture	5.30E-05	2	12	4	4	T-1.1.4
	10" FPRO-ECOM	T-1	Minor Damage	1.29E-04	3	0	1	3	T-1.2.1
		T-1	Local Denting	5.95E-05	2	1	2	2	T-1.2.2
		T-1	Leakage	5.95E-05	2	2	3	3	T-1.2.3
		T-1	Rupture	5.95E-05	2	12	4	4	T-1.2.4
	16" FPRO-ECOM	T-1	Minor Damage	1.35E-04	3	0	1	3	T-1.3.1
		T-1	Local Denting	6.25E05	2	1	2	2	T-1.3.2
		T-1	Leakage	6.25E-05	2	2	3	3	T-1.3.3
		T-1	Rupture	3.70E-05	2	12	4	4	T-1.3.4
	16" FFA-UPRO	T-2	Failure	1.37E-05	2	12	4	4	T-2.1.5

Zone	Line	Threat ID	Hazardeous Event	Probability Of Failure		Consequence Of Failure		Risk Rank	RM ID
				Probability	Score	Downtime	Score		
		T-2	Acceptable	0.00E+0	1	0	1	1	T-2.1.6
	10” FPRO-ECOM	T-2	Failure	4.57E-06	1	12	4	4	T-2.2.5
		T-2	Acceptable	0.00E+0	1	0	1	1	T-2.2.6
	16” FPRO-ECOM	T-2	Failure	4.57E-06	1	12	4	4	T-2.3.5
		T-2	Acceptable	0.00E+0	1	0	1	1	T-2.3.6

Source : RIP Patimban, 2016

While for risk posibilities that are caused by anchoring activity can be seen in the following table :

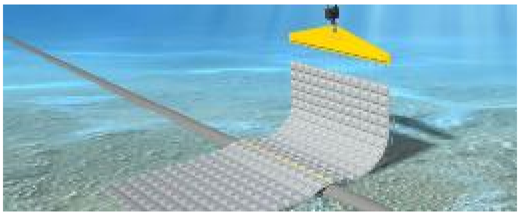
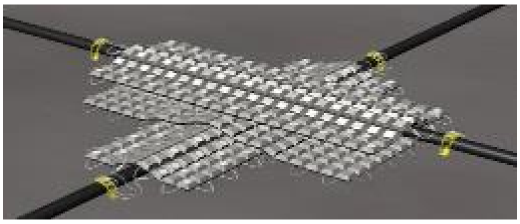
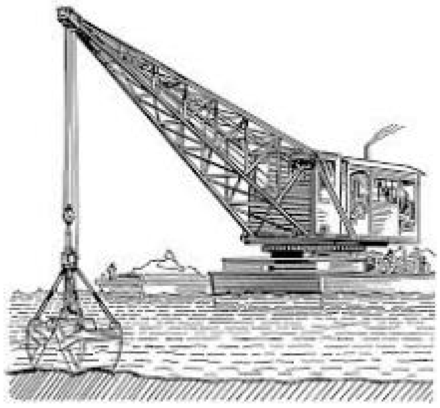
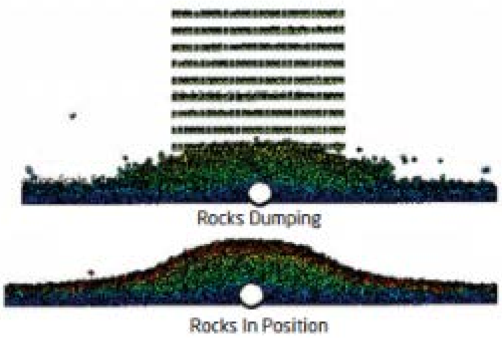
Table 1.17. Frequence and Consequence Rank Cause Due Anchoring

Pipeline	Risk ID	Freq. of Failure	Frequency Rank	Expected down time	Consequence Rank
UPRO (16" Oil)	UPRO-D1	1.1E-04	3	0 month	1
	UPRO-D2	1.5E-05	2	1-3 months	3
	UPRO-D3	9.7E-05	2	3-12 month	4
ECOM1 (10" Gas)	ECOM1-D1	1.1E-04	3	0 month	1
	ECOM1-D2	1.5E-05	2	1-3 months	3
	ECOM1-D3	9.7E-05	2	3-12 month	4
ECOM2 (16" Oil)	ECOM2-D1	1.8E-04	3	0 month	1
	ECOM2-D2	4.0E-06	1	1-3 months	3
	ECOM2-D3	3.6E-05	2	3-12 month	4

Source : JICA Survey Team

Although the predicition shows that it doesn’t need any protection, because the result of study about risk possibility is low, so in the seaport developent will not be made pipe protection. However, the plan of Patimban seaport development has pipe protection plan aims to prevent the risk of accident. Relating to the skill of pipe method construction and contruction cost, it is recommended to use protection with gravel. The used method can be seen in this following table.

Table 1.18. Method Plan of Pipe Protection

No	Method	Minimum Protection Layer Thickness			
		Description	16" FFA - UPRO	16" FPRO – ECOM	10" FPRO – ECOM
1	**Matress Placement**  	Protection system with concrete matress placement	4 x 0.3 m	1 x 0.3 m	1 x 0.3 m
2	**Rock Dumping**  	Protection system with rock dumping. That the rock dumping tidy and scattered, so one of option is using Clamshell	475.2 mm	178.1 mm	178.1 mm

Source : RIP Pelabuhan Patimban, 2016

After studying the pictures of underwater pipelines in the waters around the activity location, it can be known that pipe protection using heavy materials will cause damage to the pipe, bacause the very soft soil layers can cause the pad for supporting pipe can't withstand the given load weight. In consequence, there are some option to overcome it, in example with not giving the protection to the pipe according to the risk assesment study conclusion and underwater existing pipe condition. From the environment point of view, it is not recommended to disturb or change the existing sediment condition so it’s not affecting the friction that can damage the pipe.

In the other hand, in pipe protection that will be applied, the load in the pipe using gravel has to be minimized with the lower height than the pile of grave on the pipe.

While for ship lines that will be used in Patimban seaport with the pipe intersection on the sailing line can be seen in this following picture :

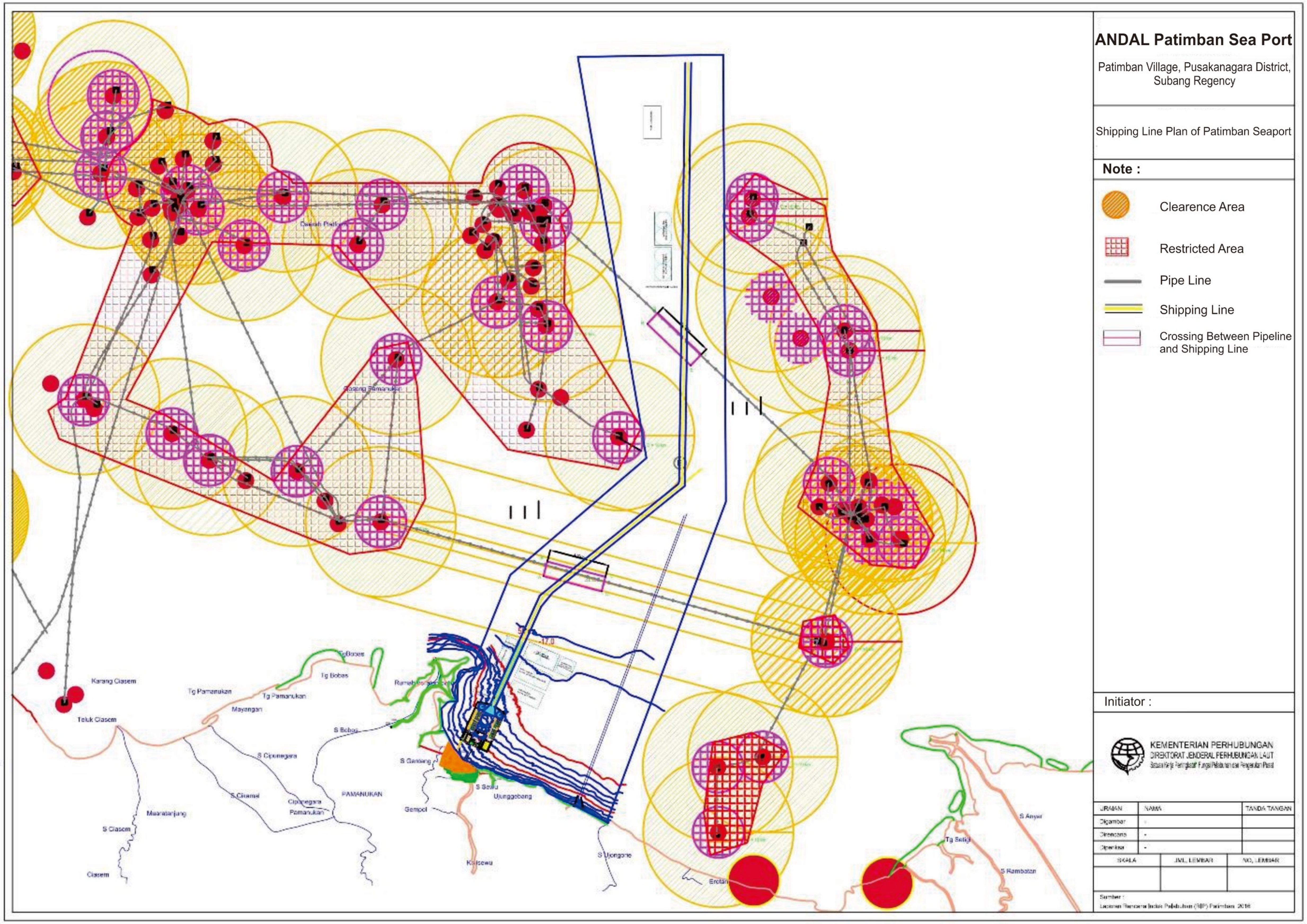


Figure 1.22. Shipping Track of Patimban Seaport

Navigation Aids Installation

As the sailing security facility of Patimban seaport, it will be installed navigation aids such as buoy areal sign around the sailing line and others restricted area. The purpose of this facility installation is as the information to the ship that pass Patimban terminal work environment area. The type of sign that used are lateral sign, cardinal sign, isolated danger sign, safe waters sign, and special sign

Based on layout of sailing line and restriction zone to off-shore platform and seabed pipe, it proposed the installation of navigational aids facility as shown in the table below and drawn in the following figure :

Table 1.19. Proposed SBNP Signs Installation

Name of signs	Information sign	Coordinate
MPMT	Buoy 0	108° 0'15.88"E, 5°44'49.24"S
B01	Buoy 1	108° 0'52.54"E, 5°50'16.72"S
B02	Buoy 2	108° 1'39.52"E, 5°54'48.86"S
B03	Buoy 3	108° 1'27.36"E, 5°54'49.97"S
B04	Buoy 4	108° 2'14.17"E, 5°59'21.63"S
B05	Buoy 5	108° 2'29.78"E, 6° 3'1.81"S
B06	Buoy 6	108° 2'48.21"E, 6° 3'48.09"S
B07	Buoy 7	107°55'52.08"E, 6°11'29.01"S
X01	Penanda Khusus Pipa 1	108° 1'30.11"E, 5°59'15.31"S
X02	Penanda Khusus Pipa 2	108° 0'31.89"E, 6° 8'0.80"S
X03	Penanda Khusus Pipa 3	107°57'15.87"E, 6° 8'9.63"S

Figure 1.23. Proposed Layout of Patimban New Port SBNP Placement (Overall)
Source : RIP Pelabuhan Patimban, 2016

Installation of Handling Container

Main equipment for container handling are Quayside Container Cranes (QCC) and Rubber Tyerd Gantry Cranes (RTGC). The required quantity of both are estimated taking into account of the demand forecast of containers including the productivity and service level of a new port. JICA's original plan has estimated at total 48 units of QCC and 120 units of RTG.

For handling cargo especially Container type ULCS, Quayside Container Gantry Cranes from super post panama type will be installed. For handling system container inter-field, System Transfer Crane (RTG) is suggested will be used considering size of container volume that will be handled.

Design and number of quayside container cranes are decided based on container volume estimation as much as 3.75 milion TEUs for container terminal no.1 and no. 2 in Phase I. related to quayside container rames, super post Panamax-type gantry rames capable to transport 13,000 container TEUs with 20 rows on deck, it projected for quay no.1 and no.2, and conventional sized cranes catering for 2,550 container TEUs with 12 or 13 rows on deck will be used for quay no. 3.

Table 1.20. Design and Number of *Quayside Container Crane*

			Container Terminal No. 1		**Container Terminal No. 2**
Item	**Symbol**	**Unit**	***Quay* No. 1**	***Quay* No. 3**	***Quay* No. 2**
Berth Length	Bw	m	840	450	840
Number of QC	Q	Unit	9	5	10
Yearly work time	H	Hour	8,760	8,760	8,760
Handling Capacity (per hour)	P	Q'ty/hr	30	30	30
QC operational availability	Sf	%	90	90	90
Berth operational availability	Sw	%	50	50	50
Conversion rate from TEU to actual quantity	TF		1.5	1.5	1.5

***Notes**: QC means "Quayside Container Crane*".

Quayside Container Crane and main specification can be seen in following figure and table :

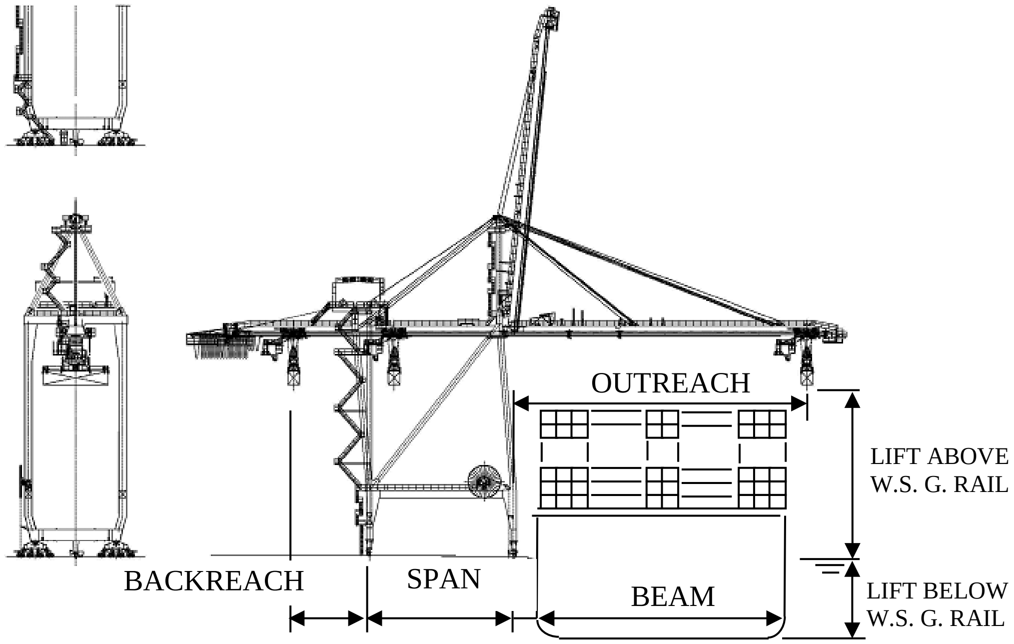


Figure 1.24. Quayside Container Crane

Table 1.21. Main specification of *Quayside Container Crane*

		Container Terminal No. 1 & 2	
Specification	**Unit**	**Container Terminal for *Quay* No. 1 & 2**	**Container Terminal For *Quay* No. 3**
Objective Container Carrier	TEU	13,000	2,550
Number of row in the deck	Row	20	12 or 13
Valued load	LT	60	40
Spreader type		Twin-20' (20-40FT Telescopic)	Single-Lift (20-40FT Telescopic)
Span	m	30	30
Outreach	m	53	37.5
Backreach	m	12	11
Lift : on the top W.S. G. Rail : under W.S. G. Rail	m m	35 16	28.5 15
Number of *Gantry Wheel* : Total : per Corner	 Wheel Wheel	 32 8	 32 8

***) Notes** : W.S. G. Rail means "*Waterside Gantry Rail*".

Design and number of Rubber Tyred Gantry Crane (RTGC) are decided based on container volume estimation as much as 3.75 milion TEUs for container terminal no.1 and no. 2 in Phase I. and same volume also estimated for container terminal no. 3 and no. 4 in Phase II and Phase III**.** Main Specification of Rubber Tyred Gantry Crane is presented in the following figure and table:

Table 1.22. Condition of *Rubber Tyred Gantry Crane Design*

			Phase I	Phase II and III
Item	**Symbol**	**unit**	**Container terminal No. 1 & 2**	**Container terminal No. 3 & 4**
Container handling capacity (TEU/Year/Terminal)	Qt	TEU	3.750.000	3.750.000
Conversion rate from TEU to actual quantity	TF		1,5	1,5
Time work per year	H	Hour	8.760	8.760
Handling capacity (per hour)	Pr	Q'ty/Hr	30	30
QC *Working Possibility*	Sf	%	90	90
Terminal *Working Possibility* Peak Factor of Handling Amount	St Kp	%	50 1,2	50 1,2

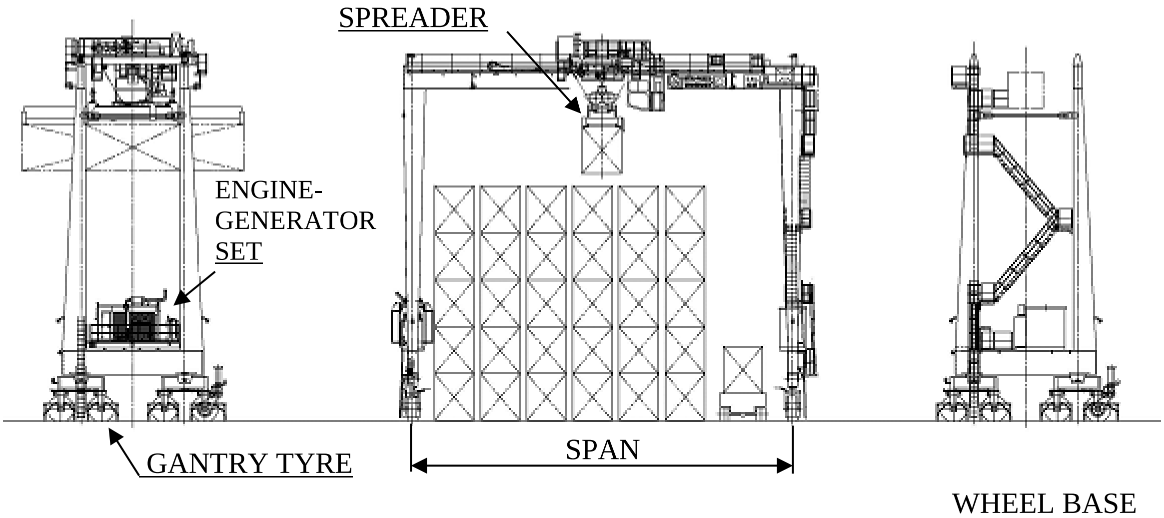


Figure 1.26. Main Specification of Rubber Tyred Gantry Crane

Table 1.23. Spesifikasi Utama *Rubber Tyred Gantry Crane*

Specification	Unit	RTG installed in terminal
Rated Load	LT	40
Type of Spreader		*Single-Lift* (*20-40FT Telescopic*)
Span	m	23.47
Stacked containers	*Row*	6 *(0+6) Arrangement*
Number of level	*Tier*	5 (1 over 5)
Number of Gantry Tire	*Wheel*	8
Wheel Base	m	2.5
Main Power		*Diesel Engine-Generator set* *(Hybrid System applied)*

Container Handling Capacity

Handling Container Capacity of 1,730 TEUs/m is adopted for balancing length. It is because Conversion from planned multi-purposed terminal, especially for handling container to mobile terminal in seaport master plan study. Total length of Berth for container handling is planned to be 4,290 m length. Maximum Unit capacity per year according to experience is estimated about 2,000 TEUs/m with reference to leading Seaport literatures in the world. And becasuse of that, decision of capacity plan is 1,730 TEUs/m considered fair and be able to be fulfilled with recognition of number of required container handling machines include container gantry cranes dan RTG. Container handling Equipments that required in Quay no. 1, 2, and 3 on Container Terminal No. 1 and 2 Summarized in the table below.

Table 1.24. Required Container Handling Equipment in Container Terminal 1 and 2

	Terminal Container No. 1		**Terminal Container No. 2**
	***Quay* No. 1**	***Quay* No. 3**	***Quay* No. 2**
Handling Equipment	**Numbers**		**Numbers**
Quayside Kontainer Crane	9	5	10
RTG	30		30
Yard Tractor	72		72
Yard Chassis	76		76
Top Lifter	6		6
Reach Stacker	6		6

Container Handling Equipment which are required in Phase I is sumerized in the following table :

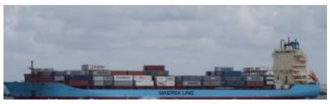
Table 1.25. Required Container Handling Equipment which Needed in Phase I

Type	Phase I
Terminal Container No.	Terminal No. 1 & 2
Quayside Kontainer Crane	24
RTG	60
Yard Tractor	144
Yard Chassis	152
Top Lifter	12
Reach Stacker	12

Plan Ship Size

Main vehicle on the port is ships. Ships which are predicted will enter and lean on Patimban Seaportare Cargo Ships, Container Ships and Bulk Cargo Ships.

Table 1.26. Plan Ship in Patimban Seaport

No	Type of Container Ships						
	Name	**DWT (Ton)**	**TEU**	**LOA (m)**	**B (m)**	**D (m)**	**Photo**
1	Maersk E Class	165,000	15,500	398	59	16	
2	CMA CGM Magellan	157,254	13,366	365	51	16	
3	Maersk Gudrum Class	115,000	10,150	367	43	15	
4	COSCO Guangzhou	107,526	9,500	350	43	15	
5	Maersk Sovereign Class	110,000	8,800	332	43	15	
6	Maersk Regina Class	84,900	6,418	318	43	14	
7	Maersk Wyoming Class	61,454	4,658	292	32	13.5	
8	Maersk Jeppesen Class	27,300	3,003	213	32	12.3	
9	Maersk Newport Class	35,100	2,478	207	30	11.4	
10	Maersk Tåsinge Class	29,700	1,597	191	28	10.6	

11	Maersk Alabama Class	17,525	1,068	155	25	9.5	

Source : http://www.maersk.com/en/hardware/fleet/maersk-line

1.1.6.2.3 Back Up Area Plan

On shore facility development location in the back up area is planned in the back part of terminal. Director general of Sea transportation conduct the land acquisition on the whole of back up area in 356,23 Ha area, which will be built at Phase I, is public area as much as 5 Ha areas, utility area 3 Ha, and 2 Ha areas for outer road.

The facilities that will be built at phase I :

a. Public Area (Public and Social Facilities)

The land that will required for public area is 5 Ha. This area has existing condition such as food stall in Patimban beach.

b. Utility Facilities Including Water Suply Tank and Power Transformer

The land needed is about 3 Ha, which is located in back up area. Utility facilities that will be built are water suply tank, power transformer, and others needs area. Here is the details:

a. Area for water suply tank with 3,000 ton capacity: 30 m x 25 m= 750 m^2
b. Area for power transformer : 10 m x 10 m= 100 m^2
c. Area for others needs : 950 m^2

c. Outer road around the back up area

Outer road that will be built has 2 Ha areas with length and width dimension of 3,800m x 5m. This outer road is constructed for facilitating public access road.

While for zoning plan in the future development is :

- empty stack container *Off-dock*
- Vehicle Storage Area *Off-dock*,
- Warehouse for Cargoes port and office building for shipping agent

- Parking lot for truck company heavy vehicle
- Road in the back up area
- Area for distribution process
- Location for water line in the back up area

The future plan for back up area zoning is seen in the picture 1.13.

1.1.6.2.4 Access Road and Bridge

Construction of access road is planned to be built in west side of the port which is connecting port location plan with Pantura national road in 8.1 km length and 60 m width, approximately 23 m width will be built as road, and the rest will be used for future development. Construction of acces road through 6 villages, Patimban village, Pusakaratu village, Kotasari village, Gempol village, and Kalentambo, with another village in different district, Pusakajaya village, Pusakajaya District, Subang Regional. Access road along 8.1 km have been acquisited partly by Subang local goverment with 30 m width.

Access road plan is devided to 4 (four) part; construction of main access road (5.0 km), construction of access road to back up area (3.1 km), construction of access bridge to connect terminal area with onshore area (1,000 m), and jetty extension (350 m).

Table 1.27. Access Road Components

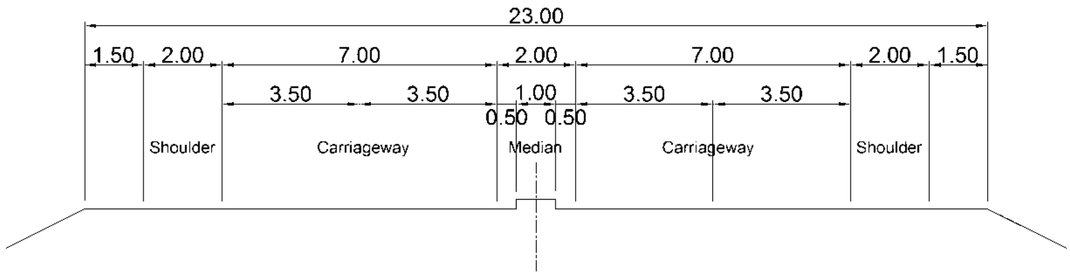
Aspect	Main Access Road	Access Road to Back up Area	Connecting Bridge	Jetty Extention
Length	5.000 m x 20 m	3.100 m x 20 m	1000 m x 20 m	350 m x 8 m
Lane	4	4	4	2

Source : JICA Survey Team

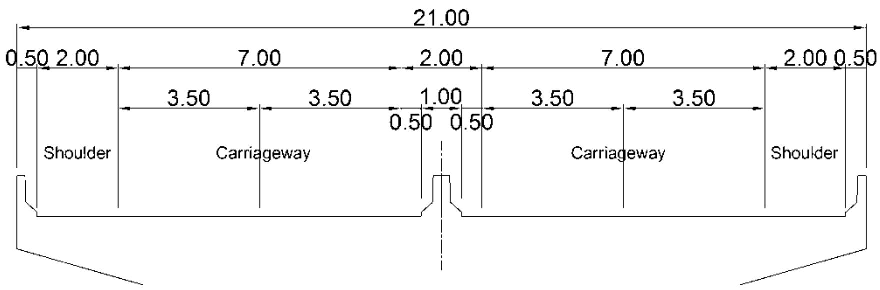
Based on consideration of bridge design standard, it will prefer to the newest bridge development design, which the design standards are following :

a. *Bridge Design Code* Vol.122, Direktorat Jenderal Bina Marga (1992)
b. *BMS Bridge Design Manual* Vol.182, Direktorat jenderal Bina Marga (1992)
c. Standar Nasional Indonesia (SNI), BSN (Badan Standarisasi Nasional Indonesia).

In the construction of Access road phase, it will be installed iron fence along the path that has been released, which aims to mark the port area, and to prevent unauthorized parties into the road construction area. It is done to maintain the security and orderliness in the construction of road aspect. Moreover, traffic signs will be installed to avoid accident. Construction of access road for Patimban Seaport consist of road construction and fly over which is connected to the road that built in certain location. Road design that has been planned for this access road construction can be seen in the following figure:



(a). Access Road



(b). Access Bridge

Figure 1.27. Size of Patimban Seaport Access Road and Bridge

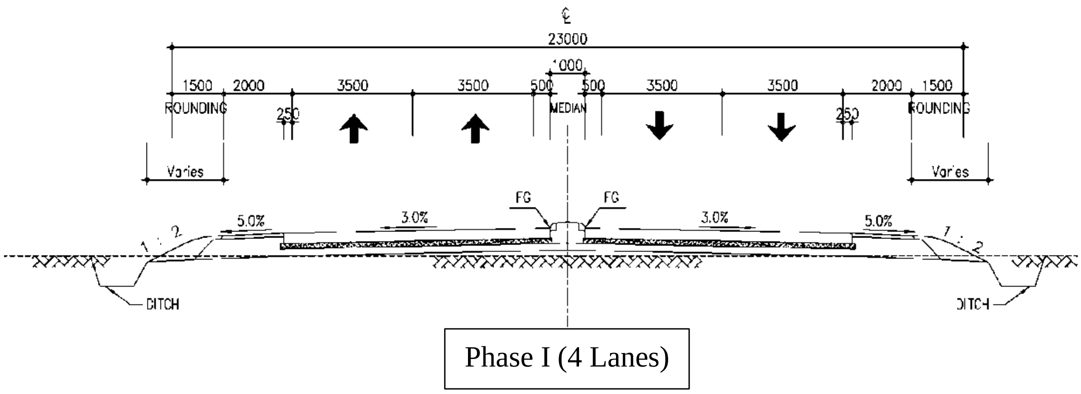


Figure 1.28. Phase Construction in Phase I Stage 1 and Phase I Stage 2

Access Road Starting Point and End Point

Starting point for Patimban Seaport access road is crossroad between Pantura national road with development plan channel which is released land, located on Pusakaratu and Pusakajaya village. Furthermore those roads will be pass through others villages such as Gempol Village, Kotasari Village, and Kalentambo village along 8.1 km. Crossroad figure in this access road starting point can be seen in this following figure:

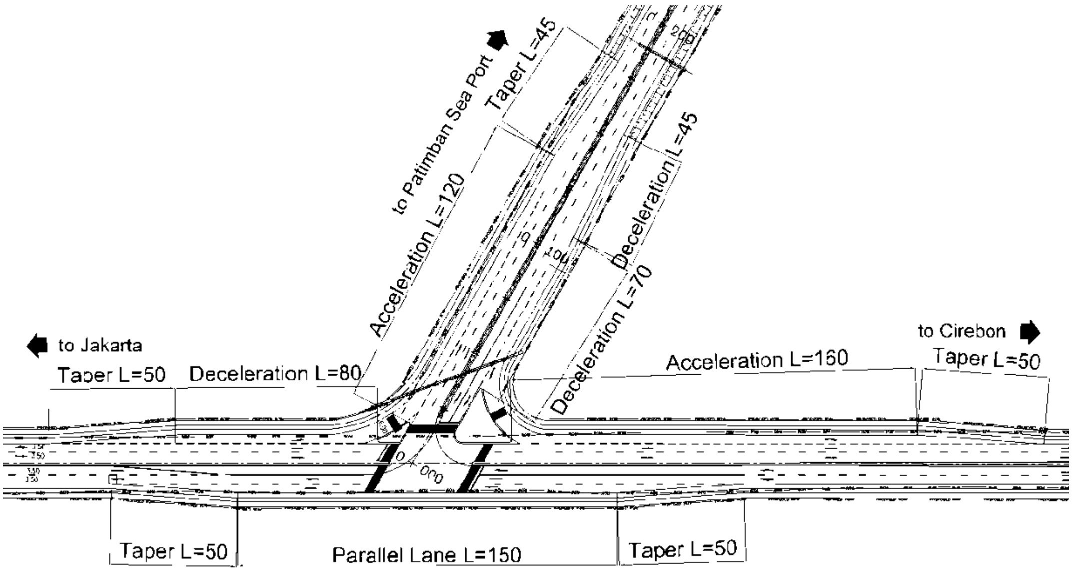


Figure 1.29. Design Outline of Access Road Crossing

End point of access road is on west side of back up area, in Patimban Village. Road design that will be built is the same.

Bend Section

Bend section is on 2/3 of end of the access road part, that is located in Patimban village. This construction is planned to be built as smooth as possible by making the turn into a slightly rounded corner, and not too retire a corner. it's also imposed maximum speed limit when pass this turn with 60 km/hour speed to minimalize accident risk. For more details can be seen in this following figure.

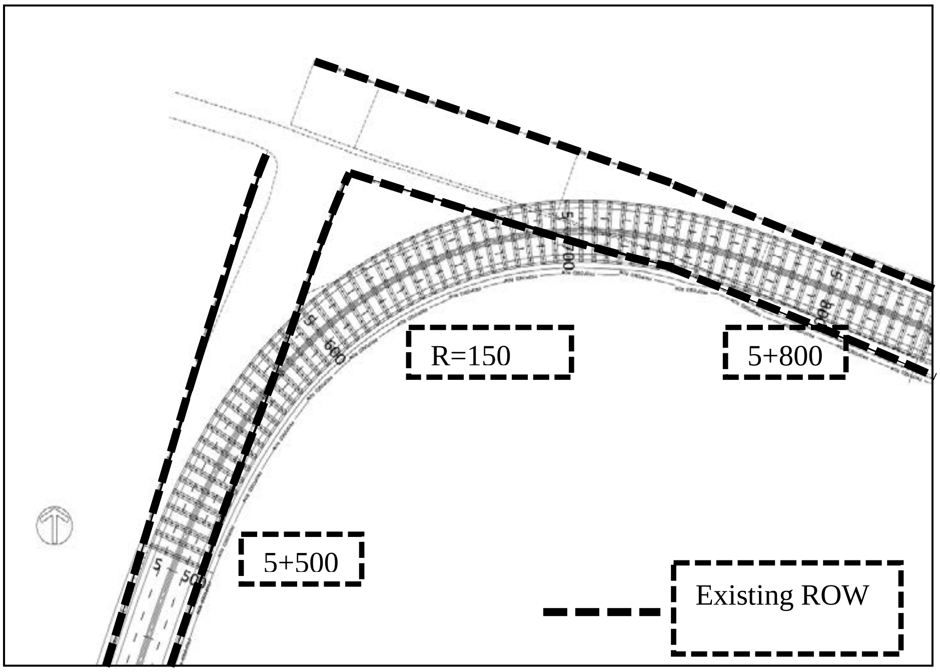


Figure 1.30. Bend Section Pattern Design That Will Be Built

Meanwhile for access road development, flood return period that is used to determine the tilt is 50 years. Flood rate on Chart Datum Level (CDL) :

- 1,49 m in sea area (Kilometer Post (KP) 8 + 75,0)
- 6.265 m di National road (KP 0 + 0,0)
- Flood rate increases to the national road from sea area as seen in this following picture.

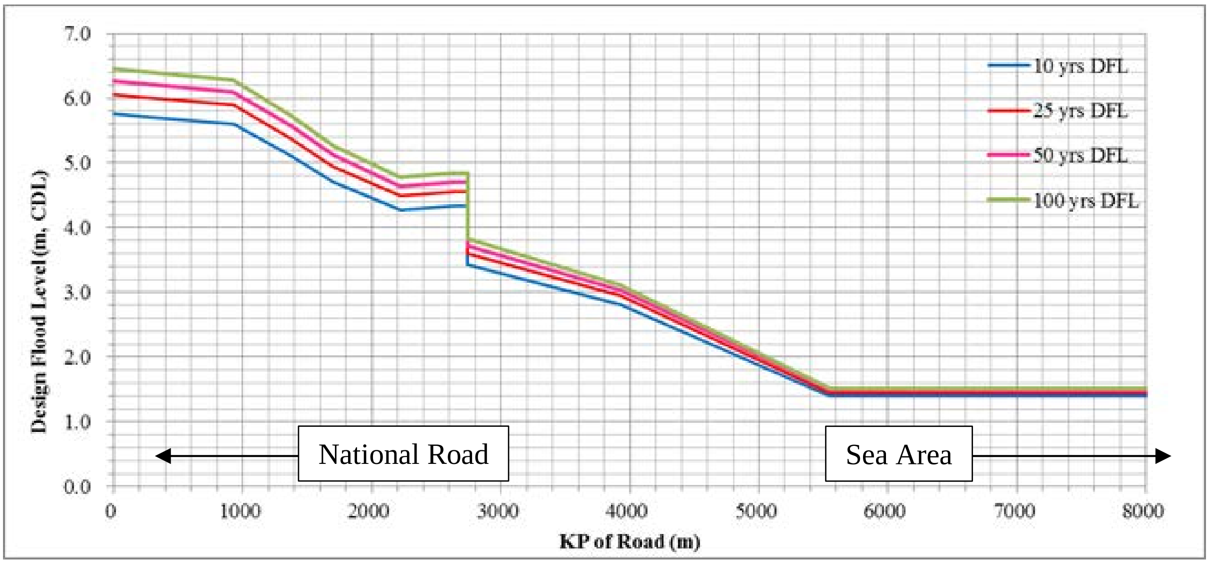


Figure 1.31. Flood Level in Access Road Location

Figure of bridge location along the access road can be seen in this following picture

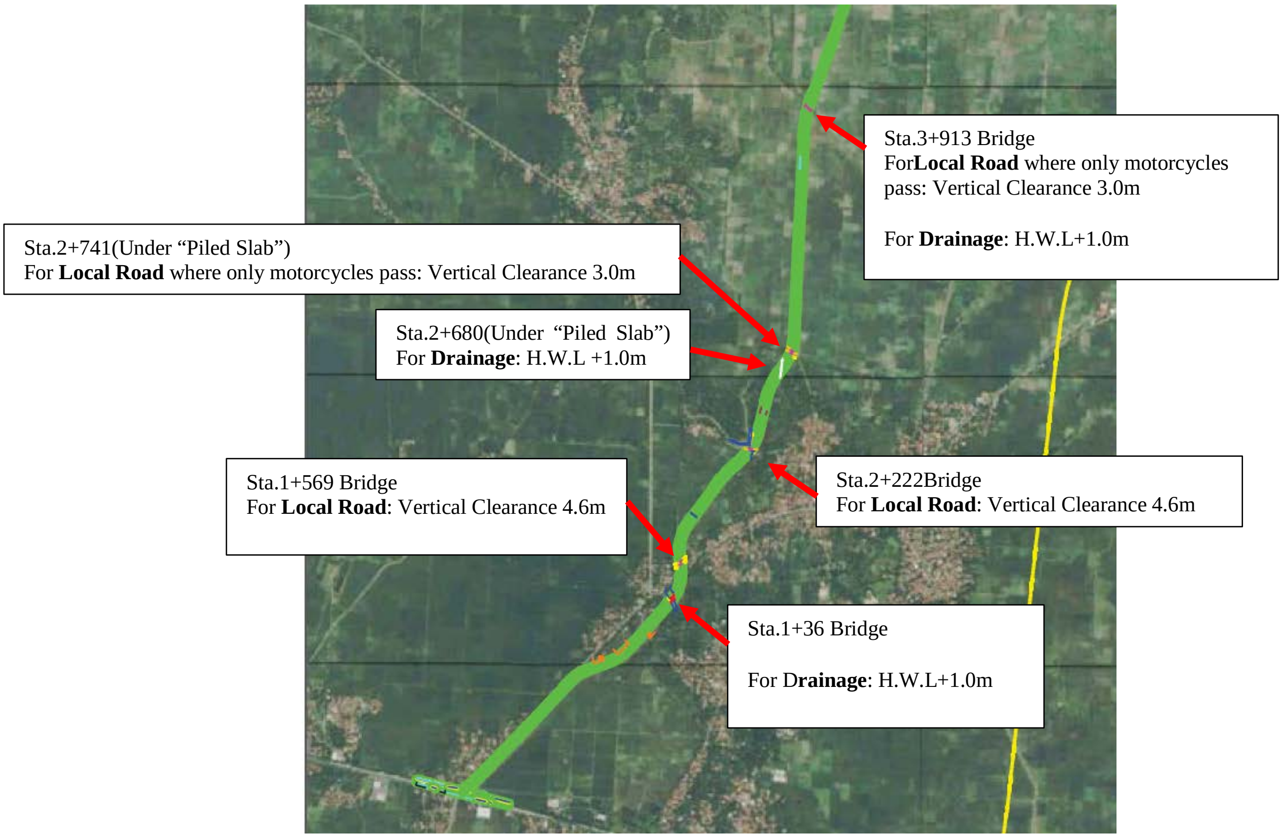


Figure 1.32. Location of Bridge and Under Pass along the Access Road

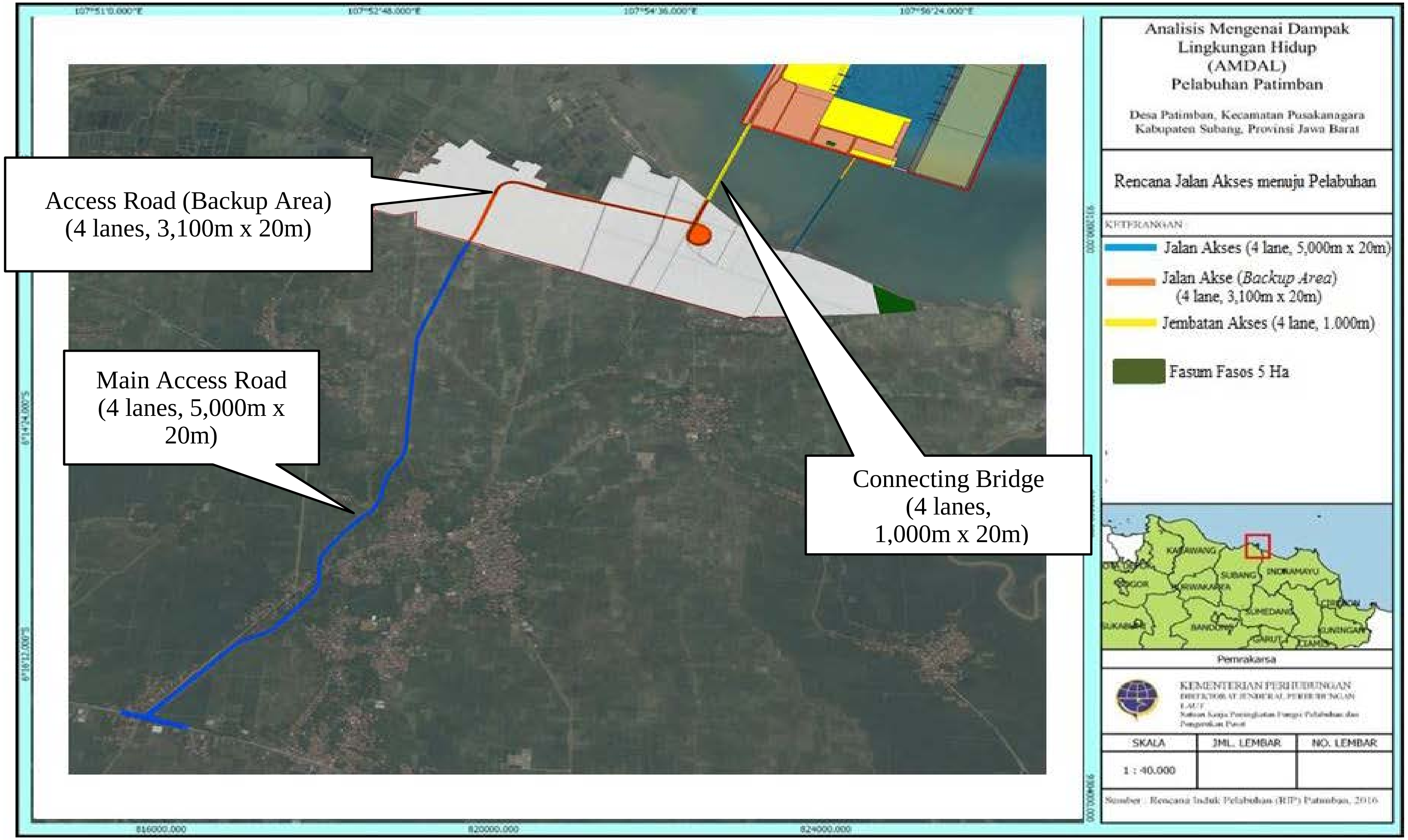


Figure 1.33. Access Road Planning

1.1.6.3 Activity Plan

Patimban Port Development is including pre – construction activity, construction activity, and operational activity. For post operation, because the structure of Patimban Port is design for 50 years or more with maintenance and also the operational plan for port is design for long times, (over 50 years), so there are no plan or limited for operational time. However, for this time, post operational phase plan can not be estimated. If the post operational phase still include in this ANDAL, the alternative plan for that is demolition of the port construction. If by any chance of demolishing the port structure, the rubbles generated by the demolition work such as concrete and metal do not include any harmful substances. The rubbles might be used as artificial fish reefs, or should be treated in conformity with the laws./regulations in the future.

Stages of development activities of Patimban Port which includes the pre – construction phase, construction phase and the operational phase, can be seen in the following sub-chapter

1.1.6.3.1. Pre – Construction Phase

Pre construction phase is including land acquisition activity. Detail description can be seen in following sub chapter.

A. Land Acquisition

Land acquisition for Patimban seaport development will be started in 2017. Land acquisition team will free the land for back up area and access road. The estimated impact that can be caused by land acquisition activity in access road and back up area are the decreasing of land productivity, livelyhood lost, and public unrest.

Back Up Area

The area for back up area is 356,23 Ha, where on that area, 314,96 Ha are owned by public and government and the rest of 41,27 Ha area are owned by private. The number of householder affected in the back up area location is 340 householder consist if 754 person.

The tenure for back up area can be seen in the table below.

Table 1.28. Total Area for Back Up Area in Each Block that Acquired

Blok	Extents (m^2)	Extents (ha)
15	757,335.48	75.73
16	222,105.85	22.21
17	729,667.51	72.97
18	377,854.42	37.79
19	1,090,140.59	109.01

20	385,194.15	38.52
Total	**3,562,297.99**	**356.23**

Source : LARAP Survey Team

Table 1.29. Land Ownership of Land Acquisition for Back Up Area

Blok	Owners	Area (m^2)	Area (ha)
15	People's land	730,396.05	73.04
16	People's land	200,646.45	20.06
17	People's land	716,757.12	71.68
18	People's land	353,162.52	35.32
19	People's land	344,604.30	34.46
	Private land of PT. Laksana Dinamika	412,705.36	41.27
20	Tanah Masyarakat	365,518.37	36.55
Total Area		**3,123,790.18**	**312.38**

Source : RIP Patimban, 2016

Table 1.30. Area of Land of Back Up Area Based on Land Use

No.	Land Usages	Area (m^2)	Area (ha)
1	Irigation	9,975.27	1.00
2	Road	34,164.84	3.42
3	Graveyard	5,318.89	0.53
4	Field	186,171.02	18.62
5	Building Area	87,733.07	8.77
6	Grass Field	26,183.63	2.62
7	Paddy Field	2,073,269.67	**207.33**
8	River	7,895.23	0.79
9	Fishpond	1,131,524.54	113.15
	Total Area	**3,562,297.99**	**356.23**

Source: LARAP Survey Team, 2016

Meanwhile the number of building affected in the land acquisition activity at back up area location can be seen in this following table.

Table 1.31. Number of Buildings that are Affected in of Back Up Area

Blocks	Number of Building (Unit)
15	4
16	4
17	6
18	19
19	143
20	40
Total Building	**216**

Source: Larap Survey Team

It is seen that building affected by the project in all block is 216 units. Those buildings are consist of permanent building, huts in the paddy fields and fishponds, and semi permanent buildings that are used for vend along the Patimban beach. While the number of householder/unit and people affected can be seen in this following table.

Table 1.32. Number of Units and Human Affected of Land Acquisition in Back Up Area

<table>
<tr><th>Affected Asset</th><th>Human Type Affected</th><th>Total KK/ Unit</th><th>Total Person</th></tr>
<tr><td rowspan="3">1. Agricultural Field</td><td>Owners</td><td>105</td><td>244</td></tr>
<tr><td>Tenants</td><td>1</td><td>1</td></tr>
<tr><td>Workers</td><td>27</td><td>27</td></tr>
<tr><td rowspan="4">2. Fishpond</td><td>Owners (Individu)</td><td>24</td><td>55</td></tr>
<tr><td>Owners (Company)</td><td>1</td><td>-</td></tr>
<tr><td>Tenants</td><td>23</td><td>48</td></tr>
<tr><td>Workers</td><td>18</td><td>18</td></tr>
<tr><td rowspan="3">3. Shop/restaurant</td><td>Owners</td><td>21</td><td>45</td></tr>
<tr><td>Tenants</td><td>43</td><td>242</td></tr>
<tr><td>Workers</td><td>64</td><td>64</td></tr>
<tr><td rowspan="2">4. House</td><td>Owners</td><td>5</td><td>5</td></tr>
<tr><td>Tenants</td><td>1</td><td>5</td></tr>
<tr><td>7. Graveyard</td><td>Owners (Government Land)</td><td>2</td><td>-</td></tr>
<tr><td>8. Mosque</td><td>Owners</td><td>1</td><td>-</td></tr>
<tr><td>9. Other</td><td>Owners</td><td>4</td><td>-</td></tr>
<tr><td colspan="2">Total</td><td>340</td><td>754</td></tr>
</table>

Source : LARAP Survey Team, 2017; Note : KK = Head of Family

Development land needed for back up area is presented in the following table.

Table 1.33. Matriks of Demand Area and Land Existing Condition

<table>
<tr><th>No</th><th>Facility Demand</th><th>Total Area in Acquisition</th><th>Land Existing Functional</th><th>Land Location that will be Acquisition</th><th>Total Human of Affected</th></tr>
<tr><td>1</td><td>Fasum Fasos /Public Area 5 ha</td><td rowspan="3">356,23 ha</td><td rowspan="3">fishpond,
field, paddy field, land builded, dll</td><td rowspan="3">Blok 15 s/d
blok 20
(see in figure 2.34)</td><td rowspan="3">340 KK including 754 person</td></tr>
<tr><td>2</td><td>Utility Area 3 ha</td></tr>
<tr><td>3</td><td>Outer Road 2 ha</td></tr>
<tr><td>4</td><td>Access Road</td><td>15,38 ha</td><td>Paddy field, field</td><td>(see in figure 2.4)</td><td>177 KK including 378 person</td></tr>
</table>

Source : LARAP Survey Team, 2016

Access Road

Access road that will be built will pass through land acquisition area in 5 village; Kalentambo, Gempol, Pusakaratu, and Kotasari, and another village outside Pusakanagara district, that is Pusakajaya village. Construction of access road is held on Subang regency land acquisition area along 5 km with 30 m width. But, for Patimban Seaport access road requirment, road wide that needed is 60 m, so it's needed additional land acquisition area that is planned as much as 30 m to the south east of access road that has been freed by Subang regency government, with total area needed is 15.38 Ha. Generally, location that released is land that has various activity such as field, fishpond/embankment, and stall. For acces road land acquisition plan, from 15.38 Ha area needed, 12.07 Ha area is government's land. The following table shows area per village that will be freed. The number of householders (KK) affected in access road location are 177 householders consist of 378 person.

Table 1.34. Extent Area of Government and Public which would be Acquiring

Ownership	Village	Area(m^2)	Area(ha)	Ownership	Area(m^2)	Area(ha)
People	Gempol	71,818.43	7.18	Government	7,591.25	0.76
	Kalentambo	30,251.08	3.03		-	-
	Kotasari	2,085.28	0.21		689.98	0.07
	Pusakajaya	2,542.62	0.25		40.17	0.00
	Pusakaratu	14,029.75	1.40		24,711.41	2.47
	Luas Total	**120,727.17**	**12.07**		**33,032.81**	**3.30**

Source: LARAP Survey Team, 2016

Condition of public and government land use that affected by the biggest impact is ricefields area. For the details look the following table.

Table 1.35. Condition of Land Uses in Access Road Area

Land Ussage	Extent (m^2)	Extent (ha)
Local People		
Fish Pond	108.54	0.01
Land Builded	6,703.80	0.67
Agricultural	30,640.33	3.06
Paddy Field	83,274.50	8.33
Total	**120,727.17**	**12.07**
Government		
Riverbanks	247.37	0.02
Irrigation	225.49	0.02
Road	1,184.65	0.12
Graveyard	825.95	0.08
Land Builded	286.87	0.03
Agriculture	550.59	0.06
Paddy Field	29,105.67	2.91
River	606.20	0.06
Total	33,032.81	3.30
Total Area	**153,759.98**	**15.38**

Source : LARAP Survey Team

Number of affected building that has been recorded is 23 units. For more detail data are figure in following table.

Table 1.36. Buildings that Affected by Development of Access Road

Village	Number of Building (Unit)
GEMPOL	9
KOTASARI	11
PUSAKAJAYA	1
PUSAKARATU	2
Total	**23**

Source : LARAP Survey Team

Meanwhile the amount of people affected in details is in this following table.

Table 1.37. Total Unit and Human Affected by Access Road Acquisition

Property Affected	Type of Human Affected	Total KK/ Unit	Total People
1.Agricultural Land	Owners	45	104
	Tenants	14	20
	Workers	14	14
2. Fishpond	Owners (Individu)	1	4
3.Agriculture Land	Owners (Company)	34	97
	Tenants	13	24
	Workers	14	14
4. Shop/restaurant	Owners	1	-
5. Office	Tenants	1	-
	Workers	6	6
6. House	Owners	25	68
	Tenants	8	27
7. Graveyard	Owners (Government Land)	1	-
Total		**177**	**378**

Source : LARAP Survey Team, 2017

Table 1.38. Total KK and Human who Needed of Relocation

Area	Total KK	Number of People
Back Up Area	70	297
Access Road	33	95
Total	**103**	**392**

Source : LARAP Survey Team, 2017

Compensation mechanism in land acquisition refers to UU No.2/2012 and PPRI No.71/2012. The assesment of compensation value is done per plot which include;

a) Land
b) Ground level and underground level space
c) Building
d) Plantation
e) Things related to the land
f) Other countable loss

The compensation can be given in the form of :
Pemberian ganti kerugian tersebut dapat diberikan dalam bentuk :
a) Money
b) Land replacement
c) Settlement
d) Shareholding
e) Others form that is agreed by both of side

Transportation Ministry more prioritize the compensation in the form of money in trading system with the owner, so they don’t provide replacment land according to LARAP recommendation. On the other hand. The Ministry of Transportation will develope livelyhood recovery program such as:

a) Prioritizing the people affected by land acquisition in the employment of construction worker according to the require qualification.
b) Arrange the training program such as:
    - Enterpreuneurship training especially for people affected which change the livelyhood
    - Technical training in the field of agriculture, animal husbandry, and fishery
    - Institutional capacity building in the improvement of business production, management, and marketing.
    - Training of small and medium scale enterprises improvement
    - Training of skill such as mechanics, sewing, and crafting.
c) Arrange venture capital assistance program
d) Arrange new business activity program
e) Arrange marketing assistance program
f) Arrange equipment aid program

Impacts that possibly will appear from the activity of land acquisition are land productivity loss, livelyhood loss, and public unrest.

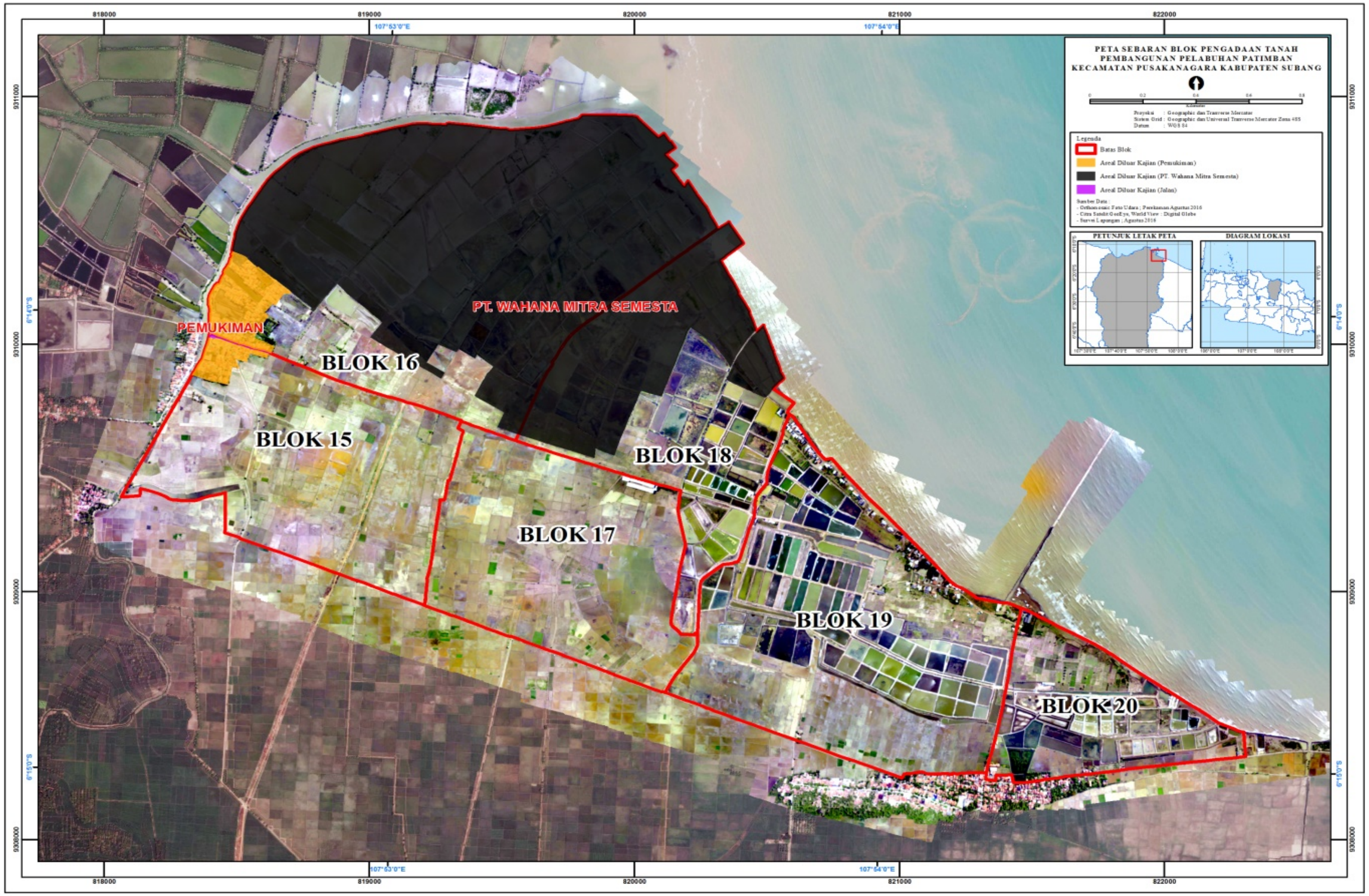


Figure 1.34. Land acquisition Area for Back Up Area
Source : LARAP Survey Team, 2016

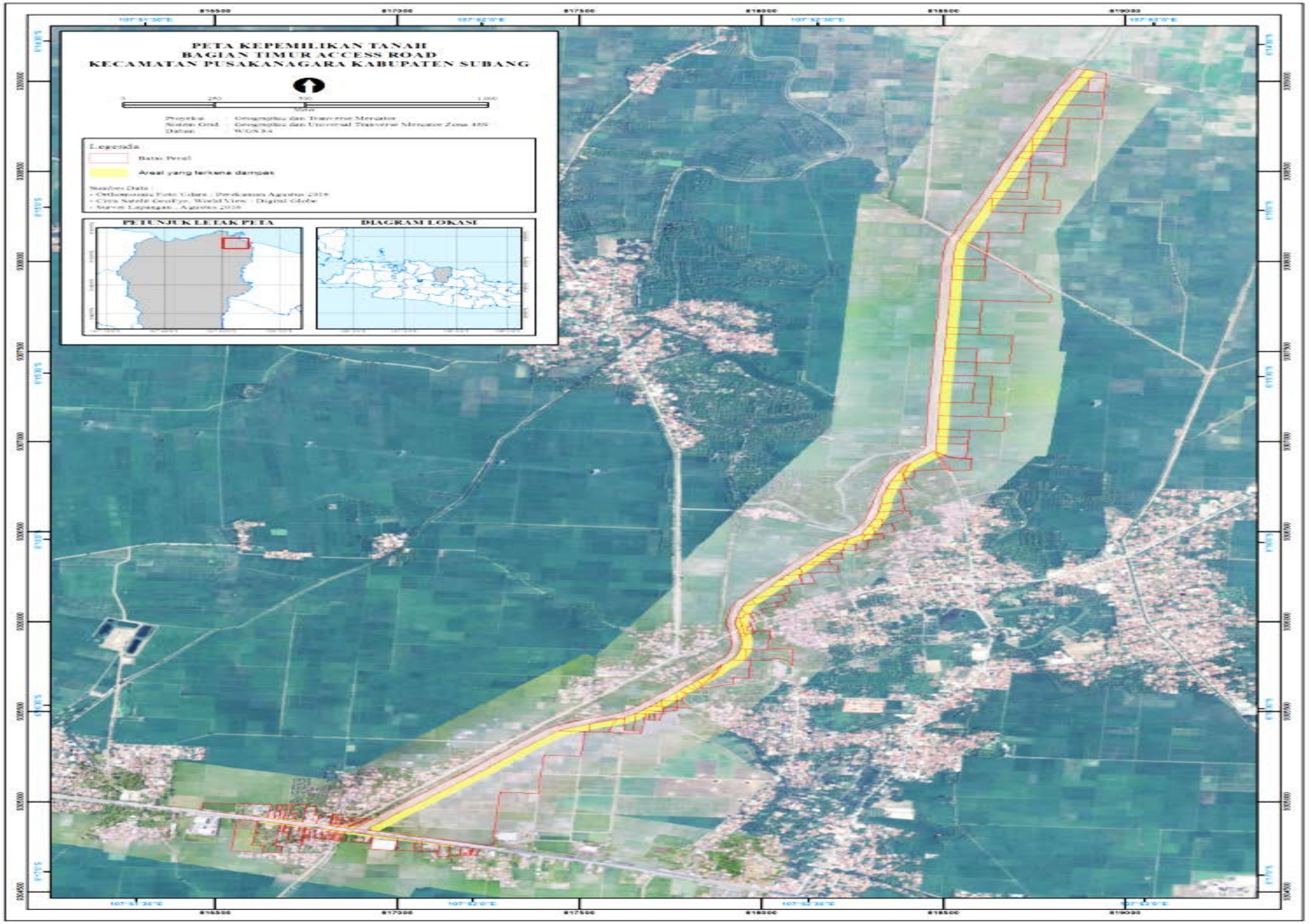


Figure 1.35. Land acquisition Area for Access Road
Source : LARAP Survey Team, 2016

1.1.6.3.2. Construction Phase

Construction phase activities will be described in the following sub section.

A. Employment of Worker and Basecamp Operational

Patimban New Port Development will use service various contractors. In the recruitments, Contractors will be required to utilize the local Workers, especially from villages around the project site. The working rule for construction workers will be regulated in accordance with Presidential Decree No.4 in 1980 on Compulsory Report Job Vacancies.

Construction workers for the project were estimated at 1030 persons in Phase I Stage 1, and 680 person in Phase I Stage 2, and among of them, about 20% is consists of local people, as shown in table below.

Table 1.39. Estimation of Construction Workers

Sector	Phase	Number of Total Worker
Port	Phase I-1	560
	Phase I-2	390
Road	Phase I-1	470
	Phase I-2	290
Total	**Phase I-1**	**1,030**
	Phase I-2	**680**

Source : JICA *Survey Team*

Office and basecamp for commuter construction workers will be built 2 units in the south part of existing berth on 1 Ha area, and in the crossingg of Pantura road and access road construction.

To keep the environmental cleanness as the result of workers domestic activities, so it will be built toilet and septic tank for domestic liquid waste, and temporary garbage dump (TPS) for domestic solid waste with 5 m^3 capacity. It’s estimated that the biggest amount of midden is 1.030 person x 2,5 liter/person/day (*Damanhuri, 2004*) = 2.575 litre/day or equal with 2,57 m^3/day. These garbage will be transported daily by cleanliness agencies of Subang regency to the TPST/TPA in Subang regency.

Domestic liquid waste produce from workers domestic activities/workers needs such as bathing, washing, etc. Standard that is used to get the domestic liquid waste volume is 80% from clean water needs or in the mathematics form is calculated as follow (Metcalf dan Eddy, 1981).

QAL = 0,8 x Total of clean water needs

So, if the average needs of water is 60 L/person/day (Permen PU No 01/PRT/201), it can be known the estimated water volume needed and liquid waste produced for workers and construction activities from each development phase as seen in the following table.

Table 1.40. The Estimation Of Water Volume That Is Required For Workers And Construction Phase

Requirements	Unit	Terminal		Access Road	
		Phase I Stage 1	**Phase I Stage 2**	**Phase I Stage 1**	**Phase I Stage 2**
Number of construction workers	Person	560	390	470	290
Construction Periode	Day	720	1050	540	540
Domestic Waste	L/day	1,400	975	1,175	725
Portable Water	ton/day	11.2	7.8	9.4	5.8
Water for construction	ton/day	18-20	18-20	6-8	6-8

Source: JICA Survey Team

The procurement of employee activity and basecamp operation are predicted to make the appear of the impact such as opened job opportunity and infectious diseases.

B. Mobilization of Heavy Equipment and Material

The impact that can be occured from these activities are air quality reduction (TSP and emision), the increasing of noise, land and offshore traffic disturbance, road damage, and public unrest. Types and numbers of heavy equipments for Patimban seaport development at the Phase I stage I untill Phase I stage 2 can be seen in the table below :

Table 1.41. Estimation of Construction Heavy Equipment Planned for Phase I Stage 1 (Port)

No	Heavy Equipment	Capacity	Numbers	No	Heavy Equipment	Capacity	Numbers
1	*Backhoe*	0.7m3	27	16	*Tire Roller*	20t	2
2	*Grab Dredger*	2.0m3	7	17	*Belt Conveyer*	800m	1
3	*Backhoe Barge*	0.7m3	7	18	*Soil Barge*	5000m3	2
4	*Material Barge*	600t	7	19	*Tug Boat*	4000ps	2
5	*Tug Boat*	300ps	7	20	*Patrol boat*	-	4
6	*Crane Barge*	50t	7	21	*Piling Barge*	40m	3
7	*PVD Machine*	H 10m	0	22	*Material Barge*	1,000t	3
8	*TSHD Dredger*	3,500m3	4	23	*Tug Boat*	300ps	8
9	*Dump Truck*	10t	15	24	*Bulldozer*	D4	4
10	*Grab Dredger*	23m3	1	25	*Concrete plant*	100m3/day	3
11	*Bulldozer*	D6	4	26	*Concrete Truck*	10t	12
12	*Tire Roller*	20t	4	27	*Crane*	50t	3
13	*Grader*	6m	4	28	*Crane*	25t	3
14	*Wheel roader*	2m3	3	29	*Flat truck*	10t	3
15	*CDM Ship*	-	3				

Source : JICA Study Team

Table 1.42. Estimation of Consruction Heavy Equipments Planned For Phase I Stage 2 (Port)

No	**Heavy Equipment**	**Capacity**	**Numbers**	**No**	**Heavy Equipment**	**Capacity**	**Numbers**
1	*Soil Barge*	5000m^3	6	5	*Crane Barge*	50t	5
2	*Tug Boat*	4000ps	4	6	*TSHD Dredger*	16,000m^3	1
3	*Piling Barge*	40m	5	7	*Grab Dredger*	23m^3	3
4	*Material Barge*	1,000t	5	8	*Tug Boat*	300ps	5

Source **:** JICA Study Team

Table 1.43. Number of Heavy Equipment for Each Phase

Activity	Number of Heavy Material								
	Truck (10t)	Backhoe	Bulldozer	Grader	Compacter	Trailer	Pile Hammer	Crawler Crane	Mobile Crane
Reclamation for Platform	60	5	5						
While construction for road	4	2	2	2	2				
Front construction for road	4	2	2	2	2				
Underpass	10	3						1	2
Canal diversion									
Excavation	10	3							
Revetment	1								
Pile slab									
Spun pile driving						5	20	20	
Superstruktur									20
Pavement and utility	10			10	10				
Concrete bridge									
Pondation and sub – structure						2	10	10	
Superstrukture								10	
Utility bridge and pavements	2			2	2				
Approach (*Earth work* and pavement)	2	1	1	1	1				
Main construction for road									
Earth work	50	3	3	2	2				
Acessories and pavement	9	3	3	3	3				
Connecting bridge terminal									
While construction								2	
Pondation and sub structure						2	5	5	
Superstruktur								5	
Acessories and pavement	1			1	1				

Source : JICA Survey Team, 2016

The transportation of heavy equipment to the project site will be done by land transportation (road) passing through Pantura national road using heavy vehicles such as trucks and other kind of simillar vehicle .And the transportation of heavy equipment to the project site will also be done by sea (ships). With the quarry location in Purwakarta, so transportation is held by land track through Pantura National road, and head to the road that has been freed by Subang regency government (Red soil).

The estimation of vehicle volume amount at the Phase I stage 1 can be seen in this following table.

Table 1.44. *Embankment* And Volume of Vehicles For Access Road and Back Up Area

Aspect	**Unit**	**Phase I Stage 1**
Volume *Embankment*	m^3	292.722
Truck capacity	m^3	8
Work Duration	Month	10
Number of Truck	Month	3659.0
	Rit/Day	**122.0**

Source: JICA Survey Team

While for the estimation of the ship number for sand transportation (sea track) and truck number for rock transportation for offshore facility development (land track) can be seen in the table below.

Table 1.45. Estimation of Ship Number for Sand Transportation (Sea Route)

Item	Unit	Phase I Stage 1	Phase I Stage 2
Sand Volume	m^3	1,400,000	6,600,000
Barge Capacity	m^3	3,000	3,000
Work Duration	Day	93	440
Total Ships	Day	5	5

Source : JICA Survey Team

Table 1.46. Estimation of Ship Number for Rock Transportation (Land Route)

Item	Unit	Phase I Stage 1	Phase I Stage 2
Rock Volume	m^3	331,000	-
Truck Capacity	m^3	8	-
Work Duration	Day	540	-
Total Truck	Day	76,6	-

Source : JICA Survey Team

C. Reclamation and Off-Shore Facility Development

Generally, the estimated impact from reclamation and off-shore facility development activity are the decline of water quality (increasing of TSS), marine life disturbance (necton and benthos), Fishing ground change, and public unrest. Description of activities in reclamation and off-shore facilitities development is as follow.

1. Reclamation

Reclamation activity is conducted in Phase I Stage 1 and Phase I Stage 2 construction, which is used in terminal development (off-shore). Total soil material landfill that require for reclamation is 10.300.000 m^3, which is for Phase I Stage 1 development, beside rely on sand that purchased from third parties, it als will use the mixture of cement and rake soil from dredging activity. Description of reclamation requirements can be seen in the following table:

Table 1.47. Volume of Reclamation in Every Development Phase

Phase	Reuse ofe cement and rake soil mixture (m^3)	Sand Purchasing (m^3)	Total (m^3)
Phase 1 Stage 1	2.300.000	1.400.000	3.700.000
Phase 1 Stage 2	0	6.600.000	6.600.000
Total	**2.300.000**	**8.000.000**	**10.300.000**

Source : JICA Survey Team

Based on the plan, sand material sources that will be purchased and used for reclamation, will be took from quarry, which came from Lampung and Purwakarta. Sand supplier location were selected because there are abundant minerals providers in those location and they are licensed for sea sand minning activities. Description of licensed mining companies can be seen in the letter issued by the directorate general of minerals and coal, Ministry of Energy and Mineral Resorces of Indonesia Republic, number 1343.Pm/04/DJB/2016 about Determination of 19th IUP Clear and Clean, and list of IUP that has been revoked by governor/regent/mayor (attachment X). As for the list of major companies mining material provider can be seen on the pages of appendices.

As previously described that reclamation activity will use sand and dredging materials from basin and sailing line to mix with cement. In the aspect of method used, Patimban seaport development will use method as written in this following table.

Table 1.48. Reclamation Method

Reclamation Method		
Item	**Phase I Stage 1**	**Phase I Stage 2**
Reuse of reclamation material	a. *Clay* by dredging with cement improvement b. Reuse by terminal development in Phase 1 mean 0.7 m.	Dredged of *clay* impossible if used and needed of cement soil wic used land development. l
Reclamation by purchased sand	1. Target 15.000 m3 per day 2. Thicness sand surface up to 1.3 m until 2 m	Target 20.000 m^3 perday
Soil improvement	a. Existing soft ground is improved by cement deep mixing method b. Soil dredging used by *cement pipe mixing* method for terminal reclamation	- PVD method and added of sand Working is more with consideration again is effective and must be considering of berth construction - Handling by cement if needed

Source **:** JICA Survey Team, 2016

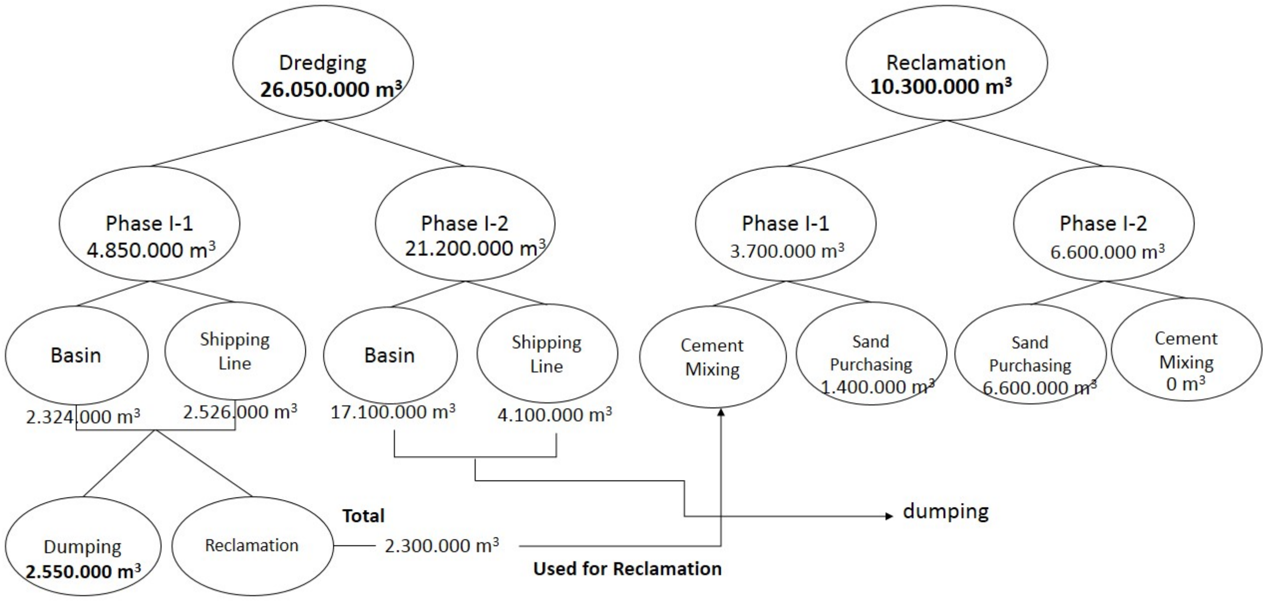


Figure 1.36. Flow Chart Volume of Reclamation and Dredging Activity

Reclamation materials transportation will be done by sea track using big size ship. Reclamation materials which come from Lampung will be sent directly to Patimban Seaport location. While the transportation of rock material for construction activity will use land track, so it need calculation of the potential of transpotation volume increase.

For the route of transportation, because the rock materials will be take from Purwakarta, so the using routes are : materials is transpported from Purwakarta - Jalan Raya Sukatani – Jl. Ciganea – Jl. Tol Cipularang – Jl. Tol Jakarta Cikampek –Jalan Pantura – Seaport access road (Red soil/seaport access road that has been freed by Subang government). While for the class of road that will be passed in the material transportation route from Purwakarta can be seen in the following table.

Table 1.49. Road Class and Tonase Route of Rock Transportation for Off-Shore Facility Development

No	Road Name	Road Class	Tonase
1	Jl. Raya Sukatani	Regancy Road	8 ton
2	Jl. Ciganea	Province Road	10 ton
3	Jl. Tol Cipularang	Tol Road	12 ton
4	Jl. Tol Jakarta Cikampek	National Tol Road	12 ton
5	Jl. Pantura	National Road	12 ton
6	Jalan Akses Pelabuhan (tanah merah)		

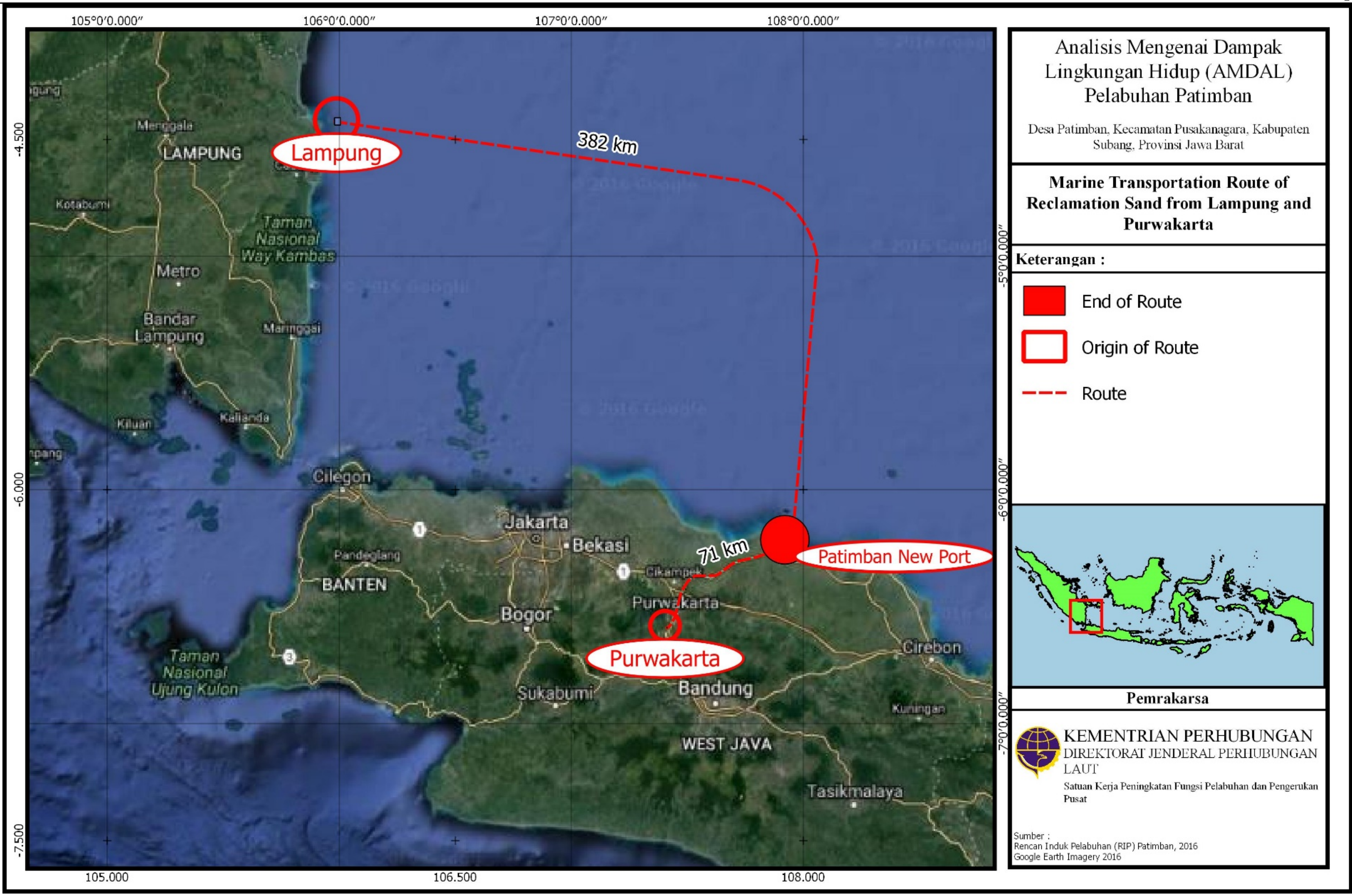


Figure 1.37. Reclamation Material Route Patimban Seaport

2. Off-Shore Facility Development

Off-shore facilities construction are series of activities involving a wide variety of things to support the ongoing activities of port development, generally, there are few types of activities that performed from Phase 1 Stage 1 until Phase I Stage 2 is :

1. Construction of terminal
   a. Construction of Container Terminal
   b. Construction of Vehicle Terminal
   c. Construction of Ro-ro ship and Boat Terminal
   d. Construction of Petroleum Terminal (BBM)
2. *Breakwater*
3. *Revetment / Seawall*
4. *Berth*

1. Construction of Terminal Plan

Plan of Patimban terminal area consists of some kind of terminal construction activities and supporting facilities construction such as:

a. Container terminal
b. Vehicle terminal
c. Ro-ro ship and Boat terminal

For each terminals construction process, will consist of 2 processing phase, it is :

Cement Soil Improvement (Fast construction for Phase I Stage 1)

a. CDM (Cement Deep Mixing)

This method has been used widely for airport and seaport development in many Asian countries. CDM can be used on the soft soil, can increase soft soil with adding *cement slurry column.*Technically, particular heavy equipment (installed in transporting work ship) will adding cement slurry into the soil from agitation process. Compare with conventional vertical drain method such as PVD and SD (Sand Drain), CDM method has biggest possibility to do in the short time period. Although the cost is relatively high, but it’s very efective to be used in gradual development. Generally 800 m^3 of row per day can be applied.Normally, CDM used in range of 10 – 50 %.

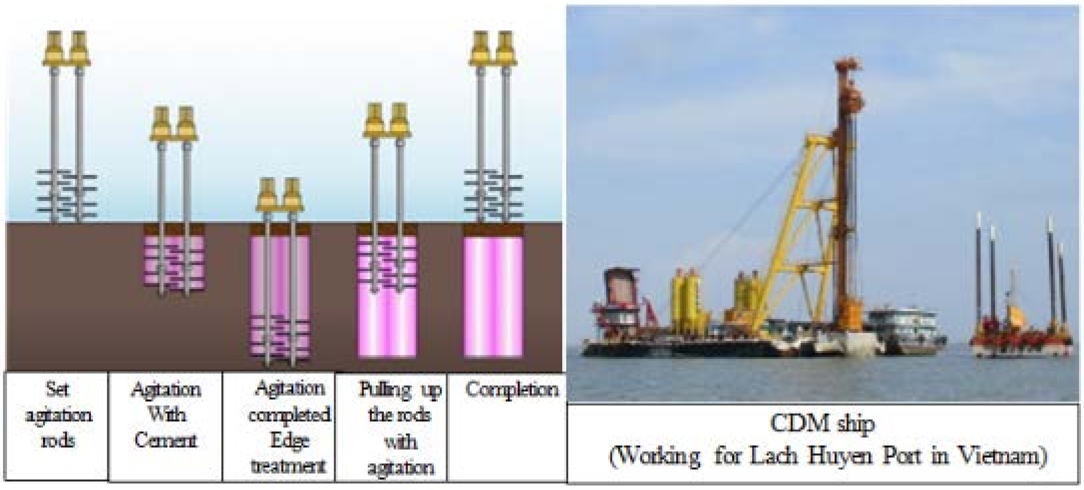


Figure 1.38. CMD Process

b. CPM (Cement Pipe Mixing)

CPM is widely used in Japan to build airport. CPM can be used on dredging soil and can't be used for soft foundation like CDM. Dredging tools are pumped by pneumatic vessel and cements are added into the soil at the same time with the process of bringing materials through the pipe. Cement and dredging materials are mixed into piping process and finally added cement soil. This method is effective for muddy clay reused for reclamation material. Although the used system is more complicated than CDM, the excellence of this method is very quick. Generally, dredging soil can be reused with productivity of 600 – 800 m^3/hour and very contributed in rapid development demanded.

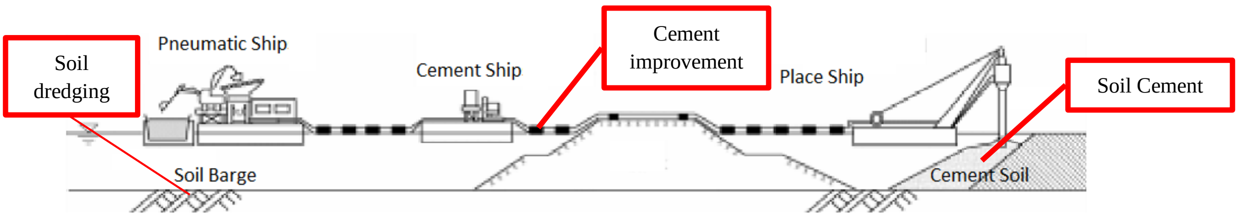


Figure 1.39. CPM Method

Figure 1.40. Construction Phase with CPM Method

Design that is used for Patimban Seaport development will use cement soil mixture as drawn in the figure below.

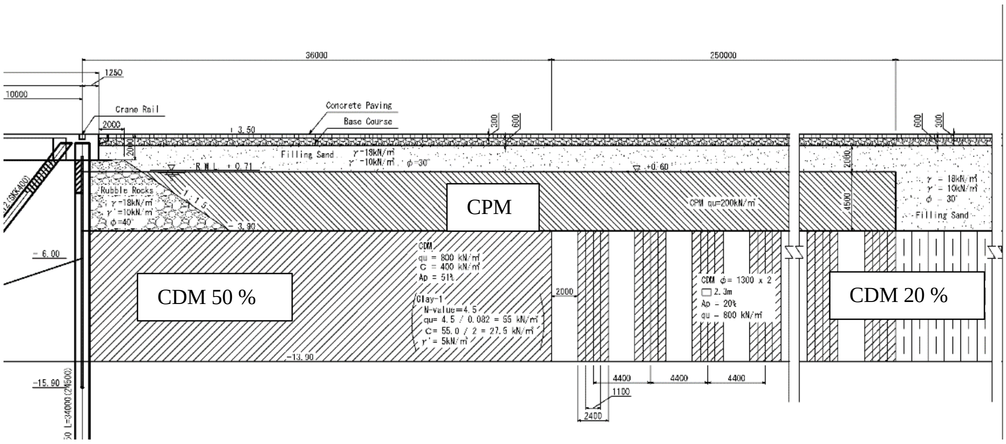


Figure 1.41. Terminal Construction Design Phase I Stage 1

To reduce ground pressure in berth retaining wall and to protect the building from berth construction, use of CDM with low ratio about 20 % will be enough to sustain terminal decline process. CPM will be used on the soil surface with 0.7 height and sub – base part with the marge will be used on cement soil used.

Plastic Vertical Drain (PVD) Soil Improvement (Phase I Stage 2)

PVD method is used to accelerate compounding for waterproof material installation that streamline dewatering the existing soil. There are many type of dewatering material such as PVD, sand drain, and fiber drain. After the installation of the drain, additional load is required such as sand materail. This method is cheaper than *cement soil improvement*, however the time is very long (7 – 10 months) to finished compounding.

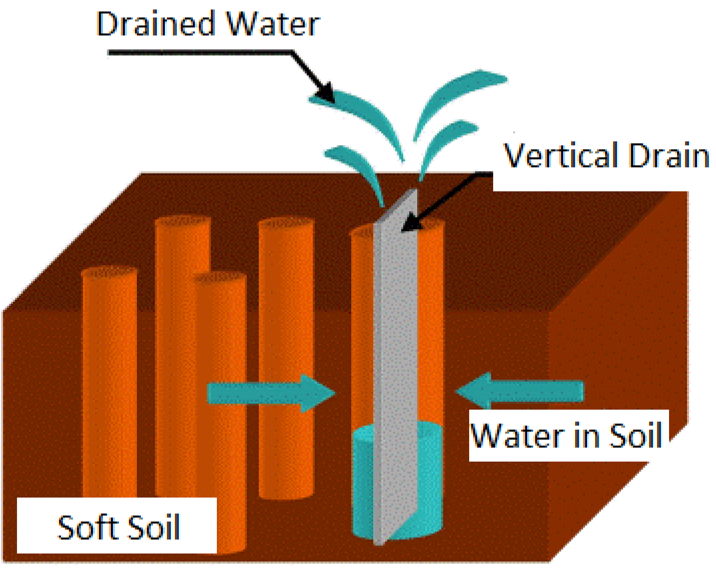


Figure 1.42. Vertical Drain Method

Standard design for terminal compounding with PVD method in terminal from Phase I Stage 1 untill Phase I Stage 2 can be seen in the figure below.

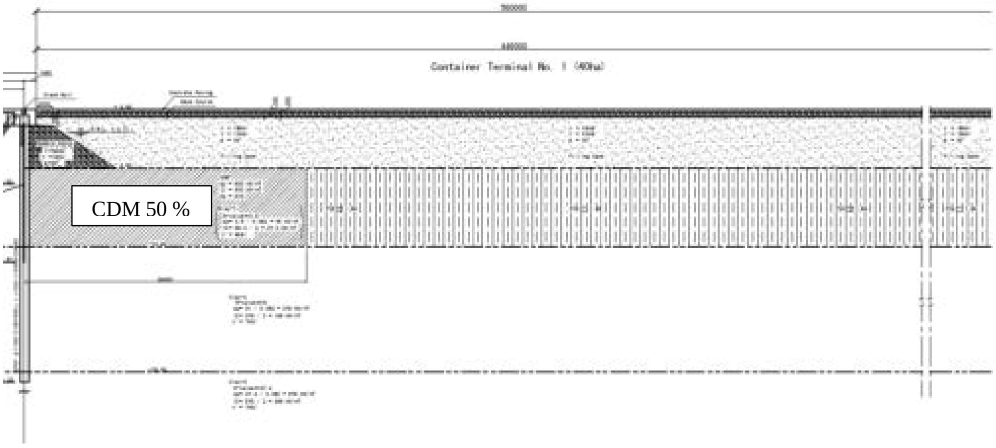


Figure 1.43. Terminal Development Design Phase I Stage 1 until Phase I Stage 2

2. *Breakwater*

Breakwater will be built in the beginning phase of development. Material for breakwater development will use rocks with composite pile type with breakwater block.

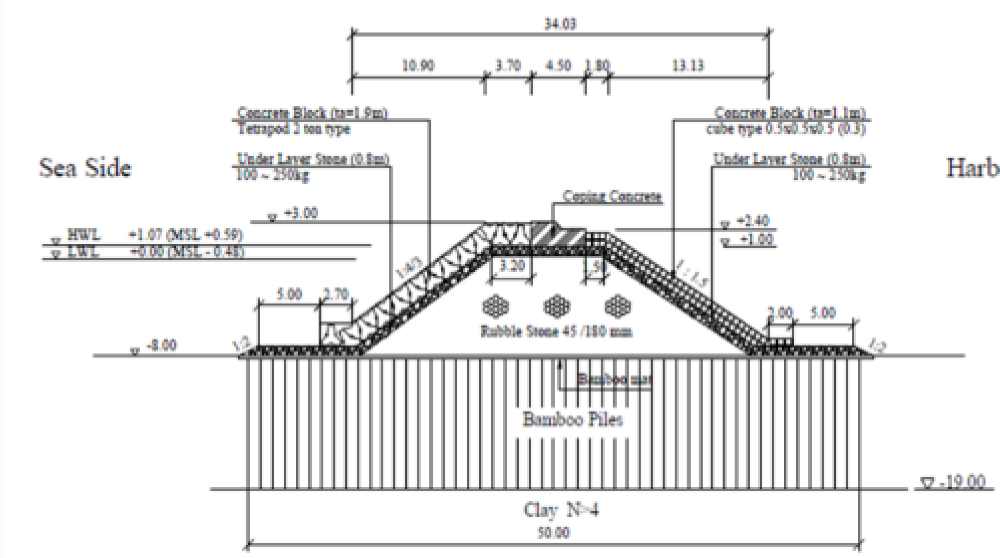


Figure 1.44. Breakwater Develpoment Plan

3. Revetment and Seawall

Revetment development will be conducted in Phase I Stage 1 in a short time. Main revetment development that will be built is in east and west side to overcome the big wave from Northeast and sedimentation from the west. Revetment will be shaped pillars and most of them have to arange from concrete pillars according to geography of Patimban waters.

For East side revetment, there are very deep area, so the use of concrete pillars will be changed with iron pillars which are stronger than concrete, thus suitable to use in that agitated area.

Seawall structure and revetment area are designed following the concept of the peak of the sea wall to the design of waves up to 1.5 m. Waves Design height (Wh) is adopted for seawall design, but for southern revetment area and shore area of back-up area is set on 0.5 m of height. Height of top of West and East Side Seawalls/Revetment Areas is is set on HWL + ½ Wh (1.5 m). Height of Top Of West Side Seawall is set to +2.5 m from CDL considering height of 1.5 m waves design, Period of waves design is 6 seconds and Dominate direction is from North-East side.

Considering soil condition of Revetment Area Foundation and Phase I Schedule, foundations of west and east side Seawalls will be strengthen by removing the soft mud material and replace it with soft sand. Containing materials of Yard Area is planned using material dredged from basin. Containing material will be strengthen by environmentally friendly Prefabricated Vertical Drain (PVD) method and surcharged soil on the area.

Seawall/ revetment area Structure is designed with gravity type (concrete block wall is placed on pile of boulders from sea basin depth to -4.0-4.5 m LWS). Both side of Seawall are protected by pile of armoured debris and concrete block is placed on pile of boulders. Steel boulder (500 kg-1 ton type) will be placed on slope of off-shore side of revetment area as wave absorber facility and debris of boulder layer (250-500 kg) will be placed slopingly. Below of concrete block reclamation sand filled until +1,50 m (MSL +1.00) and approximately 15 m from surface height concrete block is increased gradually until reached +3.5 m (MSL +3.0 m) by filling material.

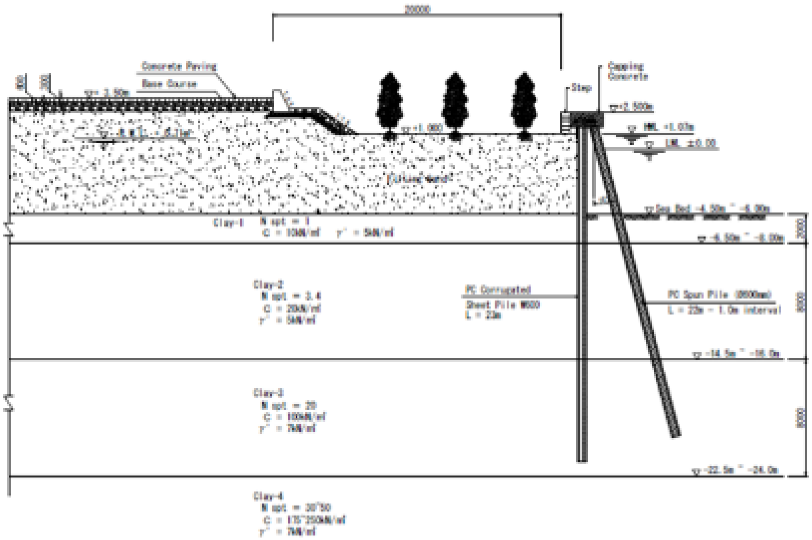


Figure 1.45. Revetment and Seawall Development Plan

4. Berth

To build berth, berth section is required so that the building on it still steady. Berth section has the smaller number of pole than berth structures in general. Pile interval is selected based on calculation every 10 m in longitudinal direction, although it normaly will require 5 – 6 m. Low pole will produce low sound and vibration for environment and public around the project site.

Construction of pillar section will be done in the factory with welding method. Total work for this development is devided into 2 parts, in the factory and in the project site. Every process will be done in parrarel so shorten development time. Construction of this berth section will be done critical phase from the entire development in Phase I Stage 1.

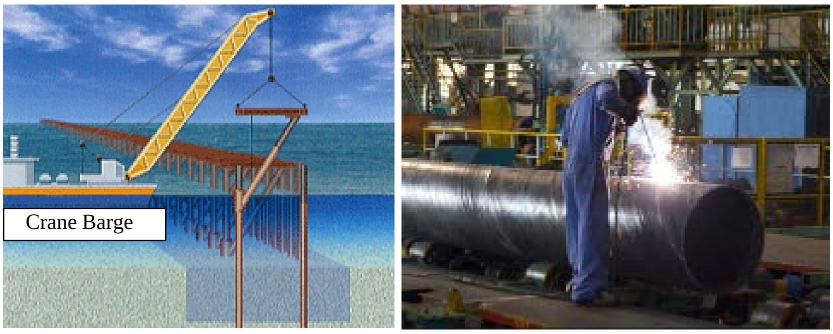


Figure 1.46. Construction of Berth Section in Parrarel

Concrete cover board structure that is planned on the berth section is using pre-cast type and is going to give a little sustain in development area.

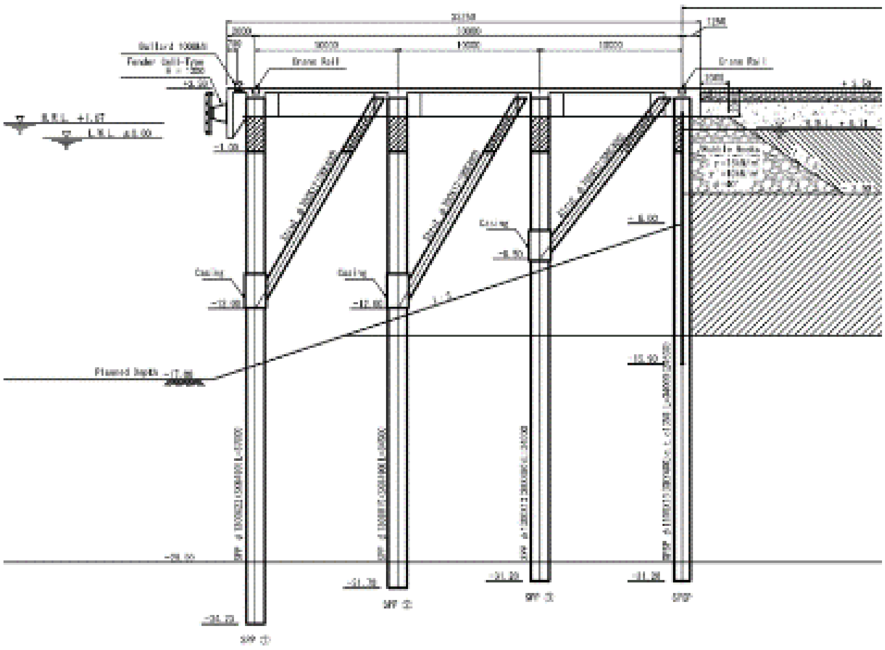


Figure 1.47. Berth Section

5. Waste Estimation during Terminal Area in Construction Phase

Waste will be collected after separation by type, and then transported by licensed contractor according to the regulation. The numbers of construction waste is estimated by using statistic data from the Japan Ministry of Environment, based on project scale. Waste estimation that may produce from development activity for terminal area can be seen in the table below.

Table 1.50. Waste Estimation That Generates in Every Construction Phase

Types	Terminal Area	
	Phase I Stage 1 (ton/day)	**Phase I Stage 2 (ton/day)**
Oil Waste	0,06	0,12
Paper and Wood	0,15	0,27
Metal Waste	0,55	1,02
Total	**0,76**	**1,41**

Source : JICA Survey Team

D. Dredging and Disposal of Dredged Material

- ***Dredging***

Dredging is an attempt to move sediment material from one place to another. Related to the construction of the New Port Patimban, dredging is conducted to remove sediment on the seabed at the construction terminal site. the type of dredging tool that will be used are Cutter Suction Dredger (CSD) and Trailer Suction Hopper Dredger (TSHD) for the dredging of access Chanel, and CSD for port basin.

The estimation of dredging volume in each development phase is shown in the following table.

Table 1.51. Estimation of Dredging Volume Each Development Phase

Dredging depth	**Processing Time**	***Sailing Channel***	***Basin***	**Total** (m^3)
CD-10 m	Phase I Stage 1	a. Total Volume : 2.526.000 m^3 b. Dredging volume per day : 7,000 m3 (work ratio 0.82) c. Dredging component : TSHD d. All of dredging material will dumping in off shore location	a. Total volume : 2.324.000 m^3 b. Dredging volume per day : 9,000 m^3 (work ratio 0.82) c. dredging component : GD 20 m^3 1 fleet	4.850.000
CD-14 m	Phase I Stage 2	a. Total volume : 4.100.000 m^3 b. Dredging volume per day : 7,000 m3 (work ratio 0.82) c. Dredging component : TSHD d. All of material dredging is dumping. **Note :** dumping area can be change based on monitoring result in phase I-1	a. Total volume : 17.100.000 m^3 b. Dredging volume per day : 32,000 m3 (work ratio 0.82) c. Dredging component : GD 20 m3 fleet (16 hours work per day basis + alfa) d. All of dredging material is dumping. **Note :** dumping area can be change based on monitoring result in phase I-1	21.200.000
Total		**6.626.000**	**19.424.000**	**26.050.000**

Source : JICA Survey Team

The estimation of dredging total volume from Access Chanel (Navigation Chanel) and port basin reach approximately 26.050.000 m^3 , which 6.626.000 m^3 are from navigation channel and 19.424.000 m^3 are from the basin. As much as 2.300.000 m^3 from that volume will be used for port terminal reclamation, and the rest as much as 23.750.000 m^3 will be dumped in sugested offshore area.

Table 1.52. Dredging Volume and Off – shore Dumping

Phase	Dredging Volume	Reusage of Dredging Soil for Mixing with Cement (m3)	Off-Shore Dumping (m3)
I stage 1	4.850.000	2.300.000	2.550.000
I stage 2	21.200.000	-	21.200.000
Total	26.050.000	2.300.000	23.750.000

Source : JICA Survey Team

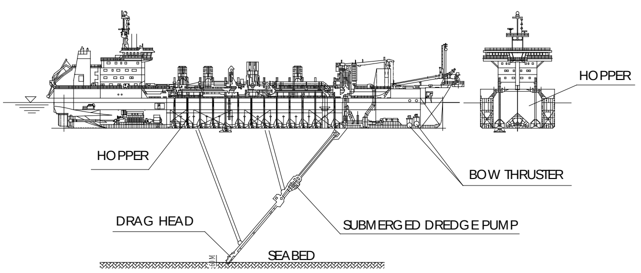
Characteristics of each dredging tools can be seen on **Table 1.53.** While dredging method can be seen in **Table 1.54**. In that table also is seen the dredging depth, beside dredging and dumping limit volume is also seen. Location of offshore dumping is sugested at 15 km distance in offshore from construction site with 23 m depth.

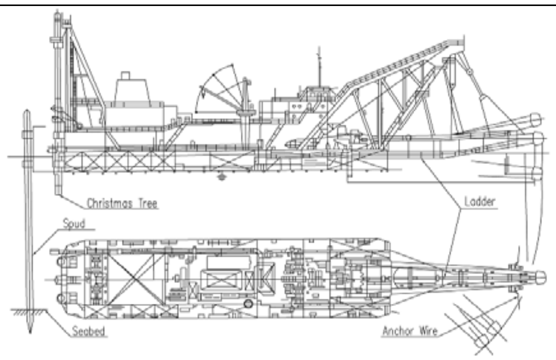
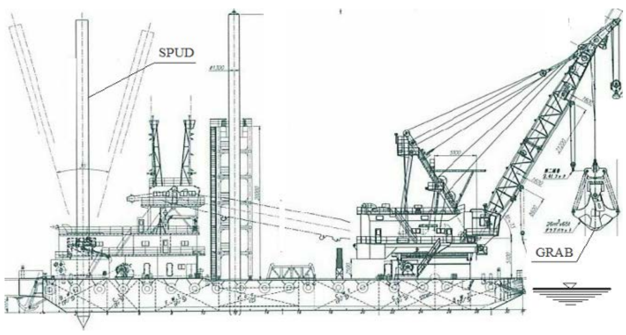
Table 1.53. Characteristic of Each Main Dredging Equipment

Examined Item	TSHD 16.000m^3	CSD 8.000m^3	GD 23m^3
Border by the existing natural condition	2	3	3
Work efficiency in indoor area or narrow area	3 (0)	2 (0)	1 (3)
Total value in indoor area or narrow are	5 0	5 0	4 3

Notes : Value 3 = good, 2 = normal, 1 = bad, 0 = impossible
Source : Secondary Data, 2015

Table 1.54. Main Dredging Equipment

<table>
<tr><th rowspan="2">Type</th><th rowspan="2">Ilustration</th><th colspan="4">Dimention (m)</th></tr>
<tr><th>Length (LOA)</th><th>Width (B)</th><th>Depth (D)</th><th>Draft (d)</th></tr>
<tr><td>SHD:
Trailer Suction Hopper Dredger
(Hopper Capacity : 16,500 - 20,000 m^3)</td><td>
</td><td>157.0
-
167.0</td><td>28.0 - 31.0</td><td>12.5 - 15.5</td><td>10.5 - 11.0</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

Type	Ilustration	Dimention (m)			
		Length (LOA)	Width (B)	Depth (D)	Draft (d)
CSD: Cutter Suction Dredger (Main Pump 7,000 - 10,000 Ps)		131.0	19.4	6.1	4.53
Grab Dredger (Grab Bucket 20 - 26 m^3)		60.0	24.0	4.0	2.0

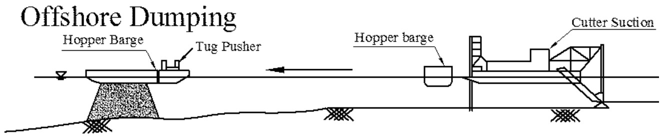
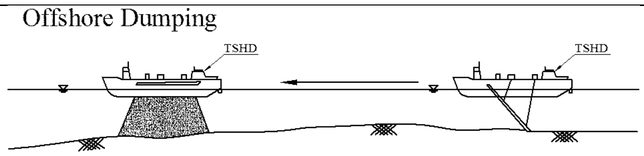
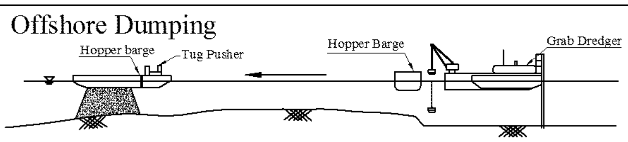
Source : JICA Survey Team

Reclamation activity is predicted will be cause many impact such as decreasing of sea water quality, disturbance of marine life (nekton and benthos), change of fishing ground, and public unrest.

- ***Materials Dredging Disposal***

As mentioned before, that materials dumping from port channel and basin are as much as 23.750.000 m^3 that will be dumped in suggested offshore location, at 15 km distance from project site in 23 m depth. Location of dumping site is choose based on offshore disposal activity standard by Badan Standarisasi Nasional, Republic of Indonesian, while minimum distance to dumped is minimum 12 mil from on shore and/or in deep sea water is -20 m. Transportation and dumping dredging materials method can be seen in **Tabel 1.55**, and dumping location figure can be seen in figure below.

Table 1.55. Method of Transport and Dumping Maerial in Offshore

No	Transportation and Dumping Method	Dredged fleets	Description
1		CSD + hopper barges with tug boats	CSD 8,000ps class with pump of low hydraulic head dapat can discharge direcly to barge. CSD continuous operation will contribute the highest productivity. According to the Japanese standard, combination of hooper barge 5.000 m3 class, and tug 4.000 ps class is match to CSD 8.000 ps. For access channel : 2 – 4 fleets. For basin dreging : 3 – 5 fleets are necessary to maintain continuous operation.
2		TSHD	Intermitted Operation for dredging soil dumping by TSHD is self playing between dredging and dumping sites. Larges class of TSHD 16.000 m3 needs 11 m draft and common size TSHD 35.000m3 needs 6 m on average. Cant approach shallow area. However, total managements is the easier compared to the dredger types.
3		GD + hopper barges with tug boats	Less productivity than CSD / YSHD. Self standing by its own spoud so less influence to other work vessels. According to the Japanese Standard, combination of hooper barge 1.300 m3 class and tug 2.000 ps class is match to GD 23 m3. For Access Channel : 4 fleets, for basin dredging : 3 – 5 fleets are necessary to maintain continous operation.

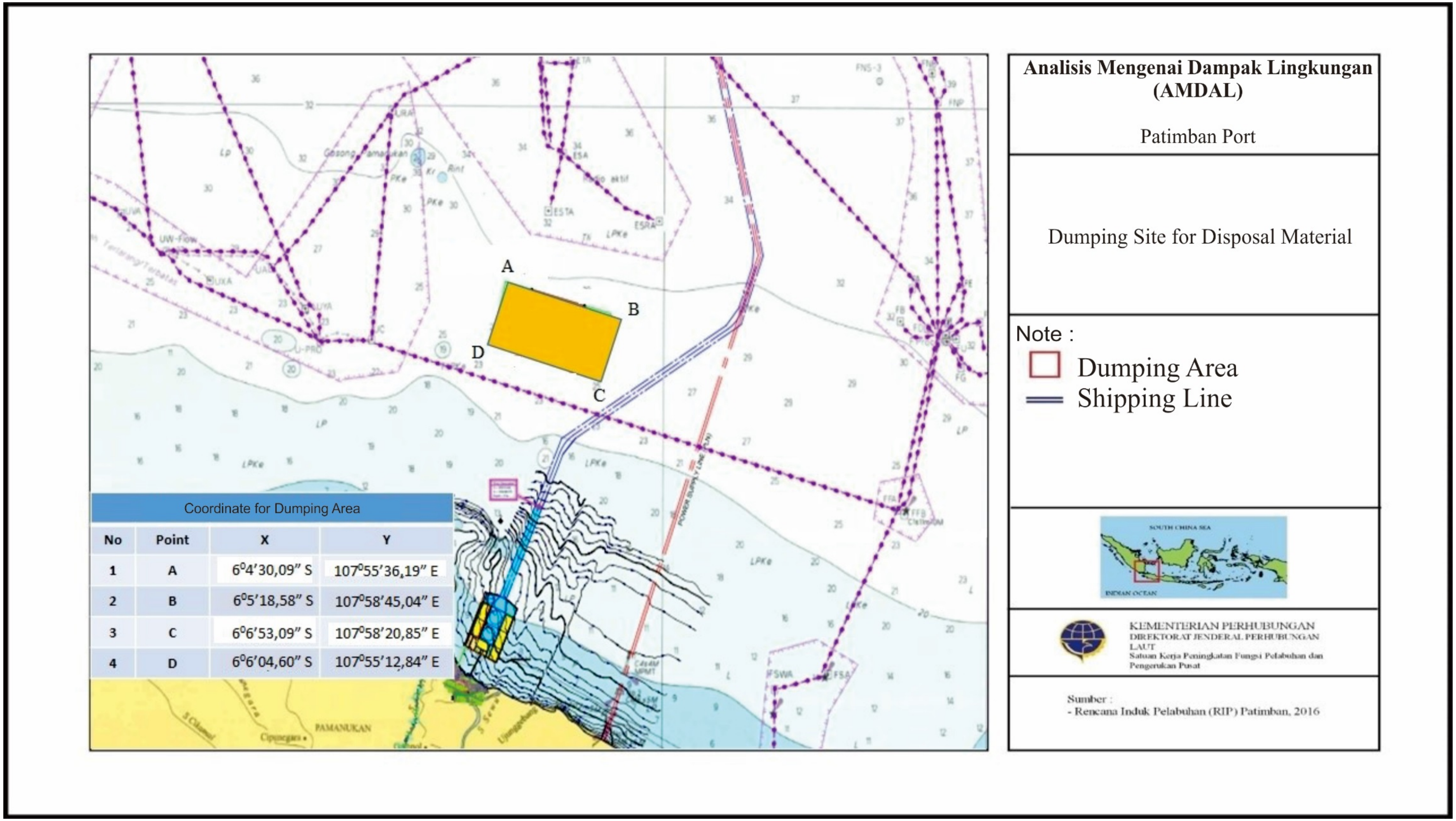
In table 1.55, seen that dredging method will be used by TSHD method and Grab Dredger method, so it predicted that turbidity impact can minimalized. Then, for the minimalized of turbidity impact by dredging and dumping, some plan for reduce of turbidity is such as seawall construction in earlier, reduce the dumping volume for reused again the dredging material for port reclamation, and installation of silt protector.

On this Phase of Development, Traffic Volume of Ships is estimated as table below

Table 1.56. Capacity and Duration of Reclamation Work of Phase 1 Stage 1 – Phase 1 Stage 2

Aspects	Unit	Total
Reclamation Sand Volume	m^3	23.750.000
Series Capacity	m^3	800
Work Duration	Month	40
Number of Ship	Per Month	742.2
Total	**Per day**	**24.7**

Dredging and dumping will make some impact in environment like decreasing of sea water (increasing of TSS) and disturbance of marine life (nekton and benthos).



Coordinate for Dumping Area

No	Point	X	Y
1	A	6⁰4'30,09" S	107⁰55'36,19" E
2	B	6⁰5'18,58" S	107⁰58'45,04" E
3	C	6⁰6'53,09" S	107⁰58'20,85" E
4	D	6⁰6'04,60" S	107⁰55'12,84" E

Figure 1.48. Location of Dumping Site

E. On-Shore Facility Development

It is estimated that impact from on-shore facility development activities are the decreasing of air quality, the increasing of noise, the increasing of water run off, terestrial animal disturbance (bird), terestrial plant disturbance, and publlic unrest.

Back up area is only zoning plan while the detail of construction methodology will be planned in the future. But, construction plans which are possibly conduct during phase I are as follow.

1. Land Handling

There are so many fishponds and ricefields on the land that will be built as back up area. That lands have soft soil texture so it need a treatment so that the entire of activities components in back up area can run safely and smoothly. There are some design in that land treatment, by adding cement to the soil surface. That method is choosen because it easy to apply. Soft soil then excavated using Excavator 0.7 m^3 – 1.2 m^3 *class*, and added cement that mixed with the soil the same time, so the soil will be hard.

2. Landfill and Soil Compaction

After soil treatment for strengthening, then reclamation is held. Reclamation soil is transported by dump truck and reclamation is proccessed by Excavator 0.7 m3 – 1.2 m^3 *class*. Basically the height of reclamation in one layer is 30 cm and every layer will be compacted by compactor to make a good foundation.

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3. *Revetment*

Revetment will be built along the seaside which is needed to anticipate the soil collapse piles in the back up area. Mangrove green area will be also prepared in the seaside are.

4. Pavement and other support works

As the final phase, pavement and other support works will be done. The thickness of the pavement will be build based on the design and required space alocation. The type of other component works include lighting, irrigation, fiber cable for communication, and drainage.

F. Development of Access Road

Access road development activity can rise various impacts. Estimation of impacts are the decreasing of air quality , the increasing of noise, the decreasing of water surface qualtiy, the increasing of water run-off, and public unrest.

Access road construction process is devided into two parts :

- **Construction Plan for Access Road**

The sequence of construction for access road is planned according to the following steps :

1. Site Cleaning

   Prior to starting the embankment works, site cleaning including the removal of trees root should be removed by a bulldozer.
2. Work Embankment

   The material of the embankment will be carried by dump truck from the borrow pit and compacted by a pneumatic tire roller.
3. Slope Protection Work

   The slope of the embankment will be formed by backhoe after compaction by bulldozer. After that, slope protection works including planting and shaping should be done.
4. Pavement Work

   Generally, Base Course and Subbase Course are leveled by motorized grader, and compacted by road roller and a pneumatic tire roller.

- **Construction Plan for Bridge**

1. Cast in Place RC Pile (CIP RC Pile)

   CIP RC Piles are selected considering the ease of construction and procurement of the materials. After installation of temporary steel casing into the ground using vibrator, the soil inside the casing will be removed, and bentonite slurry will be used to stabilize the soil and prevent the excavated hole from collapsing.

   After installation of the reinforcement cage into the bored hole, the concrete is poured into the excavated hole using a tremie pipe. At the end of the casting operation, the temporary steel casing will be removed.

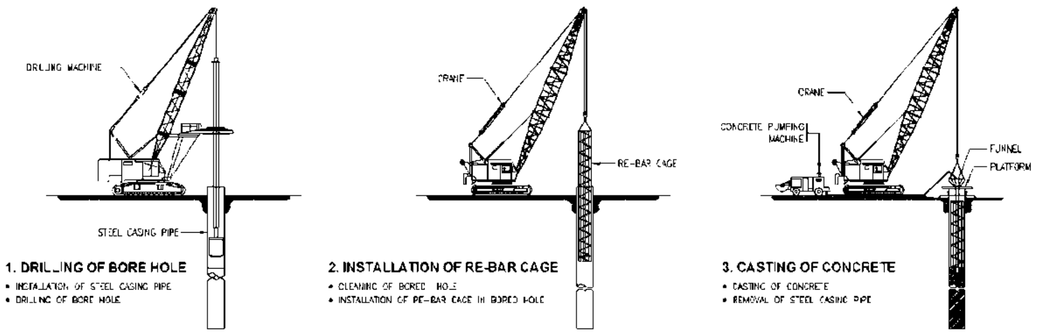


Figure 1.49. Construction Metho for CIP RC
Source : JICA Survey Team

2. Pile Cap

   After installation of steel sheet piles, excavation works will be carried out up to the required level. Then, lean concrete will be poured so as to prepare a plane surface on which the formwork and re-bar can be installed. After casting the pile cap and removal of the formwork, the backfill work will be carried out up to the top surface of pile cap shortly afterwards..

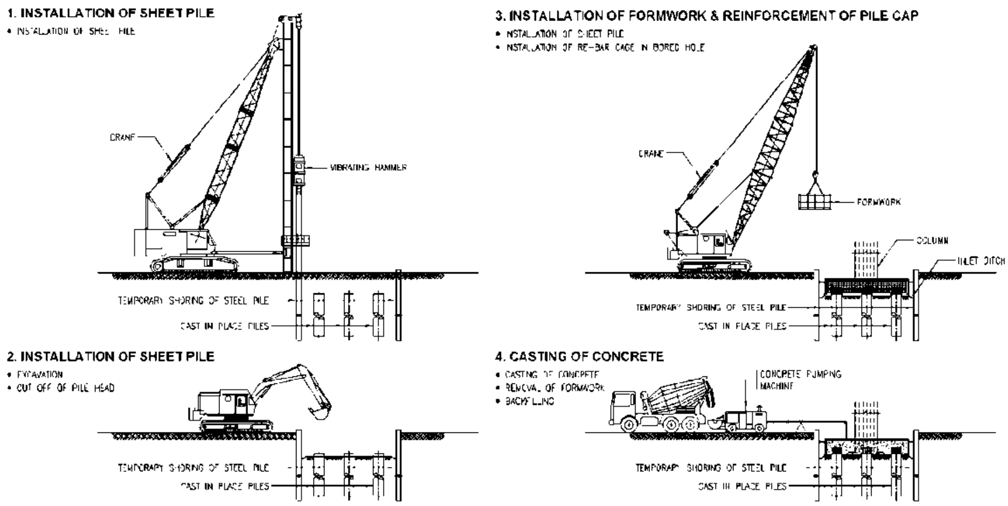


Figure 1.50. Construction Method for Pile Caps
Source : JICA Survey Team

3. Pier

   After installing re-bars overlapping the starter bars of the pile cap, vertical formwork will set up and concrete casting will be done eventually.

For the pier head, support should be assembled from the ground and the formwork will then be installed on top of pier head. After that the installation of re-bars and the pier head casting will be done sequentially.

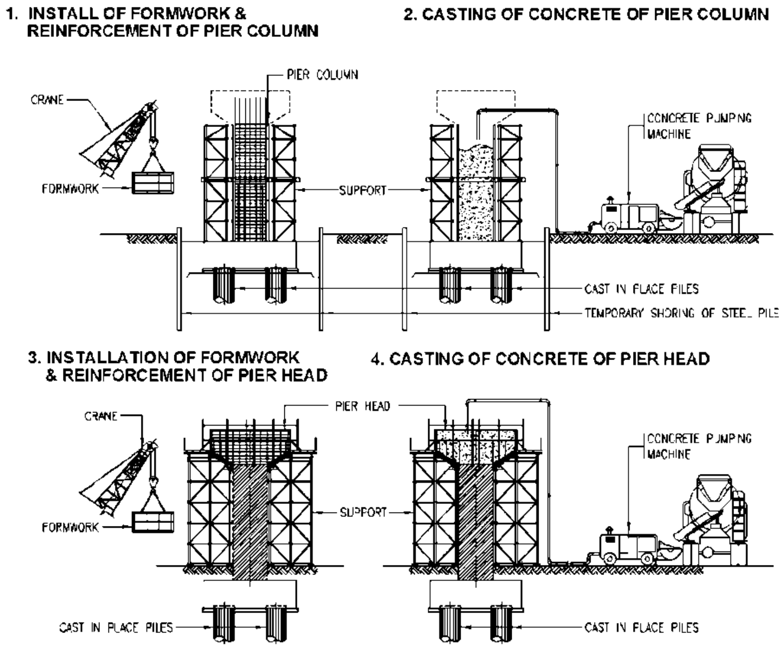


Figure 1.51. Construction Method for Pier
Source: JICA Survey Team

4. Superstructure (PC-1 Grider)

During the construction of substructures, PC-I girders will be manufactured in advance at fabrication yards near the site. After completion of the piers, PC-I girders should be erected using truck cranes.

If the construction by truck cranes becomes impossible, the construction by erection girders can be followed. This shall be considered in the detailed design stage if the necessity becomes an critical issue.

This method involves casting long sections of the bridge superstructure in a stationary formwork behind abutment, and carrying completed sections towards bridge longitudinal axis following girder erection method

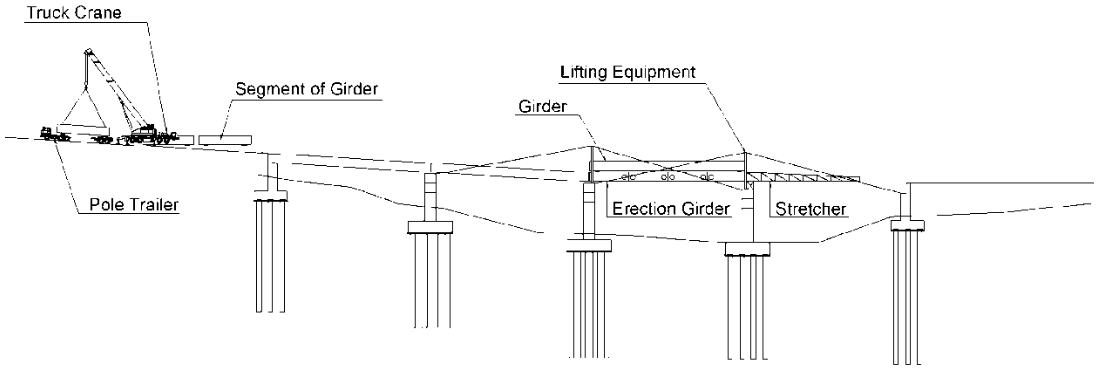


Figure 1.52. Method Construction for Superstruktur
Source : JICA Survey Team

The numbers of heavy equipment that are used based on access road development activity will be started from Phase I Stage I until Phase I Stage 2 development, can be seen in this following table.

Estimation of Waste Generation of Construction Phase of Access Road

Waste will be collected after separation by type, and then transported by licensed contractor according to the regulation. The numbers of construction waste is estimated by using statistic data from the Japan Ministry of Environment, based on project scale. Waste estimation that may produce from development activity for terminal area can be seen in the table below.

Table 1.57. Estimation of Waste Generation of Construction Phase of Access Road

Type	Access Road Phase I Stage 1 (ton/day)
Oil waste	0,05
Paper and wood	0,12
Metal Waste	0,45
Total	**0,62**

Source: JICA Survey Team

1.1.6.3.3. Operational Phase

In the operational phase, seaport activity consists of some activities that will be done, such as:

- Procurement of employer
- Off-shore facilities operational
- On-shore facilities operational
- Maintenance of basin and sailing line
- Access road operational

A. Employment of Workers

The workers have been employed in Phase I Stage 1 to start port activity, although the required amount for this phase is not large. In order to manage and to operate Patimban New Port, operator terminal will be designed through a connection scheme (KPS, Koneksi Pelabuhan Skema). Required workforce for the port management and operation is estimated in the table below.

Workers divided by functions :

a. Basic Operations Port-based infrastructure which is the Port Authority's labor authorities will handle the Berth breakwater, navigation, maintenance of port facilities, the cost of rent and charges, collection of data and information.
b. Government functions are coordinated by the port authorities to cover customs, quarantine, immigration, police, fire, safety delivery, and more.
c. Security including port security, vessel and cargo field.
d. Operational unloading ports by carriers, cleaning service

Workers for the container terminal and car terminal can be hired from local people. The estimation of the possible number of worker is 240 parsons (30%).

Table 1.58. Estimation of Requirement of Number of Workerss on Operational Phase I Stage 1 – Phase I Stage 2

Work Spectrum	Number of Worker
Port authority Office, Harbor Master Office, other office, Quarantine office, Imigration Office	150
Container Terminal	600 (300 x 2)
Car Terminal	200

Source: JICA Survey Team

Employment of workers can make a positive impact like opened of career opportunity and negative impact like Incidence of Communicable Diseases.

B. Marine Facility Operational

Marine facility operational activity is a series of activities which carried out after the construction of terminal has been completed, that will start to operate in 2019. Those activities consist of few types of activity such as:

a. *Calling Vessel* Activity
b. Loading and unloading ships activity
c. Cargo and transportation storage activity
d. Ship waste management activity
e. Water Sullpy
f. Waste Water Treatment
g. Power Supply

Off-shore facilities operational activity predicted can produce impacts such as air quality decline (TSP and emision), sedimentation, sealine change, water quality decline (increasing of TSS), sea traffic disruption, marine life disruption (benthos and necton), fishing ground change, and public unrest. Description of activity in this phase can be seen as follow.

1. *Calling Vessel* (Ship) Activity

Activities include arrival of the Ships, tethering, lie at anchor, departure and maintenance for required ship. Ship anchored activity in seaport during unloading process generally are unloading and loading ships loads container, dry bulk cargo, wet bulk cargo and general cargo. Tethering time depends on number of good that have to unload or load, usually between 1 - 3 days with standard time 2 hours/day. Capacity of tether of ships at Patimban Seaport maximum is 30 ships.

Before ships anchored, ships must stop outside of the port water before unloading and loading time. The number of ships is according to the pattern of ships trafic and berth capacity. Vessels Arrival is started with announcement from vessel or agent of vessel about arrival completed by identity of vessel, cargo, and unload/load plan. The arriving vessel must be guided so the one arrived at port before must wait for guidance of port officer.

Guidance is conducted by guidance officer or ship puller. Guidance finished until vessel and tetherer tethered correctly. Duration for guidance process between 20 - 50 minutes depend on guidance distance. The delay of ship is general agenda and assigned set the benchmark amount. Departure of vessel depart from the port activity (tethering and Anchoring). Departure finished after administrative requirements is fulfilled. For traffic safety, then socialization and coordination to head of the fish aution and Pertamina Co. about sailing Route and applied the OSP of ships tethering and departure activity.

Patimban Seaport is an international harbor, then there are ships coming from overseas, thereby potentially carry disease from the source region, for it has been established the following rules:

1. At the time of the foreign vessel at the jetty, the quarantine was the first to board the ship beforehand to double check the health of the crew, animals and plants
2. If ditemukaan their disease is suspected, it's crew will soon be brought to the hospital and for animals and plants will be quarantined.
3. The ship was banned to enter and perform loading and unloading.
4. To overcome the disease vectors such as rats, then the boat rope tied around Bolard, will be rigged with a kind of ball in the middle of mice did not get past the rope.

To maintain the cleanliness of the environment, there will be efforts as follows:

1. Applying sanctions to ship the waste disposed in the area of Terminal Patimban.
2. Provide barge carrier ship waste to take it to the next at the reception facility (RF).
3. Prohibit all vessels not to throw waste in Terminal Patimban, both in peraiaran and the mainland.

Numbers of calling Vessels at Patimban new port are estimated as shown in the following table which will be base plan.

Table 1.59. Calling Vessel Ship Prediction in Every Years

Years	Number of Calling Vessel Ships					
	PCC (International	PCC (Domestic)	General Cargo Vessel (Steel Rolls)	Petroleum Tanker	Container Vessel	
					Feeder Vessel	Feeder Vessel
2019	107	214	19	-	394	0
2020	115	230	20	-	394	0
2025	162	324	27	19	331	336
2030	219	437	36	24	496	504
2037	320	640	53	34	943	957

Source : JICA Survey Team

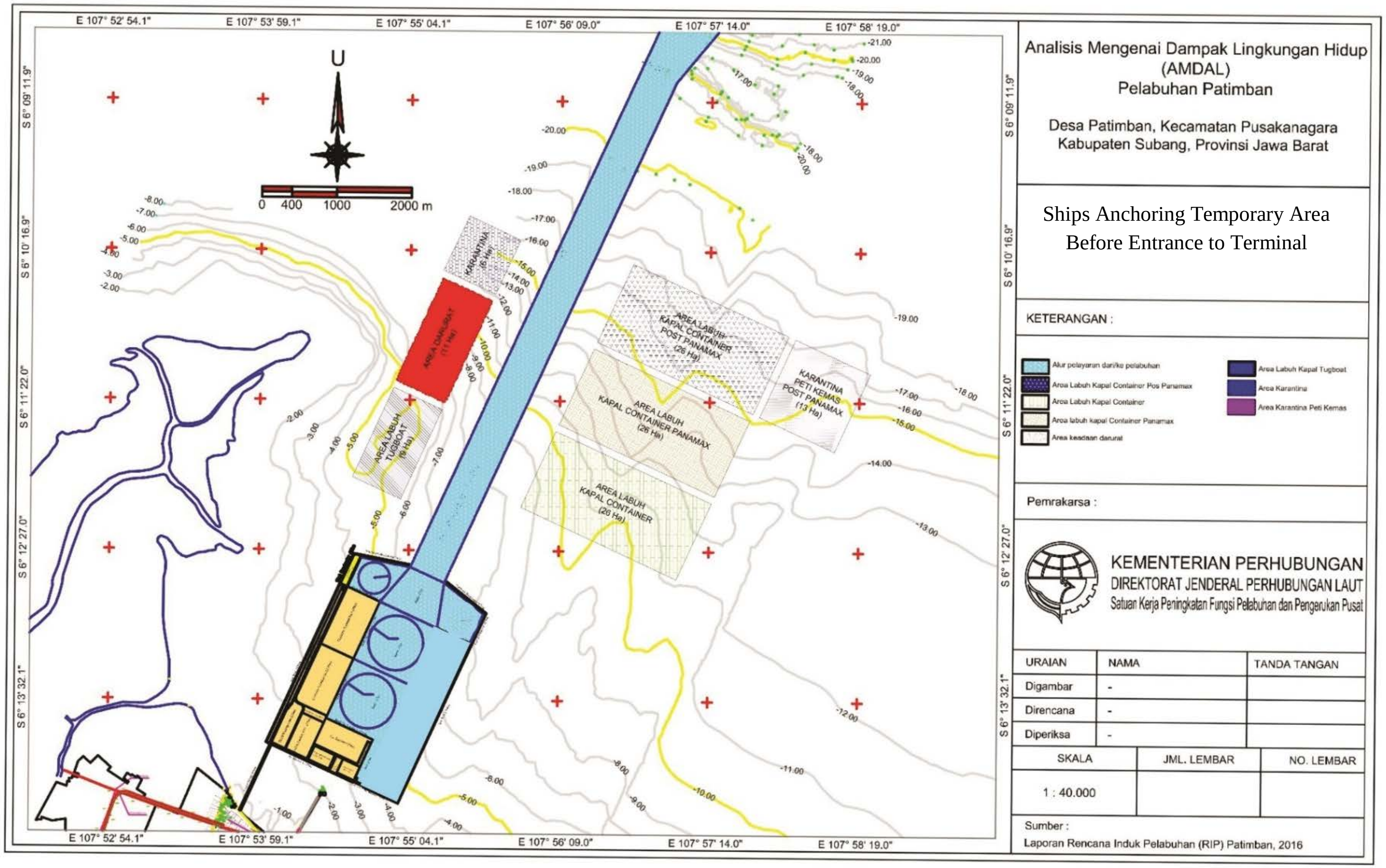


Figure 1.53. Plan Anchor Area Before Entrance to Patimban Seaport

2. Loading-Unloading Ships Activity

Loading ships activity is the activity to load some cargoes to the ships, while unloading activity is an activity to decrease the cargo to the port. Unloading activity is done by crane. For cargoes handling, especially ULCS container type, it will be installed Quayside Container Gantry Cranes from super post Panamax. While for container handling system between the courts, calculating container volume, it will be proposed System Transfer Crane (RTG).

Design and numbers of quayside container cranes are determined based on container volume estimation of 3.389 million TEUs for container terminal No.1 and 2 in Phase I. Associated with quayside container cranes, super post Panamax-type granty cranes can transport 13,000 TEU container with 20 rows in the deck, projected for Quay No.1 and 2, and conventional sized cranes catering for 2,250 TEU container with 12 (twelve) or 13 (thirteen) rows in the deck will be used for Quay No.3.

Estimation of yearly cargoes loading-unloading activity is shown in the following table.

Table 1.60. Summary of Volume Yearly Unloading Cargoes Activity Patimban Seaport

Phase I Stage 1 (2019)							
Demand TEU	**Container Ship Type**	**Ship Call (Ship/Week)**	**Qcc/Ship (Unit)**	**Quay Length (m)**	**Total Qcc Twin Qcc**	**ASC (Unit)**	**SCs (Unit)**
200,000	Internasional	2	2	238	2	4	6
300,000	Domestik	5	2	210	2	4	6
Total				**447**	**4**	**8**	**12**
Phase I Stage 2 (2022)							
Demand TEU	**Container Ship Type**	**Ship Call (Ship/Week)**	**Qcc/Ship (Unit)**	**Quay Length (m)**	**Total Qcc Twin Qcc**	**ASC (Unit)**	**SCs (Unit)**
1,355,482	Internasional	4	4	764	8	16	24
2,033,022	Domestik	33	2	1,124	10	20	30
Total				**1,888**	**18**	**36**	**54**

Source : RIP Patimban, 2016

Table 1.61. Summary of Volume Yearly Unloading Car Activity Patimban Seaport

Berth								
No	**Phase Development**	**Demand**	**Ship Plan**			**Ship Call**	**Nb**	**Length Quay**
		Cars	Name	Capacity	Loa (m)	Ship/week	Berth	
1	Phase 1 Stage 1	215.975	GAIA LEADER	7.500	199,4	1	2	439
2	Phase 1 Stage 2	2911.069	GAIA LEADER	7.500	199,4	1	2	439

Source : RIP Patimban, 2016

Heavy equipment will be operating in container terminal. Numbers of heavy equipments that has been planned can be seen in this following table.

Table 1.62. Demand of Kontainer Handling Equipment

Container Terminal No	Terminal No 1 and 2
Quayside Container Crane	24
RTG	60
Yard Tractor	144
Yard Chassis	152
Top Lifter	12
Reach Stacker	12

Source : RIP Patimban, 2016

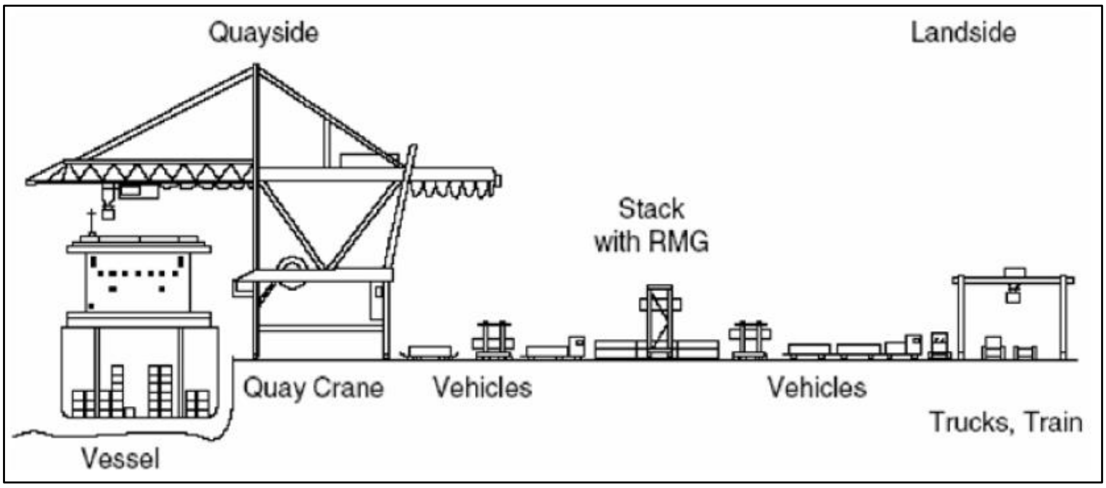


Figure 1.54. Cycles of Unloading Cargoes
Source : RIP Patimban, 2016

3. Cargoes Storage and Transportation Activity

Patimban New Port activity includes cargoes from Hinterland Port before it loaded to the vessel. Cargoes are transported by truck before it loaded and arranged in the yard. Cargoes are arranged according to its type. Cargoes that are not airtight put in indoor warehouse, while the airtight cargoes put in the open yard. The arrangement and expenditure of cargoes are made by FIFO system (first in first out). Cargoes expenditure is taking goods activity from the port to the outside of port area (hinterland). Revenues and expenditures will increase the density of traffic around the port. The estimated number of heavy vehicle in 2019 is about 2.271 unit perday.

4. Waste Management Activity

Estimation of waste type that will possibly appear from ships and terminal activity in each phase of development are oil waste and domestic waste. Solid waste volume is calculated by using *statistical data of Ministry of the Environment Japan* dan *statistical data at Tokyo Port in Japan* based on project scale.

Waste will be collected after separation by type, and then transported by licensed contractor according to the regulation. For the details about the waste generation that may produce and management methode can be seen in the table below.

Table 1.63. Estimation Of Ship and Terminal Activity Waste Type and Volume

Waste type	**Terminal**		**Treatment Method**
	Phase I Stage 1 (ton/day)	**Phase I Stage 2 (ton/day)**	
Oil Waste	0.3	1.1	Collected in Decided Area, Dumping is conducted as soon as possible by related party. Collecting frequency is suggested by contructor
Ship Supply (Plastic)	1.3	4.3	Collecting Waste is conducted in decided location and dumped by related party. Frequency of collecting is formulated by contructor.
Domestic Waste	53.8	173.4	Collecting Waste is conducted in decided location and dumped by related party. Frequency of collecting is formulated by contructor.
Oil Waste from Vessel	3.4	9.3	Collecting Waste is conducted in decided location and dumped by related party. Frequency of collecting is formulated by contructor.
Solid Waste from Vessel	3.5	9.8	Collecting Waste is conducted in decided location and dumped by related party. Frequency of collecting is formulated by contructor.

Source: JICA Survey Team.

Toxic and hazardous (B3) liquid waste management that produce from ships and terminal activities are collected in the collective tank ang then will be submitted to the licensed third party. The number of tanks that required are 7 tanks with volume of 25,000 gallon.

Based on the apendix of Kep-01/Bapedal/09/1995 about procedures and technical requirements of storage and collection of toxic and hazardous (B3) waste, it is planned the layout of B3 waste storage which can be seen in the following figure.

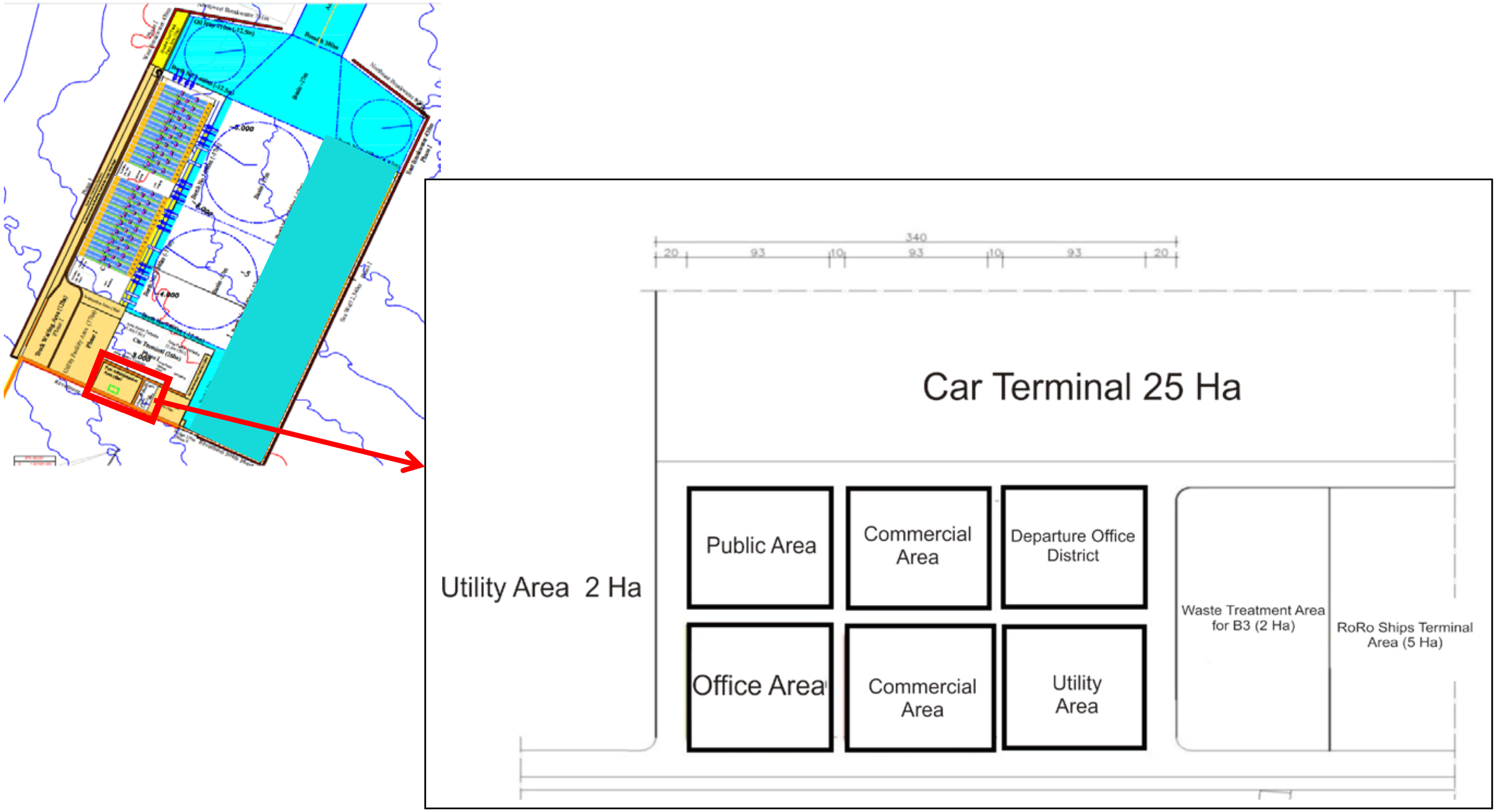


Figure 1.55. Layout Plan of Reception Facility

5. Water Supply

Water needs and water suply facility

Water needs for the ship, fire station, and building are include. Water suply facility for phase I is estimated for container terminal handling activity.

Table 1.64. Requirement of Water Supply for Terminal Phase I

Demand	Design
1) Domestic Consumption	
1-1) Port Administration management office (Public PA)150persons	15 ton/day
1-2) Terminal operator office (operator, 200persons) 20 t/ x 2 terminals and 10 ton for car terminal	50 ton/day
1-3) Terminal operation works shop, washing equipment; 50 t/ x 2 CNT	100 ton/day
1-4) Terminal back up area on the coast area	50 ton/day
1-5) Water sprinkle in the yards; 10 ton/terminal/day x 3	30 ton/day
1-6) Losses	10 %
2) Ship Supply by operator	
2-1) 1,000 ton /day/Container terminal berth x 3 berths	3,000 tons/day
2-2) 100 ton/day/ Car terminal berth x 2 berths	200 ton/day
3) Fire Fighting	
3-1) Maximum Reserve	200 tons
4) Demands per day (Approx.. 3,670ton/day, say;)	3,700 ton/day (42 L / second)

Source : JICA Survey Team

Water suply system for Patimban will use water reservoir (Ground Tank 3.000 ton, 50 m x 25 m x 3 m), *pump house* (50 m x 25 m), and high water tank (50 m). All of water reservoir line for Patimban Seaport will be built by each user operator. Water pipe in the terminal will be connected with main water reservoir in the project site.

The outdoor-hydrant boxes are installed in the Maintenance Shop and CFS. The indoor-hydrant boxes are provided for the other buildings. The water supply pits and pipeline along the berth of the terminal will be installed to supply the water to ships. Minimum pressure at the farthest supply point should be 50 psi for the domestic demand and ship supply, while much higher pressure of 65 psi should be provided for the fire fighting.

Water Supply Resource

Relating with water needs that required for Patimban Terminal, it will be fullfilled by Subang regency PDAM (Taruma Timur), where the water source and water suply facility is from Compreng, which has production capacity of 50 L/second (lps). Meanwhile the water needs for Patimban seaport activity is 42 L/second all over Phase I, so aditional water suply is needed and planned to provide from the adition of Compreng water suply with the total of all suply is 50 L/second in 2019. But, for water suply in phase I stage 1 that owned by PDAM has suffice all operational activity.

Network system that will be used to meet water needs of Patimban seaport can be seen in the following figure.

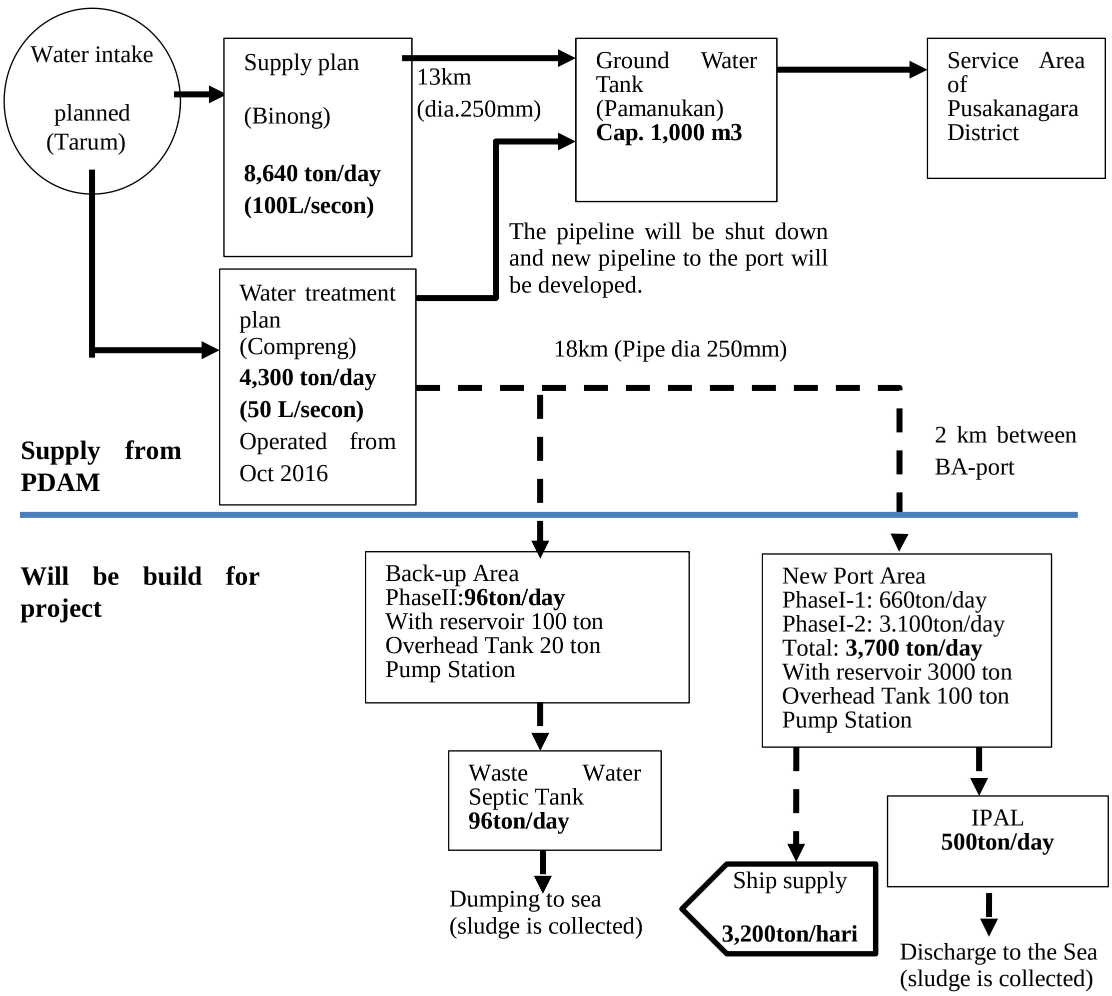


Figure 1.56. Flow Chart of Water Supply and Waste Water Flow in Patimban Port (Phase I) by PDAM

Raw water source in the irrigation of PDAM Taruma Timur has SIPA (license withdrawals) 200L/second. At this moment, PDAM take raw water 150 L/second (100L/second for WTP Binong and 50 L/second for WTP Compreng). Raw water source that is used can be seen in the following table.

Table 1.65. Raw Water Quality Standard in Taruma Timur

No	Parameters	Units	Max Standard (**)	Result of Lab
1	Odors	-	No Odors	No Odors
2	TDS	mg/l	1000	128
3	Turbidity	NTU	-	78,39
4	Fe	mg/l	0,5	0,22
5	Fluorida	mg/l	1,5	1,05
6	Hardness CaCO3	mg/l	-	79,34
7	Chloride	mg/l	300	75,28
8	Mn	mg/l	0,2	0,387
9	Nitrat as N	mg/l	10	1,34
10	Nitrit as N	mg/l	0.06	0,978
11	pH		6 – 9	7,3
12	Sulphate	mg/l	300	76,59
13	Organic Matter (KMnO4)	mg/l	10	6,44
14	Residual Chlor	mg/l	-	0,00

Source : PDAM, Subang Regency, 2016

(**) Peraturan Gubernur No. 12 Tahun 2013 Tentang Baku Mutu dan Pengendalian Pencemaran Air

Table 1.66. Raw Water Quality Standard in Compreng for Drink Demand

No	Parameters	Units	Maximum Standard	Result of Laboratory
1	Odors	-	No Odors	No Odors
2	TDS	mg/l	500	107
3	Turbidity	NTU	5	0,87
4	Fe	mg/l	0,3	0,19
5	Fluorida	mg/l	1,5	0,89
6	Hardness CaCO3	mg/l	500	76,18
7	Chloride	mg/l	250	69,18
8	Mn	mg/l	0,4	0,3
9	Nitrat as N	mg/l	50	6,9
10	Nitrit as N	mg/l	3	0,47
11	pH		6,5 – 8,5	7,4
12	Sulphate	mg/l	250	82,59
13	Organic Matter (KMnO4)	mg/l	10	3,62
14	Residual Chlor	mg/l	-	0,4

source : PDAM, Subang Regency, 2016

(*) Permenkes No 492 Tahun 2010 tentang Persyaratan Kualitas Air Minum

Transmission pipe

Subang PDAM has installed transmission pipe with 4,000 m length. PDAM need the new transmission pipe for patimban seaport along 17.890 m with 250 mm diameter.

First plan for Underground Tank and Elevated Tank Development

Transmission pipe from Compreng will be connected untill Patimban seaport management office. As for transmission pipe that will be built can be seen in the following picture.

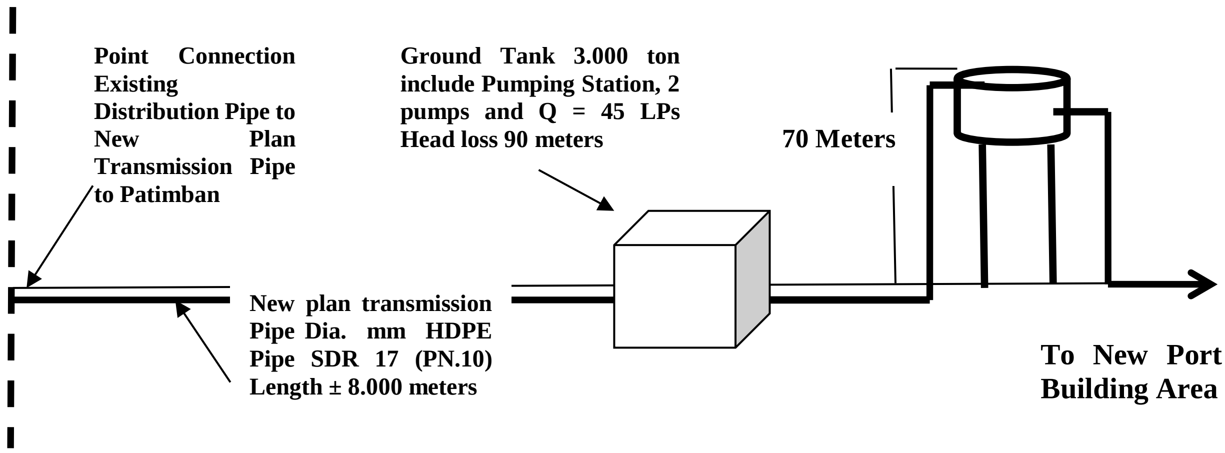


Figure 1.57. Existing Water Supply System around the Patimban Surrounding area

Water Needs and Alocation

Water suply needs for each port area can be seen in the table follow

Table 1.67. Water Supply demand Allocation to the Facilities

No	Description	Water Demand		Note
		Ton/day	LPs	
D-1	Port Administration Area	97	1.123	Calculation of water demand include losses 10% and Fire Fighting each area 25 ton/day
D-2	Roro Terminal	135	1.563	
D-3	Car Terminal	200	2.315	
D-4	Port Service Yard	58	0.671	
D-5	Utility Facility Area	80	0.926	
D-6	Truck Waiting Area	50	0.579	
D-7	Container Terminal 1	1525	17.650	
D-8	Container Terminal 2	1525	17.650	

Source : JICA Survey Team

Design Criteria of Allocation to each terminal

- Velocity between 0.3- 3 m/sec
- Roughness of pipe 100
- Minimum pressure at farthest supply point 50 psi (34 m = 3.4 bar) for domestic demand and ship supply. For fire fighting 65 psi (45 m = 4.5 bar)
- Detention time of reservoir (ground + elevated) 20 hours

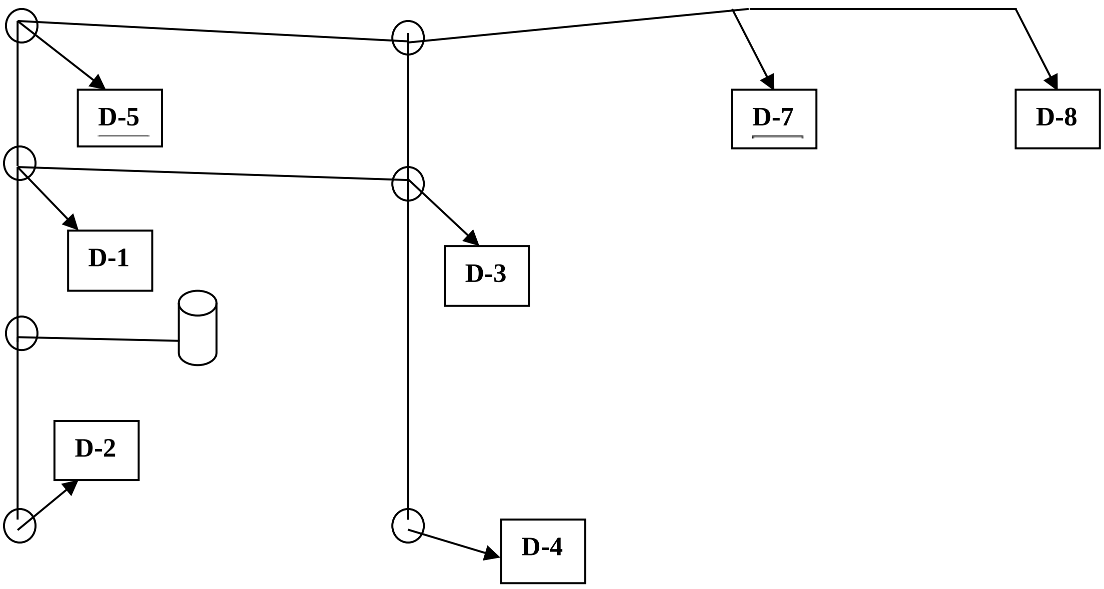


Figure 1.58. Water Demand Allocation

Underground Reservoir and Elevated Tank Plan

Underground reservoir planned capacity of 3.000 m^3 with dimension of 25 m width, 30 m length, and 4 m height. Underground reservoir design will use cement with K-350. Ground reservoir consists of 2 compartment, which each compartment has volume capacity of 1,500 m^3.

Elevated tank capacity arrange in the volume of 100 m^3 and height level of 50 m for under the ground. Elevated tank construction is made by combining cement with steel columns to support the underlying structure.

Pumping Station Plan

Dimension of pumping station is 16 m width and 30 m length. Construction is made strengthen by K-175 cement. The number of pumps supplied is 3 units. Pumps type is *centrifugal pump positive suction.* Pump specification is organized in the flow of 43 L/second and head 55m.

6. Waste Water Management

Estimation of water waste management volume

Estimation of disposal system capacity and water waste management depend on water waste debit. Grey water and black water, both will be processed simultaneously. Water waste is counted from water suply, and here are the details.

Table 1.68. Estimation of Water Waste Volume

No	Description	Water Demand	Average Waste Water			Note
		Ton/day	%	Ton/day	LPs	
W-1	Port Administration Area	97	80%	78	0.9	Domestic area
W-2	Roro Terminal	135	20%	27	0.3	Commercial area
W-3	Car Terminal	200	20%	40	0.5	Commercial area
W-4	Port Service Yard	58	60%	35	0.4	Combine area
W-5	Utility Facility Area	80	20%	16	0.2	Commercial area
W-6	Truck Waiting Area	50	20%	10	0.1	Commercial area
W-7	Container Terminal 1	1525	20%	305	3.5	Commercial area
W-8	Container Terminal 2	1525	20%	305	3.5	Commercial area

Source : JICA Survey Team

Water waste total volume that estimated to be processed is 816 ton/day or 9,4 L/second. Water waste management location will be in the public utility area.

Design Criteria of Planning System

- Peak factor from average wastewater flow figure
- Q peak = Q average x Fp
- Q infiltration from infiltration flow figure
- Q peak total = Q peak + Q infiltration (Q = wastewater flow)
- d/D plan = 0.6
- Velocity plan 1.6 m/sec
- Slope plan 0.004 m
- Start elevation of pipe at node 1 is - 0.5 m
- Position manhole every 100 meter
- Maximum of pipe depth – 3 m

- Pump station if depth of pipe more than – 3 m

Disposal system is planned to follow water suply network in the opposite direction.

Waste Water Management Installation

Water waste management installation is sugested to use *Rotating Biological Contractor* type with modular system improvement. These tools consist of 3 modular and each modular has capacity 3 L/second or 1.296 ton/day = 1.300 ton/day.

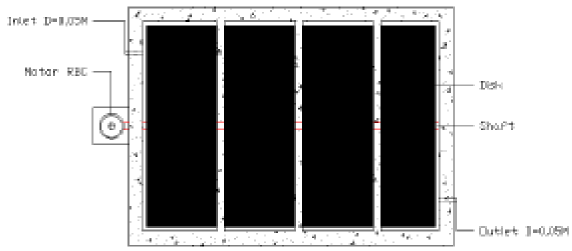


Figure Lay Out RBC

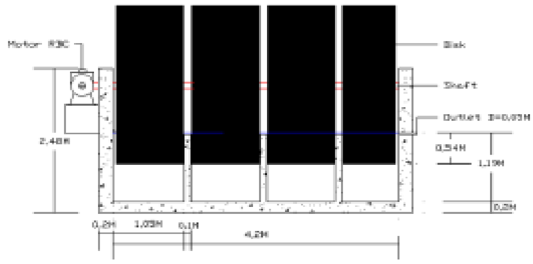
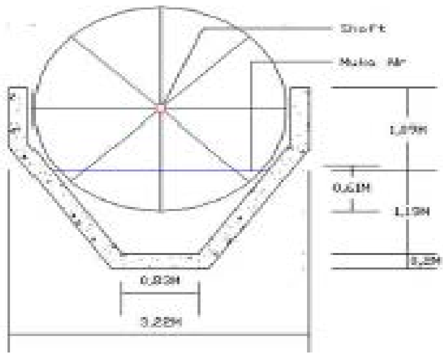


Figure Cross Section of RBC



Modul of RBC

Figure 1.59. Waste Water Treatment Equipment

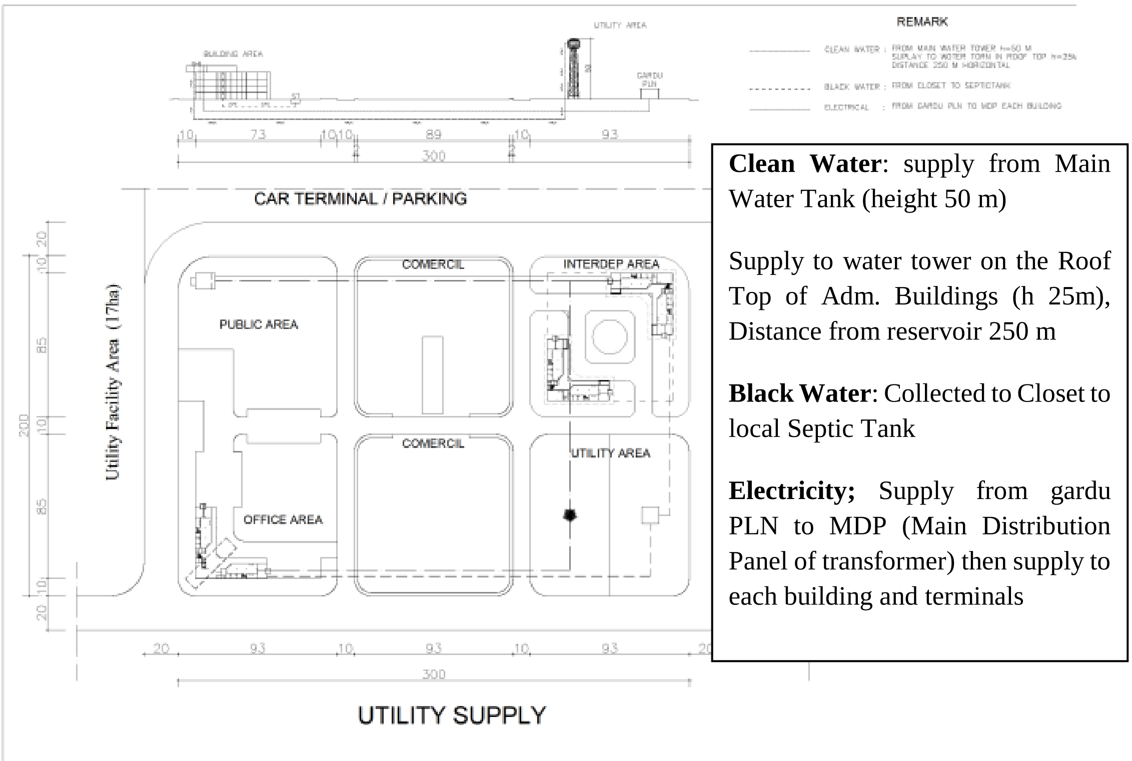


Figure 1.60. Plan of Water Supply Pipe and Electric Power Cable within the Area

7. Electricity Supply

Electricity Needs for Phase I

Electricity needs for all activities at Phase I is summarized in the table below.

Patimban Seaport electricity needs will be obtained from national electricity company (PLN) Subang regency. A unit of generator equipment is prepared for emergency condition for office and terminal needs.

Table 1.69. Requirement of Electricity Supply for Phase I

Demand Source	Design Demands/terminal	Design for Phase 1
Gantry Cranes per Unit; 3,300 KW x 6 units/terminal for ULCS Gantry Cranes; 2,500KW x 3 units/wharf for medium size	19,800 KW /terminal 7,500 KW	19,800 x 2 terminals and 7,500 = 47,100KW for Phase 1
Reefer Container per Unit, 12kw/reefer, 50 units/terminal	600 KW/terminal	1,200KW
Lighting for yards/terminal, X ray inspection etc.	180 KW,	360KW
Offices, workshops, for container terminal	300 KW,	600KW
Water supply pumps, x ray inspection /container terminal	180 KW/terminal	360KW

Demand Source	Design Demands/terminal	Design for Phase 1
Power supply for Car Terminal	200KW	200KW
Port Management office and government service buildings		600KW
Power supply for Port Backup area		360 KW
TOTAL DEMAND		50,780 KW

Source : JICA Survey Team

Electric Power Source

Electricity suply for now and the future will be obtained from PT. PLN Cabang Purwakarta. Based on PT. PLN cabang Purwakarta is able to suply 22.000 KW for early operational phase and 50.780 KW for phase I Patimban Seaport development.

PLN cabang Purwakarta will suply power needs in coordination with PLN centre. PLN centre agree to suply the Patimban Seaport power needs.

PLN branch office propose to connect electricity directly to the high voltage, because the demand volume more than 30,000 KW and PLN has high voltage cable near to Patimban Seaport about 3 km of distance from the seaport.

- During the meeting with PLN, thera are 3 alternatives. Alternative 1 and 2 will be arrange by PLN, while alternative 3 will be arrange by port operator.
- Profit of alternative 1 and 2 is port operator will not take responsibility in the operation and maintenance of electricity suply, but the main weakness is there is no guarantee for third party when the disturbance occured.
- The weakness of alternative 3 is operator has to operate and maintain by themselves, but free from interference of third party

Thus, alternative 3 is recommended.

For phase I seaport operational, it is suggested to install 2 units x 30 MVa (high voltage). For phase 2 project, it is suggested to install 2 units x 30 MVa (high voltage).

8. Layout Plan of Public Utility Facilities

The following facilities are planned in the lay out plan.

1. Ground Reservoir
2. Pumping Station
3. Elevated Tank
4. Security Building

5. Office Building
6. Transformer Building (Power Electricity Building)
7. Waste Water Treatment Plant

Public facilities location is planned in seaport administration area, total area required is 10.000 m^2. Layout plan is as follow

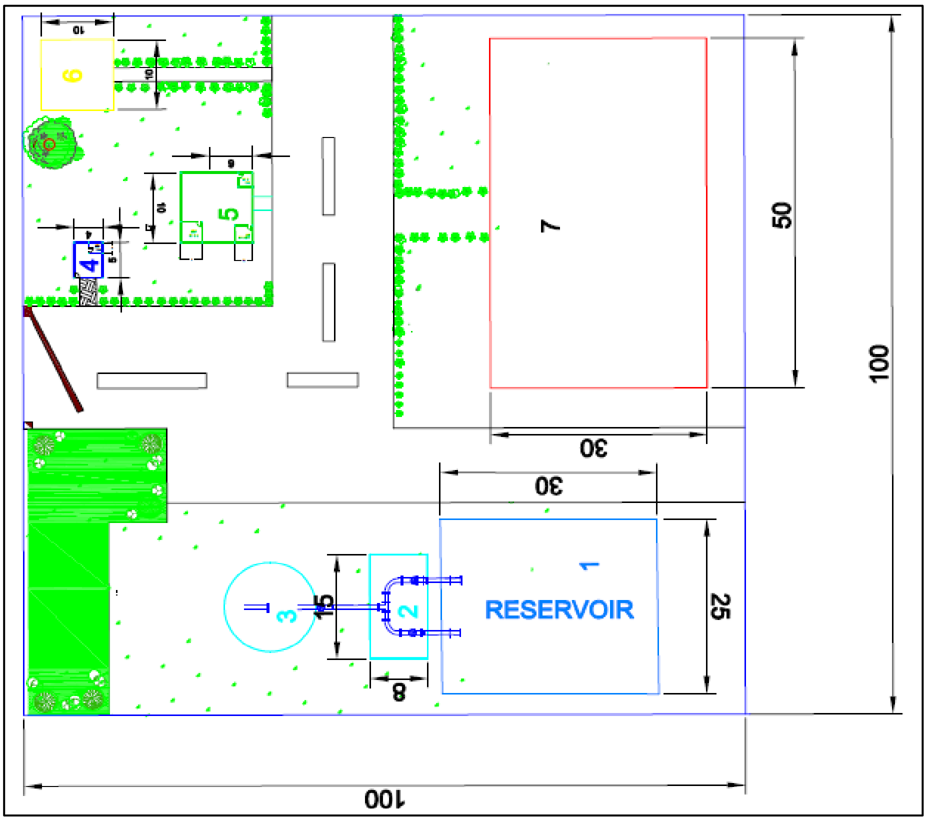


Figure 1.61. Layout Plan of Public Utility Facilities

C. On-Shore Facility Operational

Onshore facilities operational is a series of activities that consist of support and port employee activity, loading-unloading vessel activity, and other supporting activity in the back up area. Some important component related to activity of on-shore facilities operational are:

- Waste management
- Water suplly and Waste Water Treatment
- Electricity utility

Development plan for back up area in the future is will be operated by private company and detail design will be developed by invester. For the impact prediction in this activity such as decreasing of air quality (TSP and exhaust gas), increasing of noise level, increasing of run off, decreasing of sea water quality (increasing TSS), terrestrial fauna disruption, and public unrest.

For detail activity that will be done in this phase are :

1. Waste Management

Waste from on-shore activities is categorized as domestic waste such as domestic waste and shipping supply waste such as plastic. Solid waste will be collected at collection station which located in each facility, then handed to the licenced company for the dumping.

2. Water Supply and Waste Water Management

Required water for back up area are figure in chapter before. Water source and distribution system is follow by system that has been already by Port Authority (look in previous chapter)

3. Electricity Utility

Generaly, the requirements of Patimban electricity will obtain from coorporation with PLN for a while, which the power source is from PT. PLN Purwakarta branch, Purwakarta Regency same as the port system (refer to prior section). It has been proposed that for electricity usage will use high voltage direct connection because the demand is more than 30.000 KW, moreover PLN has been has high voltage cable near Patimban New Port which is 3 Km distance. For location of building can be seen in figure 1.13. In the future plan, Patimban Port will be used electricity channel by it self for port supply, and UKL – UPL will be done by PLN.

D. Maintenance of Basin and Shipping Line

Patimban New Port needs to make optimal treatment in the basin depth and connecting lines. Based on the plan, connecting lines depth is -17 m, and basin depth maximum is also -17 m, that accommodate Ultra Large Container Ship (ULCS) with capacity of 13,000 TEUs. Pool and sailing line treatment is planned to be done once several years using dredging method in order to keep the depth. Dredge would be dumped in dumping site. In other hand, it will be done pool and flow cleaning activities from the floating garbage every day, as well as the installation of garbage filters in the river Kaligenteng, Cipunagara, and Kalisewu, if necessary.

Estimation of dredging volume and time of dredging, with assumption that maintenance is done after deposition as thick as 50 cm, so based on calculation can be seen on this following table.

Table 1.70. Estimation of Dredgimg Volume and Maintenance Time

Area	Deposition Height (cm/years)	Maintenance in Deposition Height 50 cm (years)	Deposition Volume (m^3/years)	Dredging Volume (m^3)
Sailing Line	11,5	4,3	186.693	811.709
Anchorage Basin	3,5	14,3	84.329	1.204.700
Inner Basin Channel	13	3,8	12.644	48.631

Source : JICA Survey Team

Maintenance of basin and shipping line will make the impact like decreasing of sea water quality (increasing TSS), and disturbance of marine life (benthos and nekton)

E. Access Road Operation

Types of activities that included in access road operation are road operation. Access road that planned will operate in 2019, to sustain material transportation to Port area. In early operational period, frequency of access road traffic is low, because it's located on government aqcuisited land where in the suburbs rice fieds area. However, with the passing of population growth and development of all area, vehicle volume will increase, which is expected to lead traffic service quality.

In order to provide good and adequate service, it is necessary to make a new facility development and maintenance. Maintenance activities are generally intended to prevent further deterioration of the road, such as resurfacing the road surface, repairing traffic signs, etc.

Prediction for vehicle volume in access road can be seen in following table.

Table 1.71. Vehicles Volume Prediction in Access Road

Year	**2019**	**2015**	**2037**
Number of Light Vehicles (/day)	227	2.710	6.017
Number of Weight Vehicles (/day)	2.271	27.104	60.171

Source : JICA Survey Team

Operational of access road is predicted can be make some impact such as decreasing of air quality (TSP and exhaust gas), increasing of noise level, land conversion, road traffic disruption, road damage, and public unrest.

1.2. Summary of Hypothetic Significant Impact

1.2.1. Determination of Hypothetic Significant Impact

Begin from identification process of significant impact that is conducted based on interaction between activity plan description and environmental baseline. This potential significant impact identification process is done by using interaction matrix and flow chart methods. To know the hypotetical impact, all of potential impact is analyzed. The result of those evaluation is producing Hypothetical Significant Impact, are explained simple by following table.

Table 1.72. Matrix of Potential Impact

No	Environment Component	Component Activity											
		Pre-Construction Phase	Construction Phase						Operational Phase				
		1	2	3	4	5	6	7	8	9	10	11	12
A	**Physic – Chemical**												
1	Decreasing of Air Quality (TSP and Exhaust Gas)			X			X	X		X	X		X
2	Increasing of Noise Level			X			X	X			X		X
3	Decreasing of Surface Water Quality							X					
B	**Hidrology**												
1	Increasing of Run Off Water						X	X			X		X
C	**Oceanography**												
1	Sedimentation									X			
2	Change of Shoreline									X			
3	Decreasing of Sea Water Quality		X		X	X	X			X	X	X	
D	**Space, Land, and Transportation**												
1	Land Conversion												X
2	Land Traffic Disruption			X									X
3	Marine Traffic Disruption			X						X			
4	Road Damage			X									X
E	**Biology**												
1	Disturbance of Marine Life (Nekton and Benthos)				X	X				X		X	
2	Disturbance of Terrestrial Fauna (Bird)						X				X		
3	Disturbance of Terrestrial Flora						X						
F	**Social, Economic, and Culture**												
1	Opened Employment and Bussiness Opportunities		X						X				
2	Loss of Land Productivity	X											
3	Change of Fishing Ground				X					X			
4	Loss of Livelihood and Income	X											
5	Social Unrest	X		X	X		X	X		X	X		X
G	**Public Health**												
1	Incidence of Communicable Diseases		X						X				
2	Pile of Waste									X			

Note

Pre – Construction Phase
1. Land Acquisition

Construction Phase
2. Mobilization of Workers and Operational Basecamp
3. Mobilization of Heavy Equipment and Material
4. Reclamation and Marine Facility Construction
5. Dredging and Disposal
6. Onshore Facility Construction
7. Access Road Construction

Operational Phase
8. Employment of Workers
9. Marine Facility Operational
10. Onshore Facility Operational
11. Maintenance of Basin and Shipping Line
12. Operational Access Road

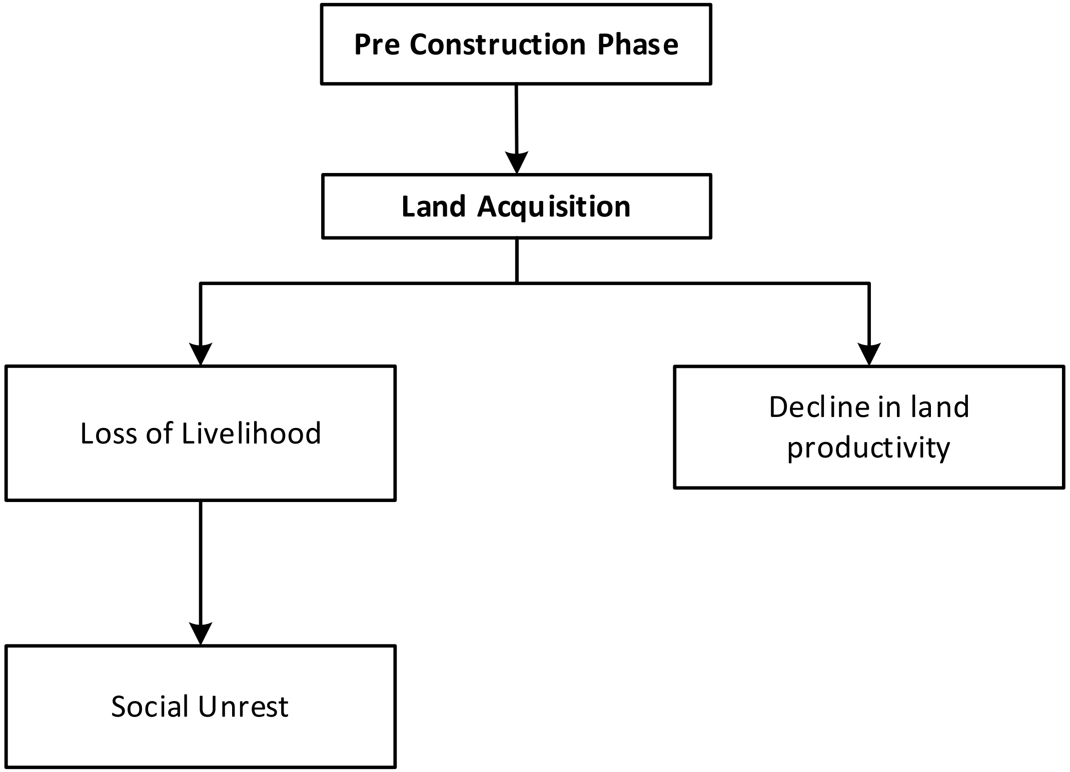


Figure 1.62. Flow Chart Pre-Construction Phase

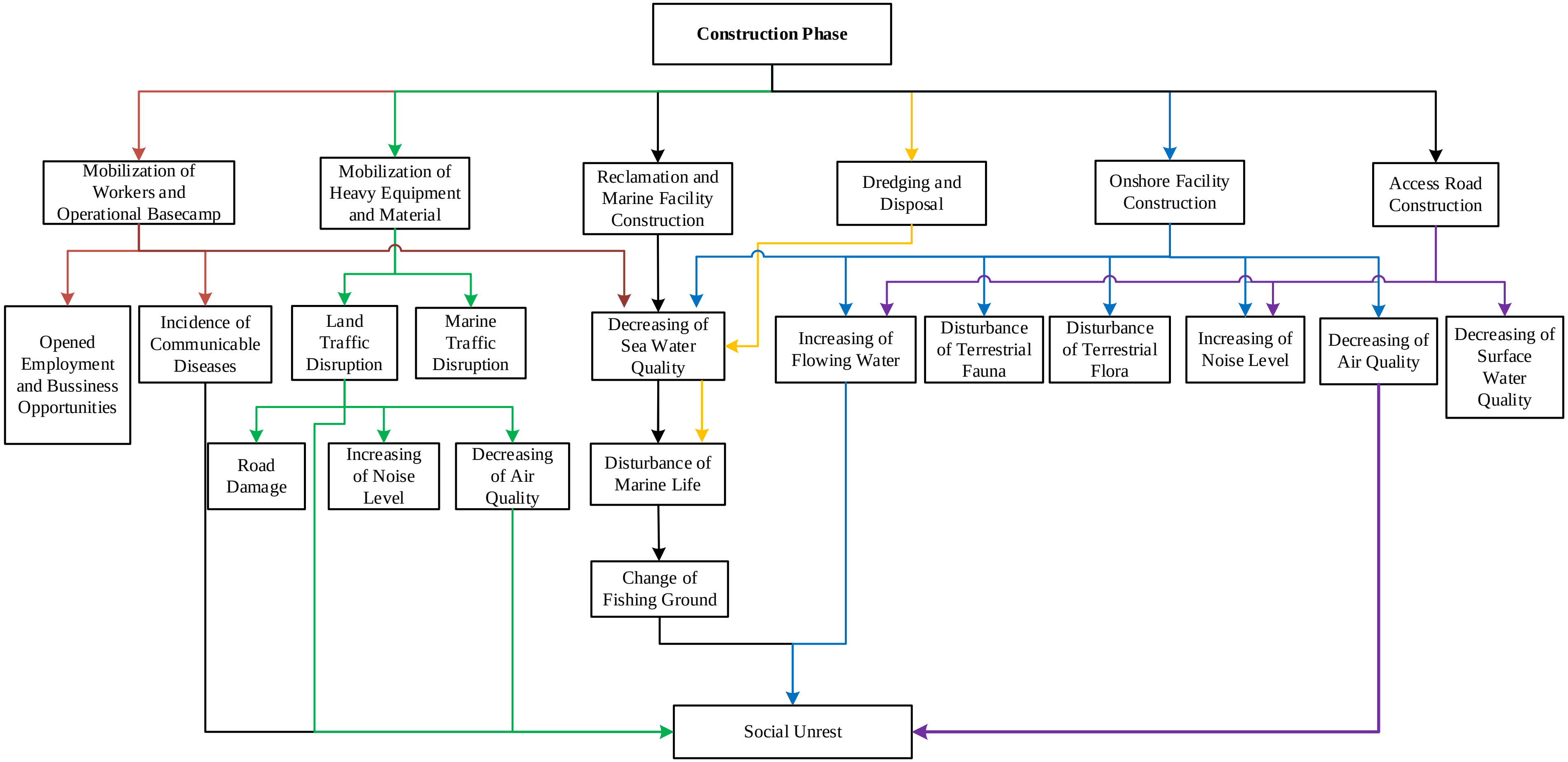


Figure 1.63. Flow Chart Construction Phase

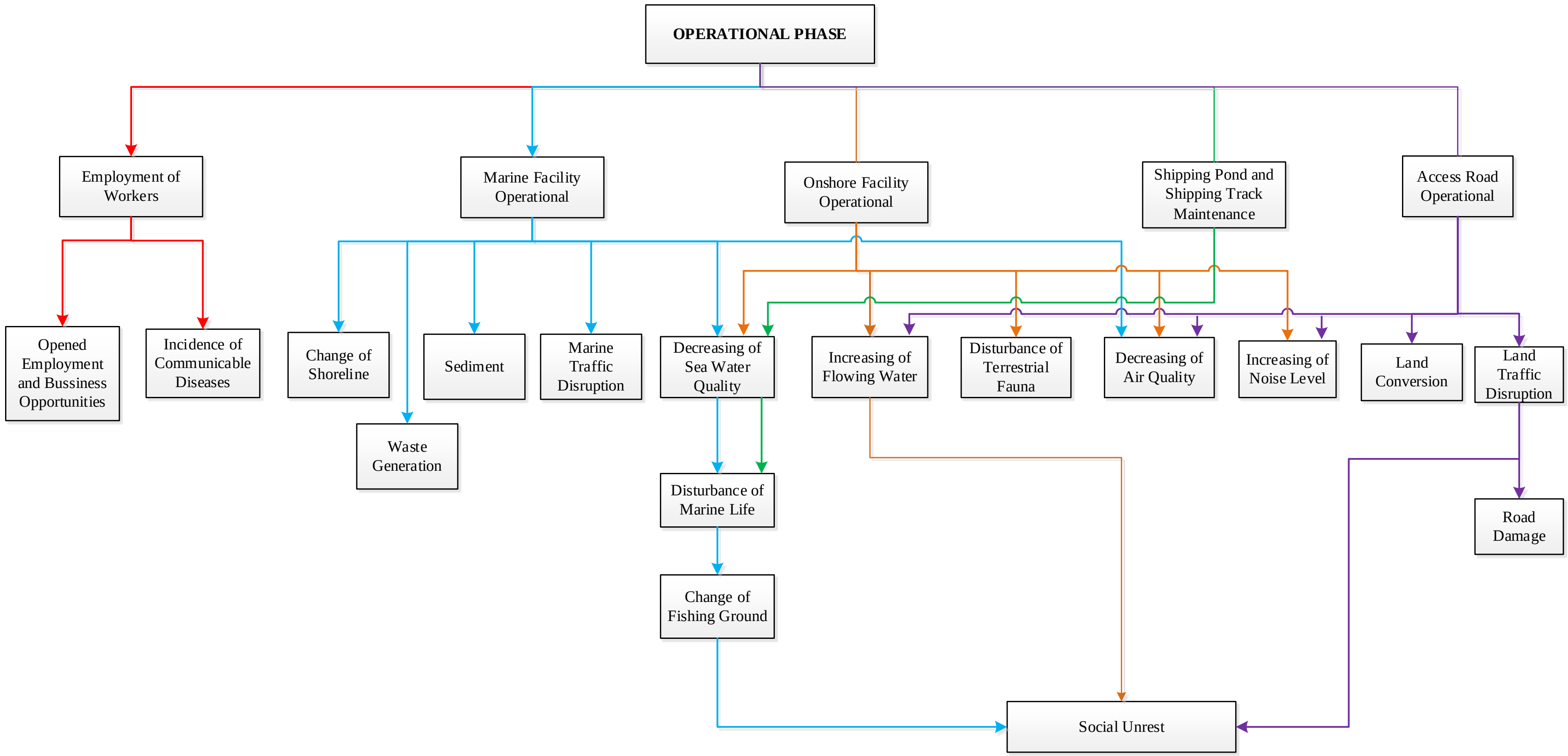


Figure 1.64. Flow Chart Operational Phase

Table 1.73. List of Hipotetical Significant Impact (HSI)

No	Environment Component	Component Activity											
		Pre-Construction Phase	Construction Phase						Operational Phase				
		1	2	3	4	5	6	7	8	9	10	11	12
A	**Physic – Chemical**												
1	Decreasing of Air Quality (TSP and Exhaust Gas)			**HSI**			NHSI	NHSI		**HSI**	NHSI		**HSI**
2	Increasing of Noise Level			**HSI**			NHSI	NHSI			NHSI		**HSI**
3	Decreasing of Surface Water Quality							NHSI					
B	**Hidrology**												
1	Increasing of Run Off Water						**HSI**	NHSI			**HSI**		NHSI
C	**Oceanography**												
1	Sedimentation									**HSI**			
2	Change of Shoreline									**HSI**			
3	Decreasing of Sea Water Quality		NHSI		**HSI**	**HSI**	NHSI			NHSI	NHSI	**HSI**	
D	**Space, Land, and Transportation**												
1	Land Conversion												NHSI
2	Land Traffic Disruption			**HSI**									**HSI**
3	Marine Traffic Disruption			**HSI**						NHSI			
4	Road Damage			NHSI									NHSI
E	**Biology**												
1	Disturbance of Marine Life (Nekton and Benthos)				**HSI**	**HSI**				NHSI		**HSI**	
2	Disturbance of Terrestrial Fauna (Bird)						NHSI				NHSI		
3	Disturbance of Terrestrial Flora						NHSI						
F	**Social, Economic, and Culture**												
1	Opened Employment and Bussiness Opportunities		**HSI**						**HSI**				
2	Loss of Land Productivity	**HSI**											
3	Change of Fishing Ground				**HSI**					**HSI**			
4	Loss of Livelihood and Income	**HSI**											
5	Social Unrest	**HSI**		**HSI**	**HSI**		**HSI**	NHSI		**HSI**	**HSI**		**HSI**
G	**Public Health**												
1	Incidence of Communicable Diseases		NHSI						NHSI				
2	Pile of Waste									NHSI			

Note

Pre – Construction Phase
1. Land Acquisition

Construction Phase
2. Mobilization of Workers and Operational Basecamp
3. Mobilization of Heavy Equipment and Material
4. Reclamation and Marine Facility Construction
5. Dredging and Disposal
6. Onshore Facility Construction
7. Access Road Construction

Operational Phase
8. Employment of Workers
9. Marine Facility Operational
10. Onshore Facility Operational
11. Maintenance of Basin and Shipping Line
12. Operational Access Road

Note : HSI = Hypotetical Significant Impact ; NHSI = Non Hypotetical Signiificant Impact

Table 1.74. Hypotethic Significant Impact List

NO	Hypothetical Significant Impact	ACTIVITY		
		PRE-CONSTRUCTION	CONSTRUCTION	OPERATION
1.	Decreasing of air quality (TSP and emision)		Equipment and materials mobilization	• Off-shore facility operational • Access road operation
2.	Increasing of noise		Equipment and materials mobilization	Access road operational
3.	Sedimentation			Off-shore facility operational
4.	Increasing of water run-off		On-shore facility developmnet	On-shore facility operational
5.	Shoreline change			Off-shore facility operational
6.	Decreasing of sea water quality		• Reclamation and off-shore facility development • Dredging and dumping	Basin and sailing line maintenance
7.	Land traffic disruption		Equipment and materials mobilization	Access road operational
8.	Sea traffic disruption		Equipment and materials mobilization	
9.	Marine life disruption		• Reclamation and off-shore facility development • Dredging and dumping	Basin and sailing line maintenance
10.	Opening of job and business opportunity		Recruitment of workers and providing basecamp	Recruitments of workers
11.	*Fishing Ground change*		· Reclamation and off-shore facility development	Off-shore facility operational
12.	Liveyhood loss	Land Acquisition		
13.	Loss of land productivity	Land Acquisition		
14.	Public unrest	Land Acquisition	• Equipment and materials mobilization • Reclamation and on-shore facilities development • On-shore facilities development	· Off-shore facility operational • On-shore facility operational · Access road operation
15.	Infectious disease		Workers reqruitment and providing basecamp	Workers recruitment

Table 1.75. Hypotethic Non – Significant Impact List

NO	Hypothetical Non-Significant Impact	ACTIVITY		
		PRE-CONTRUCTION	CONSTRUCTION	OPERATION
1.	Decreasing air quality (TSP and emision)		• On-shore facility development • Access road contruction	On-shore facility operation
2.	Increasing of noise		· On-shore facility development • Access road contruction	On-shore facility operation
3.	Decreasing of water surface quality		Access road construction	
4.	Increasing of water run off		Access road construction	Access road operation
5.	Decreasing of Sea water quality (increasing of TSS)		• Workers recruitment and basecamp operation • On-shore facility development	• On-shore facility operation • Basin and sailing line maintenance
6.	Sea traffic disruption			Off-shore facility operation
7.	Road damage			Access road operation
8.	Land conversion			Access road operation
9.	Terestrial Fauna disruption		On-shore facility development	On-shore facility operation
10.	Terestrial Flora disruption		On-shore facility development	
11.	Public unrest		Access road construction	
12.	The emergence of Infectious diseases		Workers recruitment and basecamp operation	Workers recruitment
13.	Waste generation			Off-shore facility operation

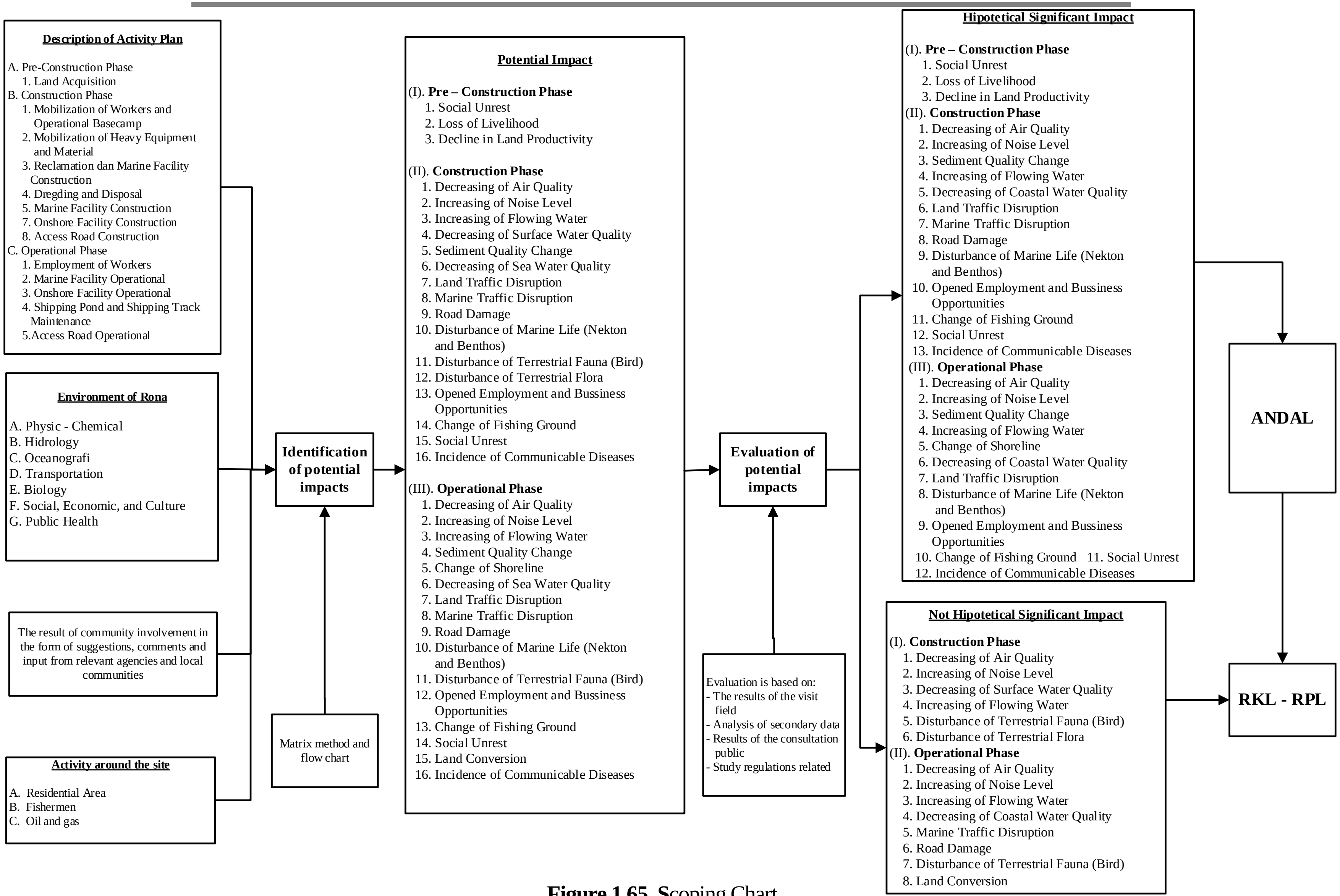


Figure 1.65. Scoping Chart

1.3 Study Area and Period Boundary

1.3.1 Study Area Boundary

Determination of study area scope is intended to draw the line of ANDAL study area in accordance with the result of significant impact scooping and consider resource limitation, time and energy, with advance, opinion, and response from the public. Study area boundaries for development of Patimban New Port Area EIA include:

1. Project Boundary

Project boundary is space where the project development activities occur start from pra-construction phase until post-construction phase (operational) which located in the land of 534.23 Ha (356.23 Ha for back up area, and 178 Ha for port area in Patimban village, Pusakanagara District, Subang Regency). And 15.38 Ha for access road 8.1 km length, which passing through Patimban, Pusakaratu, Kotasari, Gempol, and Kalentambo village. Pusakanagara District, Subang Regency.

2. Ecological Boundary

Ecological boundary is distribution space of impacts as the result of development activity according to the water and air transport media where the natural process occur in the space around activity estimated will have fundamental changes. Basically, ecological boundary is determined by hypothetical significant impact especially based on water and air media approach. Hypothetical significant impact which is closely related to water media is degradation of sea water quality, so ecological boundary based on water media is determined by considering the direction and speed of currents, which are 5 mil radiuses from Patimban New Port area and 2 mill radiuses from dumping area.

In order to see the distribution of impact in air media, based on hypothetical significant impact, degradation of air quality are measured when equipment and material mobilization as long as the process of construction. Considering the wind direction, air ecological boundary is determined in radius 50 meter in the left and the right side along the access road that will be passed, especially residences area in Patimban, Pusakaratu, Kotasari, Gempol and Kalentambo village, Pusakanagara District, Subang Regency. And for access road is assumed in 100 m radius.

3. Social Boundary

Social boundary is a space where occurred an activity and social interaction. In that space, there are several social interactions that contain norms and values that have been established. Areas that are predicted to experience a change is around the project site that is Patimban, Pusakaratu, Kotasari, Gempol, and Kalentambo village, Pusakanagara District, Indramayu Regency.

4. **Administrative Boundary**

   Administrative boundary is space limit where public can do their social economic and social culture in accordance with the applicable regulations, that is Patimban, Pusakaratu, Kotasari, Gempol, and Kalentambo village, Pusakanagara District, Subang Regency.

5. **Study Area Boundary**

   Study area boundary is integration and resultant from those four boundaries above (project boundary, ecological boundary, social boundary, and administrative boundary), thus obtained resultant outer boundary which is the boundary of study area.

1.3.2 Period of Study Boundary based on Scooping Result in KA

Scope of ANDAL period of study boundary is determined by consideration of business and/or activity plan execution limitation period. Period of study boundary is a study time limit that will be used in estimating and evaluating the impact in ANDAL study. Determination of this period boundary then used as a base to determine environmental setting change without activity plan or with activity plan

Table 1.76. Period of Study Boundary

No	Hypotetical Significant Impact	Period of Study Boundary
A. Pre – Construction Phase		
1	Land Productivity Loss	1 month after land acquisition, impact is predicted occur after land acquisition
2	Livelyhood and Income Loss	1 month after land acquisition, impact is predicted occur after land acquisition
3	Public Unrest	1 month after land acquisition, impact is predicted occur while land acquisition
B. Construction Phase		
1.	The decreasing of air quality	In the first year of back up area and access road construction activity (2018), it is estimated that in that year will occur peak of activities which are affected to the decreasing of air quality.

No	Hypotetical Significant Impact	Period of Study Boundary
2.	The increasing of noise level	In the first year of back up area and access road construction activity (2018), it is estimated that in that year will occur peak of activities which are affected to the increasing of noise level
3.	The increasing of water run-off	In the first year of back up area construction activity (2018), it is estimated that in that year will occur peak of land clearing activity that will change water run off coefficient in the project site.
4.	The decreasing of seawater quality	In the first year of dredging, reclamation, and dumping activity (2018), it is estimated that in that year will occur peak of sea water quality change impact in the project site.
5.	Land traffic disruption	In the first year of back up area and access road construction activity (2018), it is estimated that in that year will occur peak of activities which are affected to the land traffic disruption
6.	Sea traffic disruption	In the first year of development with soil mixing and revetment and breakwater construction activity (2018), it is estimated that in that year will occur peak of sea traffic disruption impact
7.	Marine life disruption (Benthos and necton)	In the first year of dredging activity at phase I stage 1 (2018), it is estimated that in that year will occur peak of marine life disruption as derivative impact of sea water change around the project site
8.	Opening of job and business opportunity	In the first year of preparation activity at phase I stage 1 (2018), it is estimated that in that year will occur peak of workers recruitment.
9.	Fishing ground change	In the first year of dredging activity at phase I stage 1 (2018), it is estimated that in that year will occur peak of fishing ground change impact
10.	Public unrest	In the year of 2020, because in this year all of construction activity at phase I stage 2 coincide with operational activity phase I stage 1, so the public unrest impact reach the peak.
C. Operational Phase		
1.	Decreasing of air quality	Second year (2020) operational activity, estimated occur in that year
2.	Increasing of noise level	Second year (2020) operational activity, estimated occur in that year
3.	Increasing of water run off	Second year (2020) operational activity, estimated occur in that year

No	Hypotetical Significant Impact	Period of Study Boundary
4.	Sedimentation	Third year (2020) operational activity, estimated occur in that year
5.	Shoreline change	Third year (2020) operational activity, estimated occur in that year
6.	Decreasing of sea water quality	Second year (2020) operational activity, estimated occur in that year
7.	Land traffic disruption	Fifth year (2020) operational activity, estimated occur in that year
8.	Marine life disruption (Benthos and necton)	Second year (2020) operational activity, estimated in that year occur the peak of marine life disruption (Necton and benthos) around the seaport waters.
9.	Opening of job and business opportunity	First year operational (2019) operational activity, estimated in that year occur the peak of workers recruitment.
10.	Fishing ground change	In the 2020, because it is estimated that in this year occur the peak of fishing ground change
11.	Public unrest	First year operational activity at phase I stage 1 (2019), estimated in that year occur the peak of public unrest around the seaport location.

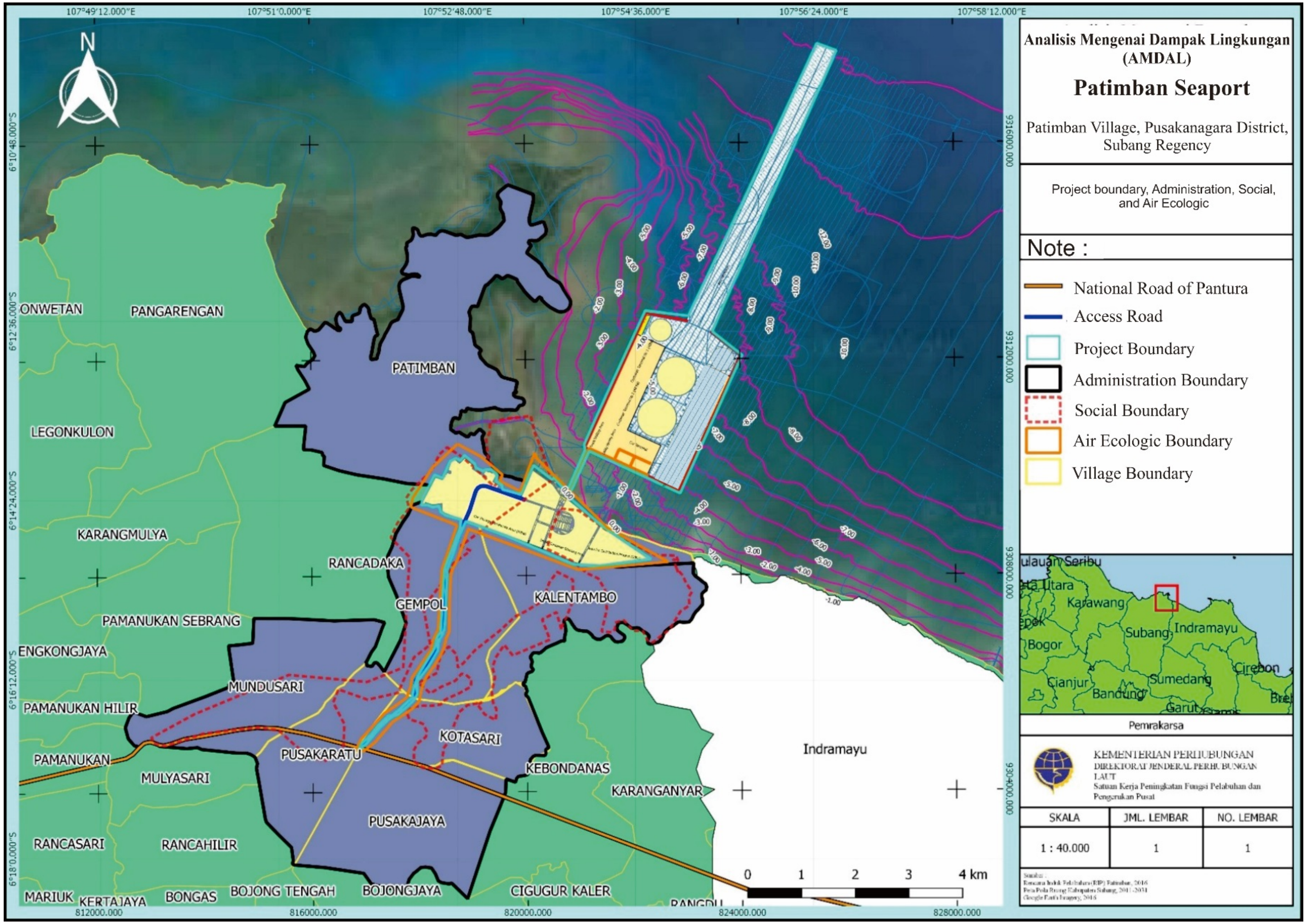


Figure 1.66. Detail of Project Boundary, Administrative, Social, and Ecologic (Air)

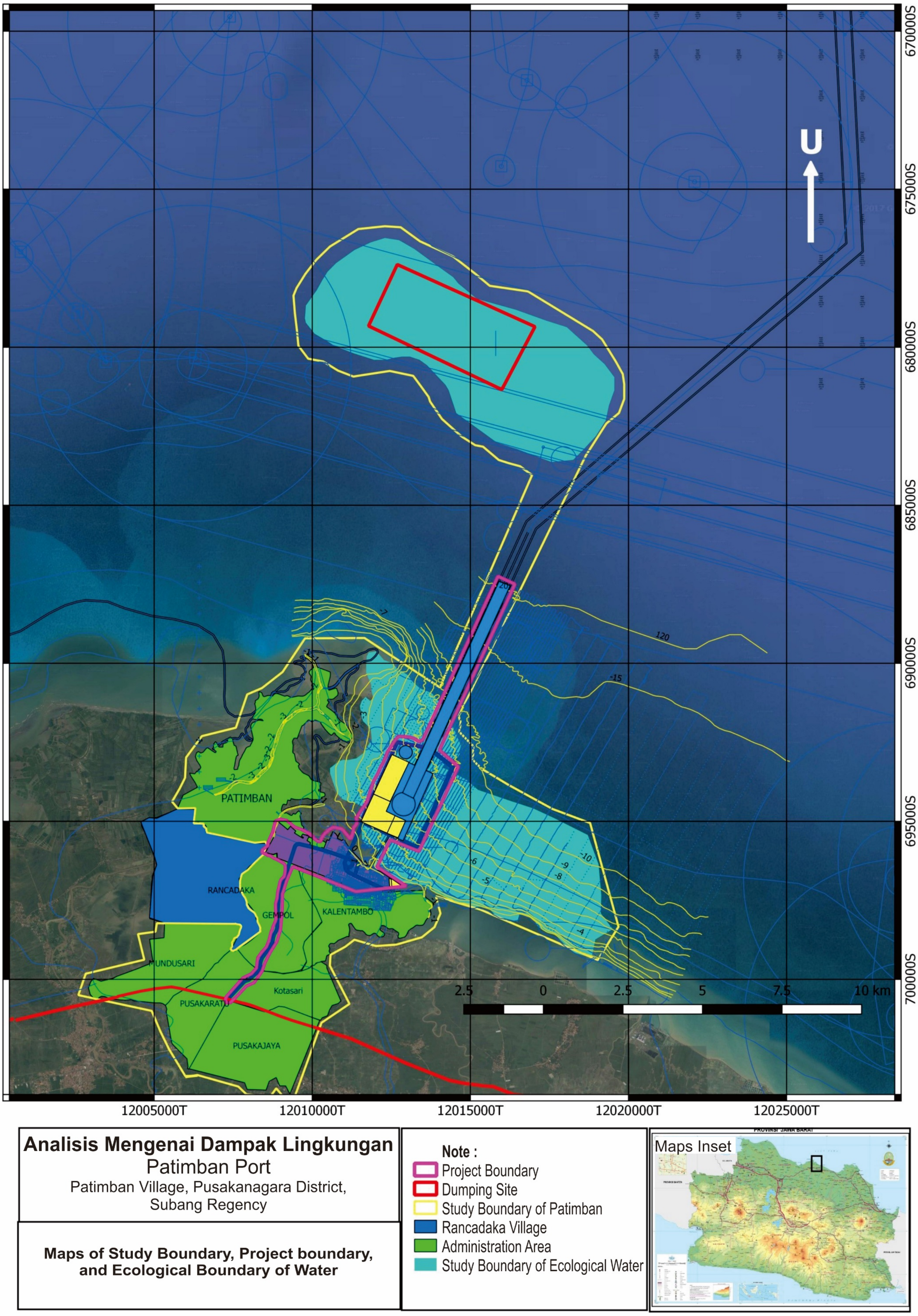


Figure 1.67. Maps of Study Boundary, Project Boundary, and Water Ecologic Boundary

CHAPTER II

DETAIL DESCRIPTION OF PRELIMINARY ENVIRONMENTAL

2.1. Environmental Affected Component

2.1.1. Geophysical and Chemical Component

1. Climate

a. Rainfall

Rainfall data is acquired from Meteorological Climate and Geophysic Agency, Station Class I Bandung, it is rain station Pusakanagara District since 10 years ago (2007-2016). Total rainfall average is 1.300 mm/years and rainy day total in one year is 78 rainy days. Rainfall data and rainy day show that rainy season is in october until may with rainfall highest is 273.50 mm it is in January and lowest rainy days is 36.00 mm in August, while high rainy frequency is in February with average is 14 days (Table 2.1 and 2.2.)

Table 2.1. Rainfall and Rainy Days Monthly Period 2007-2016

Sta. Pusakanagara District – Subang

Month	2007		2008		2009		2010		2011		2012		2013		2014		2015		2016	
	CH	**HH**	**CH**	**HH**	**CH**	**HH**	**CH**	**HH**	**CH**	**HH**	**CH**	**HH**	**CH**	**HH**	**CH**	**HH**	**CH**	**HH**	**CH**	**HH**
January	133	8	270	12	357	9	278	8	135	11	299	19	409	10	676	23	102	14	76	2
February	641	13	405	26	244	13	79	11	108	7	218	12	103	9	368	16	95	11	288	21
March	264	12	110	11	137	9	162	9	31	4	121	11	221	14	102	12	45	7	105	7
April	184	13	45	5	73	7	83	5	69	6	49	6	72	6	96	10	5	3	172	13
May	83	8					73	3	35	2	86	2	145	8	10	4	18	2	146	10
June	89	5	20	2		15	59	8			59	3	128	6	54	4	17	2	101	8
July					15		84	6					92	10	90	5	40	2	11	5
August			6	1			49	4											53	4
September			4	1	4	1	173	9			11	1							149	5
October	20	4	40	8	20	2	59	5	33	1			33	1	10	2			176	9
November	225	9	86	9	144	4	118	8	161	14	57	4	68	3	10	2	40	4	156	8
Desember	193	8	81	12	725	7	156	8	228	13	348	16	214	14	121	14	75	8	59	8
Total	**1832**	**80**	**1067**	**87**	**1719**	**67**	**1373**	**84**	**800**	**58**	**1248**	**74**	**1485**	**81**	**1537**	**92**	**437**	**53**	**1492**	**100**

Sourcer : BMKG Sta. Geophysic Class 1 Bandung, 2017

Note :

CH **:** Rainfall

HH : Rainy Day

Table 2.2. Average Monthly of Rainfall Data, Rainy Days And Air Temperature
Rainy Sta Pusakanagara District-Subang Regency Period 2007-2016

Month	CH (mm)	HH	Suhu (^{0}C)
January	273.50	12	25.55
February	254.90	14	25.60
March	129.80	10	25.80
April	84.80	7	25.90
May	74.50	5	25.65
June	65.90	6	24.95
July	55.30	6	24.80
August	36.00	3	24.85
September	68.20	3	25.30
October	48.90	4	26.00
November	106.50	7	26.00
Desember	220.00	11	25.75

Source : BMKG Sta Geophysic Class 1 Bandung, 2017

Note : CH = Rainfall; HH = Rainy Days

Maximum rainfall assessment is used to know possibility of recurrence maximum rainfall in certain period (2 years, 5 years,10 years, etc.), and years period while the rain in certain intencity (maximum) expect to not occur.

Maksimum average of rainfall value in around location of measurement is calculated based on arithmetic mean formula, it means ;

$$\overline{X} = \frac{\sum_{i=1}^{N} Xi}{N}$$

While for deviation standard calculated based on formula :

$$S_X = \sqrt{\frac{\sum_{i=1}^{N} (Xi - \overline{X})^2}{N-1}}$$

Daily maximum data of rainfall in every years with statistic calculation can seen in Tabel 2.3.

Table 2.3. Rainy Days Maximum and Calculation Statistic

Years	***Xi***	***Xi* - $\bar{X}$**	**(*Xi* - $\bar{X}$)^2**
2007	49	16	254
2008	16	-18	317
2009	104	70	4.927
2010	35	1	2
2011	18	-16	251
2012	22	-12	135
2013	41	8	57
2014	29	-4	16
2015	7	7	53
2016	14	-20	387
Average *Xi*	**33**		**6.398**

According to formula in table, number of rainy days maximum average in Back Up Area location Patimban Port is :

$$\overline{X} = \frac{334}{10} = 33.4 \text{ mm}$$

While deviation standard is :

$$S_X = \sqrt{\frac{6398}{10-1}} = 26{,}66 \text{ mm}$$

Calculation of rainfall daily maximum in reset period 2, 5, 10, 25, 50, and 100 years is using forecasting formula : $X_T = \overline{X} + K_T \cdot S_X$

Where :

X_T = Rainfall in reset period up to - T (mm).

$\overline{X}$ = Rainfall average (mm)

S_X = Deviation dtandard

K_T = frequence factor, calculated by using formula ;

$$K_T = -\frac{\sqrt{6}}{\pi}\left\{0{,}5772 + Ln\left[Ln\left(\frac{T}{T-1}\right)\right]\right\}$$

The maximum daily rainfall data in the period of re-transformed into the intensity of the rainfall in mm per hour using the approach Mononobe (duration 2.5 hours) as follows;

$$I = \frac{R_{24}}{24}\left[\frac{24}{t}\right]^{2/3}$$

Where :

I = Rainy intencity (mm/jam)

t = Duration of rainy (jam)

R_{24} = Rainfall maximum in one day (24 hours) (mm)

Based on value n = 10, so rainfall daily maximum in location for reset period 2, 5, 10, 25, 50, and 100 years, are show in following table.

Table 2.4. Daily Rainfall maximum and Intencity of Rainy Maximum

For reset period 2, 5, 10, 25, 50, and 100 years

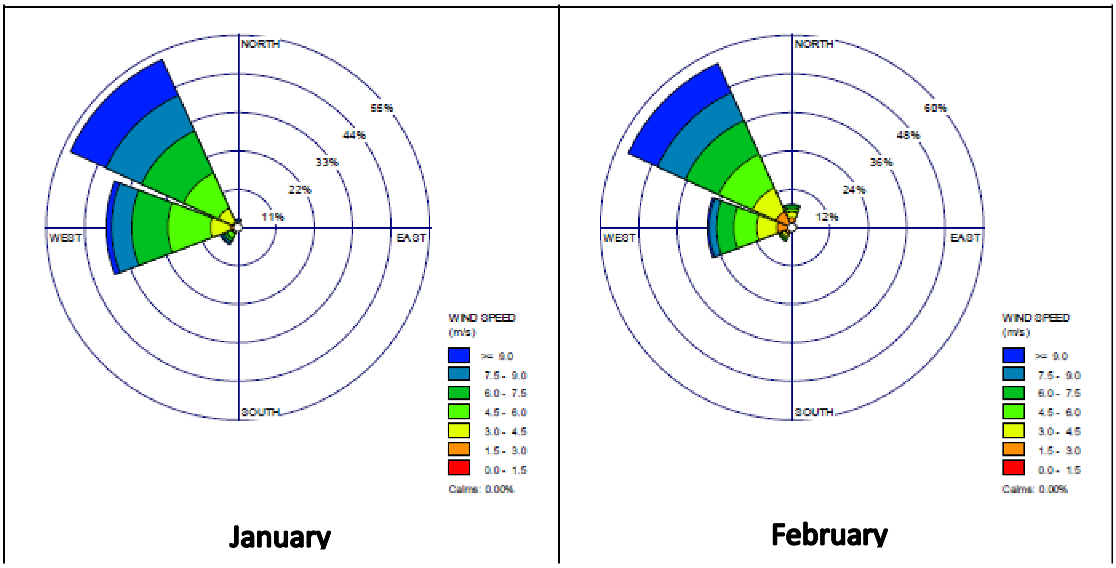
T (years)	K_T	X_T (mm/days)	I (mm/hour)
2	-0.164	29,02	5.56
5	0.720	52,60	9,90
10	1.305	68,19	12,83
25	2.045	89,92	16,92
50	3,044	114,55	21,55
100	3,138	117,06	22,03

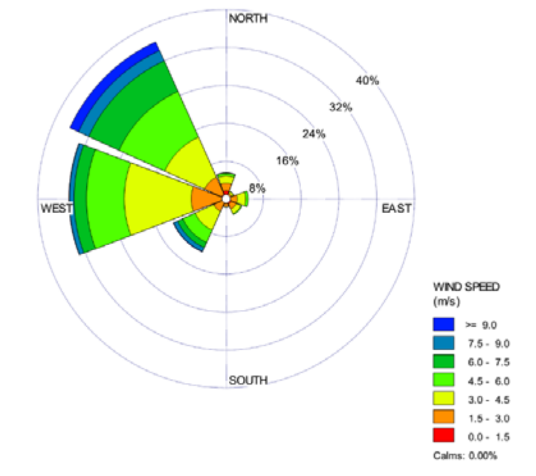
Source : Analyzed by JICA Survey Team (2017)

b. Wind

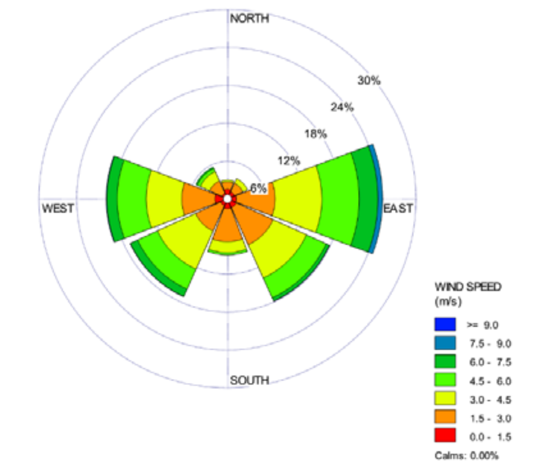
Wind speed distribute per direction and per class of speed in study location, where wind dominant came from west and south east. From data in 11 years back, show the wind speed Distribution.

Figure 2.1. Windrose Years 2004-2015
Source : Masterplan Patimban, 2016

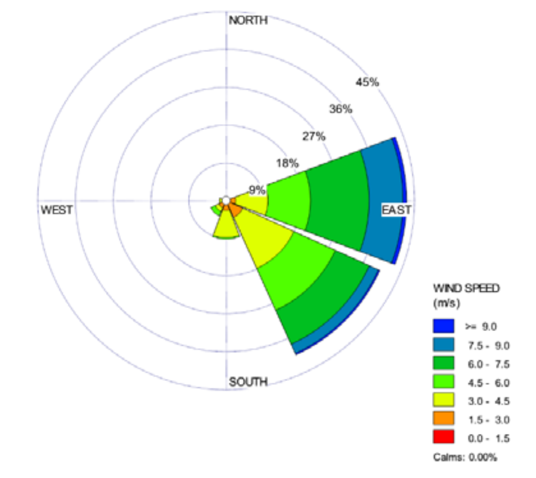




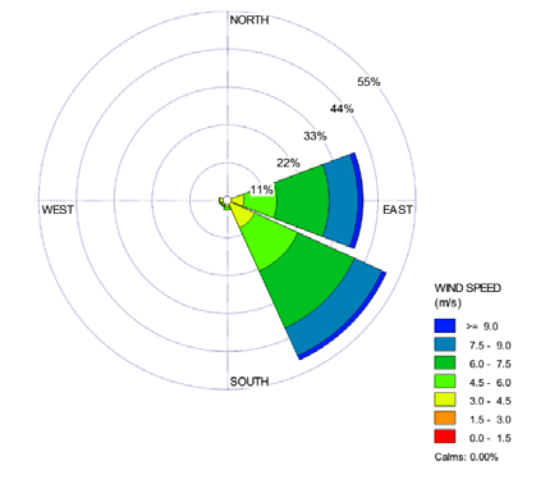
March



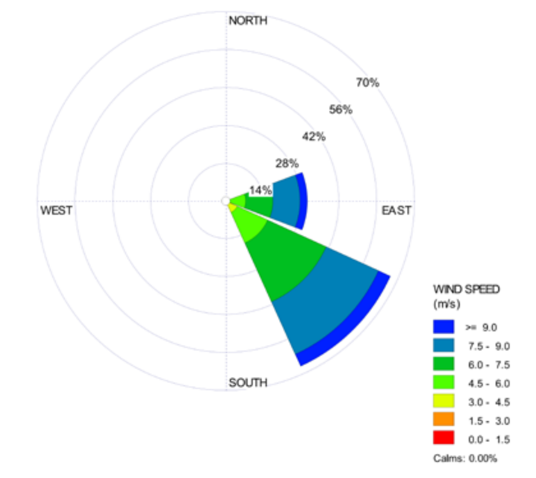
April



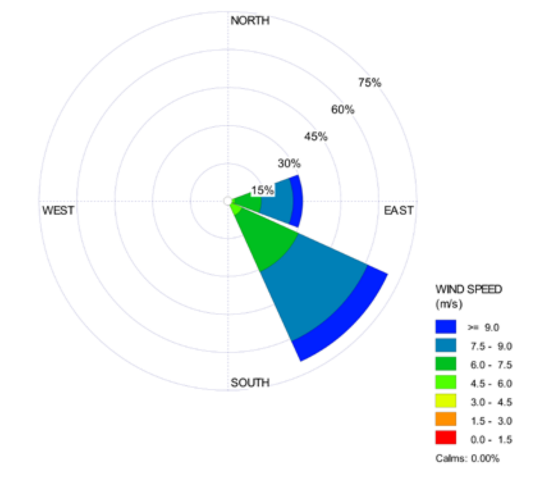
May



June



July



August

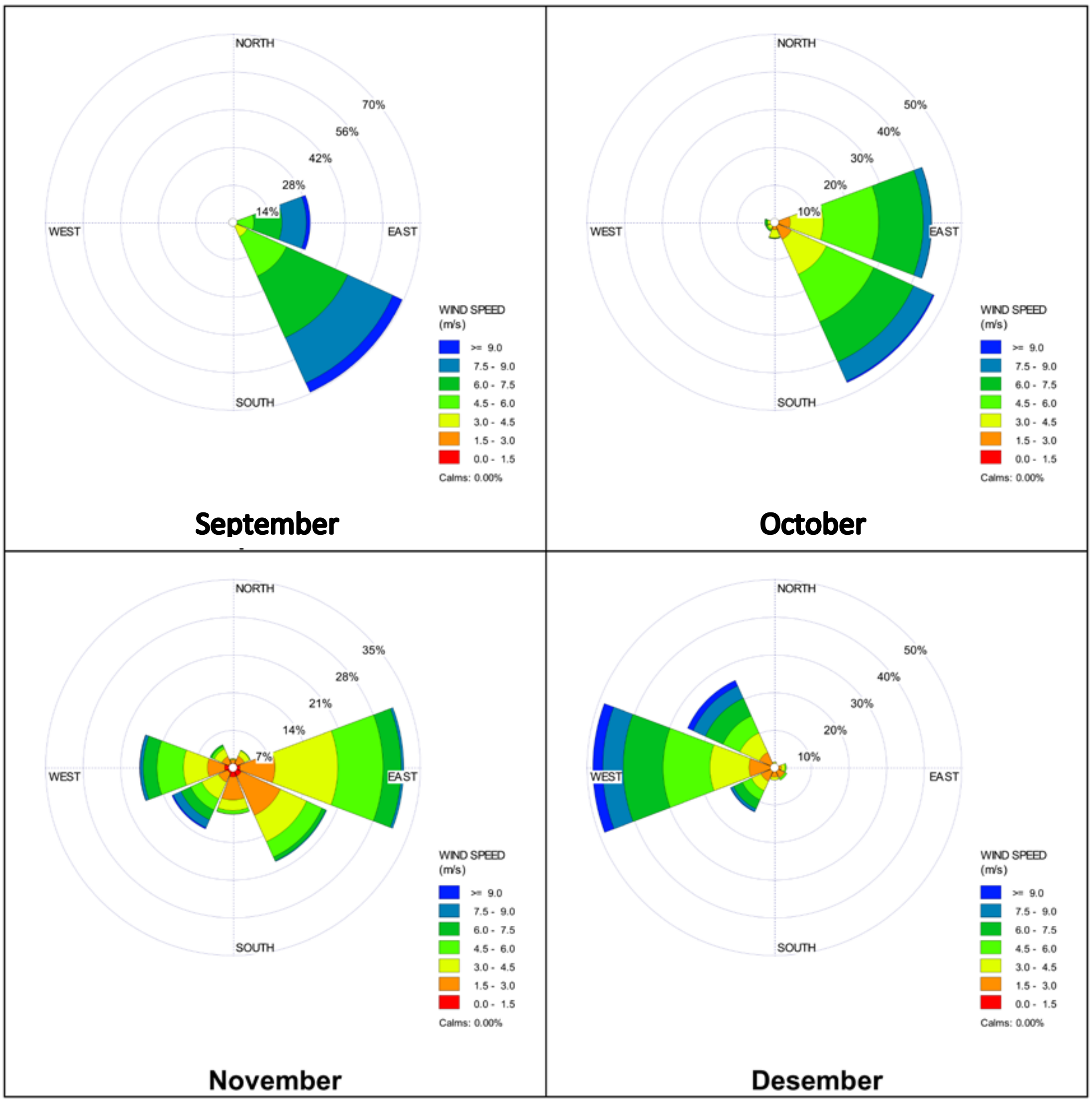


Figure 2.2. Windrose Every Month in Patimban Village

Source : (i) Master Plan Patimban, 2016; (ii) Resolution of Daily Data

From *windrose* per month, show that west monsoon wind came from Desember until March, and east monsoon wind from May until October, and wind transitional season from April until November. From these data, can be concluded that from Desember until May, waves are high because fetch estimate which used from hindcasting process came from south, south west, west, north west, and north.

2. Air Quality and Noise Level

In May, 3th 2016, ambient air quality sampling has been done. Result of air quality and noise in three station at nearest terminal (06°14’615”S – 107°54’302”E), Patimban village (06°15’033”S - 107°54’283”E) and national road Pantura (06°17’070”S - 107°52’487”E) show tahat all parameters is still standard which assigned by government (PP No 41 year 1999). Analysis result can seen by following table. Air quality in each station in good condition, because in every sampling location is minimum in resident activity which affected of air quality, like industry, port, or another activity. Many location is different, so sampling result is not same, but has a simmiliar number.

Table 2.5. Air Quality and Noise in Each Location

No	Parameter	Units	Standard	Result			Method
				AN 1	AN 2	AN 3	
	Air Quality						
1	Air Temperature	°C	-	33.3	31.5	30.5	
2	Humidity	%	-	61.1	51.2	68	
3	TSP (debu)	µg/Nm³	230	3.37	16.28	175.42	SNI 19-7119.3-2005
4	PM 10	µg/Nm³	150	3.37	4.07	43.85	Gravimetric
5	NOx	µg/Nm³	400	<9.97	<9.97	24.77	SNI 19-7119.2-2005
6	SO2	µg/Nm³	900	88.26	88.26	100.34	SNI 19-7119.7-2005
7	CO	µg/Nm³	30000	2286	1143	9144	
8	Wind Direction	°	-	West	North	West	SNI 19-4845-1998
9	Wind Speed	km/hour	-	0.9- 6.1	0.5 – 2.1	0.5 – 1.2	
	Noise						
10	Noise Level	dB	70	54.5	50.7	72.0	SNI 7231 2009

Source : Primary Data, 2016

Note :

Sampling Station AN 1 : Nearest of Patimban Port (Side of Patimban Beach, 06°14’615”S – (107°54’302”E)

Sampling Station AN 2 : Village (Patimban Village, 06°15’033”S - 107°54’283”E)

Sampling Station AN 3 : Narional Road (Jl. R.National Pantura, 06°17’070”S - 107°52’487”E)

Result of noise quality sampling in three location on 24 hours, indicate the values (LSM) are below standard quality for noise level in terminal location and villages area. However, Noise level mean in AN 3 is higher than both of two area and exceeds standard quality for noise level. This result maybe because the AN 3 area is near the national road that transportation activity is very high compared another area.

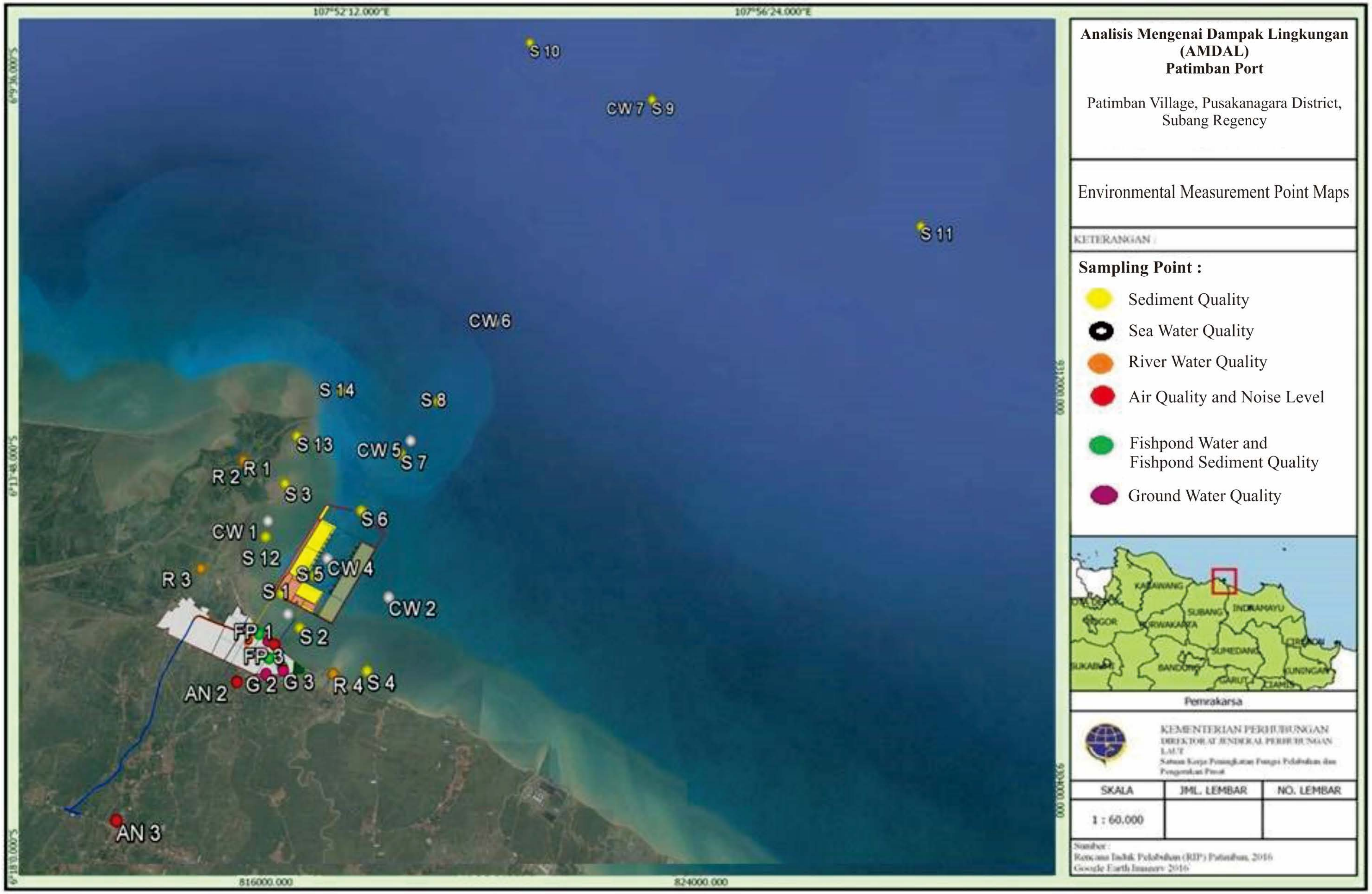


Figure 2.3. Sampling Maps Location of Patimban Port

Large value of noise level can be caused by a vibrating source. Vibration noise sources disturbing the air molecules around so that the molecules vibrate to participate. Vibration sources caused a wave of mechanical energy propagation in the medium of air according to the pattern of longitudinal propagation (Sasongko and Hadiyarto, 2000). Type of environmental noise sources come from :

- Natural noise sources, such as high winds, waterfalls, the roar of waves.\
- Anthropogenic noise sources, such as road traffic, aviation, human activities (Hadi NA, 1998).

Value of noise level around the sampling locations that exceed the standard quality for citizen area, are caused by various sources of noise, mainly from anthropogenic noise sources (human activities and road traffic) and natural noise sources.

3. Morphology

The location study is in the coastal areas of the northern part of Java Island with the plain surface relief sloped terrain varies less than 5%, generally land in the vicinity of the site plan as a fish farm activity (Figure 2.4).

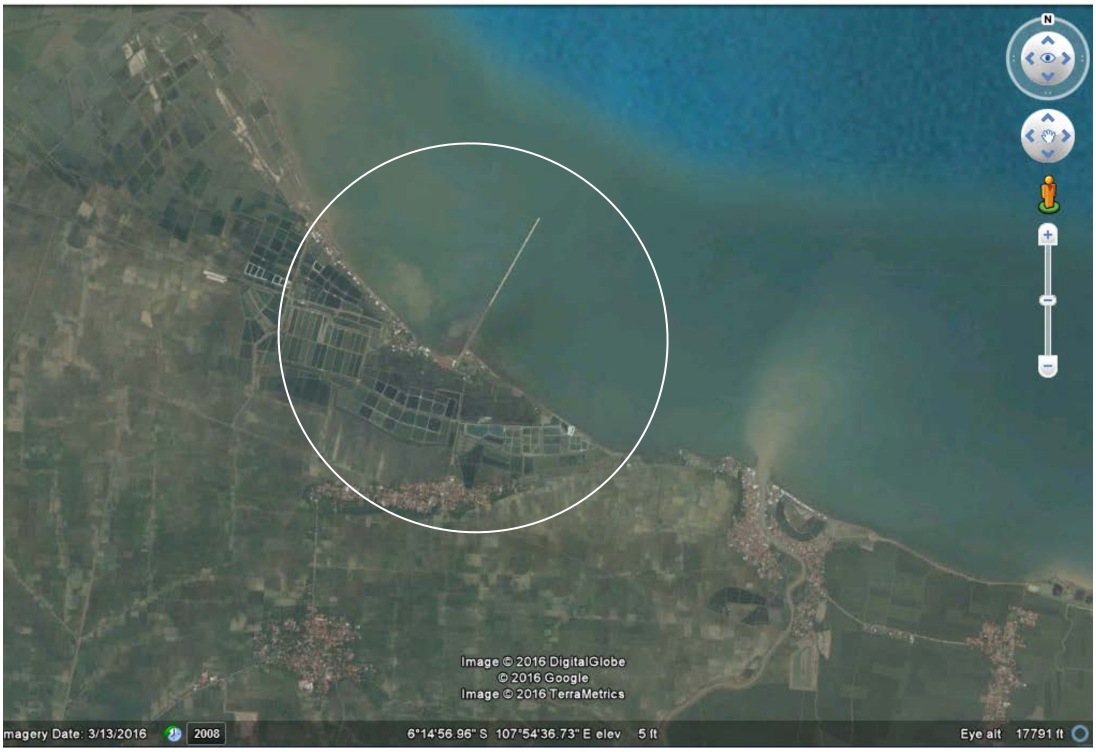


Figure 2.4. Landsat Image the Development Plan of Patimban Port

4. Geology and Geotechnique

a. Geomorphology

According to Map of Geomorphology of Indonesia, and Boring Survey data of JICA Survey Team, the area that is become into Port Development, consists of alluvial deposits of Quaternary age. The alluvial deposits are anticipated to comprise interbedded clays and silts. Bedrock, the boring into 30-35 m underground, is not found.

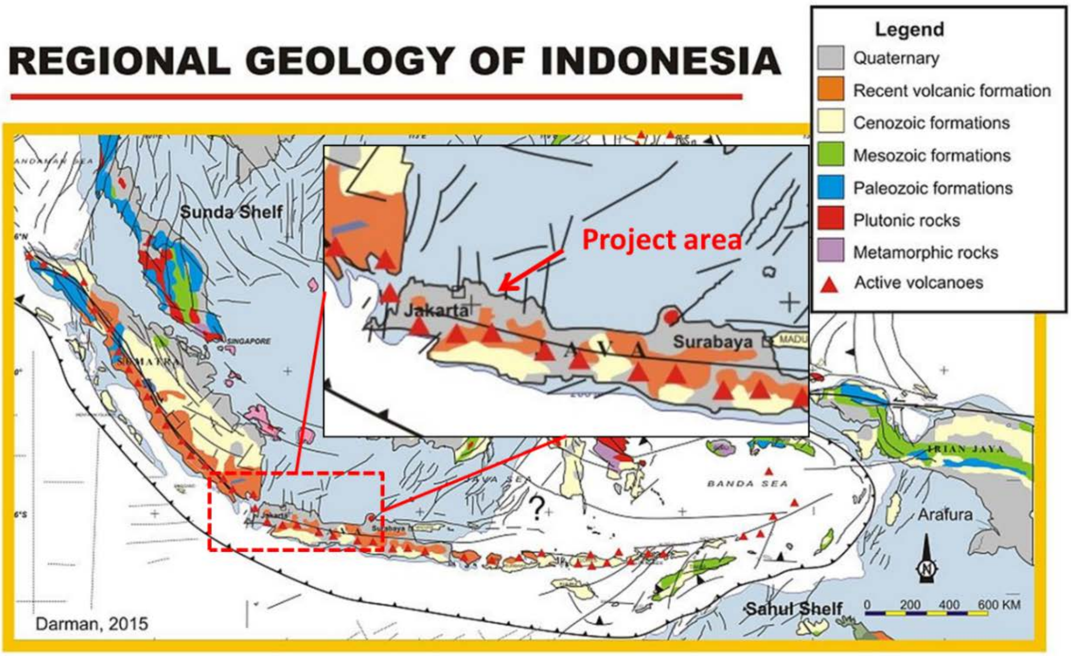


Figure 2.5. Map of Geology of Indonesia

Source: JICA Survey Team

b. Seismic Setting

peak ground acceleration (PGA) in the project area should be taken as 0.15 to 0.2g, with a 10% probability of exceedance in 50 years. the following earthquake coefficient was adopted for structural design at Patimban port :

- Regional seismic coefficient C = 0.05
- Stiffness Factor of structures; K = 1.0
- Importance Factor; I = 1.5
- Kh = K x C x I = 1.0 x 0.05 x 1.5 = 0.075
- Kv = not considered = 0

The seismic coefficient for the preliminary design of the new terminal facilities is upgraded to 0.1 for Kh given the importance of Patimban port facilities.

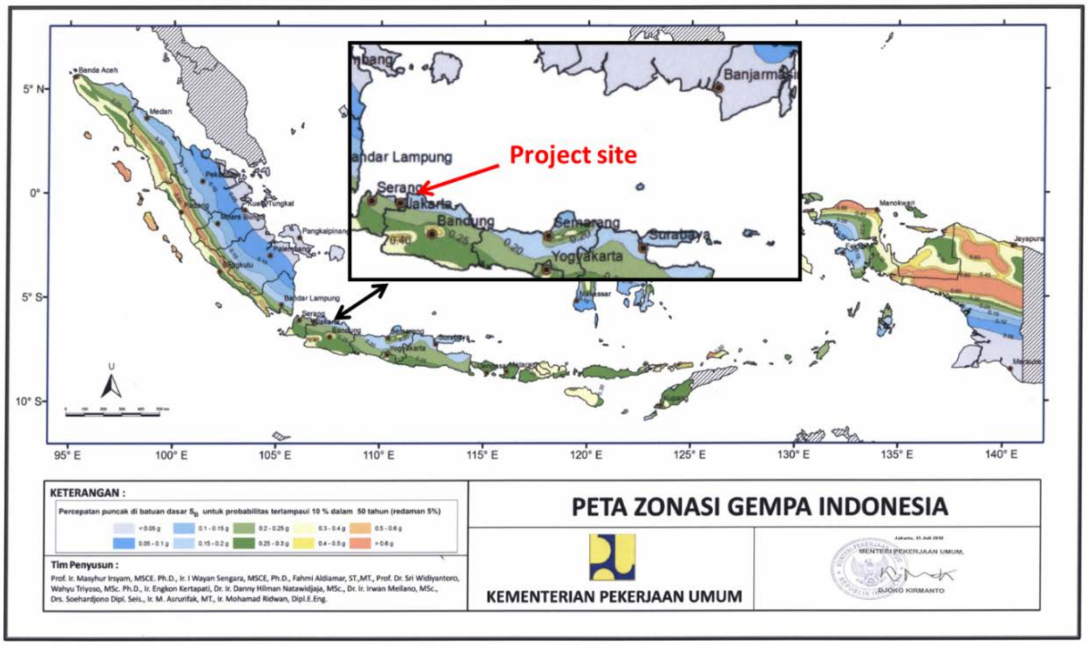


Figure 2.6. Seismic Zone Maps in Indonesian

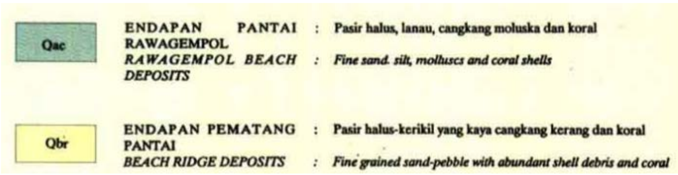
c. Goetechnical Condition

Acoording to Geological Maps of Pamanukan Scale 1 : 100,000 that has been make by Abidin and soetrisno (1992), scoping area is composed by 2 (two) rocks formation, it is deposition Rawa Gempol Coast (Qac) and deposition causeway coast (Qbr). Deposition Rawa Gempol Coast wide spread westward fine sand, silt, shells of mollusks oral dank, while Deposition Coastal in the form lenses Coastal Sediment Formation consists of fine sand that is rich shells of mollusca and corals (Figure 2.6 Geological map).

Based on the drilling technique performed by the JICA Survey Team to obtain physical and engineering properties of soil layers down to a depth of -35 m below ground surface locals still have not found bedrock. Penampang geotechnical drilling results demonstrate the value of N Standard Penetration Test (N-SPT) from the area along the outer wall of the west, Along the Path Access and Basin Area and the Outer Wall Along the East Section.

Figure 2.7. Geological Maps of Patimban Village

Note :



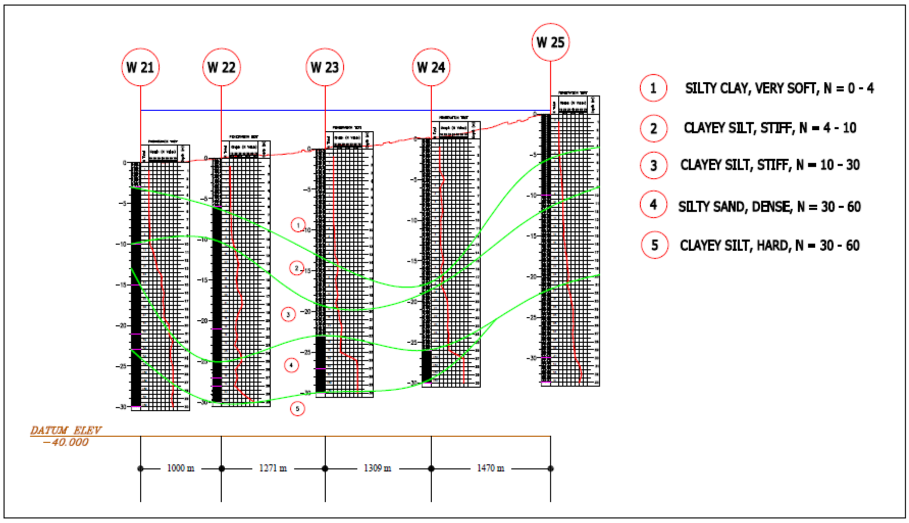


Figure 2.8. Soil Profiles Along West Outer Wall
Source : JICA Survey Team

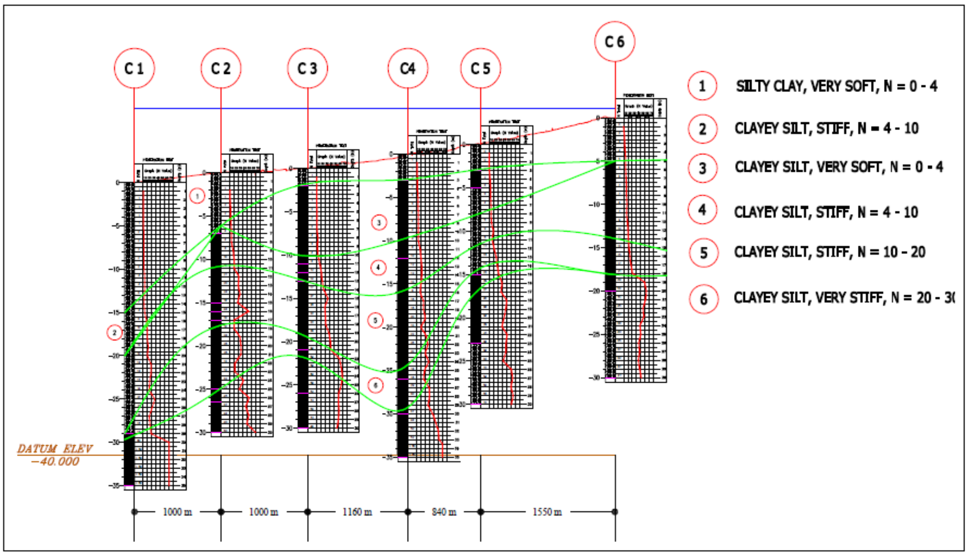


Figure 2.9. Soil Profiles Along Access Channel And Turning Basin Area

Source : JICA Survey Team

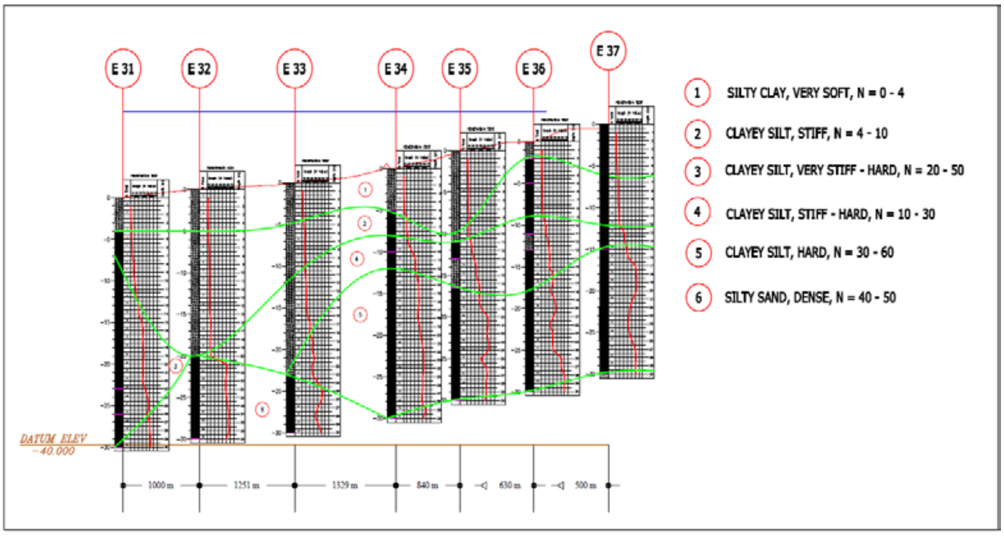


Figure 2.10. Soil Profiles Along the East Outer Wall

Source : JICA Survey Team

5. Hydrological

Tread planned activities as presented occupies the northern coastal areas of Java which contained around major river mouths, like in the east part of Kali Sewo which empties into the estuary Sewo and in the western part of Kali Genteng. Tread plan of activity is between both rivers are used by local people as fishpond. The meandering river flow patterns and watering throughout the season as well as influenced by the tide.

a. Ground Water Quality

Ground water quality sampling is doing by used of water from people well in surrounding project location. For the sampling location can seen in figure 2.3. Result of ground water sampling that has done can seen in following table.

Table 2.6. Ground Water Sampling Result

No	Test Description	Unit	Standard	Result (Location		
				1	2	3
Physical Paramater						
1	Temperature	˚C	TA ± 3˚C	29.1	29.1	30.1
Chemical Parameter						
1	pH		6.5-9.0	7,16	7,55	7,21
2	Salinity	-		4,5	3,5	5
3	Total Ammonia (NH_3-N)	mg/L		0,318	1,294	0,273
4	Sulphide (H_2S)	mg/L		<0,0003	<0,0003	<0,0003
5	Total Hydrocarbon	mg/L		<0,1	<0,1	0,141
6	Total Phenol Compund	mg/L		0,006	0,006	0,007
7	Oil & Fat	mg/L		<0,1	<0,1	0,162
8	MBAS	mg/L	0.5	0,075	<0,070	<0,070
9	BOD	mg/L		<2,0	<2,0	<2,0
11	COD	mg/L		<8,09	<2.0	<8,09
12	Copper (Cu)	mg/L		<0,0079	<0,0079	<0,0079
13	Zinc (Zn)	mg/L	15	0,086	0,033	0,077
14	Cadmium (Cd)	mg/L	0.005	<0,0081	<0,0081	<0,0081
15	Mercury (Hg)	mg/L	0.001	0,0003	0,00016	0,0006
16	Lead (Pb)	mg/L	0.05	0,05	<0,0238	<0,0238
Microbiology Parameter						
1	Total Coliform	MPN/100 mL	50	20	30	20

Note :

Based on Permenkes 416/Menkes/X/1990 Attachment 2
G1 : X=107°54'27.50"E ; Y=6°15'1.10"S
G2 : X=107°54'13.00"E ; Y=6°15'4.60"S
G3 : X=107°54'10.10"E ; Y=6°14'37.07"S

Result from that table, show that in every parameters that tested in ranged of standard quality.

6. Coastal Water Quality

Coastal water quality is collected from 7 location in 2 differant period, tide and low tide, in rainy season and dry season with total sampel is 28.

Relate to Guidance in TOR, locations are decied by following Coordinate (UTM 48s) below :

Table 2.7. Coordinate for Air Quality Survey

Location	X	Y
CW 1	107°53'51.62"E	6°12'50.16"S
CW 2	107°55'51.24"E	6°13'55.93"S
CW 3	107°54'23.57"E	6°14'13.32"S
CW 4	107°54'51.43"E	6°13'23.04"S
CW 5	107°55'54.51"E	6°11'28.22"S
CW 6	107°57'4.94"E	6° 9'20.01"S
CW 7	107°59'41.43"E	6° 4'35.09"S

Coastal water quality survey has been doing in rainy and dry season. In rainy season, based from observations result of sea water quality at tide condition, the obtained parameters exceed the quality standard, except Total Suspended Solid (TSS) at CW 1 in surface sampling (324,00 and standard is 80). Organic materials are composed of suspended substances of different types of compounds such as cellulose, fats, proteins, bacteria, and algae. These organic materials derived from natural sources and also derived from the waste of human activities such as industrial activities, agriculture, mining or household activities.

pH condition in every sampling location are different, and the result show that some of sampling area are a little more of high from quality standard, like CW 3 in bottom sampling (8,59 standard are 8,5), CW 4 in surface sampling (8,54 standard are 8,5), CW 5 in surface sampling (8,58 standard are 8,5), and CW 7 in surface and bottom sampling (8,52 standard are 8,5 and 8,51 standard are 8,5). From the total ammonia parameter, the result show that two sampling area that exceeded quality standard in CW 1 and CW 3 (0,613 and 0,610; standard are 0,3). The difference is also shown in lead (Pb) level, the reslt show that in every sampling area, Pb level are exceeded except in CW 4 (< 0,049 ; standard are 0,05). Some of parameters are a little more quality standard, but from another physical and chemical quality in every area is still good. Maybe some of parameters are higher than standard because from the result of human activity who take a water from river and another activity in sea like fish pond which always give a woof for they fish in they pond.

Result of coastal water quality measurement in dry season on low tide condition, it is showed that almost of all parameters are still at and below quality standard, except TTS parameter which is in sampling point of CW 1 (118 mg/L), CW 2 (102 mg/L), CW 4 (119.5 mg/L), CW 5 (118.5 mg/L), dan CW 7 (110.5 mg/L), exceeds quality standard which is 80 mg/L. beside, transparency parameter in several locations also has various value. On location CW 1 and CW

3, it has value below the standard which is set to >3m, the value is 0.5 m. TSS has effect on turbidity. Whose value is high in some locations, is caused by much of particles are brought by waves when sampling, so it affects to result of measurement. Transparency also is related to turbidity, that affects to visibility of Assessors.

Coastal water quality measurement on high tide condition in dry season, it can be showed almost of all measured parameters have value in the range of quality standard but TSS, Total Phenol, Total Ammonia, and Accumulated Cd parameters. In TSS measurement, it shows that measured parameters in all of locations have value exceeds the standard (80 mg/L) although on some locations, the values are not too high like the CW 6 (85 mg/L). Other Parameters as Total Ammonia are measured in every locations have value below standard but in location CW 7 where total ammonia value is 0.933 mg/L with standard 0.3 mg/L. parameter of total phenol also has various values, which are in the some locations the values are below standard and in other locations the values are above standard, such as CW 1 (0.013 mg/L), CW 3 (0.008 mg/L), CW 4 (0.009 mg/L), and CW 7 (0.011 mg/L) where the standard is 0.002 mg/L. last but not least, dissolved Cadmium (Cd) which has value above standard in location CW 6, though the amount is not too high (0.03 mg/L standard : 0.01 mg/L).

Complete data from result of coatal water quality survey in rainy season can be seen in following table.

Table 2.8. Coastal Water Quality in Rainy Season in Tide Condition

No	Parameter	Unit	Standard	Result (Location)													
				CW 1 (± 6m)		CW 2 (± 6m)		CW 3 (± 3m)		CW 4 (± 5m)		CW 5 (± 10m)		CW 6 (± 18 m)		CW 7 (± 25m)	
				S	B	S	B	S	B	S	B	S	B	S	B	S	B
A.	**Physical Parameters**																
1	**Temperature**	^0C	Natural	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	28.0	25.0	25.0	25.0	25.0
2	**Total Suspended Solid (TSS)***	mg/L	80	324.00		<11.75		54.00		12.00		39.00		<11.75		<11.75	
3	**Odour**	-	No Odour	No Odour	No Odour	No Odour	No Odour	No Odour	No Odour	No Odour	No Odour	No Odour	No Odour	No Odour	No Odour	No Odour	No Odour
4	**Transparency**	m	>3	3.5		3.6		3.6		3.4		3.7		3.6		3.5	
5	**Turbidity**	NTU	-	26.56	0.92	<1	2.45	1.775	5.35	<1	<1	<1	<1	<1	2.11	<1	<1
6	**Rubbish (S)/Garbage (B)**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	**Oil Slick (S)/ Oil Layer (B)**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B.	**Chemical Parameters**																
1	**pH***	-	6.5-8.5 (S)/7.0-8.5 (B)	8.21	8.45	8.52	8.24	8.46	8.48	8.54	8.39	8.58	8.19	8.41	8.38	8.52	8.40
2	**DO**	mg/L	-	3.0	3.2	3.0	2.9	3.0	2.9	3.0	2.9	3.0	2.9	3.0	2.9	3.0	3.1
3	**Salinity**	-	Natural	31.0	29.1	31.0	33.4	31.0	30.2	30.0	33.4	31.0	34.5	32.0	34.5	32.0	34.5
4	**Total Ammonia (NH_3-N)**	mg/L	0.3	0.613		0.254		0.610		0.262		0.257		0.035		0.218	
5	**Sulphide (H_2S)**	mg/L	0.03	0.001		<0.0003		<0.0003		<0.0003		<0.0003		<0.0003		<0.0003	
6	**Total Hydrocarbon**	mg/L	< 1	0.625		<0.1		<0.01		<0.1		<0.1		0.052		0.149	
7	**Total Phenol Compund**	mg/L	0.002	<0.001		<0.001		<0.001		<0.001		<0.001		<0.001		<0.001	
8	**MBAS**	mg/L	1	<0.070		0.122		<0.070		0.106		<0.070		<0.070		0.098	
9	**Oil & Fat**	mg/L	5	<0.1031		<0.1031		<0.1031		0.123		<0.1031		0.104		<0.1031	
10	**PCBs**	µg/L	0.01	<0.005		<0.005		<0.005		<0.005		<0.005		<0.005		<0.005	
11	**TBT**	µg/L	0.01	<0.005		<0.005		<0.005		<0.005		<0.005		<0.005		<0.005	
C.	**Dissolved Metal Parameters**																
1	**Mercury (Hg)**	mg/L	0.003	<0.0002		0.0001		<0.0002		<0.0002		0.0015		0.0007		<0.0002	
2	**Cadmium (Cd)**	mg/L	0.01	<0.037		<0.037		<0.037		<0.037		<0.037		<0.037		<0.037	
3	**Copper (Cu)**	mg/L	0.05	<0.018		<0.018		<0.018		<0.018		0.1139		0.0644		<0.018	
4	**Lead (Pb)**	mg/L	0.05	0.378		0.822		0.600		<0.049		0.378		0.378		0.600	
5	**Zinc (Zn)**	mg/L	0.1	0.065		0.077		0.297		0.065		0.048		0.083		0.071	
1	**Total Coliform**	MPN/ 100mL	1000	600		570		720		560		700		600		500	

Source : Primary Data, 2016

Note : S = Sampling in Surface of Sea Layer; B = Sampling in Bottom of Sea Layer

Table 2.9. Coastal Water Quality in Rainy Season in Low Tide Condition

No	Parameter	Unit	Standard	Result (Location)													
				CW 1 (± 6m)		CW 2 (± 6m)		CW 3 (± 3m)		CW 4 (± 5m)		CW 5 (± 10m)		CW 6 (± 18 m)		CW 7 (± 25m)	
				S	B	S	B	S	B	S	B	S	B	S	B	S	B
A.	**Physical Parameters**																
1	**Temperature**	^0C	Natural	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
2	**Total Suspended Solid (TSS)***	mg/L	80	320.00		<11.75		73.00		16.00		36.00		<11.75		<11.75	
3	**Odour**	-	No Odour	No Odour	No Odour	No Odour	No Odour	No Odour	No Odour	No Odour	No Odour	No Odour	No Odour	No Odour	No Odour	No Odour	No Odour
4	**Transparency**	m	>3	3.2		3.5		3.2		3.2		3.5		3.3		3.5	
5	**Turbidity**	NTU	-	29.52	0.92	<1	<1	2.813	5.35	<1	<1	<1	<1	<1	0.25	<1	<1
6	**Rubbish (S)/Garbage (B)**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	**Oil Slick (S)/ Oil Layer (B)**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B.	**Chemical Parameters**																
1	**pH***	-	6.5-8.5 (S)/7.0-8.5 (B)	7.10	8.56	7.36	8.52	8.62	8.59	8.70	8.50	7.43	8.47	8.03	8.49	8.84	8.51
2	**DO**	mg/L	-	3.1	3.0	3.3	3.0	3.2	3.0	3.2	3.0	3.0	3.0	3.1	32.0	3.0	3.0
3	**Salinity**	-	Natural	31.0	27.0	31.7	31.0	33.4	28.0	32.4	31.0	31.0	32.0	32.3	3.0	37.2	32.0
4	**Total Ammonia (NH_3-N)**	mg/L	0.3	0.412		0.218		0.66		0.28		0.211		0.042		0.235	
5	**Sulphide (H_2S)**	mg/L	0.03	0.006		<0.0003		<0.0003		<0.0003		<0.0003		<0.0003		<0.0003	
6	**Total Hydrocarbon**	mg/L	< 1	0.311		<1		<0.01		<0.1		<0.1		0.652		0.149	
7	**Total Phenol Compund**	mg/L	0.002	<0.001		<0.001		<0.001		<0.001		<0.001		<0.001		<0.001	
8	**MBAS**	mg/L	1	<0.070		0.146		<0.070		0.114		<0.070		<0.070		0.077	
9	**Oil & Fat**	mg/L	5	<0.103		<0.103		<0.103		0.133		<0.103		0.121		<0.103	
10	**PCBs**	µg/L	0.01	<0.005		<0.005		<0.005		<0.005		<0.005		<0.005		<0.005	
11	**TBT**	µg/L	0.01	<0.005		<0.005		<0.005		<0.005		<0.005		<0.005		<0.005	
C.	**Dissolved Metal Parameters**																
1	**Mercury (Hg)**	mg/L	0.003	<0.0002		0.0003		<0.0002		<0.0002		0.0018		0.0011		<0.0002	
2	**Cadmium (Cd)**	mg/L	0.01	<0.037		<0.037		<0.037		<0.037		<0.037		<0.037		<0.037	
3	**Copper (Cu)**	mg/L	0.05	<0.018		<0.018		<0.018		<0.018		0.116		0.072		<0.018	
4	**Lead (Pb)**	mg/L	0.05	0.312		0.342		0.611		<0.049		0.408		0.167		0.611	
5	**Zinc (Zn)**	mg/L	0.1	0.097		0.060		0.320		0.088		0.052		0.051		0.077	
D.	**Microbiology Parameter**																
1	**Total Coliform**	MPN/ 100mL	1000	700		600		630		600		700		550		610	

Source : Primary Data, 2016

Note : S = Sampling in Surface of Sea Layer; B = Sampling in Bottom of Sea Layer.

Table 2.10. Coastal Water Quality in Dry Season at Low Tide Condition

No	Parameters	Unit	Standard	Result (Location)													
				CW 1 (± 6m)		CW 2 (± 6m)		CW 3 (± 3m)		CW 4 (± 5m)		CW 5 (± 10m)		CW 6 (± 18 m)		CW 7 (± 25m)	
				S	B	S	B	S	B	S	B	S	B	S	B	S	B
A.	**Physical Parameters**																
1	**Temperature**	^0C	Natural	30.4	30.1	31.1	30.1	29.7	30	29.3	29.4	29.4	28.3	29.3	28.1	29.2	28.5
2	**Total Suspended Solid (TSS)***	mg/L	80	95		191		97.5		158		110.5		85		102	
3	**Odour**	-	No Odour	No Odour	No Odour	No Odour	No Odour	No Odour	No Odour	No Odour	No Odour	No Odour	No Odour	No Odour	No Odour	No Odour	No Odour
4	**Transparency**	m	>3	0.5	0.5	6	6	0.5	0.5	4	4	8	8	8	8	8	8
5	**Turbidity**	NTU	-	27.93	15.73	18.17	19.55	15.62	20.61	25.45	25.45	111.71	32.8	18.17	27.93	25.49	25.488
6	**Rubbish (S)/Garbage (B)**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	**Oil Slick (S)/ Oil Layer (B)**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B.	**Chemical Parameters**																
1	**pH***	-	6.5-8.5 (S)/7.0-8.5 (B)	6.56	7.41	8.04	8.1	7.3	7.57	5.71	5.63	8.29	8.28	8.27	8.27	8.27	8.25
2	**DO**	mg/L	-	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1
3	**Salinity**	-	Natural	31	31	31	32.5	32	32	32	32	33	33	33	33	30	33
4	**Total Ammonia (NH_3-N)**	mg/L	0.3	0.071		0.019		0.231		0.024		0.114		0.687		0.933	
5	**Sulphide (H_2S)**	mg/L	0.03	<0.0003		<0.0003		<0.0003		<0.0003		<0.0003		<0.0003		<0.0003	
6	**Total Hydrocarbon**	mg/L	1	<0.1		0.149		0.189		0.464		0.122		<0.1		<0.1	
7	**Total Phenol Compund**	mg/L	0.002	0.013		<0.0001		0.008		0.009		0.0004		<0.0001		0.011	
8	**MBAS**	mg/L	1	<0.070		<0.070		<0.070		<0.070		<0.070		<0.070		<0.070	
9	**Oil & Fat**	mg/L	5	<0.1		<0.1		<0.1		<0.01		<0.1		<0.1		<0.1	
10	**PCBs**	μg/L	0.01	<0.005		<0.005		<0.005		<0.005		<0.005		<0.005		<0.005	
11	**TBT**	μg/L	0.01	<0.005		<0.005		<0.005		<0.005		<0.005		<0.005		<0.005	
C.	**Dissolved Metal Parameters**																
1	**Mercury (Hg)**	mg/L	0.003	0.0002		0.0002		0.0002		0.0015		0.0009		0.0007		0.0018	
2	**Cadmium (Cd)**	mg/L	0.01	<0.0081		<0.0081		<0.0081		<0.0081		<0.0008		0.03		<0.0081	
3	**Copper (Cu)**	mg/L	0.05	0.037		0.029		<0.0079		<0.0079		0.036		<0.0079		0.036	
4	**Lead (Pb)**	mg/L	0.05	<0.0238		<0.0238		<0.0238		0.038		<0.0238		<0.0238		<0.0238	
5	**Zinc (Zn)**	mg/L	0.1	0.036		0.034		0.052		0.06		0.042		0.046		0.048	
D.	**Microbiology Parameter**																
1	**Total Coliform**	MPN/ 100mL	1000	700		700		800		700		900		700		800	

Source : Primary Data, 2016

Note : S = Sampling in Surface of Sea Layer; B = Sampling in Bottom of Sea Layer

Table 2.11. Coastal Water Quality in Dry Season at Low Tide Condition

No	Parameters	Unit	Standard	Result (Location)													
				CW 1 (± 6m)		CW 2 (± 6m)		CW 3 (± 3m)		CW 4 (± 5m)		CW 5 (± 10m)		CW 6 (± 18 m)		CW 7 (± 25m)	
				S	B	S	B	S	B	S	B	S	B	S	B	S	B
A.	**Physical Parameters**																
1	**Temperature**	^{0}C	Natural	25.4	25.7	26.5	26.7	25.1	25.3	23.3	25.4	29.1	28.2	29.2	28.3	29.4	28.3
2	**Total Suspended Solid (TSS)***	mg/L	80	118		102		76.5		119.5		118.5		60.5		110.5	
3	**Odour**	-	No Odour	No Odour	No Odour	No Odour	No Odour	No Odour	No Odour	No Odour	No Odour	No Odour	No Odour	No Odour	No Odour	No Odour	No Odour
4	**Transparency**	m	>3	0.5	0.5	6	6	0.5	0.5	4	4	8	8	8	8	8	8
5	**Turbidity**	NTU	-	13.29	27.93	20.61	27.33	27.93	27.93	27.93	27.93	10.27	25.49	27.93	20.61	111.71	32.8
6	**Rubbish (S)/Garbage (B)**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	**Oil Slick (S)/ Oil Layer (B)**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B.	**Chemical Parameters**																
1	**pH***	-	6.5-8.5 (S)/7.0-8.5 (B)	6.32	7.41	7.87	7.95	7.02	7.31	5.4	5.32	8.28	8.26	8.33	8.27	8.29	8.28
2	**DO**	mg/L	-	0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1
3	**Salinity**	-	Natural	29	30	32.5	32	32	32	33	32	33	33	33	33	33	33
4	**Total Ammonia (NH_3-N)**	mg/L	0.3	<0.015		0.0044		0.034		0.029		<0.015		0.065		0.114	
5	**Sulphide (H_2S)**	mg/L	0.03	<0.0003		<0.0003		<0.0003		<0.0003		<0.0003		<0.0003		<0.0003	
6	**Total Hydrocarbon**	mg/L	1	<0.1		<0.1		<0.1		0.172		<0.1		<0.1		0.122	
7	**Total Phenol Compund**	mg/L	0.002	0.012		0.011		<0.0001		0.011		0.0004		<0.001		0.0004	
8	**MBAS**	mg/L	1	<0.070		<0.070		<0.070		<0.070		0.301		0.087		<0.070	
9	**Oil & Fat**	mg/L	5	<0.1		<0.1		0.159		<0.01		0.104		<0.1		<0.1	
10	**PCBs**	μg/L	0.01	<0.005		<0.005		<0.005		<0.005		<0.005		<0.005		<0.005	
11	**TBT**	μg/L	0.01	<0.005		<0.005		<0.005		<0.005		<0.005		<0.005		<0.005	
C.	**Dissolved Metal Parameters**																
1	**Mercury (Hg)**	mg/L	0.003	0.0002		0.0002		0.0016		0.0007		0.0006		0.0003		0.0009	
2	**Cadmium (Cd)**	mg/L	0.01	<0.0081		<0.0081		<0.0081		<0.0081		0.01		0.009		<0.0081	
3	**Copper (Cu)**	mg/L	0.05	0.018		0.038		0.041		0.0033		0.014		0.008		0.036	
4	**Lead (Pb)**	mg/L	0.05	<0.0238		<0.0238		<0.0238		<0.0238		<0.0238		<0.0238		0.0238	
5	**Zinc (Zn)**	mg/L	0.1	0.084		0.089		0.041		0.039		0.011		0.009		0.042	
D.	**Microbiology Parameter**																
1	**Total Coliform**	MPN/ 100mL	1000	900		700		700		800		300		400		900	

Source : Primary Data, 2016

Note : S = Sampling in Surface of Sea Layer; B = Sampling in Bottom of Sea Layer

7. River Water Quality

River water quality survey has been done in May, 3, 2016. Analysis result of water river quality show that the water in good condition because most of parameters are below quality standard, based on Government Regulation in PP RI No 82 Years 2001. However, there is one parameter which higher than standard quality, that is Zinc level. Zinc level in two area are highly in Cipunagara river 1 and Kali Sewu river. In direcly observation, this river are many densely populated, so maybe because too many activity in there so zinc level are high. For the complete data we can see in **Table 2.11.** are list below.

Table 2.12. River Water Quality Result (Rainy Season)

No	Parameter	Unit	Standard	Result			
				R 1	**R 2**	**R 3**	**R 4**
A	**Physical**						
1	Temperature	°C	Ambient ±3	25.0	25.0	25.0	25.0
2	TSS*	mg/L	400	153.00	260.0	10.0	15.0
3	Turbidity	-	NTU	26.56	26.63	5.35	1.775
B	**Chemical**						
1	pH*	-	6 - 9	7.39	7.45	7.45	7.47
2	Salinity	-	-	1	1.0	2.8	7.0
3	DO	mg/L	3	3	3.0	3.0	3.0
4	BOD	mg/L	6	<2	<2	<2	<2
5	COD	mg/L	50	<7.57	<7.57	27.07	<7.57
6	NH3-N	mg/L	-	0.040	0.038	1.198	0.298
7	PO4	mg/L	1	0.08	0.04	0.02	0.01
8	Detergent (MBAS)	mg/L	0.2	0.21	0.138	<0.070	<0.070
9	Phenol	mg/L	0.001	<0.001	<0.001	<0.001	0.008
10	Total Hydrocarbon	mg/L	-	0.778	0.250	0.219	1.199
11	PCBs	µg/L	-	<0.005	<0.005	<0.005	<0.005
12	Oil and Fat	mg/L	1	0.164	0.140	0.114	0.210
13	H2S	mg/L	0.002	0.001	0.001	<0.0003	<0.0003
14	Cd	mg/L	0.01	<0.037	<0.037	<0.037	<0.037
15	Cu	mg/L	0.02	<0.018	<0.018	<0.018	<0.018
16	Pb	mg/L	0.03	<0.049	<0.049	<0.049	<0.049
17	Hg	mg/L	0.002	<0.0002	<0.0002	<0.0002	<0.0002
18	Zn	mg/L	0.05	1.676	<0.011	<0.011	0.873
C	**Biology**						
1	Total Coliform	MPN/100 ml	10000	800	1200	1300	1000

Source : Primary Data, 2016

Note :

R 1 = Cipunagara River 1 (06°11’892”S – 107°53’2.80”E)
R 2 = Cipunagara River 2 (06°11’985”S – 107°53’4.38”E)
R 3 = Kali Genteng River (06°13’35.56”S – 107°52’58.55”E)
R 4 = Kali Sewu River (06°15’1.10”S – 107°55’1.80”E)

8. Sediment Quality (Sea)

Sediment quality has been done in May, 3rd – 4th 2016. Sampling of surface (bed) sediment for environmental quality assessment purpose has been done in 14 (fourteen) station in the following points (UTM 48S coordinate). Survey result of characteristic sediment in deep sea is dominated by mud. this result is tend by chemical material from local people.

Table 2.13. Coordinate from Each Location

Location	X	Y	Location	X	Y
S1	107°54'15.02"E	6°13'55.48"S	S8	107°56'16.84"E	6°10'47.22"S
S2	107°54'35.98"E	6°14'24.96"S	S9	107°59'41.43"E	6° 4'35.09"S
S3	107°54'1.47"E	6°12'14.12"S	S10	107°57'19.06"E	6° 3'16.80"S
S4	107°55'39.88"E	6°14'59.38"S	S11	108° 4'26.16"E	6° 7'12.50"S
S5	107°54'42.56"E	6°13'39.07"S	S12	107°53'51.99"E	6°13'4.89"S
S6	107°55'16.35"E	6°12'37.76"S	S13	107°54'5.27"E	6°11'26.96"S
S7	107°55'46.91"E	6°11'42.00"S	S14	107°54'41.57"E	6°10'39.61"S

Because there are no quality standards for sediment quality in Indonesia and Southeast Asia, the quality standards of sediment Australia and Canada are used to assess sediment pollution. As for the quality standard selected is the standard of Canada (SQG), because the range of values for each parameter applied, the average value is higher than the standard of Australia, resulting in the analysis of the sampling results can be more stringent. Comparison with quality standards, all parameters are below the quality standard.

Table 2.14. Sediment Quality Standard in Australia and Canada

No	Parameters	Unit	Standard		
			1	2	3
1	Mercury (Hg)	mg/kg	0.15	0.13	0.7
2	Arsenic (As)	mg/kg	20	7.24	41.6
3	Cadmium (Cd)	mg/kg	1.5	0.7	4.2
4	Chromium (Cr)	mg/kg	80	52.3	160
5	Copper (Cu)	mg/kg	65	18.7	108
6	Nickel (Ni)	mg/kg	21	-	-
7	Zinc (Zn)	mg/kg	200	124	271
8	Lead (Pb)	mg/kg	50	30.2	112

Note: Standard

1. National Assessment Guidelines for Dredging 2009. Australian Government. Screening Level
2. Canadian Sediment Quality Guidelines (SQG) for the Protection of Aquatic Life (Canadian Council of Minister of the Environment/ CCME). ISQG: Interim marine sediment quality guideline,
3. Canadian Sediment Quality Guidelines (SQG) for the Protection of Aquatic Life (Canadian Council of Minister of the Environment/ CCME) PEL: Probable Effect Level.

Table 2.15. Sediment Quality Sampling Result

No	Parameter	Unit	Standard	Result													
				S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14
Physic																	
1	Appearance	-	-	Cake	Cake	Cake	Cake	Cake	Cake	Cake	Cake	Cake	Cake	Cake	Cake	Cake	Cake
2	Odor	-	-	No	No	No	No	No	No	No	No	No	No	No	No	No	No
3	Color	-	-	Blackish Brown	Blackish Brown	Blackish Brown	Blackish Brown	Blackish Brown	Blackish Brown	Blackish Brown	Blackish Brown	Blackish Brown	Blackish Brown	Blackish Brown	Blackish Brown	Blackish Brown	Blackish Brown
4	Moisture Content	%	-	6.36	7.18	7.28	7.55	7.96	7.76	8.51	8.54	12.22	12.02	10.97	4.74	6.74	13.05
5	Density	g/ml	-	1.56	1.183	0.828	1.570	1.980	1.209	0.923	1.145	1.156	0.845	1.066	1.845	1.436	0.817
6	Volatile	%	-	5.97	7.87	11.5	9.22	6.73	12.3	10.92	15.28	7.11	7.26	15.04	3.16	12.74	6.92
7	Ash Content	%	-	87.67	84.93	81.22	83.23	85.31	79.94	80.57	76.18	80.67	80.72	73.99	92.1	80.52	83.14
8	Ignition Loss (LOI)	%	-	12.33	15.07	18.78	16.77	14.69	20.06	19.43	23.82	19.33	19.28	26.01	7.90	19.48	16.85
9	Grading Analysis																
	a. 2000 – 1000 µ	%	-	0	0	0	0.1	0	0	0	0.18	0	0	0.59	0	0	0.48
	b. 1000 – 500 µ	%	-	0	0.01	0	0.69	0	0.01	0.01	0.28	0.07	0.28	0.76	0	0.04	0.11
	c. 500 – 200 µ	%	-	0.04	0.06	0.01	0.88	0.01	0.05	0.05	0.29	1.08	1.24	4.22	0.09	0.06	4.22
	d. 200 – 100 µ	%	-	0.03	0.04	0.01	0.12	0.01	0.03	0.03	0.14	0.06	0.08	0.29	0.05	0.02	0.30
	e. 100 – 50 µ	%	-	0.04	0.02	0.01	0.42	0.01	0.02	0.02	0.27	0.02	0.06	0.27	0.02	0.01	0.26
	f. 50 – 20 µ	%	-	1.42	12.80	24.03	18.03	24.51	9.67	11.87	18.51	29.23	3.07	26.06	13.74	22.01	25.86
	g. 20 – 5 µ	%	-	15.94	6.24	16.31	4.75	10.43	4.43	10.41	4.49	17.44	21.98	10.09	16.03	0	9.99
	h. 5 – 2 µ	%	-	72.57	72.5	54.03	69.82	56.66	77.06	66.07	60.71	40.33	62.17	46.24	59.54	73.38	46.44
	i. 2 – 0,5 µ	%	-	9.96	8.32	5.60	5.08	8.37	8.73	11.53	15.14	11.78	11.11	11.49	10.53	4.46	11.59
	j. <0,5 µ	%	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chemical																	
1	Mercury (Hg)	mg/Kg	0.7	0.007	0.007	0.002	0.006	0.016	0.007	0.005	0.001	0.001	0.0011	0.002	0.001	0.001	0.005
2	Arsenic (As)	mg/Kg	41,6	0.076	0.137	0.075	0.146	0.066	0.157	0.048	<0.033	0.117	<0.033	0.097	<0.033	<0.033	<0.033
3	Cadmium (Cd)	mg/Kg	4,2	<0.135	<0.135	<0.135	<0.135	<0.135	<0.135	<0.135	<0.135	<0.135	<0.135	<0.135	<0.135	<0.135	<0.135
4	Chromium (Cr)	mg/Kg	160	2.591	0.404	1.664	2.290	1.423	2.479	<0.072	<0.072	5.127	<0.072	3.377	<0.072	1.883	1.043
5	Copper (Cu)	mg/Kg	108	8.821	4.786	9.223	12.352	10.293	11.475	6.913	1.047	6.030	1.167	7.623	1.063	3.476	2.821
6	Nickel (Ni)	mg/Kg	-	5.761	<0.067	3.458	4.890	1.713	4.744	<0.067	2.250	6.345	3.152	1.674	<0.067	<0.067	<0.067
7	Zinc (Zn)	mg/Kg	271	114.7	60.63	59.60	97.09	59.73	60.12	43.64	33.88	54.38	36.09	58.88	25.06	32.83	23.21
8	Lead (Pb)	mg/Kg	112	9.925	3.911	7.291	7.701	3.931	9.206	5.950	2.170	19.097	8.001	17.202	3.889	7.167	5.617

Source : Primary Data, 2016

Note : Standard Quality Based on Canadian Sediment Quality Guidelines (SQG) for the Protection of Aquatic Life (Canadian Council of Minister of the Environment/ CCME) PEL: Probable Effect Level.

9. Fishpond Water and Sediment Quality

Water and sediment quality of surrounding fishpond have been examined as a baseline. Sampling has done in September, 10th, 2016. The parameters for water are the same with the groundwater quality survey and those for sediment are the same with the sediment quality survey at sea, and coordinate for survey locations are presented in following table. The survey was conducted in the dry season.

Table 2.16. Coordinate for Fishpond Water and Sediment Quality

Location	X	Y
FP 1	107°54'26.30"E	6°14'58.50"S
FP 2	107°54'13.24"E	6°14'51.38"S
FP 3	107°54'0.90"E	6°14'31.10"S

a. Fishpond Water Quality

Result of laboratory analysis in table above shows that in almost all locations, the paramaters are in range of quality standard, but Total Phenol parameter is tested exceeds standard, that is set in 0.002 mg/L, in FP 1 (0.007 mg/L), FP 2 (0.008 mg/L), and FP 3 (0.009 mg/L). BOD and COD of all locations have different values, BOD and COD of location FP 1 have values less than location FP 2 and FP 3. Beside, dissolved Lead (Pb) in location FP 1 has value that slightly exceeded the standard, 0.074 mg/L with standard value 0.05 mg/L.

Laboratory result of fishpond water quality are figure in following table.

Table 2.17. Fishpond Water Quality Sampling Result

No	Test Description	Unit	Standard	Result (Location)		
				FP 1	FP 2	FP 3
Physical Paramater						
1	Temperature	˚C	Natural	32.8	31.6	30.1
Chemical Parameter						
1	pH		6.5-9.0	7.67	6.65	7.02
2	Salinity		Natural	8	19	17
3	Total Ammonia (NH_3-N)	mg/L	0.3	0.19	0.888	1.005
4	Sulphide (H_2S)	mg/L	0.03	<0.0003	<0.0003	65.36
5	Total Hydrocarbon	mg/L	1	<0.1	<0.1	<0.1
6	Total Phenol Compund	mg/L	0.002	0.007	0.008	0.009
7	Oil & Fat	mg/L	5	<0.1	<0.1	<0.1
8	MBAS	mg/L	1	<0.070	0.125	0.074
9	BOD	mg/L	-	<2.0	14.78	26.14
10	COD	mg/L	-	<8.09	36.95	65.36
11	Total Phosphate (PO4)	mg/L	-	0.07	0.02	0.02
12	PCBs	µg/L	0.01	<0.005	<0.005	<0.005
13	TBT	µg/L	0.01	<0.005	<0.005	<0.005
Dissolved Metal Parameter						
12	Copper (Cu)	mg/L	0.05	0.0007	0.0006	0.0004
13	Zinc (Zn)	mg/L	0.1	<0.0081	<0.0081	<0.0081
14	Cadmium (Cd)	mg/L	0.01	0.025	<0.0079	<0.0079
15	Mercury (Hg)	mg/L	0.003	0.0238	0.0238	0.0238

No	Test Description	Unit	Standard	Result (Location)		
				FP 1	FP 2	FP 3
16	Lead (Pb)	mg/L	0.05	0.074	0.04	0.048
Microbiology Parameter						
1	Total Coliform	MPN/100 mL	1000	660	800	700

Source : Primary Data, 2016

Note : Based on Ministry of Environment Permit No 51/2004 Attach 1

b. Fishpond Sediment Quality

In table above, result of analysis of every locations for each Physical and Chemical Paramaters that are tested, is different, however the difference is not too far and still in the same range.

Fishpond sediment quality measurement result can be seen in following table.

Table 2.18. Fishpond Sediment Quality Sampling Result

No	Parameters	Unit	Standard	Result (Location)		
				FP 1	FP 2	FP 3
Physical Parameters						
1	Appearance	-	-	Cake	Cake	Cake
2	Odor	-	-	No	No	No
3	Color	-	-	Blackish Brown	Blackish Brown	Blackish Brown
4	Moisture Content	%	-	12.26	11.19	11.36
5	Specific Gravity	g/ml	-	0.86	1.09	1.569
6	Volatile	%	-	7.11	14.74	5.97
7	Ash Content	%	-	79.11	72.51	80.92
8	Ignition Loss (LOI)	%	-	18.89	25.49	12.08
9	Grading Analysis					
	a. 2000 – 1000 µ	%	-	0	0.58	0
	b. 1000 – 500 µ	%	-	0.27	0.74	0
	c. 500 – 200 µ	%	-	1.22	4.14	0.04
	d. 200 – 100 µ	%	-	0.08	0.28	0.03
	e. 100 – 50 µ	%	-	0.06	0.26	0.04
	f. 50 – 20 µ	%	-	3.01	25.54	1.39
	g. 20 – 5 µ	%	-	21.54	9.89	15.62
	h. 5 – 2 µ	%	-	60.93	45.32	71.12
	i. 2 – 0,5 µ	%	-	10.89	1.26	9.76
	j. <0,5 µ	%	-	0	0	0
Chemical Parameters						
1	Mercury (Hg)	mg/L	-	<0.0026	<0.0026	<0.0026
2	Arsenic (As)	mg/L	-	<0.0026	<0.0026	<0.0026
3	Cadmium (Cd)	mg/L	-	<0.015	<0.015	<0.015
4	Chromium (Cr)	mg/L	-	<0.027	<0.027	<0.027
5	Copper (Cu)	mg/L	-	<0.017	<0.017	<0.017
6	Nickel (Ni)	mg/L	-	<0.011	<0.011	<0.011
7	Zinc (Zn)	mg/L	-	<0.025	<0.025	<0.025
8	Lead (Pb)	mg/L	-	<0.031	<0.031	<0.031

Source : Primary Data, 2016

2.1.2. Oceanography

a. Bathymetry and Topography

Survey and sea mapping (*sea surta*) basically is a depiction of the process the physical state of the water area by data from measurement results on the ground. The data is that visualizing the condition of the water horizontally and vertically.

Measurements were done to get the detailed data on the field either natural object or building bridges, roads, and other. The objects that has been measured then measured in horizontal position and vertical position, to further contour line can be estimated by interpolation.

From the topographical survey in an alternative location for new access roads to the Patimban Port show that most of these locations are paddy fields. In some locations also found near the shoreline ponds and mango gardens. Residential area are not too much visible along the survey line. Elevation of land along the topographic survey ranged from -0.67 meters to in the rice fields, ± 2.00 meters for a residential area, ± 1.00 meters for the area along the shoreline.

The observation of the bathymetry of the Port Patimban locations can be seen in the following picture.

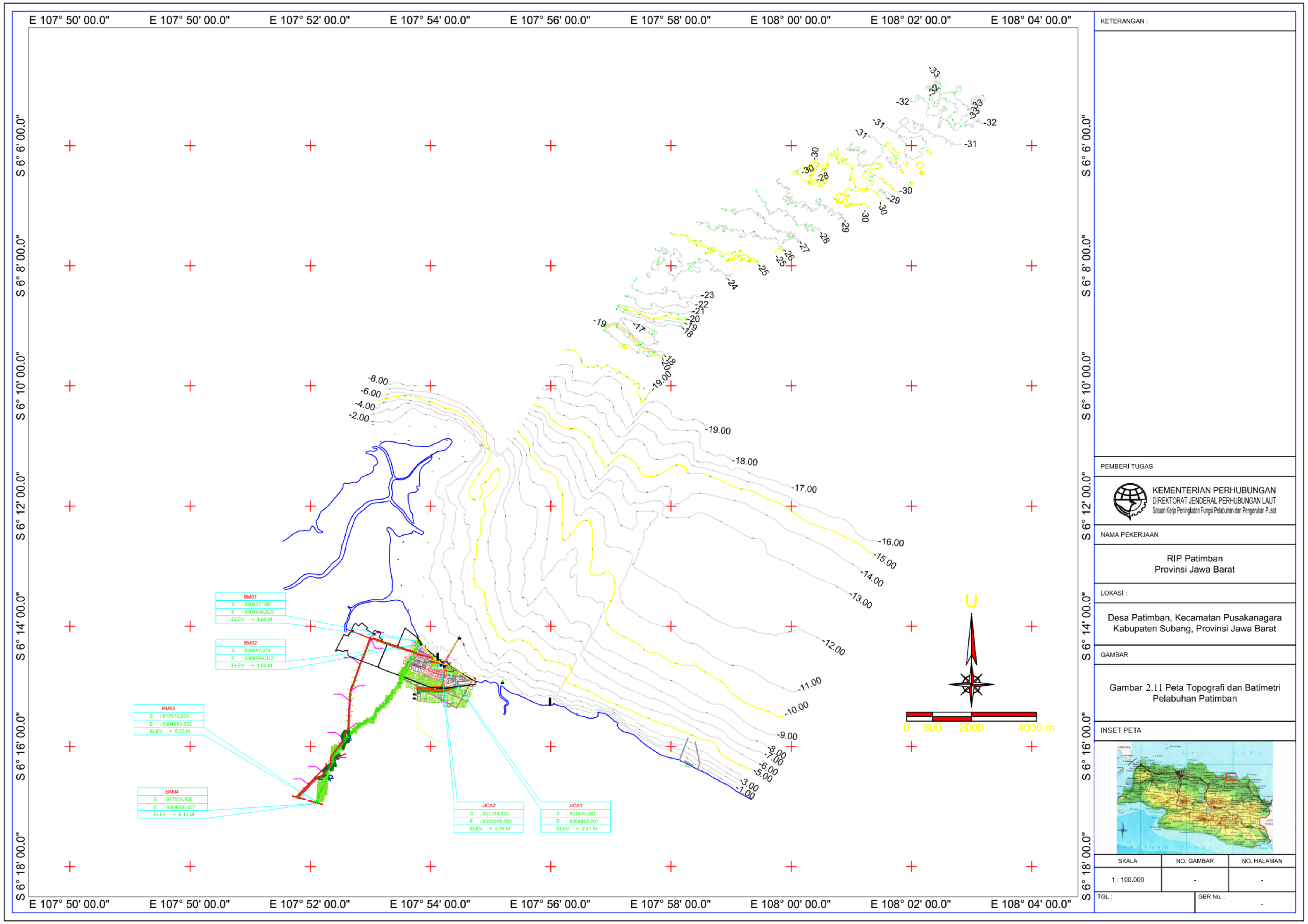


Figure 2.11. Topographyc and Bathymetry Measurement Result

b. Tide Condition

Tide observations conducted to obtain data on the high tidal / water at a given location. Tide observations done with the data record or record high ocean tides or water at any certain time interval. In this work done tide observations during 30 days 30 nights from the 23rd May-June 23, 2016 at hourly intervals.

Tide observations are done at three observation sites as shown in the following table.

Table 2.19. Coordinate for Tide Sampling

Location	X (UTM 48S)	Y (UTM 48 S)
Tide Patimban 1	6°11'52.80"S	107°54'14.42"E
Tide Patimban 2	6°15'16.05"S	107°56'34.65"E

Table 2.20. Comparrison of Tide Constituent

Constituents	Symbol	Patimban 1		Patimban 2	
		g° phase	H=Amplitude (m)	g° phase	H=Amplitude (m)
Average water level	Z_0		0.5376		0.5608
Main lunar constituent	M_2	296.7573°	0.1324	296.3879°	0.1339
Main solar constituent	S_2	160.7360°	0.0299	181.4894°	0.0375
Lunar constituent, due to Earth-Moon distance	N_2	119.9504°	0.0539	119.6251°	0.0545
Soli-lunar constituent, due to the change of declination	K_2	87.8209°	0.0158	56.7040°	0.0235
Soli-lunar constituent	K_1	68.3318°	0.1667	71.1414°	0.1813
Main lunar constituent	O_1	19.3899°	0.0859	18.9042°	0.0873
Main solar constituent	P_1	5.5596°	0.0819	359.0556°	0.0910
Main lunar constituent	M_4	107.8878°	0.0043	95.7519°	0.0046
Soli-lunar constituent	MS_4	71.3424°	0.0029	72.5035°	0.0037

Source : JICA SurveyTeam, 2016

According to calculated in formzhal value is 1.56 so type of tide in Patimban Port is mix and dominated by diurnal type. From this figure can seen the graphic of tide level in Patimban.

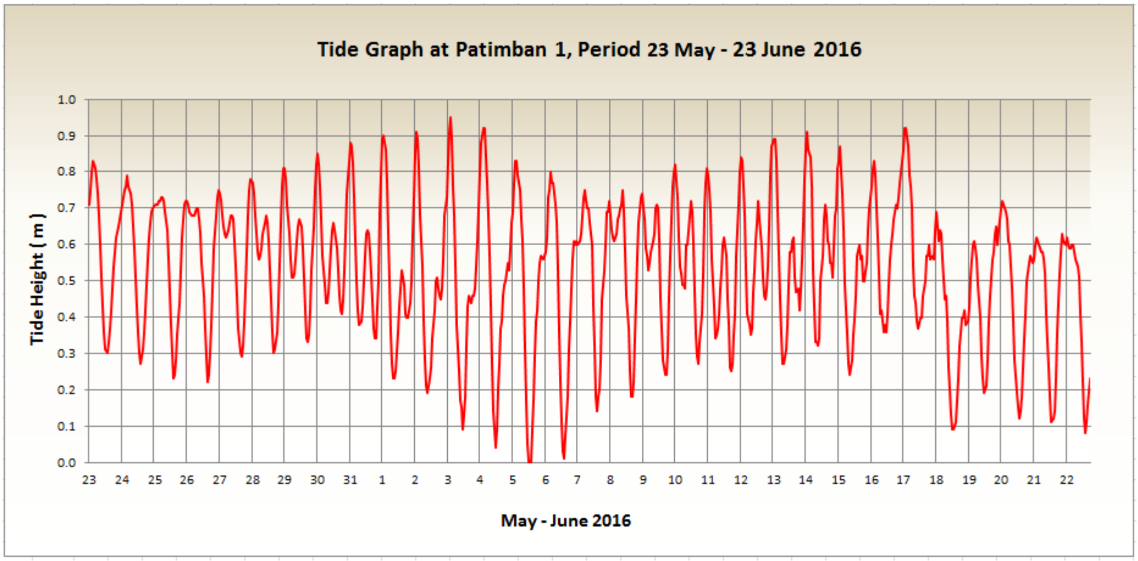


Figure 2.12. Tide Condition in Location 1

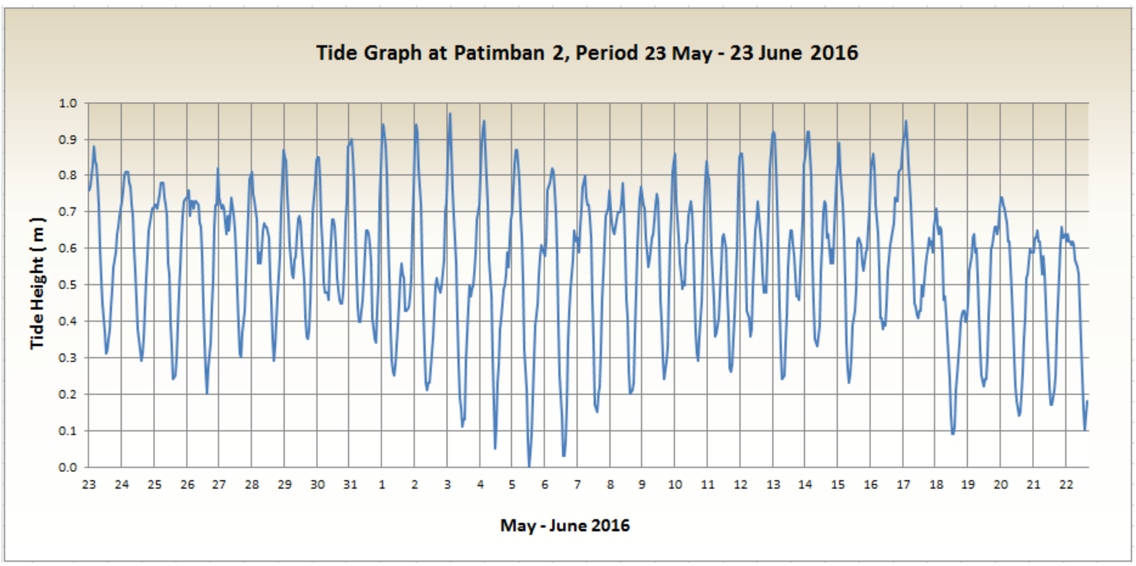


Figure 2.13. Tide Condition in Location 2

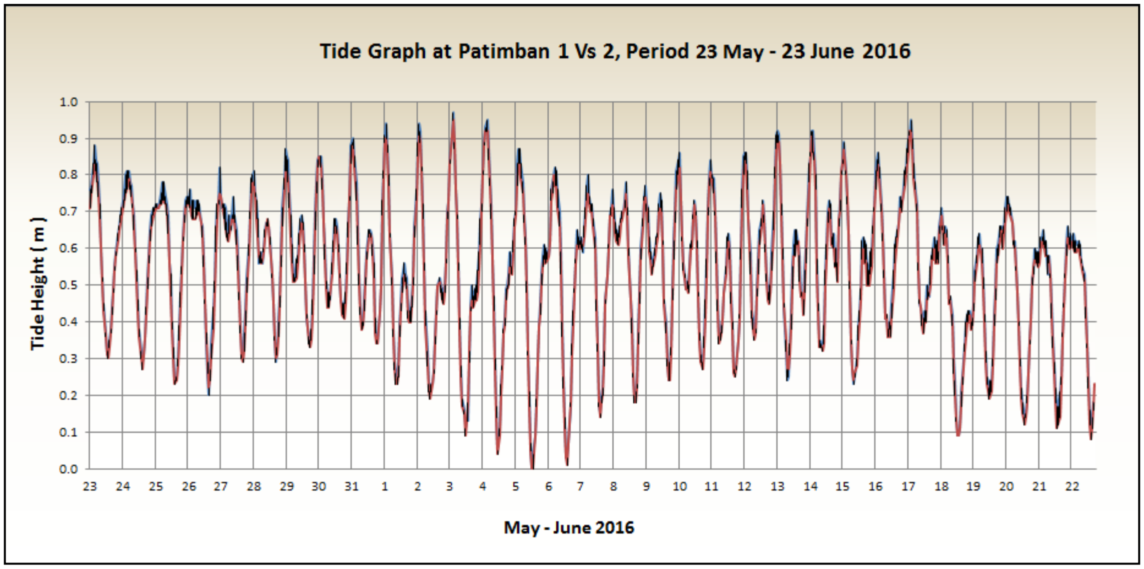


Figure 2.14. Graphic of Tide sampling in Patimban from 23 May until 23 jun 2016

Source : JICA Survey Team, 2016

c. Waves Condition

In wave analysis we know that the wind make the sea waves, therefore the wind data can be used to estimate the height and direction of the waves at sampling location. Given the wave data field measurement results are not available, and if there is only a short note, the data are less reflect the overall condition of the wave, then to the analysis of this wave will using wave forecast results based on the wind data. Wind data required as input data in order to obtain a high wave forecasting waves plan.

The maximum wind speed and direction will be used to predict the daily high and the period of maximum wave that can be generated winds in the period of time certain. Methodology wave analysis as follows :

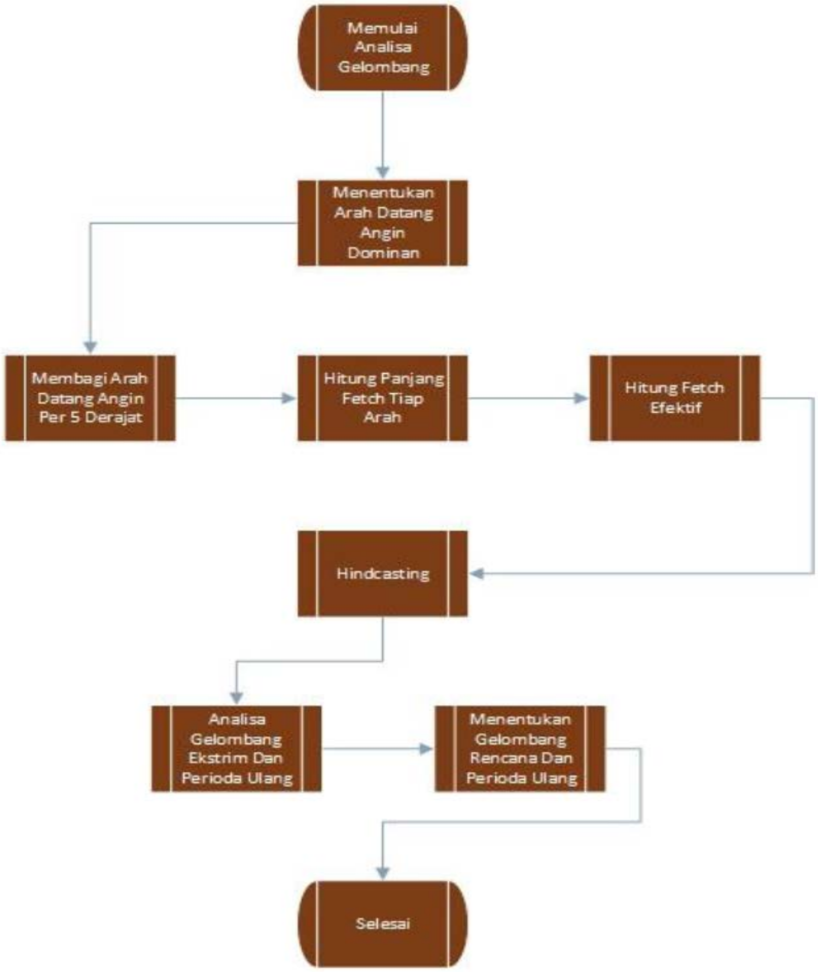


Figure 2.15. Flow Chart of Waves Condition Analyzed

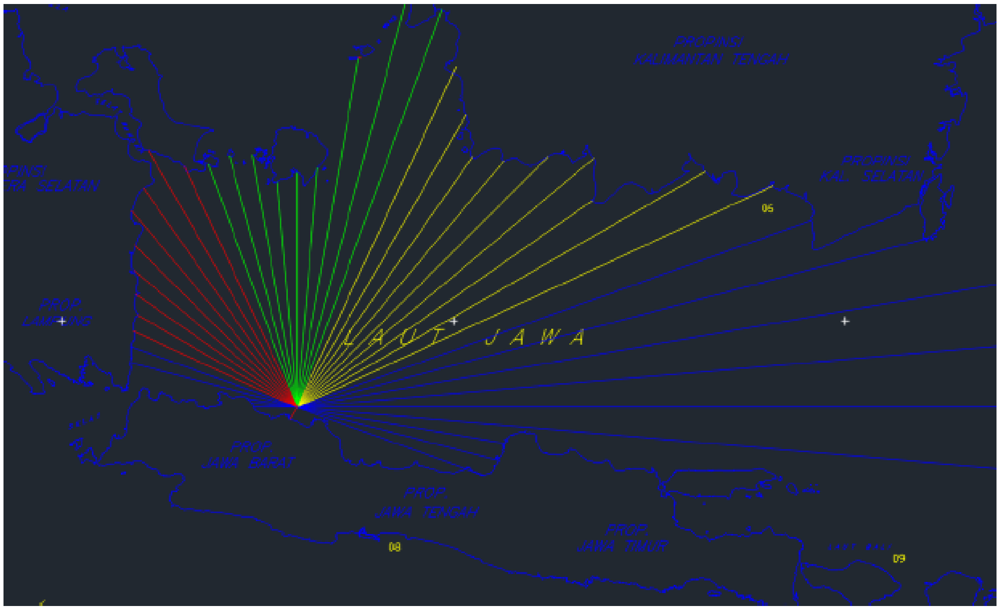


Figure 2.16. Fetch in Study Location

Source : (i) Master Plan of Patimban, 2016

After fetch is determining then we will calculate the effective fetch in each direction of the wind. Fetch effective is wave formation area indicated by area wind blowing from the deep sea. Effective fetch length calculation is done using the help of a topographical map location with a large enough scale so that it can be seen islands / mainland that affect the formation of waves in a given location. Here are the steps of determining the effective fetch length :

- From wind coming direction from the sea then made 450 to the left and right. Then divided into 9 pieces of fingers at a distance, for example 50. As sumbucutama is the radius which coincides with the dominant wind direction.
- Calculate the radius length and forecast point until the point where the radius is cut the mainland.
- Calculating the effective fetch.

In following table we can seen the calculated of effective length fetch from eight direction.

Table 2.21. Length of Effective Fetch in Study Location

Fetch	
Direction	**Length**
N	419523
NE	538912
E	900840
SE	0
S	0
SW	0
W	75970
NW	327693

Hindcasting is calculated method for predicted the waves, where in calculating process is using wind data from past. Hindcasting method can seen in following figure.

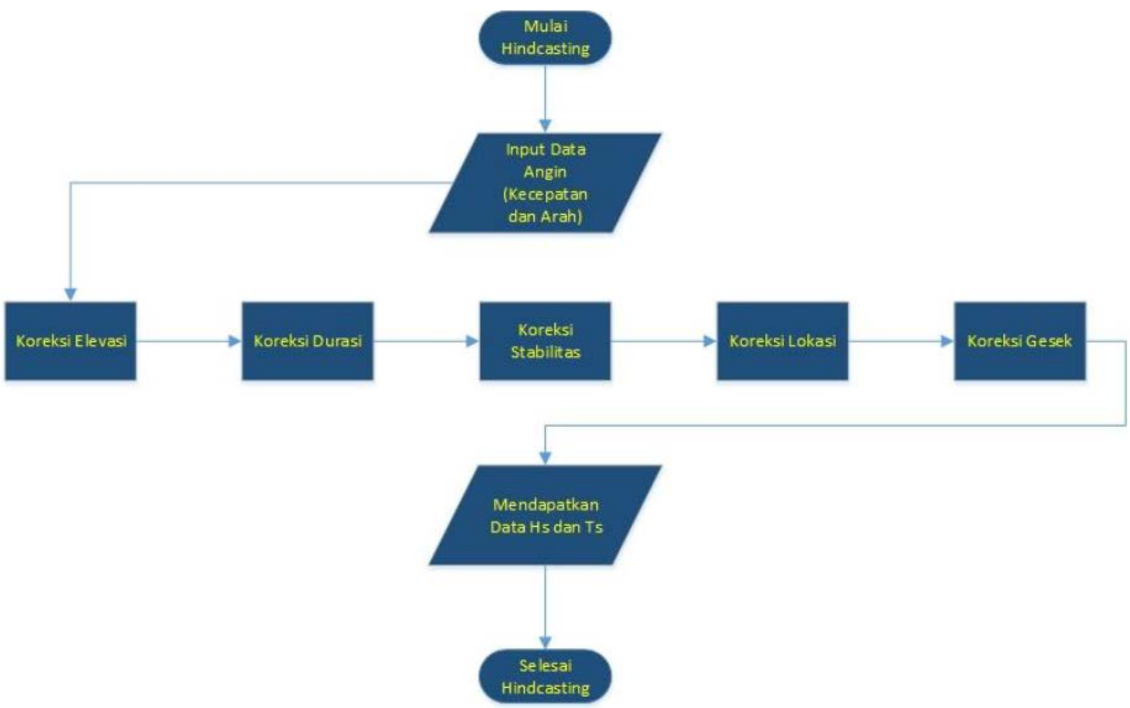


Figure 2.17. Flow Chart of Hindcasting Method

For the flowchart of hindcasting calculating are seen in following figure :

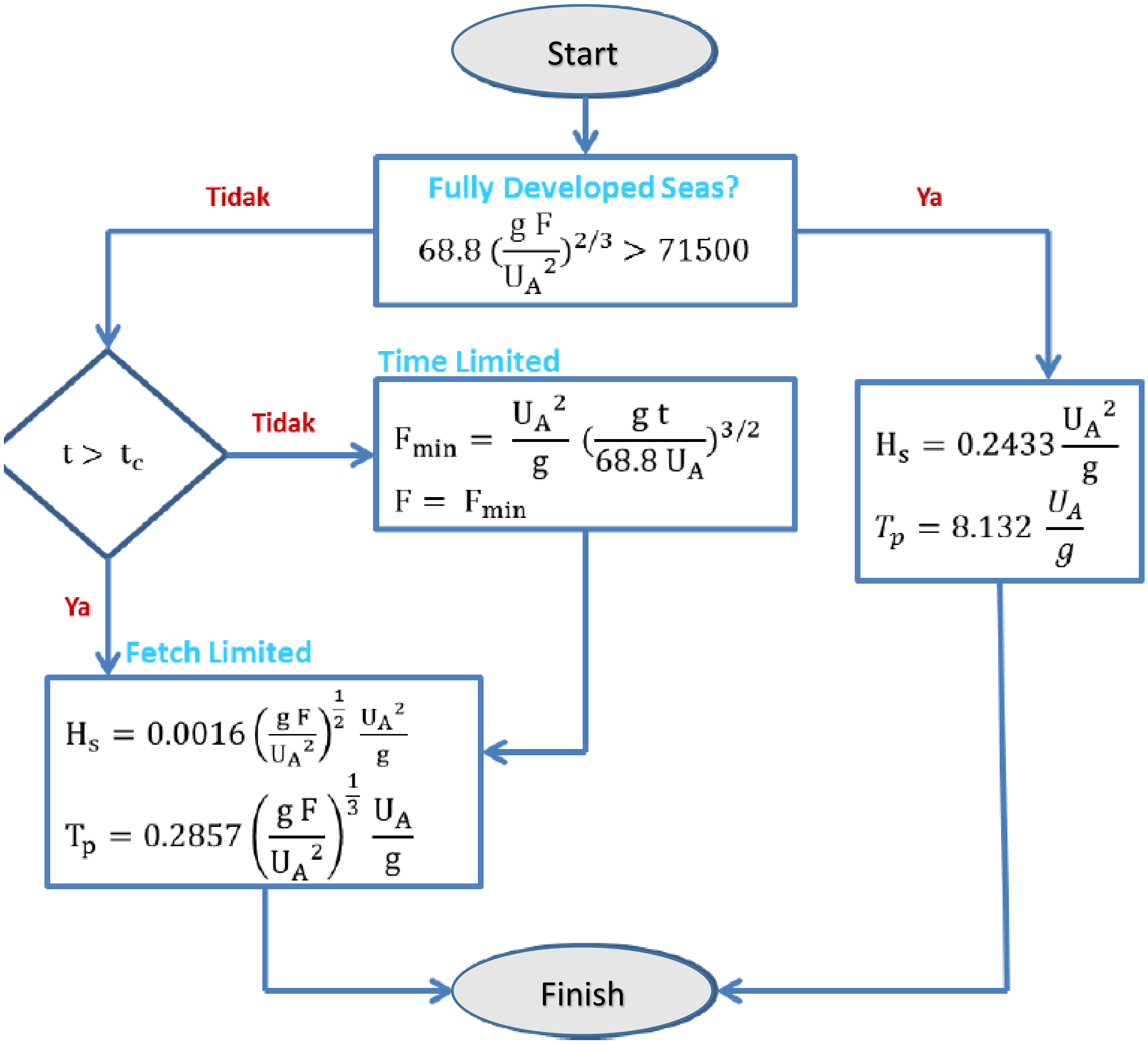


Figure 2.18. Flowchart SMB Calculated Method

Waves height values of hindcasting result can generate waverose at location of study. Waverose is showed on figure below.

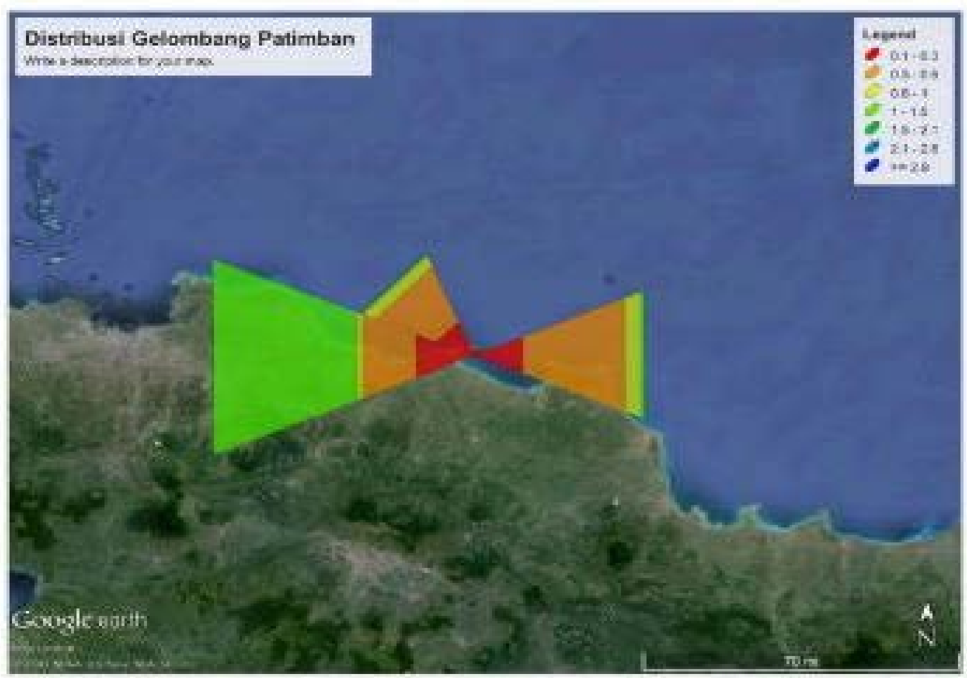
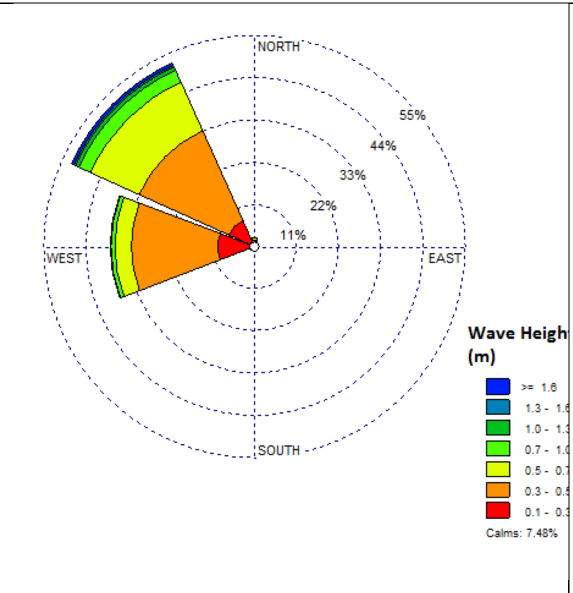


Figure 2.19. Waverose in Patimban

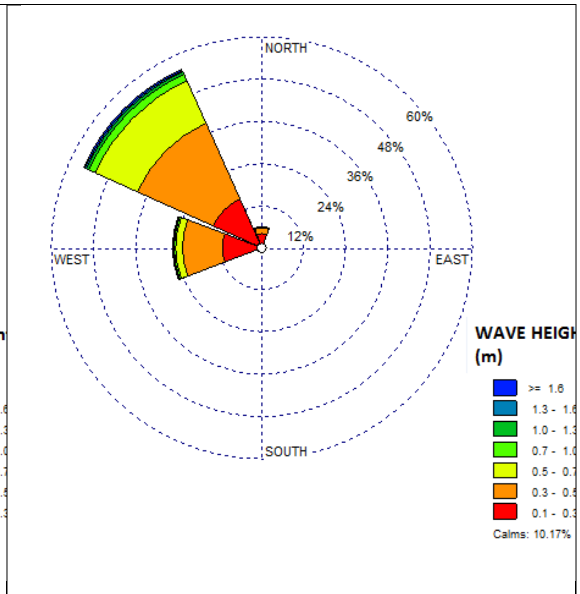
Source : (i) Masterplan of Patimban, 2016 ; (ii) resolution of daily data

(iii) using determinated method of effective length fetch and hindcasting

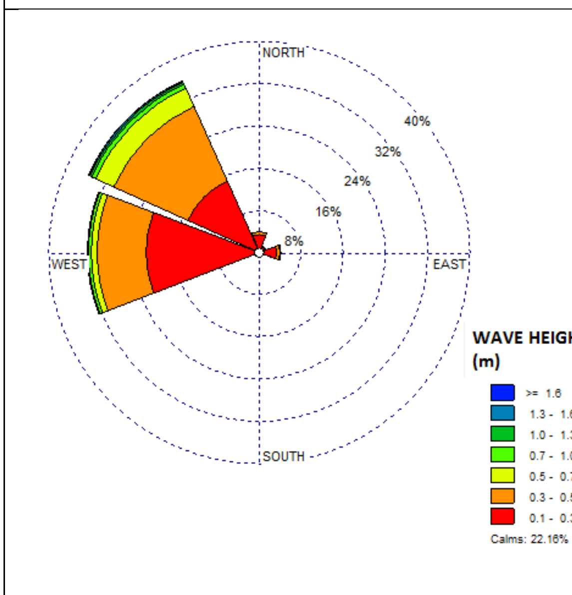
On figure above can be seen dominant waves come from west and dominant wave height estimated 1,0-1,5 meter.



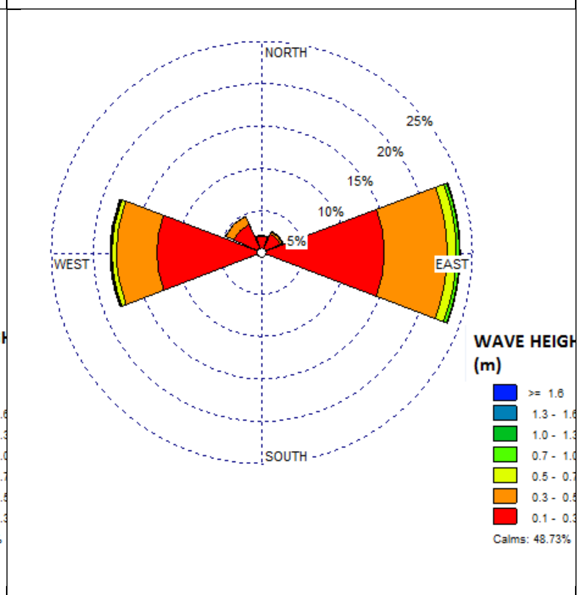
January



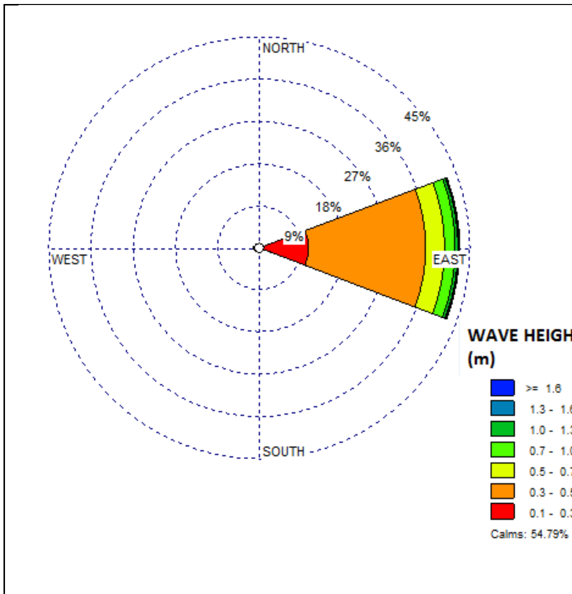
February



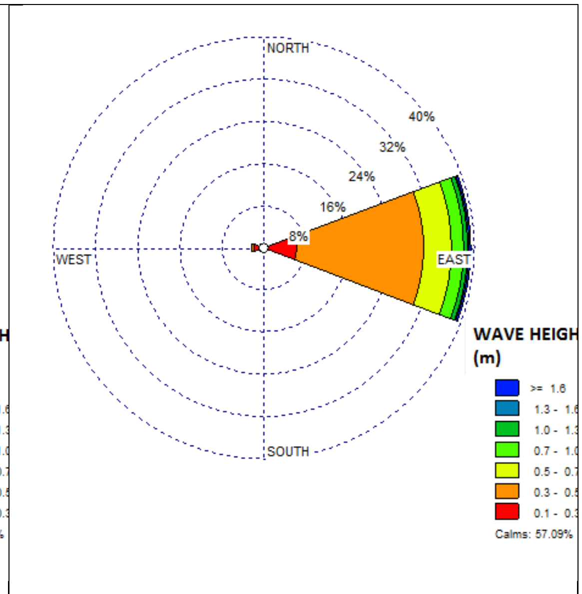
March



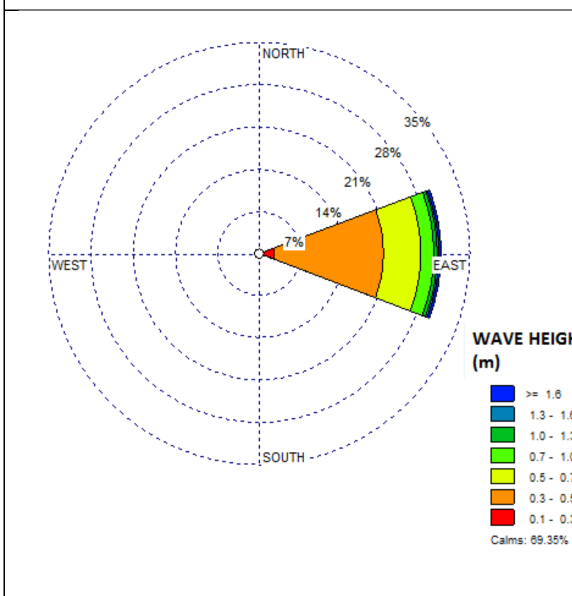
April



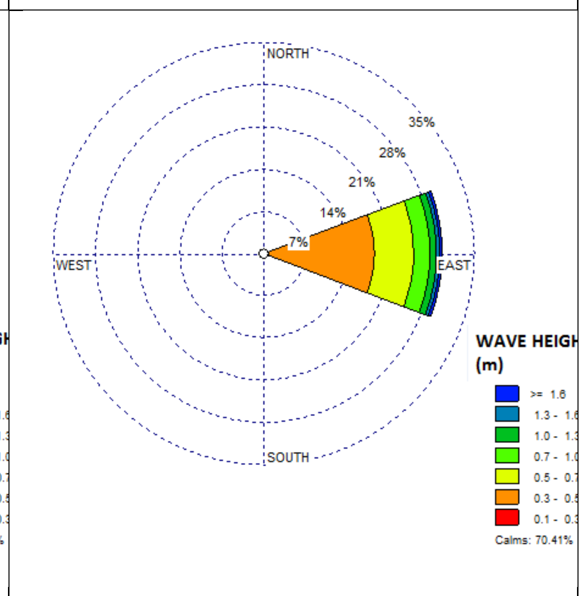
May



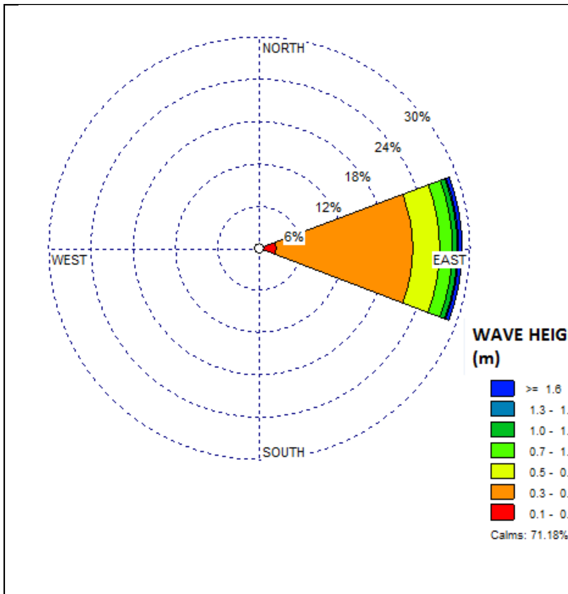
June



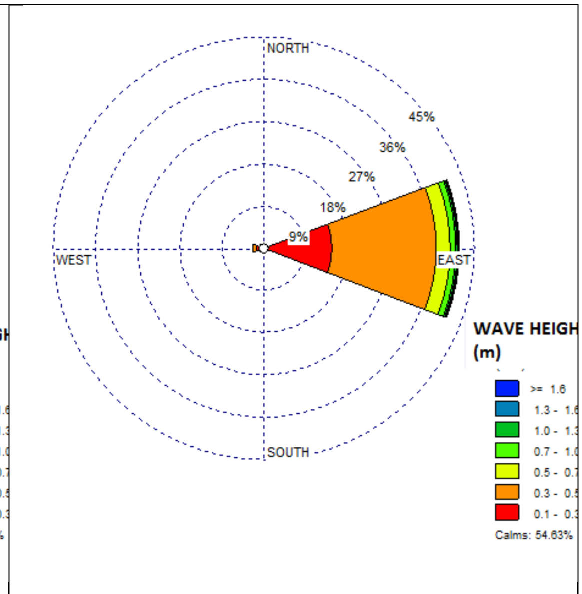
July



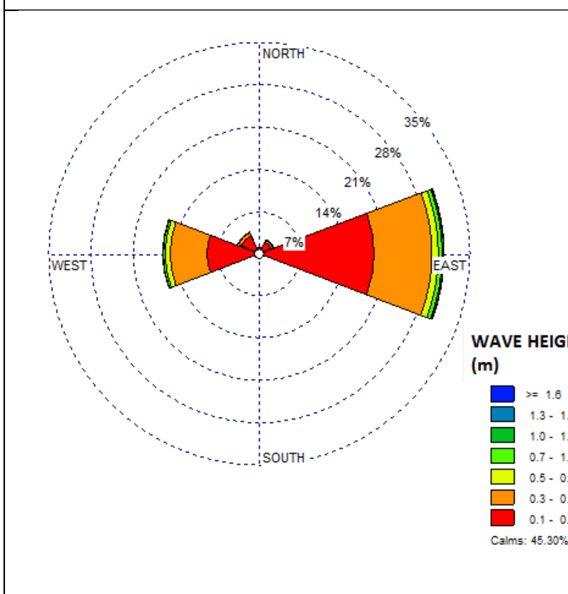
August



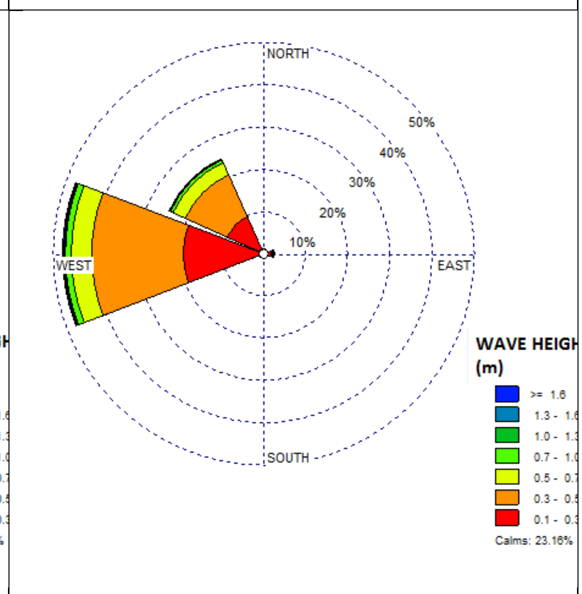
September



October



November



Desember

Figure 2.20. Waves Distribution from January – Desember 2004 – 2005

Source : (i) Masterplan of Patimban, 2016 ; (ii) maximum daily resolution data

Result from hindcasting method that is a time series data of waves and periode, will be analyzed its extreme value to obtain waves height plan. At analysis of extreme value will be used six distribution methods. From those 6 methods will take relative error value, and method result with small relative error value that will be taken as extreme value of wave height of study location. This is wave result plan which will be used in location around Patimban Port.

Table 2.22. Wave Plans with Various Repeat Periodes

Probability	Repetition Period (years)	NORTH (Log Pearson)		NORTH EAST (Log Pearson)		EAST (log Pearson)		WEST (Log Pearson)		NORTH WEST (Log Pearson)	
		Prediction (m)	Std. Deviation	Prediction (m)	Std. Deviation	Prediction (m)	Std. Deviation	Prediction (m)	Std. Deviation	Prediction (m)	Std. Deviation
0.995	200	3.7	7.2923	0.54	0.2522	3.16	1.3166	3.59	1.5364	3.31	0.6863
0.99	100	2.69	3.7573	0.49	0.1918	3.16	1.2732	3.21	1.1475	3.15	0.5538
0.98	**50**	**1.95**	**1.9078**	**0.44**	**0.1408**	**3.16**	**1.1532**	**2.85**	**0.8324**	**2.99**	**0.4361**
0.96	25	1.41	0.9424	0.39	0.0999	3.14	0.9531	2.5	0.5838	2.81	0.3361
0.9	10	0.9	0.3574	0.32	0.0631	3.07	0.5693	2.06	0.3487	2.54	0.2378
0.8	5	0.63	0.1841	0.26	0.0478	2.94	0.2417	1.73	0.2359	2.31	0.1925
0.667	3	0.48	0.1229	0.21	0.0401	2.77	0.2411	1.48	0.182	2.1	0.1716
0.5	2	0.37	0.0837	0.17	0.0335	2.51	0.4021	1.27	0.1485	1.9	0.1575

Source : F/S Patimban Port, 2015

From table above, 50 years repeat periode is choosed, whose highest wave height comes from Northeast as much as 3.16 m.

d. Current Condition

Current sampling is done with observation directly on the field and simulation program. Field observation is doing to current measurement.Assesement of sampling result based on RMAE (Relative Mean Absolute Error). Verification will used for significant current height, lowest period current, and direction result simultaneous current. Current measurements is doing in November 10th until November 23th 2016 (still continue). Current survey doing by RDI ADCP Sentinel

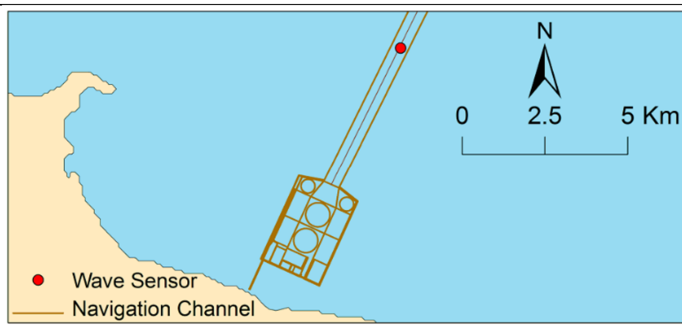
Workshore 600 kHz. In bottom part of ADCP is installed with -18 depth for each point. For the coordinate of current measurement are seen in following table.

Table 2.23. Coordinate Point for Current Sampling

Equipment	Easting (m)	Northing (m)	Longitude (E)	Latitude (S)	Depth (m)
ADCP	825334	9316824	107°56’21.41”	6°10’21.13”	± 18

Result from current measurement that has been done are figure in following figure.

Parameter	Wave	Data retrieval	1st download
Significant wave height (Hs) unit	meter	Time interval	1 hour
Peak period (Tp) unit	second	Period	10/11/2016 – 23/11/2016
Mean direction (Dp) unit	degree	Length	13 days



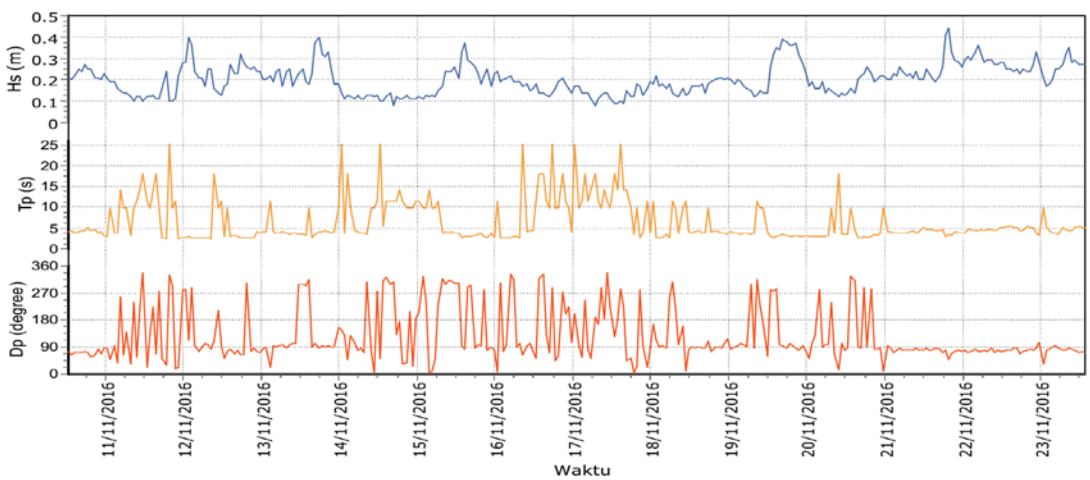
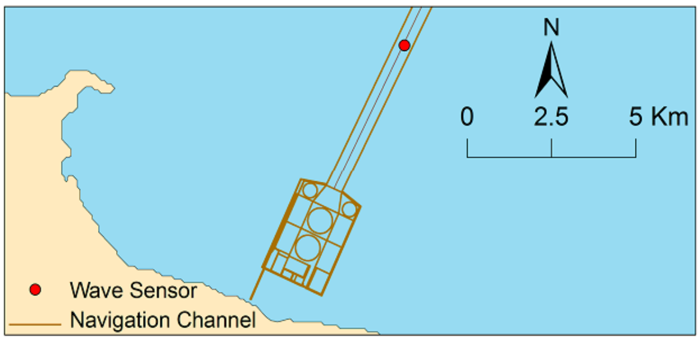


Figure 2.21. Time Series of Wave Parameter

Parameter	Wave	**Data retrieval**	1st download
Maximum wave height (Hmax) unit	meter	**Time interval**	1 hour
		Period	10/11/2016 – 23/11/2016
		Length	13 days



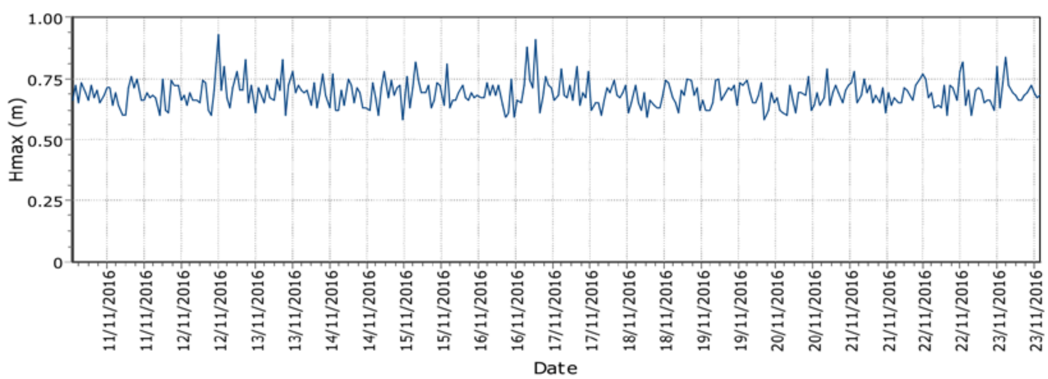


Figure 2.22. Time Series of Wave Height

Parameter	Current	**Data retrieval**	1st download
Current velocity unit	m/s	**Time interval**	10 minutes
		Period	10/11/2016 – 23/11/2016
		Length	13 days

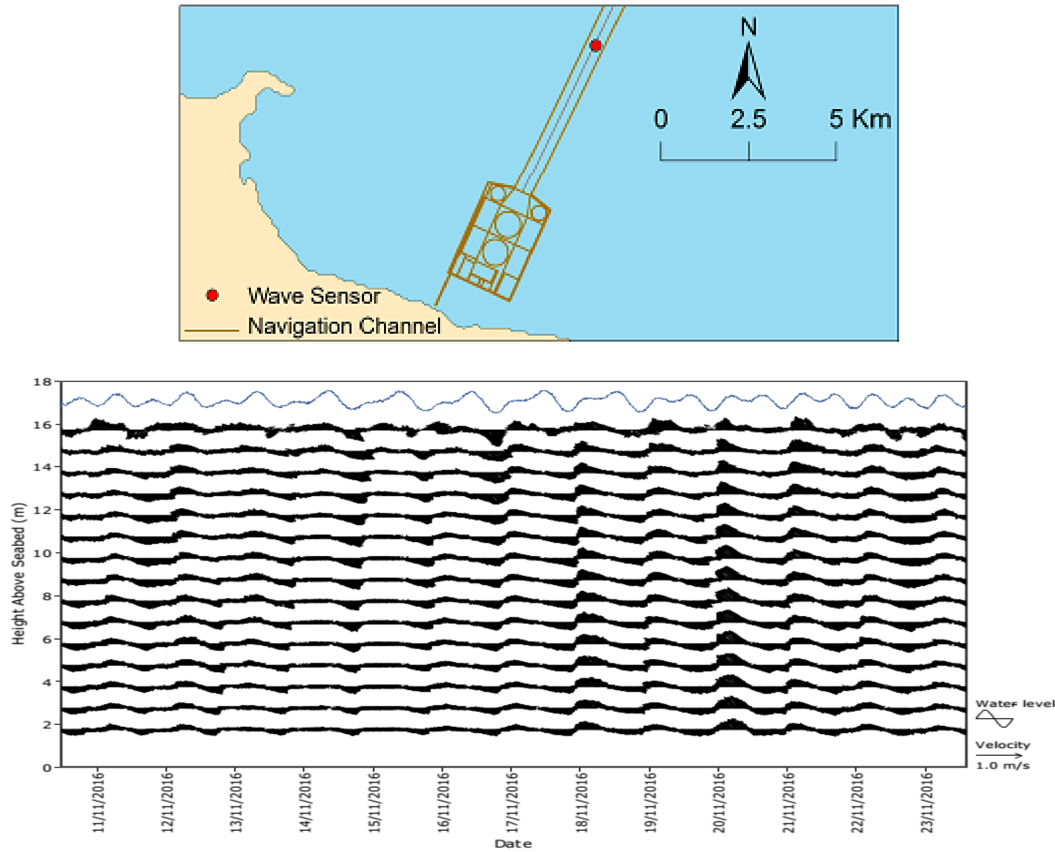


Figure 2.23. Feather Plot from Current

e. Sediment

The type of seabed sediments in around location is described by the results of analysis of samples of the seabed at some point in the image below.

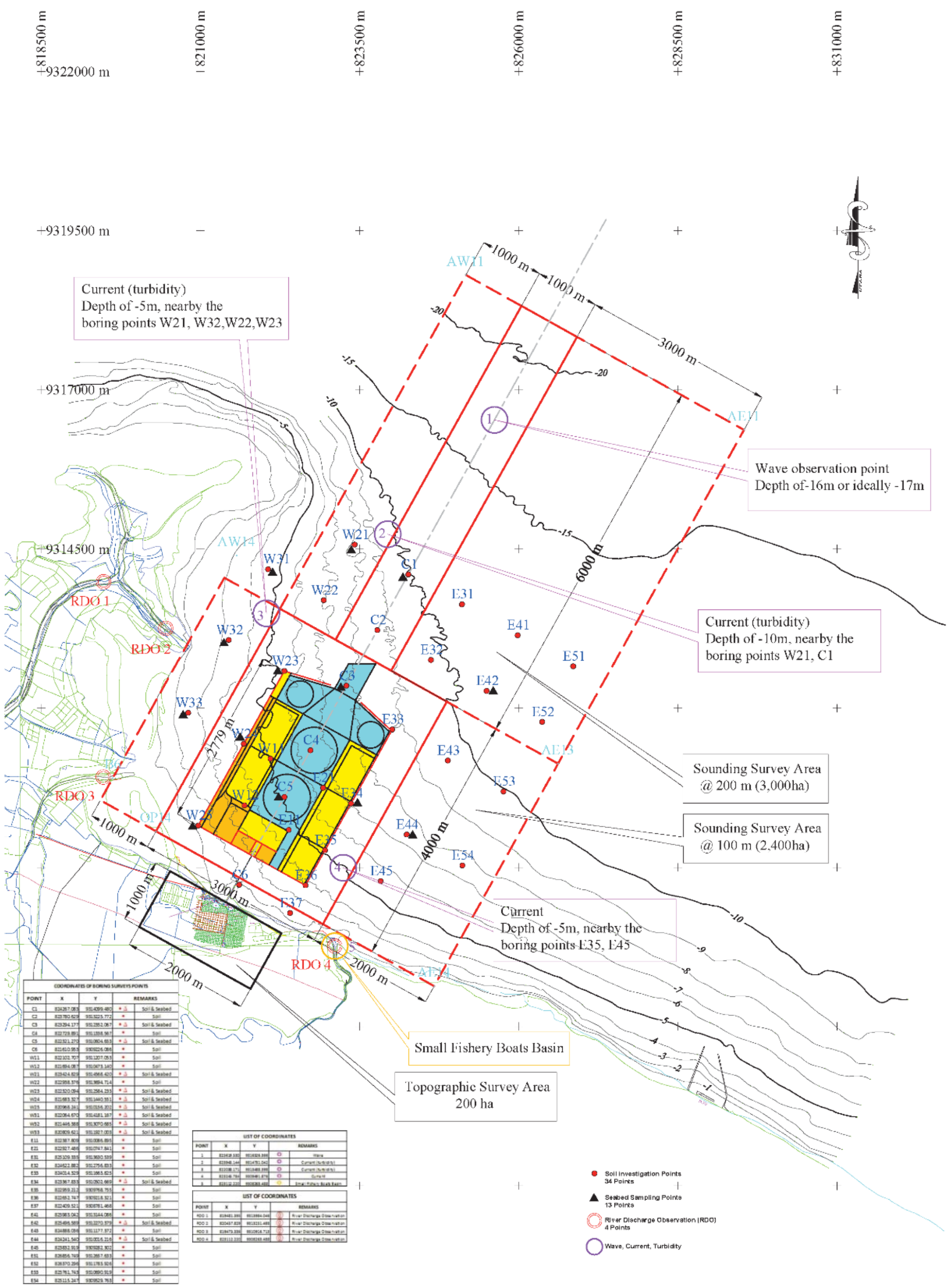


Figure 2.24. Sampling Location for Sediment Data

Table 2.24. Seabed Sediment Characteristic in Around Location Project

Location*	Depth(m)	Content Rate (%)			
		Gravel	Sand	Silt	Clay
C1	8.7	0.00	8.38	71.25	20.37
C3	6.9	0.17	2.68	46.75	50.40
C5	4.0	0.16	0.92	71.17	27.75
E34	6.6	0.00	11.31	54.14	34.55
E42	9.5	0.00	1.41	54.28	44.31
E44	6.4	0.00	0.56	90.99	8.45
W21	6.6	0.00	0.23	66.54	33.23
W23	4.8	0.00	0.07	70.70	29.23
W24	3.5	0.00	0.17	41.60	58.23
W25	0.8	0.00	0.87	81.26	17.87
W31	4.6	0.00	0.23	82.14	17.63
W32	2.5	0.00	0.70	67.53	31.77
W33	1.5	0.00	0.39	53.32	46.29
Average		**0.03**	**2.15**	**65.51**	**32.31**

Source : JICA Survey team, 2016

Based on particle analysis, composition of seabed sediments in the study area is dominated by silt.

f. Sea Level Rise and Climate Change

According to the Fourth Assessment Report (IPCC, 2007), model projections predicted a sea level rise of 0.2-0.6 m in 2100 for the 90% confidence with a central estimate of 0.4m. In the absence of the official level rise value for Indonesia water, the central estimate of 0.4m. could be adopted for the calculation of the Total Design Still Water level. The argumentation for adopting the mean sea level figure relates to the fact that sea level rise will develop slowly such that there is time to react as the main effect related to overtopping can be mitigated if future measured sea level rise indicates a necessity. Prediction of sea level rise on earth sea surface based on IPCC report. *(Reference; Based on the calculation by Dr. Ir. Subandono, sealevel rise ratio is 7.1mm/year at Jakarta and 8.1mm at Semarang. Sealevel rise ratio at Patimban is calculated as 7.4mm/year interporating from Jakarta and Semarang by distance. Based on the ratio, sealevel will be 0,6m in the year of 2100 at Patimban.)*

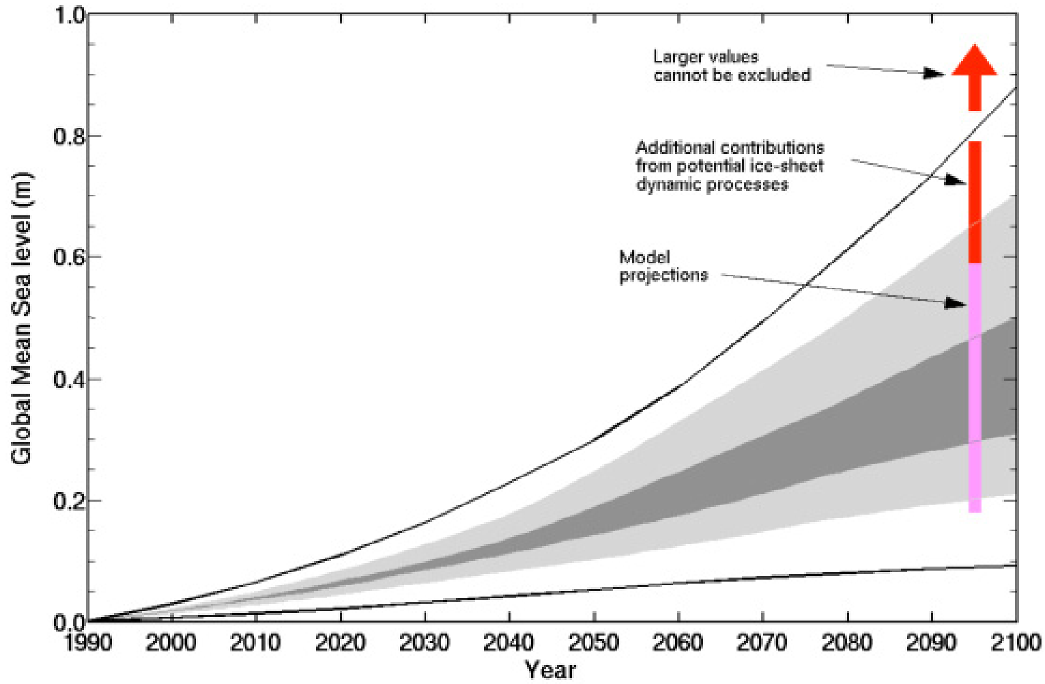


Figure 2.25. Predicted future variation in the mean waterlevel of the Earth's Ocean Surface according to IPCC's Report
Source : JICA Survey Team

g. Erosion Potential

Based in obtained data of the shoreline positions and shoreline changes in 2009 and 2015, Erosion Potential data for Patimban Port is obtained, where :

- **Tendency to Erosion :**
  1. Distance 3,500m to 6,000m

     Because of interference with the sediment transport toward west by the fish pond at the east side of this area.
  2. Distance 6,700m to 8,900m (the west side of the power plant)

     Because of interference with the sediment transport toward west by the jetty
- **Stable Trend :**
  1. Distance 0m to 900m (at the west side of the jetty)

     Because of the stone revetments

2. Distance 1,100m to 3,500m

   Because of the stone revetments

3. Distance 6,000m to 6,700m（at the fish pond）

   Because of the stone revetments

- **Tendency to Deposit :**

1. Distance 0m

   Because of the artificial reclamation for the fish ponds

2. Distcance 1,000m (at the east side of the jetty)

   Because of interference with a west sediment transport by the jetty

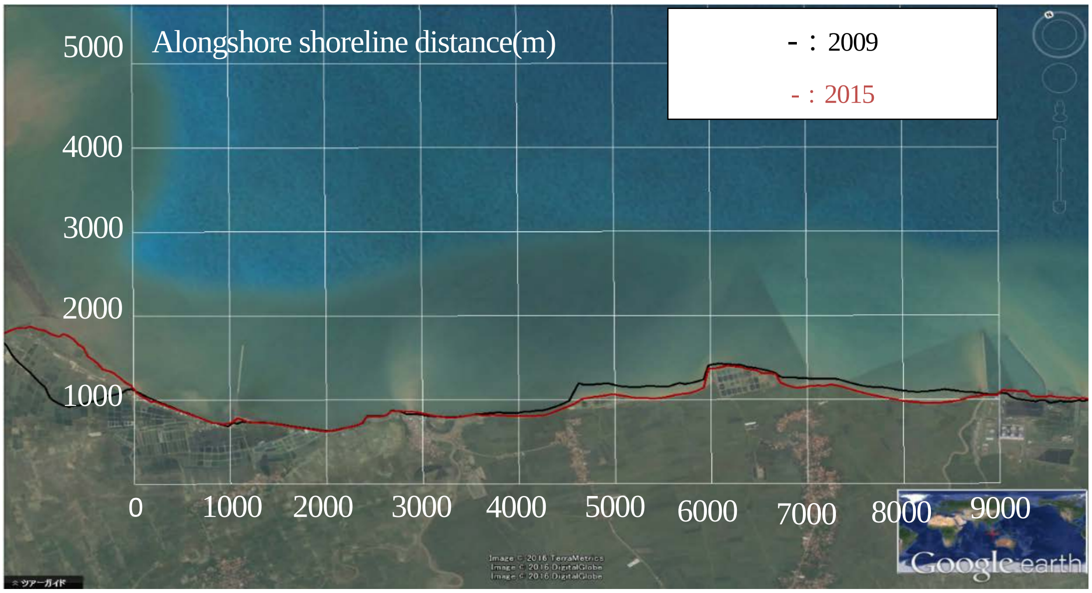


Figure 2.26. Tendency of Shoreline Change from 2009 to 2015
Source : JICA Survey Team

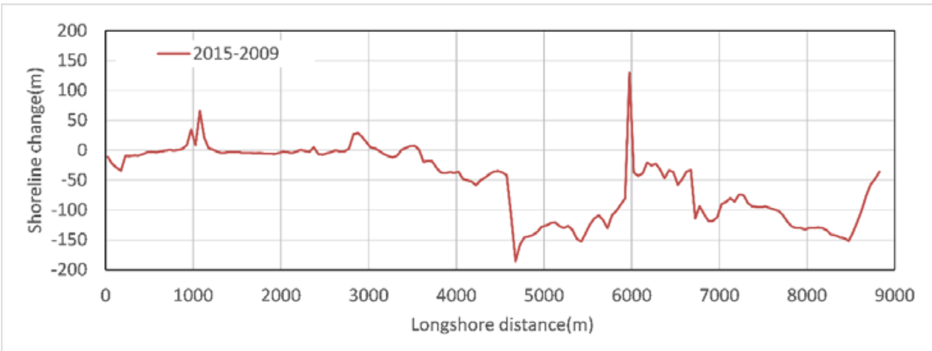


Figure 2.27. Past Shoreline Changes Year 2009 – 2015
Source : JICA Survey Team

2.1.3. Transportation

The location of Patimban Port development is Patimban Village, Pusakanagara District, Subang Regency, West Java Province. It location can access from Subang and Indramayu/Cirebon. Around road in Patimban Port is Gempol intersection of Pusakanagara, intersection of Pusakanagara in Jatireja road, and Pantura road of Pusakanagara.

Access route into port are figure in following figure.

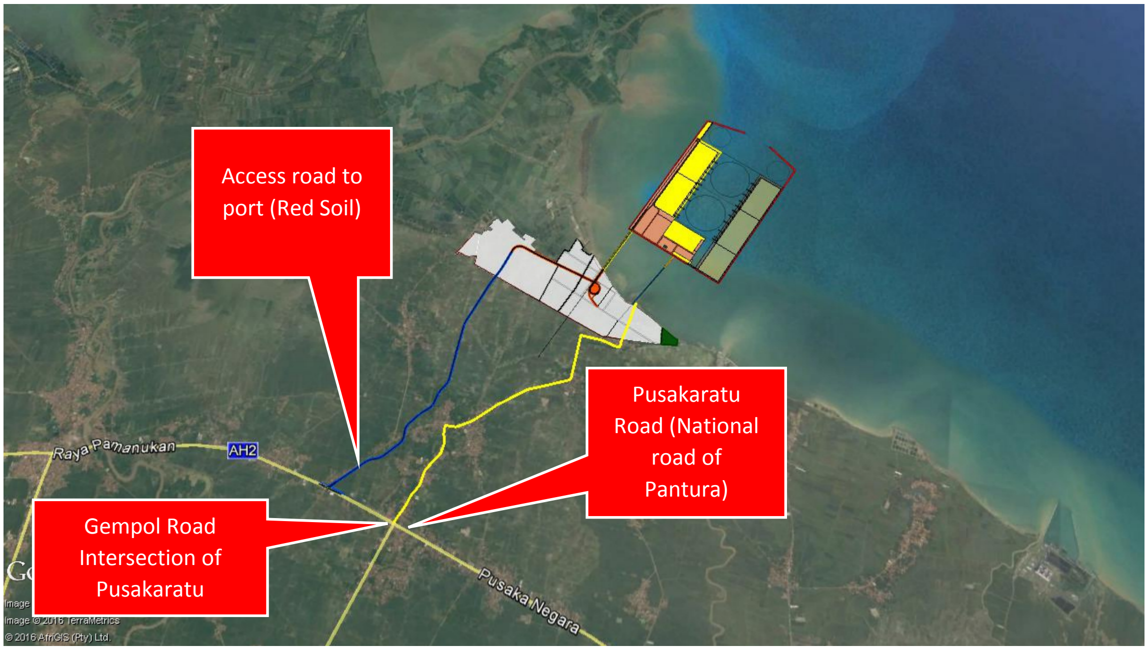


Figure 2.28. Access Channel Route to Patimban Port

Gempol intersection of Pusakanagara and intersection of Pusakanagara in Jatireja road, has 6 m wide, with construction structure is concrete material and some of that structure is broke, and has 1 line, 1 row and 2 way. This road has no median. Type of vehicles that pass in this road is bike and sedan. This road is local road.

Figure 2.29. Condition of Vehicles in Gempol intersection of Pusakanagara

Figure 2.30. Condition of Vehicles in intersection of Pusakanagara in Jatireja road

Pantura Pusakanagara road is national road with construction structure is asphalt and the condition of road is good, with traffic volume is low and traffic flow is smoothly. The type of vehicles that pass in this road is bike, sedan, bus, and truck. This road has 16 m wide and has a median.

Figure 2.31. Condition in Pantura National Road

Red soil road is road that has been acquired by Suabng Government, and that road is still without asphalt and concrete. The condition of road are figure in following figure.


Figure 2.32. Condition Road in Access Road Plan into Patimban Port (Red Soil)

Table 2.25. Road Condition in Around of Patimban Port

Segment Street	Road Condition		Road		Road Pavement		Traffic Condition		Total Way	
	Good	Damage	Length (m)	Wide (m)	Concrete	Asphalt	Jammed	Smooth	2 way	1 way
Gempol intersection of Pusakanagara and intersection of Pusakanagara in Jatireja road	Good	-	-	6		Asphalt		Smooth	2 way	-
Pantura Pusakanagara Road	Good			16		Concrete		Smooth	2 way	

Source : Survey Team, 2017

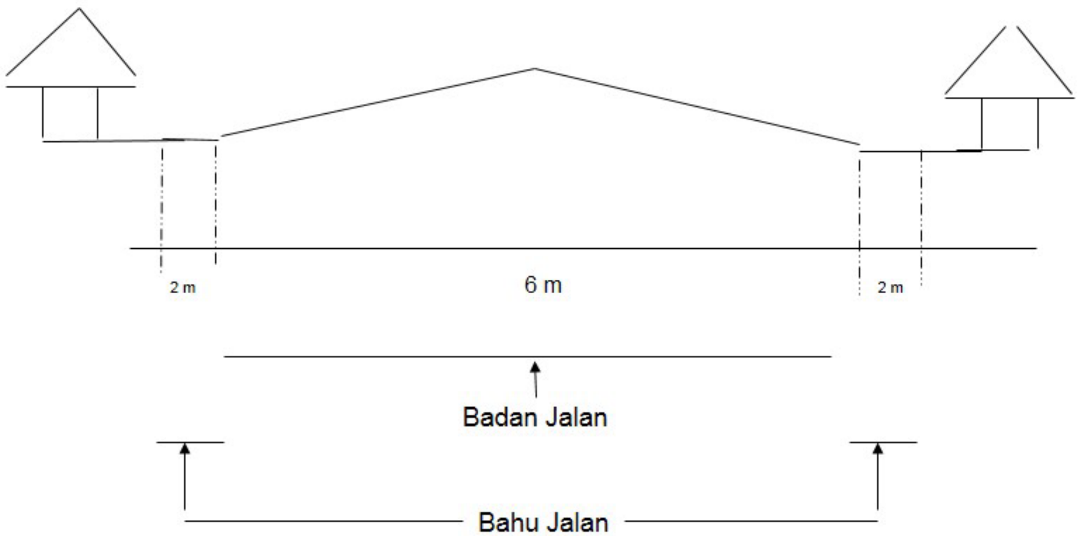


Figure 2.33. Section Road of Gempol Intersection and Jatireja Road of Pusakanagara Intersection

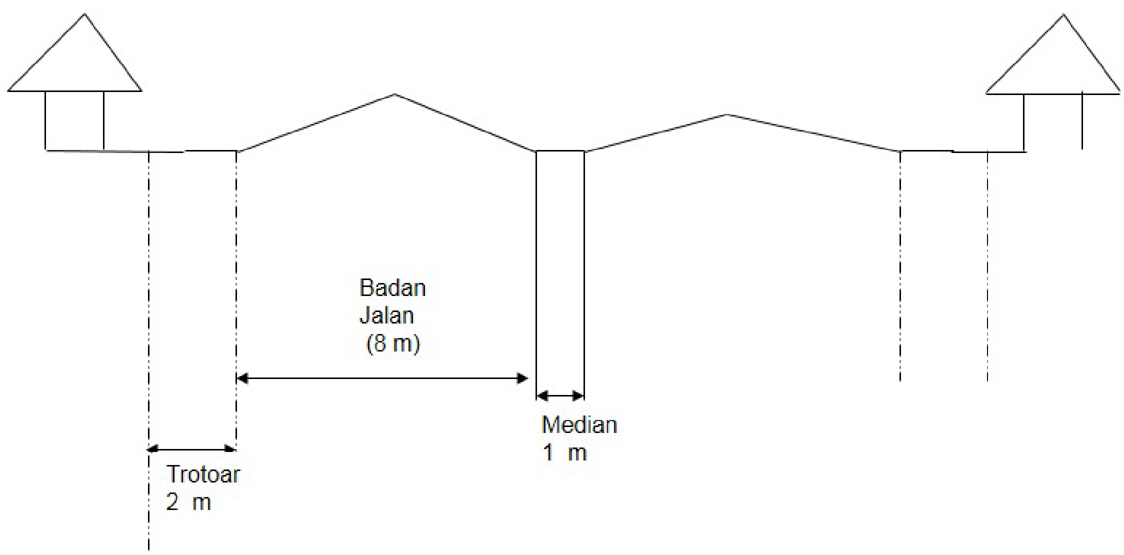


Figure 2.34. Section Road of Pantura Pusakanagara

Patimban Port development will be affected of traffic condition in Gempol Road Intersection of Pusakanagara, Jatireja road Intersection of Pusakanagara, and Pantura Pusakanagara Road. To known the effect of traffic, observation is done in that two section road. Observation is done from

06.00 until 21.00. the type of vehicles that count is light vehicles (general transportation, and private car), heavy vehicles (bus and truck) and bike. In following table are presented about vehicles volume that pass in observation point.

Table 2.26. Vehicles Volume in Observation Point

Time	Location	Volume / Type of Vehicles		
		Light Vehicles Ken/Hours	Heavy Vehicles Ken/Hours	Bike Ken/Hour
Morning Peak Hour (07.00-08.00)	1	219	96	768
	2	503	72	922
	3	39		597
	4	42		636
Afternoon Peak Hours (12.00-13.00)	1	284	96	705
	2	339	105	1212
	3	98		976
	4	72		852
Evening Peak Hours (17.00-18.00)	1	363	117	1534
	2	375	169	1952
	3	82		1049
	4	75		1042
Night Peak Hours (18.00-19.00)	1	221	77	445
	2	257	47	1297
	3	55		599
	4	26		527

Source : Observation Directly,18 Januari 2017

Note :

1. Pantura Pusakanagara Road, Cirebon Way, 06º17.086’ S dan 107º52.533’ T
2. Pantura Pusakanagara Road, Pamanukan Way , 06º17.080’ S dan 107º52.50’ T
3. Gempol Road Intersection of Pusakanagara, 06º17.07’S dan 107º52.49’ T
4. Jatireja Road Intersection of Pusakanagara 06º17.071’S dan 107º52.043’ T

Table 2.27. Capacity Roads

Name of Roads	**Co**	F_{CW}	F_{CPA}	F_{CHS}	**C**
Pantura Pusakanagara Road, Cirebon Way	1700	1,03	1	0,90	1576
Pantura Pusakanagara Road, Pamanukan Way	1700	1,03	1	0,90	1576
Gempol Road Intersection of Pusakanagara	3100	1	1	0,90	2790
Jatireja Road Intersection of Pusakanagara	3100	1	1	0,90	2790

According to calculation of capacity roads, so the road capacity is :

1 = Pantura Pusakanagara Road, Cirebon Way has 1576 smp/hours capacity roads

2 = Pantura Pusakanagara Road, Pamanukan Way has 1576 smp/hours capacity roads

3 = Gempol Road Intersection of Pusakanagara has 2799 smp/hours capacity roads

4 = Jatireja Road Intersection of Pusakanagara has 2799 smp/hours capacity roads

From following table are known taht VCR value of Pantura Pusakanagara Road in point sampling is 0,27-0,69., while Gempol Intersection Road and Jatireja Intersection Road is 0,06-0,12.

Table 2.28. Vehicles Volume Based on Calibration smp/hours

Time	Point	Volume (smp/hours)	Capacity	VCR	Speed (km/hours)	Service Level
Morning Peak Hours	1	536	1576	0.34	Be Driven > 20 km/ hours	B
	2	827	1576	0.52	Be Driven > 20 km/ hours	C
	3	188	2790	0.07	Be Driven > 30 km/ hours	A
	4	201	2790	0.07	Be Driven > 30 km/ hours	A
Afternoon Peak Hours	1	585	1576	0.37	Be Driven > 20 km/ hours	B
	2	779	1576	0.49	Be Driven > 20 km/ hours	C
	3	342	2790	0.12	Be Driven > 30 km/ hours	A
	4	285	2790	0.10	Be Driven > 30 km/ hours	A
Evening Peak Hours	1	899	1576	0.57	Be Driven > 20 km/ hours	C
	2	1083	1576	0.69	Be Driven > 20 km/ hours	C
	3	344	2790	0.12	Be Driven > 30 km/ hours	A
	4	336	2790	0.12	Be Driven > 30 km/ hours	A
Night Peak Hours	1	432	1576	0.27	Be Driven > 20 km/ hours	B
	2	642	1576	0.41	Be Driven > 20 km/ hours	B
	3	205	2790	0.07	Be Driven > 30 km/ hours	A
	4	158	2790	0.06	Be Driven > 30 km/hours	A

Notes :

1. Pantura Pusakanagara Road, Cirebon Way, 06º17.086’ S dan 107º52.533’ T
2. Pantura Pusakanagara Road, Pamanukan Way , 06º17.080’ S dan 107º52.50’ T
3. Gempol Road Intersection of Pusakanagara, 06º17.07’S dan 107º52.49’ T
4. Jatireja Road Intersection of Pusakanagara 06º17.071’S dan 107º52.043’ T

Based on characteristic of service level, VCR value that highly in Pantura Road that is 0.69 and Gempol Intersection Road and jatireja Intersection Road that is 0.12. based on characteristc table of Services Level that Pantura Road has highly services level C and Gempol Intersection Road and Jatireja Intersection Road has highly services level A. It shown that Pantura Road has steady flow, but speed and vehicles movement are controlled. The driver is limited from choose of speed, while Gempol Intersection Road and Jatireja Intersection Road has free flow condition with maximum speed, driver can choose speed that they want without obstacle.

Table 2.29. Characteristic of Services Level

Services Level	Characteristics	Limit Scope V/C
A	Free flow condition with maximum speed, driver can choose the speedthat they want without obstacle.	0.00 – 0.20
B.	Stable flow, but speed of operation began to restricted by traffic condition. Driver can choose the speed that they want.	0.20 – 0.44
C.	Stable flow,but speed and vehicles movements is controlled. Driver is limited from choose the speed.	0.45-0.74
D.	Approaching unstable flow, velocity can be tolerated.	0.75-0.84
E.	The volume is aproaching or in capacity. The flow is not stable and sometimes the speed is stoped.	0.85 – 1.00
F.	Flow that separated or jammed, low speed, volume in below capacity. The queue is long and make the big obstacles.	> 1.00

Source : Menuju lalu lintas dan angkutan jalan yang tertib, Direktorat Jenderal Perhubungan Darat, 1997

2.1.4. Biology Aspect

1. Protected Area

West part of the project site is designated as a protected forest, while there is no protected forest in the backup area. Production forests and conservation forest are located in 30km south and 75km south west of the project site. According to the Forest Law No.41 / 1999, Protected forest is designated as the forest for water and soil conservation such as watershed preservation, flood protection, soil-erosion protection, and seawater intrusion. In a protected forest, commercial logging is prohibited. Production forest is defined as the forest which has the function of producing forest products. Conservation forest is designated as the forest areas with the function of maintaining biodiversity and ecosystem of plants and animals. In the conservation forest, commercial logging and other resource development is prohibited.

Other national parks and Ramsar wetlands do not exist in and around the project site.

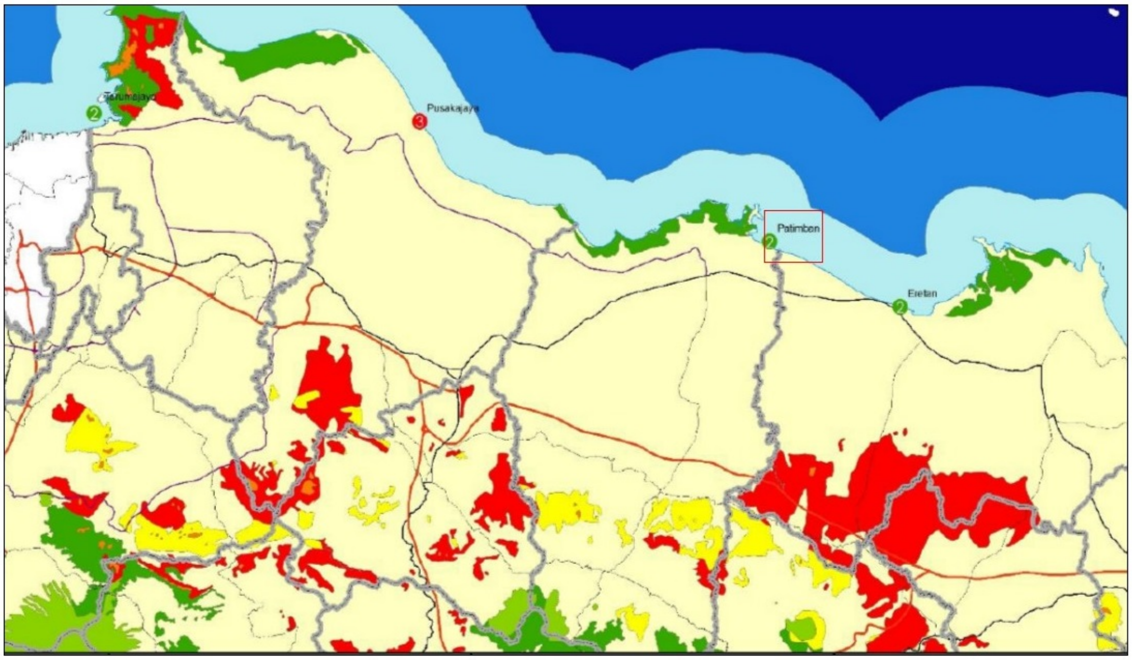


Figure 2.35. Designated Forest Area Around the Project Site
Source : DGST Pre-F/S

Note :

Green : Protected Forest,
Red : Production Forest,
Yellow : limited Production Forest,
Yellow Green : Preservation Forest

General condition of the seabed around the port development site is muddy and coral reef and seagrass have not been confirmed. The land for the backup area is used as fish ponds. Major part of the coast line has been covered by revetment except for the sandy beach located at the south part of the existing pier. On the other hand, the protected forest is located around northwest to west side of the backup area, where mangrove forest is observed. In addition, the south part of the west side of the protected forests has been developed as fish ponds.

There are no existing information on flora/fauna and ecosystem in and around the backup area. Important bird and biodiversity areas (IBA) designated by Bird Life International are located in about 100km west and about 40km east of the project site, however, no IBA is existed in and around the project site. Picture of surrounding areas which are significant biologically can be seen on figure below.

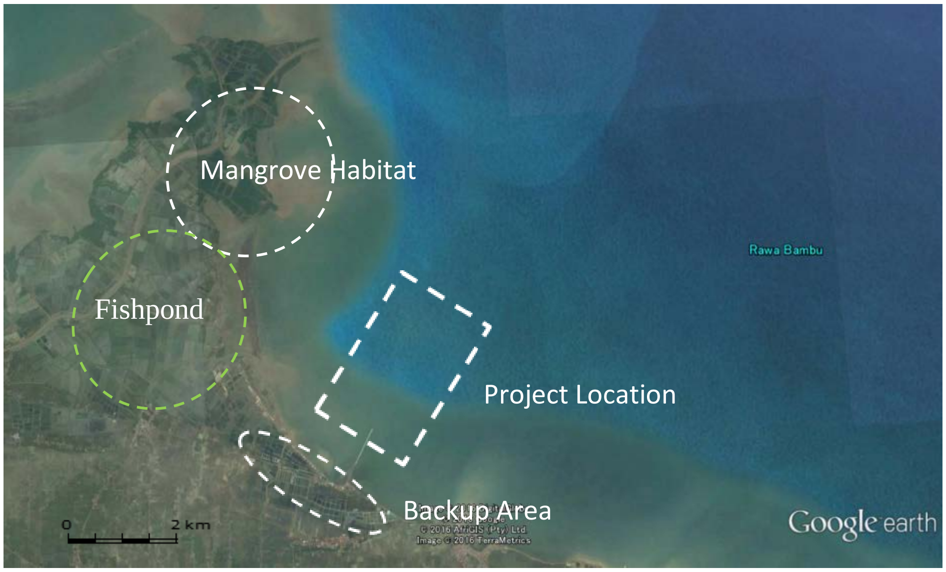


Figure 2.36. Zonation of Mangrove Habitat Presence in Project Location

Figure 2.37. Important Areas for Avifauna and Biodiversity Areas (Green)

Source : Bird Life International

2. Benthos

Sampling of benthos has carried out on preliminary study in Mei 4th 2016. Data are taken from 11 similar locations with sediment quality sampling. Benthos that can be found in every location, but the number is not too many. Identified Benthos species can be seen in **Table 2.30**.

Table 2.30. Benthic which Found in Sampling Location

No	Species	Location (Number /m^2)										
		S 1	**S 2**	**S 3**	**S 4**	**S 5**	**S 6**	**S 7**	**S 8**	**S 9**	**S 10**	**S 11**
Gastropoda												
1	*Melanoides tuberculata*	0		0	0	29,41					205,88	
2	*Pleurocera* sp.	0	29,41									
3	*Melanoides* sp.			0	0						88,23	
Bivalvia												
1	*Dreissena* sp.		29,41									
2	*Anadara grandis*					58,82	147,47	0	0	29,41	58,82	0
3	*Polymesoda* sp.						29,41		0			
4	*Mytillus* sp.							0				0
5	*Proptera* sp.									29,41	88,23	
	Total (N)	0	58,82	0	0	88,23	176,47	0	0	58,82	441,17	0
	Taxa Number (S)	-	2	-	-	2	2	-	-	2	4	-
	Diversity Index/Shanon – Wienner (H')	0	0.69	0	0	0,63	0,45	0	0	0,69	1,26	0
	Equitability Index (E)	-	1.00	-	-	0,91	0,65	-	-	1,00	0,91	-
	Dominance Index (D)	0	0.50	0	0	0,55	0,72	0	0	0,50	0,31	0

Source : Primary Data, 2016

Notes :

H' = *Diversity Index* (- ∑ Pi ln Pi)
S = *Taxa Number*
E = *Equivalent Index* (H'/Ln (S))
D = *Dominance Index* (∑ (Ni/N)^2)

Follow barbour et al (1987), classified the diversity index Shanon and Wiener result diversity is very low. This result figure that in S10 has highly diversity index (1.26), and S1, S3, S4, S7, S8, and S11 has low diversity index (0). This result figure in S10 are contaminated medium, and S1, S3, S4, S7, S8, and S11 are contaminated weight. Odum (1971) said that diversity in ecosystems tend have lower species cause pressure of physical or chemical factors. Fisherman activities through in every sampling location. They are catch fish and shrimp in every sampling location especially in sea side (near ashore).

The species which most frecuency in every sampling location is Anadara sp. (Bivalvia) And Melanoides sp. (Gastropoda). This species can be being an indicator of pollutant water, because that ability which pollutant absorb.

Table 2.31. Coordinate of Benthic Sampling Location

Location	X	Y	Location	X	Y
S 1	107°54’15.02”E	06°13’55.48”S	S 7	107°55’46.91”E	06°11’42.00”S
S 2	107°54’35.98”E	06°14’24.96”S	S 8	107°56’16.84”E	06°10’47.22”S
S 3	107°54’0147”E	06°12’14.12”S	S 9	107°59’41.43”E	06°04’35.09”S
S 4	107°55’39.88”E	06°14’59.38”S	S 10	107°57’19.06”E	06°03’16.80”S
S 5	107°54’42.56”E	06°13’39.07”S	S 11	108°04’26.16”E	06°07’12.50”S
S 6	107°55’16.35”E	06°12’37.76”S			

3. Plankton

Plankton sampling process has been done in May, 4, 2016. Sampling Location of plankton are in 7 locations, with each Coordinates are written in table below.

Table 2.32. Coordinate of Plankton Sampling

Location	X	Y
P 1	107°53'51.62"E	6°12'50.16"S
P 2	107°55'51.24"E	6°13'55.93"S
P 3	107°54'23.57"E	6°14'13.32"S
P 4	107°54'51.43"E	6°13'23.04"S
P 5	107°55'54.51"E	6°11'28.22"S
P 6	107°57'4.94"E	6° 9'20.01"S
P 7	107°59'41.43"E	6° 4'35.09"S

Based on plankton analysis result in wet/rainy season at observation location, there are zooplanktons and Phytoplanktons that consist of 22 species phytoplankton are divided into 9 classes, and 15 species zooplankton are divided into 9 classes. From obtained data, it can be seen that every locations has species difference which is found and affect plankton diversity in the sea. For complete data can be seen in the table below.

Table 2.33. Phytoplankton Species and that Diversity in Rainy Season in Every Sampling Area

No	Species	∑ Individu/L (Location)						
		P 1	P 2	P 3	P 4	P 5	P 6	P 7
PHYTOPLANKTON								
Charophyta								
1	*Closterium gracile*	5000	4000	6000	23000	2000	3000	3000
2	*Gonatozygon kinahani*	9000	23000	39000	63000	26000	43000	26000
3	*Zygnemopsis circumcarinatum*	1000	0	0	0	0	1000	0
4	*Closterium cornu*	0	0	1000	3000	0	0	0
5	*Closterium* sp.	0	0	0	0	0	0	1000

No	Species	∑ Individu/L (Location)						
		P 1	**P 2**	**P 3**	**P 4**	**P 5**	**P 6**	**P 7**
6	*Spirogyra prolifica*	0	0	0	0	0	0	1000
Chlorophyta								
1	*Volvox aureus*	0	0	0	0	0	0	1000
Cyanophyta								
1	*Spirulina major*	1000	1000	1000	1000	2000	1000	0
Dinoflagellata								
1	*Ceratium fusus*	18000	0	23000	0	0	0	0
2	*Ceratium furca*	2000	0	1000	0	0	0	0
3	*Ceratium tripos*	1000	0	7000	0	0	0	3000
4	*Noctiluca* sp.	0	0	0	1000	0	0	0
Bacillariophyta								
1	*Bacillaria paxillifera*	0	0	0	0	1000	0	0
2	*Biddulphia mobiliensis*	0	0	0	0	0	0	1000
3	*Triceratium* sp.	0	0	1000	0	0	0	0
4	*Synedra acus*	25000	57000	43000	133000	48000	50000	23000
5	*Melosira granulata*	15000	0	4000	0	0	0	0
6	*Asterionella* sp.	1000	0	8000	0	0	0	0
7	*Pinnularia* sp.	6000	3000	4000	5000	2000	3000	3000
8	*Leptocylindrus minimus*	0	0	1000	0	0	0	0
9	*Chaetaceros* sp.	2000	12000	20000	2000	0	0	1000
Euglenophyta								
1	*Euglena acus*	0	0	0	0	0	0	1000
Total (N)		**86000**	**100000**	**159000**	**231000**	**81000**	**101000**	**64000**
Taxa Total (S)		**12**	**6**	**14**	**8**	**6**	**6**	**11**
Diversity Index, Shanon – Wienner (H')		**1.960**	**1.192**	**2**	**1**	**1**	**1**	**2**
***Equitability Index* (E)**		**0.789**	**0.665**	**0.756**	**0.547**	**0.556**	**0.564**	**0.648**
***Domination Index* (D)**		**0.178**	**0.394**	**0.177**	**0.416**	**0.456**	**0.428**	**0.302**

Source : Primary Data, 2016

NOTE :

Shannon-Wienner (Wilhm and Doris (1968) in Wilhm (1975 dan Wilhm et al.,(1975) in Mason (1981)):

	= H'<1	= Low Diversity and Polluted Level High
	= 1<H'<3	= Average Diversity and Polluted Level is Average
	= H'>3	= High Diversity and Polluted Level is Low
Equitability Index (E):	= E<0,4	= Low Equitability
	= 0,4<E<0,6	= Average Equitability
	= E>0,6	= High Equitability
Dominancy Index (D):	= D<0,4	= Low Diminance
	= 0,4<E<0,6	= Average Dominance
	= D>0,6	= High Dominance

Based on the table, amount of phytoplankton obtained 22 species in 7 Phylum, sampling at 7 locations. Plankton is one of environmental indicator conditions, especially water. One way to see the indications of water pollution can use the index calculation diversity (biodiversity) Shannon-Wiener. Based on the results of a calculation by Shannon-Wiener index, generally Patimban Sea is average polluted with the Shannon-Wiener index value ranging from 1 to 2.

Supporting factor for phytoplankton growth are very complex and interacting between the factors of physico-chemical waters such as light intensity, dissolved oxygen, temperature stratification, and availability of nutrients nitrogen and phosphorus, while the biological aspect is activity of predation by animals, natural mortality and decomposition (Goldman and Horne, 1983).

Pollution factor in Patimban waters came from ponds effluent in surround of the beach. The effluent stream carrying life materials that sustaining nutrients for phytoplankton life in Patimban sea water. However, effluent ponds also carries sediment that can inhibit the growth of phytoplankton because sediment turbidity in water and inhibits sunlight for photosynthesis. This is consistent with the values of quality of sea water.

Based on the table, diversity index and total species of phytoplankton in Bacillariophyta Phyllum is highest. This is because this phyllum can be adapted with around environment condition between with othe class. This is suitable eith atatement by Arinardi et al (1997), that Bacillariopyceae is more adapted with environment condition. This class is cosmopolite and tolerant with change of environment.

Other index that supporting of Shannon-Wiener index can be seen in the table, among other things, Equitability Index (E), this index to analyze the level of evenness while dominance index to analyze dominance level of a certain species. In the above table, the value of both index is inversely proportional to each other. At a certain sampling point that has high Equitability Index values, will have a value of low dominance index. It is shows, in P1, P2, P3 and P7, the types of phytoplankton are spread evenly and no one dominated at these points.

For the types of Zooplankton that has been found are figure in following table.

Table 2.34. Zooplankton Species and that Diversity in Rainy Season in Every Sampling Area

No	Type	∑ Individu/L (Location)						
		P 1	**P 2**	**P 3**	**P 4**	**P 5**	**P 6**	**P 7**
ZOOPLANKTON								
Artropoda								
1	*Acanthacyclps robustus*	1000	0	0	0	0	0	0
2	*Copepod nauplius*	3000	0	0	0	0	0	0
3	*Cyclopoid copepodite*	4000	0	13000	0	0	0	0
4	*Cyclops bicuspidatus*	2000	0	0	0	0	0	0
5	*Undinula vulgaris*	9000	0	23000	0	0	0	0
6	*Barnacle nauplius*	0	0	1000	0	0	0	0
Ciliophora								
1	*Tintinnid* sp.	52000	1000	1000	0	0	0	0
Crustaceae								
1	*Alonella dadayi*	1000	0	0	0	0	0	0
2	*Hyperia* sp.	0	1000	0	0	0	0	0
Eurotifera								
1	*Keratella* sp.	2000	0	3000	5000	6000	4000	3000
Sarcodina								
1	*Arcella vulgaris*	1000	2000	2000	0	1000	1000	1000
Adenophorea								
1	*Rabdalaimus* sp.	0	2000	0	1000	0	0	0
Maxillopoda								
1	*Nauplius* sp.	0	0	2000	0	0	0	0
Urochordata								
1	*Tunicate larva*	0	0	1000	0	0	0	0
Malacostraca								
1	*Procambarus* sp.	0	0	0	0	0	1000	0
Total (N)		**75000**	**6000**	**46000**	**6000**	**7000**	**6000**	**4000**
Taxa Total (S)		**9**	**4**	**8**	**2**	**2**	**3**	**2**
Diversity Index, Shanon – Wienner (H')		**1.106**	**1.329**	**1.404**	**0.450**	**0.410**	**0.867**	**0.562**
***Equitability Index* (E)**		**0.503**	**0.959**	**0.675**	**0.650**	**0.591**	**0.789**	**0.811**
***Domination Index* (D)**		**0.500**	**0.277**	**0.339**	**0.722**	**0.755**	**0.5**	**0.625**

Sourrce : Primary Data, 2016

Based on the data in the table, the number of species of zooplankton is 30 species in 9 classes. Patimban sea water is moderate polluted and height based on Shannon-Wiener index calculations with a range of 1.1 to 1.4 value and height polluted from 0.41 to 0.86. If compared with Shannon-Wiener value of phytoplankton, sampling points that suitable with phytoplankton value and zooplankton are P1, P2, and P3. While sampling points of P4-P7, the number of Shannon-Wiener index value Zooplankton is heavily polluted. This is probably due to the number of species obtained at points P4-P7 sampling is lower than the sampling points P1-P3. Thus resulting index values of other affected as well.

4. Nekton

Nekton sampling has been done in May, 4, 2016, at seven location in rainy season and follow same as plankton sampling location. Coordinate location which used for this sampling are figure in following table.

Table 2.35. Coordinate Location of Nekton Sampling

Location	X	Y
N 1	107°53'51.62"E	6°12'50.16"S
N 2	107°55'51.24"E	6°13'55.93"S
N 3	107°54'23.57"E	6°14'13.32"S
N 4	107°54'51.43"E	6°13'23.04"S
N 5	107°55'54.51"E	6°11'28.22"S
N 6	107°57'4.94"E	6° 9'20.01"S
N 7	107°59'41.43"E	6° 4'35.09"S

Result of this sampling there are 8 species are found in every location which divided two class, pisces and crustaceae, like showed in following table.

Table 2.36. Nekton which Found in Sampling Area

No	Species	Local Name	Location														Total Individu	
			N 1		N 2		N 3		N 4		N 5		N 6		N 7			
			RS	DS	RS	DS	RS	DS	RS	DS	RS	DS	RS	DS	RS	DS	RS	DS
Pisces																		
1	*Leiognathus equulus*	Ikan Petek	3					3					28	**7**	35	**3**	**61**	**13**
2	*Sardinella gibbosa*	Ikan Tembang					1		1								**2**	
3	*Valamugil seheli*	Ikan Blanak	2	1				1						**4**		**2**	**2**	**8**
4	*Solea solea*	Ikan Sebelah	1														**1**	
5	*Chanos chanos*	Ikan Bandeng					3										**3**	
Crustaceae																		
6	*Litopenaeus vannamei*	Udang Jerbung				3	1	2	5				2	**1**	1		**9**	**6**
7	*Harpiosquilla raphidea*	Udang Lipan		1	1												**1**	**1**

No	Species	Local Name	Location														Total Individu	
			N 1		N 2		N 3		N 4		N 5		N 6		N 7			
			RS	DS	RS	DS	RS	DS	RS	DS	RS	DS	RS	DS	RS	DS	RS	DS
8	*Charybdis feriatus*	Rajungan Karang	1														**1**	
9	*Scylla Sp.*	Kepiting Bakau		1														**1**
Total Species			**4**	**3**	**1**	**1**	**2**	**3**	**3**	**0**	**2**	**0**	**2**	**3**	**2**	**2**	**80**	**29**

Source : Primary Data, 2016

Note : RS = Sampling in Rainy Season; DS = Sampling in Dry Season

From table, we can see the table show that many species are found in N 1 with 4 species and the fewest species is in N 5 with nol species. This result figured that sea condition are not good due to too few diversity in every sampling area. The few number of species found in area maybe because sampling place, timing, and equipment that used are less fit. Sampling time is significant to fishes that are obtained, equipments affect catchment result, and sampling location affects fish presence in one location whether there are plenty or not. In number of fishing result, *Ikan Petek* (*Leiognathus equulus*) is the most caught fish with 66 indiviuals in all of sampling location. This species also is found in other location, where in 4 locations, this species is capable to be found, so is *Udang Jerbung* (*Litopenaeus vannamei).*

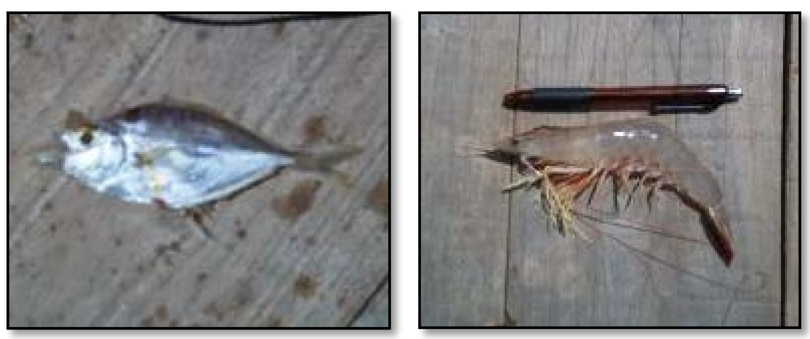


Figure 2.38. *Petek Fish* (*Leiognathus equulus*) and *Jerbung Shrimp* (*Litopenaeus vannamei*)

5. Terrestrial Flora and Fauna

Sampling of terrestrial flora and fauna has carried out in preliminary survey on May 23th-25th 2016. Terrestrial flora an fauna data retrieval is divided into several vegetation type at 3 observation points, those farmfield, riparian, open field.

Table 2.37. Coordinate for Terrestrial Flora and Fauna Sampling

Location	X	Y
F 1	107°54'11.65"E	6°14'38.54"S
F 2	107°54'20.47"E	6°14'39.47"S
F 3	107°52'58.02"E	6°14'28.14"S

a. Terrestrial Flora

Vegetation types in every observation location such as leftside and rightside of port and access road. Flora types that are found from every observation locations can be seen in table below.

Table 2.38. List of Flora in Sampling Location

No	Local Name	Scientific Name	Family	Sampling Location			Conservation Status	
				F1	F2	F3	UU-RI	IUCN
1	*Akasia Daun Lancip*	*Acacia auriculiformis*	Fabaceae	√	√	√		
2	*Angsana*	*Pterocarpus indicus*	Papilionaceae			√		
3	*Bakau Akar*	*Rhizopora sp.*	Rhizoporaceae	√				
4	*Belimbing*	*Averrhoa sp.*	Oxalidaceae			√		
5	*Cabai Rawit*	*Capsicum frutescens*	Solanaceae			√		
6	*Jabon*	*Neolamarckia cadamba*	Rubiaceae		√	√		
7	*Jagung*	*Zea mays*	Poaceae	√				
8	*Jambu Air*	*Syzygium aqueum*	Myrtaceae			√		
9	*Jambu Biji*	*Psidium guajava*	Myrtaceae			√		
10	*Jarak*	*Ricinus communis*	Acalypheae			√		
11	*Jeruk Nipis*	*Citrus aurantifolia*	Rutaceae			√		
12	*Kangkung Laut*	*Ipomoea pescaprae*	Convolvulaceae	√	√			
13	*Katuk*	*Sauropus androgynus*	Phyllanthaceae			√		
14	*Kayu Manis*	*Cinnamomum verum*	Lauraceae			√		
15	*Kemangi*	*Ocimum citriodorum*	Lamiaceae			√		
16	*Kelapa*	*Cocos nucifera*	Arecaceae	√	√	√		
17	*Kersen*	*Muntingia calabura*	Mutingiaceae			√		
18	*Ki Hujan*	*Albizia saman*	Fabaceae			√		
19	*Lamtoro*	*Leucaena leucocephala*	Fabaceae		√	√		
20	*Lengkeng*	*Dimocarpus longan*	Sapindaceae			√		
21	*Leunca*	*Solanum nigrum*	Solanaceae			√		
22	*Mangga*	*Mangifera indica*	Anacardiaceae			√		
23	*Nangka*	*Artocarpus heterophyllus*	Moraceae			√		

No	Local Name	Scientific Name	Family	Sampling Location			Conservation Status	
				F1	F2	F3	UU-RI	IUCN
24	*Padi*	*Oryza sativa*	Poaceae	√	√	√		
25	*Pepaya*	*Carica papaya*	Caricaceae		√	√		
26	*Petai*	*Parkia speciosa*	Fabaceae			√		
27	*Pisang*	*Musa sp.*	Musaceae	√	√	√		
28	*Rumput teki*	*Cyperus rotundus*	Cyperaceae		√			
29	*Salak*	*Salacca zalacca*	Arecaceae			√		
30	*Sidagori*	*Sida rhombifolia*	Malvaceae	√	√	√		
31	*Soka jawa*	*Ixora javanica*	Rubiaceae	√				
32	*Sukun*	*Artocarpus altilis*	Moraceae			√		
33	*Suren*	*Toona sureni Merr*	Meliaceae	√	√			
34	*Talas*	*Colocasia esculenta*	Araceae			√		
35	*Tebu*	*Saccharum sp.*	Poaceae			√		
36	*Tembelekan*	*Lantana camara*	Verbenaceae		√			
37	*Terong Ungu*	*Solanum melongena*	Solanaceae	√				
38	*Tomat Besar*	*Solanum lycopersicum*	Solanaceae	√				
39	*Waru Laut*	*Thespesia populnea*	Malvaceae	√	√	√		

Source : Primary Data, 2016.

Note:

F1 = *Coastal area Behind Terminal* (Right side)
F2 = *Coastal area Behind Terminal* (Left side)
F3 = Access road area
UU-RI = Protected by Indonesia Government (PP No 7, Tahun 1999)
IUCN = International Union for Conservation of Nature (VU means Vulnerable)

The Plant community in F1 location are agricultural plants such as Paddy *(Oryza sativa)*, Coconut *(Cocos nucifera)*, Eggplant *(Solanum melongena)*, Tomato *(Solanum lycopersicum)*, Banana *(Musa sp.)*, and Corn *(Zea mays)*. Another plants that are present such as Acacia *(Acacia auriculiformis)*, Root Mangrove *(Rhizopora sp.)*, Kangkung Laut *(Ipomoea pescaprae)*, Sidagori (*Sida rhombifolia*), soka (*Ixora javanica*), dan suren (*Toona sureni Merr*) can be found in this area too. But, the very dominant plant in this area is Paddy. From this sampling area, there are no plant who status categorized is protected by government. Even so, there is flora species that in the ecosystem become significant things because their function and role in ecosystem, that is mangrove. Mangrove that is found, is Rhizopora sp. This plant has important role in habitat and presence of animals in the mangrove ecosystem as place for fishing, protection, and breed.

Figure 2.39. Dominant plants in F1 (Coastal area behind the terminal (Right)) sampling area
Source : Primary Data, 2016

From F2 (Coastal area behind the terminal (Left)) sampling location, the dominant plant who can be found like Paddy (Oryza sativa), Grass (Cyperus rotundus), Banana (Musa sp.), Coconut (Cocos nucifera), Acacia (Acacia auriculiformis), Suren (Toona sureni Merr), and Jabon (Neolamarckia cadamba). Some plants who can be found in this area are not really dominant like Kangkung Laut (Ipomoea pescaprae), Lamtoro (Leucaena leucocephala), Papaya (Carica papaya), Sidagori (Sida rhombifolia), Tembelekan (Lantana camara), and Waru laut (Thespesia populnea). Plant community of this site is a transition between plant near rim of sea and settlement, so that's why the plants from this site like a mix plant from both of transition area. There are no plants who protected categorized by government from this site.

Figure 2.40. Dominant plants in F2 (Coastal area behind the terminal (Left)) sampling area
Source : Primary Data, 2016

From F3 (Access road area) sampling location, the dominated plants who can be found are Paddy *(Oryza sativa)*, Lamtoro *(Leucaena leucocephala)*, Manggo *(Mangifera indica)*, Jabon *(Neolamarckia cadamba)*, and Coconut *(Cocos nucifera)*. Especially plant is Mango and Paddy. Some plants who can be found in this area but not really dominant like Waru laut *(Thespesia populnea),* Tebu (*Saccharum sp.),* Talas (*Colocasia esculenta),* Sukun (*Artocarpus altilis),* Sidagori (*Sida rhombifolia),* Salak *(Salacca zalacca),* Banana *(Musa sp.),* Petai *(Parkia speciosa),* Papaya *(Carica papaya),* Nangka *(Artocarpus heterophyllus),* Kersen *(Muntingia calabura),* Cinnamon *(Cinnamomum verum),* Citrus*(Citrus aurantifolia),* Jarak *(Ricinus communis), Guava (Psidium guajava),* Star Fruit *(Averrhoa sp.), Angsana (Pterocarpus indicus), and Acacia (Acacia auriculiformis).* There are some annual and agriculture plant who can be found in this area like Pepper (*Capsicum frutescens),* Katuk (*Sauropus androgynous),* Kemangi (*Ocimum citriodorum),* and Leunca (*Solanum nigrum).* The plant communities in this sampling area are transitions from home garden plant community, agriculture plant community, and paddy field. That's why in this area we can found those plants. There are no plants who protected categorized by government from this site.

Figure 2.41. Plants from F3 (Access road area) sampling area
Source: Primary Data, 2016

b. Terrestrial Fauna

Mammals, Reptile, and Amphibian

Type of fauna except bird that found in around of sampling location, are wild animals and domestic animals. Terrestrial fauna survey is conducted with 2 methods, first direct observation and indirect method as interview to local people for collecting fauna information that is present in the observation location but is not observed directly. From those methods, the result is number of fauna is 18 species from 3 classes and 14 families. 10 species are found directly, other 8 species are interview result. For more completed data can be seen in following table.

Table 2.39. Mammals, Reptile, and Amphibia that Founded in Around Location

No.	Family	Name			Location			Conservation Status
		Local Name	Binomial	English	F1	F2	F3	
Mammals								
1	Ovidae	Kambing	*Ovis aries*	Sheep	V	V	V	Least Concern
2	Gallidae	Ayam	*Gallus gallus*	Chicken	V	V	V	Least Concern
3	Felidae	Kucing	*Felis domesticus*	Domestic Cat	V	V	V	Least Concern
4	Canidae	Anjing	*Canis lupus*	Dog	V	V	V	Least Concern
5	Bovidae	Kerbau	*Bubalus bubalis*	Water Buffalo			V	Least Concern
6	Muridae	Tikus*	*Rattus sp.*	Rat	V	V	V	Least Concern
7	Sciuridae	Bajing Kelapa*	*Callosciurus notatus*	Plaintain Squirrel	V	V	V	Least Concern
Reptile								
8	Agamidae	Kadal	*Mabuia multifasciata*	East Indian Brown Mabuya	V	V	V	Least Concern
9	Agamidae	Kadal Terbang	*Draco volans*	Common Flying Dragon		V	V	Least Concern
10	Agamidae	Londok	*Calotes jubatus*	Garden Lizard			V	Least Concern
11	Colubridae	Ular Air Pelangi*	*Enhydris enhydris*	Rainbow Water Snake	V		V	Least Concern
12	Colubridae	Ular Kisik*	*Xenochrophis vittatus*	Striped keelback	V			Least Concern
13	Colubridae	Ular Sapi*	*Natrix pittatus*	Grass Snake		V	V	Least Concern
14	Elapidae	Ular kobra*	*Naja sp*	Cobra Snake		V	V	Least Concern
15	Varanidae	Biawak*	*Varanus salvator*	Monitor Lizard		V		Least Concern
Amphibia								
16	Ranidae	Katak	*Rana sp*	Frog	V	V	V	Least Concern
17	Discoglossidae	Katak sawah*	*Fejervarya sp.*	Rice field frog		V	V	Least Concern
18	Bufonidae	Kodok	*Buffo melanotictus*	Toad	V	V	V	Least Concern

**Note : ***mean : Animals that may exist in the location of the observations but were not observed directly (by interview).

Habitat types of F1 location are backyards, fields, and fishponds. Type of fauna except bird (avifauna) that are found in F1 location are Sheep (*Ovis aries*), Chicken (*Gallus gallus*), Cat (*Felis domesticus*), Dog (*Canis lupus*), and Amphibia and Reptillia, those are East Indian Brown Mabuya and Common Flying Dragon (*Mabuia multifasciata, Draco volans)*, also frog and toad (*Rana sp.* and *Bufo melonotictus*). While fauna that are not observed directly (interview result) are Monitor Lizard (*Varanus salvator*), Grass Snake, Cobra, Striped Keelback and Rainbow water snake (*Natrix pittatus*, *Naja sp.*, *Xenochrophis vittatus*, *Enhydris enhydris*), also rice field frog (*Fejervarya* sp.), and Rat (*Rattus* sp.).

Habitat types of F2 location are shoreline, paddy field, vegetable farm (tomato, chilli, and corn), and fishpond. Fauna species that are found in F2 location are Sheep (*Ovis aries*), Chicken (*Gallus gallus*), Cat (*Felis domesticus*), Dog (*Canis lupus*), herpetofauna such as frog and toad (*Rana sp.* and *Bufo melonotictus*) and East Indian Brown Mabuya (*Mabuia multifaciata*). Fauna that are not observed directly (interview result) are snakes, Rainbow water snake and Striped Keelback (*Enhydris enhydris, Xenochrophis vittatus*).

Figure 2.42. Wild Animal which Found in Sampling Location
Source: Primary Data, 2016

Habitat types of F3 location are paddy field and backyard. Sheep (*Ovis aries*), Chicken (*Gallus gallus*), Cat (*Felis domesticus*), Dog (*Canis lupus*) also water buffalo (*Bubalus bulalis*), East Indian Brown Mabuya and Common Flying Dragon (*Mabuia multifasciata, Draco volans*), and Garden Lizard (*Calotes jubatus*), Toad (*Bufo melanostictus*). While Fauna that are not observed directly (interview result) are Grass Snake, Cobra, Striped Keelback and Rainbow water snake (*Natrix pittatus, Naja sp., Xenochrophis vittatus, Enhydris enhydris*), also rice field frog (*Fejervarya* sp.), and Rat (*Rattus* sp.). Mudflat or shoreline that is formed of mud material, is not found in every observation locations.

In observation locations, there is no fauna that is protected by Law or stated in 'High Risk' in IUCN Red Lits. But, with Port Development in Patimban, it may cause some wild fauna disappear or move to other place, that has better or equal condition with existing habitat due to its habitat is changed, such as Monitor Lizard that requires humid location and far from human. While, other fauna may still adapt with environmental changes in their habitat and can live coexist with human.

Birds (Avifauna)

Avifauna is a group of the birds that live in a period, or in a certain area (Lincoln *et al*, 1993). For bird sampling is used IPA method, where the observe silence for 20 minutes at one point, then move as far as 200 m from the previous point to the next point. Total distance of each point of observation is 800 m for each location. Bird watching is done by observing the extent to within view of observers on all sides to follow the wind direction, then records the type of the bird species along with the numbers.

Birds present in every station sampling area in Patimban Village can be seen at following table.

Table 2.40. List of Bird Type which Found in Sampling Location

No	Name			Family	Location		
	Local	Binomial	English		F1	F2	F3
1	*Walet Sapi*	*Collocalia esculenta* (Linnaeus, 1758)	Glossy Swiftlet	Appodidae	77	99	164
2	*Bondol Peking*	*Lonchura punctulata* (Linnaeus, 1753)	Scally-Breasted Munia	Estrildidae	122	14	28
3	*Cici Padi*	*Cisticola juncidis* (Rafinesque , 1810)	Zitting Cisticola	Silvidae	20	0	13
4	*Kacamata Biasa*	*Zosterops palpebrosus* (Temminck, 1824)	Oriental White-Eye	Zosteropidae	0	0	1
5	*Cabai Jawa*	*Dicaeum trochileum* (Sparrman, 1789)	Scarlet-Headed Flowerpecker	Dicaeidae	0	0	1
6	*Blekok Sawah*	*Ardeola speciosa* (Horsfield, 1821)	Javan-Pond Heron	Ardeidae	12	23	2
7	*Kapasan Sayap Putih*	*Lalage sueurii* (Vieillot, 1818)	White-Shouldered Triller	Campephagidae	0	0	1
8	*Raja Udang Biru*	*Alcedo coerulescens* Vieillot, 1818	Cerulean Kingfisher	Alcedinidae	0	0	3
9	*Bondol Haji*	*Lonchura maja* (Linnaeus, 1766)	White-Headed Munia	Estrildidae	32	27	12
10	*Remetuk Laut*	*Gerygone sulphurea* (Wallace, 1864)	Golden-Bellied Gerygone	Acanthizidae	0	0	1
11	*Tekukur Biasa*	*Geopelia striata* (Linnaeus, 1766)	Zebra Dove	Columbidae	2	20	5
12	*Merbak Cerukcuk*	*Pycnonotus goiavier* (Scopoli, 1886)	Yellow-Vented Bulbul	Pycnonotidae	2	0	34
13	*Kuntul Cina*	*Egretta eulophotes* (Swinhoe, 1860)	Chinese Egret	Ardeidae	18	13	2
14	*Kuntul Kecil*	*Egretta garzetta (*Linnaeus, 1766)	Little Egret	Ardeidae	1	35	8
15	*Gereja Erasia*	*Passer montanus (*Linnaeus, 1758)	Eurasian Tree Sparrow	Ploceidae	24	93	65
16	*Punai Gading*	*Treron vernans* (Linnaeus, 1771)	Pink-Necked Green Pigeon	Columbidae	0	0	2
17	*Bondol Jawa*	*Lonchura leucogastroides* (Horsfield & Moore, 1858)	Javan Munia	Ploceidae	1	5	59
18	*Cerek Tilil*	*Charadrius alexandrinus* (Linnaeus, 1758)	Kentish Plover	Charadriidae	20	33	0
19	*Kapinis Laut*	*Apus pacificus* (Latham, 1802)	Pacific Swift	Apodidae	13	0	0
20	*Gagang Bayam Timur*	*Himantopus leucocephalus* (Gould, 1837)	White-Headed Stilt	Recurvirostridae	0	7	0
21	*Layang - Layang Batu*	*Hirundo tahitica (*Gmelin, 1789)	Pacific Swallow	Hirundinidae	1	7	0
22	*Burung Madu Sriganti*	*Nectarinia jugularis* (Linnaeus, 1766)	Olive-Backed Sunbird	Nectariniidae	0	1	0

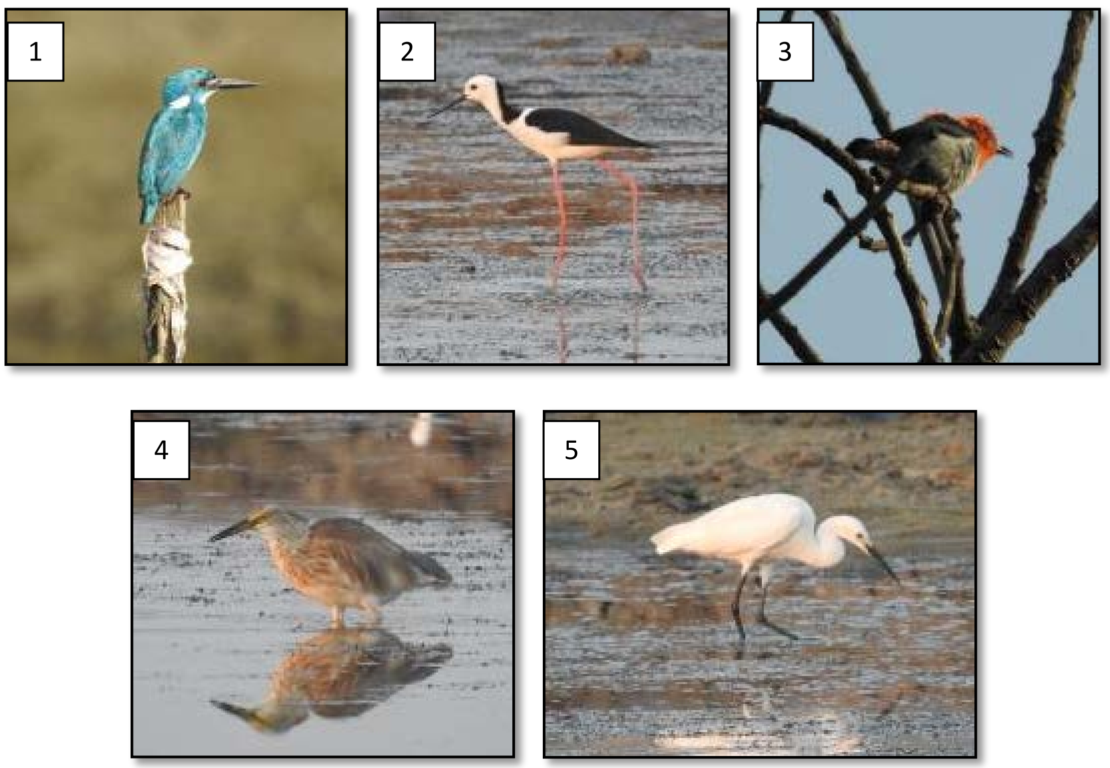
Source : Primary Data, 2016

Note :

F1 = Coastal area behind terminal (Right)
F2 = Coastal area belakang terminal (Left)
F3 = Access Road

The dominant bird species in this sampling area is Glossy-Swiftleft (Collocalia esculenta), Eurasian Tree Sparrow (Passer montanus), and Scally-Breast Munia (Lonchura punctulata), with consecutive dominance value is 30,28%, 16,21%, and 14,6%. **Table 2.41**. show the high dominance is Glossy-Swiftleft and Eurasian Tree Sparrow. Glossy-Swiftleft life in every type habitat like beach, lake, ponds, farm, paddy field, road, trees, garden, and agricultural land. While

Eurasian Tree Sparrow life in agricultural land, paddy field, road, trees, and garden. The bird species that not really dominant in this sampling area is Oriental White-Eye (Zosterops palpebrosus), Scarlet-Headed Flowerpecker (Dicaeum trochileum), White-Shouldered Triller (Lalage sueurii), Cerulean Kingfisher (Alcedo coerulescens), Golden-Bellied Gerygone (Gerygone sulphurea), Pink-Necked Green Pigeon (Treron vernans), and Olived-Backed Sunbird (Nectarinia jugularis), with consecutive dominance value is 0,09%, 0,09%, 0,09%,



Source : Primary Data, 2016

Figure 2.43. Birds which Found in Sampling Location.

1 = Raja Udang Biru (*Alcedo coerulescens* Vieillot, 1818); **2** = Gagang Bayam (*Himantopus leucocephalus* Gould, 1837); **3** = Cabai Jawahttps://en.wikipedia.org/wiki/Scarlet-headed_flowerpecker (*Dicaeum trochileum* Sparrman, 1789); 4 = Blekok Sawah (*Ardeola speciosa* Horsfield, 1821); **5** = Kuntul Kecil (*Egretta garzetta*Linnaeus, 1766).

Diversity Index Shannon-Wienner (H') in the study area is 2,24 or in condition moderate category. Based on primary data of 2016, in the study area recorded Olived-Backed Sunbird *(Nectarinia jugularis)*, that have a status protected by regulation and legislation of Republic of Indonesia, Act No. 5 Year 1990, and Government Regulation No. 7 Year 1999. In addition, from 22 species found, based on Government Regulation No. 7 Year 1999 about Preservation of Plant and Animal, five types of birds that is Javan-Pond Heron, Chinese Egret, Little Egret, Cerulean Kingfisher, and Olived-Backed Sunbird, are wildlife that is protected.

Table 2.41. Diversity Index of Bird Species in Sampling Location

No	English	Binomial	AR	AR %	FR	FM	FR %	H'	D
1	Glossy Swiftlet	*Collocalia esculenta* (Linnaeus, 1758)	340	30.28	3	1.00	6.82	2.24	Dominant
2	Scally-Breasted Munia	*Lonchura punctulata* (Linnaeus, 1753)	164	14.6	3	1.00	6.82		Dominant
3	Zitting Cisticola	*Cisticola juncidis* (Rafinesque , 1810)	33	2.94	2	0.67	4.54		Sub-dominant
4	Oriental White-Eye	*Zosterops palpebrosus* (Temminck, 1824)	1	0.09	1	0.33	2.27		Not Dominant
5	Scarlet-Headed Flowerpecker	*Dicaeum trochileum* (Sparrman, 1789)	1	0.09	1	0.33	2.27		Not Dominant
6	Javan-Pond Heron	*Ardeola speciosa* (Horsfield, 1821)	37	3.29	3	1.00	6.82		Dominant
7	White-Shouldered Triller	*Lalage sueurii* (Vieillot, 1818)	1	0.09	1	0.33	2.27		Not Dominant
8	Cerulean Kingfisher	*Alcedo coerulescens* Vieillot, 1818	3	0.27	1	0.33	2.27		Not Dominant
9	White-Headed Munia	*Lonchura maja* (Linnaeus, 1766)	71	6.32	3	1.00	6.82		Dominant
10	Golden-Bellied Gerygone	*Gerygone sulphurea* (Wallace, 1864)	1	0.09	1	0.33	2.27		Not Dominant
11	Zebra Dove	*Geopelia striata* (Linnaeus, 1766)	27	2.4	3	1.00	6.82		Sub-dominant
12	Yellow-Vented Bulbul	*Pycnonotus goiavier* (Scopoli, 1886)	36	3.21	2	0.67	4.54		Sub-dominant
13	Chinese Egret	*Egretta eulophotes* (Swinhoe, 1860)	33	2.94	3	1.00	6.82		Sub-dominant
14	Little Egret	*Egretta garzetta (*Linnaeus, 1766)	44	3.92	3	1.00	6.82		Dominant
15	Eurasian Tree Sparrow	*Passer montanus (*Linnaeus, 1758)	182	16.21	3	1.00	6.82		Dominant
16	Pink-Necked Green Pigeon	*Treron vernans* (Linnaeus, 1771)	2	0.18	1	0.33	2.27		Not Dominant
17	Javan Munia	*Lonchura leucogastroides* (Horsfield & Moore, 1858)	65	5.79	3	1.00	6.82		Dominant
18	Kentish Plover	*Charadrius alexandrinus* (Linnaeus, 1758)	53	4.72	2	0.67	4.54		Dominant
19	Pacific Swift	*Apus pacificus* (Latham, 1802)	13	1.16	1	0.33	2.27		Sub-dominant
20	White-Headed Stilt	*Himantopus leucocephalus* (Gould, 1837)	7	0.62	1	0.33	2.27		Sub-dominant
21	Pacific Swallow	*Hirundo tahitica (*Gmelin, 1789)	8	0.71	2	0.67	4.54		Sub-dominant
22	Olive-Backed Sunbird	*Nectarinia jugularis* (Linnaeus, 1766)	1	0.09	1	0.33	2.27		Not Dominant

Source : Primary Data, 2016

Note: AR = Relative Abundance; FR = Relative Frequency; H '= Diversity Index Shannon -Wienner; D = Dominance

After classifies avifauna to each family, total of 17 family that inhabit in study area. The most dominant family from Ardeidae with four species. Family Ardeidae is birds with long legs, long neck and long straight beak used to prey small fish or small invertebrates (MacKinnon et al, 2010).

Table 2.42. Conservation Status of Avifauna Species which Found in Sampling Location.

No	Family	Binomial	English	Conservation Status		
				IUCN	CITES	UU-RI
1	Appodidae	*Collocalia esculenta* (Linnaeus, 1758)	Glossy Swiftlet			
2	Estrildidae	*Lonchura punctulata* (Linnaeus, 1753)	Scally-Breasted Munia			
3		*Lonchura maja* (Linnaeus, 1766)	White-Headed Munia			
4	Silvidae	*Cisticola juncidis* (Rafinesque , 1810)	Zitting Cisticola			
5	Zosteropidae	*Zosterops palpebrosus* (Temminck, 1824)	Oriental White-Eye			
6	Dicaeidae	*Dicaeum trochileum* (Sparrman, 1789)	Scarlet-Headed Flowerpecker			
7	Ardeidae	*Ardeola speciosa* (Horsfield, 1821)	Javan-Pond Heron			√
8		*Egretta eulophotes* (Swinhoe, 1860)	Chinese Egret	VU		√
9		*Egretta garzetta (*Linnaeus, 1766)	Little Egret			√
10	Campephagidae	*Lalage sueurii* (Vieillot, 1818)	White-Shouldered Triller			
11	Alcedinidae	*Alcedo coerulescens* Vieillot, 1818	Cerulean Kingfisher			√
12	Acanthizidae	*Gerygone sulphurea* (Wallace, 1864)	Golden-Bellied Gerygone			
13	Columbidae	*Geopelia striata* (Linnaeus, 1766)	Zebra Dove			
14		*Treron vernans* (Linnaeus, 1771)	Pink-Necked Green Pigeon			
15	Pycnonotidae	*Pycnonotus goiavier* (Scopoli, 1886)	Yellow-Vented Bulbul			
16	Ploceidae	*Passer montanus (*Linnaeus, 1758)	Eurasian Tree Sparrow			
17		*Lonchura leucogastroides* (Horsfield & Moore, 1858)	Javan Munia			
18	Charadriidae	*Charadrius alexandrinus* (Linnaeus, 1758)	Kentish Plover			
19	Apodidae	*Apus pacificus* (Latham, 1802)	Pacific Swift			
20	Recurvirostridae	*Himantopus leucocephalus* (Gould, 1837)	White-Headed Stilt			
21	Hirundinidae	*Hirundo tahitica (*Gmelin, 1789)	Pacific Swallow			
22	Nectariniidae	*Nectarinia jugularis* (Linnaeus, 1766)	Olive-Backed Sunbird			√

Source : Primary Data, 2016

Note :

IUCN = *International Union for Conservation of Nature* (VU mean Vulnerable Status)
CITES = *Convention of International Trade in Endangered Species of Wild Flora and Fauna*
UU-RI = Protected by Government Regulation (No 7, Tahun 1999)

2.1.5. Social, Economic, and Culture Aspect

1. Number of Residents

The welfare of population is a parameter of the success of a nation, so that the welfare population is always a main target in the process management of the country. This goal is not unattainable if the Government cannot solve the problem of population: as the magnitude of the population and not meratanya or not terberdayakannnya residents spread all the inhabitants. Based on the results of the projection figure, Subang Regency by 2014 amount to approximately 1,524,670 inhabitants with a population density of approximately 743.10 inhabitants per square kilometer.

The spread of residents in Subang Regency is not evenly between other district. Subang district is a district with the highest population density level it is 2896.13 inhabitants/km2. The plan of the development activities of the port Patimban located in Pusakanagara district also affect the surrounding area namely Pusakajaya Village. Pusakanagara and Pusakajaya District was 2 region in Subang Regency which will be affected directly from physical development of the Patimban Port.

One of the major changes that will affect by 2 district are aspects of demography. Social change will occur significantly, in the medium term as well as long demographic change will occur (succession demographics), socio-economic (employment, income, changes in consumption patterns) and cultural (lifestyles) and diversity. This region would be a "*melting pot*" gathering place for people with diverse backgrounds. Therefore to consider changes in the population from year to year of Pusakanagara District and Pusakajaya District, Subang Regency. The goal is to see the economic development of the region as seen from the growth of the population.

According to the BPS Subang Regency in 2015, rate of population growth per year in 2000-2010 and 2010-2014. Population growth rate years 2000-2010 in Pusakanagara District was 0.48 and in 2010-2014 is 0.45. In Pusakajaya District, the rate of population growth years 2000-2010 is 0.43, and in 2010-2014 is 0.39. Rate of population growth in Pusakanagara District and Pusakajaya District as well as predictions of population growth until the year 2024.

Table 2.43. Number of Residents and Growth Rate in Pusakanagara District and Pusakajaya District

No.	Years	Number of Residents		Note
		Pusakanagara District	Pusakajaya District	
1.	2000	36.451	42.808	Source : BPS Subang Regency
2.	2010	38.253	44.668	
3.	2014	38.951	45.373	
4.	2015	39.125	45.549	Sumber : Consultant Analyzed based on prediction of residents growth, 2107
5.	2016	39.299	45.725	
6.	2017	39.473	45.901	
7.	2018	39.647	46.077	
8.	2019	39.821	46.253	
9.	2020	39.995	46.429	
10.	2021	40.169	46.605	
11.	2022	40.343	46.781	
12.	2023	40.517	46.957	
13.	2024	40.691	47.133	

Source : BPS Subang Regency and Analyzed by Consultant, 2017

A fairly high population growth have an impact on the issue of employment. The growth of the workforce less offset by growth in employment will cause employment levels tend to decline. However the number of residents who work do not always describe the amount of job opportunities that exist.

This is because often the occurrence of discrepancies in the job market. Labor is capital for the movements of the wheel of development. The number and composition of the workforce will continue to undergo changes in line with the demographic process. Such is the case with the development plan of the port Patimban which will slowly increase the number of inhabitants in the region. The impact that must be anticipated is the provision of supporting facilities and infrastructure for the population as well as the field of jobs appropriate education and expertise.

a. Education Degree

Composition of education degree, most of residents of Pusakanagara District have Elementary school degree with percentage 28.87% of 27,781 persons and other ones have Diploma (D3) degree is the lowest number of residents that is 153 persons with 0.55% percentage. Residents that have Bachelor degree are up to 255 persons with percentage 0.92%. this condition shows that human resources around project area have low degree of education. In the Table below, education degree of Pusakanagara District and Pusakajaya Village is showed.

Table 2.44. Number of People by Education Level

No	Village	Not/Yet in School	Not Finished in Elementary	Finished				
				Elementary	Junior High School	Senior high School	Academic	University
1	Pusakaratu	1.889	1.757	2.572	1.160	852	74	123
2	Gempol	890	842	817	298	168	8	36
3	Kalentambo	1.321	1.322	1.484	653	390	23	42
4	Kotasari	1.336	889	1.397	460	320	30	36
5	Patimban	2.215	1.869	1.753	467	244	17	19
Total		**7.660**	**6.680**	**8.021**	**3.038**	**1.974**	**153**	**255**
1	Pusakajaya	2.626	1.938	3.082	1.424	952	92	159
Total		2.626	1.938	3.082	1.424	952	92	159

Source : BPS Subang District, 2014

b. Age Group

In Tabel 2.45, number of resident of Pusakanagara District based on grup age year 2014 and Pusakajaya Village in 2015 is showed. This shows that Pusakanagara District is dominated by 55+ age group whose number is 3,439 persons. Therefore, ratio of dependence in this area is low, so productive age residents do not burden to fund the non-productive and yet-productive age. While in Pusakajaya Village, in dominated by 55+ age group with 1.113 people.

c. Main Livelihood

People in Pusakanagara District have various main occupations. Following table shows main occupation types based on profile and Typology data of Pusakanagara District year 2014, and Pusakajaya Village in 2015.

Table 2.45. Total population based on age in Pusakanagara District year 2014.

No.	Village	0 - 4	5 - 9	10 – 14	15 - 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 +	Total
1	Pusakaratu	829	791	835	749	640	749	762	641	557	477	454	953	8.437
2	Gempol	236	265	260	218	171	218	235	266	258	240	218	471	3.057
3	Kalentambo	467	453	516	424	379	433	451	439	356	330	276	711	5.236
4	Kotasari	438	410	479	369	332	413	376	369	292	260	185	543	4.466
5	Patimban	634	677	715	532	452	474	544	593	458	403	341	760	6.585
Total		**2.603**	**2.597**	**2.805**	**2.292**	**1.976**	**2.288**	**2.369**	**2.308**	**1.920**	**1.710**	**1.474**	**3.439**	**27.781**
1	Pusakajaya	948	1.028	1.081	907	817	959	821	805	766	640	530	1.113	10.415
Total		**948**	**1.028**	**1.081**	**907**	**817**	**959**	**821**	**805**	**766**	**640**	**530**	**1.113**	**10.415**

Source : Pusakanagara District, 2014 ; and Pusakajaya District, 2015

Table 2.46. Number of Residents Based on Occupation Year 2014.

No	Village	Agriculture		Mining and Dredging	Industrial	Electrical, Gas, Water	Constructed	Trading, Hotel, and Restaurant	transportation	Financial Institution	Services	Other	Total
		Farmer	Labor										
1	Pusakaratu	261	986	6	145	10	100	1.047	175	26	614	104	3.473
2	Gempol	141	532	0	28	11	22	265	92	4	256	8	1.359
3	Kalentambo	295	1.116	0	73	8	42	395	86	13	144	25	2.199
4	Kotasari	165	626	4	43	6	290	417	63	7	139	129	1.889
5	Patimban	366	1.299	2	20	11	27	613	59	6	115	43	2.539
Total		**1.206**	**4.558**	**12**	**310**	**47**	**480**	**2.738**	**474**	**55**	**1.269**	**309**	**11.459**
1	Pusakajaya	330	1.249	4	175	12	129	1.081	351	26	445	172	3.956
Total		**330**	**1.249**	**4**	**175**	**12**	**129**	**1.081**	**351**	**26**	**445**	**172**	**3.956**

Source : Pusakanagara District, 2014 ; and Pusakajaya District, 2015

2. Economical Facility

Residents of Pusakanagara District are dominated by Farm Workers (39.78%) and the least livelihood (occupation) is Mine and Quarry (0.1%). Majority of instutions of economy in Pusakanagara District are small shops that are up to 541 units. While for major owner for marketing place in Pusakajaya Village is shopping complex with n 102 units. Economical Facilities that located in Pusakanagara District and Pusakajaya Village is able to be seen in following table.

Table 2.47. Marketing Place in Pusakanagara District, 2014 and Pusakajaya Village, 2015

No	Village	Market	Kios	Warung	Shop	Other
1	Pusakaratu	-	26	115	48	1
2	Gempol	-	22	76	7	1
3	Kalentambo	-	13	54	30	-
4	Kotasari	-	5	32	27	-
5	Patimban	-	5	264	50	1
	Total	**-**	**70**	**541**	**162**	**3**
1	Pusakajaya	1	49	264	102	2
	Total	**1**	**49**	**264**	**102**	**2**

Source : Pusakanagara District, 2014 and Pusakajaya District, 2015

In term of Land use, most of lands in project area are used as farmlands. Most of farmlands in project area are paddy field 1,687.2 Ha or 44.43% or total lands in the project area. While, majority land used in Pusakajaya Village is paddy field among 512.00 Ha. Extents area by type of soil used in Pusakanagara District year 2014 and Pusakajaya Village years 2015.

Table 2.48. Soil Extent by Used in 2014

No	Village	Paddy Field	Moor	Housing	Graveyard	Garden	Fish Pond	Other	Total (Ha)
1	Pusakaratu	290	30	104,29	2	2,64	0	9,06	437,99
2	Gempol	218,2	0,98	63,06	0,62	58	0	13,10	353,96
3	Kalentambo	603,40	0,60	64,40	1,97	3,41	0	1,08	674,86
4	Kotasari	252,40	0,70	39,41	1,32	1,32	0	5,37	300,52
5	Patimban	314,20	0	155,42	3	51,66	1.053	432,24	2.009,52
	Jumlah	**1.678,2**	**32,28**	**426,58**	**8,91**	**117,03**	**1.053**	**460,85**	**3.776,85**
1	Pusakajaya	516.00	3.00	90.22	3.00	6.90	0	0.88	620.00
	Jumlah	**516.00**	**3.00**	**90.22**	**3.00**	**6.90**	**0**	**0.88**	**620.00**

Source: Pusakanagara District, 2014 and Pusakajaya District, 2015

Table 2.49. Paddy Productivity in Pusakanagara District

Village	Total Area (Ha)	Productivity per ha (Ton/Ha)	Production (Ton)
Pusakaratu	322,00	6,83	2.197,65
Gempol	241,00	7,05	1.699,05
Kalentambo	641,00	6,83	4.374,83
Kotasari	357,00	6,28	2.240,18
Rancadaka	869,00	6,80	5.909,20
Patimban	303,00	5,80	1.757,40

Village	Total Area (Ha)	Productivity per ha (Ton/Ha)	Production (Ton)
Mundusari	327,00	7,44	2.42,88
Total	**3.060,00**	**47,02**	**20.611,18**

According to paddy productivity in Pusakanagara District, can seen that total area that used for paddy field is 3.060 ha with total production is 20.611,18 ton. The most of paddy productivity is Rancadaka village with 5.909,20 ton.

3. Perception of Resident

a. The Respondents Knowledge About The Port Patimban Construction Plan

The Knowledge of its society about the Construction of the Port Patimban Plan is the one thing that is important in the smooth construction in the future. The society need to know the action plan and its possible impacts, both positive and negative.

From the results of the survey and interview data showed that people in the research area most of which amounted to 85% of respondents who have already knew about the plan Port Patimban Construction will be implemented and only 15% of respondents were not aware of these activities. The are still the majority of respondents who do not know Port Patimban Construction plan shows which needs an intensive socialization so that people will know about and support Port Patimban Construction Plan. The data presented in Table and Figure below.

Table 2.50. The Respondents Knowledge About The Port Patimban Construction Plan

No.	The Village Respondents Origin	The Respondents Knowledge About The Port Patimban Construction Plan		Total
		Know	Does Not Know	
PUSAKANAGARA DISTRICT				
1.	GEMPOL	11	1	12
2.	PATIMBAN	32	6	38
3.	KALENTAMBO	12	0	12
4.	PUSAKARATU	9	3	12
5.	KOTASARI	10	3	13
PUSAKAJAYA DISTRICT				
6.	PUSAKAJAYA	11	2	13
Total		85	15	100
Percentage		85,0%	15,0%	100,0%

Source : Social Survey Team, 2016

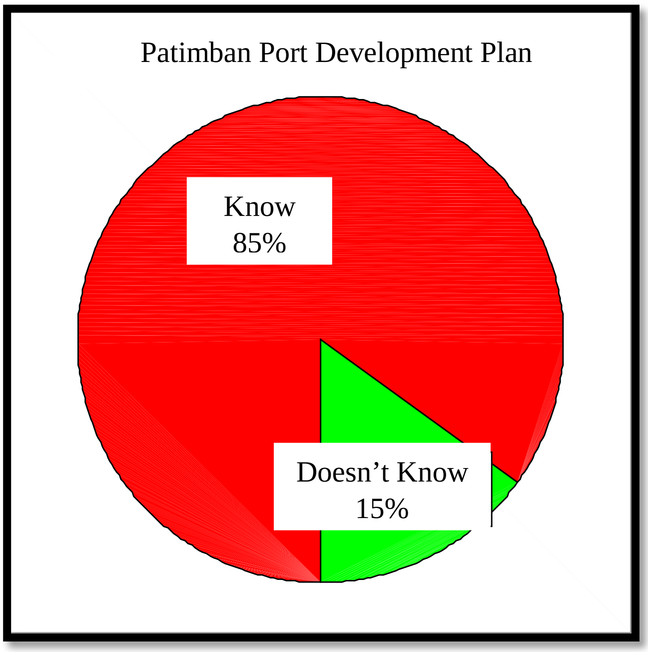


Figure 2.44. Respondents Knowlege about Patimban Port Construction Plan
Source : Social Survey Team, 2016

b. The Source Information of Patimban Port Construction

The Sources of information obtained by the respondents who had knowledge of the plans of Port Patimban Construction is derived from a variety of sources, including from the: village / district, RT / RW / Society Figure, the proponent (The Ministry of Transportation), Neighbors Neighborhood / Friends and Media.

From the results of questionnaires, data showed that the source of most information obtained from neighbors / friends to the percentage of 61% followed by resources from the village / district which was answered by 11% of respondents then information from the proponent in this case the Ministry of Transportation, which was answered by 9% of respondents. Further information is derived from the RT / RW / Society Figure who answered by 3% of respondents, and the last is the information from the media answered by 1% of respondents. The data presented in Table and Figure below.

Table 2.51. The Source Information Port Patimban Construction

No.	The Village Respondents Origin	The Source Information Port Patimban Construction						Total
		Not Answered	Village/ Subdisctric	RT/RW/ Society Figure	The Ministry of Transortation (KEMENHUB)	Neighbour/Friends	Media	
Pusakanagara District								
1.	Gempol	1	1	0	4	6	0	12
2.	Patimban	6	3	1	1	27	0	38
3.	Kalentambo	0	0	0	1	10	1	12
4.	Pusakaratu	3	1	1	0	7	0	12
5.	Kotasari	3	2	0	3	5	0	13
Pusakajaya District								
6.	Pusakajaya	2	4	1	0	6	0	13
Total		15	11	3	9	61	1	100
Percentage		15,0%	11,0%	3,0%	9,0%	61,0%	1,0%	100,0%

Source : Social Survey Team, 2016

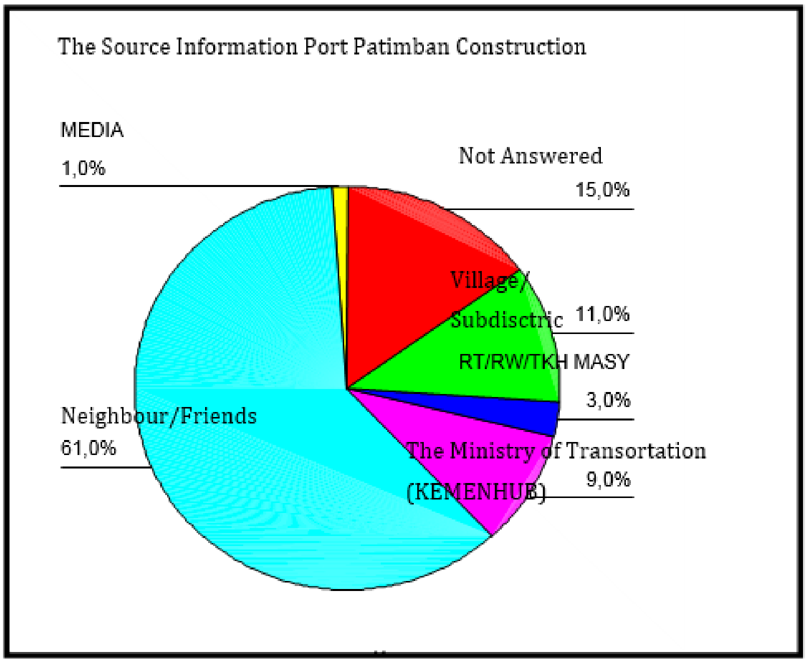


Figure 2.45. Source Information Port Patimban Construction
Source : Social Survey Team, 2016

c. Perceptions of Respondents Against The Construction Plan

The society support in construction activities is very important for the smooth construction of the Port of Patimban at all stages. From the results of the survey and interview data showed that as many as 62% of respondents support Port Patimban Construction plan. The Positive interaction that has been built by the Ministry of transportation which has built a great support from the community to the plan activities. However, there are 38% of respondents who do not agree of the Port Patimban Construction plan. The data presented in Table and Figure below.

Table 2.52. Perceptions of Respondents Against the Construction Plan

No.	The Village Respondents Origin	PERCEPTIONS OF RESPONDENTS AGAINST THE CONSTRUCTION PLAN		Total
		AGREE	DISAGREE	
Pusakanagara District				
1.	Gempol	10	2	12
2.	Patimban	14	24	38
3.	Kalentambo	12	0	12
4.	Pusakaratu	10	2	12
5.	Kotasari	7	6	13
Pusakajaya District				
6.	Pusakajaya	9	4	13
Total		62	38	100
Percentage		62,0%	38,0%	100,0%

Source : Social Survey Team, 2016

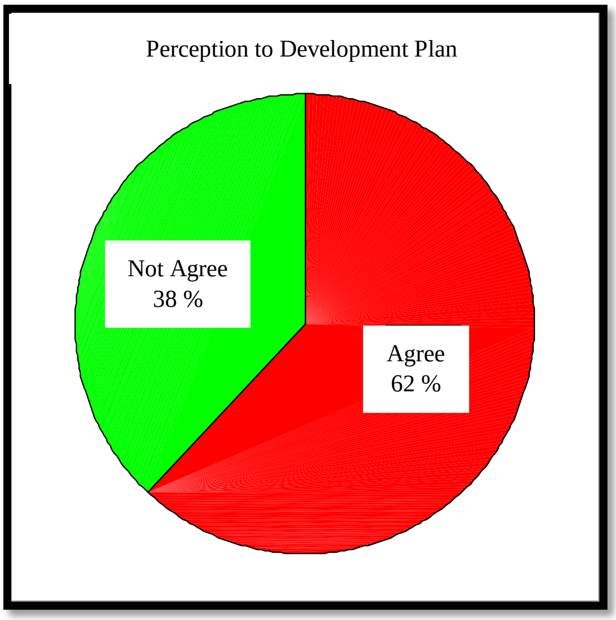


Figure 2.46. Perceptions of Respondents Against the Construction Plan

Source : Social Survey Team, 2016

d. The Agreement Reasons for The Port Patimban Construction

The support from the society who agreed with the plan of Port Patimban Construction is based on the reason, those are the construction of the Port Patimban: can promote the environment, create jobs, will open up business opportunities, increased incomes and the environment around Patimban will be crowded by newcomers. From the various agreed reasons, such sorted from most large percentage of answer was 32% of respondents revealed that the Port Patimban will open a lot of good jobs for workers in the port as well as supporting staff. The next highest answer is Port Patimban Construction can open up business opportunities and bring the environment into advanced, two answers were equally stated by 22% of respondents.

There are also 5% of respondents who answered that the Port Patimban Construction can increase the income of the population that has had a current job and the last answer is by 5% of respondents Port Patimban Construction will make the environment more crowded and developed into the region. The data presented in Table and Figure below.

Table 2.53. The Agreement Reason for Patimban Port Construction

No.	The Village Respondents Origin	The Agreement Reasons for The Port Patimban Construction						Total
		Not Answered	can promote the environment	create jobs	open up business opportunities	increased incomes	Crowded by the new comers	
Pusakanagara District								
1.	Gempol	1	5	1	2	2	1	12
2.	Patimban	9	4	10	15	0	0	38
3.	Kalentambo	3	4	3	1	1	0	12
4.	Pusakaratu	0	2	9	0	1	0	12
5.	Kotasari	4	4	2	1	1	1	13
Pusakajaya District								
6.	Pusakajaya	0	3	7	3	0	0	13
Total		17	22	32	22	5	2	100
Percentage		17,0%	22,0%	32,0%	22,0%	5,0%	2,0%	100,0%

Source : Social Survey Team, 2016

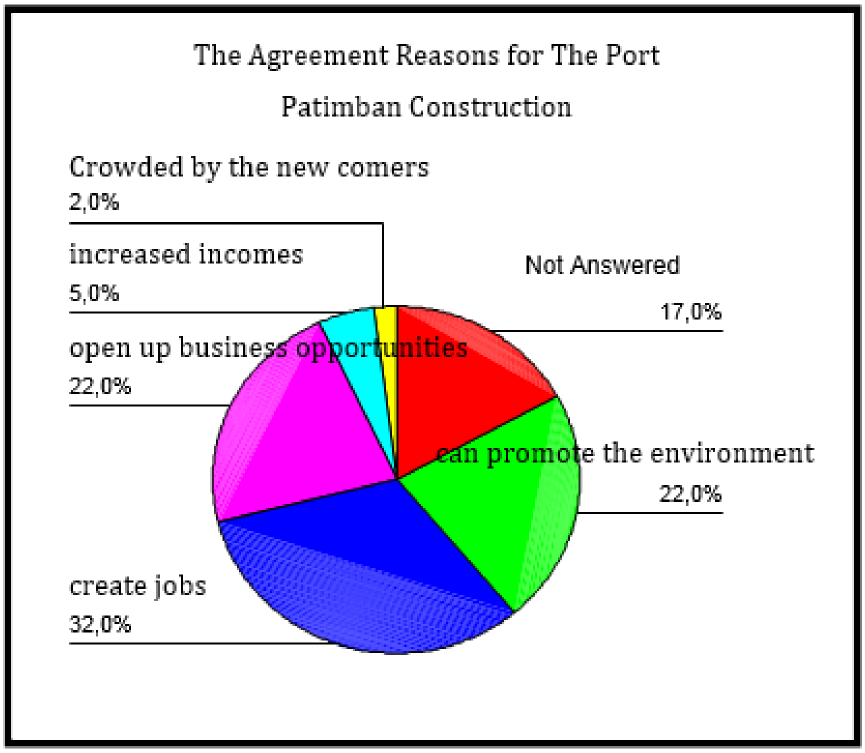


Figure 2.47. The Agreement Reason for Patimban Port Construction
Source : Social Survey Team, 2016

e. The Disagree Reason for Port Patimban Construction

On the each plan activities that related to the wider society will always be pros and cons or disagreement. The respondents reason which were not support the plan of construction activities of Patimban plan consists of a variety of reasons, including loss of livelihood, loss of income, loss of land to sea / fishing, noise pollution, land eviction of citizens, the environment becomes prone to crime, congestion, the risk of flooding, citizens become individualistic and original residents will be left behind because of their entrants.

The order of disagree reason of Port Patimban construction is the greatest percentage loss of livelihoods, especially for the farmers whose land will be the site of Port Patimban Construction, it is stated by 30% of respondents. Similarly, the associated disquiet over land eviction of citizens which has been used for the benefit become the reason of the large disagree enough also is stated by 27% of respondents. There are 8% of respondents who do not agree to the construction of the Port of Patimban because it would give the occurrence of jam. Its conditions are expected by 7% of respondents that will cause a reduction in income due to the activity of the locals to earn a living will be disrupted.

For residents who work as fishermen go to sea there is a concern because less land will be hindered by the activity of the Port Patimban Construction, as stated by 6% of respondents. Port Patimban construction also makes 6% of respondents are upset their noise pollution from large ships that will be docked in the port of this Patimban. It being more in percentage is small enough that concerns the susceptibility of criminality in the environment, the risk of flooding, residents become individualistic and original residents be left behind because of their arrivals, things were equally stated by 1% of respondents. The data presented in Table and Figure below.

Table 2.54. The Disagree Reason for Patimban Port Construction

No.	The Village Respondents Origin	**The Disagree Reason for Port Patimban Construction**											Total
		Not Answered	loss of livelihood	Less Income	loss of land to sea	noise pollution	land eviction of citizens	becomes prone to crime	congestion	the risk of flooding	become individualistic	original residents be left behind	
Pusakanagara District													
1.	Gempol	5	4	0	1	0	0	0	1	0	0	1	12
2.	Patimban	1	18	6	4	1	7	0	1	0	0	0	38
3.	Kalentambo	3	4	1	0	0	3	1	0	0	0	0	12
4.	Pusakaratu	3	0	0	1	1	5	0	2	0	0	0	12
5.	Kotasari	3	3	0	0	0	7	0	0	0	0	0	13
Pusakajaya District													
6.	Pusakajaya	1	1	0	0	0	5	0	4	1	1	0	13
Total		16	30	7	6	2	27	1	8	1	1	1	100
Percentage		16,0%	30,0%	7,0%	6,0%	2,0%	27,0%	1,0%	8,0%	1,0%	1,0%	1,0%	100,0%

Source : Social Survey Team, 2016

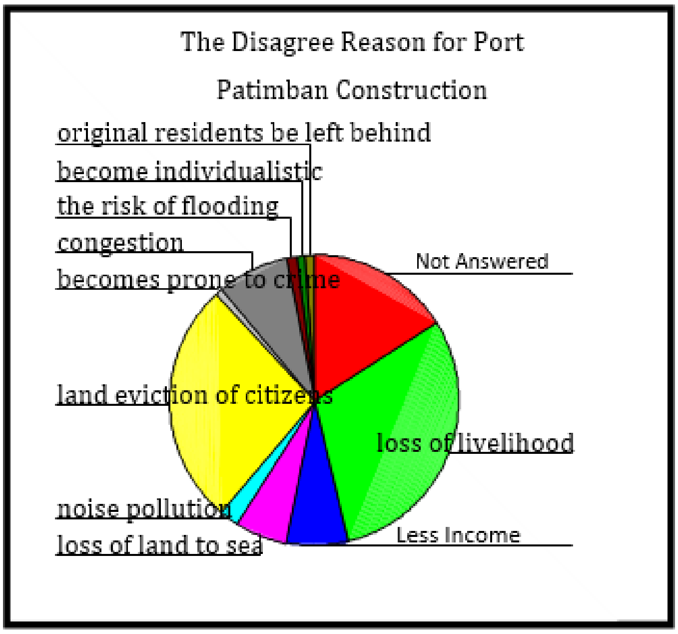


Figure 2.48. The Disagree Reason for Patimban Port Construction
Source : Social Survey Team, 2016

f. The Respondent's Expectation Concerning To The Port Patimban Construction

Port Development Plan in Patimban Village area, The Pusakanagara Subistrict has provided a number of positive expectations for the society around, both of residing in the Sub-district of Pusakanagara and Sub-distric of Pusakajaya or people who are not staying at that location but interact intensively with the territory.

Some expectations from those surveyed respondents are sorted from the start of the most substantial: 49% of respondents expect that local residents can be involved work in the construction of the Port of Patimban that would adapted to the educational qualifications acquired; 27% of respondents would like to be given of a place of business aound of Patimban Port, particularly for local residents who have had to be prioritized; 5% of respondents expect that the construction of the Patimban Port would not to the detriment the society; 4% of respondents expect for residents who affected by land evictions for Patimban Port Construction will get compensation / reimbursement prices as they desired; The next 4% of respondents there are also expect that his land is not evicted because they do not have anywhere else as a source of livelihood; 3% of respondents expect this Port Patimban Construction can be controlled from the side of safety and not to cause any disturbance to the environment; 2% of respondents expect the Port Patimban later can become a tourist attraction; 2% respondents wanted the Port Patimban Construction can bring the environmental progress and prosperity for the society; 2% of respondents want the population who are farmers but the land be evicted for the Port Patimban Construction can still farming in a new better replacement location and the last 1% of respondents expect for residents affected by land acquisition so that the price of it could rise up from the previous replacement. The data presented in Table and Figure below.

Table 2.55. The Respondent's Expectation Concerning to Patimban Port Construction

No.	The Village Respondents Origin	The respondent's expectation concerning to The Port Patimban Construction											Total
		can be involved work in the construction of the Port of Patimban	would like to be given of a place of business	can be controlled from the side of safety and not to cause any	get compensation / reimbursement prices	can become a tourist attraction	Not Evicted	Do Not Let it Give Disadvantages	Flood Causes Considering	can bring the environmental progress and	Rise up the Land Price	can still farming	
Pusakanagara District													
1.	Gempol	5	4	0	0	0	1	2	0	0	0	0	12
2.	Patimban	20	14	1	1	1	0	0	0	0	0	1	38
3.	Kalentambo	7	3	0	0	0	0	0	0	0	1	1	12
4.	Pusakaratu	4	4	2	0	0	0	1	0	1	0	0	12
5.	Kotasari	6	0	0	3	1	2	1	0	0	0	0	13
Pusakajaya District													
6.	Pusakajaya	7	2	0	0	0	1	1	1	1	0	0	13
Total		49	27	3	4	2	4	5	1	2	1	2	100
Percentage		49,0%	27,0%	3,0%	4,0%	2,0%	4,0 %	5,0%	1,0%	2,0%	1,0%	2,0%	100,0%

Source : Social Survey Team, 2016

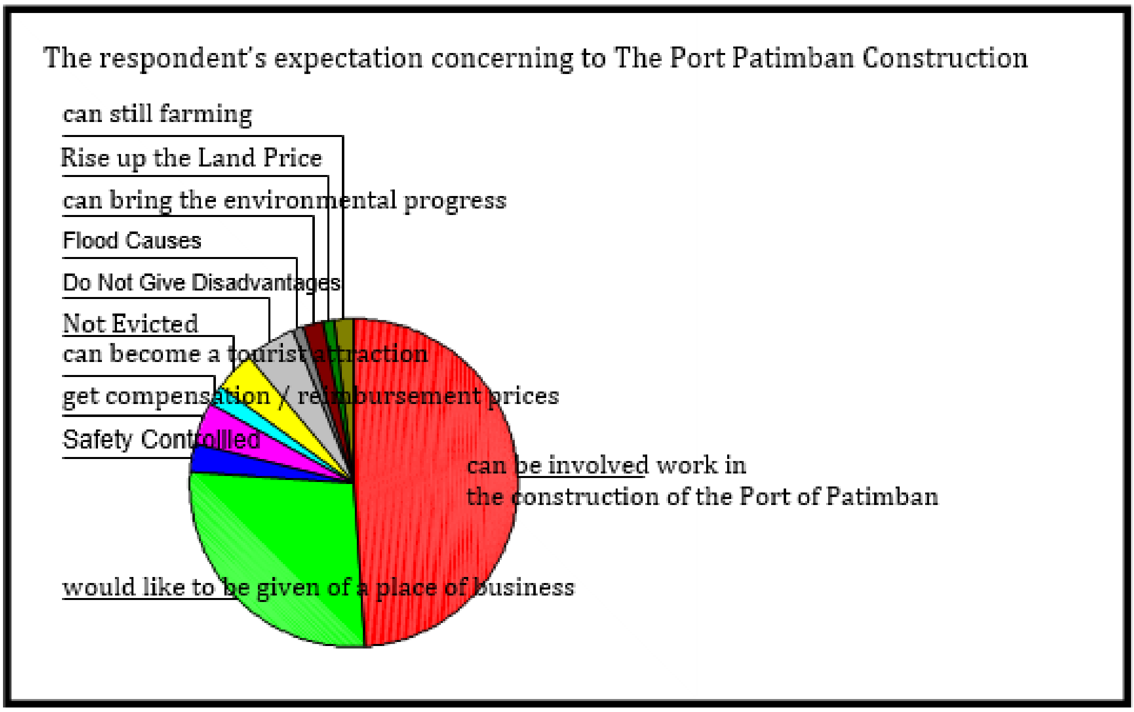


Figure 2.49. Respondent's Expectation Concerning to Patimban Port Construction
Source : Social Survey Team, 2016

g. The Fresh Water Sources Which Is Used To Bathing And Washing

The fresh water is a basic needs for the human to be used to drink water, cooking needs, bathing, or washing. The fresh water supplying to fulfill the household needs in the research area, they are consist of the various sources they are: dig well, drilled well, buy and others.

Based on the questionnarie spreading result, the fresh water sources which is mostly used by the respondents who is obtained from the drilled well is about 56%, and the respondents who are obtained from the dig well is about 33%, and the respondents who use the water from their neighboor is baout 5%, and the small part of respondents also use the water from the small river is about 1%.

The respondents who use the water from the dig well or drilled well using the water sourced from the lower ground / and the depth is around the various average value from <10 which is answered by 49% respondents and the depth 10-20m is stated by 8% respondents. The data itself shown by the table and the figure below.

Table 2.56. The Fresh Water Sources Which is Used to Bathing and Washing

NO.	The Village Respondents Origin	THE WATER SOURCES FOR BATHING AND WASHING					TOTAL
		DIG WELL	DRILLED WELL	BUY	NEIGHBOUR'S HELP	SMALL RIVER WATER	
Pusakanagara District							
1.	Gempol	2	9	1	0	0	12
2.	Patimban	15	22	0	1	0	38
3.	Kalentambo	2	5	3	1	1	12
4.	Pusakaratu	2	9	0	1	0	12
5.	Kotasari	6	7	0	0	0	13
Pusakajaya District							
6.	Pusakajaya	6	4	1	2	0	13
Total		33	56	5	5	1	100
Percentage		33,0%	56,0%	5,0%	5,0%	1,0%	100,0%

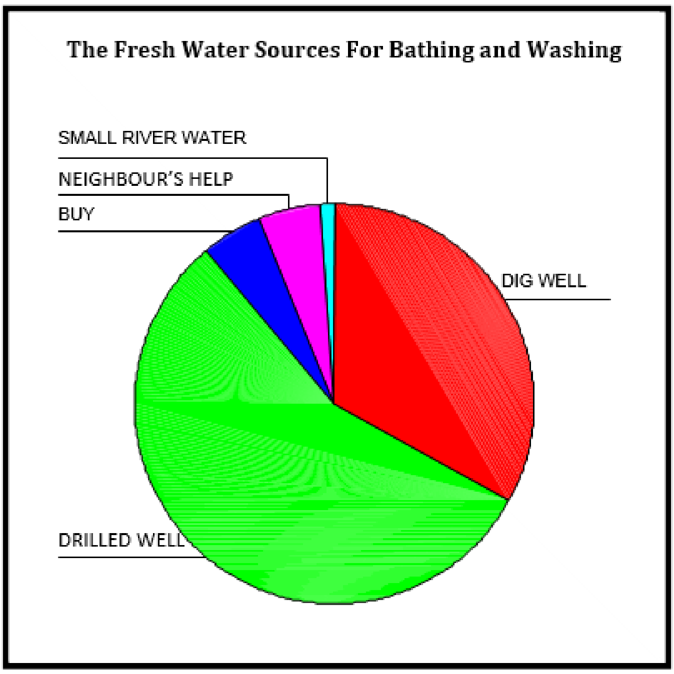


Figure 2.50. Fresh Water Sources Which is Used to Bathing and Washing
Source : Social Survey Team, 2016

h. The Fresh Water Sources For Drinking and Cooking

For some respondents, the consumption for drinking and cooking there is the difference between the water for bathing and washing because of the condition of the water which is not possible to enter into the human body. Based on the interview result, it was obtained that 83% respondents choose to buy the water for drinking and cooking, 9% respondents keep the water from the drilled well water for drinking and cooking, 6% others also keep using the dig well water for drinking and cooking, and 2% respondents keep the water from theirs neighbour's help for drinking and Cooking. Those data is presented in this table bellow.

Table 2.57. The Fresh Water Sources Which is Used to Drinking and Cooking

NO.	The Village Respondents Origin	THE WATER SOURCES FOR DRINKING AND COOKING				TOTAL
		DIG WELL	DRILLED WELL	BUY	NEIGHBOUR'S HELP	
Pusakanagara Distict						
1.	Gempol	0	0	12	0	12
2.	Patimban	2	1	35	0	38
3.	Kalentambo	1	1	9	1	12
4.	Pusakaratu	2	5	5	0	12
5.	Kotasari	1	0	12	0	13
Pusakajaya District						
6.	Pusakajaya	0	2	10	1	13
Total		6	9	83	2	100
Persentage		6,0%	9,0%	83,0%	2,0%	100,0%

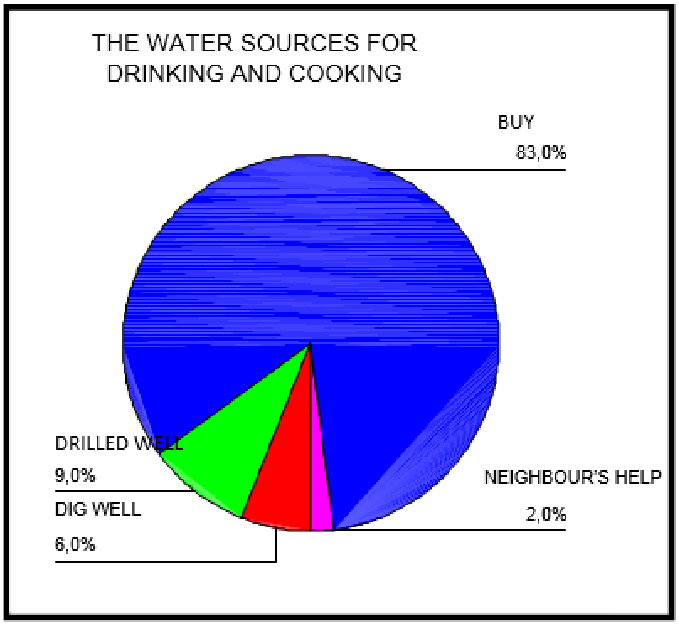


Figure 2.51. Fresh Water Sources Which is Used to Drinking and Cooking
Source : Social Survey Team, 2016

i. The Water Quality Which is Used by The Respondents

Based on the questionnarie spreading, the water quality which is used by the most of the respondents in the research area is basiclly fresh and good condition as stated by 76%

respondents. Some of them are said that the water sources which is used for daily needs (bathing and washing) is less good condition, as stated by 18% respondents which are stated that the water sources is turbid, 4%respondents stated that the water sources is salty tasted because of the water sources position is near by the North beach of the Java. There are also 2% respondents who stated that the water sources they are used is smells bad. The data is presented in this table below.

Table 2.58. The Water Condition who Used by Respondents

No.	The Village Respondents Origin	Water Condition				Total
		GOOD/CLEAR	TURBID	SMELLS BAD	TASTED	
Pusakanagara District						
1.	Gempol	11	0	0	1	12
2.	Patimban	29	7	2	0	38
3.	Kalentambo	10	1	0	1	12
4.	Pusakaratu	8	4	0	0	12
5.	Kotasari	9	4	0	0	13
Pusakajaya District						
6.	Pusakajaya	9	2	0	2	13
Total		76	18	2	4	100
Percentage		76,0%	18,0%	2,0%	4,0%	100,0%

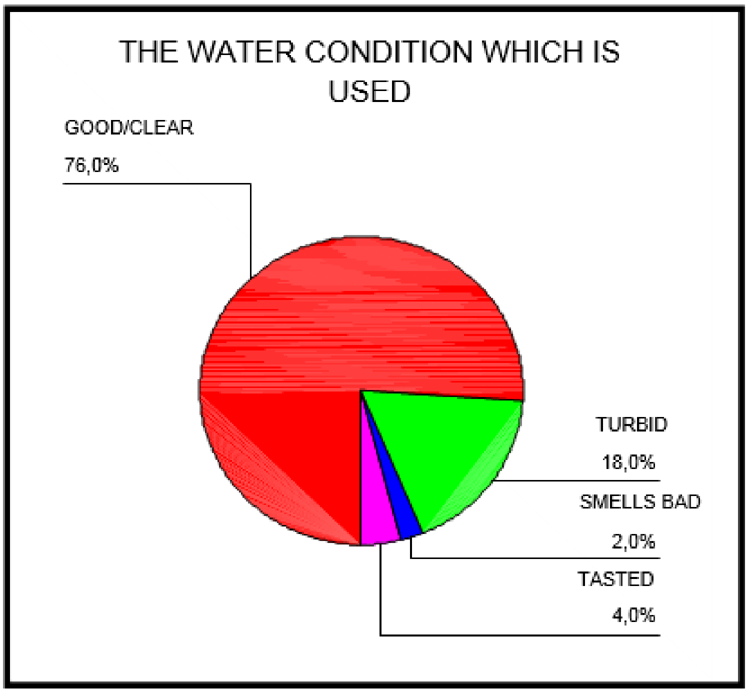


Figure 2.52. Water Condition which Used by Respondents
Source : Social Survey Team, 2016

j. Sewerage System

The society around the Port development generally manage the wastewater invidually in each household. The system used is the local sanitation (on-site sanitation), by the managing tools lavatory waste water in the form of a septic tank, as stated by 62% of respondents. Furthermore, there are 21% of respondents who distribute the dirty water from the house with a direct channel to the sea, the next 16% of respondents discard the dirty water into drainage channels and 1% of respondents channeling dirty water directly into the gutter. For sewerage without septic tank system, wastewater is usually a former laundry and kitchen waste water. The data is shown in Table and Figure below.

Table 2.59. Sewerage System

NO.	The Village Respondents Origin	Sewerage System				Total
		Septic Tank	Drainage Channels	A Direct Channel To The Sea	The Gutter	
Pusakajaya District						
1.	Gempol	6	5	1	0	12
2.	Patimban	25	10	3	0	38
3.	Kalentambo	8	0	4	0	12
4.	Pusakaratu	7	1	4	0	12

5.	Kotasari	8	0	4	1	13
Pusakajaya district						
6.	Pusakajaya	8	0	5	0	13
Total		62	16	21	1	100
Percentage		62,0%	16,0%	21,0%	1,0%	100,0%

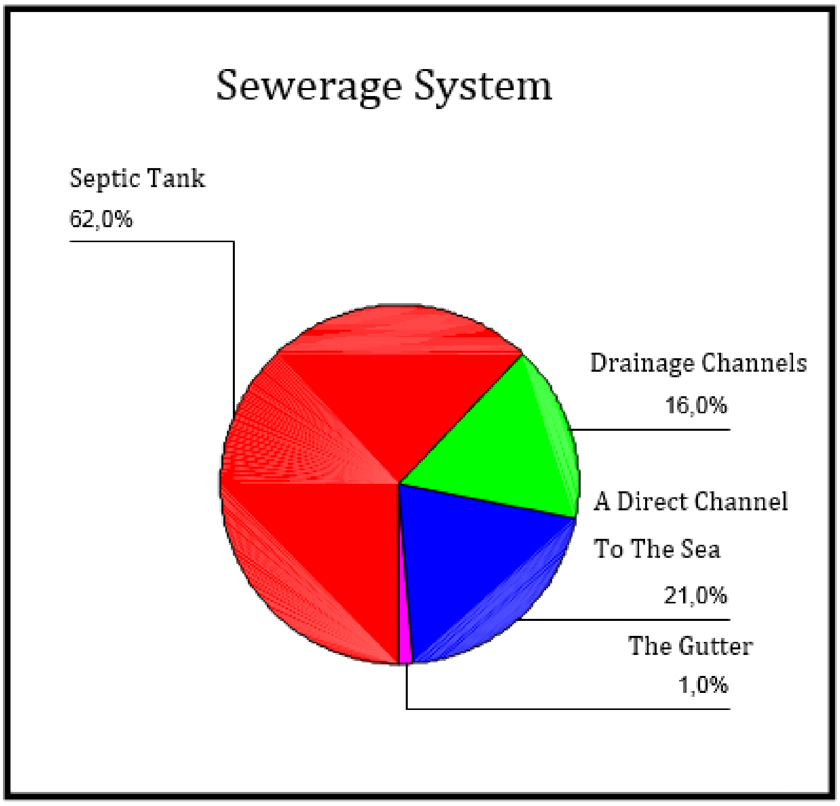


Figure 2.53. Sewerage System
Source : Social Survey Team, 2016

k. Waste Management

System Level Waste Disposal in Household

The waste disposal system arounf the Patimban ort development mostly use the communal system that is collected and combusted directly as stated by 47% respondents. This is due to the presence of the waste management system provided by the government. Besides the dominant summited waste is the household waste in relative quantity does not full. In addition to more practical, the pollution also level has not too high and would be done by local people. Things need to be done is should to do an approval together by the local society is about the waste location which is carried out of the arson. Certainly, the chosen location is far away from the location of settlements so it would not influence the health of the population.

There are 27% of respondents who throw trash household activities directly into the river, especially for the respondents whose home is close to the river flow. There is also 26% of respondents who collect it in the landfill at their home / put in the trashbin. The data shown in Table and Figure below.

Table 2.60. System Level Waste Disposal in Household

No.	The Village Respondents Origin	System Level Waste Disposal in Household			Total
		Throw It Into The Trashbin	Burn Directly	Throw It To The River	
Pusakanagara District					
1.	Gempol	2	7	3	12
2.	Patimban	10	8	20	38
3.	Kalentambo	1	10	1	12
4.	Pusakaratu	4	8	0	12
5.	Kotasari	4	8	1	13
Pusakajaya District					
6.	Pusakajaya	5	6	2	13
Total		26	47	27	100
Percentage		26,0%	47,0%	27,0%	100,0%

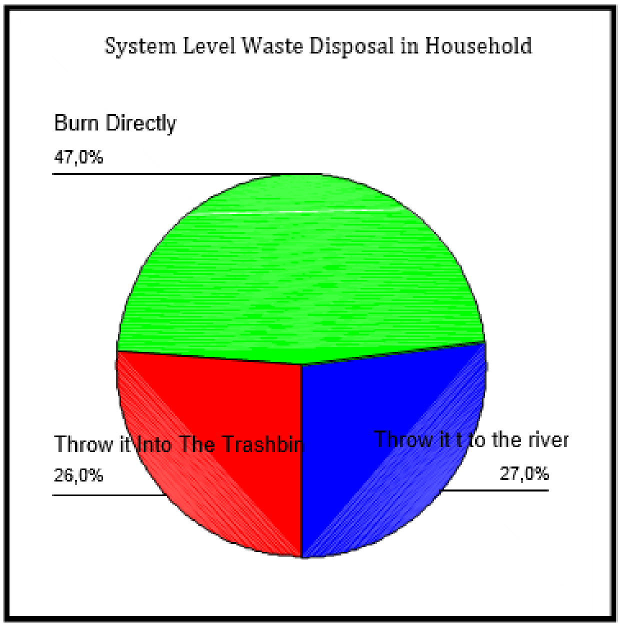


Figure 2.54. System Level Waste Disposal in Household
Source : Social Survey Team, 2016

The Sorting Waste by Respondents

Domestic waste from the rest of the household activities are not entirely discarded, some respondents that sorting between organic (derived from the remains of living things that undergo decomposition, such as leaves, woods, egg shells, etc.) and non-organic waste (derived from materials are not easily decomposed by the bacteria, such as plastic, beverage bottles, cans, etc.). In the research area, there are 21% of respondents who do the sorting of waste by its type. Their aim is to make non-organic waste that has been collected can be sold back to the collector and earn the money. The majority of respondents are 79% do not pick through the trash but discarded immediately. The data shown in Table and Figure below.

Table 2.61. Sorting Waste by Respondents

No.	The Village Respondents Origin	The Sorting Waste		Total
		Yes	Not	
Pusakanagara District				
1.	Gempol	2	10	12
2.	Patimban	6	32	38
3.	Kalentambo	4	8	12
4.	Pusakaratu	4	8	12
5.	Kotasari	1	12	13
Pusakajaya District				
6.	Pusakajaya	4	9	13
Total		21	79	100
Percentage		21,0%	79,0%	100,0%

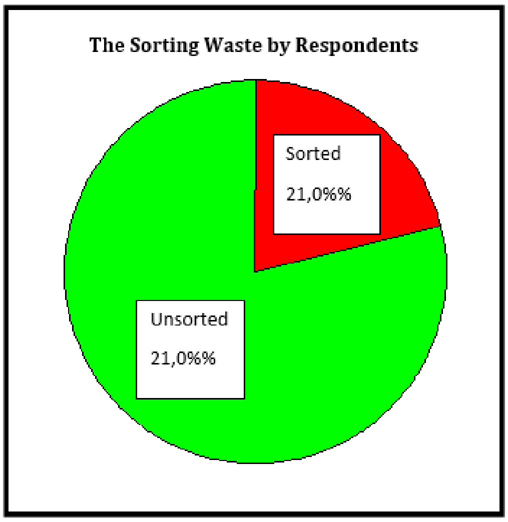


Figure 2.55. Sorting Waste by Respondents

4. Auction Places (TPIs) as Fields of Study with Number of Registered

There are auction places of fish around project site, those are :

1. TPI Kali Genteng
2. TPI Truntum
3. TPI Tanjung Pura

There are numbers of fishermen which are registered in every TPI can be seen in following table.

Table 2.62. Auction Places (TPIs) by Number of Registered Fishermen

Item	TPI		
	Kali Genteng	**Truntum**	**Tanjung Pura**
Number of Fishermen (person)	**146**	**119**	**157**
Number of Fishermen That Have Fishing Boats (person)	105	109	146
Number of Fishermen That Do Not Have Fishing Boats (person)	41	10	11
Number of Total Village Population (person)	867	1.854	1.356

Source : Fishig Ground Survey Team, 2016

- **Fishermen Fish Production and Fishing Ground (TPI Kali Genteng)**

  Kali Genteng Residence is an area with the most fishing activity in Pusakanagara District. There are 8 groups of fishermen with 105 persons members. Main commodity of their catching is White pomflet fish with 368 kg amount. There is amount of fishes which is usually obtained by fishermen of TPI Kali Genteng, can be seen in following figure.

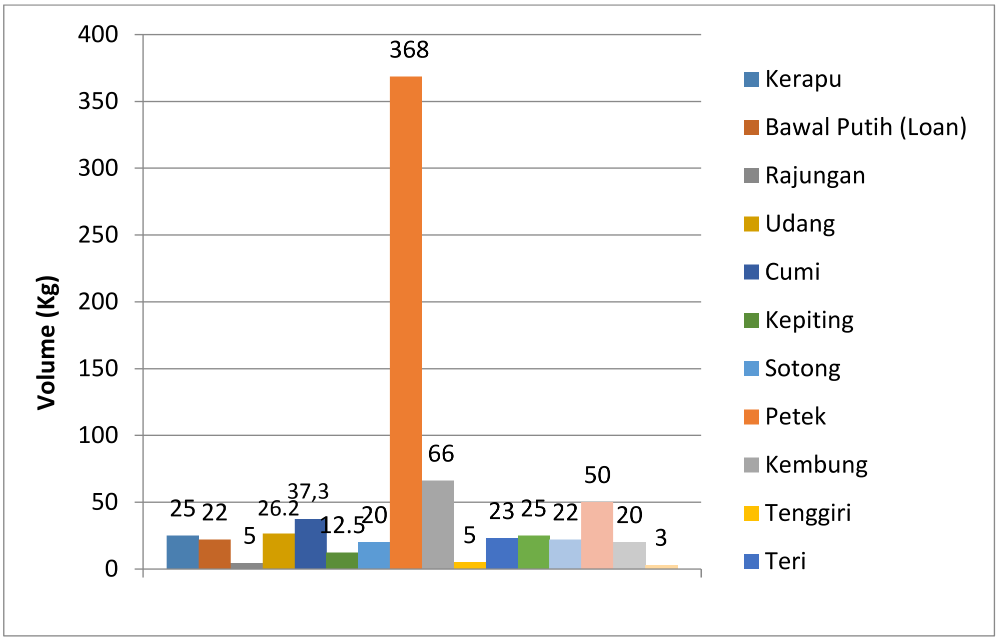


Figure 2.56. Comodity of Fish Cath in TPI Kali Genteng
Source : Fishing Ground Survey Team, 2016

- **Fishermen Fish Production and Fishing Ground (TPI Trungtum)**

There are 5 group of fishermen, those are Kerapu Mas, Rebon Mas, Mina Jaya Harapan, Mina Subur Jaya, dan Mina Bahari. Main commodities of this TPI among them is glass fish. Amount of fishes that is usually obtained can be seen on following figure.

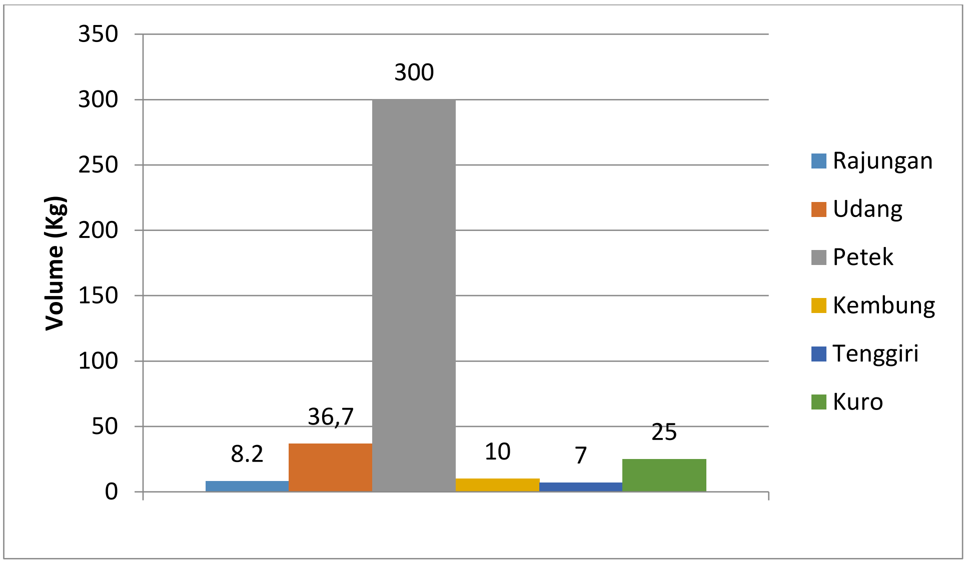


Figure 2.57. Comodity of Fish in TPI Truntum
Source : Fishing Ground Survey Team, 2016

- **Fishermen Fish Production and Fishing Ground (TPI Tanjungpura)**

Tanjung pura is one of large residences in Pusakanagara District, with main activity of its community is Fishermen. Fishing results that are often got, are White pomflet fish and shrimp. Amount of main fishing result can be seen on Following Figure.

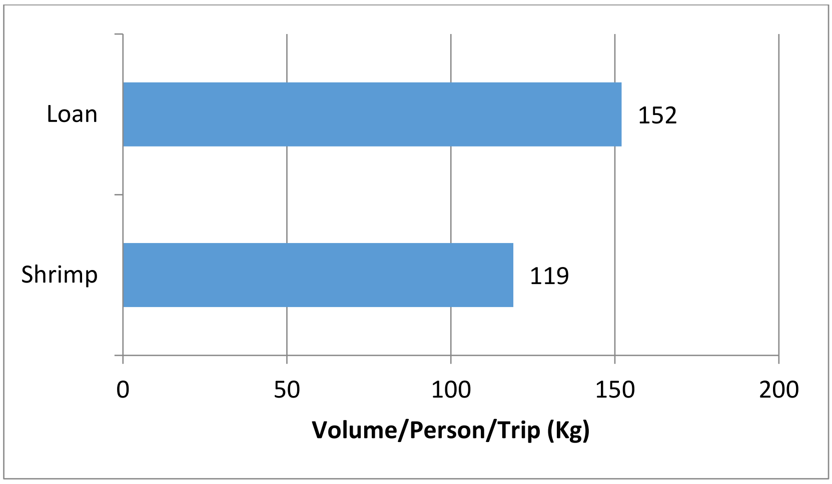


Figure 2.58. Comodity of Fish Cath in TPI Tanjungpura
Source : Fishing Ground Survey Team, 2016

5. Fishing Ground

Fishing ground names are taken based on nearest area to fishing ground, for example, Ciasem Fishing ground is named because the location near with Karang Asem region, and Mayangan Fishing ground is taken from Mayangan Region.

Based on survey which has conducted, there are 6 fishing grounds that often become place to fish for fishermen of 3 TPIs. The locations are :

1. Ciasem
2. Mayangan
3. Bobos
4. Pantai Patimban
5. Gebang
6. Eretan (Electricity Steam Power Plant)

According to collected data, fishermen do not only fish in one fishing ground, but also fish in another fishing grounds.

- **Fishing ground of TPI Kali Genteng Fishermen**

  Majority of Fishermen of TPI Kali Genteng fish in Gebang Ground due to amount of fish is more than other grounds. Plus, distance of Kali Genten and Gebang ground is not too far to be reached. So that the cost for going fish become less. Figure of fishing ground of TPI Kali Genteng Fishermen can be seen in figure 2.59.

- **Fishing ground of TPI Truntum Fishermen**

  Some of fishermen of this TPI fish around Pantai Patimban as many as 36% of fishermen. Because TPI and fishing ground have distance not too far. So the cost of fish is less. Figure of Fishing ground of TPI Truntum Fishermen can be seen in Figure 2.60.

- **Fishing ground of TPI Tanjung Pura Fishermen**

  Majority of fishermen of this TPI fish in Gebang ground due to the ground is not far from TPI. Then the second visited ground. On other hand, Mayangan becomes less visited ground by fishermen because of it is distant from TPI. Figure of Fishing ground of TPI Tanjung PuraFishermen can be seen in Figure 2.61.

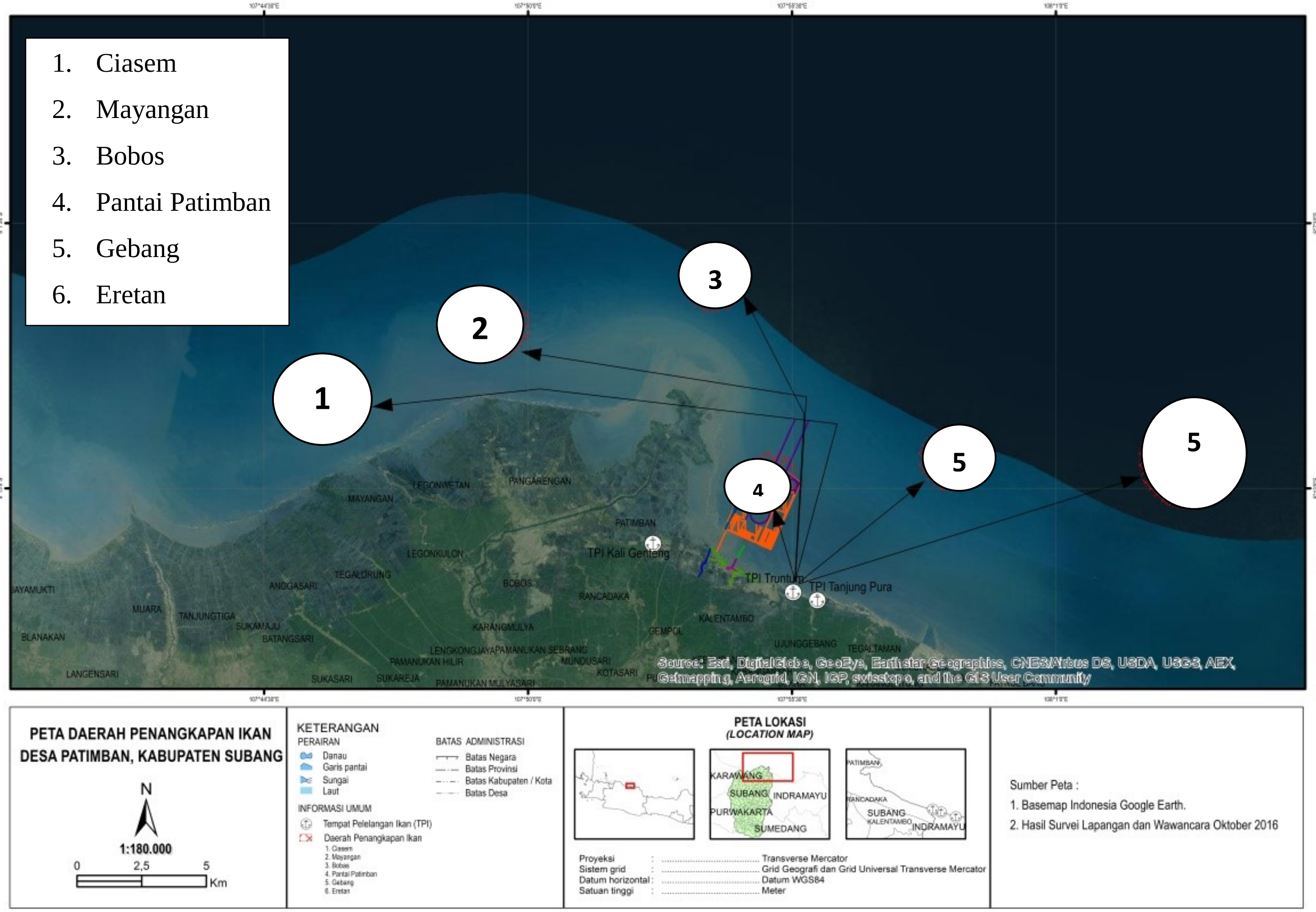


Figure 2.59. Maps of Kali Genteng Fishermen Fishing Route by Fishing Ground

Source : Fishing Ground Survey Team, 2016

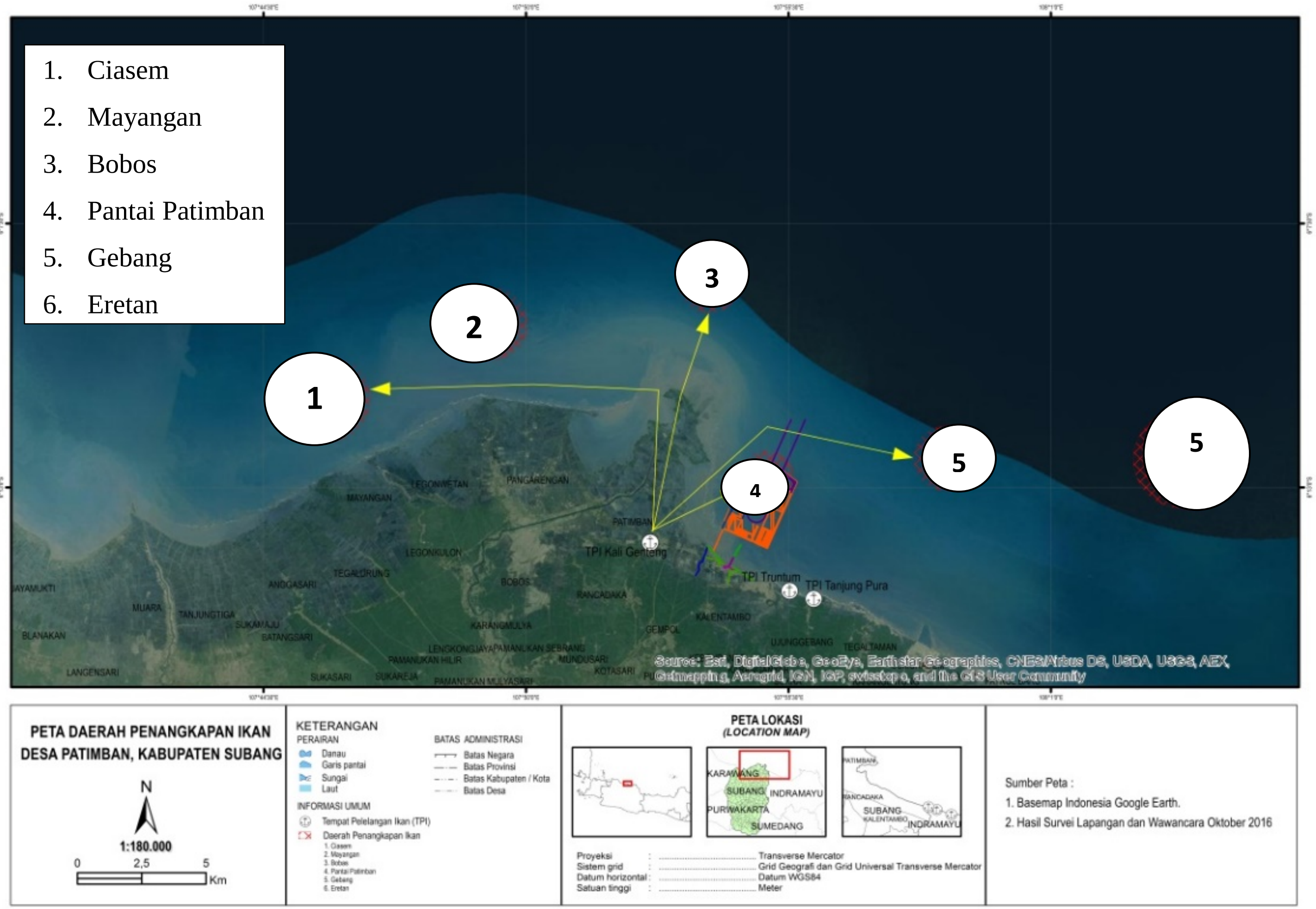


Figure 2.60. Maps of Truntum Fishermen Fishing Route by Fishing Ground
Source : Fishing Ground Survey Team, 2016

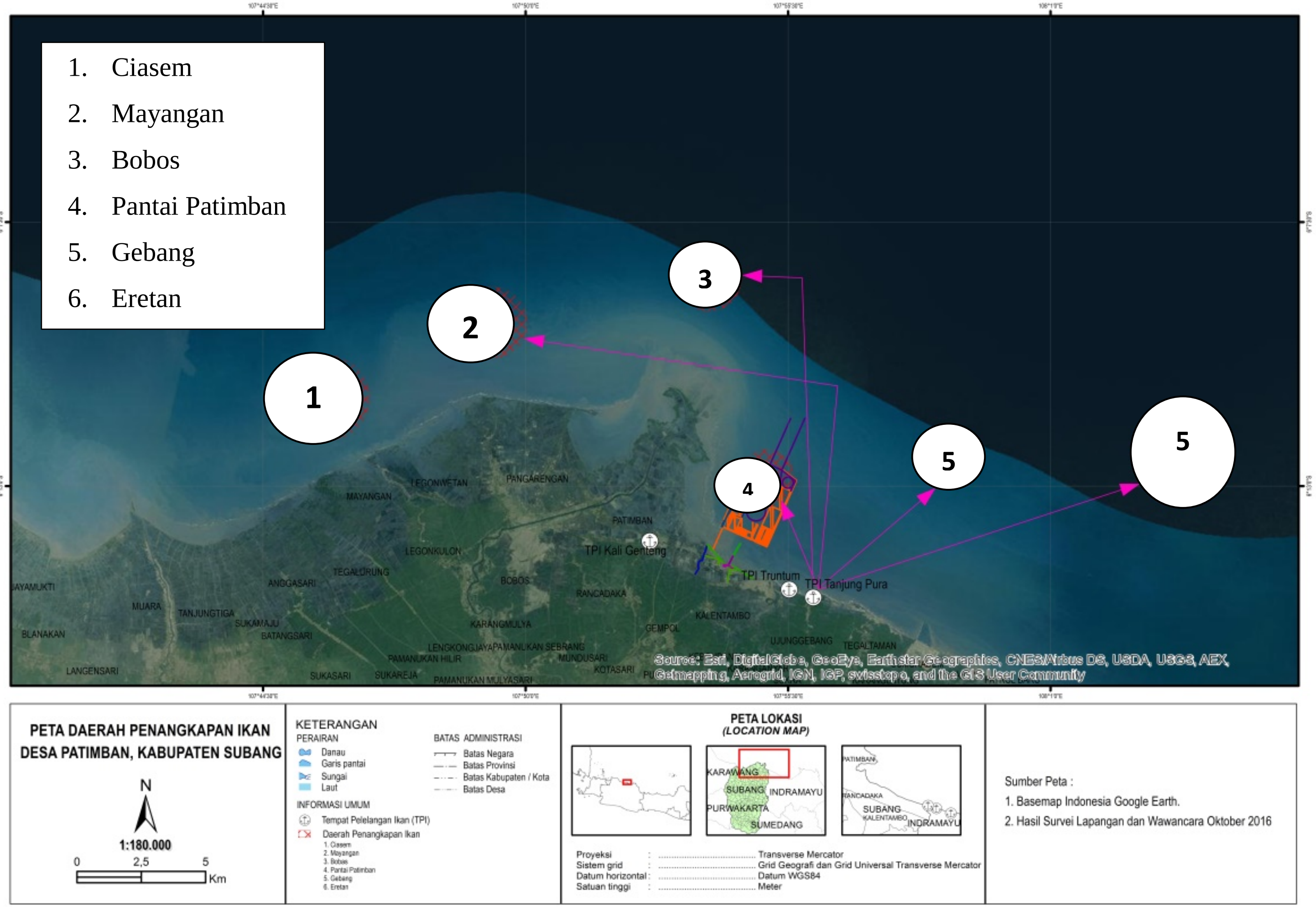


Figure 2.61. Maps of Tanjungpura Fishermen Fishing Route by Fishing Ground

Source : Fishing Ground Survey Team, 2016

6. Fish Farming Activities

a. Fish Farming on Brackish Water Activities

There is a brackish water fish farming activities or better known as the fishpond in the area of the project footprint. In the planning, there is a land of ponds to be used for back-up area. Aquaculture activities conducted in the region of the project footprint is cultivated with commodities milkfish (*Chanos chanos*) and vannamei shrimp (*Litopenaeus vanamei*).

From the results of a survey of the field, there are two categories of fishpond if classified based on the technology culture, i.e. the fishpond with extensive/traditional technologies and technology intensive farm. On cultivating technology extensively cultivated commodity, is fish, while the cultivation technology of intensive shrimp commodity vanamei has.

In this patimban port development activities, in particular for back up area will be. There is a land of ponds covering an area of 113.15 Ha are affected by the project footprint. Most of the land is farmed with technology-intensive.

In this patimban port development activities, in particular for back up area. There is a land of ponds covering an area of 113.15 Ha are affected by the project footprint. Farmed land affected by the project footprint is located in Block 16, 18, 19 and 20. As for the area of land farmed for each block can be seen in the following table:

Table 2.63. Wide Fishpond on every block

No.	Block	Broad Causeway (Ha)
2	Block 16	1.47
3	Block 18	32.39
4	Block 19	56.65
5	Block 20	22.64

Source: LARAP, 2016

If viewed from the condition of the asset, identified 34 businesses from fishpond but which is a productive farm as much as 19 fishpond. the following is a productive farm data on each block.

Table 2.64. The Number Of Productive Fishponds

No.	Block	The number of productive fishponds
1	Block 15	1
2	Block 16	0
3	Block 17	2
4	Block 18	6
5	Block 19	6
6	Block 20	4

Source: LARAP, 2016

For most types of farm commodities are shrimp of 72.7 percent and 27.3 percent milkfish ponds.

Table 2.65. Commodity Types Of Ponds

No.	Block	Farmed Shrimp	Farmed Whitefish
1	Block 15	1	1
2	Block 16	0	1
3	Block 17	2	0
4	Block 18	4	2
5	Block 19	5	1
6	Block 20	4	1
	Total	**16**	**6**

Source: LARAP, 2016

b. Milkfish Farming Activities

Based on the results of field surveys, fish farming activities banding is performed with the solid stocking 4,000-5,000 head/ha. Milkfish farming activities carried out during the 4 months of/siklus, so that it can be done in 1 year cultivation by as much as 3 cycles. Harvest activities carried out at the time of banding reach a size of 6-8 tails/kg.

Figure 2.62. Pond Farming Milkfish

The following is an analysis of income from fish farming activities milkfish per production cycle per swath in the region of the project footprint (back-up area) in the village of Patimban.

Table 2.66. Expenses For The Production Of Fish Whitefish

Component	Unit	Price (Rp)	Unit	The total number of	Description
Cost of preparation					
vitamins, ursal and probiotics	Bag	50,000	4	200,000	wholesale
Nener	Tail	800	5.000	4 million	
Saponins	Kg	8,000	50	400,000	
Labor costs					
land preparation	Today The Working People (HOK)	1,500,000	1	1,500,000	wholesale
Harvest	Today The Working People (HOK)	100,000	4	400,000	
Expenditure				6,500,000	

Source: Survey and analysis, 2017

Table 2.67. Revenue for the production of Fish Whitefish

SR = 80%	4,000	tail
Production	666.67	kg
income	RP	10 million

Source: Survey and analysis, 2017

Based on the second table above, note that the loss of income due to loss of land that is used as the project's footprint is Rp. 3,500,000/outdoor/cycle.

As for the aspirations of farmers, fish farmers/milkfish farmers is the replacement of the corresponding land, and diolibatkan in the development activities of the port.

c. Shrimp Farming Activities Vanamei

In production generally there are 1 outdoor tandon to serve 4 ponds that are used as outdoor production. the average pool used for the production of measuring 0.5 Ha. Shrimp aquaculture activities carried out with intensive technology vanamei. It is characterized by densely stocking high, i.e. an average of 100 head/m2. Benur used for shrimp aquaculture activities was *Post; plural larvae* (PL) 5 days. In the activities of production, cultivation cycle 1 had a time of 6 months. as for the types of cultivated shrimp are shrimp vannamei (*Litopenaeus vannamei*).

Figure 2.63. Species Of Shrimp farmed (*Litopenaeus vannamei*)

Shrimp harvest Activities carried out in partial vanamei, where harvest is first done on size/size 80 (tail/kg), while the second harvest is done at the time of the size/size 50 (tail/kg). the average market price for size 80 is Rp. 60,000 head/kg, while for size 50 is Rp. 80,000. partial harvesting activities are generally carried out by doing the harvest by 30% in phase 1 for size 80 and 70% in phase 2 for size 50. In one production cycle, the resulting average production of 8 tons.

Shrimp farming activities vanamei intensively is a capital-intensive farming activities. However, these activities also generate enormous profits from each production. Following is the result of revenue analysis of the shrimp farming activities vanamei intensively in the area of the project footprint.

Table 2.68. Expenditure for Production Intensive Vanamei Shrimps Per Cycle

Component	Unit	Price (Rp)	Unit	Total	Description
Cost of preparation					
Plastic	Roll	5 million	4	20 million	
benur PL-5	Tail	45	500,000	22,500,000	
Lime	Kg	1,000	2,000	2 million	
Maintenance costs					
Urea	Kg	15	2,000	30,000	
Bran	Kg	3,000	300	900,000	
Feed	Kg	16,000	10,000	160 million	
Electric		40 million	1	40 million	1 cycle
Windmills	Unit	572,000	7	4,004,000	
Labor costs					
land preparation	Today The Working People (HOK)	7 million	1	7 million	Wholesale
Harvest	Today The Working People (HOK)	4 million	1	4 million	Wholesale
Security/security guard	Person Of The Month (OB)	2,500,000	4	10 million	
Feeder	Person Of The Month (OB)	2,500,000	4	10 million	
Technician	Person Of The Month (OB)	4 million	6	24 million	
Expenditure				**304,434, 000**	

Source: Survey and analysis, 2017

Table 2.69. Revenue from production of the Vanamei Shrimps Intensively Per Cycle

SR = 80%	400,000	Tail
partial harvesting 1	120,000	Tail
partial harvest 2	280,000	Tail
partial harvest production 1	1,500	Kg
partial harvest production 2	5,600	Kg
partial harvest revenue 1	RP	120 million
partial harvest income 2	RP	448 million
the amount of income	RP	568 million

Source: survey and analysis, 2017

Based on the results of the analysis of pengeluaan and income above, it can be noted that in one production cycle per pond, making a profit of Rp. 263.566.000/cycle/pond. so if that value then may be known to an average loss of income from their respective employers and workers farmed due to loss of land for the construction of the back-up area of the harbour.

Figure 2.64. Pond Farming Intensively Vanamei Shrimps

As for the aspirations of the farmers affected by the construction of the port area to back up is the obvious replacement with a price to match. Given the magnitude of the gains were lost due to loss of land farmed.

7. Farming Activities

a. Extensive Areas of potentially impacted by the project in *a Back-Up Area*

Based on survey results obtained in the field, total area of *back-up* area is 356.23 acres . The total area is planned, as many as 10 hectares will be used for the *back-up* on the phase 1, while the rest of the land will be used for long-term development, the Green open space and buffer zone. Based on the mapping and logging results, then the project location the port of Patimban in the Pusakanagara subdistrict of Subang Regency is divided into 6 main blocks, namely Blocks 15, 16, 17, 18, 19, and 20. Spacious, each block can be seen in the following table.

Table 2.70. Broad *Back-Up The Area* in each block (in addition to PT. Wahana)

Block	Area (M^2)	Area (Ha)
15	757,335.48	75.73
16	222,105.85	22.21
17	729,667.51	72.97
18	377,854.42	37.79
19	1,090,140.59	109.01
20	385,194.15	38.52
Total	**3,562,297.99**	**356.23**

Source: LARAP Survey Team, 2016

The results of the field survey also shows that in the area there are the roads, rivers and irrigation canals.

The Total area of land owned by the company or the local community and the private sector that will be affected by the plan of the harbor construction project Patimban is 3 1 2, 38 hectares and land area owned by the Government is 43, 85 hectares.

Table 2.71. The Total area of land belonging to local people and Companies

Block	The owner of the	Area (m^2)	Area (ha)
15	Public land	730,396.05	73.04
16	Public land	200,646.45	20
17	Public land	716,757.12	71.68
18	Public land	353,162.52	35.32
19	Public land	344,604.30	34.46
	Private land (PT. Governance Dynamics)	412,705.36	41.27
20	Public land	365,518.37	36.55
Total area		**3,123,790.18**	**312.38**

Source: LARAP Survey Team, 2016

Table 2.72. Government Land Area Per Block

Block	Owner	Area (m^2)	Area (ha)
15	The Land Of The Village	7, 944.64	0.79
	State Land	18, 994.76	1.90
16	Twisted Land	1, 628.98	0.16
	The Land Of The Village	8, 363.84	0.84
	State Land	11, 466.58	1.15
17	The Land Of The Village	2, 253.24	0.23
	State Land	5, 920.45	0.59
	Public Works Land	1, 996.46	0.20
	The Waqf Land	2, 740.23	0.27
18	The Land Of The Village	1, 390.97	0.14
	State Land	23, 300.93	2.33
19	Twisted Land	295, 808.23	29.58
	The Land Of The Village	450.72	0.05
	State Land	13, 110.93	v1.31
	LahanPemerintah Area	20, 911.62	2.09
	Waqf Land (Mosque)	2, 549.44	0.25
20	The Land Of The Village	16, 906.32	1.69
	Waqf Land (Mosque)	2, 769.45	0.28
Total		**438, 445.98**	**43.85**

Source: analysis of Quantifying Spatial 2016.

b. The number of Fields and Land Owner

Back-Up Area

Based on the survey, there were 266 fields owned by the land owner in the area 156 *back-up* of any of the affected blocks. There are only a few landholders in the area of *back-ups* that have more than one area of the farm and it is distributed in different blocks. Because of that, therefore the number of landholders in each block, namely 188 people, be it does not represent the actual amount of land owners. Details of the number of fields and land owners can be seen in the following table.

Table 2.73. The total number of fields and land owner

Block	Fields	Land Owner
15	80	50
16	27	25
17	75	43
18	15	13
19	46	35
20	23	22
Total	**266**	*** 156**

* **Note:** Not a total land areas per block, but only based on actual land owner.

Access Roads

Based on the survey, there were 106 the owner of land in the Kalentambo Village, Gempol Village, Kotasari Village, Pusakajaya Village, and Pusakaratu Village. Meanwhile, the number of fields that are potentially affected by the expansion of the access road to the project is as much as 229 fields. The number of land owners and land areas per village presented in the following table.

Table 2.74. The number of Fields and Land Owners per Village

Village	**Fields**	**Land Owner**
Gempol	56	47
Kalentembo	20	18
Kotasari	19	19
Pusakajaya	7	7
Pusakaratu	20	19
Total	**122**	**106**

Source: LARAP Survey Team, 2016

c. Status Of Land Tenure

***Back Up* Area**

Based on the identification of the ownership status of the land in the area of the port development project of Patimban, then the overall status of the ownership of land is divided into two categories, namely, the first is Private Land Ownership and Government Land. The definition of the status of land tenure can be described as follows:

1. **Land Property of Private-owned**

   In this case it is/was associated with land ownership documents in the form of Document Girik/tax payments, deed of sale and purchase, or a certificate of ownership rights, use rights, usage rights, and land management. Status of land property rights in the village of Patimban, owned by individuals or companies.

2. **Government-Owned Land**

   Among them are:

   - State-owned land usage, management, and whatever has not been mandated to local governments. Types of land include land located along the banks of streams or riparian zone and the newly formed land due to accumulation of sedimentation of marine material.
   - The land of the village belongs to, which in this case is the land allocated for the facilities of the village.

- Land *Crooked*, which in this case is not the village land devoted to the public interest.
- Subang Regency, lands, which in this case is in the form fields that are used as samples to estimate the volume of the construction project for the port of Patimban.

Land Ownership status that are mentioned above are compiled through surveys of assets on the LARAP with Deploy questionnaires to residents potentially affected, where its status 25.97% as owner, landlord and tenant 41,56%, and the status of the remaining 32.47% as a tenant. A complete overview of the status of land tenure can be seen in the following table.

Table 2.75. The Status Of Land Ownership

No.	Block	The status of land ownership			Total
		Owner	Owner and tenant	Tenants	
1	15	0	45	0	**45**
2	16	0	15	0	**15**
3	17	0	36	0	**36**
4	18	9	0	4	**13**
5	19	33	0	67	**100**
6	20	18	0	4	**22**
Total		**60**	**96**	**75**	**231**
percentage		**25.97%**	**41.56%**	**32.47%**	**100.00%**

Source: LARAP Survey Team , 2016

From all areas of land, most of the land had the ownership documents, such as certificates, *giri*k, and the deed of sale and purchase. The land is mostly have ownership documents or documents that explain the legal basis of their tenure, such as certificates, girik, and the deed of sale and purchase of land. The number of residents who have proof of ownership such as certificates, girik, and the deed of sale was as much as 96,1%, and that can't be a legitimate document indicating as much as 2.9%. In this case, the good citizens who have land ownership documents, do not understand the problem, or they do show documents, however, is not a proof of ownership rights to the land. In the acquisition of land or compensation, in the process of land use conditions are relatively similar, proof of ownership documents are also factors that determine the amount of compensation, because this document is evidence of the legal rights of land ownership. The higher the status of ownership, then the compensation obtained will be higher.

Table 2.76. Proof of ownership of land documents that potentially affected by the Port Development

Proof of Ownership Documents	Block						Total	%
	15	16	17	18	19	20		
Certificate	13	3	14	6	8	5	49	**47.1**
Without Certificate	0	1	0	1	0	1	3	**2.9**
Girik/Tax Payment	2	0	5	4	4	1	16	**15.4**
The Deed Of Sale And Purchase	12	1	17	0	1	5	36	**34.6**
Total	**27**	**5**	**36**	**11**	**13**	**12**	**104**	**100.0**

Source: LARAP Survey Team, 2016

Tenants in most affected areas occupying land with permission, but without paying (60%) and rent (40,0%).

Table 2.77. The Status Of Land Ownership (Tenant)

The status of land ownership	Block						Total	%
	15	16	17	18	19	20		
Rent	0	0	0	0	18	0	**18**	**40.0**
Occupying land under a permit without paying	0	0	0	0	23	4	**27**	**60.0**
Total	**0**	**0**	**0**	**0**	**41**	**4**	**45**	**100.0**

Source: LARAP Survey Team , 2016

d. Land Use Conditions

***Back-Up* Area**

Land use refers to the land area used for a particular purpose. Based on the results of field analysis and validation of spatial, land use in the development plan of Patimban Port are classified into 9 categories such as can be seen in Table 5-10. With reference to the results of the analysis of the quantification of spatial, extensive land use in the area of *back-up* with an area of 207.24 hectares of its use is for rice paddies, and then followed by the use of land for a farm with an area of 113.15 hectares. The rest is used for agriculture, cemeteries, pastures, home page, roads, irrigation, and the river. Extensive land use in the area of *back-up* area and the land use of each block can be seen in the following table.

Table 2.78. Extensive land use in *Back-Up Area*

No.	Land use	Area (m^2)	Area (ha)
1	Irrigation	9,975.27	1.0
2	Road	34,164.84	3.42
3	Grave	5,318.89	0.53
4	Agriculture	186,171.02	18.62
5	Builded Lands	87,733.07	8.77
6	The Meadow	26,183.63	2.62
7	Rice fields	2,073,269.67	207.33
8	River	7,895.23	0.79
9	Brackish Water Fishponds	1,131,524.54	113.15
	Total	**3,562,297.99**	**356.23**

Source: LARAP The Survey Team, 2016

Table 2.79. Extensive land use in each Block the port development project Patiban

Block	Land use	Area (m^2)	Area (Ha)
15	Irrigation	669.19	0.07
	Road	22, 387.91	2.24
	Rice fields	734, 216.54	73.42
The total area of the block 15		***756, 372.28***	***75.64***
16	Rice fields	207, 374.39	20.74
	Brackish Water Fishponds	14, 731.46	1.47
The total area of the block 16		***222, 105.85***	***22.21***
17	Irrigation	5, 920.45	0.59
	Road	2, 253.24	0.23
	Awakened Lands	9, 154.73	0.92
	Rice fields	712, 339.09	71.23
The total area of the block 17		***729, 667.51***	***72.97***
18	Irrigation	2, 919.44	0.29
	Road	1, 390.97	0.14
	Rice fields	49, 672.12	5
	Brackish Water Fishponds	323, 871.88	32.39
The total area of the block 18		***377, 854.42***	***37.79***
19	Irrigation	466.18	0.05
	Road	5, 326.58	0.53
	Graves	2, 549.44	0.25
	The Field Of Agriculture	90, 617.21	9.06
	Awakened Lands	64, 983.19	6.50
	The Meadow	26, 183.63	2.62
	Rice fields	325, 624.53	32.56
	River	7, 895.23	0.79

Block	Land use	Area (m^2)	Area (Ha)
	Brackish Water Fishponds	566, 494.59	56.65
The total area of the block 19		***1,090, 140.59***	***109.01***
20	Road	2, 806.14	0.28
	Graves	2, 769.45	0.28
	The Field Of Agriculture	95, 553.81	9.56
	Awakened Lands	13, 595.14	1.36
	Rice fields	44, 043.00	4.40
	Brackish Water Fishponds	226, 426.61	22.64
The total area of the block 20		***385, 194.15***	***38.52***
Total Area Of All Blocks		**3,562, 297.99**	**356.23**

Source: analysis of Quantifying Spatial 2016

Access Roads

Based on the results of quantification, the total area of land belonging to the local community and Government is of 61.50 hectares. There are several land use in the area, the largest land use in the region for rice is as big as the land belongs to 28.63 acres in local communities, and land acres 17.21. The results of extensive quantification on land use in areas potentially affected by the presented on the following table.

Table 2.80. Land use by the community and the Government of the Inventoried

No.	Land use	Area (m^2)	Area (ha)
Local Community			
1	Brackish Water Fishponds	875.38	0.09
2	Irrigation	952.25	0.10
3	Road	112.76	0.01
4	Builded Lands	43,440.29	4.34
5	The Meadow	10,519.23	1.05
6	Farm	89,984.27	9.00
7	Paddy fields	286,413.16	28.64
	Total	**432,297.35**	**43.23**
Government			
1	Irrigation	981.80	0.10
2	Road	3,539.47	0.35
3	Graves	1,291.15	0.13
4	Awakened Lands	1,529.09	0.15
5	Farm	656.27	0.07
6	Rice fields	172,058.63	17.21
7	River	1,101.61	0.11
8	Riverside	2,214.61	0.22

No.	Land use	Area (m^2)	Area (ha)
	Total	**183,372.63**	**18.34**
	Total	**615,669.98**	**61.57**

Source: LARAP Survey Team , 2016

Table 2.81. Extensive inventory of land use in each village

Village	Land use	Area (m^2)	Area (ha)
Gempol	Irrigation	324.69	0.03
	Road	2, 403.47	0.24
	Awakened Lands	4, 146.85	0.42
	The Field of Agriculture	61, 529.60	6.15 in the
	Rice fields	199, 791.58	19.98
	River	361.58	0.04
Total		**268, 580.85**	**268, 579.28**
Kalentambo	Irrigation	952.25	0.10
	Rice fields	114, 199.69	11.42
Total		**114, 501.70**	**115, 151.95**
Kotasari	Irrigation	657.11	0.07
	Road	961.55	0.10
	Builded lands	23, 947.86	2.39
	The Meadow	10, 519.23	1.05
	The Field of Agriculture	16, 224.59	1.62
	Paddy fields	4, 536.43	0.45
	River	223.27	0.02
	Riverside	572.63	0.06
Total		**57, 642.68**	**57, 642.68**
Pusakajaya	Brackish Water Fishponds	875.38	0.09
	Road	208.58	0.02
	Builded Lands	16, 853.14	1.69
	Rice fields	3, 171.10	0.32
	River	260.58	0.03
Total		**21, 368.78**	**2.14**
Pusakaratu	Road	78.64	0.01
	Graves	1, 291.15	0.13
	The Field of Agriculture	12, 884.78	1.29
	Paddy fields	136, 772.99	13.68
	River	256.18	0.03
	Riverside	1, 641.98	0.16
Total		**152, 925.72**	**15.29**
The Number of All Villages		**615, 669.98**	**61.5 7**

Source: LARAP Survey Team , 2016

e. The General conditions of the Owner and tenant Farmers Or Peasants Land in Back Up Area

Based on a map of land use, land tenure in *back-up* area was dominated by the ownership of the fields and fishponds. Paddy field owned by unidentified individuals and village in the form of *Crooked* Land or land that is used as the paddy fields to finance salaries of village officials. Meanwhile, ownership of the Causeway is divided into individual and corporate ownership or private ownership. There are two companies that do business in areas of brackish water fishponds of the administration of the village of Patimban, namely PT. Wahana Mitra Semesta and PT. Laksana Dinamika.

Owners of land in Patimban Village mostly living outside in Patimban, among others, in the village of Kalentambo, village Rancadaka, Gempol village, and some of them even lived outside the District of Subang. Different from owner, tenant of the land generally lived in the village of Patimban and they have lived in the village for a very long time. A total of 156 owners of land in *back-up* area. Dominant livelihood of renter in *back-up* area are identified in line with land use, among other things :

1. Farmers of paddy fields.
2. Tenant farm for fishpond business.
3. Farmers of agriculture land.
4. Tenant of land for purpose of the retail business.

With pattern of land management, in general, owner of the land to manage their own land with employs several workers. However, there are also some land owners who cede their land management they land to tenants or farmers. In addition, there is also the owner of the land who manage their own land and also became farmers on land belonging to another person. The following table contains the number of the quantification of owners and tenant farmers or land tenants per block in the *back-up area.*

Table 2.82. The number of land Owners and Land Tenants in the area of the port of Patimban Project

Block	The number of Owners	The Number Of Tenants
15	50	-
16	25	-
17	43	-
18	13	6

19	35	72
20	22	2
Total	**156**	**80**

Source: LARAP Survey Team

Plants that are Potentially affected by the project in back Up Area

Based on field survey, there are 36 kinds of plants in the entire block of potentially impacted by the project. Details of the plants that are potentially affected by the project can be seen in the following table.

Table 2.83. The number of plants that are Potentially affected by the Project

No.	**Type Of Plant**	**Block**						**Total**	**%**
		15	**16**	**17**	**18**	**19**	**20**		
1	Akasia	3	0	0	9	43	16	71	*2.62*
2	Angsana	0	0	0	0	8	0	8	*0.30*
3	Asem	0	0	0	0	0	4	4	*0.15*
4	Bakau	0	15	0	16	160	0	191	*7.06*
5	Belimbing Wuluh	0	1	0	0	0	0	1	*0.04*
6	Beringin	5	0	0	1	9	0	15	*0.55*
7	Bintaro	0	0	0	0	1	0	1	*0.04*
8	Gamal	45	80	0	0	12	15	152	*5.62*
9	Gempol	0	1	0	0	0	0	1	*0.04*
10	Glodokan	0	0	0	0	0	1	1	*0.04*
11	Jabon	25	2	0	0	0	0	27	*1.00*
12	Jambu Air	30	5	0	0	0	0	35	*1.29*
13	Jambu Biji	13	14	0	0	0	10	37	*1.37*
14	Jati	1	1	0	0	1	0	3	*0.11*
15	Kelapa	39	241	0	2	8	24	314	*11.60*
16	Kersen	29	43	2	6	47	0	127	*4.69*
17	Ketapang	0	0	0	1	49	8	58	*2.14*
18	Lamtoro	46	66	0	15	67	69	263	*9.72*
19	Mahoni	0	0	0	0	0	4	4	*0.15*
20	Mangga	41	171	0	0	0	73	285	*10.53*
21	Mengkudu	7	21	0	0	0	3	31	*1.15*
22	Nangka	0	8	0	0	0	1	9	*0.33*
23	Palem putri	0	0	0	0	0	13	13	*0.48*
24	Palem tiang	0	0	0	0	0	11	11	*0.41*
25	Palem tupai	0	0	0	0	0	5	5	*0.18*
26	Pepaya	8	33	0	0	0	6	47	*1.74*
27	Pete	0	14	0	0	0	0	14	*0.52*
28	Pisang	70	121	1	58	189	268	707	*26.12*
29	Randu	9	17	0	0	0	1	27	*1.00*

No.	Type Of Plant	Block						Total	%
		15	16	17	18	19	20		
30	Kisah	0	4	0	0	0	0	4	*0.15*
31	Sawit	0	1	0	0	0	0	1	*0.04*
32	Sawo	0	10	0	0	0	2	12	*0.44*
33	Srikaya	0	0	0	0	0	1	1	*0.04*
34	Sukun	0	17	0	0	0	0	17	*0.63*
35	Trembesi	0	2	0	0	9	10	21	*0.78*
36	Waru	4	95	0	24	32	34	189	*6.98*
	Total	***375***	***983***	***3***	***132***	***635***	***579***	***2707***	***100***

Source: LARAP Survey Team, October 2016

Based on the results of questionnaire distribution in each block, plants that are potentially affected by the project can be seen in the following description.

f. Trees and plants that potentially affected by the project

Annual Plant

Based on the survey, 30.4% of the annual crop of potentially affected by the project is the rice, and then followed by bananas (19.6%) with an area of between 1,000 m^2 up to 30,000 m^2. More details on this can be seen in the following table.

Table 2.84. The number of Annual Crop Fields are potentially affected by the Project

No.	Types Of Annual Plants	Block						Total	%
		15	16	17	18	19	20		
1	Onion	0	0	0	0	2	0	**2**	**4.3**
2	Buntung	0	0	0	0	1	0	**1**	**2.2**
3	Corn	0	0	0	0	0	1	**1**	**2.2**
4	Nut	0	0	1	0	0	0	**1**	**2.2**
5	Long Beans	0	0	0	0	1	0	**1**	**2.2**
6	Coconut	0	0	0	0	1	0	**1**	**2.2**
7	Coconut	0	0	0	0	1	1	**2**	**4.3**
8	Kormis	0	0	0	0	1	0	**1**	**2.2**
9	Mango	2	0	0	0	0	1	**3**	**6.5**
10	Mango	0	0	0	0	1	0	**1**	**2.2**
11	PADI	5	1	4	0	2	2	**14**	**30.4**
12	Reduce	0	0	1	0	0	0	**1**	**2.2**
13	Papaya	0	0	0	0	0	1	**1**	**2.2**
14	Banana	2	0	0	1	4	2	**9**	**19.6**
15	Mustard greens	0	0	0	0	1	0	**1**	**2.2**
16	Watermelon	0	0	0	0	2	0	**2**	**4.3**
17	Eggplant	0	0	0	0	1	0	**1**	**2.2**
18	Cucumber	0	0	0	0	2	0	**2**	**4.3**

No.	Types Of Annual Plants	Block						Total	%
		15	16	17	18	19	20		
19	Sweet	0	0	0	0	1	0	**1**	**2.2**
Total		**9**	**1**	**6**	**1**	**21**	**8**	**46**	**100.0**

Source: LARAP Survey Team , 2016

Table 2.85. The Selling Price Per Kg

Not	The sales price (Rp)	Block			Total	%
		15	19	20		
1	4,000	0	2	0	**2**	**25.0**
2	7,000	0	1	0	**1**	**12.5**
3	100,000	2	0	0	**2**	**25.0**
4	900,000	0	0	1	**1**	**12.5**
5	4 million	0	2	0	**2**	**25.0**
Total		**2**	**5**	**1**	**8**	**100.0**

Source: LARAP Survey Team , 2016

Plant Woody

There are 13 species of woody plants that potentially affected by land acquisitions, it is, *Earleaf Acacia* and *Terminalia Catappa* (18.2%) and *Sonneratia* (13.6%).

Table 2.86. The Number Of Potentially Exposed Wood Plant Project

No.	Types Of Plants Are Woody	Block						Total	%
		15	16	17	18	19	20		
1	Banyan	2	0	0	0	0	0	**2**	**9.1**
2	Chili	0	0	0	0	0	1	**1**	**4.5**
3	Teak	0	0	0	0	1	0	**1**	**4.5**
4	Kapidada	2	0	0	1	0	0	**3**	**13.6**
5	Ketapang	0	0	0	0	4	0	**4**	**18.2**
6	Albizia Saman	0	0	0	0	1	0	**1**	**4.5**
7	Kormis	0	0	0	0	4	0	**4**	**18.2**
8	Pumpkin	0	0	0	0	0	1	**1**	**4.5**
9	Lantoro	0	0	0	1	0	0	**1**	**4.5**
10	Banana	0	0	0	0	0	1	**1**	**4.5**
11	Rundu	0	0	0	0	1	0	**1**	**4.5**
12	Breathtaking	0	0	0	0	1	0	**1**	**4.5**
13	Waru	0	0	0	0	1	0	**1**	**4.5**
Total		**4**	**0**	**0**	**2**	**13**	**3**	**22**	**100.0**

Source: LARAP Survey Team , 2016

Based on the age of the plant, 69.7% of woody plants that could potentially have affected more than 10 years, and then followed by ages 6-10 years as much as 21.2%.

Table 2.87. The amount of Woody Plants that are Potentially Affected (based on the age of the plant)

No.	The age of the plant	Block						Total	%
		15	16	17	18	19	20		
1	1-3 years	0	0	0	0	1	1	**2**	**6.1**
2	4-5 years, with a wood diameter of 4-6 cm	0	0	0	0	1	0	**1**	**3.0**
3	6-10 years, with a wood diameter of 7-8 cm	0	0	0	0	7	0	**7**	**21.2**
4	Over 10 years, with a wood diameter of more than 20 cm	1	0	0	10	12	0	**23**	**69.7**
Total		**1**	**0**	**0**	**10**	**21**	**1**	**33**	**100.0**

Source: LARAP Survey Team , 2016

Fruit Plants

There are 27 kinds of fruit plant that potentially affected by the project, it is, bananas (29.6%) and mango (22.2%). More details on this can be seen in the table below.

Table 2.88. The Number Of Potentially Affected Fruit Crop Projects

No.	Type Of Plant Fruit	Block						Total	%
		15	16	17	18	19	20		
1	Chili	0	0	0	1	0	0	**1**	**3.3**
2	Nut	0	0	1	0	0	0	**1**	**3.3**
3	Coconut	0	2	0	0	4	2	**8**	**26.7**
4	Pumpkin	0	0	0	1	0	0	**1**	**3.3**
5	Mango	4	1	1	0	0	2	**8**	**26.7**
6	Papaya	0	1	0	0	1	0	**2**	**6.7**
7	Banana	0	1	2	1	2	2	**8**	**26.7**
8	Eggplant	0	0	0	1	0	0	**1**	**3.3**
Total		**4**	**5**	**4**	**4**	**7**	**6**	**30**	**100.0**

Source: LARAP Survey Team , 2016

Based on age, 47.2% of fruits that could potentially have affected is 1-3 years, 47.1% of the plants have more than 10 years of age, and 11.8% of the plants have aged 4-5 years.

Table 2.89. The number of Fruits that are Potentially affected by the project (based on age)

No.	Operate Plant Fruit	Block						Total	%
		15	16	17	18	19	20		
1	1-3 years	1	0	1	3	0	2	**7**	**30.4**
2	4-5 years	0	0	0	0	0	1	**1**	**4.3**
3	6-10 years	1	0	0	1	3	0	**5**	**21.7**
4	Above 10 years	2	1	2	0	2	3	**10**	**43.5**
Total		4	1	3	4	5	6	**23**	**100.0**

Source: LARAP Survey Team , 2016

Total production in one age category based on crop plants can be seen in the following table.

Table 2.90. Production Per Plant in one Harvest (based on the age of the plant)

Age Of Plant	Production Per Plant (Kg)	Block						Total	%
		15	16	17	18	19	20		
1-3 years	20	0	0	1	0	0	0	**1**	**8.3**
	200	0	0	0	1	0	0	**1**	**8.3**
	3	0	0	0	1	0	0	**1**	**8.3**
	5	0	0	0	1	0	0	**1**	**8.3**
4-5 years	1	0	0	0	0	1	0	**1**	**8.3**
	5	0	0	0	0	1	0	**1**	**8.3**
6-10 years	100	1	0	0	0	0	0	**1**	**8.3**
	15	0	0	0	1	0	0	**1**	**8.3**
	40	0	0	0	0	1	0	**1**	**8.3**
Above 10 years	100	1	0	0	0	0	0	**1**	**8.3**
	200	0	0	0	0	0	1	**1**	**8.3**
	40	0	0	0	0	1	0	**1**	**8.3**
Total		**2**	**0**	**1**	**4**	**4**	**1**	**12**	**100.0**

Source: LARAP Survey Team , 2016

Table 2.91. The frequency of the Harvest in a year (based on the age of the plant)

Age Of Plant	The Frequency Of Harvest	Block						Total	%
		15	16	17	18	19	20		
1-3 years	2	0	0	1	0	0	3	**4**	**30.8**
	15	0	0	0	1	0	0	**1**	**7.7**
	20	0	0	0	1	0	0	**1**	**7.7**
	100	0	0	0	1	0	0	**1**	**7.7**
4-5 years	12	0	0	0	0	1	0	**1**	**7.7**
6-10 years	1	1	0	0	0	0	0	**1**	**7.7**
	10	0	0	0	1	0	0	**1**	**7.7**
Above 10 years	1	1	0	0	0	0	0	**1**	**7.7**
	12	0	0	0	0	1	1	**2**	**15.4**
Total		**2**	**0**	**1**	**4**	**2**	**4**	**13**	**100.0**

Source: LARAP Survey Team , 2016

Fruit sale price ranges between Rp 800 to Rp 1.000.000 per kg at each harvest.

Table 2.92. The selling price per Kg in a single Harvest

No.	The sales price (Rp)	Block						Total	%
		15	16	17	18	19	20		
1	800	0	0	0	0	0	1	**1**	**5.9**
2	2,000	0	1	0	0	0	0	**1**	**5.9**
3	2,500	0	0	0	1	0	0	**1**	**5.9**
4	4,000	0	0	0	1	0	0	**1**	**5.9**

5	5,000	0	0	1	0	0	0	**1**	**5.9**
6	6,000	1	0	0	1	0	1	**3**	**17.6**
7	7,000	0	0	0	0	1	0	**1**	**5.9**
8	10,000	0	0	0	0	2	1	**3**	**17.6**
9	12,000	0	0	0	0	0	1	**1**	**5.9**
10	14,000	0	0	0	0	1	0	**1**	**5.9**
11	15,000	1	0	0	0	0	0	**1**	**5.9**
12	20,000	0	0	0	1	0	0	**1**	**5.9**
13	1.000.000	1	0	0	0	0	0	**1**	**5.9**
Total		**3**	**1**	**1**	**4**	**4**	**4**	**17**	**100.0**

Source: LARAP Survey Team 2016

h. The attitude of Society backed Up the Area Affected On the development plan of the port Patimban

After learning about the existence of Patimban Port development plan, 78.5% community argue agree of this Patimban Harbor Development, only 3.8 percent who disagreed.

Table 2.93. The Attitude of the Affected Communities Regarding Patimban Port Development Plan

No.	**Block**	**The Attitude Of The Society**			**Total**
		Agree	**Do Not Agree**	**Don't Answer**	
1	15	42	1	8	**51**
2	16	14	0	1	**15**
3	17	25	3	4	**32**
4	18	7	0	1	**8**
5	19	8	0	3	**11**
6	20	6	1	6	**13**
Total		**102**	**5**	**23**	**130**
Percentage of the		**78.5%**	**3.8%**	**17.7%**	**100%**

Source: LARAP Survey Team 2016

The reason of affected people in back up area are supported in Patimban Port development include:

- Can change the fortunes of the balance
- It can help the economy
- For development
- Can replace in same land
- Compensation in accordance with the wishes of the community
- Join with others

- Build the economy
- Building a village
- Opening job opportunity
- For upgrade the local economy
- The development of the region
- Development of indigenous communities
- Want to be a developed area
- The acceleration of development

The reason of community affected in back up area not support in Patimban Port project include:

- Should Start a business from beginning
- Land Price is expensive, they fear can not buy anymore
- Fear of displaced from place of birth
- Worry about loss of work

2.1.6. Public Health Component

Number of Health Faclities in Study area can be seen in below table.

Table 2.94. Data of Facilities in Pusakanagara Year 2014

No	Village	Hospital	Puskesmas	Posyandu	Pos KB	Clinic
1	Pusakaratu	0	1	8	1	0
2	Gempol	0	0	5	1	0
3	Kalentambo	0	1	6	1	0
4	Kotasari	0	0	4	1	0
5	Patimban	0	0	7	1	0
	Total	**0**	**2**	**30**	**5**	**0**
1	Pusakajaya	0	0	11	1	1
	Total	**0**	**0**	**11**	**1**	**1**

Source : Puskesmas Pusakanagara District, 2014 ; Pusakajaya Dalam Angka 2015

Based on those data above, Pusakanagara District is known to have the most number of Health Facilities as Posyandu 30 units, pos KB 5 units, and Puskesmas 2 units, but other health facilities is none. While in Pusakajaya Village, public health facility which have is posyandu in 11 units. The nearest health facility located in port development activity site is health center (posyandu) of Pusakanagara which located in Pusakajaya village, as well as local general hospitals (Hospital), Subang regency.

a. High Desease Types

Highest disease types in study area can be seen on below figure

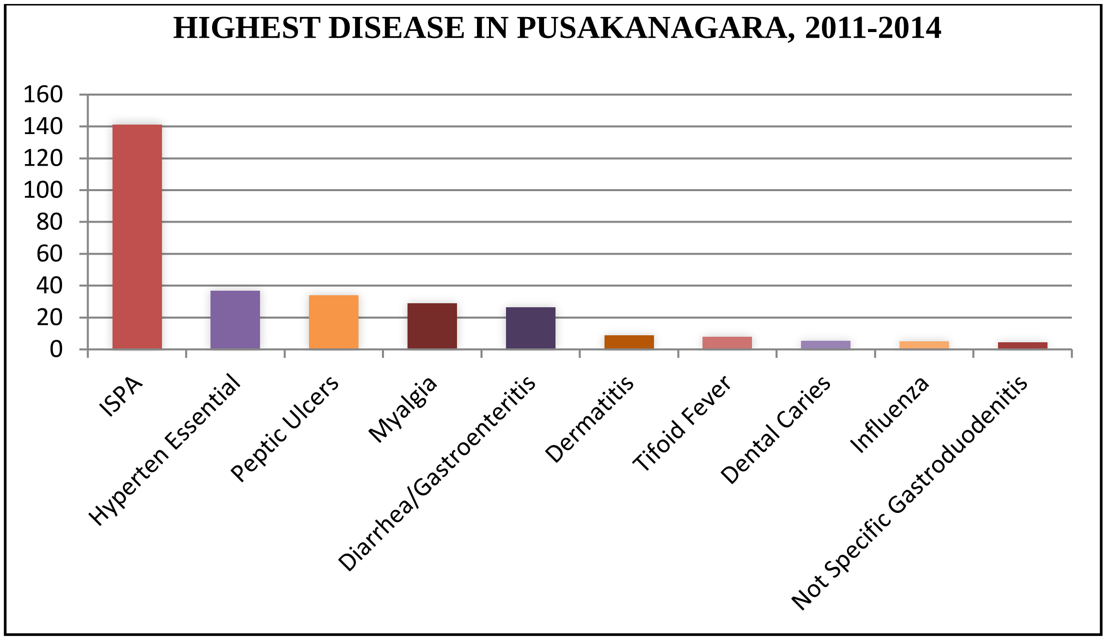


Figure 2.65. Disease Types in Pusakanagara Puskesmas year 2014

According to figure above, in Pusakanegara Puskesmas in 2014, the most dominant disease is other acute infection of respiratory tract disease as many as 141,12 cases.

Table 2.95. Number of Cases of HIV/AIDS, STI(Sexually Transmitted Infection), Dengue Fever, TBC, Diarrhea, Malaria in Pusakanagara District Year 2014.

Sub-District	HIV/AIDS	IMS	Dengue Fever	Diarrhea	TBC	Malaria
Pusakanagara (Pusakaratu, Gempol, Kalentambo, Kotasari, Rancadaka, Patimban, Mundusari)	13	226	3	1010	39	0
Total	**13**	**226**	**3**	**1010**	**39**	**0**

Source : BPS Subang Regency, 2015

To find out information about the existence of a population of around HIV / AIDS around Port development plan Patimban, secondary as well as primary data required to support information.

The method used to obtain the primary data is in-depth interview to the officer Responsible for the field of HIV / AIDS in sub-district Puskesmas Pusakanagara. Primary data was also supported by a survey in the community about the people living with HIV / AIDS. Secondary data obtained through Literature Review of Books Reports in Public Health District Health Clinics Pusakanagara.

Based on data from the health center UPTD Pusakanagara 2015 recorded a number of findings of infectious diseases in 2014. The data is described in the following table.

Table 2.96. Sexually Transmitted Diseases in Pusakanagara District

No.	Infectious Diseases	Number of people)
1.	**HIV (+) / AIDS**	**84**
2.	syphilis	23
3.	Gonorrhea (GO)	67

Source: PHC UPTD Pusakanagara 2015

People With HIV / AIDS (PLWHA) in this region, but they currently live and mingle with other people. Especially for community data that has been recorded HIV / AIDS, health centers Pusakanagara officer detailing the amount Based on year. The data is described in the following table.

Table 2.97. Number of people living with HIV / AIDS in the District Pusakanagara

No.	Year Identification PLWHA	Number of people)	Information
1.	2009 -2014	69	Gender was not recorded
2.	2015	12	- 5 men (Customer) - 7 women (Housewife, instead Female Sexual Worker / WPS)
3.	2016	3	Information : - 2 people died, - 1 treatment
amount		84	

Source: Data HIV and Leprosy Program UPTD PHC Pusakanagara 2015

From these data it can be seen that the number of AIDS patients has declined every year her. Since unidentified number of people living with HIV from 2009 to 2016 recorded 86 (+) AIDS. Until mid 2016 PLHIV diminishing as have many died. There is only one HIV-positive people who are still identified and are currently undergoing treatment at the health center Pusakanagara, especially HIV and Leprosy Field Services. To identify people living with HIV in particular, the detection process is carried directly to lokalisasis in the area around Patimban.

Party information Pusakanagara based health centers, in Patimban there are 3 Localization namely tiles, Truntum and Palm Beach. The WPS / PSK on the localization were from the local population (around Subang) as well as newcomers. Locals who became WPS in localization are from the region and Patokbeusi Ciasem. WPS is a newcomer coming from Indramayu, Cirebon and also from Tasikmalaya region.

Knowledge About HIV / AIDS In Local Environment

HIV (Human Immunodeficiency Virus) is a virus that attacks the human immune system and can cause AIDS. The existence of people living with HIV / AIDS (PLWHA) can not be known directly through visual identification as in people suffering from dengue fever or smallpox where there are particular features on the face or other body parts. Symptoms of HIV / AIDS can only be known through laboratory tests.

HIV / AIDS is often associated with sex, drug use and death, many people who do not care, do not accept, and the fear of this disease in almost all walks of life. It makes people living with HIV are often shunned because society considers dirty disease that can be transmitted and has no cure.

Questions pertaining to HIV / AIDS presented a rather sensitive question when asked of respondents. Most respondents / 74% tend to respond with answers not know people with HIV / AIDS in their immediate environment and even some respondents did not answer 4%. But there are also 22% of the respondents answered that there are people living with HIV / AIDS who live in the surrounding neighborhood. The data shown in the table below.

Table 2.98. Knowledge About HIV / AIDS at the Local Environment

No.	VILLAGE OF ORIGIN OF RESPONDENTS	PEOPLE WITH HIV / AIDS IN THE LOCAL			Total
		No answer	There is	There is no	
Pusakanagara District					
1.	Gempol	1	7	4	12
2.	Patimban	0	5	33	38
3.	Kalentambo	0	3	9	12
4.	Pusakaratu	2	2	8	12
5.	Kotasari	1	4	8	13
Pusakajaya District					
6.	Pusakajaya	0	1	12	13
Total		4	22	74	100
Percentage		4.0%	22.0%	74.0%	100.0%

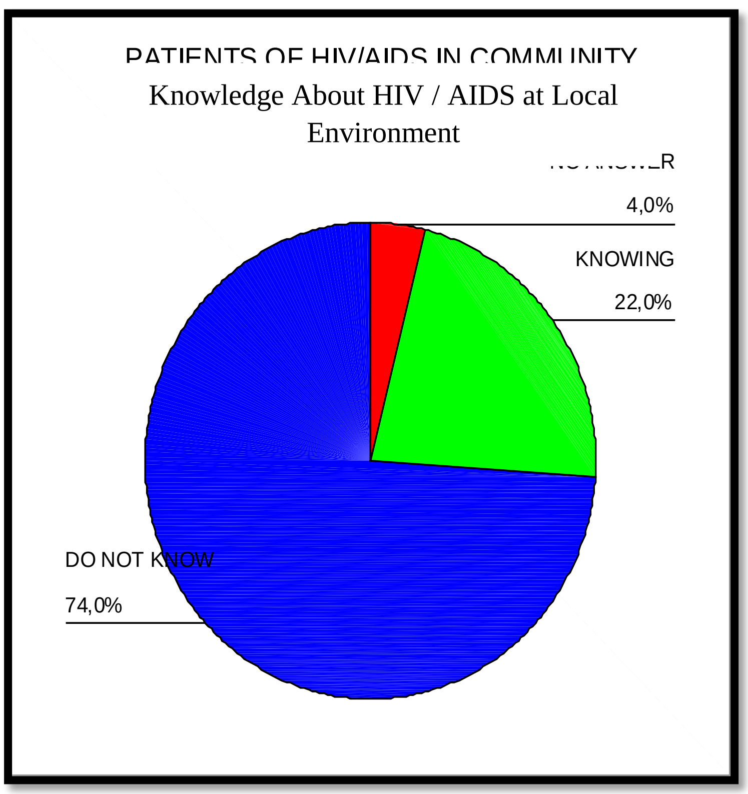


Figure 2.66. Knowledge About HIV / AIDS at the Local Environment
Source: Survey Results, 2016

Efforts handling HIV / AIDS patients by PHC Pusakanagara

In order to prevent the development of disease transmission of HIV / AIDS, sub-district Puskesmas Pusakanagara Party has undertaken various programs / activities, including :

1. Socialization prevention disease sexually transmitted directly to Lokali sasi, either to Customers Sex and the WPS / PSK. one of form prevention is with use condom if do risky sexual relationships.
2. Treatment for patients suffering from STI, GO and syphilis with Inject and Oral methods in health centers Pusakanagara.
3. Examination regularly (every 3bulan once) through VCT method
4. Cooperation with NGOs Resik for socialization prevention of STIs and HIV / AIDS.
5. Cooperate with Organization residents AIDS Care (WPA) in level village for do various activity positive with PLWHA, one only Gathering activities. time this WPA-level organizations village new in the Village Patimban and Village Kotasari while WPA level districts not yet formed.

Expectations of Port Development Patimban Related Issues HIV / AIDS

Related plans Patimban Port Development, the health center Pusakanagara have some hope in order to support the smooth development. Expectations are that:

1. Localization of existing do not dissolved / removed. The goal is that no happen spread disease the sexually transmitted bersiko high spread more large to community. localization prostitution permanent be guarded level more security strict to be more easy do supervision by various side related.
2. Focus coaching in Localization by sharing intansi related, among others Service Health and Service Social.
3. Held Mobile Clinic for watching WPS health basis fast.
4. Do socialization / education about danger transmission disease be sexually transmitted routine good the WPS or community in Spacious around Port Patimban.

2.2. Other Activities in Nearby Planned Activities

Existing condition in location which would be port is trading activity like warung and shop, shrimp pond, fish pond, fishermen, agricultural, (paddy), and other industry activity like salted fish making and terasi. Beside, there are education facility (SD) and religion facility (Mosque). Other than that, until now, sea traffic of Patimban are dominated by fishermen ship with 5 PK size. For that reason, in process of Patimban Port socialization and coordination with head of TPI, fishermen group, and PT. Pertamina is must to do. Beside, signs will be installed in this sea.

With the planned construction of Patimban Port would make largely affect it's existence and activities of the days in public. In construction location of back up area (for example), would be erased of fishpond area and agricultural area for build to be access road, operational office, parking area, electrical installation, and clean water installation. For sea area, would be affected in fishermen activity in search of fish, cause construction activity like container terminal, car terminal, petroleum terminal, seawall, berth, and other facilities. Maps of another surrounding activity in port location area figure in following figure

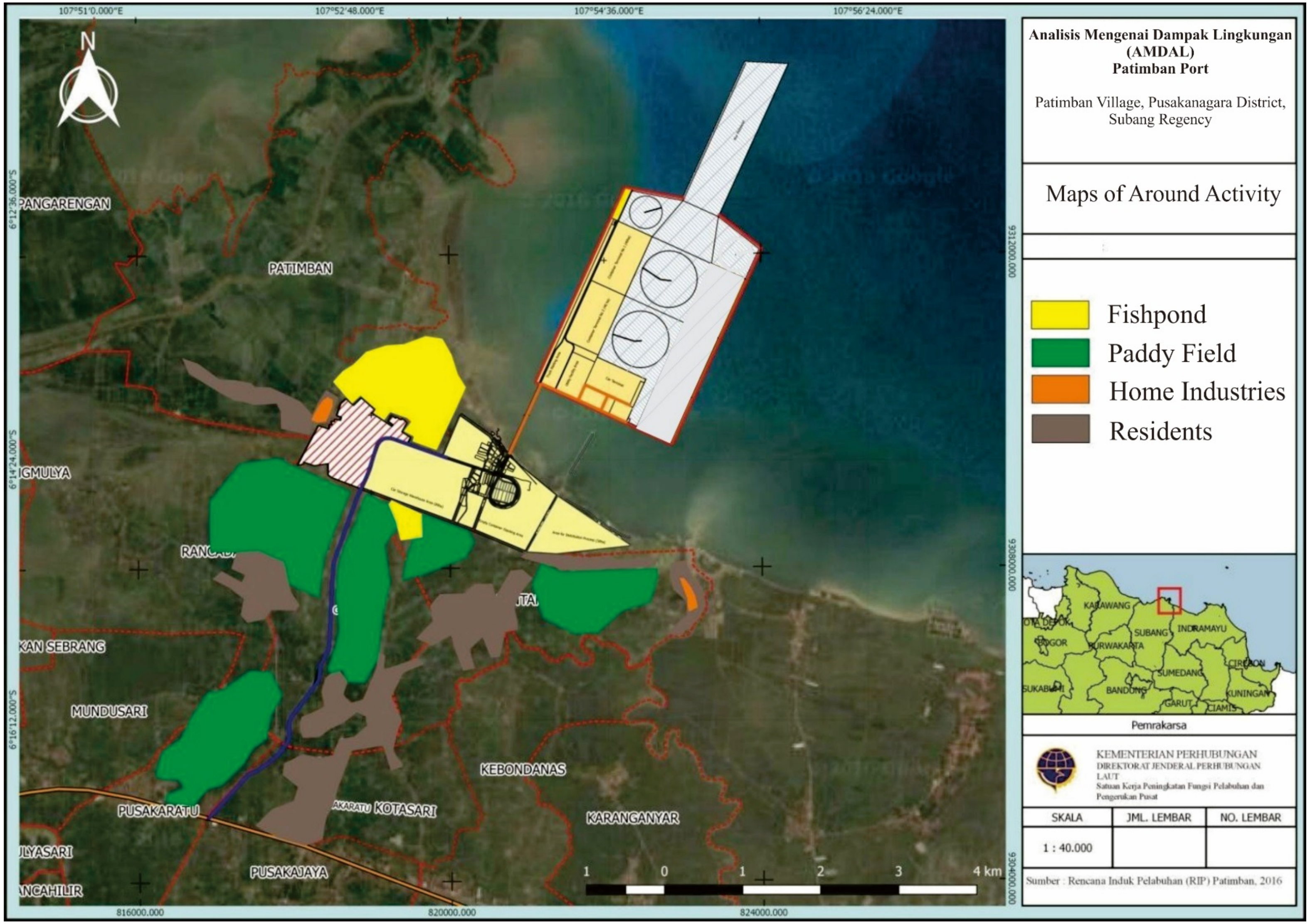


Figure 2.67. Maps of Another Surrounding Activity in Port Location Area

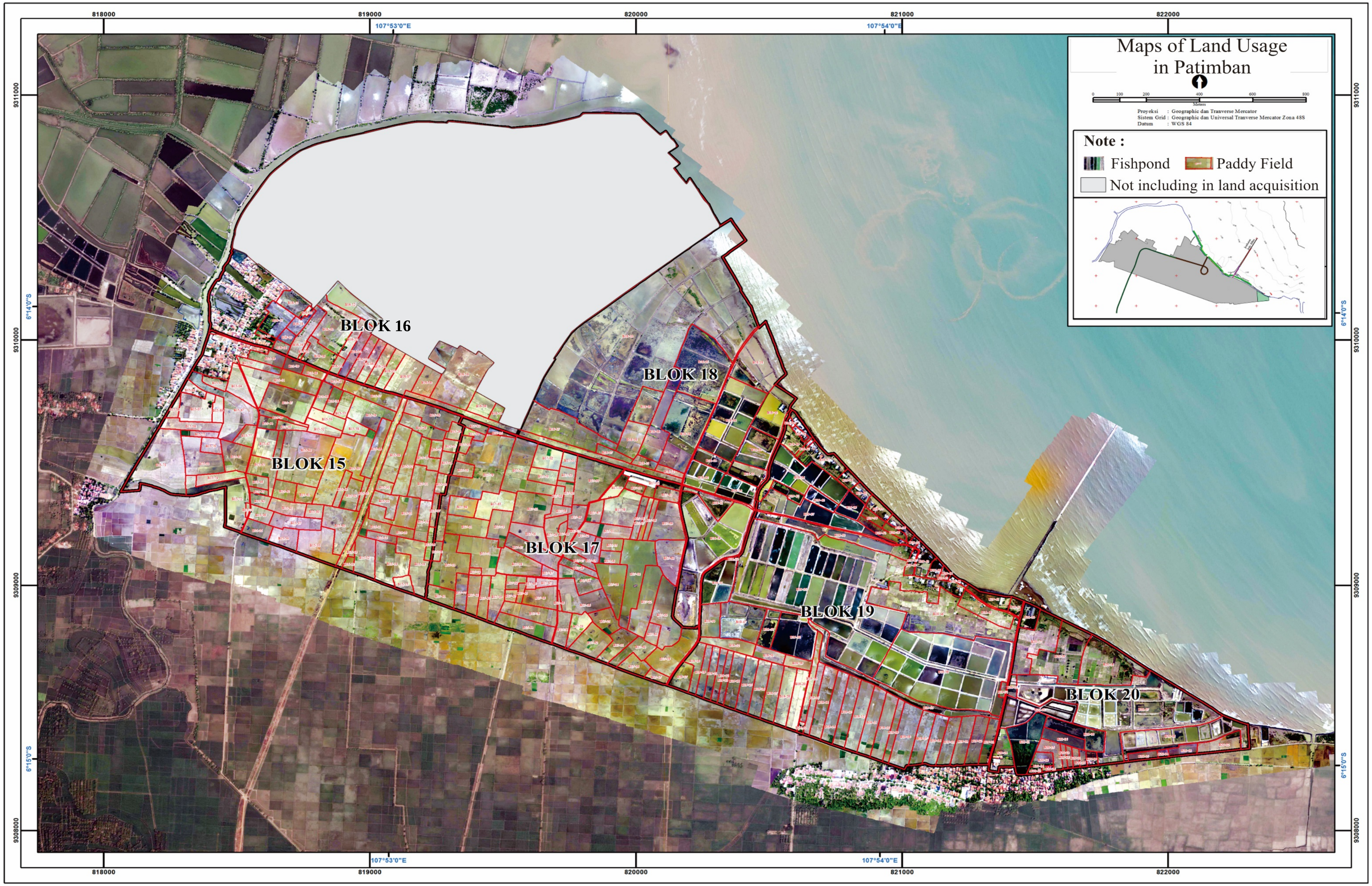


Figure 2.68. Maps of Land Use in Back up Area

CHAPTER 3

SIGNIFICANT IMPACT ASSESSMENT

Assessment of significant impact is conducted on environmental parameters including hypothetical significant impacts in accordance with the results of scoping in Chapter I. This assessment consists of 2 (two) phases, namely :

1. Assessment of Magnitude Impact

Assessment of magnitude impact is conducted to determine whether an environmental impact affects large, medium or small by assessing how large the scale changes in the environmental quality of the conditions that will come than the condition without the project before.

2. Determination of Impact Importance

Determination of important charactertistic of the impact is done by connecting every magnitude with 7 criteria of significant impact as contained in clause 22 verse (2) Regulations No. 32 Year 2009 about The Protection an management of the environment and Goverment Regulations No. 27 year 2012 about the environmental permit, as follows;

1. The number of people affected
2. The sperad area of impact
3. Intensity and duration of the impact
4. The number of other environmental components affected
5. Cumulative character of impact
6. Reversible or irreversible impact
7. Knowledge and technology criteria

Environmental parameter include Hypothetic Significant Impact and estimated impact are as follow:

3.1. Pre-Construction Phase

3.1.1. Land Acquisition

3.1.1.1. Loss of Livelihood

Land acquisition involves 2 areas, 23 Ha for *Back Up area* and 15,79 Ha for access road along 5 km. Land owners for back up area are 156 person and 106 person for access road. Land acquisition activity will cause termination of cultivation on the land both for back up area and access road. This land acquisition will cause discontinuation of cultivation on the land for the back up area and access road. And then that activity will cause loss of livelihood such as farmers, farm workers, fishponds owners, and fishpond workers. Based on the baseline survey for Resettlement Action Plan, the number of affected people are 297 persons (70 famillies) for the back-up area and 95 persons (33 families) for the access road development.

Table 3.1 Unit and People Number Affected by Back Up Area Land Acquisition

Affected asset	Types of people affected	Householder/ Unit	People number
1. Farm land	Owner	105	244
	Tenant	1	1
	worker	27	27
2. Fishpond	Owner (Induvidualal)	24	55
	Owner (Company)	1	-
	Tenant	23	48
	Worker	18	18
Total		**199**	**393**

Source : LARAP Survey Team, 2017

Furthermore, the number of people affected by access road land acquisition is in this following table

Table 3.2. The Number of People Affected by Access Road Land Acquisition

Affected asset	Types of people affected	Householder/ Unit	People number
1.Farm land	Owner	45	104
	Tenant	14	20
	worker	14	14
2. Fishpond	Owner (Induvidualal)	1	4
Total		**74**	**142**

Source : LARAP Survey Team, 2017

Table 3.3. The number of Householders and People Required to Relocate

Area	The number of householder	The number of people
Back Up Area	70	297
Access road	33	95
Total	103	392

Source : LARAP Survey Team, 2017

Table 3.4. The Whole Number of Unit and People Affected by Back up area and Access Road Land Acquisition

Affected asset	Types of people affected	Number of people
1. Farm land	Owner	348
	Tenant	21
	worker	41
2. Fishpond	Owner (Induvidualal)	59
	Owner (Company)	-
	Tenant	48
	Worker	18
Total		**535**

The change or loss of livelyhood especially will occur to farmer owners, tenants, or workers, along with brackish water fish farmer (fishpond) both of owner, tenants, and workers (with commodity of fishmilk and vannamei shrimp) whom affected by land acquisition for Back up area and access road.

Loss of Farmer Livelyhood

Agriculture activity in Pusakanagara district is one of Patimban people main livelyhood beside aquaculture and capture fisheries. The loss of Patimban farmmers livelyhood counts with operational cost analysis as follows:

Table 3.5. Operational Cost of Farmer/Harvest

No.	Uraian	Amount (Rp)
A. Modal		
1	Benih, 30 kg @ Rp. 8.000	240.000
2	Pupuk kandang 1000 kg @ Rp. 1.000	1.000.000
3	Pupuk Urea, 150 kg @ Rp. 1.300	195.000
4	Pupuk SP36, 100 kg @ Rp. 2.200	220.000
5	Pupuk NPK Ponska 300 kg @ Rp. 2.300	690.000
6	Petroganik, 1000 kg @ Rp. 500	500.000
7	Pestisida / Insektisida, 2 liter @ Rp. 75.000	150.000
	Amount Modal (A)	**2.995.000**
B.Biaya Operasional / Upah Kerja		

1	Pengolahan lahan 30 HOKp @ 30.000 atau wholesale	900.000
2	Pencabutan bibit + penanaman 20 HOKw @ Rp.45.000	900.000
3	Penyiangan + pemupukan ke-1 16 HOKp @ Rp. 50.000	800.000
4	Penyiangan + pemupukan ke-2 16 HOKp @ Rp. 50.000	800.000
5	Penyemprotan 4 HOKp @ Rp. 50.000	200.000
6	Panen dan pasca panen 12 HOKp @ Rp. 50.000	600.000
7	Biaya pengeringan 8 HOKp @ Rp. 50.000	400.000
	Amount Biaya Operasional (B)	**4.600.000**
	Pengeluaran (A+B)	**7.595.000**

Source : Survey and analysis, 2017

Income

- Paddyrice productivity of Pusakanagara district based on Subang regency BPS data 2014 = 47,02 ton/ha/year (as describe previously in section 2).
- After exsiccate 18% so the result ,1 ton GKG per hectare
- Therefore Pusakanagara net paddyrice productivity is 38,56 ton/ha.
- Price for 1 kg GKG is Rp. 4.000.

So, the crops that obtained by farmer per Pusakanagara district = 38.560 kg x Rp. 4.000= Rp. 154.240.000

Notes :

GKP = Gabah Kering Panen (crop dry grain)

GKG = Gabah Kering Giling (dried paddy)

- If IP (Index Planting) Paddyrice in Pusakanagara **district is 2 x once a year/harvest cycles.**
- Expenses for farming every year: Rp.7.595.000 x 2 harvest cycles = Rp.15.190.000/year

Profit

= Income – outcome

= Rp. 154.240.000– Rp.15.190.000

= Rp. 139.050.000/year

Distribution system of agricultural products in Pusakanagara district use profit sdayng system called “maro” (‘maro’ system explanation describe in the last part of livelyhood loss and income change estimation). The profit that obtained by land owner and tenant is crop profit/year devided by 2 Rp. 139.050.000/year : 2 = Rp. 69.525.000/owner/year.

Workers average income in agriculture activity/month (HOK) is Rp.850.000 = Rp.10.200.000. Therefore, loss of income from agriculture aspect for land owner is Rp. 69.525.000/owner/year, renter Rp. 69.525.000/renter/year, and worker Rp.10.200.000/person/year.

Milkfish Farmer Income Loss

Based on the baseline survey of farming ponds in back up area location, there are 2 pond that used for milkfish farming on area of 1 Ha/swath. It is located in Patimban village Dusun Genteng.

The milkfish farming activity is done by the stocking density of 4.000 – 5.000 fish/Ha. The milkfish farming activity is carried out for 4 months/cycle, so the farming activity can be done as much as 3 cycles in a year. The harvesting activity is done when the milkfish reach the size of 6-8 fish/kgs. These are the income analysis of milkfish farming activity per swath per production cycle in the project site area (back-up area) in Patimban Village:

Table 3.6. Expenditures for Milkfish Production

Component	Piece	Price (Rp)	unit	Amount	description
Preparation cost					
Vitamine, Ursal and Probiotic	Bag	50,000	4	200,000	wholesale
Nener	fish	800	5,000	4,000,000	
Saponin	Kg	8,000	50	400,000	
Workers cost					
Land preparation	Day person work	1,500,000	1	1,500,000	wholesale
Harvest	Day person work	100,000	4	400,000	
Expenditures				6,500,000	

Source: Survey and analysis, 2017

Table 3.7. Income for Fishmilk Production

SR =80%	4,000	Fish
Production	666.67	Kg
Income	Rp	10,000,000 / cycle
	Rp.	30.000.000/year

Source: Survey and analysis, 2017

Based on both table above, it is known that the loss of income caused land lost that used as project site is Rp.3.500.000/pond/cycle. Therefore, loss of income from fishpond farming is Rp.3.500.000/pond/cycle x 3 cycle/year = 10.500.000. The negative impact felt quite large by fishpond owners and workers. While the aspiration from fishpond/milkfish farmer is suitable land replacements, and they could be involved in Patimban Seaport development activity.

Vanamei shrimp farmer loss of income

Venamei shrimp farming activity is done with intensive technology. It marked by high stocking density which is 100 shrimp/m^2. Seed that used for shrimp farming activity is *Post larvae* (PL) aged 5 days old. In production activity, 1 cycle cultivation has 6 months periods. So there are 2 venamei shrimp harvest cycle in a year.

Venamei shrimp harvest activity is done partialy, where the first harvest is done in size 80 (shrimp/kg), while the second harvest is done in size 50 (shrimp/kg). Average market price for size 80 is Rp.60.000 ekor/kg, while for size 50 is Rp.80.000.

Partial harvesting activity is generally done 30% at phase I for size 80 and 70% at phase 2 for size 50. In 1 cycle of production, production average is 8 ton.

Venamei shrimp farming is capital intensive activity. However, this activity is also producing high profit from each production. Here is the analysis of income from venamei shrimp farming intensively in the project site area.

Table 3.8. Expenditure for Shrimp Vanamei Production Intensively per cycle

Component	Piece	Price (Rp)	Unit	Amount	Description
Preparation cost					
Plastic	Roll	5,000,000	4	20,000,000	
Benur PL-5	fish	45	500,000	22,500,000	
Calx	Kg	1,000	2,000	2,000,000	
Maintenance cost					
Urea	Kg	15	2,000	30,000	
Bran	Kg	3,000	300	900,000	
Fish feed	Kg	16,000	10,000	160,000,000	
Electricity		40,000,000	1	40,000,000	1 Cycle
Spool	Unit	572,000	7	4,004,000	
Workers cost					
Land preparation	Day person work	7,000,000	1	7,000,000	Wholesale

Component	Piece	Price (Rp)	Unit	Amount	Description
Harvest	Day person work	4,000,000	1	4,000,000	Wholesale
Security	Person month	2,500,000	4	10,000,000	
Feeder	Person month	2,500,000	4	10,000,000	
Technician	Person month	4,000,000	6	24,000,000	
Expenditures				**304,434,000**	

Source : Survey and analysis, 2017

Table 3.9. Income from Vanamei shrimp production Intensively per Cycle

SR =80%	400,000	Fish
Partial harvest 1	120,000	Fish
Partial harvest 2	280,000	Fish
Partial harvest 1 production	1,500	Kg
Partial harvest 2 production	5,600	Kg
Partial harvest 1 income	Rp	120,000,000
Partial harvest 2 income	Rp	448,000,000
Amount of income	Rp	568,000,000 / Cycle
	Rp.	1.136.000.000 /year

Source : Survey and analysis, 2017

Outcome which is obtained by fishmilk ponds owner (Rp.30.000.000/year) and venamei shrimp (1.136.000.000 /year) in Pusakanagara district is Rp. 1.166.000.000/year.

Sdayng profit system for both of agriculture land owner and fishpond farming with the sharecroppers in Patimban is using “maro” system. Profit sdayng system bridge land owners needs to the sharecroppers to manage their land with the needs of land availability from farmer community whom landless.

“Maro’ sdayng profit system can be done by :

- Before give the land to the sharecroppers, owner get some money – profit sdayng 50 % of crops per cultivate season; workers who provide production facilities.
- Before cultivation, land owner obtain crops that worth the money and then share the profit 50%
- Sharecroppers provide production facility; owner requires a certain portion from the crops; the rest of crops is devided equally; workers provide all of cost needed including worker

Table 3.10. Estimation Analysis of livelyhood and Income Loss Impacts caused by Patimban Seaport Development

No.	Livelihood sector	Worker unit	Without Project (Wo/P)		With Project (Wi/P)		Besaran Dampak (Wi/P - Wo/P)	
			Person	Rupiah/Year	Person	Rupiah/Year	Person	Rupiah/Year
1.	Agriculture	Owner	348	695.250.000	348	0	348	-695.250.000
2.		Tenant	21	695.250.000	21	0	21	-695.250.000
3.		Worker	41	102.000.000	41	0	41	-102.000.000
4.	Fishpond	Milkfish Owner (Induvidual)	59	150.000.000	59	0	59	-150.000.000
5.		Shrimp owner (Induvidual)		5.680.000.000		0		-5.680.000.000
6..		Milkfish ponds tenant	48	150.000.000	48	0	48	-150.000.000
7.		Shrimp pond tenant		5.680.000.000		0		-5.680.000.000
8.		Milkfish pond worker	18	60.000.000	18	0	18	-60.000.000
9.		Shrimp pond worker		84.000.000		0		-84.000.000
Amount			**535**	**13.296.500.000**	**535**	**-**	**535**	**-13.296.500.000**

Source : Calculation result, 2017

Land acquisition will cause loss of livelyhood and change of income from agriculture aspect and brackish water fishponds (fishmilk and shrimp) untill 0 rupiah/year. Therefore land acquisition can be categorized into activity that can cause significant impact to the decreasing of farming production and brackish water fishponds (fishmilk and shrimp).

These impacts are Negative significant impact (P-) based on consideration :

1. **The number of people affected**

   People affected are land owners, tenants and farm/pond workers who work on land for back up area and access road. The number of land farming owner are 348 person, tenants are 21 person, and workers are 41 person. The number of fishpond owner are 59 person, tenants are 48 person, and workers are 18 person. So, the impact is **significant impact (P)**.

2. **Impact Spread Area**

   Impact spread area is more than one village consist of Pusakaratu village, Kalentambo village, Kotasari, and Patimban, Pusakanagara district and Pusakajaya village, Pusakajaya district. So the impact is rated as **significant impact (P).**

3. **Duration and intensity of impact**

   As told before, the land acquisition process will cause discontinuation of cultivation so that many people will lost their livelihood specifically in the farming and fishpond sectors. Although the activities happens in short duration, but the impact will continue especially when they do not get a replacement livelihood. It will cause aftereffects to the loss of income that reach total number of **(–) Rp13.296.500.000/ year.** So, this impact is **significant impact (P)**.

4. **Other Component Affected**

   Other component affected is social component, which is public unrest, so the impact rated as **significant impact (P)**

5. **Cummulative Nature of Impact**

   Impact source of livelihood loss only come from land acquisition activity, so the impact is not cummulative. Based on estimation in this criteria, impact is rated as **non significant impact (TP)**.

6. **Reversible or irreversible impact**

   Impact is irreversible, because farmer and farm/pond workers can't back to work on that land untill they able to find other job. So, impact is rated as **significant impact (P)**.

3.1.1.2. Lost of land Productivity

Based on field analysis and spatial validation, land use in Patimban Seaport development plan in Patimban village is classified into 9 category as seen in the table 3-11. Refering to the result of spatial quantification analysis, the biggest land use in the back up area is 207,24 ha for ricefields, and then followed by fishponds on 113,15 ha area. The rests are used for agriculture, funeral, meadow, yard, road, irrigation, and river. Land use area in the back up area is in the following table:

Table 3.11. Land use area in the *Back-Up Area*

No.	Land use	Width (m^2)	Width (ha)
1	Irrigation	9,975.27	1.0
2	Road	34,164.84	3.42
3	Funeral	5,318.89	0.53
4	Farm	186,171.02	18,62
5	Built land	87,733.07	8.77
6	Meadow	26,183.63	2.62
7	Sawah	2,073,269.67	207,33
8	Sungai	7,895.23	0.79
9	Tambak Air Payau	1,131,524.54	113,15
	Total	**3,562,297.99**	**356,23**

Source : Spacial Quantification Analysis 2016

Here is the analysis of farming, ricefields, and brackish water fishpond productivity decline from land use of Patimban Seaport back up area.

Scale of impact to the farming, ricefields, and brackish water fishpond productivity decline will be count with formulas:

$$\mathrm{Pr}_0 = \sum_{j=1}^{n} 1_j \, \mathrm{Pr}_j$$

$$\mathrm{Pr}_{tp} = \sum_{j=1}^{n} 1_{tpj} \, \mathrm{Pr}_{tpj}$$

$$\mathrm{Pr}_{dp} = \sum_{j=1}^{n} (1_{tpj} - 1_{ij}) \, \mathrm{Pr}_{dpj}$$

Where :

l	=	Land area of farming/ricefield/brackish water fishpond;
Pr	=	production (Rp/ha);
l_{tp} dan Pr_{tp}	=	consecutive area and production at time t_1 without project;
l_i	=	Land area of farming/ricefield/brackish water fishpond developed
Pr_{dp}	=	Production with project at time t_1
J	=	Kind of plantation;

Patimban Seaport Development Impact to The farming and Ricefield

Farming and ricefield production at time t_1 is estimated not simillar to the baseline t_0, because of agriculture intensification, so the activity impact to the farming and ricefield production is :

$$\mathbf{\Delta\ Pr = (Pr_{dp} - Pr_{tp})}$$

If :

L	:	Ricefield and moor (as described in the section 2 Detail of Baseline) = 1.710,48 ha;
Pr	:	Paddyrice productivity in the Pusakanagara district bsed on data of Subang regency BPS 2014 = 47,02 ton/ha/year (as described in the section 2)
l_{tp} dan Pr_{tp}	:	1.710,48 ha and 47,02 ton/ha
l_i	:	Developed farm and ricefields land area = 18,62+207,33 = 225,95 ha
J	:	Paddy-rice;

Answer:

Paddyrice production :

Pr_{tp} = 1.710,48 ha x 47,02 ton/ha = 80.427 ton/ha

Pr_{dp} = (1.710,48 – 225,95) ha x 47,02 ton/ha

= 1.484,53 x 47,02 ton/ha

= 69.803 ton/ha

Δ Pr = (Pr_{dp} – Pr_{tp}) = 69.803 - 80.427 ton/ha/year

= (minus) 10.624 ton/ha/year

Patimban seaport development project in 2027 potentially make Pusakanagara district area loss of farming production potency as much as **(minus) 10.624 ton/ha/year x 10 year = 106.240 ton/ha.**

Patimban Seaport Development Impact to The Fishmilk Ponds

Impact of Patimban seaport development activity to the fishmilk ponds production is:

$$\Delta \mathbf{Pr = (Pr_{dp} - Pr_{tp})}$$

If :

L	:	Brackish water ponds area (as described in section 2 environmental hue) = 461,73 ha;
Pr	:	Fishmilk ponds productivity/year in Pusakanagara district based on primary data = 2 ton/ha
l_{tp} dan Pr_{tp}	:	461,73 ha and 2 ton/ha
l_i	:	113,15 ha
J	:	Brckish water pond

Answer :

Fishmilk ponds production

Pr_{tp} = 461,73 ha x 2 ton/ha = 923,46 ton/ha

Pr_{dp} = (461,73 – 113,15) ha x 2 ton/ha

= 348,58 ha x 2 ton/ha

=697,16 ton/ha

$$\Delta \mathbf{Pr = (Pr_{dp} - Pr_{tp}) = 697.16 - 923{,}46\ ton/ha/year}$$

$$\mathbf{= (minus)\ 226{,}30\ ton/ha/year}$$

Patimban seaport development project in 2027 potentially make Pusakanagara district area loss of fishmilk ponds production potency as much as **(minus) 226.3 ton/ha/year** x **10 = 2.263,0 ton/ha**

Patimban Seaport Development Impact to The Venamei Shrimp ponds

Patimban Seaport Development Impact to The Venamei Shrimp ponds production is :

$$\Delta \mathbf{Pr = (Pr_{dp} - Pr_{tp})}$$

If:

L	:	Brackish water ponds area (as described in section 2 environmental hue) = 461,73 ha;
Pr	:	Venamei shrimp ponds productivity/year in Pusakanagara district based on

primary data = 8 ton/ha

l_{tp} dan Pr_{tp} : 461,73 ha and 8 ton/ha

l_i : 113,15 ha

J : Brackish water pond

Answer :

Brackish water production

Pr_{tp} = 461,73 ha x 8 ton/ha = 3.693,84 ton/ha

Pr_{dp} = (461,73 – 113,15) ha x 8 ton/ha

= 348,58 ha x 8 ton/ha

= 2.788,64 ton/ha

Δ Pr = (Pr_{dp} – Pr_{tp}) = 2.788,64 - 3.693,84 ton/ha/year

= (minus) 905,2 ton/ha/year

Patimban seaport development project in 2027 potentially make Pusakanagara district area loss of brackish water production potency as much as **(minus) 905,2 ton/ha/year** x **10 = 9.502 ton/ha**

Table 3.12. Analysis of Impact Estimation of Land Productivity Loss with Patimban Seaport Development in Pusakanagara District

No.	Type of Land	Without Project (Wo/P) (ton/ha)	With Project (Wi/P) (ton/ha)	Magnitude of impact (Wi/P-Wo/P) (ton/ha)
1.	Farm and Ricefields	69.803	80.427	-10.624
2.	Brackish water pond (Fishmilk)	697,16	923,46	-226,30
3.	Brackish water pond (Fishmilk)	2.788,64	3.693,84	-905,20
	Amount	**73.288,80**	**85.044,30**	**-11.755,50**

Source : Consultant analysis, 2017

Seen from the magnitude of land productivity loss which is 11.755 ton/ha from land acquisition activity, it can be categorized into causing significant impact.

This impact is rated as Negative Significant Impact (P-) based on consideration :

1. The Number of People Affected

The affected people is land owner, tenants, and farm/ponds workers that work in the land for Back up area and access road. The number of farm land owners are 348 person, tenants are 21 person, and workers are 41 person. While the number of Induvidualal fishpond owners are 59 person, tenants are 48 person, and workers are 18 person. So the impact is rated as **significant impact (P)**.

2. **Impact Spread Area**

   Impact spread area is more than one village consist of Pusakaratu village, Kalentambo village, Kotasari, and Patimban, Pusakanagara district and Pusakajaya village, Pusakajaya district. So the impact is rated as **significant impact (P).**

3. **Duration and Intensity of Impact**

   Based on the calculation above, Patimban seaport development project in 2027 potentially make Pusakanagara district area loss of agriculture production potency as much as **(minus) 10.624 ton/ha, fishmilk ponds (minus)226.3 ton/ha** and Venamei shrimp ponds **(minus) 905,20 ton/ha**. Thus the impact is rated as **significant impact (P)**.

4. **Other Component Affected**

   Other component affected is social component sosial that is public unrest, So the impact is rated as **significant impact (P).**

5. **Cummulative Nature of Impact**

   Impact source of livelihood loss only come from land acquisition activity, so the impact is not cummulative. Based on estimation in this criteria, impact is rated as **non significant impact (TP)**.

6. **Reversible or Irreversible Impact**

   Impact is irreversible, because farmer and workers can't work in those land anymore untill they able to look for another job. So, the impact is rated as **significant impact (P).**

3.1.1.3. Public Unrest

Land acquisition activity is estimated affect to public unrest as the result of livelihood loss and decreasing of agriculture productivity due to land conversion from farmland and fishpond to back up area and access road.

The decreasing or even the loss of arable land such as fishponds and ricefields induce public unrest about the loss of their main livelyhood source. It is in accordance with survey result that with the highest persentage of 30% respondents feel worried with the Patimban Seaport development plan, because of the loss of livelyhood as the result of land conversion from farming and fishpond area to the back up area and access road, especially for sharecroppers and fishpond farmer. Hence, land acquisition impacts is quite potentially make public unrest generally and farmer unrest especially. If there's not handling on public unrest as the result of land acquisition and it is allowed to be protracted, so it may cause potential conflict in the public. So that, land acquisition activity can be categorized to arouse significant impact of \public unrest.

So that, land acquisition activity can be categorized as rise big impact to the public unrest.

Table 3.13. Analysis of Public Unrest Impact Estimation in The Construction Phase

No.	Types of Impact	Without Project (Wo/P)	With Project (Wi/P)	Besaran Dampak (Wi/P- Wo/P)
1.	Public unrest percentage as the effect of development plan	Public unrest is unidentify without seaport project	There are 30% respondents state worries	30% respondents feel worried due to livelihood and income loss

Source : Consultant analysis, 2017

This impact is rated as Negative significant impact (P-) based on consideration:

1. **The Number of People Affected**

   The affected people is land owner, tenants, and farm/ponds workers that work in the land for Back up area and access road. The number of farm land owners are 244 person, tenants are 1 person, and farm workers are 27 person. While the number of individual fishpond owners are 55 person, tenants are 48 person, and workers are 18 person. So the impact is rated as **significant impact (P).**

2. **Impact Spread Area**

   Dispersion area of impact is more than 1 village,consists of Pusakaratu village, Gempol, Kalentambo, Kotasari, and Patimban, Pusakanagara district and Pusakajaya village, Pusakajaya district. So, the impact is rated as **significant impact (P).**

3. **Duration and Intensity of Impact**

   As told before, the land acquisition process will cause discontinuation of cultivation so that many people will lost their livelihood specifically as farmers and farm workers. Although the activities happens in short duration, but the impact will continue especially when they do not get a replacement livelihood. So, this impact is estimated to be **significant impacts (P)**.

4. **Other Component Affected**

   Other Component Affected is social component that is public unrest, so the impact is rated as **significant impact (P).**

5. **Cummulative Nature of Impact**

   The impact source of livelyhood loss is only come from land acquisition, so the impact is non cumulative. Based on estimation, impact is rated as **non significant impact (TP)**.

6. **Reversible or Irreversible Impact**

Impact is irreversible, because farmer and farm/pond worker is not able to back to work in those lands untill they can look after another job. So, the impact is **significant impact (P)**

3.2. Construction Phase

3.2.1. Procurement of Labor and Operation Basecamp

3.2.1.1. Job and Bussiness Opportunity

The needs of construction worker are 1.030 person for Phase I stage 1, and 680 person for Phase I stage 2, about >20% workers is prioritized local people, as seen in the table below. The neeeds of local workers is estimated 206 person for all phase 1.

Table 3.14. Estimation of Construction Workers Phase I Stage 1 – Phase I Stage 2

Section	Phase	Total workers
Port	Phase I-1	560
	Phase I-2	390
Road	Phase I-1	470
	Phase I-2	290
Total	Phase I-1	1,030
	Phase I-2	680

Source : JICA Survey Team

Estimation of job and business opportunities impacts are determined by comparing recruited local workers ratio with the required total workers to recruited total workers ratio with unemployment number in the study area. In the description of the environmental baseline, it is known that the number of other category (people who do not have a permanent job) from 2 districts is 481 person (See section type of work). The ued formula is:

$$\mathbf{LO} = \frac{LO\ in/LOn}{LOn/UL} \mathbf{x\ 100\ \%}$$

Which :

LO : Job opportunity rate

LO in : Number of recruited local worker

LO n : Total number of total recruited workers

UL : Number of unemployment people around study area

The impact criteria is as follow :

(i) Activity has significant impact in make job opportunity if LO = 1

(ii) Activity has enough impact if LO is valued between 0 to less than 1 and more than 1 – 2; and

(iii) Activity has less impact if LO more than 2

Calculation of those formulas area :

$$LO = \frac{1.710/206}{1.710/481} x\ 100\ \%$$

$$= 2,3$$

Through that calculation, it is obtained the conclusion that job opportunity impact criteria has fair value. However, job opportunity is very needed by local people, so it is very important to be sought for job seekers around the location of Patimban seaport development. It need to be consider that the impact of created job opportunity is different with business opportunity. With the huge number of required workers, it will create job opportunities and business opportunities for the people around the project location. Most of workers who are not come from that area will stay in basecamp which is completed with canteen that can be managed by local people. Providing shelter and its supporting facilities will also completed with canteen/food stalls with expected capacity that can fullfill workers eat and drink needs everyday. Beside canteen/food stall, workers also need other daily needs such as bathing and washing needs. Those needs can be fullfilled by shop/groceries around the project site.

The impacts of created business opportunity are estimated by counting the potential foodservice and lodging that may appear from Patimban seaport development activity :

- ❖ **Food service**

The total number of construction workers (person) x construction time (day) x 3 times eating/day x Price of a meal (rupiah) :

1.030 person x 720 days x 3 x Rp.15.000 = Rp. 33.372.000.000

- ❖ **Lodging services**

The number of recruited commuter (non-local) construction workers (person) x construction time (month) x rent price/month (Rupiah) :

824 person x 24 month x Rp.300.000 = Rp. 5.932.800.000

Table 3.15. Analysis of Job and Business opportunities Impact with Patimban Seaport Development in Location affected

No.	Business opportunity	Without Project (Wo/P)	With Project (Wi/P)	Scale of impact (Wi/P- Wo/P)
1.	Food service	0	33.372.000.000	33.372.000.000
2.	Lodging service	0	5.932.800.000	5.932.800.000
	Total	**0**	**39.304.800.000**	**(+) 39.304.800.000**

Source: Consultant analysis, 2017

It is expected with the appearance of food and lodging services business will increase local peopple standard of living. Regarding the calculation result, so the positive impact that occured is categorized as significant. Seeing from impact of interset based on significant impact criteria, so the impact of workers employment activity to the job opportunity parameter can be described as follow :

1. **The Number of People Affected**

   The local residents that will accept the benefits of this activity is estimated around 206 person (20%), they have big opportunities to be recruited as construction workers. As for business opportunities, the big opportunities comes from food and lodging services for non-local workers. So that job opportunity for local people and business opportunities in workers employment activities are predicted as **significant impacts (P)**.

2. **Impact Spread Area**

   Employment procurement activities potentially involving workers from outside and also various villages around project area such as Pusakaratu Village, Gempol Village, Kalentambo Village, Kotasari Village and Patimban Village, District Pusakanagara. Because of that the impact is considered to be **significant impacts (P)**.

3. **Duration and Intensity of Impact**

   Workers employment activity to the job opportunity is estimated to occur in quite long term around 24 months, so the impact is estimated as **significant impact (P).**

4. **The Other Component Affected**

   There are no other environmental components affected by the activities of emplotment procurement, so that the impact is considered as **non significant impact (TP)**.

5. **Cummulative Nature of Impact**

   Impact of job and business opportunities are not cummulative. So, the impact is predicted as **non significant impact (TP)**.

6. Reversible or Irreversible Impact

Impact of job and business opportunity parameter can be reversible because people either can work or have business in others place or sector. So, the impact that appeared is estimated as **non significant impact (TP)**

Based on description above, so the impact of workers employment to the job opportunity is estimated as **positive significant impact (+P)**.

3.2.2. Mobilization of Heavy Equipment and Materials

3.2.2.1. Road Traffic Disruption

Most of heavy equipment and material mobilization for seaport development will be through sea route. While for back up area and access road, heavy equipment and material mobilization will be through land route.

Rock material will be taken from Purwakarta, so the mobilization route is : material is transported from purwakarta – Jalan Raya Sukatani – Jl. Ciganea – Jl. Tol Cipularang – Jl. Tol Jakarta Cikampek – Jalan Pantura – seaport access road (seaport access road that has been freed by Subang government). The estimated number of trucks are 123 ritation per day for access road construction materials mobilization and 77 ritation for seaport development material mobilization (rocks). Using work assumption 8 hours, calibrated with 1,3 and round-trip transport, so the extra traffic volume obtained from materials mobilization is 40 smp per hour. Based on that route and high amount of truck, traffic disruption is estimated to occur around the crossing between access road and Pantura road.

Table 3.16. VCR Value in Material and Heavy Equipment Mobilization Construction Phase

Time	Point	Existing *(Without Project)*			Tahap konstruksi + Eksisting *(With Project)*			Magnitude impact/ Change from existing + construction (%)
		Volume (smp/jam)	Capacity	VCR existing	Volume (smp/jam)	VCR	Service rate	
Morning peak hour (07.00-08.00)	1	536	**1576**	0.34	576	0.37	B	7.47
	2	827	**1576**	0.52	867	0.55	C	4.84
Afternoon peak hour (12.00-13.00)	1	585	**1576**	0.37	625	0.40	B	6.84
	2	779	**1576**	0.49	819	0.52	C	5.14
Evening peak hour (16.00-17.00)	1	899	**1576**	0.57	939	0.60	C	4.45
	2	1083	**1576**	0.69	1123	0.71	C	3.69
Night peak	1	432	**1576**	0.27	472	0.30	B	9.25

Time	Point	Existing *(Without Project)*			Tahap konstruksi + Eksisting *(With Project)*			Magnitude impact/ Change from existing + construction (%)
		Volume (smp/jam)	Capacity	VCR existing	Volume (smp/jam)	VCR	Service rate	
hour (18.00-19.00)	2	642	**1576**	0.41	682	0.43	B	6.23

Description :

1. Pantura road Pusakanagara head to Cirebon , 06º17.086' S dan 107º52.533' T
2. Pantura road Pusakanagara head to Pamanukan , 06º17.080' S dan 107º52.50' T

From the table above, it show that VCR average is increasing around 0.03 or the average of the increasing traffic volume is around 9.25 %. It show non-significant increasing volume. The rise of traffic volume around 200 trucks per day will affect the traffic around the crossing between access road and Pantura road crossroads. Deceleration of vehicle speed will occur in the crossroads as the result of traffic volume increase and material mobilization activity.

Seen from the aspect of the impact of interest, so it can be analyzed as follows:

1. **The Number of People Affected**

   The number of people affected are people along the crossing between access road and Pusakanagara Pantura road which is became mobilization route and road user make this impact as **significant impact (P)**

2. **Impact Spread Area**

   Impact dispersion area is Pusakanagara Pantura road which is became mobilization route in the study area. So, the impact is **significant (P).**

3. **Duration and Intensity of Impact**

   Impact occur during material mobilization activity which is 60 months with vehicle ritation is 200 truck. The deceleration is estimated to be occur and will affect to others vehicle speed, so it will cause traffic jam. So that, this impact is **significant impact (P).**

4. **The Other Component Affected**

   The other environmental component that will be affected by impact is public unrest as the result of traffic jam. So the impact is **significant (P).**

5. **Cummulative Nature of Impact**

   Traffic seizure impact is cummulative because it will occur increasing of traffic volume during 8 hours per day for 60 months. It can be categorized into **significant impact (P).**

6. **Reversible or Irreversible Impact**

   Although temporary, the impact can't be reversible with management because the seizure will be still high so the impact is **significant (P).**

Based on description above, it can be said that material mobilization activity has **significant negative impact (-P)** to the land traffic.

3.2.2.2. Decreasing of Air Quality

Construction material transportation activity involve many heavy vehicle type dump truck as many as 123 ritation per day for access road construction material mobilization and 77 ritation for seaport development material mobilization (rock). So the total ritation is 200 ritation trucks per day. Those vehicles activity use fuel oil so it will produce exhaust gases for emissions. The exhaust gas emissions will affect the decreasing of air quality as the result of the increasing of gas pollutants such as SO2, NO2, and CO and the increasing of local dust from the windblown soil particles.

Material transportation activity will through Pantura national road and then heading to access road. Based on the laboratory analysis result in baseline survey measurement, it is known that the current levels of SO2 is 100.34 µg/Nm3 (BM 900 µg/Nm3), NO2 is 24.77 µg/Nm3 (BM 400 µg/Nm3), CO is 9.144 µg/Nm3 (BM 30.000 µg/Nm3) and dust (TSP) is 175,42 µg/Nm3 (BM 230 µg/Nm3), still below the quality standard.

The material transportation activity potentially increase the burden of air pollutants especially the spread of dusts that can exceed the quality standard and spread to the settlements.

Estimation of Air Quality Impact without Patimban Seaport Activity (Without Project)

Because it is estimated that there is no another significant development in activity location which conduce traffic arouse except Patimban Seaport develompent, so it is assumed that air quality during 24 months of construction period is simillar to the baseline.

Estimation of Air Quality Impact with Patimban Seaport Activity (With Project)

The calculation of pollutant number estimation that emited form diesel-fueled vehicle can be calculated with Gaussian formula with line source model as follows:

$$C(x,z) = \frac{2QL}{(2\pi)^{0,5}\,\delta z u}.Exp\left[-0,5\left(\frac{H}{\delta z}\right)^2\right]$$

where:

C (x, z)	= Pollutant concentrations in ambient air (atmosphere), μg/m^3
X	= Distance between road and *receptor*, m
Z	= Height of *receptor* above ground, m
QL	= e*mision rate* per distance unit, gr/det.m
Π	= Coefisien; 3,14
U	= Wind speed average on the x axis, m/det
H	= Height of vehicle exhaust gas source point, m
δz	= Gaussian vertical dispersion coefisien, m

In the estimation of impact during this construction material mobilization, assumption that used is :

- Using of truck fuel is 0.2 litre diesel fuel for mileage of 1 km, so diesel fuel consumption = 0,2 Lt/km = 0,0002 Lt/m
- Average vehivle velocity is about 30 km/hour which is operated for 8 hours per day, so in vehicle/meter 0,00083 vehicle/meter.
  Based on that unit, it can be predicted :
  Diesel fuel needs per vehicle per day
  = (0,0002 Lt/m : 0,00083 kend/m) x 200 = 48 Lt/day = 0,048 m^3/day
- Wind speed is known from baseline data as much as 5,3 m/dt from the west
- Gaussian disperse coefficient (σz) at the stability of atm B is 3,4 m
- Recipient height (H) is 2 m

Meanwhile for diesel fuel oil vehicle emition factor based on WHO standard is presented in this following table :

Table 3.17 Emision Factor of Diesel-fuel Truck Vehicle

No.	Parameter	Unit	Emision factor
1.	Partikulat	Kg/m^3	2,4
2.	SO_2	Kg/m^3	19
3.	NOx	Kg/m^3	11
4.	CO	Kg/m^3	43,5

Source : WHO, 1982

After those data are inserted into Gaussian equation with Line Source model, obtained distribution number due to activity of construction material transporting vehicle as follows:

Particulate

- Q Source particulate emision= (0,048 m^3/day) x (2,4 kg/ m^3)
  = 0,1152 kg/day= 0,0013 gr/sec
- Concentration (C)

$$C_{partikulat} = \frac{2 \times 0,0013}{(2 \times 3,14)^{0,5} \times 5,3 \times 3,4}.Exp\left[-\frac{1}{2}\left(\frac{2}{3,4}\right)^2\right] = 0,000049 \mu g/m^3$$

SO_2

Q Emision source SO_2 = (0,048 m^3/day) x (19 kg/ m^3)
= 0,912 kg/day = 0,0105 gr/sec

Concentration (C)

$$C_{SO_2} = \frac{2 \times 0,0105}{(2 \times 3,14)^{0,5} \times 5,3 \times 3,4}.Exp\left[-\frac{1}{2}\left(\frac{2}{3,4}\right)^2\right] = 0,00039 \mu g/m^3$$

NO_2

Q Emision source NO_2 = (0,048 m^3/day) x (11 kg/ m^3)
= 0,528 kg/day = 0,0061 gr/sec

Concentration (C)

$$C_{NO_2} = \frac{2 \times 0,0061}{(2 \times 3,14)^{0,5} \times 5,3 \times 3,4}.Exp\left[-\frac{1}{2}\left(\frac{2}{3,4}\right)^2\right] = 0,00023 \mu g/m^3$$

CO

Q Emision source CO = (0,048 m^3/day) x (43,5 kg/ m^3)
= 2,08 kg/day= 0,0241 gr/sec

Consentration (C)

$$C_{CO} = \frac{2 \times 0,0241}{(2 \times 3,14)^{0,5} \times 5,3 \times 3,4}.Exp\left[-\frac{1}{2}\left(\frac{2}{3,4}\right)^2\right] = 0,0009 \mu g/m^3$$

Table 3.18 Pollutant Contribution to the Ambien Air Quality When Construction Material Mobilization in Pantura National Road

No.	Parameter	Piece	Magnitude
1.	Particulate/dust	$\mu g/m^3$	0,000049
2.	NO_2	$\mu g/m^3$	0,00022
3.	SO_2	$\mu g/m^3$	0,00039
4.	CO	$\mu g/m^3$	0,0009

Source: Calculation result, 2016

Especially for dust parameter, the increasing estimation is also obtained from the dusts resuspension which are lifted into the air as the result of the truck wheels movement. The calculation of dust quantity can be approached by empirical formula from Midwest Research Institute (MRI, 1979) as follows:

$$e_u = 5{,}9(\ 0{,}083 \text{ x s })(\ 0{,}033 \text{ x S })(\ 0{,}143 \text{ x W })^{0{,}5}(\ 0{,}0027 \text{ x d})$$

where :

e_u = Amount of dust per road length (lb/mile)
s = Silt content (%)
S = Vehicle speed (mile/jam)
W = Vehicle weight (Ton)
d = Amount of non rainy day in a year

With the asumption:

- Vehicle speed 30 km/hour (18.634 mile/hour),
- Vehicle weight 10 ton (22.222 lbs),
- The amount of non rainy days 150 days/year,
- Silt content ± 10 %.

So, the amount of dusts that will be produced by the moving of one transporting vehicle (dump truck) on the road is 1,374 lb/mile (384,3 kg/km), If there are about 200 operating vehicle ritation per day and the dispersion area is assumed 1000 m^2, so the amount of dusts will be 76,86μg/m^3. The estimation of air quality condition with the project (Construction material mobilization activity) is presented in the table below :

Table 3.19. Analysis of Ambien Air Quality Estimation Without and With Project while Construction Materials Mobilization

No.	Parameter	Piece	Baseline*)	Final hue**)	Impact magnitude	Standard (PP No 41 Year 1999)
Location : National Pantura Road						
1.	Particulate/dust	μg/m^3	175,42	252.2805	76.86048	230
2.	NO_2	μg/m^3	24,77	24.7704	0.00039	400
3.	SO_2	μg/m^3	100,34	100.3402	0.00023	900
4	CO	μg/m^3	9.144	9144.0009	0.0009	30000

Source: Calculation result, 2016
Description :
*) Ambien air quality estimation without Patimban Seaport Development
**) Ambien air quality estimation with Patimban Seaport Development

Seen from the impact of interest based on significant impact criteria, the impact of air quality decline can be describe as follows:

1. **The Number of People Affected**

   The number of people affected is the people along Pantura road that become mobilization route according to the study area boundary. The number of residents who live around the mobilization route make this impact as **significant impact (P)**

2. **Impact Spread Area**

   The spread of impact only include settlements area in transport lane, which are including 6 villages; Pusakaratu, Gempol, Kalentambo, Kotasari, and Patimban village, Pusakanagara ditrict and Pusakajaya village, Pusakajaya district. So it is considered as **significant impact (P)**.

3. **Duration and Intensity of Impact**

   Material transportation activity involve many heavy vehicle with dump truck type as many as 200 trucks/day during the construction which is 18 months, so the decreasing of air quality impact will occur continuously during that times.

   The intensity of impact, especially dust parameter rise significantly during the mobilization activity, so the final hue is 252.2805μg/m^3 which closes to quality standard 230 μg/m3. So it is considered as significant **impact (P).**

4. **The Other Component Affected**

   The other environmental that affected is public health, so it is considered as significant impact (P).

5. **Cummulative Nature of Impact**

   The impact of air quality decline is cumulative. So it is considered as significant impact (P).

6. **Reversible or Irreversible Impact**

   Irreversible impact because the decreasing of air quality is occur continuously. So it is considered as significant impact (P).

Based on the explanation above, the decreasing of air quality impact as the result of equipment and material mobilization is considered as significant negative impact (-P).

3.2.2.3. The Increasing of Noise Intensity

The mobilization of construction materials will arouse traffic flow especially in the mobilization route from/to project site, so the noise intensity will arouse too. The baseline condition of noise intensity in Pantura national road is 72 dBA. Where that quantity was on standard noise level according to KepMenLH No. Kep-48/MENLH/11/1996 (for settlement area is 55 dBA). It is caused by transportation activity in Pantura national road, the vehicle volume in Pantura national road is 432 – 1083 smp/hour.

Estimation of the increasing of noise level impact without Patimban Seaport Development Activity (without project)

Because it is predicted that there is no other significant development activity which cause traffic arouse except Patimban seaport development, so it assumed that noise level during 24 months of construction periode is simillar to the baseline 75 dBA with vehicle volume 432 – 1083 smp/jam.

Estimation of the increasing of noise level impact with Patimban Seaport Development Activity (with project)

To determine the noise intensity as the result of material mobilization trucks, theoritically it can be approached by formula from Rau and Wooten (1980):

$$\mathbf{Leq = Lo_i + 10 \log (N_i/S_i) + 10 \log (15/d) + 0{,}s - 13}$$

Which :

Lo_i	=	noise level of type I vehicle = 80 dBA(J. Rau dan Wooten,1980)
Ni	=	number of passing vehicle (truck) per hour
Si	=	Truck speed average, 30 km/hour
d	=	Distance of noise source to the measurement point
S	=	“Shiedding Factor” = 3 dBA

Based on the traffic analysis, the number of the trucks that will be used to transport construction materials and minerals are 200 ritation/day with assumption of working hour is 8 hour/day so it is estimated that mobilization activity per hour is 25 trucks (Ni). Because of that noise intensity calculation in the peak condition in the distance of 50 m is:

$$L_{eq(peak)} = 80 + 10 \log (25/30) + 10 \log (15/50) + 0{,}3 - 13$$

$$= 90{,}82 \text{ dBA.}$$

So that, the increasing of noise level impact magnitude is the difference between noise level with project and without project; 90,82 – 72 = 18,82 dBA. Furthermore, it can be seen in the table below :

Table 3.20. Analysis of Noise Level Impact Estimation With Equipment And Material Mobilization

No	*Parameter*	*without project*	*With project*	Impact magnitude
1	Noise level (dBA)	72	90,82	18,82
2	Vehicle volume (Evening peak hour 17.00-18.00)	1083 vehicle/hour	1108 vehicle/ hour	25 vehicle/ hour

Source : Analysis result, 2017

In the term of impact significant, it can be described as follows:

1. **The Number of People Affected**

   The number of people affected are people which do their activity along the transporting route, National Pantura Road. At this moment, the traffic on that road always dense because it is the main lane between city and between province. So the residents have been being accustomed with high noise level. It make the impact is categorized as **non-significant impact (TP).**

2. **Impact Spread Area**

   Spread of impact is only limited in settlements area on the transporting lane. Beside, the activity of vehicles movements are occured shortly. Thus, it is estimated as **non-significant impact (TP).**

3. **Duration and Intensity of Impact**

   Material transportation activities involve many heavy vehicle with dump truck type as many as 200 ritation/day during the construction which is 18 months, so the decreasing of air quality impact will occur continuously during that times. The intensity of impact rise significantly during the mobilization activity, the increasing of noise level occur as many as 18,82 dBA from 72 dBA into 90,82 dBA which has exceeded noise level standard in the amount of 55 dBA (settlement area). So it is considered as **significant impact (P).**

4. **Other Component Affected**

   No other environment component affected, so the impact is rated as **non-significant impact (TP).**

5. **Cummulative Nature of Impact**

   Increasing of noise intensity impact is cummulative. So, the impact is predicted as **non significant impact (TP).**

6. **Reversible or Irreversible Impact**

   Impact can be reversible because the impcat of noise increase only occur during mobilization activity. So, the impact is predicted as **non-significant impact (TP).**

Based on analysis above, so the impact of noise intensity due to equipments and materials mobilization is predicted as **non-significant impact (-TP).**

3.2.2.4. Sea Traffic Disruption

Most of the construction equipment and material for the Port project site will be mobilized via sea route for the port development. Major transportation works are transportation of material for reclamation and dumping.

Based on baseline, activitiy in the project site (Patimban beach) is dominated by fishermen from TPI Truntum, the data shows that fishermen who have ship in the TPI are 109. So it assumed that if all of ships are operating on the same day, so the highest traffic activity without project will be 109 ships per day.

The number of ships is predicted as many as 5 ships per day for material transportation from Lampung and 24 ships per day for material transportation from dredging area to the dumping area (15 km off-shores). The reclamation and dumping material transporting ships movement will disturb fishermen ships movement which will pass activity location . Thus, it is estimated that because of impact of seaport activity, ship traffic in the activity location is become 135 ships/day.

Table 3.21. Analysis of Sea Traffic Disruption Impact Estimation with Equipment and Material Mobilization

No	***Parameter***	***without project condition***	***With project Condition***	**Magnitude of Impact**
1	Vehicle volume	109 ship/day	138 ship/day	29 ship/day

Source : Analysis result, 2017

Seen from the impact of interest aspect, so it can be analyzed as follow:

1. **The Number of People Affected**

   The number of people affected is fisherman and people who use sea area around site project as a mobilization route, so this impact is categorized as **significant impact (P)**.

2. **Impact Spread Area**

   The total area of the impact spread is not only limited to sea area around the project site, but also to the mobilization route of material along sea area, which is come from Lampung. So this impact is categorized as **significant impact (P).**

3. **Duration and Intensity of Impact**

   Impact occur during material mobilization as long as 18 months. So, this impact is **significant impact (P).**

4. **The Other Component Affected**

   No other environmental components that will be affected, so this impact is considered as a **non significant impact**. **(TP)**.

5. **Cummulative Nature of Impact**

   The impacts is cumulative because there will be additional volume of traffic as many as 29 ships for 8 hours per day for 60 months. It is considered as a **significant impact (P).**

6. **Reversible or Irreversible Impact**

   The impact is temporary, and reversible after activity finish. So it is considered as **non significant impact (TP).**

Based on the analysis above, material mobilization has significant negative impact (**-P**) to the traffic.

3.2.2.5. Public Unrest

Impacts that appear from heavy equipment and materials mobilization are the decreasing of air quality, the increasing of noise level, land and sea traffic disruption, road damage, and public unrest. Public unrest that appears in the equipment and material mobilization is derivative impact from land traffic disruption for 60 months. That impact is in accordance with quesioner distribution result to the people around Patimban seaport development location who feel worried, such as : 8 % respondents feel worried of traffic jam and 6 % respondents feel worried of noise pollution from large ships which will be anchored in Patimban seaport.

Data analysis method to calculate public unrest is done by comparing attitude/argument/negative perception as the result of public unrest to the occupation with positive perception to the occupation. Public unrest appear when %Urs is bigger than 100% as seen in this following formula:

$$\%Urs = \frac{Negative\ perception\ (disagree)}{Positive\ perception\ (agree)} * 100\%$$

%Urs = Restless percentage

P(+) = Positive perception to the activity

P(−) = Negative perception to the activity

Restless rate calculation based on that formula :

$$\%Urs = \frac{Negative\ perception\ (0{,}38)}{Positive\ perception\ (0{,}62)} * 100\% = 61{,}29\%$$

Based on that calculation, it can be conclude that Patimban seaport plan activity doesn't make significant public unrest. It is shown by Urs calculating result as many as 61,29% that smaller than 100%.

Table 3.22. Analysis Of Public Unrest Impact Estimation With Equipment And Materials Mobilization

No	***Parameter***	***without project Condition***	***With project Condition***	**Magnitude of impact**
1	Public unrest when equipment and material mobilization	No public unrest from Patimban seaport development plan	8 % restless bacause of traffic jam, 6% restless bacause of noise pollution potency from material transporting ships activity	Restless stated appear when %Urs more than 100%, magnitude of impact shows Urs as much as 61,29%, So the restless is not significant.

Source : Analysis result, 2017

Seen from the impact of interest based on significant impact criteria, so heavy equipment and materials mobilization impact to the public unrest parameter can be described as follow:

1. **The Number of People Affected**

   The people who will be restless due to the mobilization heavy equipment and material activities in the construction phase are the people who live along the mobilization track and also road users. So, the public unrest predicted as **significant impacts (P).**

2. **Impact Spread Area**

   Material mobilization activity to the public unrest has dispersed potential along the mobilization route, Pantura National road, so it estimated as **significant impact (P).**

3. **Duration and Intensity of Impact**

   Impact of material mobilization activity to the public unrest is estimated occur during 60 months, so the impact is estimated as **significant impact (P).**

4. **The Other Component Affected**

   The impact of material mobilization activity to the public unrest parameter is not affected to others environmental components, so the impact is estimated as **non significant impact (TP).**

5. **Cummulative Nature of Impact**

   The public unrest impact is not accumulate. Because of that the impact is considered as **non significant impacts (TP).**

6. **Reversible or Irreversible Impact**

   The public unrest impact is reversible because of development of social process that occurs in the local resident. That development accordance with the people's understanding of environmental changes. So the impact is considered as **non significant impacts (TP).**

Based on the analysis above, so the material mobilization impact to the public unrest is estimated as significant negative impact (-**P**).

3.2.3. Reclamation and Off-Shore Facility Construction

3.2.3.1. Decreasing of Sea Water Quality

Off-shore facility development in this sub section means construction of breakwater and seawall, which the materials for breakwater construction is stone in the size of 10 – 20 cm. Those stones will be installed and stacked slowly pn bamboo mat. So the turbidity caused by this off-shore facility construction will not be significant.

After that facility development, it continue to reclamation activity which is landfill activity for terminal construction (part of the sea) and back up area (terestrial). The total of landfill material that is required for reclamation untill Phase II is 15.023.135 m^3, but for phase I stage 1 and 2, which is studied in this EIA, the reclamation volume reachs 10.300.000 m^3. Based on the result of seawater quality measurements at the activity area, it is known that from 7 measurement location, 6 points show that TSS parameter is below quality standard (80 mg/L). As well as turbidity estimation due to off-shore facility development, in the reclamation phase also estimated that turbidity rate will be low and limited in the consideration as follow :

- Seawall will be built before reclamation materials are insterted
- Reclamation materials are sea sands. Sea sands have big particle diameter and able to settle quickly, so the clays do not spread. Sand particle is assumed 0,3783 mm according to the survey result, so the settling velocity is 4.327 m/day based on Stoke equation. The depth average around project site is 7 meter, while particles can reach sea bed in 2 minutes.
- Dredging materials is used as reclamation materials using Cement Pipe Mixing (CPM) method. Through that method, dredging materials will be mixed with cement and then the mixture will be poured slowly into the sea, so the turbidity is predicted to be non-significant.

Table 3.23. Analysis of Sea Water Quality Impact Estimation fron Reclamation Activity

No	*Parameter*	*without project Condition*	*With project Condition*	**Magnitude of impact**
1	TSS and turbidity	From 7 measurement location, 6 point show TSS parameter are below quality standard (80 mg/L)	Selection of technology and material for reclamation is made in order to sludge materials do not spread so the increasing of turbidity become small.	Turbidity as the effect of this marine facility development will not significant.

Source : Analysis result, 2017

Seen from the impact of interest based on significant impact criteria, so the impact of off-shore facility development activity and reclamation to the sea water quality can be described as follow:

1. **The Number of People Affected**

   People who affected by the impact of sea water quality are the fishermen, so from this criteria, the impact is estimated as **significant impact (P).**
2. **Impact Spread Area**

   Area that experience sea water quality decrease is area in reclmation plan. So, it is estimated as **non significant impact (TP).**
3. **Duration and Intensity of Impact**

   The impact intensity of sea water quality deacrease from off-shore facility development activity and reclamation only occur during activity. So, it is estimated as **non significant impact (TP).**

4. The Other Component Affected

Another component affected is the marine life disruption, so the impact is predicted as **significant impact (P).**

5. Cummulative Nature of Impact

The impact of sea water quality deacrease is non cummulative with other activity. So, it is estimated as **non significant impact (TP).**

6. Reversible or Irreversible Impact

The impact is reversible because this impact only occur while off-shore facility development activity and reclamation. So, it is estimated as **non significant impact (TP).**

Based on the analysis above, so the impact of sea water quality decrease in reclamation activity is estimated as significant negative impact (-**P**).

3.2.3.2. Disturbance of Marine Life (Nekton and Benthos)

Estimation of Impact without Patimban Seaport Development Activity (Without Project)

Based on baseline, current condition at the activity plan location there are 8 kinds of benthos which consist of 3 kinds of Gastropods and 5 kinds of Bivalves. Benthos diversity index at the activity plan location is between around 0 – 1,26. According to Barbour *et al* (1987), Shannon Wiener diversity index classification shows that diversity index at the activity location is very low. Sampling station location S10 has the highest diversity index as many as 1.26, while S1, S3, S4, S7, S8, and S11 have low diversity index as many as 0. Those results show that S10 is categorized to moderate contaminated, while S1, S3, S4, S7, S8, and S11 are heavy contaminated. The kinds of Benthos that the most commonly found in the sampling location are *Anadara* sp. (Bivalves) and *Melanoides* sp.(Gastropods). Both of them can be one of indicators of water pollution, because of its ability in absorbing the pollutant.

Estimation of Impact with Patimban Seaport Development Activity (With Project)

Reclamation activity has derivative impacts such as marine life disruption (Benthos). Reclamation activity will need total landfill materials untill 15.023.135 m^3, so this activity is potentialy causing turbidity and the increasing of TSS rate in the waters. Moreover, in the reclamation site, kinds of benthos will be disappear because buried by the sand. The decreasing of seawater quality can disperse to the waters around reclamation site and damage the habitat of marine life. The increasing of sedimentation rate and suspended solid content, also the increasing of water turbidity can cause the death of benthos. Habitat change also will affect to the benthos habitat loss.

Estimation of Impact Magnitude

The baseline for benthos in the rainy season shows that benthos abundance is varied from 0 – 205,88 Induvidualal/m^2. In the rainy season, in some location are not found benthos. There are two classes of benthos in the activity location, which are Gastropods and Bivalves. The most dominating spesies from Gastropods class is *Melanoides tuberculata*, while from Bivalve is *Anadara grandis*. Both of gastropods and bivalves commonly live in the substrat based. With the reclamation activity on 180 Ha areas, it is predicted that 317.646.000 Induvidualal of benthos will be vanished.

Based on the result of sea water measurements in the activity location, it is known that from 7 measurements location, 6 points show TSS parameter is below quality standard (80 mg/L). Total landfill material needs for reclamation reachs 15.023.135 m^3, so the reclamation activity has potency to cause turbidity and the increasing of TSS rate in the waters that can exceed quality standard because of the entry of landfill materials such as sands and cements into the sea waters. In the other hand, fishpond water quality that will be reclamated as back up area has rate above water quality standard such as in the ammonia and fenol contents parameters. But, it still below waste water standard quality. However, with the plan of seawall construction before dumping activity, so the increasing of turbidity will not be significant. Even so, waters quality control is needed.

Table 3.24. Analysis of Marine Life Disription Impact Estimation from Reclamation

No	*Parameter*	*without project*	*With project*	Magnitude impact
1	Bhentos	317.646.000 Induvidual	-	(-) 317.646.000 Induvidual

- Source : Analysis result, 2017

Seen from the impact of interest based on significant impact criteria, so the impact of reclamation activity to the marine life can be described as follow:

1. **The Number of People Affected**

   There are no people affected by marine life disruption, because component that directly affected is marine life itself which is benthos. So, from this criteria, the impact is predicted as **non significant impact (TP)**.

2. Impact Spread Area

Impact spread area is limited only in the area affected by reclamation and the surrounding area. So, the impact is predicted as **non-significant impact (TP).**

3. Duration and Intensity of Impact

Because of the decreasing of sea water quality impact intensity that come from fishponds water waste is only occur when reclamation activity of fishponds area, so the intensity of marine life is also low. Thus, the impact is estimated as non **significant impact (TP).**

4. The Other Component Affected

There's no other component affected, so the impact is predicted as **non-significant impact (TP).**

5. Cummulative Nature of Impact

Marine life disruption impact is cummulative which it comes from dredging activity. So the impact is predicted as **non-significant impact (P).**

6. Reversible or Irreversible Impact

This impact is reversible because it only occur in the reclamation area of fishponds. So the impact is estimated as **non-significant impact (TP).**

Based on the analysis above, so the impact of marine life disruption (Benthos) in the reclamation activity is predicted as **non significant impact (-TP)** and not managed because of derivative impact, so the management is optimized in its primary impact.

3.2.3.3. Fishing Ground Changes

Fishing ground change when reclamation process occur because of water quality change that affect to marine life such as necton (fish). Based on the baseline, current condition at the activity plan location there are 9 kinds of necton which consist of 5 species of fishes (Pisces) and 4 spesies of shrimps (Crustaceae). The amount of catch fish are more commonly found in rainy season, while in the dry season are less. The amount of Individual of each fish species found in all sampling location is varied. In the number of catches, the species that most commonly found is petek fish (*Leiognathus equulus*) with 66 Induvidualal in all of sampling location. This species is often found in others location, which is 4 locations. So does jerbung shrimp (*Litopenaeus vannamei*) that found in the sampling location.

The increasing of turbidity in the waters will disturb fish respiratory system generally because the increasing of suspended particle will affect to the spawn. The spawns in the waters with high turbidity and sediment rate will have high mortality rate. Dissolved particles can also cause the death of non benthic egg through absorbtion in the eggshell surface. Both of influence make the decreasing of water current and dissolved oxygen into the egg. Both of influence to the fish behavior occur in fish refusal to the turbid water, eating disoreder, and the increasing of finding shelter. Other than that, turbidity also decrease activity and influence the fish's migration lane. Reduction in the number of marine fish will affect to the amount of the catch in that area.

Based on the fishing ground survey, there are 3 fish auction (TPI) in the activity location, Kali Genteng, Truntum and Tanjung Pura. The number of registered fishermen is 381 people.

Based on the interview result, those fishermen catch the fishes not only in one fishing ground but also to others area if they did not catch a fish in the area before. Fishing ground areas around those 3 TPI are Ciasem, Mayangan, Bobos, Patimban beach, Gebang, and Eretan.

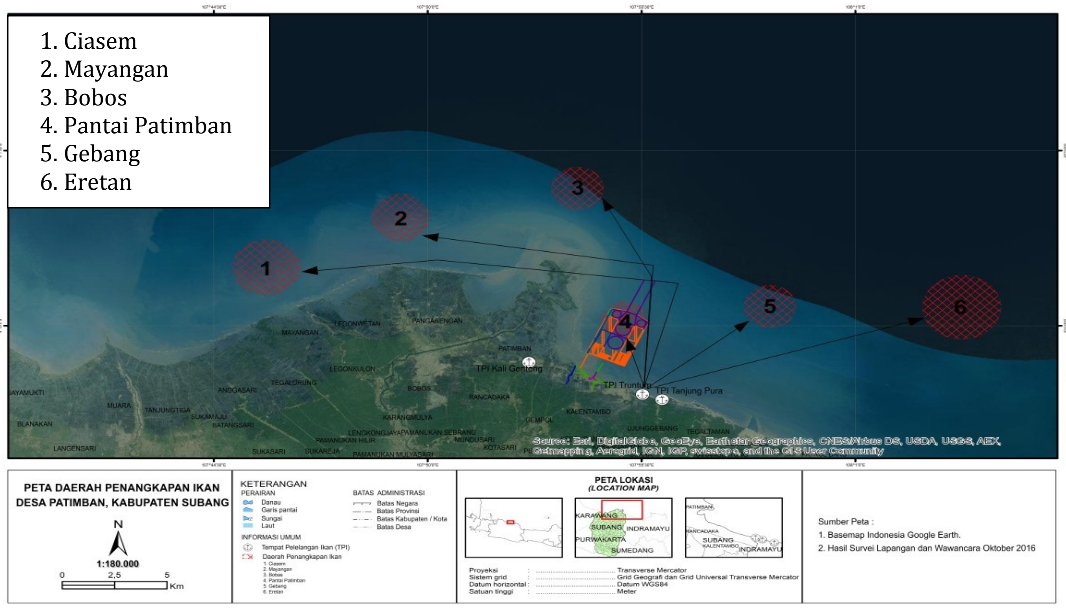


Figure 3.1. Fishing Ground Around the Port Project Site

Among the 6 fishing grounds above, there is a fishing ground that located in the project site of terminal development; Pantai Patimban. Pantai Patimban area give a quite big contribution to the fishermen catch in that area. Necton species that give big contribution is Petek fish (*Leiognathus equulus*).

To know the impact of fishing ground loss in Patimban waters, here is the data of catches fish in that area.

Table 3.25. Average Catches of Fish (kg/trip) based on the interview result of Fishermen in the TPI Kali Genteng

No	Type of Fish	Fishing Ground					
		Ciasem	Mayangan	Bobos	Patimban	Gebang	Eretan
1	Grouper					25	
2	White pomfret				15	95	
3	Fresh water crab (rajungan)			10		8	
4	Shrimp	70		77	80	165	
5	Squid	70		165	50	200	
6	Crab					25	
7	Cuttlefish					40	
8	Petek fish	2200		300	1100	820	
9	Salmon	10		200	120		
10	Mackerel			5			
11	Anchovy	46					
12	Black jewfish	35				15	
13	Balakutak			26		18	
14	Blama					50	
15	Jerbung shrimp					20	
16	Kuro fish			3			
Total		**2431**	**0**	**796**	**1365**	**1502**	**0**

Source: Fishing Ground Survey Team (Interview Survey, October 2016)

Table 3.26. Average Catches of Fish based on Fishermen Interview Result in Trumtum TPI

No	Type of Fish	Fishing Ground					
		Ciasem	Mayangan	Bobos	Patimban	Gebang	Eretan
1	Bilis	500	300	500	500		900
2	Lapan						1100
3	Salmon			10			
4	Kuro fish			25			
5	Mackerel			7			
6	Fresh water crab (rajungan)			6	6		
7	Barramundi			50	0	5	
8	Shrimp		50				
9	Petek		300				
Total		**500**	**650**	**598**	**506**	**5**	**200**

Source: Fishing Ground Survey Team (Interview Survey, October 2016)

Table 3.27. Average Catches of Fish based on Fishermen Interview Result in Tanjung Pura TPI

No	Type of Fish	Fishing Ground					
		Ciasem	**Mayangan**	**Bobos**	**Patimban**	**Gebang**	**Eretan**
1	Shrimp	0	4	46	29	77,5	39,5
2	Pomfret	0	0	22	20	50,5	15,5
3	Rajungan	0	0	10	0	0	0
Total		**0**	**4**	**78**	**49**	**128**	**55**

Source: Fishing Ground Survey Team (Interview Survey, October 2016)

Based on the data above, fishing ground location in Patimban gives big contribution to the fisherman catches, which the calculation result of cathches contribution from Patimban fishiing ground is 21,65% from the recapitulatuion in the six fishing ground. The estimation impact of with and without project to the fish production refers to the data above is as follow :

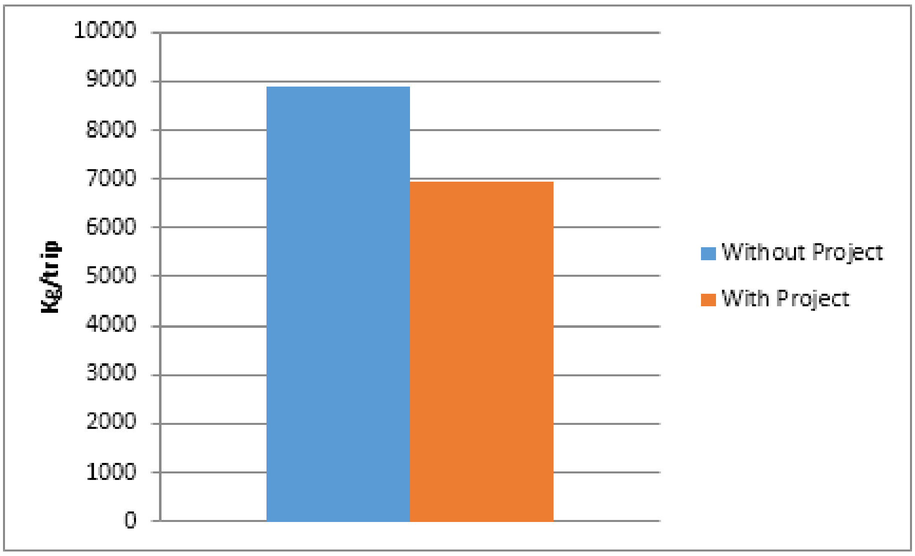


Figure 3.2. Estimation of with and without project reclamation activity impact to the fish productivity

Based on the picture above, impact of reclamation activity to the fishing ground loss is Patimban waters has implication with fish production loss in that location. The result of calculation based on survey result is estimated that the loss/reduction of catches is 1920 kg/trip when the fishermen choose Patimban waters location as the fishing ground.

Seen from the impact of interest based on significant impact criteria, so the impact of reclamation to the fishing ground can be described as follow:

1. **The Number of People Affected**

   The people who impacted by change fishing ground is the fishermen who catch fish in the area Gebang and Pantai Patimban that is the fishermen as many as 381 people who devided into 3 fish auction (TPI); TPI Kali Genteng, Truntum, dan TPI Tanjung Pura. So based on these criteria, the impacts is predicted as significant impacts **(-P).**

2. **Impact Spread Area**

   Reclamation activity cause the impact of fishing ground loss in the Patimban waters. So, it estimated as **significant negative impact (-P)**.

3. **Duration and Intensity of Impact**

   The loss of fishing ground impact in the reclamation activity occur continuously because fishing ground location change into terminal and Patimban seaport off-shore facilities. So it is estimated as **significant negative impact (-P).**

4. **The Other Component Affected**

   The other components are affected by changes in fishing ground is the emergence of unrest on local fishermen**.** So the impact is predicted as significant impact **(-P).**

5. **Cummulative Nature of Impact**

   The impact is not cumulative with other impacts. So the impact is predicted as significant impact **(TP).**

6. **Reversible or Irreversible Impact**

   Impact is irreversible because fishing ground area in the Patimban waters has reclamated into terminal and seaport marine facilities. So, it is estimated as **significant negative impact (-P).**

Based on the analysis above, so the impact of fishing ground change in the reclamation activity is estimated as **significant negative impact (-P).**

3.2.3.4. Public Unrest

Based on the results of interviews with fishermen, it is known that the area of fishing ground Gebang and Patimban Beach is an area that is quite often used as fishing grounds for local fishermen.

Patimban waters is fishing ground for fishermen from Tanjung Pura TPI, Trumtum, and Kaligenteng because the location is near to the TPI so the operational cost can be reduce. Based on the result of intervies, the fishermen opinion about fishing ground loss as the effect of reclamation activity is as follow :

Table 3.28. Impact of Fishing Ground (Loss or disruption of lane) Faced by Fishermen Due To Seaport

No	Fishing Ground	TPI		
		Kali Genteng	Truntum	TanjungPura
1.	Ciasem	-	D	D
2.	Mayangan	-	D	D
3.	Bobos	-	D	D
4.	PantaiPatimban	E	E	E
5.	Gebang	D	-	-
6.	Eretan	D	-	-

Description:
• E = fishing ground loss
• D = Lane disruption to fishing ground

Moreover, the fishing ground change as the result of off-shore facilities construction will arouse the anxiety of fishermen. The anxiety that occur is disruption of Patimban and Bobos fishing ground. Both of the fishing ground have near distance to the three of fish auction location (TPI) around the seaport location. In other hand, the result of catches from both fishing ground is quite high if compared with all of fishing ground location.

Facing the disruption of fishing ground location, fisherman can look after new location of fishing ground with the risk of higher operation cost and the condition of new fishing ground that is unknown. The fishermen operation cost and income in normal condition (without project) and with project are as follow :

Table 3.29. Operational Cost and Income of Fishermen in TPI Kali Genteng

Average Cost per year	Without project (Rp)	With project (Rp)
A, Fuel cost	27,216,000	35,380,800
B, Ships maintenance	3,425,000	4,452,500
C, Ships machine maintenance	2,231,250	2,900,625
D, Fishermen fishing equipment	8,662,500	8,662,500
Net Income	**Rp**	**Rp**
Ship owner fishermen average income	34,800,000	24,360,000
Ship non-owner fishermen average income	25,200,000	17,640,000

Source : Survey and analysis, 2017

Table 3.30 Operational Cost and Income of Fishermen in TPI Trumtum

Average Cost per year	Without project (Rp)	With project (Rp)
A, Fuel cost	24,240,000	31,512,000
B, Ships maintenance	2,000,000	2,600,000
C, Ships machine maintenance	1,812,500	2,356,250
D, Fishermen fishing equipment	5,015,625	5,015,625
Net Income	**Rp**	**Rp**
Ship owner fishermen average income	31,540,000	22,078,000
Ship non-owner fishermen average income	22,460,000	15,722,000

Source : Survey and analysis, 2017

Table 3.31. Operational Cost and Income of Fishermen in TPI Tanjung Pura

Average Cost per year	Without project (Rp)	With project (Rp)
A, Fuel cost	24,864,000	32,323,200
B, Ships maintenance	1,393,000	1,810,900
C, Ships machine maintenance	1,531,250	1,990,625
D, Fishermen fishing equipment	13,281,250	13,281,250
Net Income	**Rp**	**Rp**
Ship owner fishermen average income	46,800,000	32,760,000
Ship non-owner fishermen average income	18,000,000	12,600,000

Source : Survey and analysis, 2017

With the project, which are reclamation and off-shore facility development activity, so the disruption will be occur to the fishing ground and the lane to the fishing ground. The farther the route to the fishing ground, the higher the cost of operation such as 20-30% for fuel oil, ships and machine maintenances. The increasing of operational cost will reduce net production as many as the increasing of the operational cost.

Table 3.32. Analysis of Impact Estimation of Public Unrest from Fishing Ground Change in Reclamation Activity

No	*Parameter*	*without project condition*	*With project condition*	Impact magnitude (Rupiah)
1	Disruption of fishing ground affect public unrest due to the increasing of operational cost	Average Income (fishermen have ships) : • 34,800,000 • 31,540,000 • 46,800,000	Average Income (fishermen have ships) : • 24,360,000 • 22,078,000 • 32,760,000	(-) 10.440.000 (-) 9.462.000 (-) 14.040.000

Source : Analysis result, 2017:

So, by seeing the impact of interest based on significant impact criteria, it can be described as follow:

1. **The Number of People Affected**

   People affected are the fishermen whom fishing in the Gebang area and Patimban beach as many as 381 person which is devided into 3 fish auction place (TPI); TPI Kali Genteng, Truntum, and TPI Tanjung Pura. So, based on the criteria, the impact is estimated as **significant negative impact (-P).**

2. **Impact Spread Area**

   Impact spread area involve Bobos and Patimban beach fishing ground. Although there are 4 other fishing ground, but its distance and production potency are lower. So the impact is estimated as **significant negative impact (-P).**

3. **Duration and Intensity of Impact**

   Public unrest impact as the effect of fishing ground change occur shortly and limited in the begining of construction phase, but the impact intensity is relative big so it is predicted as **significant impact (P).**

4. **The Other Component Affected**

   No other component affected so the impact is predicted as **non significant impact (TP).**

5. **Cummulative Nature of Impact**

   Impact is non cummulative with the other impact. So impact is predicted as **non significant impact (TP).**

6. **Reversible or Irreversible Impact**

   Impact is irreversible because the location are lost and change into terminal and Patimban seaport marine facilities. So, it is estimated as **significant negative impact (-P)**.

Based on the analysis above, so the impact of public unrest to the reclamation and marine facilities development are estimated as **significant negative impact (-P).**

3.2.4. Dredging and Disposal

3.2.4.1. Decreasing of Sea Water Quality

Marine construction works such as dredging and dumping of dredged soil will generate turbidity into seawater. In order to assess the turbidity diffusion quantitatively, spread and concentration of Suspended Sediment (SS) generated by the construction works was predicted using numerical simulation.

Before dredging activity at the phase I in the Patimban seaport area, marine facilities have been built partially such as *breakwater* and *revetment* as in this following picture

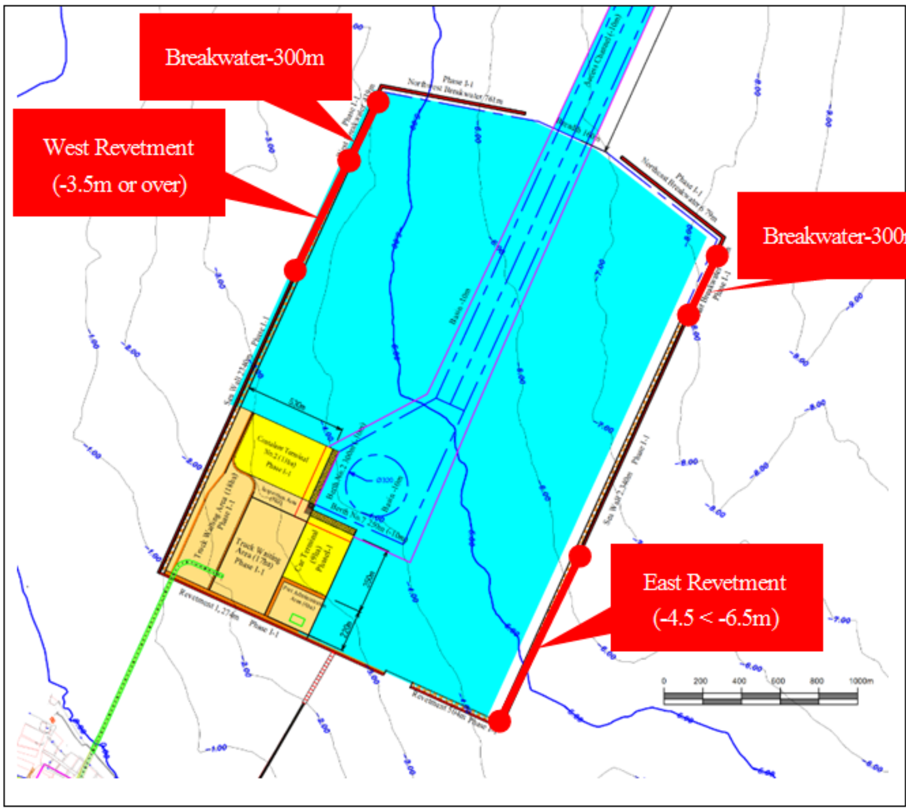


Figure 3.3. Topographical Conditions (in the starting period of dredging at Phase1-1 and initial situation of Phase1-2 after the completion of Phase1-1)

In the phase I-2, all of breakwater and revetment around the Patimban seaport have been built as in this following picture :

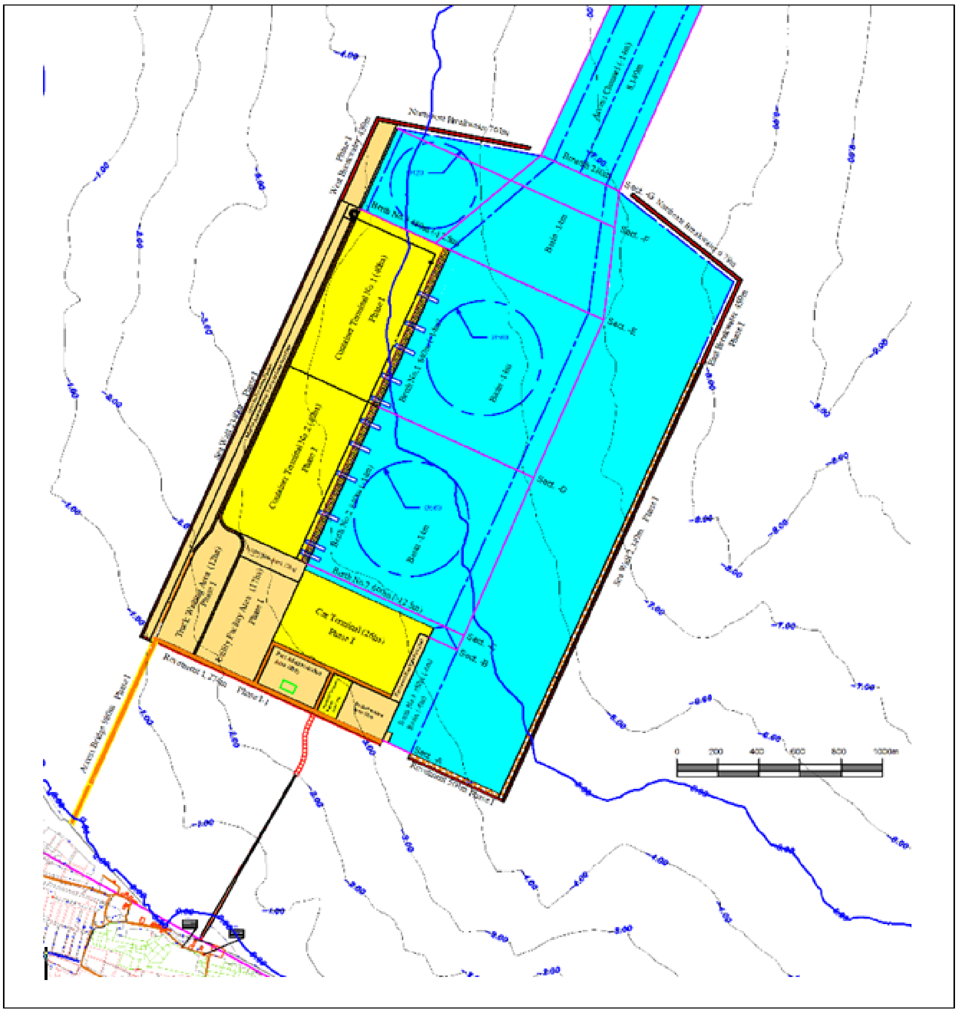


Figure 3.4. Topographical Conditions after the completion of Phase1-2

Condition above is used as model design in the hydrodynamics mathematics modeling and sediment dispersion when the dredging occur.

Mathematics modeling is done in two condition, rainy season and dry season as follow :

- January (rainy season)

  Wind velocity : 2.8m/s

  Wind direction : 286° (clockwise from North direction) -WNW-

- July (dry season)

  Wind velocity : 3.4m/s

  Wind direction : 118° (clockwise from North direction) -ESE-

Initial conditions of *Suspended Sediment*(SS) concentration when modeling is assumed 0.

The intensity of simulation period is 240 hours that has represented steady state condition in the modeling. Here is the sediment particle size and settling velocity from sediment that is used in the mathematics modeling.

Table 3.33. Particle size and Sediment settling velocity

Types of soil	Particle size (mm)	Typical Particle size (mm)	*Settling velocity* Typical Particle size (m/day)
Sand	0.075～2	0.3873	4327.22
Silt	0.005～0.075	0.0194	30.58
Clay	(0.001)～0.005	0.0022	0.39

Turbidity that occur when dredging and dumping in dumping area is estimated as the effect of many sediment volume that taken or disposed, the following is estimation of dredging volume per day :

Table 3.34. Estimation of sediment volume in dredging and dumping activities in the dumping area

(1) Phase I stage 1

Dredging area	**Source of turbidity**	**Dredging use**	**Description**
Sailing lane	Dredging	Suction dredger ship	6.000m^3/ day → Off-shore dumping
	Overflow	Suction dredger ship	
	Dumping (off-shore)	Suction dredger ship	
Anchorage basin	Dredging	Dreger taker ship (*3)(7.5m^3 class)	6.000m^3/ day → Using CPM to recover soil in the container terminal

(2) Phase I Stage 2

Dredging area	**Source of turbidity**	**Dredging use**	**Description**
Sailing lane	Dredging	Suction dredger ship	17.500m^3/ day → Off-shore dumping
	Overflow	Suction dredger ship	
	Dumping (off-shore)	Suction dredger ship	
Anchorage basin	Dredging	Dredger taker ship (*2)(15-20 m^3 class)	17.500m^3/ day → Off shore dumping
	Overflow	Tongkang ship	
	Dumping (off-shore)	Tongkang ship	

This following is activity location based on activity phase :

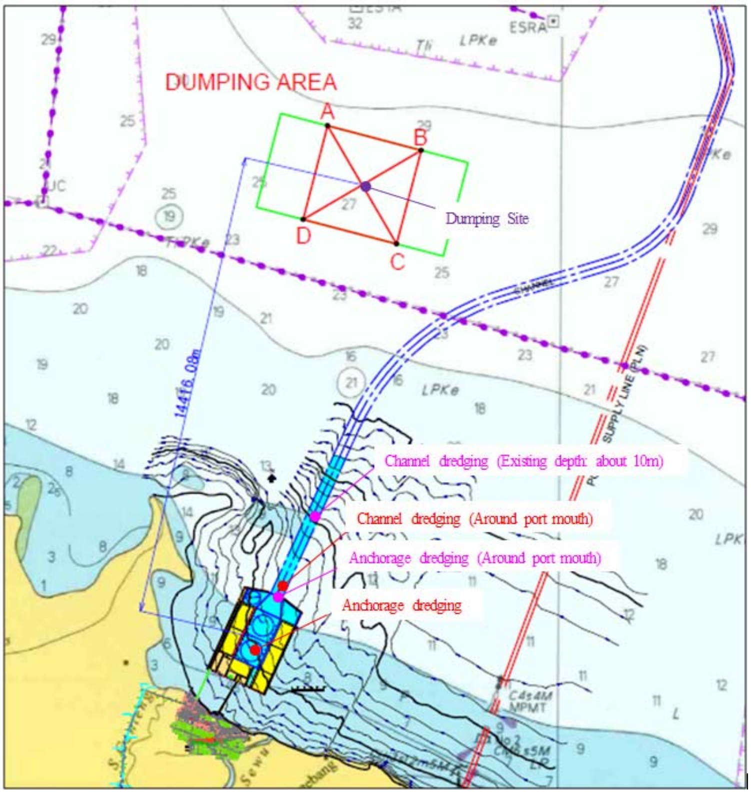


Figure 3.5. Turbidity Source Assumption Location in the Dredging and Dumping Sediment Based on Activity Phase (Phase 1 Stage 1 and Phase 1 Stage 2)

In the estimation of turbidity source density magnitude, it is used *"Guideline of prediction of effect of turbidity diffusion by port construction work, April 2004, Ministry Land, Infrastructure, Transport and Tourism (MLIT)"* with the equation as follow :

$$w = \frac{R}{R_{75}} w_0 \qquad \text{(a)}$$

$$W_s = w \times Q_s \qquad \text{(b)}$$

Where,

w : *turbidity source basic unit* (kg/m^3)

w_0 : *existing turbidity source basic unit standardized with current velocity of*7cm/s (kg/m^3)

R : *particle size accumulation distribution percentage of critical turbidity sediment particle size by applying the local current velocity as the critical turbidity velocity* (%)

R_{75} : *particle size accumulation distribution percentage of sediment smaller than 0.075mm by applying the existing turbidity source basic unit of*w_0(%)

W_s : *amount of yielded turbidity* (kg/day)

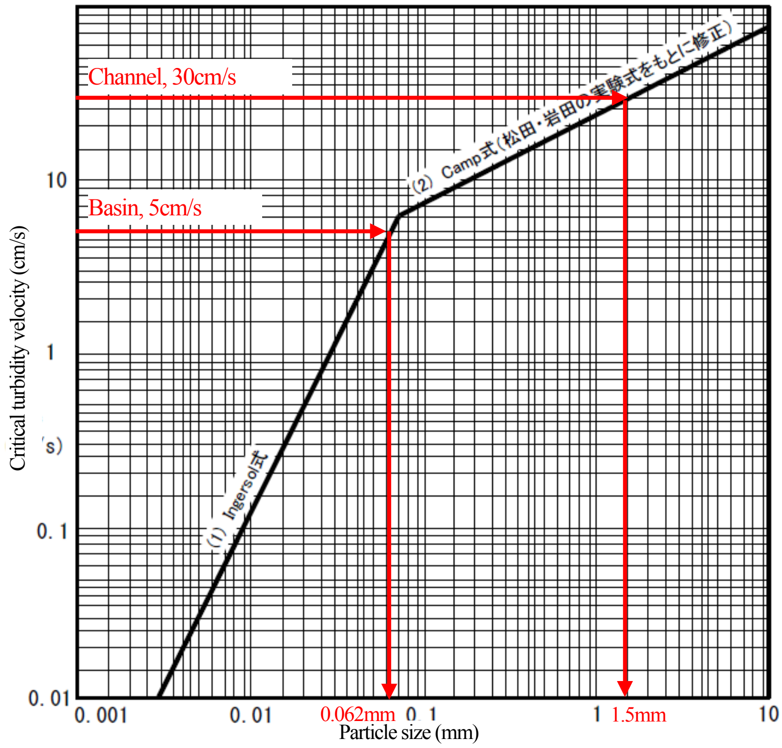
Q_s : *Execution volume* (m^3/day)

Followings are the calculation procedure of SS estimation.

- Obtaining the critical turbidity velocity from local current velocity
- Representative particle size of the bottom sediment from the cumulative particle distribution curve and obtaining the critical particle size of turbidity
- Obtaining the ratio of clayey and silty sediment particle smaller than 75µm and particle percentage (R_{75}) which are obtained from the calculated procedure of particle size accumulation distribution percentage (R) of critical turbidity sediment and existing basic unit (w_0)
- Obtaining the turbidity source basic unit based on equation (a) by multiplying the existing turbidity source basic unit standardized with current velocity of 7cm/s and above mentioned ratio of clayey and silty sediment particle smaller than 75µm and particle percentage (R_{75})
- Obtaining the amount of yielded turbidity based on the equation (b) by multiplying the turbidity source basic unit and Execution volume

According to the simulated results of current field, maximum current velocity of flood and ebb tide conditions was about 30cm/s at the dredging access channel site. On the other hand, maximum current velocity at the anchorage basin area was about 5cm/s blocking by breakwater and revetment.

The relation between the sediment particle size and critical turbidity velocity was shown in the following figure and considered particle size for turbidity becomes smaller from 0.062 to 1.5 mm.



Source : *"Guideline of prediction of effect of turbidity diffusion by port construction work (by MLIT)*

Figure 3.6. Relation between Sediment Particle Size and Critical Turbidity Speed

The comparison between typical particle and particle size that mentioned above show that silt and clay are smaller than 1.5mm and so the typical particle size are smaller than 0.062mm. On the other hand, Sand is bigger than 0.062mm and typical sand particle size is smaller than 1.5mm.

Based on those considerations, R=100% was used for material at the access channel and dumping site and R=94% (61%+33% except sand) for material at the anchorage basin area.

This following table is turbidity unit basic source applied in the modeling :

Table 3.35. Applied Turbidity Source Basic Unit

Guideline based on *MLIT*					Used value	
Activit	Working Ship	Specification	Sludge and Clay Materials Percentage (%)	Turbidity source basic unit (t/m³)	R_{75} (%) Average	Turbidity source basic unit (t/m³) Average
Excavation	Taker dredger ship (Phase1-1, 7.5m³ Class)	8m³	94.5	25.80×10^{-3}	71.9	22.55×10^{-3}
		8m³	58.0	9.91×10^{-3}		
		8m³	63.1	31.94×10^{-3}		
	Taker dredger ship (Phase1-2, 15-20 m³ Class)	18m³	97.0	5.10×10^{-3}	87.2	12.59×10^{-3}
		18m³	96.6	17.25×10^{-3}		
		18m³	84.8	18.40×10^{-3}		
		15m³	70.2	9.60×10^{-3}		
	Suction dredger ship	1765kW(2400PS)	92.0	7.09×10^{-3}	90.1	9.60×10^{-3} ※1
			88.1	1.21×10^{-2}		
Dumping	Suction dredger ship	1765kW(2400PS)	68.6	22.72×10^{-3}	68.6	22.72×10^{-3}
	Tongkang ship	500m³	96.7	11.63×10^{-3}	70.93	15.79×10^{-3}
		200m³	69.8	41.66×10^{-3}		
		180m³	57.7	8.31×10^{-3}		
		120m³	59.5	1.56×10^{-3}		

※1) turbidity by dredging and overflow from the hopper are included

According to the construction work plan, there are two possible occasions of turbidity generation, dredged soil dumping into hopper barge and overflow from effluent outlet of reclamation area. The estimation of calculating below use the reference of simillar study from *"Detailed Design Study for Lach Huyen Port Infrastructure Construction Project, Government of VietNam (Port and Road and bridge)"*

Turbidity unit basic source by overflow from hopper barge is assumed to be the same as Trailer Suction Hopper Dredger. Turbidity source basic unit by overflow from Trailer Suction Hopper Dredger was considered to be 0.8 times, the details of calculation is as follow :

Table 3.36. Estimation of SS Source Amount in Dredging Activity

(1)Phase I stage 1

Location	Type of activity	Machine and Ship	Existing Turbidity basic Unit (t/m3)$\times 10^{-3}$	R75	R	Turbidity basic unit $(t/m^3)\times 10^{-3}$	Volume (m^3/day)	SS loading amount (t/day)
Sailing lane	Dredging	Trailer hopper suction dredger	1.92 (9.60*0.2)	90.1	100	2.13	6,000	12.780
	Overflow from the dredger	Trailer hopper suction dredger	7.68 (9.60*0.8)	90.1	100	8.52	6,000	51.120
Basin	Dredging(3 parties)	Grab Dredger	22.55	71.9	94	29.48	2,000*3	58.960*3
Offshore	Dumping	Trailer hopper suction dredger	22.72	68.6	100	33.12	6,000	198.720

(2) Phase I stage 2

Location	Type of activity	Machine and Ship	Existing Turbidity basic Unit (t/m3)$\times 10^{-3}$	R75	R	Turbidity basic unit $(t/m^3)\times 10^{-3}$	Volume (m^3/day)	SS loading amount (t/day)
Sailing lane	Dredging	Trailer hopper suction dredger	1.92 (9.60*0.2)	90.1	100	2.13	17,500	37.275
	Overflow from the dredger	Trailer hopper suction dredger	7.68 (9.60*0.8)	90.1	100	8.52	17,500	149.100
Basin	Dredging(2 parties)	Grab Dredger	12.59	87.2	94	13.57	8,750*2	118.738*2
	Overflow	Hopper barge	7.68	90.1	94	8.01	8,750*2	70.088*2
Sailing lane	Dumping	Trailer hopper suction dredger	22.72	68.6	100	33.12	17,500	579.600
		Hopper barge	15.79	70.9	100	22.27	17,500	389.725

In the following table is conditions of turbidity source from dredging activity which refers to *"Guideline of prediction of effect of turbidity diffusion by port construction work, April 2004, Ministry Land, Infrastructure, Transport and Tourism (MLIT)"*. Where in the SS source modeling is given to all of layers from 3 dimensions modeling.

Table 3.37. Condition of Turbidity Source and Dredging Mathematic Model

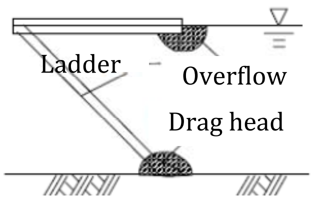
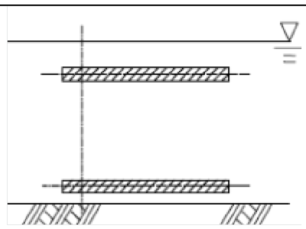
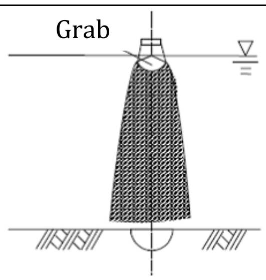
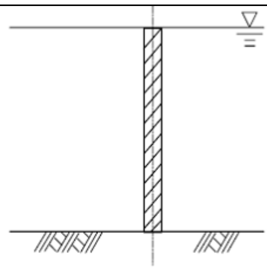
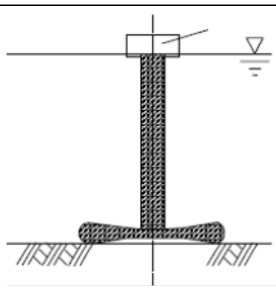
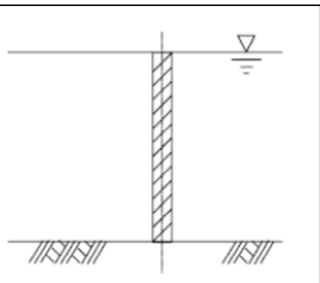
Construction Method (Equipment)	Turbidiy Source	Turbidity generation model	Turbidity source condition
Trailer Hopper Suction Dredger			Turbidity appear from overflow on water surface besid on seabed
Grab Dredger			Turbidity is produced through water surface to the seabed

Table 3.38. Turbidity Source Condition in Mathematic Model of Sediment Disposing in the Dumping Area

Construction methode (Equipment)	Turbidity sorce	Turbidity generation model	Turbidity Source Condition
Hopper Barge			Turbidity is produced through water surface to the seabed

Show distribution of turbidity generation

The figure below shows the daily maximum SS distribution in the surface and bottom of the sea in each observation point with the worst condition assumption, where the source was conditioned to be continue during simulation period.

The spread of turbidity diffusion by the basin dredge and sailing channel would not reach the west shore around the river mouth in both cases of rainy and dry season. Although the turbidity diffusion in rainy season with west wind reach the beach behind the new port, the concentration would be under 2mg/l.

The threshold which can give impact to the estimation in an area is shown in the table below. Based on that threshold, the turbidity area is high (5-10 mg/L) also limited to 2 – 3 km from project site.

Furthermore, turbidity distribution of off-shore dumping is limited. Although the concentration of turbidity source is constant, the distribution of turbidity is fluctuate because of unstable nature condition.

Table 3.39. Examples of the Threshold of the Impact on Aquatic Life

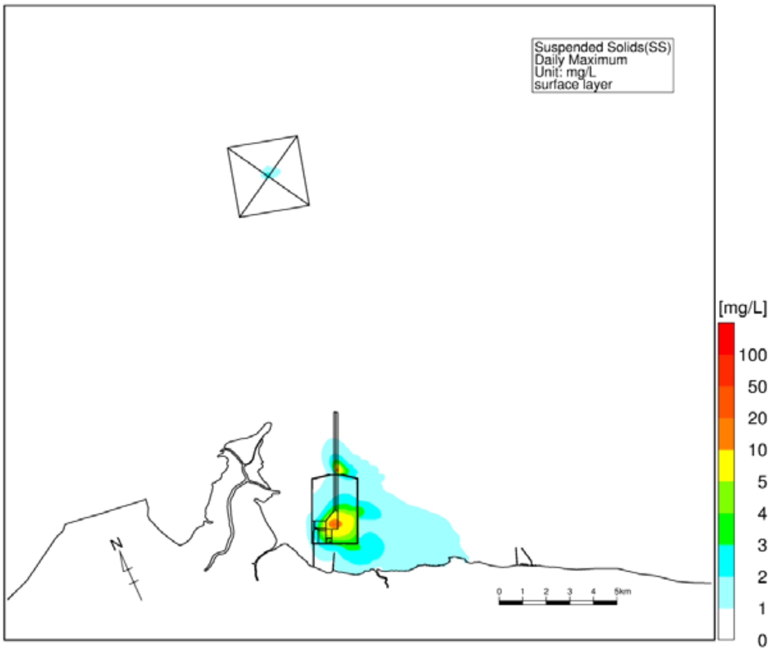
Threshold (SS)*	Country	Explanation
2 mg/L	Japan [1)]	The value has been established as a limit for aquatic species to be able to keep their healthy condition. Note: Usually 10mg/L is used as threshold on fishery imact during the construction since 2mg/L is too strict to meet.
5 mg/L	Canada[2)]	Water quality guidelines for protecting aquatic life. The value is proposed for long term exposures (24 hr-30days).
11 mg/L	Australia (Cape Lambert Port)[3)]	Used for alerting construction works adjacent to coral reefs. It bases on a study for warning indicators for corals. The value is derived from 6 NTU at which corals get stressed.

*The values do not include background concentration.

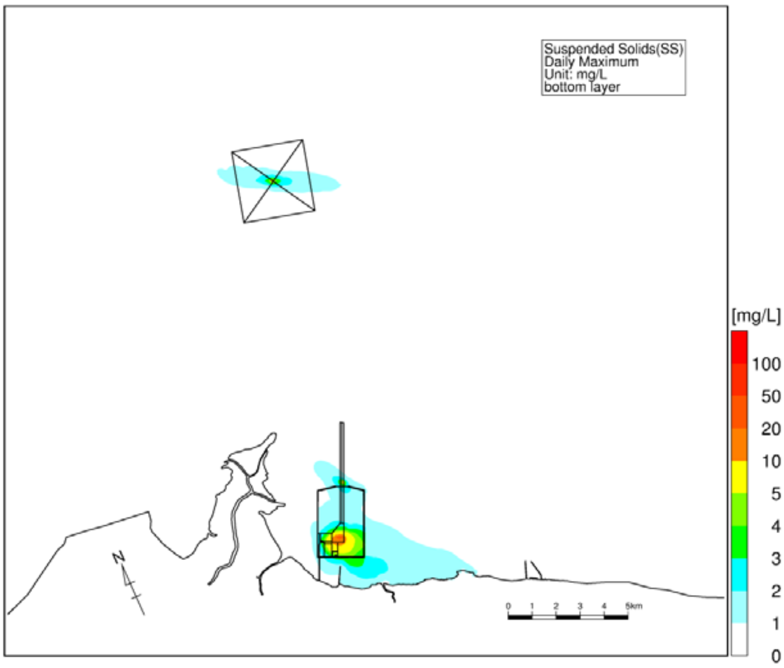
1) Japan Fisheries Resource Conservation Association, 2005

2) Canadian Council of Ministers of the Environment, 1999, updated 2002.

3) Dredging Program for the Cape Lambert Port Upgrade Referral Document



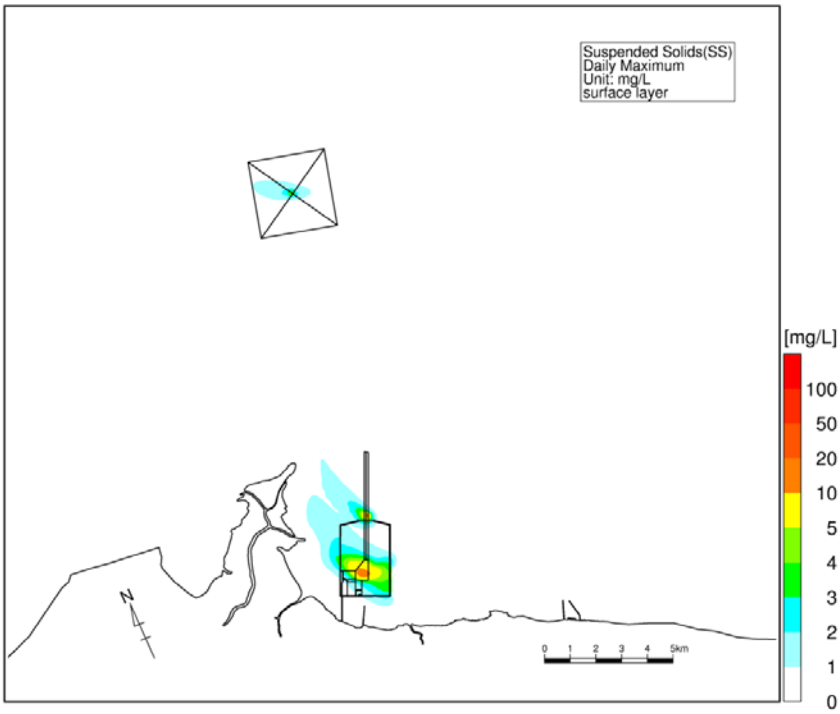
(a) Surface layer



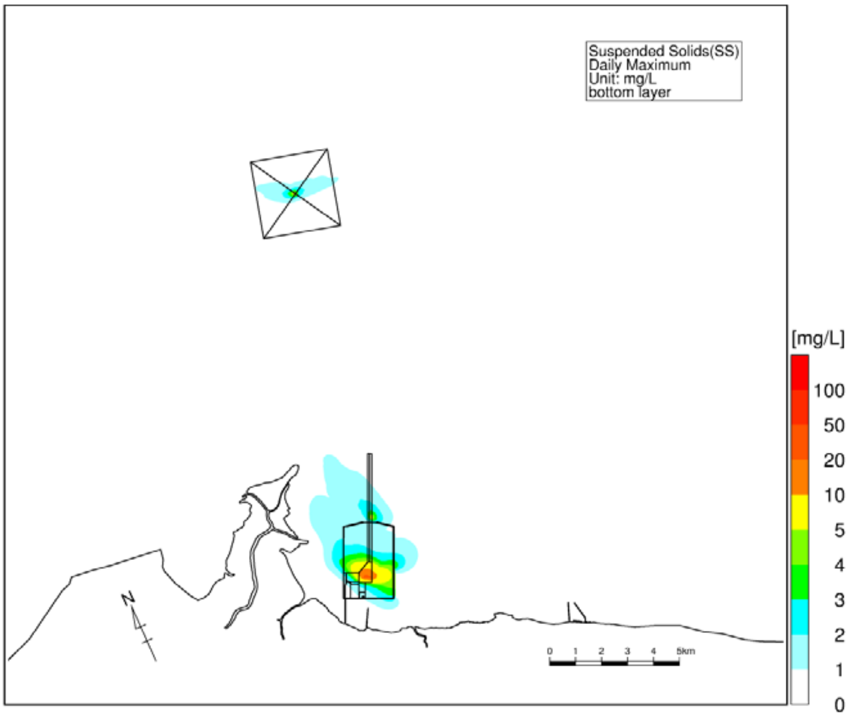
(b) Bottom Layer

- Daily Maximum Turbidity in the rainy season with west wind -

Figure 3.7. Results of Turbidity Diffusion by Construction Works for Phase 1 Stage 1



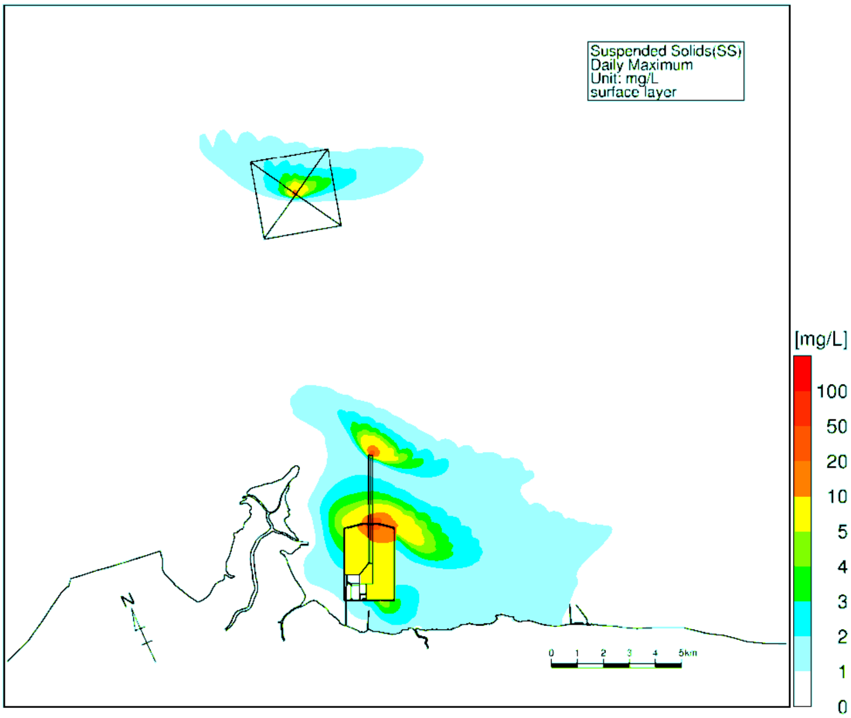
(a) Surfce layer



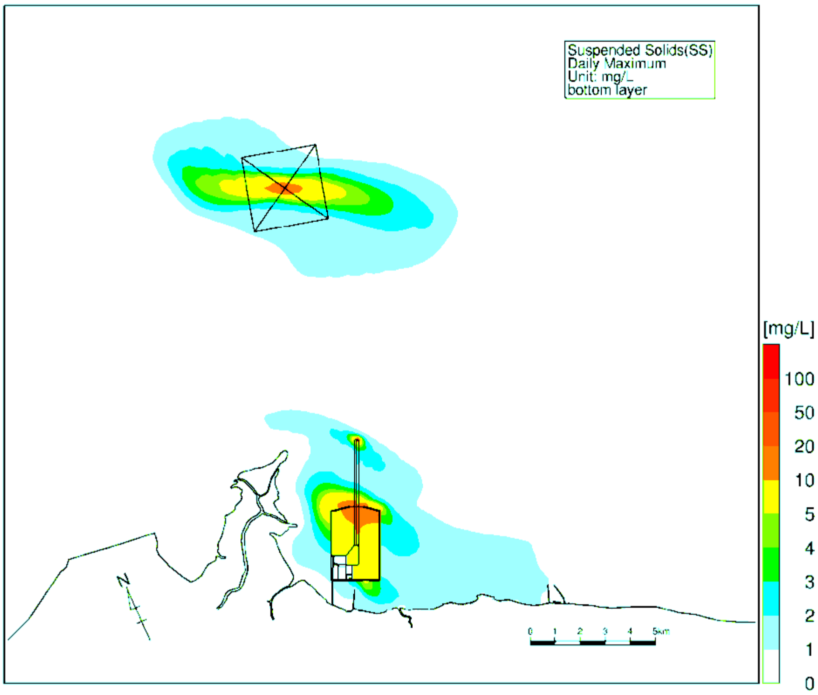
(b) Bottom Layer

- Daily Maximum Turbidity <u>in the dry season</u> with east wind –

Figure 3.8 Results of Turbidity Diffusion by <u>Construction Works for Phase 1 Stage 1</u>



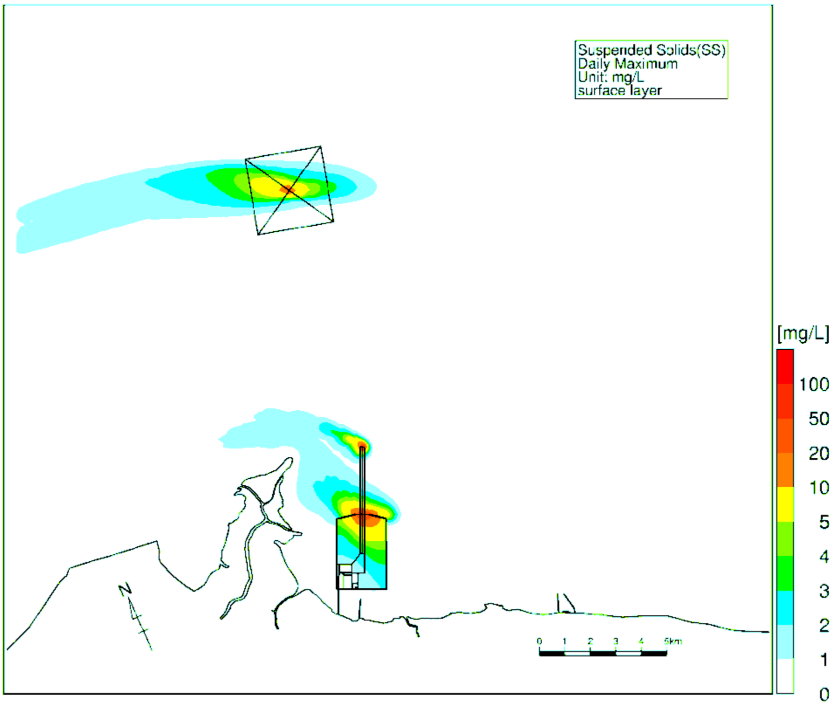
(a) Surface layer



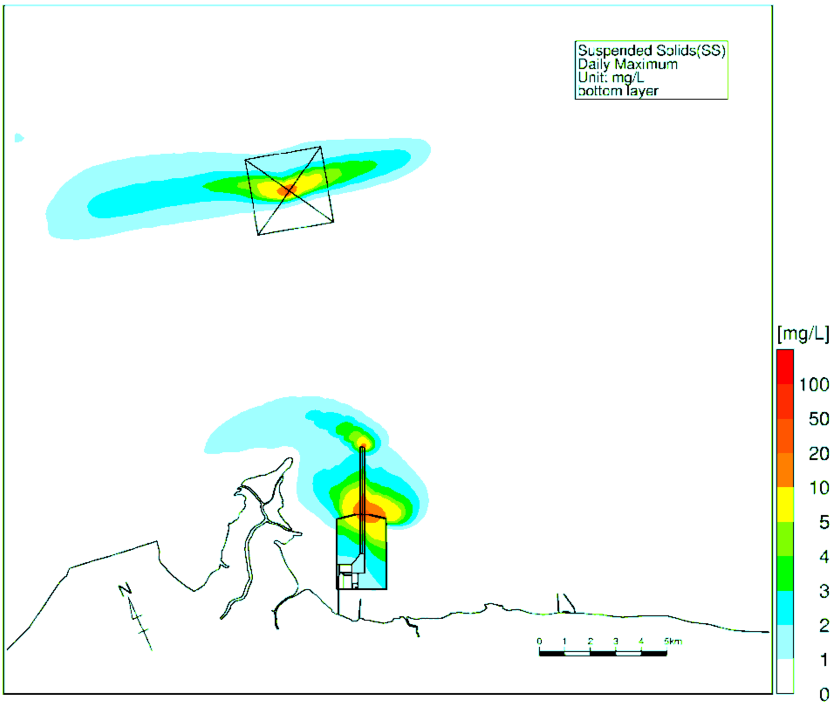
(b) Bottom Layer

- Daily Maximum Turbidity <u>in the rainy season</u> with west wind -

Figure 3.9. Results of Turbidity Diffusion by <u>Construction Works for Phase 1 Stage 2</u>



(a) Surface layer



(b) Bottom Layer

- Daily Maximum Turbidity in the dry season with east wind -

Figure 3.10. Results of Turbidity Diffusion by Construction Works for Phase I Stage 2

The following is estimation of TSS concentration value to the distance if transect line is made to the sediment distribution model.

Based on the result of modeling, it can be known that turbidity increase in the dumping area has smaller distribution distance (10 mg/l distribution distance <1 km) than during dredging activity (10 mg/l distribution distance <3 km). The increasing of average maximum Suspended Sediment concentration occur in the area less than 500 m from the activity source.

This simulation predicts that TSS input continuosly (24 hours), so the result shows distance of turbidity maximum distribution.

Dominant particle from dredging material is silt that consist of 61% particle which the size is 0,0194 mm and settling velocity is 30,58 m/day. Based on that speed, turbidity will disappear from the surface to the bottom at 2 hours in 5 meter depth and 7,8 hours in 10 meter depth.

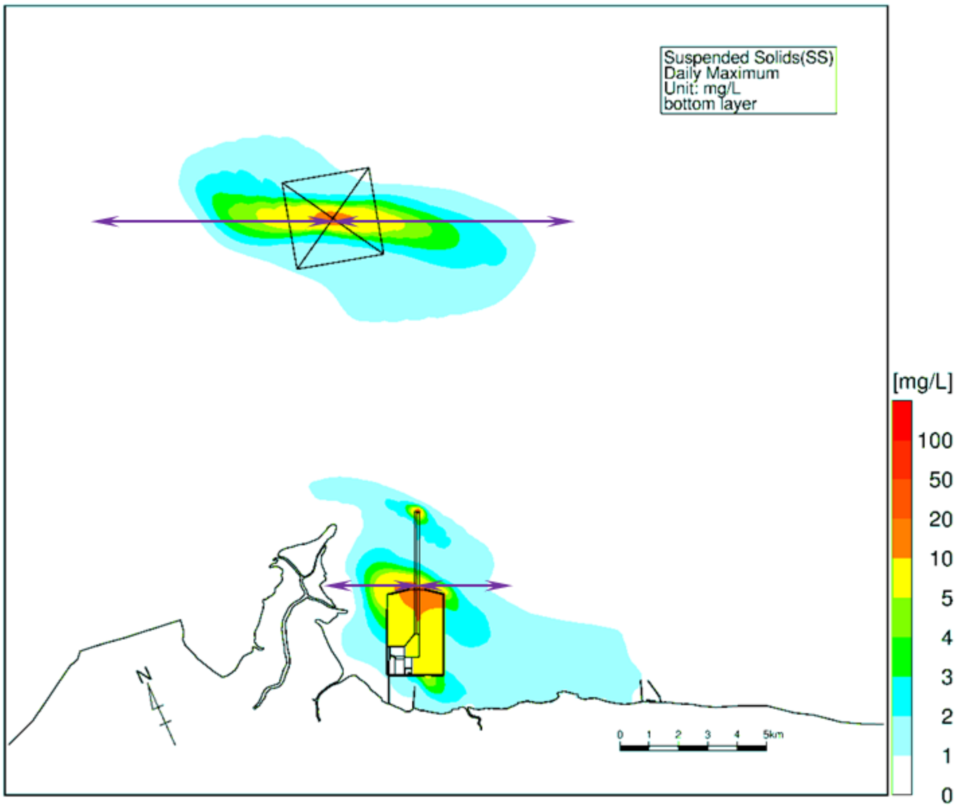
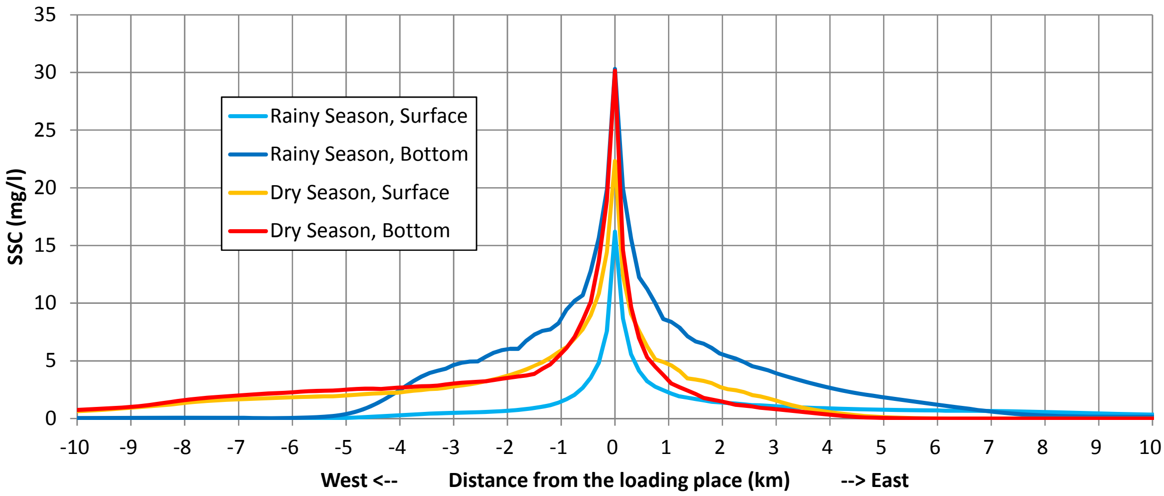
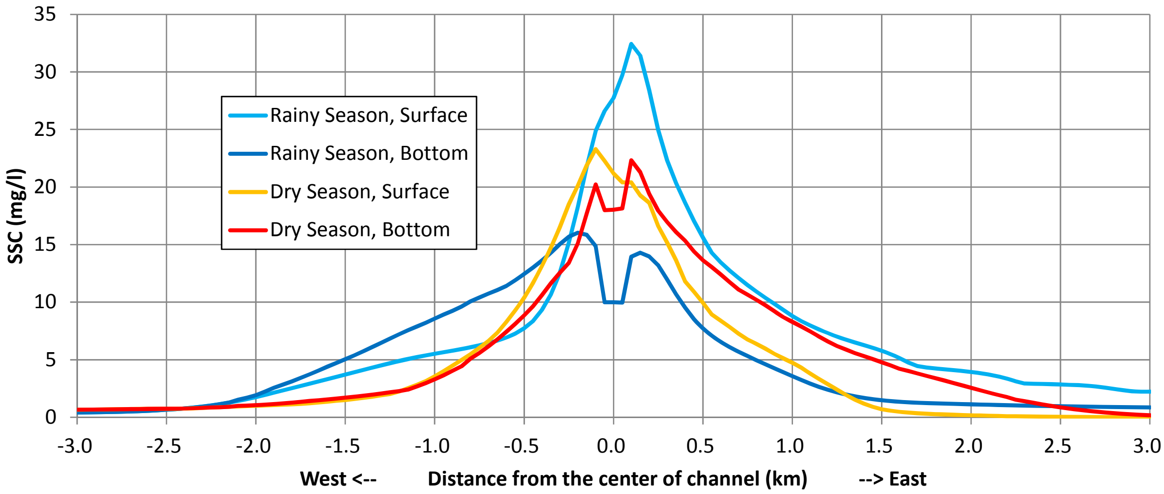


Figure 3.11 Transect sample in one of sediment distribution modeling result (phase 1 – 2)



(1) *Daily Maximum Turbidity <u>around the Dumping Site</u>*



(2) *Daily Maximum Turbidity <u>around the Dredging Site</u>*

Figure 3.12. Transect of sediment suspended distribution concentration to the distance at phase 1-2

Table 3.40. Turbidity Estimation without Project and With Project

Area	*Without Project*	*With Project*	Besaran Dampak
Dumping Site	10.2 – 11.25 mg/L (at CW7)	15.2 – 16.25 mg/L (maximum at 3km)	5mg/L
Dredging Site	12.0 – 15.8 mg/L (a t CW4)	14.5 – 18.3 mg/L (maximum at 3km)	2.5 mg/L

This impact is considered as **negative significant impact (-P)** based on the following considerations :

1. **The Number of People Affected**

   No human being affected by a decrease of sea water quality, so that the impact based on these criteria are predicted as a **non-significant impact (TP).**

2. **Impact Spread Area**

   Dredging activity causes the spread of turbidity at sailing lane and port basin *area.* So the impact is estimated to be **significant impacts (P).**

3. **Duration and Intensity of Impact**

   The impact of dredging activities on decrease of seawater quality that is increase in turbidity and TSS deployment. But the intensity of the impact expected small and limited. Because the spread of turbidity diffusion by the dredging for access channel and anchorage basin would not reach the west shore around the river mouth in both cases of rainy and dry season. Although the turbidity diffusion in rainy season with west wind reaches the beach behind the new port, the concentration would be under 2mg/l. So the impact is estimated to be **not-significant impacts (TP).**

4. **Other Component Affected**

   Other component affected is the marine life disruption, so the impact is predicted as significant impacts **(P)**.

5. **Cummulative Nature of Impact**

   The decrease of sea water quality is cumulative with the reclamation activities impact. so the impact is predicted as significant impacts **(P)**.

6. **Reversible or Irreversible Impact**

   The impact is irreversible. Based on these criteria the impact are predicted as a significant impact **(P).**

3.2.4.2. Disturbance of Marine Life (Nekton and Benthos)

a. Plankton

<u>*Estimation of Impact without Patimban Seaport Development Activity (without project)*</u>

Based on the baseline, phytoplankton abundance in the rainy season are around 64.000 – 231.000 sel/litre. While zooplankton are between 4.000 – 75.000 sel/litre. *Bacillariophyta* phylum have the highest abundance and species number such as *Synedra acus*. There are total of 31 kinds of plankton which consist of 22 kinds of phytoplankton that devided into 9 classes, and 15 kinds zooplankton that devided into 9 classes. Shannon – Wiener diversity index is around 1 – 2 for phytoplankton, while for zooplankton is around 0,41 – 1,40. Based on that value, it can be said that current conditions in the activity plan location are categorized as moderate untill heavy polluted.

<u>Estimation of Impact with Patimban Seaport Development Activity (with project)</u>

Dredging and dumping activities give the direct impact to the plankton. Dredging and dumping are causing the increasing of sedimentation rate and suspended solids contents, also the increasing of waters turbidity that will cause reduction of sun light penetration in to the waters so the primary production decline and dissolved oxygen content in the waters reduce. It especially can disturb photosynthesis process of phytoplankton which in the worst case can obstruct food production process and cause the death. The reduction of producer organism can also cause derivative impact to the food suply in the chain food above, zooplankton which has high dependency to the phytoplankton and possibly get indirect impact.

<u>Impact Magnitude</u>

The baseline for plankton in the rainy season shows that phytoplankton abundance is dominated by *Bacillariophyta* class with the abundance between 28.000 – 140.000 cel/litre. Based on seawater quality measurement result in the activity location, it is known that from 7 measurement locations, 6 points show TSS parameter below the quality standard (80 mg/L). Marine construction work such as dredging and dumping will cause turbidity in the sea water. But the impact intensity is estimated small and limited. Turbidity distribution by the basin and sailing line dredging materials will not reach west beach around the estuary both of dry and rainy season. Although the turbidity in the rainy season with the west wind reach the beach behind seaport, the concentration is still below 2 mg/L.

b. Benthos

<u>Estimation of Impact without Patimban Seaport Development Activity (without project)</u>

Based on baseline, current condition at the activity plan location there are 8 kinds of benthos which consist of 3 kinds of Gastropods and 5 kinds of Bivalves. Benthos diversity index at the activity plan location is between around 0 – 1,26. According to Barbour *et al* (1987), Shannon Wiener diversity index classification shows that diversity index at the activity location is very low. Sampling station location S10 has the highest diversity index as many as 1.26, while S1, S3, S4, S7, S8, and S11 have low diversity index as many as 0. Those results show that S10 is categorized to moderate contaminated, while S1, S3, S4, S7, S8, and S11 are heavy contaminated. The kinds of Benthos that the most commonly found in the sampling location are *Anadara* sp. (Bivalves) and *Melanoides* sp.(Gastropods). Both of them can be one of indicators of water pollution, because of its ability in absorbing the pollutant.

Estimation of Impact with Patimban Seaport Development Activity (With Project)

Dredging and dumping activity have derivative impacts such as marine life disruption (Benthos). This activity is potentialy causing turbidity and the increasing of TSS rate in the waters. The decreasing of seawater quality can disperse to the waters around reclamation site and damage the habitat of marine life. The increasing of sedimentation rate and suspended solid content, also the increasing of water turbidity can cause the death of benthos. Habitat change also will affect to the benthos habitat loss.

Estimation of Impact Magnitude

The baseline for benthos in the rainy season shows that benthos abundance is varied from 0 – 205,88 Induvidualal/m^2. In the rainy season, in some location are not found benthos. There are two classes of benthos in the activity location, which are Gastropods and Bivalves. The most dominating spesies from Gastropods class is *Melanoides tuberculata*, while from Bivalve is *Anadara grandis*. Both of gastropods and bivalves commonly live in the substrat base. Based on the result of sea water measurements in the activity location, it is known that from 7 measurements location, 6 points show TSS parameter is below quality standard (80 mg/L). Marine construction work such as dredging and dumping will cause turbidity in the sea water. But the impact intensity is estimated small and limited. Turbidity distribution by the basin and sailing line dredging materials will not reach west beach around the estuary both of dry and rainy season. Although the turbidity in the rainy season with the west wind reach the beach behind seaport, the concentration is still below 2 mg/L.

c. Necton

Estimation of Impact without Patimban Seaport Development Activity (Without Project)

Based on the baseline, current condition at the activity plan location there are 9 kinds of necton which consist of 5 species of fishes (Pisces) and 4 spesies of shrimps (Crustaceae).

The amount of catch fish are more commonly found in rainy season, while in the dry season are less. The amount of Induvidualal of each fish species found in all sampling location is varied. In the number of catches, the species that most commonly found is petek fish (*Leiognathus equulus*) with 66 Induvidualal in all of sampling location. This species is often found in others location, which is 4 locations. So does jerbung shrimp (*Litopenaeus vannamei*) that found in the sampling location.

Estimation of Impact with Patimban Seaport Development Activity (With Project)

The decreasing of water quality from dredging and dumping activity have derivative impact of marine life disruption such as necton. Benthos is main food for sea fish. If benthos is disturbed so the sea fish will has the impact. The increasing of turbidity in the waters will disturb fish respiratory system generally because the increasing of suspended particle that stick to the gill. Beside the mature Induvidualal, the increasing of suspended particle will also affected to the spawns. The spawns in the waters with high turbidity and sediment rate will have high mortality rate. Dissolved particles can also cause the death of non benthic egg through absorbtion in the eggshell surface. Both of influence make the decreasing of water current and dissolved oxygen into the egg. Both of influence to the fish behavior occur in fish refusal to the turbid water, eating disoreder, and the increasing of finding shelter. Other than that, turbidity also decrease activity and influence the fish's migration lane. Reduction in the number of marine fish will affect to the amount of the catch in that area.

Impact Magnitude

In the reclamation plan area, there are 9 kinds of necton, with majority are kinds that become consumption or livelyhood source of fishermen around the location. Patimban beach is one of fishermen fish cathcing area. Patimban beach area give a quite big contribution to the fishermen catch in that area. Necton species that give big contribution is Petek fish (*Leiognathus equulus*). Dredging and dumping activities can give high pressure to the waters environment in Patimban beach so it can cause disruption of necton. Disturbing or reducing necton not only can bother surrounding waters ecosystem but also give direct impact to the fishermen catch decrease.

Marine construction work such as dredging and dumping will cause turbidity in the sea water. But the impact intensity is estimated small and limited. Turbidity distribution by the basin and sailing line dredging materials will not reach west beach around the estuary both of dry and rainy season. Although the turbidity in the rainy season with the west wind reach the beach behind seaport, the concentration is still below 2 mg/L.

Table 3.41. Analysis of Marine Life Disruption Impact Estimation from Dredging and Dumping Activity

No	*Parameter*	*without project condition*	*With project condition*	Magnitude of impact
1	Plankton	Phytoplankton abundance in rainy season range 64.000 – 231.000 cell/litre. While zooplankton 4.000 – 75.000 cell/litre	Disrupted. Will cause decreasing of abundance	pytoplankton : Minus (64.000 – 231.000 cell/litre) Zooplankton : Minus (4.000 – 75.000 cell/litre)
2	Bhentos	Benthos abuncance 0 – 205,88 Induvidual/m^2	Disrupted. Will cause decreasing of abundance	Minus 0 – 205,88 Induvidual/m^2
3	Necton	9 kinds of necton consist of 5 fishes species (Pisces) and 4 shrimps species (Crustaceae)	Disrupted, but, necton can moving to another place	Decreasing of abundance

Source : Analysis result, 2017

This impact is considered as a **non significant negative impact (-TP)** based on the following considerations :

1. **The Number of People Affected**

   There are no people affected by marine life distribution, because the component directly affected is marine life it self, such as benthos and necton. So, from this criteria the impact is pedicted as **non significant impact (TP).**

2. **Impact Spread Area**

   Impact spread area is limited only in the area affected by dredging and dumping. So, the impact is predicted as **non-significant impact (TP).**

3. **Duration and Intensity of Impact**

   Because the intensity of the decreasing of sea water quality only occur when dredging and dumping activity, so the intensity of marine life disruption is small. Thus, the impact is predicted as **non-significant impact (TP).**

4. **Other Component Affected**

   No other component affected, so the impact is predicted as non-significant impact **(TP).**

5. **Cummulative Nature of Impact**
   The impact of marine life disruption is non cummulative with other activity. So, the impact is predicted as **non siginificant impact (TP).**
6. **Berbalik dan Tidak Berbaliknya Dampak**
   Impact is reversible because this impact only occur in reclamation activity. So, the impact is predicted as **non siginificant impact (TP).**

Based on analysis above, so the impact of marine life disruption in the dredging and dumping activities is predicted as **non significant impact (-TP) and not managed** because it is derivative impact, so the management is optimized in primary impact.

3.2.5. Construction of Onshore Facilities

3.2.5.1. Increasing of run-off

The construction of onshore facilities and some facilities, then most of the land plan that has the initial conditions in the form of agricultural land into open land up into a building. Such conditions will increase the flow coefficient for surface water impact on the rising rate of flowing water that goes into the nearest channel.

Land use change from farm land and fishpond into built land will cause the change of run off rate. Public facilities and social facilities development in the back up area on the 100.000 m^2 area, with the details ; covered by building (social facilities, public facilities, road) is 70.000 m^2 and green open space (utility) is 30.000 m^2 will increase water run off coefficient which increase water run-off debit to the early land condition.

To know water run-off debit after construction in the back up area to the early condition with flood plan debit in 50 years, maximum daily rain intensity (I=21 mm/hour), back up area (A=0,1km^2) can be described as follow :

1. Initial water run-off debit is when the land in the general condition fishpond with coefficient 0.21 is Q_{awal} = 0,278 x 0,21 x 21 x 0,1 = 0,12 m^3/second
2. Final water run-off debit (built) with assumption that building ratio to the road/channel 70 : 30, coefficient water run-off for building which involve to light industri 0,70 and road 0,90 (Suripin, 2004), so compound water run-off coefficient 0,75. Water run off coefficient for utility as green open space 0,25 is as follow :
   a. Social facility, Public facility, and road $Q_{akhir\ terbangun}$ = 0,278 x 0,75 x21 mm/hour x 0,07 km^2 = 0,29 m^3/second
   b. RTH (Utility) $Q_{akhir\ RTH}$ = 0,278 x 0,25 x21 mm/jam x 0,03 km^2 = 0,04 m^3/second

Total built water run-off debit $Q_{akhir\ total\ terbangun}$ = 0,33 m^3/second.

Magnitude of increasing water run off debit after development in the back up area for flood plan period 50 years is 0,33 m^3/second – 0,12 m^3/second= 0,21 m^3/second for back up area built land is 10 Ha area.

Table 3.42. The Increasing of Water run off impact estimation Analysis in On-shore facility development activity

No	***Parameter***	***Without project condition***	***With project condition***	**Magnitude of impact**
1	Water run off debit	Q_{awal} = 0,278 x 0,21 x 21 x 0,1 = 0,12 m^3/second	$Q_{akhir\ total\ terbangun}$ = 0,33 m^3/second	0,33 m^3/second – 0,12 m^3/second = 0,21 m^3/second

Based on the criteria of impact, it can be known that :

1. **The Number of People Affected**

   The people affeccted by the increasing of run off debit are settlements around Kali Genteng and/or its creek and Kali sewu and/or its creek. Activity plan site is very near to the shoreline, people are in the south part of site area so they are not affected by water run off from both of rivers, but because of rob water, disturbance potency can reach settlements, so the impact is **significant.**
2. **Impact Spread Area**

   The impact spread area involve *back up* area and its surrounding area which is near to the shoreline, so the impact is **significant.**
3. **Duration and Intensity of Impact**

   Impact will occur in the rainy season with average rain intensity is 21 mm/hour or 0,33 m^3/second on the area as big as back up area 10 Ha for flood plan period 50 years. So the impact is non significant.
4. **Other Component Affected**

   The increasing of water run off will not cause flood in both of rivers and directly connected to the off shore, So the impact is non significant.
5. **Cummulative Nature of Impact**

   Impact that occur mainly with rainy day intensity, beside increase run off volume it also bring sediment because of soil erosion which can rise the impact to the other environmental component, so the impact is significant.

6. Reversible or Irreversible Impact

The impact will be reversible (stop) when the rain stop, so the impact is **non significant negative.**

Based on the analysis of significant impact criteria, so the impact of on-shore facility development to the increasingg of water run off is categorized as **significant negative impact** (**-P**).

3.2.5.2. Public Unrest

Impacts that appear from on-shore facilities development activities are the increasing of water run off and public unrest. That impact is in accordance with quesioner distribution result to the people around Patimban seaport development location who feel worried, such as : 1 % respondents feel worried of Patimban seaport development.

Data analysis method to calculate public unrest is done by comparing attitude/argument/negative perception as the result of public unrest to the occupation with positive perception to the occupation. Public unrest appear when % Urs is bigger than 100% as seen in this following formula:

$$\%Urs = \frac{Negative\ perception\ (disagree)}{Positive\ perception\ (agree)} * 100\%$$

%Urs = Restless percentage

P(+) = Positive perception to the activity

P(−) = Negative perception to the activity

Restless rate calculation based on that formula :

$$\%Urs = \frac{Negative\ perception\ (0{,}38)}{Positive\ perception\ (0{,}62)} * 100\% = 61{,}29\%$$

Based on that calculation, it can be conclude that Patimban seaport plan activity doesn't make significant public unrest. It is shown by Urs calculating result as many as 61,29% that smaller than 100%.

Table 3.43. Analysis Of Public Unrest Impact Estimation With On-shore Facility Development

No	*Parameter*	*Without project Condition*	*With project Condition*	**Magnitude of impact**
1	Public unrest when on-shore facility development	No public unrest from Patimban seaport development plan	1% respondent feel restless because of Patimban seaport development	Restless stated appear when %Urs more than 100%, magnitude of impact shows Urs as much as 61,29%, So the restless is not significant.

Source : Analysis result, 2017

Seen from the impact of interest based on significant impact criteria, so the impact of on-shore facilities development activity to the public unrest parameter can be described as follow :

1. **The Number of People Affected**

   People who will be feel restless as the result of on-shore facility development activity in the construction phase are people live along the roads that are passed by materials transporting vehicle and road users. So, on-shore facility development activity to the public unrest is estimated as **significant impact (P).**

2. **Impact Spread Area**

   Project construction activities to the public unrest have potency to spread around the back up area that will be built, so it predicted as **significant impact (P).**

3. **Duration and Intensity of Impact**

   Impact of project construction development activity is long enough for 48 months, so the impact is predicted as **significant impact (p).**

4. **The Other Component Affected**

   The impact of on-shore facility development activity to the public unrest parameter does not affect to other environment component, so the impact is predicted as **non significant impact.**

5. **Cummulative Nature of Impact**

   Impact to the public unrest is not cummulative. So, the impact is estimated as **non significant impact (TP).**

6. **Reversible or Irreversible Impact**
   Impact to the public unrest is categorized into reversible impact because the social process of the people will develop in accordance with the people understanding about environmental change. So, the impact is estimated as **non significant impact (TP).**

Based on the analysis above, so the onshore facilitiy construction impact to the public unrest is estimated as **significant negative impact (-P).**

3.3. Operation Phase

3.3.1. Procurement of Labor

3.3.1.1. Job and Bussiness Opportunity

New job opportunities are expected during operation phase for the port. Labor procurement activities in the operational phase in its recruitment will give priority to a population of about proportionately in accordance with the requirements of the required capabilities.

Procurement of labor has done inPhase I stage 1 to start sea port activity. To manage and operate Patimban seaport, operator terminal will be designed by consesion scheme (KPS, Konsesi Pelabuhan Skema). The estimation of labor that is required in operational phase can be recruited from local people. The estimation of local worker is 285 person (30% from 950 person).

Table 3.44 Estimation of required labor for operational phase, Phase I stage 1 – Phase I stage 2

No.	Work Space	Total of worker
1.	Seaport authority office, *Harbor Master Office*, other office, Quarantine office, Immigration office	150
2.	Container terminal	600 (300 x 2)
3.	Vehicle terminal	200
Total		**950**

Source: JICA Survey Team

The amount of worker needed are 950 people (Administration; 150 people, Terminal labor; 800 people). Among the terminal laber, 285 people migh be hired by local people (30%). With labor needs are so great, that will create employment opportunities and to create and / or improve business opportunities for residents around the project site. Beside canteen/restaurant that fullfill worker food needs, they will also need bathing and wasing needs. These needs will be fullfilled by shop around the seaport and will arouse business opportunities.

Estimation of job and business opportunities impact are determined by comparing the amount of recruited local workers ratio with the required total workers to the ratio of recruited workers with the amount of unemployment in the study area. In the description of the environmental baseline, it is known that the number of others categorized residents (residents who have not permanent job) from 2 ditrics are 481 person (see the Type of work section). The used formula is:

$$\mathbf{LO = \frac{LO\ in/LOn}{LOn/UL} x\ 100\ \%}$$

Where :

LO	:	Job opportunity rate
LO in	:	Number of recruited local worker
LO n	:	Total number of total recruited workers
UL	:	Number of unemployment people around study area

The calculation of that formula is:

$$LO = \frac{960/240}{960/481} \text{ x } 100\ \%$$

$$= 2{,}05$$

As for the impact criterias are as follow :

(i) Activity will has significant impact in giving job opportunity if LO = 1

(ii) Activity will has fair impact if LO is between 0 to less than 1 and between more than 1 to 2; and

(iii) Activity will has less impact if LO more than 2

Calculation from that formula is :

$$LO = \frac{960/286}{960/481} \text{ x } 100\ \%$$

$$= 1{,}73$$

Through that calculation, so it can be conclude that impact criteria of job opportunity is rated as **Fair**. So, job opportunities are very needed by local people, thus it is significant impact for the job seeker around the location of Patimban seaport development.

It need to be consider, that impact of impact of created job opportunity is different with business opportunity. With the huge number of required workers, it will create job opportunities and business opportunities for the people around the project location. Most of workers who are not come from that area will stay in basecamp which is completed with canteen that can be managed by local people. Providing shelter and its supporting facilities will also completed with canteen/food stalls with expected capacity that can fullfill workers eat and drink needs everyday. Beside canteen/food stall, workers also need other daily needs such as bathing and washing needs. Those needs can be fullfilled by shop/groceries around the project site.

It is expected with the appearance of food and lodging services business will increase local people standard of living. Regarding the calculation result, so the positive impact that occured is categorized as significant. Seeing from impact of interset based on significant impact criteria, so the impact of workers employment activity to the job opportunity parameter can be described as follow :

1. **The Number of People Affected**
   The local residents that will accept the benefits of this activity is estimated around 285 people (30%), they have big opportunities to be recruited as labor. As for business opportunities, the big opportunities comes from eat and drink needs of the workers that managed by canteen in the port area. So that employment and seek for business opportunities in employment procurement activities are predicted as **significant impacts.**
2. **Impact Spread Area**
   Employment procurement activities will involve workers from outside and also villages around project area such as Pusakaratu Village, Gempol Village, Kalentambo Village, Kotasari Village and Patimban Village, District Pusakanagara. Because of that the impact is considered to be significant impacts.
3. **Intensitas dan Lama Dampak**
   Employment procurement activities is predicted to take very long as port operation, so the impact is predicted as significant impact.
4. **Component Lain yang Terdampak**
   There are no other environmental components affected by the activities of employment procurement, so that the impact is considered as not significant impact.

5. **Cummulative Nature of Impact**

Impact of opening job and business opportunties is not cummulative. So the impact is rated as non significant impact.

6. Reversible or Irreversible Impact

The impact is reversible because the residents can work and make a business somewhere or other fields. So the impact considered to be not significant impact.

3.3.2. Operation of Marine Facilities

3.3.2.1. Decreasing of Air Quality

Vessels which call to the new port will increase air pollutant in the ambient air. Therefore, the ambient concentration of the pollutants was predicted and compared with the standard.

The used estimated method to predict emision rate from the ship is determined in *"Manuals for Total Volume Control of NO_x"* [1] which is used to estimated magnitude of NO_x and SO_x content, while *"IPCC Guideline"*[2] is used to estimated magnitude of CO_2 content.This is the following formula :

$$W = 0.17 \times P^{0.98} \ (A^{0.98} \times T \times d) \qquad \text{(during anchored)}$$

$$P_{Container} = 2.2X^{0.6} \times 1.88,\ P_{PCC} = 1.4X^{0.7} \times 1.88,$$

$$W = 0.21 \times (P \times A)^{0.95} \times T \qquad \text{(during anchored)}$$

$$P_{Container} = 1.9X^{0.97},\ P_{PCC} = 4.1X^{0.96},$$

$$N = 1.49 \times P^{1.14} \ (A^{1.14} \times T \times d) \ \times 10^{-3} \times (46/22.4)$$

$$S = W \times s \times (64/32)$$

$$C = 40{,}190 \times W \times 21.1 \times \ (44/12) \ \times 10^{-6}$$

Which :

W : *Fuel consumption* (kg/vessel)

N : *Emission of* NOx (kg/vessel)

S : *Emission of* SOx (kg/vessel)

C : *Emission of* CO2 (kg/vessel)

P : *Rated power* (PS)*

X : *Gross tom* (t)

T : *Time* (hr) , 20 jam selama berlabuh dan 2 jam selama berlayar

d : *Number of working engine**

A : *Loading factor of engine*

S : *Sulfer ratio in fuel (% weight)*

*assumed 1 sub-machine during anchored and 1 main machine when ship sailing

Ship specification to estimate the emision can be seen in this following table

Table 3.45 Specification of anchored ship

Parameter		Container Ship		PCC	
		Small size	Panamax	Domestic	International
Amount of *loading container* or car		1,270 TEU	4,230 TEU	1,000 cars	6,100 cars
Gross ton		14,782 Gt	61,574 Gt	14,111 Gt	42,759 Gt
Rated power of main engine		21,057 PS	84037 PS	35,881 PS	102,863 PS
Daily number of ships per year	2019	394	0	214	107
	2025	331	336	324	162
	2037	943	957	640	320

Based on the calculation above, obtained that around 2,1 ton of NOx, 1,1 ton SOx and 106 ton CO_2 will emited everyday from the ship activity which anchored in Patimban seaport. The result of ship emision estimation in 2037 is seen in Table 3.46.

Beside of the calculation above, it is also calculated pollutant concentration in the ambient air using *Plume Model*, that shows emited pollutant dispersion from the moving ships when the wind velocity is above 1 m/s. Emision from ships is estimated as source of point. So the pollutant concentration in the points (*x, y, z*) is given by :

$$C(x,y,z) = \frac{Q}{2\pi \cdot u \cdot \sigma_y \cdot \sigma_z} \exp\left(-\frac{y^2}{2\sigma_y^2}\right)\left[\exp\left\{-\frac{(z+H)^2}{2\sigma_z^2}\right\} + \exp\left\{-\frac{(z-H)^2}{2\sigma_z^2}\right\}\right] \times 10^9$$

Where:

$C(x, y, z)$: Pollutant concentration in all of prediction points (*x, y, z*) ($\mu g/m^3$)
Q : Air pollutant emision rate (kg/s)
u : average wind rate (m/s)
H : Emision source height, *determined 30 (m)*
x : *distance from emision source to the prediction points along the wind direction (m)*
y : Horizontal distance from the prediction points perpendicular with axis x- (m)
z : Vertical distance from the prediction points perpendicular with axis x- (m)

σ_y, σ_z : dispersion width from dimension of y and z (m)

Table 3.46 Prediction Result of Emission from Vessel in 2037

			Estimation per container vessel								Estimation per PCC								Total Emission	
			Small size				Panamax				Domestic				International				Annual Estimation	Daily Estimation
Items		Unit	During Anchoring	During Navigation	Total	Annual Estimation	During Anchoring	During Navigation	Total	Annual Estimation	During Anchoring	During Navigation	Total	Annual Estimation	During Anchoring	During Navigation	Total	Annual Estimation		
Given conditions	Number of vessels	-	1	1	-	943	1	1	-	957	1	1	-	640	1	1	-	320	-	-
	Rated power	PS	1,313	21,057	-	-	3,092	84,037	-	-	2,113	35,881	-	-	4,592	102,863	-	-	-	-
	Time	hr	20	2	-	-	20	2	-	-	20	2	-	-	20	2	-	-	-	-
	Number of working engine	-	1	1	-	-	1	1	-	-	1	1	-	-	1	1	-	-	-	-
	Loading factor of engine	-	0.42	0.09	-	-	0.42	0.09	-	-	0.42	0.09	-	-	0	0	-	-	-	-
	Sulfer ratio in fuel	%	1.33	1.42	-	-	1.33	1.42	-	-	1.80	2.05	-	-	2	2	-	-	-	-
Results of Estimation of Emission	Fuel consumption	kg	1,653	546	2,199	2,073,586	3,825	2,032	5,858	5,605,995	2,635	906	3,540	2,265,778	5,637	2,463	8,100	2,591,850	12,537,209	34,349
	NOx	kg	82	33	115	108,503	217	162	378	362,144	141	61	202	129,126	340	203	544	174,026	773,799	2,120
	SO_2	kg	44	16	59	55,990	101	58	159	152,444	95	37	132	84,377	202	101	304	97,166	389,977	1,068
	CO_2	kg	5,140	1,697	6,837	6,447,540	11,895	6,320	18,214	17,431,091	8,192	2,816	11,008	7,045,134	17,527	7,658	25,184	8,059,010	38,982,775	106,802

Source : JICA Survey Team

Assumptions that are used in pollutant disperse calculation above are :

- Wind velocity : 3,0 m/det (5.8 knot, observed average rate for 11 years in Patimban on March, April, and November when the wind direction head to the northeast).
- Wind direction : Northeast is determined as the most influenced wind direction to the impact prediction points.

Impact prediction points which is determined as the most affected area illustrated in figure below. Where the sampling points in primary survey are shown with notation AN1, AN2 dan AN3. While for estimating air quality in the future with the existency of seaport, the value of AN2 measurement result is used for P1 and P2, while AN3 value is for P3.

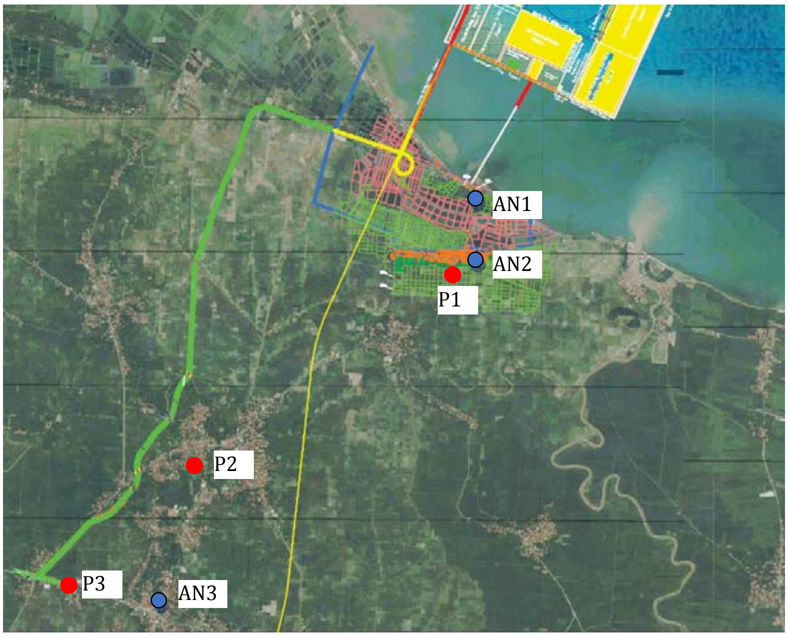


Figure 3.13. Prediction Points

Description :

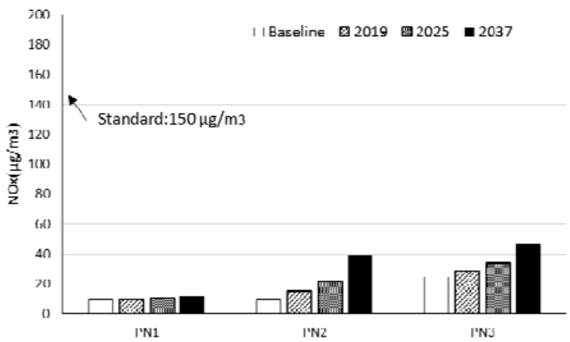
P 1 : Desa Patimban , P 2 : Desa Gempol , P 3 : Jl. R.Nasional Pantura

Model simulation that is made has consider the structure that will be built in phase II, in order to estimate maximum accumulation impact for whole activity.

Table 3.47 Predicted Ambient Air Quality from the Vessels

St.		P1	P2	P3
NOx	Baseline	<9.97	<9.97	24.77
	2019	10.29	15.42	28.9
	2025	10.66	21.82	33.8
	2037	11.64	38.74	46.6
	Standard	150		
SO_2	Baseline	88.26	88.26	100.34
	2019	88.44	91.39	102.7
	2025	88.62	94.40	105.0
	2037	89.10	102.76	111.4
	Standard	365		

.Emission Factor: Based on "Technical Note of National Institute for Land and Infrastructure Management"[1]
The standard of NOx is substituted by the NO_2 standard.



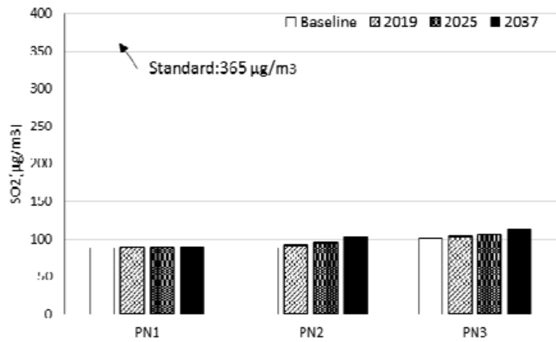


Figure 3.14. Predicted Ambient Air Quality from the Vessels

Based on the table and chart above, it can be seen that pollutant concentration such as NOx and SO2 far below quality standard that are required in accordance with PPRI No.41 1999.

This impact is rated as negative non-significant impact (-TP) based on consideration

1. **The number of people who will be affected**

   No people affected because air pollution intensity is very small, so this impact is categorized as non significant impact **(TP).**

[1] National Institute for Land and Infrastructure Management, Ministry of Land Infrastructure Transport and Tourism, Japan, Grounds for the Calculation of Motor Vehicle Emission Factors using Environment Impact Assessment of Road Project etc. (Revision of FY 2010), Technical note of National Institute for Land and Infrastructure Management No.671, 2012.

2. **The total area of the impact spread**

   The area of the impact spread is limited near vessel. Therefore, it is predicted as non significant impact **(TP).**
3. **Intensity and Duration of the impact**

   The duration of the impact is short term, with low intensity. Therefore, the impact is predicted as non significant impact **(TP)**
4. **Many other environmental components affected**

   No other environmental components affected, so the impact is considered as non significant impact **(TP).**
5. The nature of cumulative impacts

   The impact will not cumulative. So predicted as non significant impact.
6. Reversible or irreversible impact

   The impact is reversible because of the impact occurs temporary. So the impact is considered as non significant impact **(TP).**

3.3.2.2. Sedimentation

Marine facility and reclamation area affect to the sediment transport change process. Based on that condition so seabed morfology change modeling is done to estimate sedimentation patern change as the result of Patimban seaport existence.

Sedimentation mathematic modeling is done by modeling design scenario as follow :

General description Numerical Simulation Method

Numeric analysis in the sedimentation have been done to have information about dredging volume number in anchored basin and sailing line after port operational started. The figure below show general description of numeric analysis process that will be done :

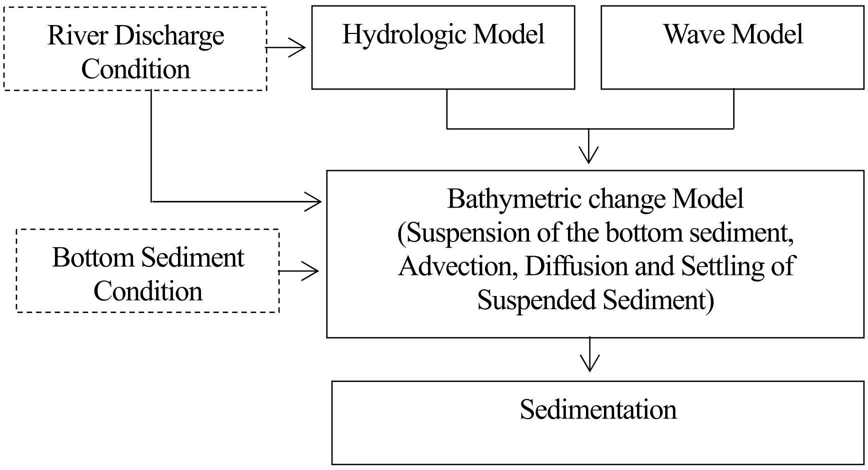


Figure 3.15 General Description Of Numeric Analysis Process

Condition for Numeric Simulation

Table 3.48 shows the results of the analysis for bottom sediment particles around the New Port. Moreover, Figure 3.16 shows an example of sediment particle diagram. It can be recognized that silt and clay particles are dominant in every location. Average watercontent is approximately 90 % except W33 that has extreme high value.

The primary result of the numerical simulation that obeys mass conservation lawis the dry Volume of sediment weight of sediment (G). Therefore, it is necessary to transform from the weight to the volumeof sediment (D) with water content (W)in order to understand easily the magnitude of bathymetric changes as bellow.

Dry Density: $\rho = \dfrac{\rho_s V_s}{V_w + V_s}$ (1)

$D = V_w + V_s = G / \rho$ (2)

Here, ρw is the density of sea water(≒1025 kg/m3), ρs is the soil particle density (≒2650 kg/m3), Vw is the volume of sea water, Vs is the volume of soil particles and G is the dry weight of sediment.

Water content of sediment : $W = \dfrac{W_w}{W_s} = \dfrac{\rho_w V_w}{\rho_s V_s}$, , $\dfrac{V_w}{V_s} = W \dfrac{\rho_s}{\rho_w}$ (3)

With the formula (1)-(3),

$$\frac{1}{\rho}=\frac{1}{\rho_s}+\frac{V_w}{\rho_s V_s}=\frac{1}{\rho_s}+\frac{W}{\rho_w} \qquad (4)$$

$$D=G\left(\frac{1}{\rho_s}+\frac{W}{\rho_w}\right) \qquad (5)$$

Table 3.48 Results of the analysis for bottom sediment particles

Location*	Depth(m)	Content Rate (%)				Water Content (%)	Remarks
		Gravel	Sand	Silt	Clay		
C1	8.7	0.00	8.38	71.25	20.37	71.71	
C3	6.9	0.17	2.68	46.75	50.40	92.42	
C5	4.0	0.16	0.92	71.17	27.75	65.85	
E34	6.6	0.00	11.31	54.14	34.55	136.91	
E42	9.5	0.00	1.41	54.28	44.31	91.92	
E44	6.4	0.00	0.56	90.99	8.45	133.72	
W21	6.6	0.00	0.23	66.54	33.23	92.09	
W23	4.8	0.00	0.07	70.70	29.23	77.93	
W24	3.5	0.00	0.17	41.60	58.23	85.11	
W25	0.8	0.00	0.87	81.26	17.87	53.22	
W31	4.6	0.00	0.23	82.14	17.63	115.04	
W32	2.5	0.00	0.70	67.53	31.77	77.93	
W33	1.5	0.00	0.39	53.32	46.29	216.01	
Average		0.03	2.15	65.51	32.31	100.76	
						91.15	Except W33

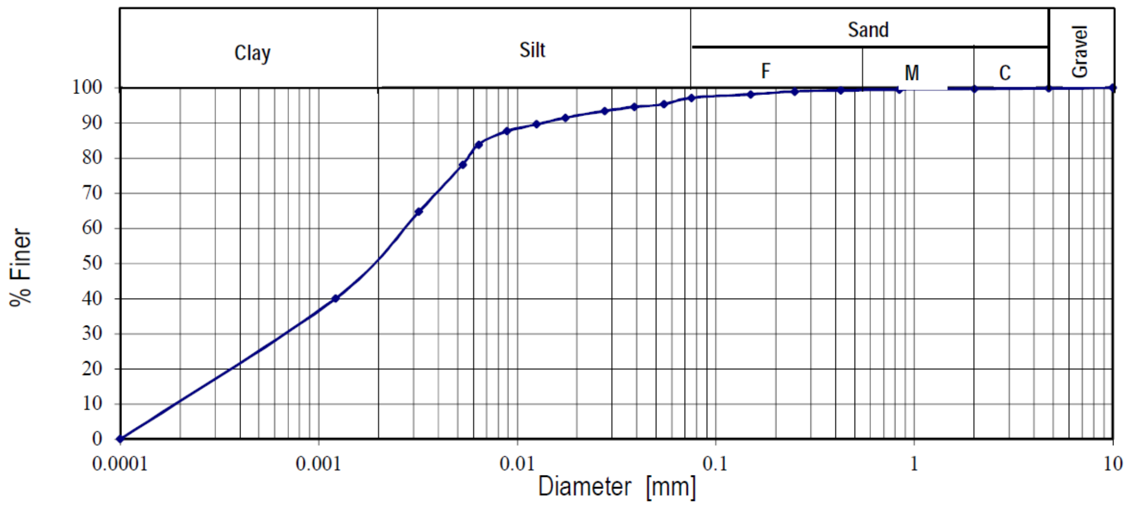


Figure 3.16 Example of the bottom particle sediment (C3)

Suspension and settling of the bottom sediment

Following formula widely accepted to obtaine the amount of suspended sediment volume E and settling volume D that were used.

$$E = M\,(\tau_b / \tau_{ec} - 1) \qquad (6)$$

$$D = W_s\,(1 - \tau_b / \tau_{dc})C_{bed} \qquad (7)$$

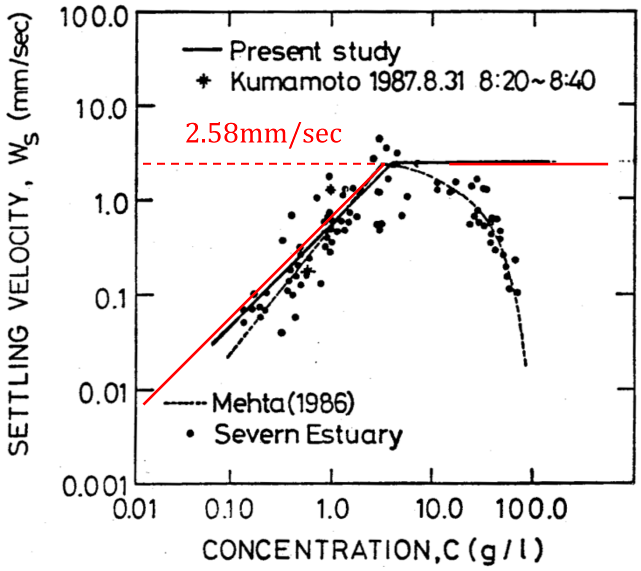
Where, M is the empirical suspension constant, τ_b is the bottom shear stress by current and wave actions, τ_{ec} is the critical shear stress for suspension, τ_{dc} is the critical shear stress for settling and C_{bed} is the concentration of suspended sediment in the bottom layer, W_s is the settling velocity.

Flocculation and Settling Velocity

Generally, the settling velocity of fine particles with flocculation is related to the suspended solid concentration. This study refers to the relation of red line shown in Figure 3.17. Maximum settling velocity is set as 2.58 mm/sec and Stokes formula for 0.01 mm diameters of single particle sets the minimum (0.009mm/s) as the settling velocity. Furthermore, the influence of salinity is considered by the method of DELFT3D (Deltares), shown in Figure 3.18.

Stokes formula: $$\frac{w_0}{\sqrt{(s-1)gd}} = \frac{1}{18}\frac{\sqrt{(s-1)gd^3}}{\nu} \qquad (8)$$

where, w0 is the settling velocity of single particle, s is the submerged specific gravity of soil particle, gis the gravitational acceleration, d is the diameter of soil particle, ν is the kinematic viscosity coefficient of fluid.



Setting with referring tsuruya et al. (1999)

Figure 3.17 Settling velocity diagram by suspended sediment concentration

(assuming of enough high salinity)

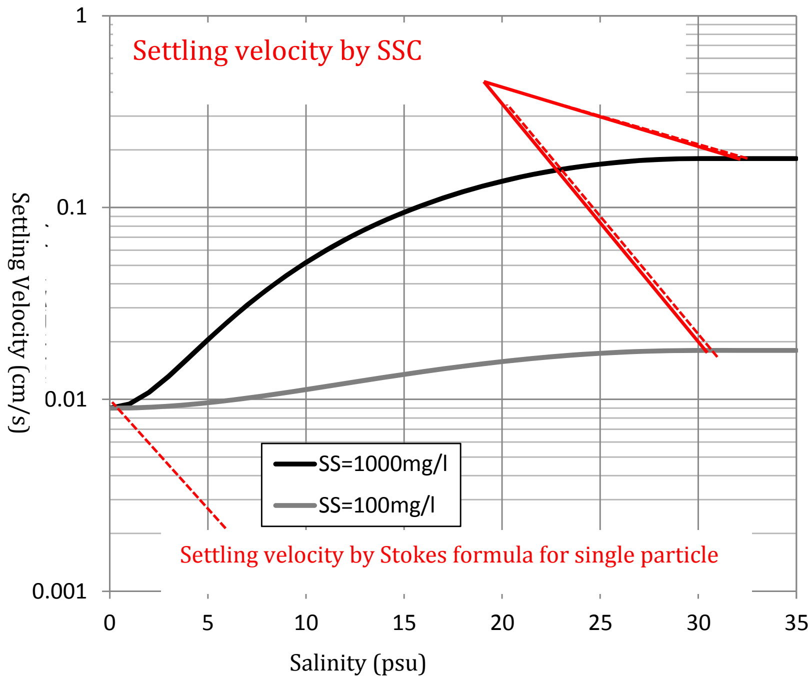


Figure 3.18 Examples of the settling velocity diagram by salinity

Calculation of Channel Deposition for Future

Empirical constants of the suspension shown in table below, it have been used for calculation of channel deposition for future topography with port facilities.

Table 3.49 Empirical Constants Of The Suspension And Settling

Parameter	Value	Description
M: empirical constants of the suspension	0.12kg/m^2/min	Berdasarkan hasil study pada Pelabuhan Tanjung Priok*
τ_{ec}: critical shear stress for suspension	0.10Pa	
τ_{dc}: critical shear stress for settling	∞	The settling always occurs irrespective of the magnitude of the turbulence by wave and current.

** Japan Overseas Ports Cooperation Association (JOPCA): Report Of The Study Group On The Development Of Estuarine Navigation Channels, Technical Guide Book For The Development Of Estuarine Navigation Channels, March 2010*

There are 3 scenario that become consideration :

- Wave conditions in rainy and dry season: energy average wave (which represents the waves with wave height less than 1.5m)
- Severe wave conditions in rainy and dry season: wave with expected occurrence of around once a year (which represent the waves with wave height over 1.5m)
- River flush condition in rainy season: extreme river discharge

External Influence

Figure 3.19 below shows each external influence condition for sedimentation.

Table 3.50 Conditions of Each External forces for Sedimentation

	Kondisi Gelombang Normal		Kondisi Gelombang Besar		Kondisi Aliran Sungai
	Musim Hujan	Musim Kemarau	Musim Hujan	Musim Kemarau	
Wind Speed	2.8m/s	3.4m/s	2.8m/s	3.4m/s	2.8m/s
Wind Direction	WNW	ESE	WNW	ESE	WNW
Offshore Wave Height	0.64 m	0.64 m	1.98 m	1.45 m	0.64 m
Offshore Wave Period	3.0 sec.	3.0 sec.	6.3 sec.	5.6 sec.	3.0 sec.
Offshore Wave Direction	WNW	NE	NW	NE	WNW
River Flow Discharge (Cipunagara River)	148m^3/s	18m^3/s	148m^3/s	18m^3/s	Time Series shown by Figure 5-9
Computation Period (except Spin-up	15 days		4 days after finishing severe wave of river flush situation (each 1day), (Total 5 days)		

Time)					
Annual occurrence of the hydrological conditions	4.0 times*1) (4.0 * 15 days)	2.4 times*1) (2.4 * 15 days)	3.7 times*1)	3.5 times*1)	2.5 times*2)
Remarks	Steady Condition except Tide		Offshore wave heights are set in time series shown by Figure 5-10		

*1) Based on the result of wave statistic analysis (refer to Figure 3.19)

*2) Based on existing data of river flow by BNBP (refer to Figure 3.19)

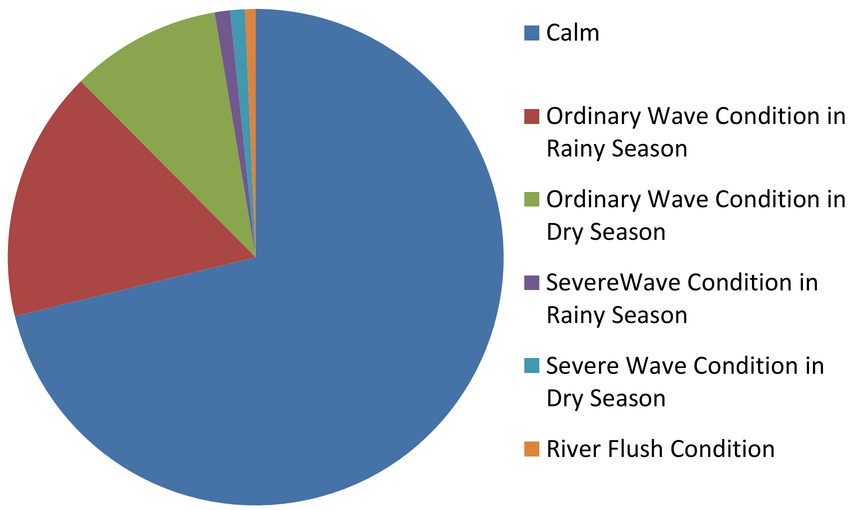


Figure 3.19. Estimated Annual Occurrence of the Hydrological Conditions

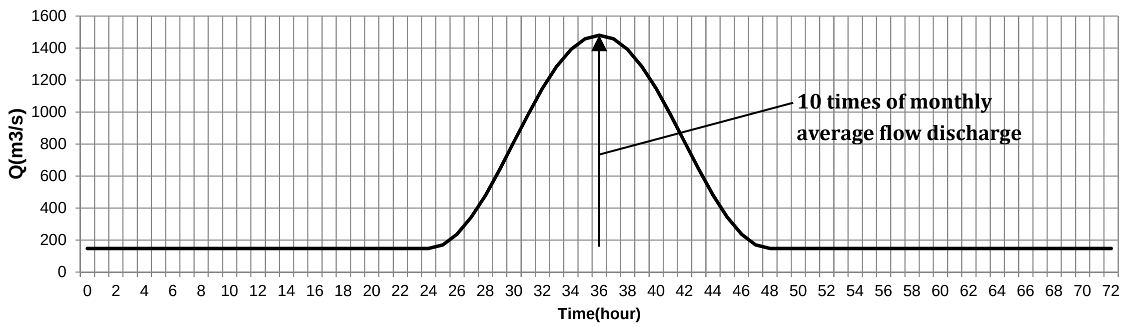
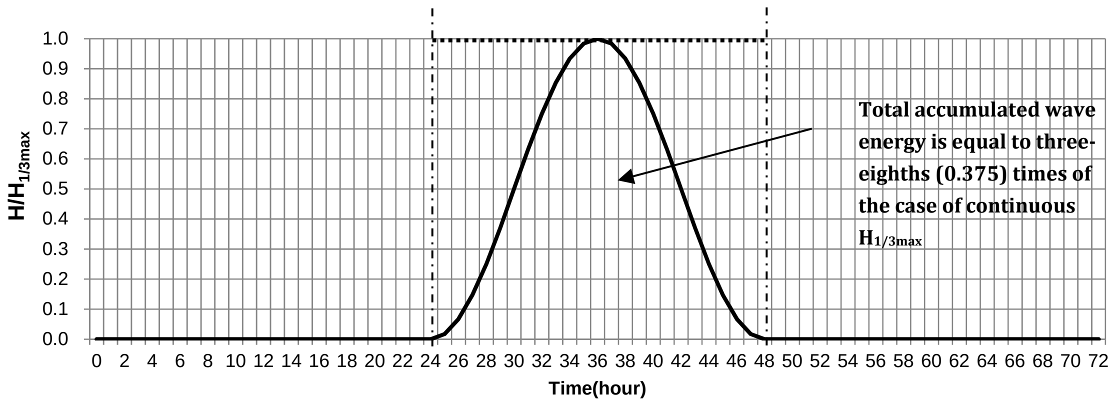


Figure 3.20 Estimated Hydrograph of Cipunagara River



$H_{1/3max}$: 1 year return period wave height

Figure 3.21 Estimated Time-series of Wave Height at the Severe Wave Condition

Model simulation considers structur that will be built in phase II, in order to estimates maximum impact for all activity.

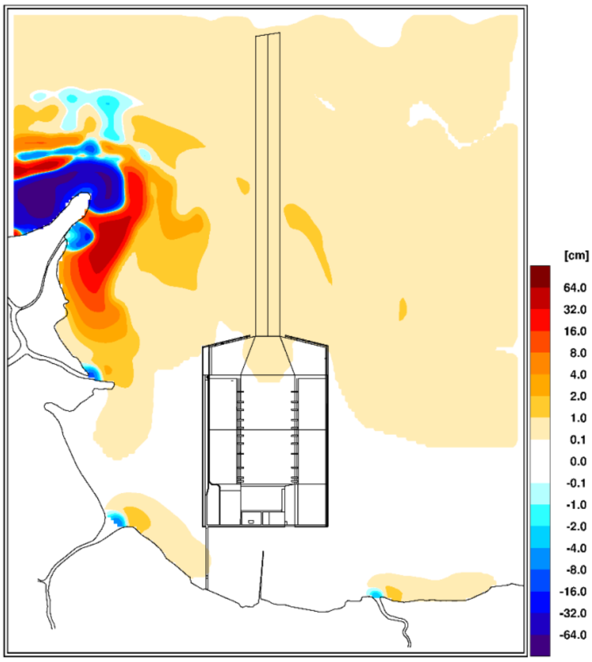
Estimation result and prediction of channel deposition

Figure 3.22 to Figure 3.24 show the predicted results of channel and anchorage basin deposition for each natural condition. Figure 3.25 shows the zoning for evaluation which was divided by 3 block as access channel block, anchorage basin block and inner basin channel block.

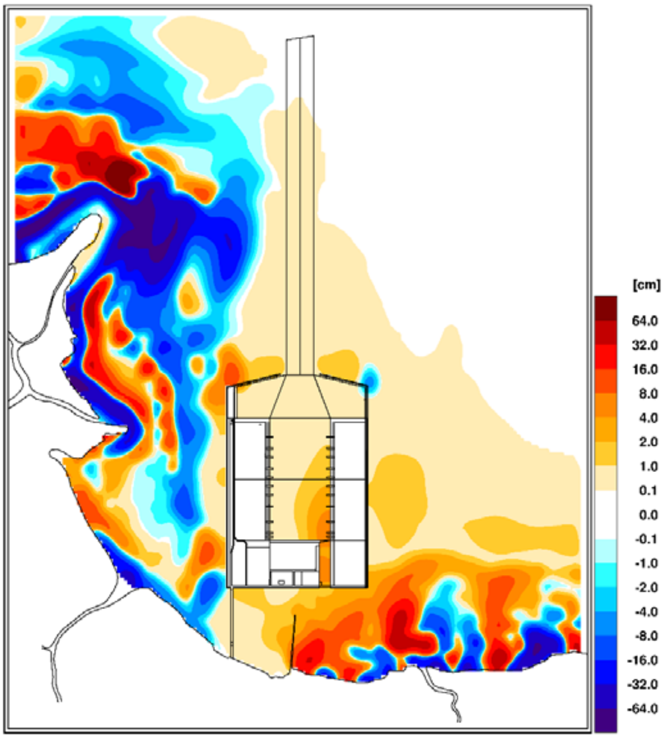
Table 3.51 and Figure 3.26 show the estimated deposition volume and thickness of above-mentioned three blocks by numerical simulation.Most of the deposition at the access channel would occur during the severe wave conditions that have low frequency. On the other hand, most of the deposition at the anchorage basin and inner channel would occur, accumulating by ordinary waves from east in dry seasona little by little.

Annual deposition at the access channel is about 10 cm. According to this result, it need interval dredging maintenance at the access channel can be considered to be around 5 years. Although the deposition volume at the inner basin channel is less than the access channel and anchorage basin, its thickness is larger than others.

Finally, the impact of river flush to the channel deposition would involve uncertain conditions in this prediction. It should be take care of unexpected natural phenomenon.

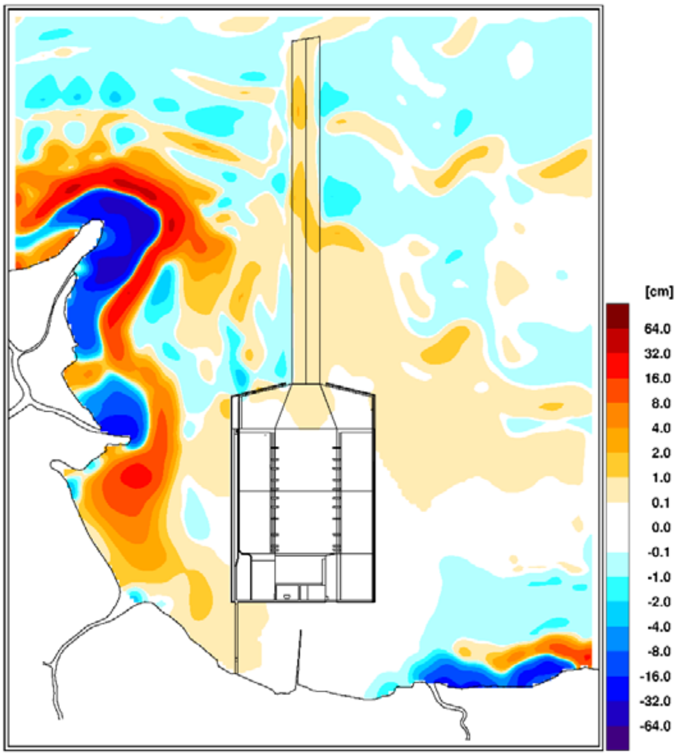


(1) Ordinary Wave Condition for 15 days in the rainy season

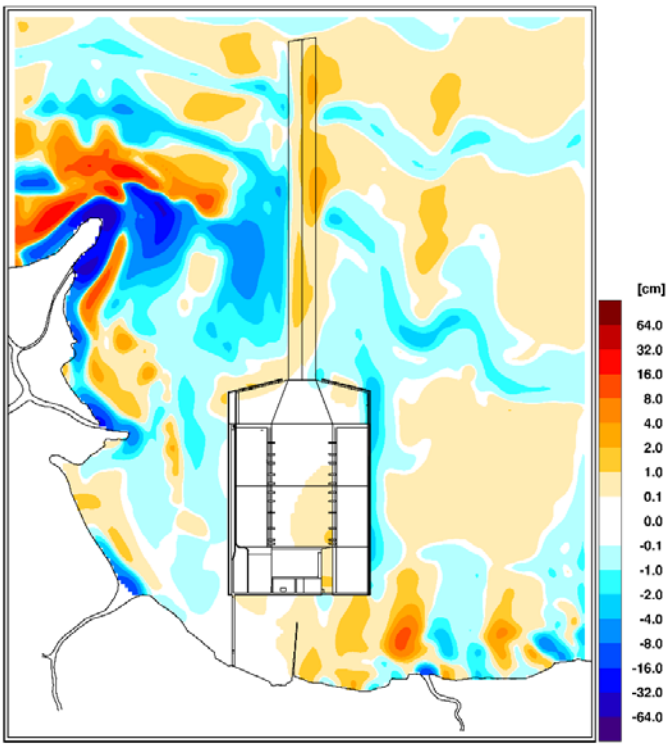


(2) Ordinary Wave Condition for 15 days in the dry season

Figure 3.22. Prediction results of Future deposition by the ordinary waves



(1) Severe Wave Condition for 1 day in the rainy season



(2) Severe Wave Condition for 1 day in the dry season

Figure 3.23. Predicted results of Future deposition by the severe waves

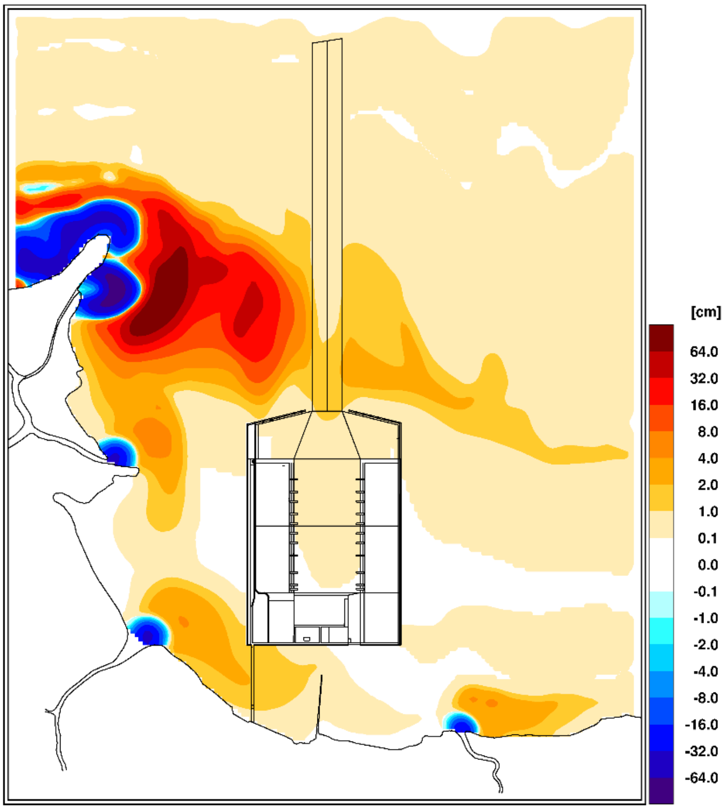


Figure 3.24. Predicted results of Future deposition by the river flow

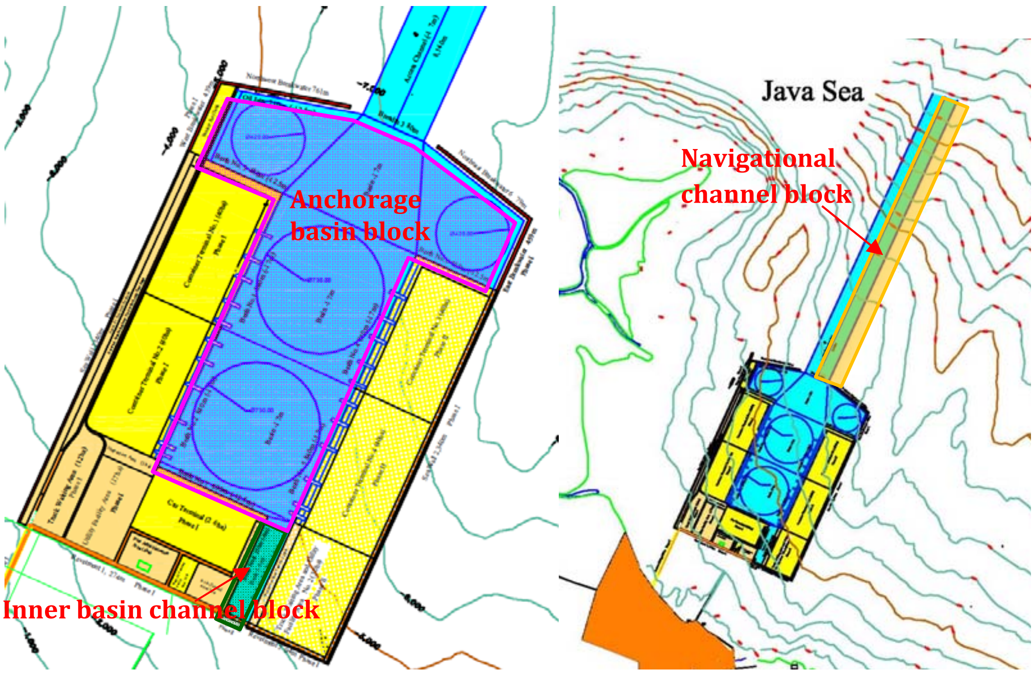


Figure 3.25. Zoning for Evaluation of Deposition

Table 3.51 Simulated Results of Deposition

(1) Navigational channel block

	Ordinary Wave Condition		Severe Wave Condition		River Flush Condition
	Rainy Season	Dry Season	Rainy Season	Dry Season	
Computation Period	15 days		4 days after finishing severe wave or river flush situation for each 24hours, Total 5 days		
Deposition Volume (m^3)	9,951	6,289	12,019	14,921	14,040
Annual occurrence of the hydrological conditions	4.0 times*1) (4.0 * 15 days)	2.4 times*1) (2.4 * 15 days)	3.7 times*1)	3.5 times*1)	2.5 times*2)
Deposition Volume (m^3/year)	39,805	15,094	44,470	52,223	35,101
Total (m^3/year)	151,592				
Spatial average deposition thickness (cm/year)	9.3				
Total (m^3/year)	186,693				
Spatial average deposition thickness (cm/year)	11.5				

(2) Anchorage basin block

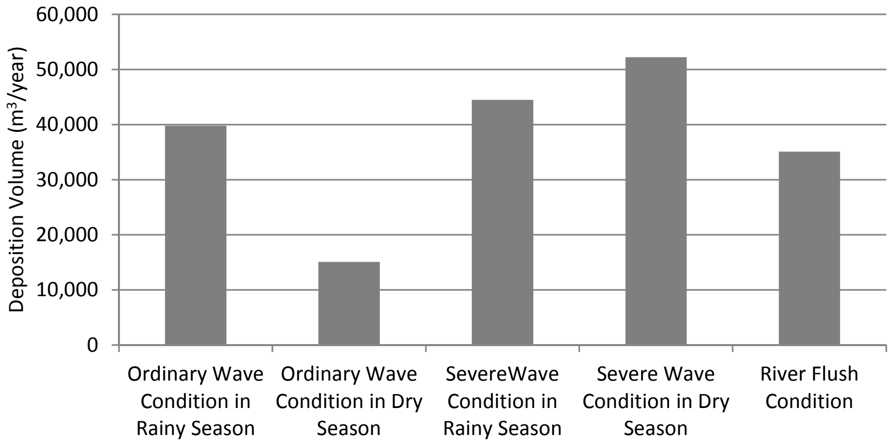
	Ordinary Wave Condition		Severe Wave Condition		River Flush Condition
	Rainy Season	Dry Season	Rainy Season	Dry Season	
Computation Period	15 days		4 days after finishing severe wave or river flush situation for each 24hours, Total 5 days		
Deposition Volume (m^3)	1,243	21,265	1,219	2,052	6,652
Annual occurrence of the hydrological conditions	4.0 times*1) (4.0 * 15 days)	2.4 times*1) (2.4 * 15 days)	3.7 times*1)	3.5 times*1)	2.5 times*2)
Deposition Volume (m^3/year)	4,971	51,035	4,511	7,183	16,629
Total (m^3/year)	68,700				
Spatial average deposition thickness (cm/year)	2.8				
Total (m^3/year)	84,329				
Spatial average deposition thickness (cm/year)	3.5				

(3) Inner basin channel block

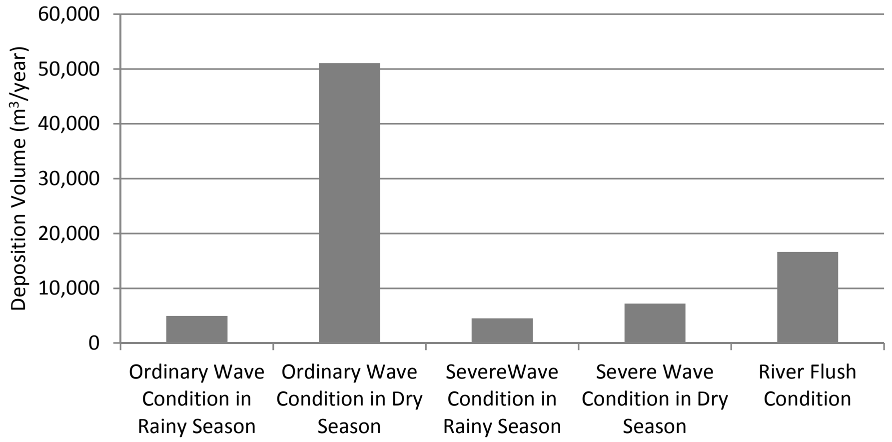
	Ordinary Wave Condition		Severe Wave Condition		River Flush Condition
	Rainy Season	Dry Season	Rainy Season	Dry Season	
Computation Period	15 days		4 days after finishing severe wave or river flush situation for each 24hours, Total 5 days		
Deposition Volume (m^3)	0	4,102	0	730	97
Annual occurrence of the hydrological conditions	4.0 times*1) (4.0 * 15 days)	2.4 times*1) (2.4 * 15 days)	3.7 times*1)	3.5 times*1)	2.5 times*2)
Deposition Volume (m^3/year)	0	9,846	0	2,554	244
Total (m^3/year)	12,400				
Spatial average deposition thickness (cm/year)	12.7				
Total (m^3/year)	12,644				
Spatial average deposition thickness (cm/year)	13.0				

*1) by the result of statistical analysis of waves

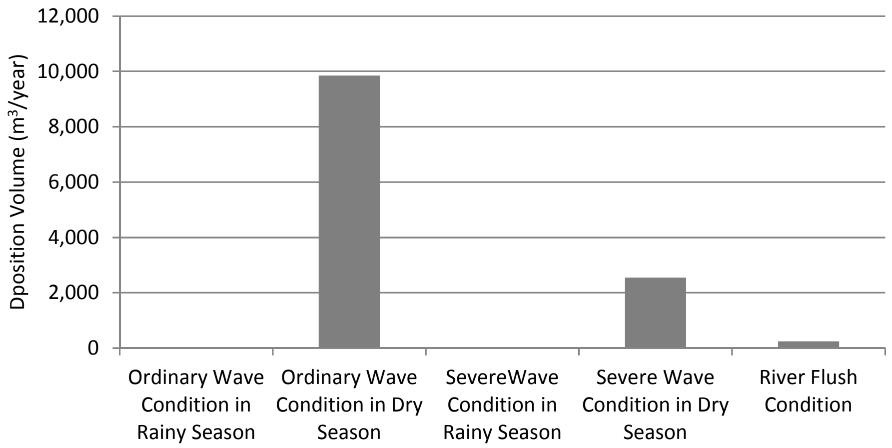
*2) by the existing data about river flush by BNBP



(1) Navigational channel block



(2) Anchorage basin block



(3) Inner basin channel block

Figure 3.26. Simulated Results of Deposition

Effect of sheltering by the port facilities

Annual average deposition at the clearance gap between the revetments of the port and the existing pier will be sized several centimeters. Because the maximum water depth behind the port facilities is shallow, about 2-3 m, it is necessary to consider the requirement of dredging in order to preserve navigational course for local fishing boats between behind the port facilities.

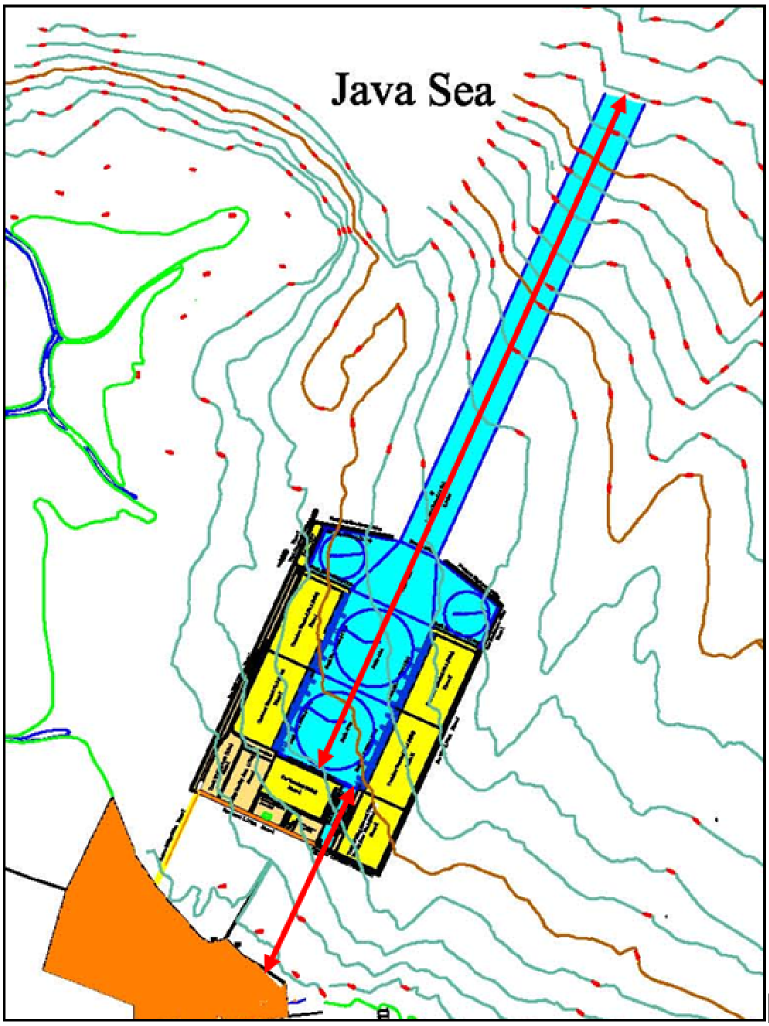


Figure 3.27.Deposition Simulation Result

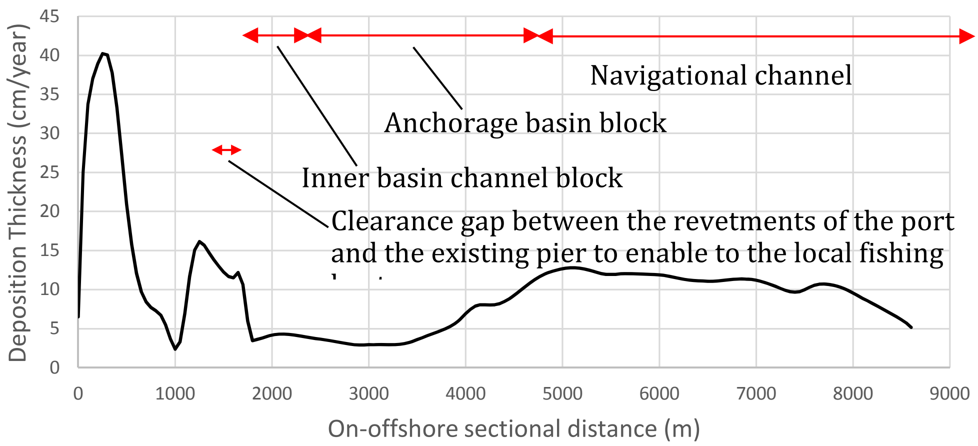


Figure 3.28. Cross Sectional Profile of Annual Deposition

Based on the calculation above, if assumed that dredging and maintenance will effect deposition every 50 cm, so dredging volume is predicted as follows:

Table 3.52 Dredging time and volume estimation

Area	Deposition Thickness (cm/year)	Year until 50cm thickness (year)	Deposition Vollume (m3/year)	Dredging volume (m3)
Navigation Channel	11.5	4.3	186,693	811,709
Anchorage Basin	3.5	14.3	84,329	1,204,700
Inner Basin Channel	13	3.8	12,644	48,631

This impact is rated as **Negative significant impact (-P)** based on consideration :

1. **The Number of People Affected**

   Sailing lane area of fishermen ships has sedimentation, so the impact is predicted as **significant impact (P)**.

2. **Impact Spread Area**

   Impact spread on fishermen sailing line area at the back side of Patimban Seaport. So the impact is categorized as **significant impact (P)**.

3. **Duration and Intensity of Impact**

   Intensity of sedimentation change impact is low but occur continuosly, so the impact is predicted as **significant impact (P)**.

4. **Other Component Affected**
   Other component affected is marine disruption, so the impact is predicted as **significant impact (P)**.
5. **Cummulative Nature of Impact**
   Impact is cummulative, so the impact is rated as **significant (P)**.
6. **Berbalik dan tidak berbaliknya dampak**
   Impact is irreversible. Based on this criteria, this impact is categorized as **significant impact (P)**.

3.3.2.3. Coastline Changes

Patimban seaport operational is predicted will induce shoreline change impact. Simulation change is done with duration 50 years based on consideration :

- Shoreline change **without** the construction of seaport facilities for 50 years
- Shoreline change **with** the construction of seaport facilities for 50 years

The distributions of the wave height of the energy average waves in rainy and dry season, whose direction offshore are WNW and NE. It is recognized that wave field change by port facilities is larger in dry season than in rainy season.

Details of methodology is as follow ;

As a long-term topographic change, following two possibilities are assessed quantitatively using numerical simulation model.

- Shoreline change due to disturbance of littoral drift
- Silt sedimentation into the dredged access channel and surroundings

Shoreline change due to construction of port facilities were studied in order to understand the effect of long term shoreline change.

Basic Concept of Numerical Simulation Method

Numerical simulation model for predicting the long-term shoreline changes based on the one-line theory has been used. One-line theory is based on the concept of balance of longshore sediment transport and can be applied to the beach where the longshore sediment transport is the dominant cause of beach profile changes. Theoretical concept of numerical simulation method for the prediction of shoreline change is outlined below

Coordinate system is shown in Figure 3.29 was used in numerical simulation method for the prediction of shoreline change and alongshore multi-cell by introducing incrementation length of dx was introduced for the numerical simulation.

Incident wave height and wave direction at wave breaking point were calculated by numerical simulation of wave field and the obtained wave height and wave direction were used to obtain the longshore sediment transport rate Q along the shoreline.

Shoreline change rate was obtained by the balance of efflux and influx of longshore sediment transport (Qi+1-Qi). Seaward movement of shoreline, in other words accretion, will occur in case the influx surpasses the efflux and landward movement of shoreline, in other words erosion, will occur in the contrary case.

For the calculation of rate of shoreline change, cross-sectional beach profile was considered to maintain original profile on the condition of onshore and offshore shoreline movement as seen in Figure 3.30.

Numerical simulation conditions such as the estimation of unknown parameters for littoral sediment transport rate formula, duration of design wave action and sediment transport rate at the boundary will be determined by trial and error approach in a reproducible fashion for past shoreline change due to wave action. This procedure was so-called reproductive calculation of the past phenomenon.

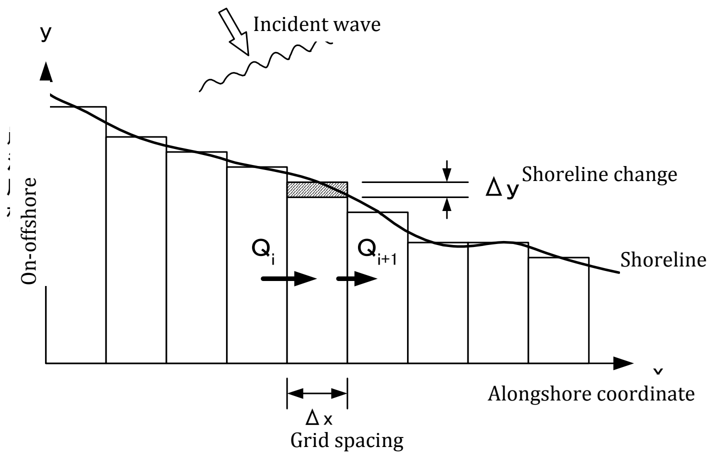


Figure 3.29. Coordinate System for the Numerical Simulation Model

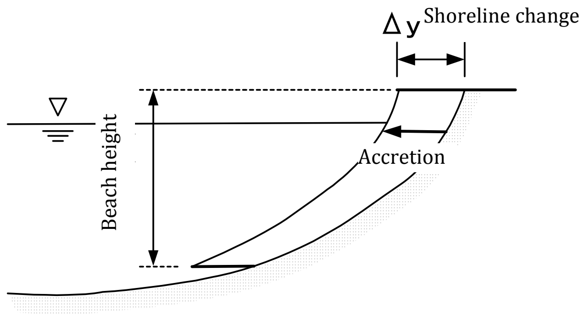


Figure 3.30. Schematic Figure of Basic Concept of Shoreline Changes in the Numerical Simulation Model

Outline of Shoreline Change Prediction Model

Outline of shoreline change prediction model were shown below.

Basic Equations:

1-line model which use the single shoreline as the representative of entire beach process due to wave action was employed. Basic equation was shown below.

$$\frac{\partial Q}{\partial x} + D_S \frac{\partial y}{\partial t} = 0$$

where, Q is the total longshore sediment transport rate including void, x and y are the coordinate of alongshore and on-offshore direction (positive for offshore direction), Ds is the representative depth of beach process (sediment transport height or critical water depth for sediment movement) and t is the time for duration of wave action.

Total Longshore Sediment Transport Rate:

Total longshore sediment transport rate induced by wave action is calculated using so-called Power Model shown below which employ the assumption that the longshore sediment transport is proportional to the alongshore component of wave energy flux at wave breaking point.

$$Q = K \frac{(Ec_g)_B \sin\alpha_{B_s} \cos\alpha_{B_s}}{(\rho_S - \rho)g(1-\lambda_v)}$$

where, $(Ec_g)_B$ is the wave energy flux at wave breaking point which is obtained by the product of wave energy density per unit area and group velocity shown below. Alpha is the incident wave direction which is defined by the angle between shoreline and wave crest line at the wave breaking point, E_B and cg_B are density of sand particle and seawater, g is the gravitational acceleration, λ_v is void ratio and K is the non-dimensional constants

$$E_B = \frac{1}{8}\rho g H_B{}^2$$

where H_B is the breaking wave height.

Trapping ratio of longshore sediment transport by jetty:

Basic idea for the determination of trapping ratio of longshore sediment transport by jetty is schematically shown in Figure 3.31. Cross-shore distribution of longshore sediment transport proposed by Tsuchiya and Yasuda (1978) shown in Figure 3.32 has been used to determine the amount of trapped longshore sediment transport based on the wave conditions at the jetty

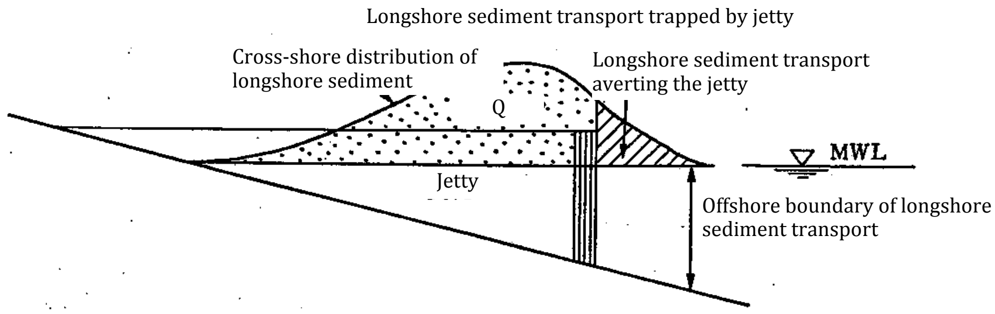


Figure 3.31. Schematic Figure of Longshore Sediment Transport Trapping by Jetty

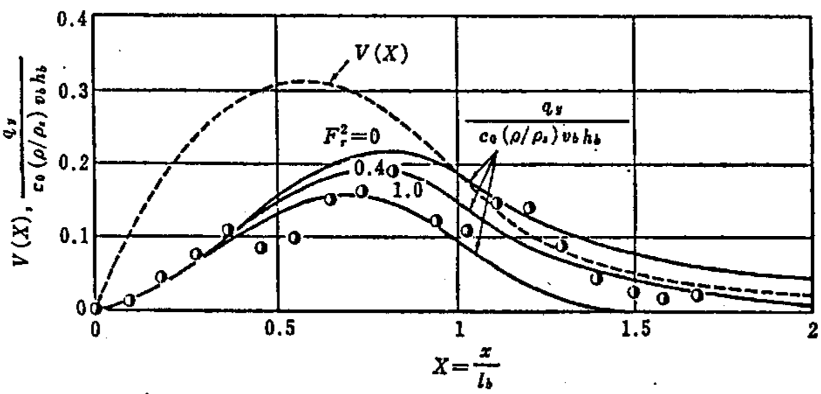


Figure 3.32. Cross-Sectional Distribution of Longshore Sediment Transport

<u>Past record of Shoreline Changes at the Site</u>

Figure 3.33 shows the shoreline positions and shoreline changes in 2009 and 2015.

Tendency to erosion:

X= 3.500~6.000 m

> Because of interference with the sediment transport toward west by the fish pond at the east side of this area

X= 6.700 ~ 8.900 m

> Because of interference with the sediment transport toward west by the jetty

Stable trend:

X= 0~900 m (the west side of jetty)

> Because of the stone revetments

X= 1.100 ~ 3.500 m

> Because of the stone revetments

X= 6.000 ~ 6.700 m （at the fish pond）

> Because of the stone revetments

Tendency to deposit:

X= ~0m

> Because of the artificial reclamation for the fish ponds

X= 1.000 m

> Because of interference with a west sediment transport by the jetty

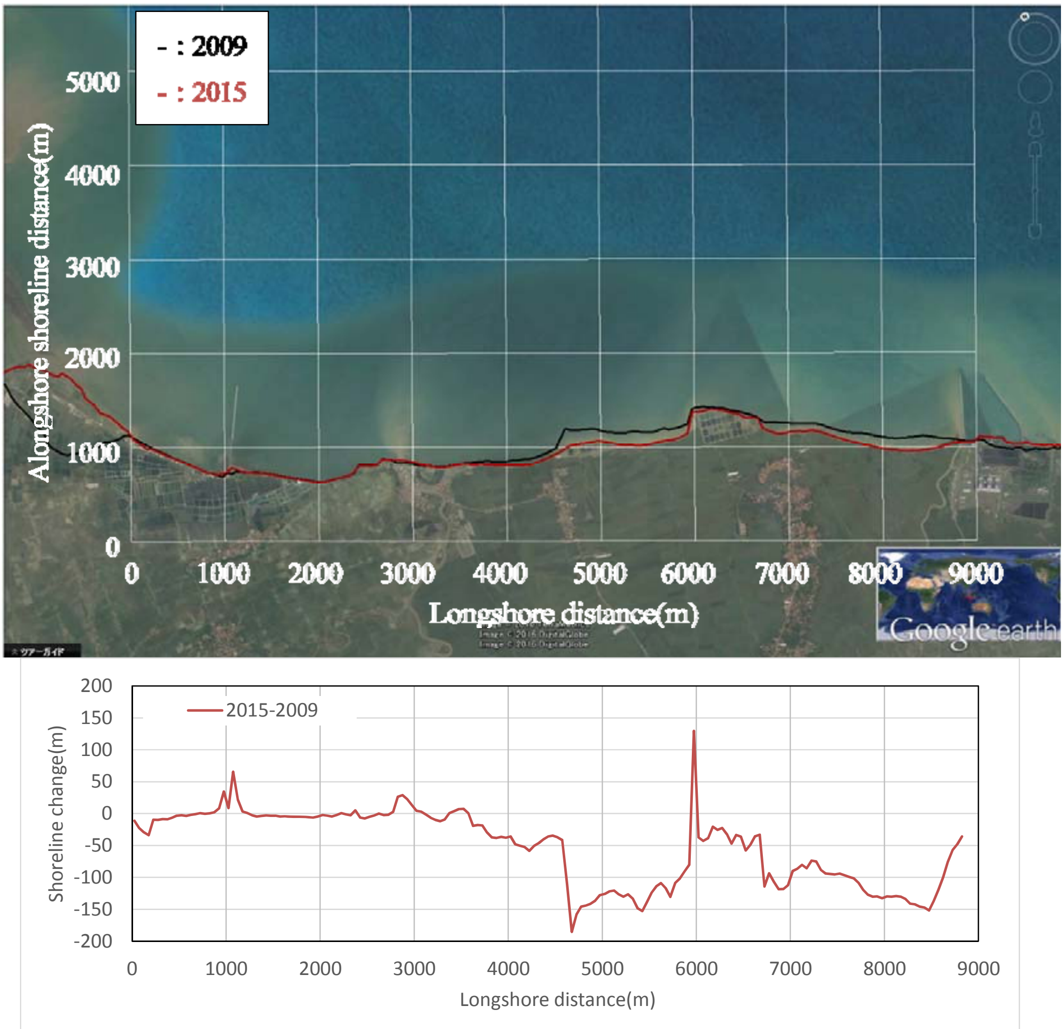


Figure 3.33. Shoreline Change in the year of 2009-2015

Conditions for Numerical Simulation

Table 3.53 shows the major calculation conditions for the reproductive calculation of the past shoreline changes.

A calculation period is 6 years from 2009, as initial shoreline, to 2015, as the end shoreline.

Sediment transport height is determined by the addition of critical water depth for sediment movement h_c and foreshore beach berm height h_R. Following relations are used to obtain those values.

$$h_c = 6.75\overline{H}_{1/3}, h_R = 0.32 h_c$$

where $\overline{H}_{1/3}$ is the annual average significant wave height. $\overline{H}_{1/3}$ at the Patimban site is 0.64m and resultant sediment transport height becomes 5.7m

Table 3.53 Major condition for simulation

Hal		**Syarat untuk Simulasi**	**Description**
Garis pantai awal		Garis pantai year 2009	Aerial photograph
Garis pantai reproduktif		Garis pantai year 2015	Aerial photograph
Durasi reproduktif		6 year	
Kondisi gelombang		Rata-rata energy gelombang dengan 2 insiden arah gelombang	Arah gelombang (TL, BTB) medan gelombang diperoleh dari model SWAN
Tinggi Perpindahan Sedimen		5.7m	
Kondisi batas		Batas terbuka	
Jetty atau breakwater		pada 1,025m, panjang:300m pada 2,875m, panjang:60m pada 8,875m, panjang:700m	
Laju perpindahan sedimen sejajar pantai	*K*	Konstanta yang dapat diatur (=1.0)	Konstanta yang dapat diatur
	Rasio sedimen void	0.4	
Ukuran partikel sedimen		0.1mm	
Grid spacing dx		50m	
Computational time interval		5menit	

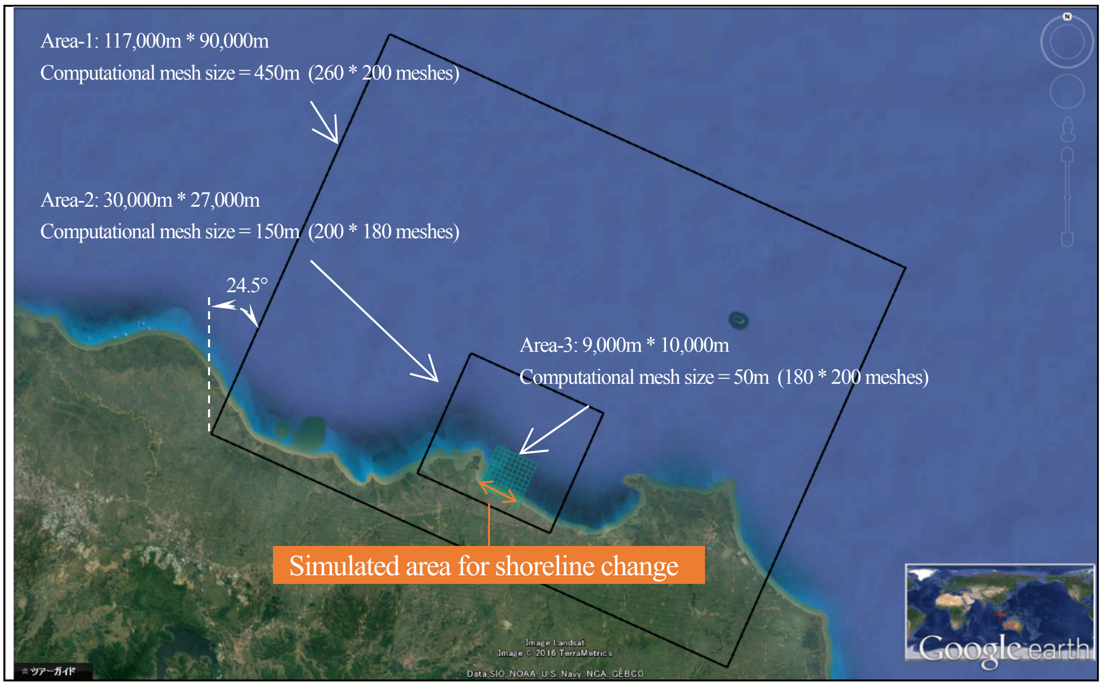


Figure 3.34. *Computational Domain* for Shoreline Change
(Wave Field Simulation Area)

Figure above shows the results of reproductive calculation. This result shows the accordance with the pattern and the quantity of erosion and accretion of the beach in the target area with considerable accuracy.

In the following analysis, this simulation model will be applied to the prediction of the future shoreline change by the construction of new port.

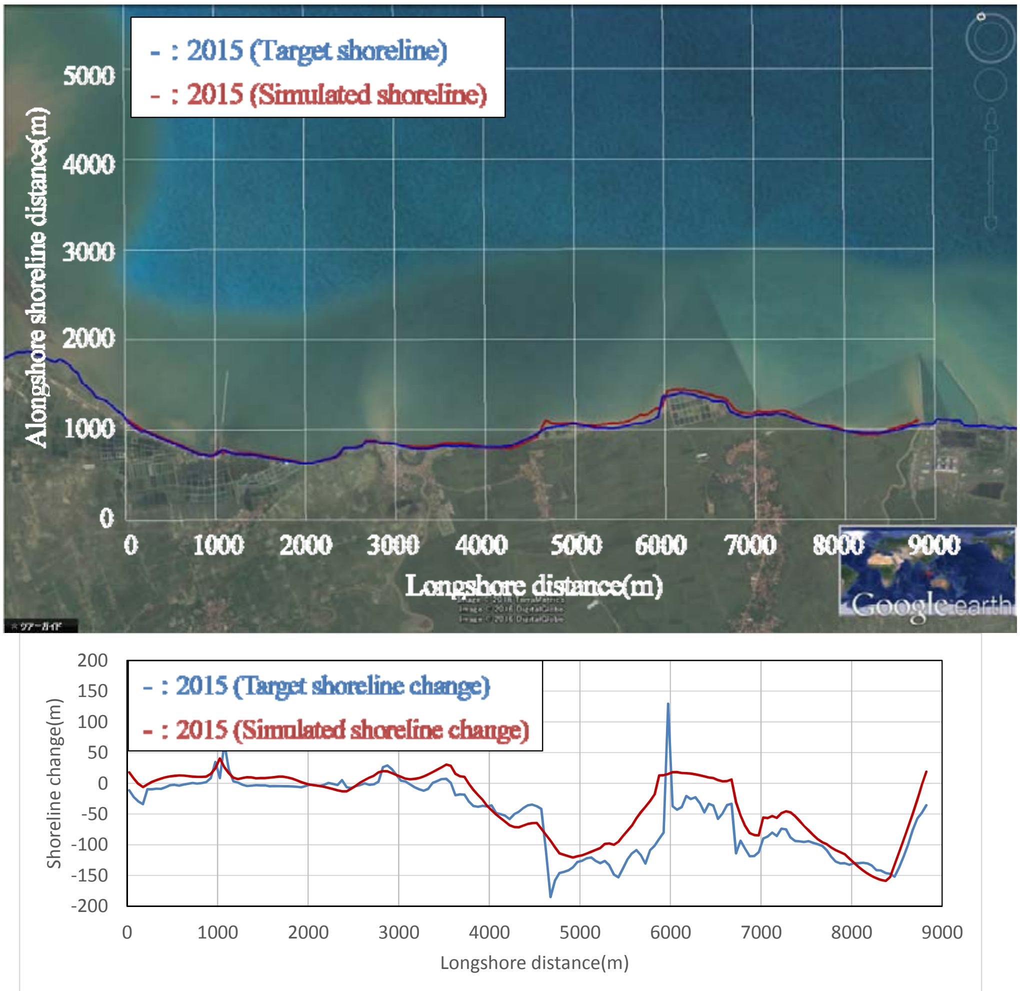


Figure 3.35. Reproductive Calculation Result

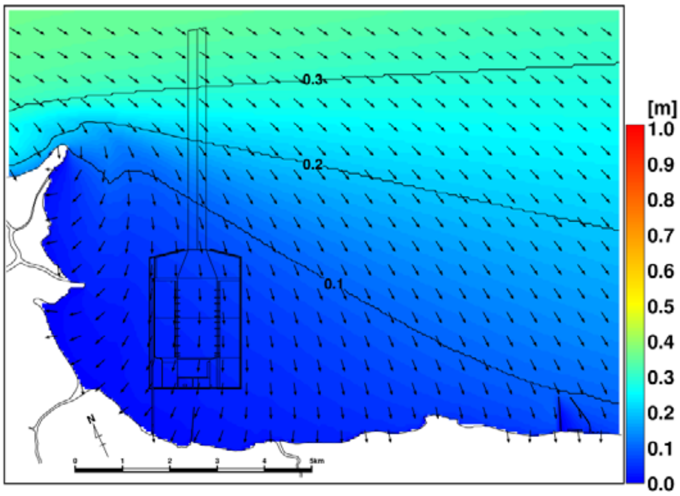
Prediction of Future Shoreline Change with New port Construction

Table above shows the major calculation conditions for the calculation of shoreline changes. For the prediction of future shoreline,training jetty at 2,875m were considered.

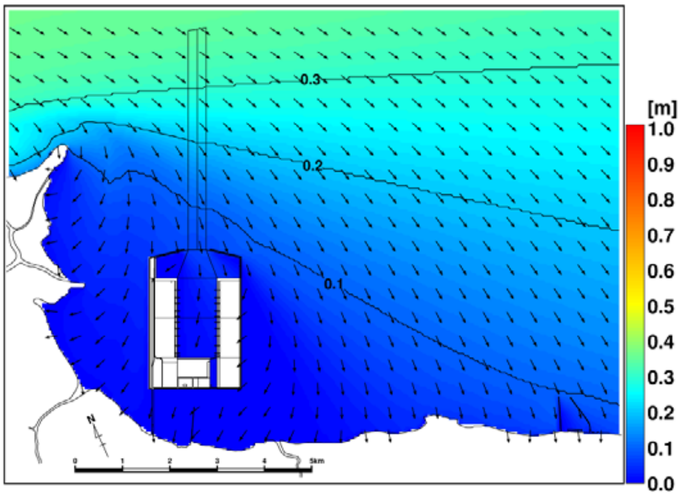
Table 3.54 Major Conditions for simulation

Item		**Condition for simulation**	**Remarks**
Initial shoreline		Shoreline at year 2016	Aerial photograph
Reproductive shoreline		50 year	
Reproductive duration		Energy average wave with 2 incident wave direcction	Arah gelombang (NE, wnw) wave field were obtained by SWAN model
Wave condition		5.7m	
Sedimen transport height		Open boundary	
Jetty or Breakwater		At 1,025m, height :300m At 2,875m, height:60m At 8,875m, height :700m	
Coastal Revetment		Refers to Figure 4-10	
Longshore sediment transport rate	*K*	1.0	Longshore Sediment transport rate
	Sediment Void Rato	0.4	
Sediment particle size		0.1mm	
Grid spacing dx		50m	
Computational time interval		5minutes	

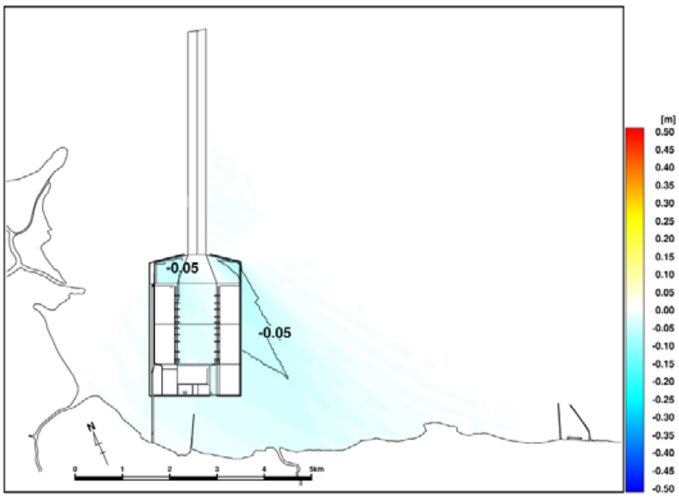
Figure 3.36 and Figure 3.37 show the distributions of the wave height of the energy average waves in rainy and dry season, whose direction offshore are WNW and NE. It is recognized that wave field change by port facilities is larger in dry season than in rainy season.



(1) Without port facilities

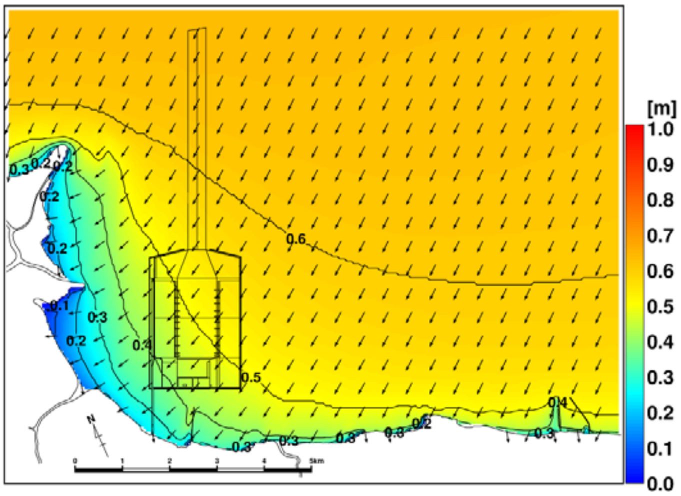


(2) With port facilities

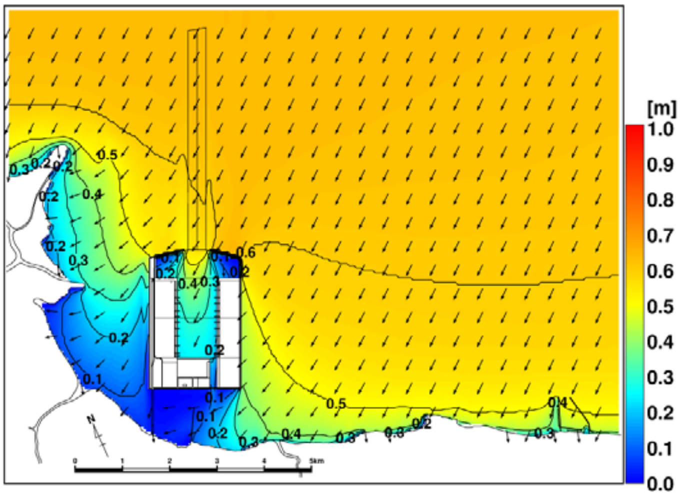


(3) Difference

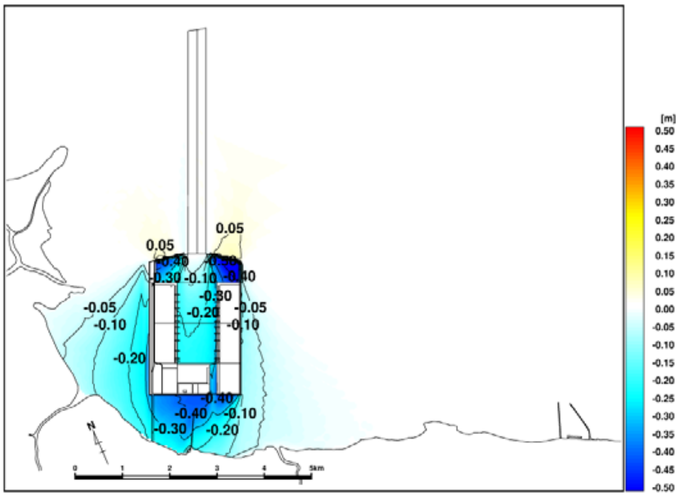
Figure 3.36. Distribution of the wave height of the energy average wave in rainy season



(1) Without port facilities



(2) With port facilities



(3) Difference

Figure 3.37. Distribution of the wave height of the energy average wave in dry season

Figure 3.39 to Figure 3.42 show the predicted shorelines after 50 years using the results of wave field simulation.

Around the fishing port at the river mouth of Sewo River (x=2,875m)

According to the result of the prediction of the future shoreline after 50 years, the west side of the river mouth is a little tendency to erosion, but the construction of the new port has only a small impact. The shoreline around the river mouth is not a tendency to erosion and a possibility that the river mouth is closed by the construction of the new port is low.

Around the existing jetty (x=1,025m)

The waves from the northeast, the dominant wave in this area, become lower as the waves approach the jetty because of interference by the new port facilities, and the amount of a west sediment transport becomes lower too. As a result, a tendency to deposit at the east side of the jetty will be strong, and the shoreline advance about 70 meters compared with the one without the new port. Therefore, the beach, at the east side of the jetty, used by the local residents is expected to extend.

On the other hand, the west side of the jetty is a result of erosion because the sediment transport turns westward by a change of the wave direction and the wave height and the amount of the west sediment transport going around the jetty decreases. Since the area will be used as the back-up area, a prevention measure for the erosion should be conducted.

For the protected forest west side of the port area, the change of the coast line nore the change of water current/wave don’t leacht the protected forest, hence the impact on the protected forest is not predicted.

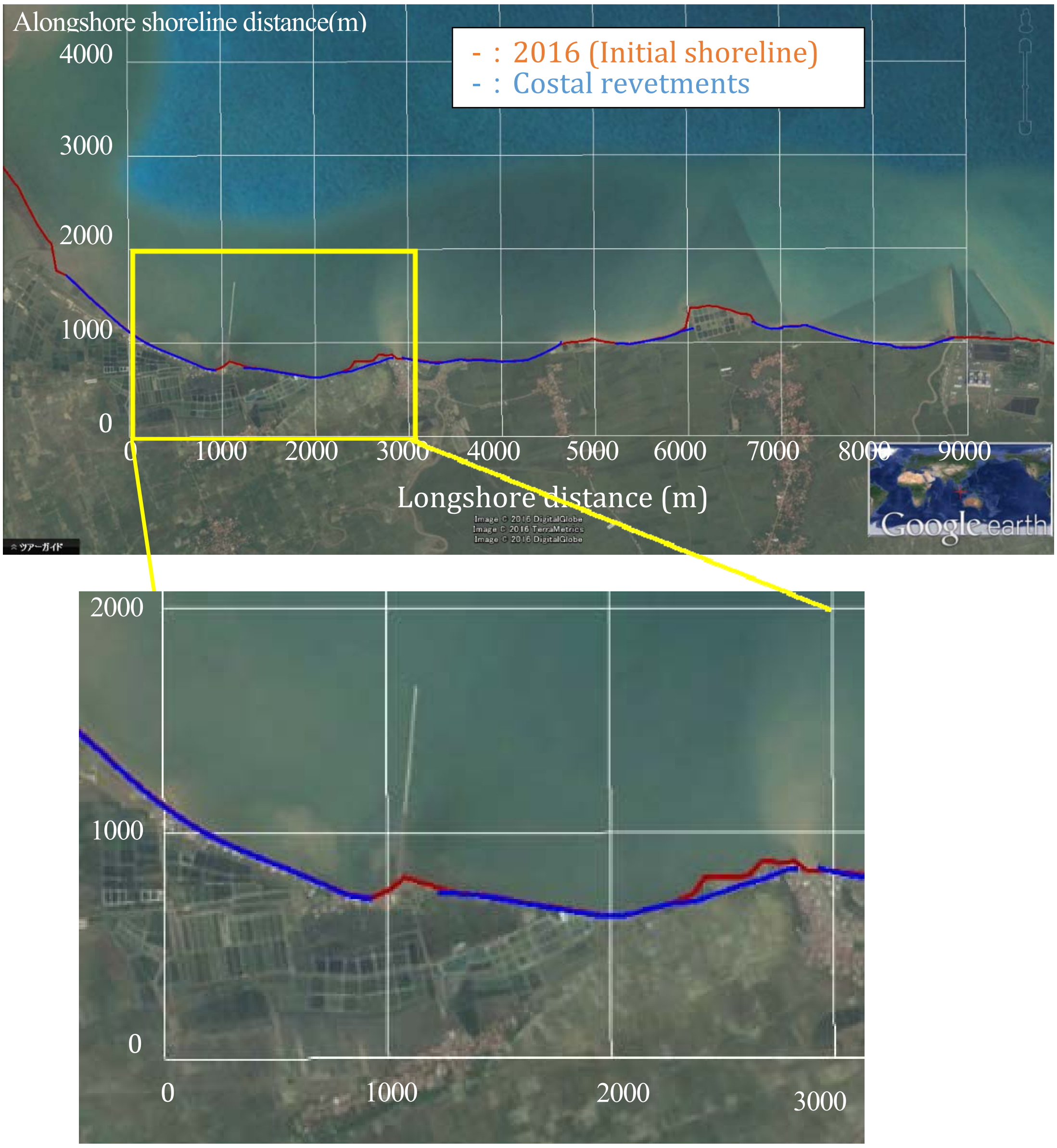


Figure 3.38. Distribution of the Coastal Revetments

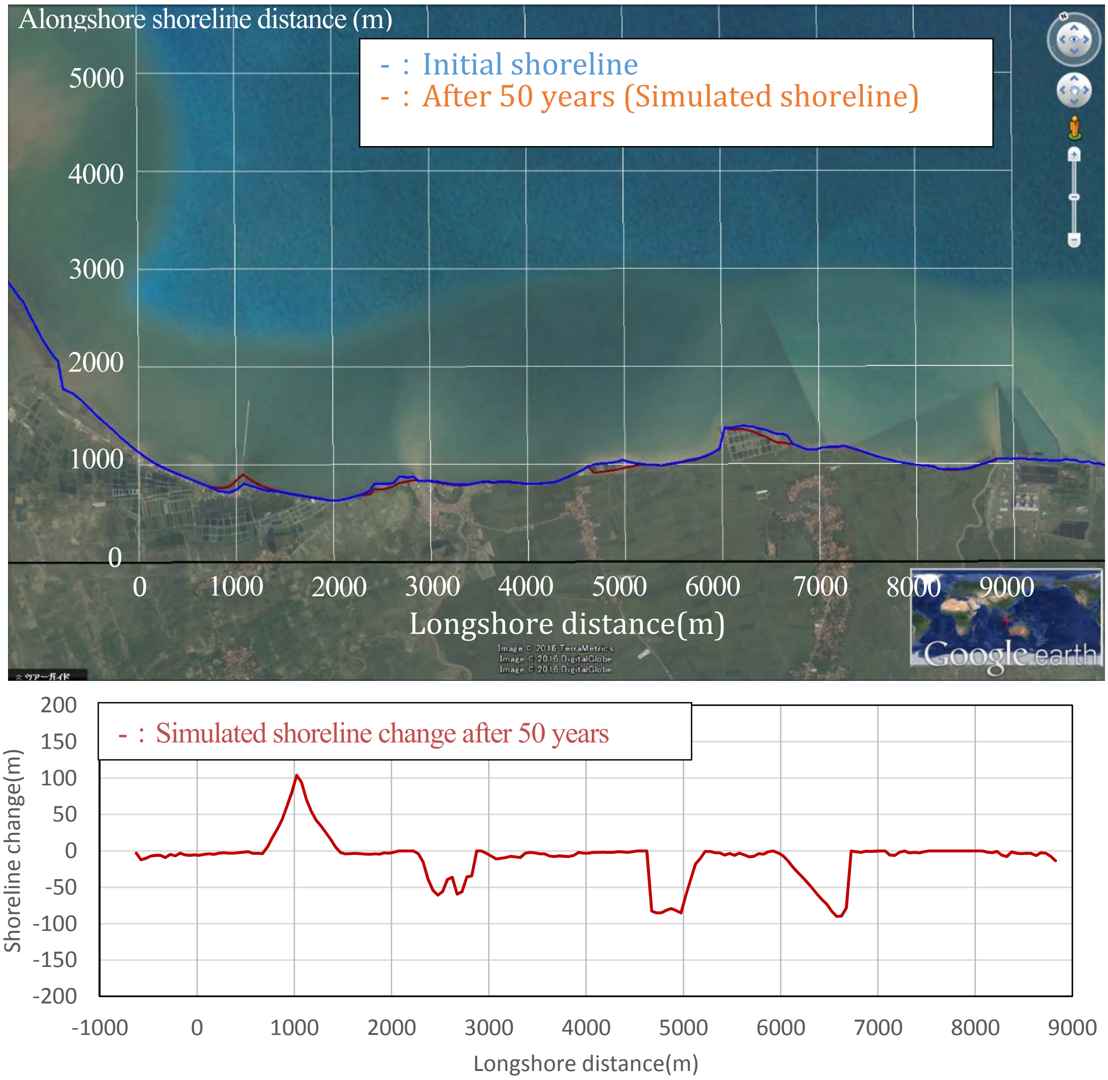


Figure 3.39. Predicted Shoreline After 50 Years <u>Without the New Port</u>

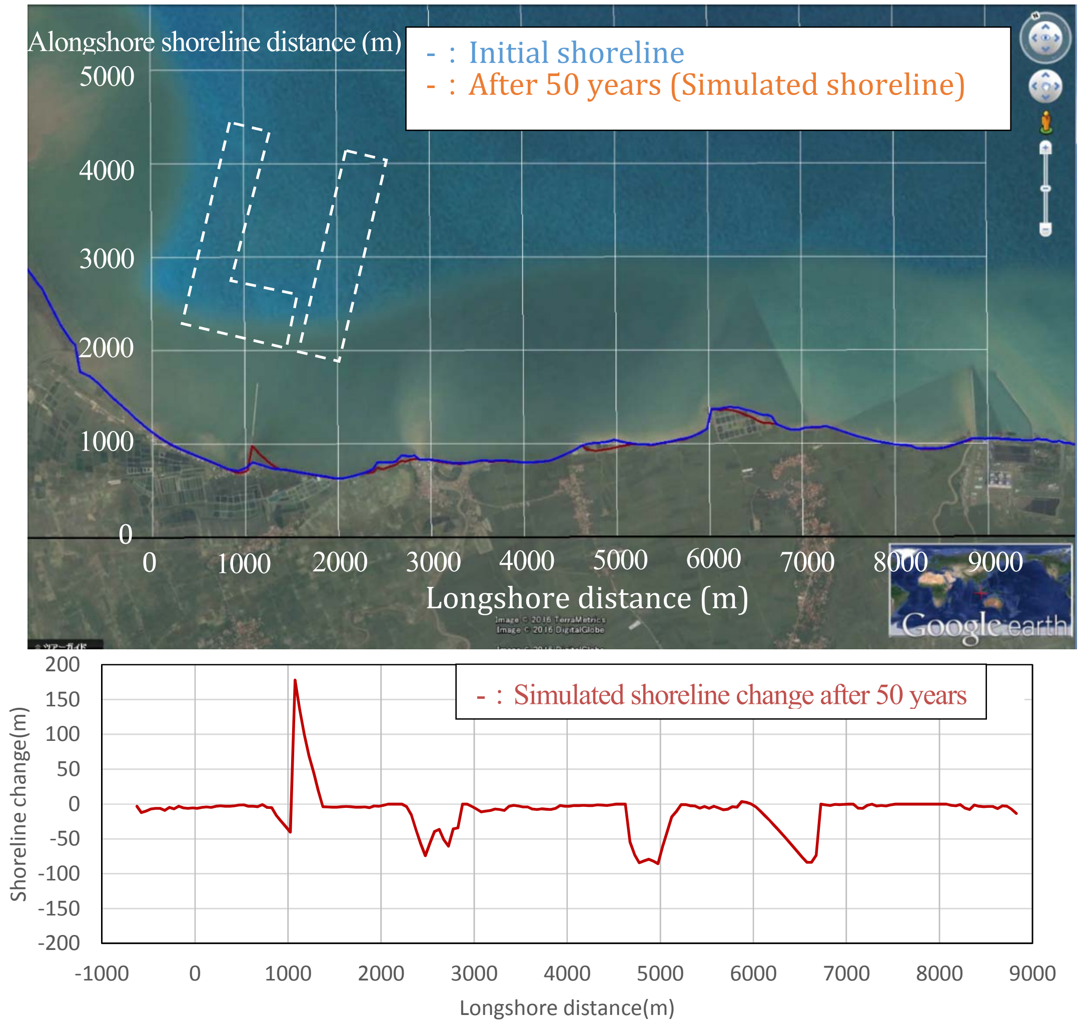


Figure 3.40. Predicted Shoreline after 50 years with New Port

Figure 3.41. Predicted Shoreline Around the Existing Jetty After 50 Years with the New Port

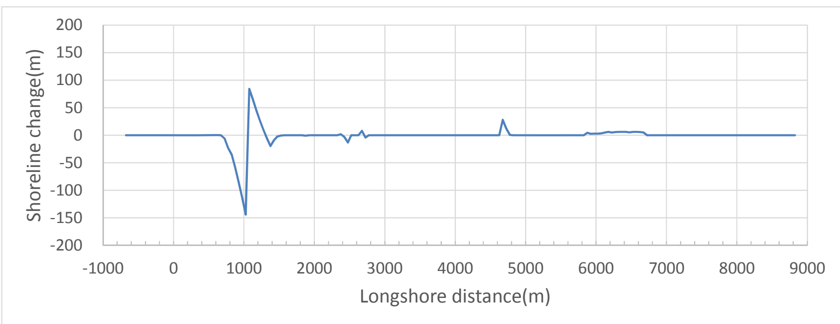


Figure 3.42. Difference of the Shoreline Change After 50 Years Between Without and With the New Port

Table 3.55 Analyisis of Shoreline Change Impact Estimation With and Without Project

Location	***Without the Project***	***With the Project*** **(After 50 Year)**	**Magnitude**
Shoreline at the west side eksisting jetty	Increase + 100m	Eroded- 50m	Eroded – 150m
Shoreline at the east side eksisting jetty	Increase + 100m	Increase + 180m	Increase + 80m

Source : Analysis result, 2017

In addition to the above, since wake generated by vessels are likely to cause impacts on natural environment or water area use by local people, height of the wave generated by the vessels are estimated,

Estimated wave height generated by the largest size and smaller size of the container ship is shown in Table 3.56. As the speed of the ships is regulated to be slow, height of the wave will be very small, 7 to 10 cm.

Table 3.56 Wave Height Generated by Container Ships

	Large ship	Small ship
Speed (kt)	10	10
Length of Vessel (m)	292	169
Wave Height (cm)	7.2	10.9

This impact is considered as **significant negative impact (-P)** based on the following considerations :

1. **The number of people who will be affected**
   No people affected, so this impact is categorized as non significant impact **(TP).**
2. **The total area of the impact spread**
   The area of the impact spread is only around the port area. Therefore, it is predicted as non significant impact **(TP)**
3. **Intensity and Duration of the impact**
   The duration of the impact is longterm, although low intensity. Therefore, the impact is predicted as significant impact **(P)**

4. Many other environmental components affected

Other environmental components affected is public unrest, so the impact is considered as significant impact **(P).**

5. The nature of cumulative impacts

The impact will not cumulative. So predicted as non significant impact **(TP)**

6. Reversible or irreversible impact

The impact is irreversible. So the impact is considered as significant impact **(P)**.

3.3.2.4. Fishing Ground Changed

The existence of seaport may change sea wave around the port and will disturb marine life. To see the wave change quantitatively, numeric simulation model is improved based of physic condition of the site such as water depth, tidal stream, wind, and river stream.

Finite difference method was used for the calculation of current field which was expressed by the combination of continuity equation and momentum equation. Basic equations are shown below.

a) Conditions of Numerical Simulation

a)-1 Data Input

Sea bottom topography and artificial structure

Figure 3.43 shows the computational domain.Figure 3.44 shows topographic data of each computation domain.

It is modelled that the acritical structures like breakwaters or revetmentsare the hydro-impermeable. On the other hand, it is considered that the piers of access bridge are completely permeable because those widths are enough smaller than the minimum spatial resolution of simulation grid (50m).

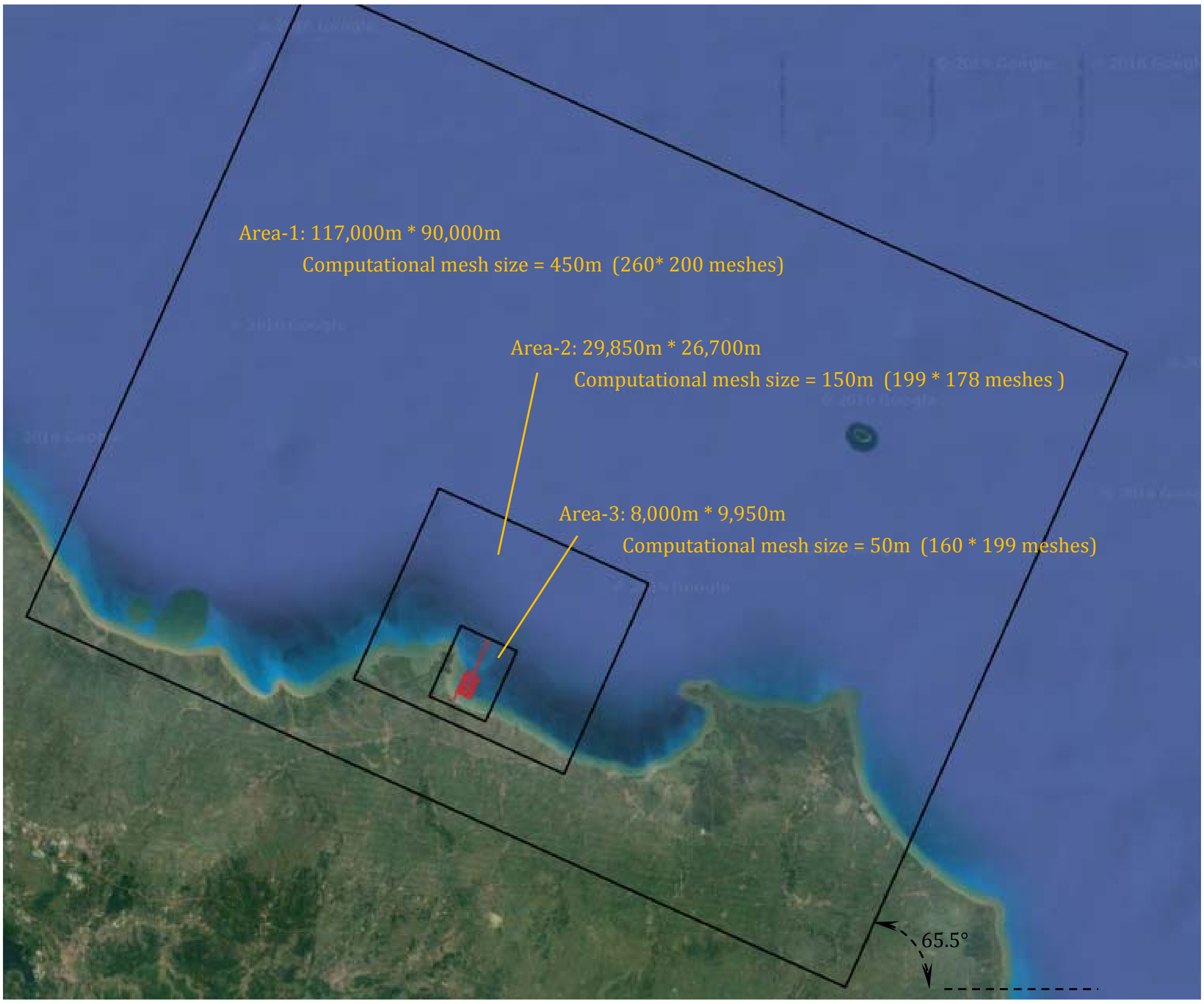
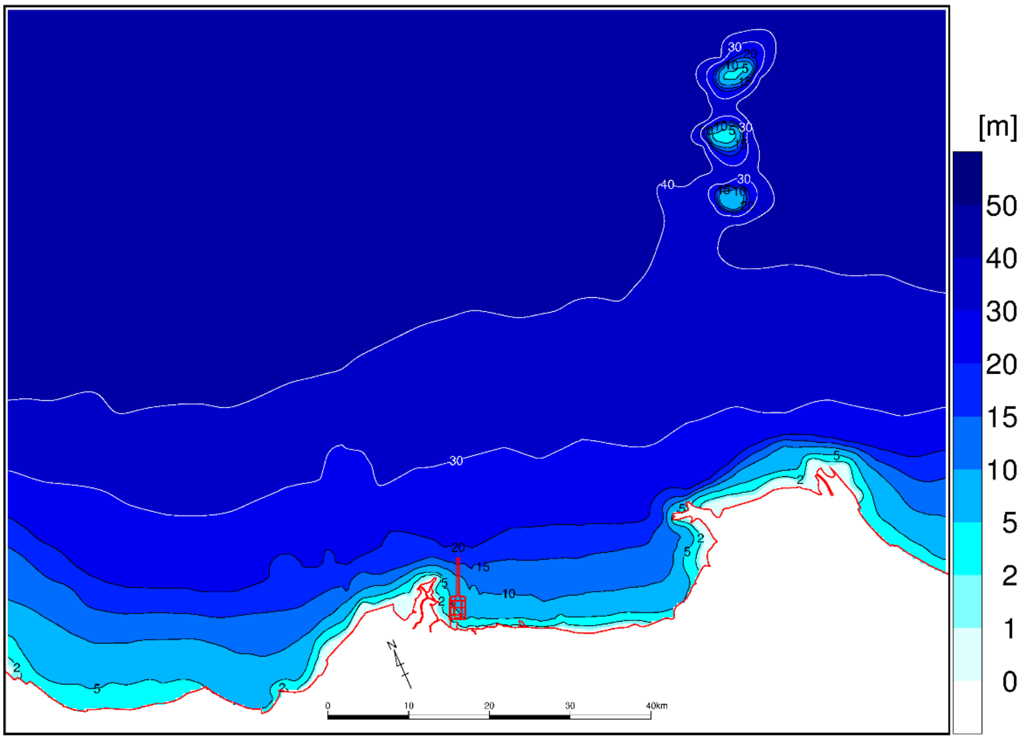
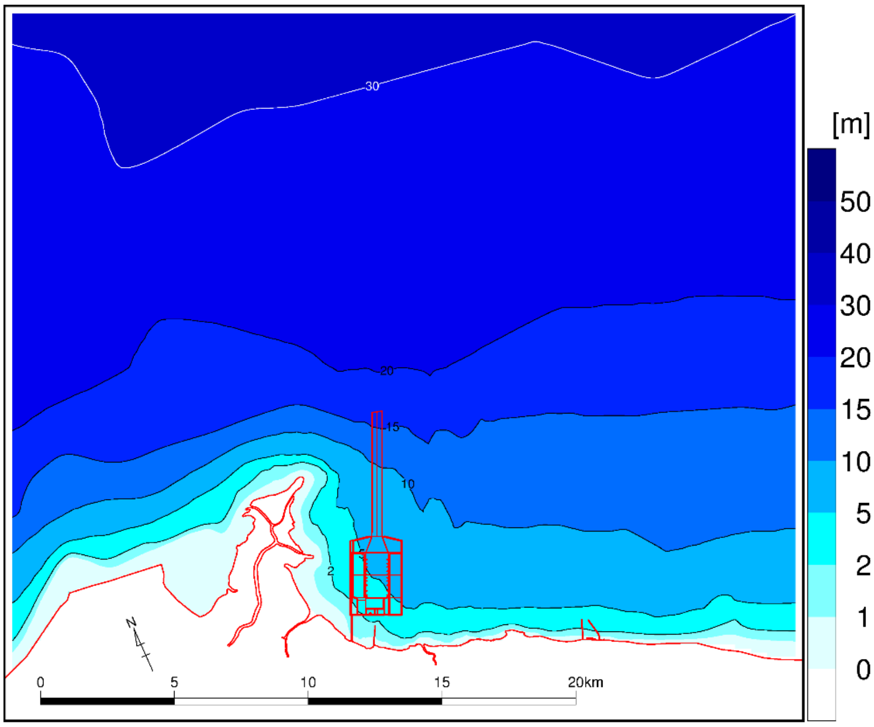


Figure 3.43. Computational Domain for Water Current Analysis

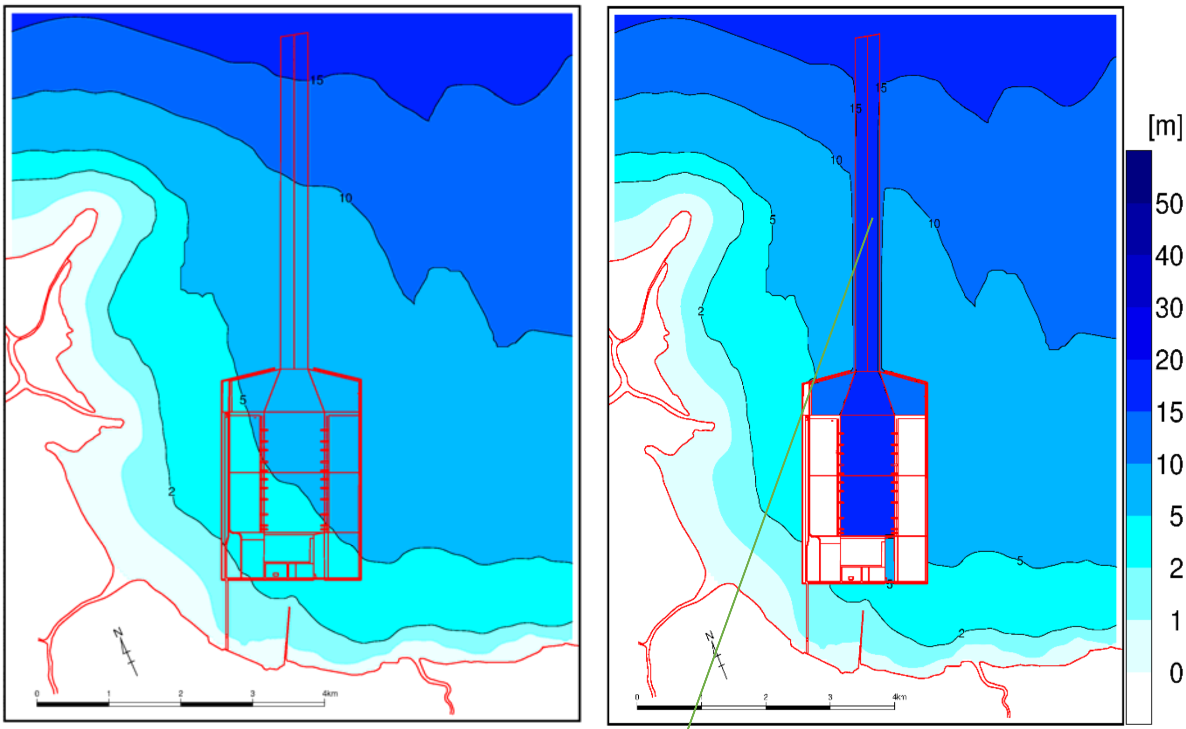


(1) Area-1

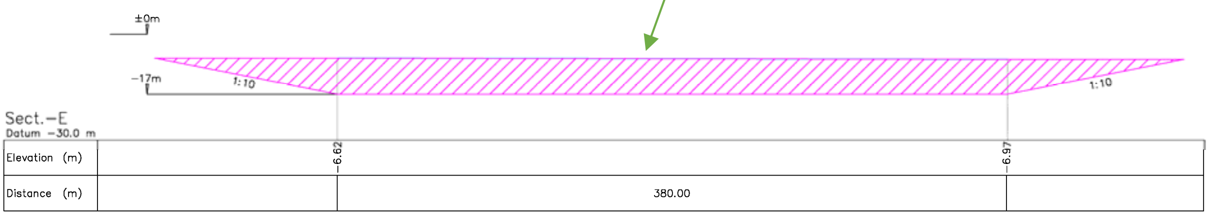


(2) Area-2

Figure 3.44. Sea Bottom Topography (DL-)



(a) Present (b) Future with the Port after the completion of Phase2



Source: the Survey Team

(c) Cross-section profile of the access channel

(3) Area-3

Figure 3.45. Sea Bottom Topography (DL--)

Table 3.57 Source Data Topography

Item	Source		Date
Bathymetri Map	Sea graph	Sea Chart No, 79 by Indonesian Government	Aug. 2013
		British Admiralty Nautical Chart 3279	Feb. 2012
	Bathymetri survey	DGST Survey	Oct. 2015
		JICA Indonesia Office	May. 2016
Terrestrial Map	Sea graph	Sea Chart No, 79 by Indonesian Government	Aug. 2013
		British Admiralty Nautical Chart 3279	Feb. 2012
	Topography map	JICA Indonesia Office	May. 2016

a)-2 Boundary Conditions for the Simulation

Tidal Flow

For the computation of tidal current, sea surface water level at the computation boundary due to tide were given. Tide modeling with 0.5 degree spatial resolution by by the Global Model of Matsumoto et.al(2000) was used for the evaluation of tidal constituent of amplitude and phase. Amplitude of K1 component (lumi-solar diurnal tide with frequency of about 24hours) which is the predominant tidal constituent at the site. More over, it was also taken account of M2 component (principal lunar tide with frequency of about 12 hours).

Location of the open boundary was shown in the following figure.

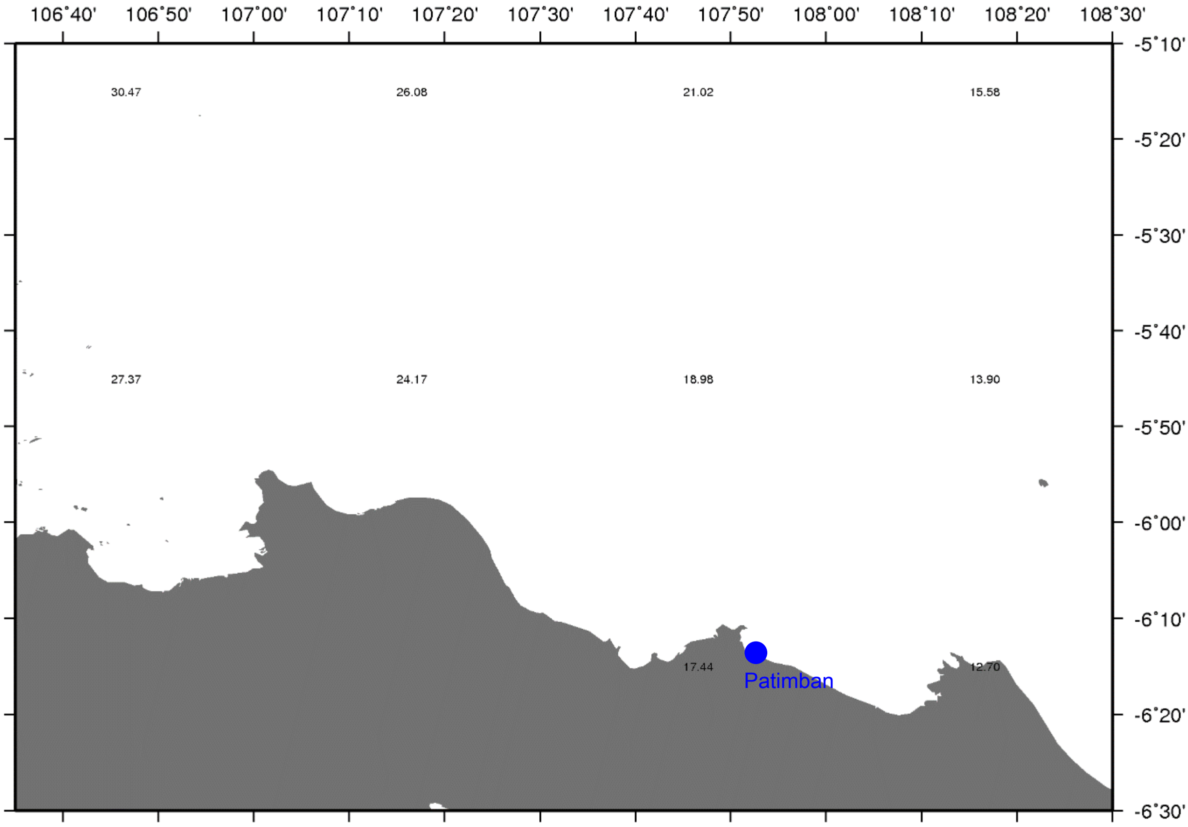


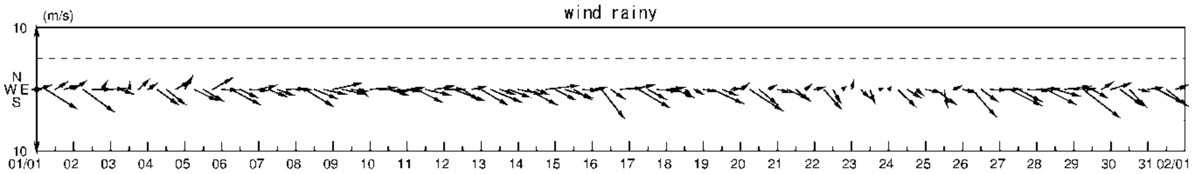
Figure 3.46. Location of open sea boundary where the amplitude of K1 constituents by Matsumoto *et al.*(2000)

Wind

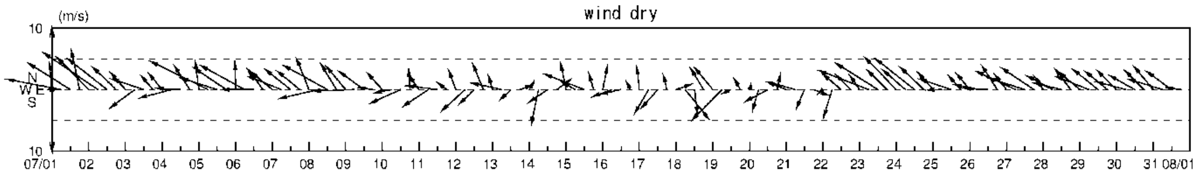
Wind flow over the sea surface was considered to generate the wind current. Constant and steady wind conditions in January (rainy season) and July (dry season) were set on the basis of the average values. By NCEP reanalysis data with 1.875 degree spatial resolution, wind situation on the ground surface (10m of altitude) around Patimban in 2009 was almost average since 1979 to 2011.

Figure 3.47 shows time series wind data at an altitude of 10m around Patimban in January and July 2009 by JMA Reanalysis value with 0.5 degree spatial resolution, more detailed than the above-mentioned NCEP. With these data, it was analyzed average values as bellows.

- January (rainy season)
  Wind velocity：2.8m/s
  Wind direction：286°（clockwise from North direction）-WNW-
- July (dry season)
  Wind velocity：3.4m/s
  Wind direction：118°（clockwise from North direction）-ESE-



(1) January, 2009



(2) July, 2009

Figure 3.47. Wind data at an altitude of 10m around Patimban by JMA

River discharge

Figure 3.48 shows local survey results of river discharges around Patimban. Flow dischargeswere calculated with results of the cross-section survey of rivers and the current velocity measurement. Furthermore, sediment discharges were calculatedwith the flow discharges and results of the suspended sediment measurement.

Yearly and monthly discharges of Cipunagara River, the largest river around Patimban New Port, were estimated by the above-mentioned local survey results. Here, some assumptions asfollows were put.

- Precipitation in the catchment area of Cipunagara River before the local survey was up to the average.

- Flow discharge of the river (Q) is directly proportional to amount of the precipitation (R).

- Sediment discharge of the river (L) is directly proportional to the square of the flow discharge (Q).

Precipitation was referred to as data (Figure 3.49) in Panmukan where is located in catchment area of Cipunagara River. Table 3-58 shows the estimated results of flow discharge (Q) and sediment discharge (L) of Cipunagara River.

On the other hand, the result of local survey of Sewo River is highly possible to be overestimated by the comparison with catchment area of Cipunagara River (Figure 3-50). It is supposed that the tidal current from the sea and the river current from the land were mixed.

It is reasonable that the flowand sediment discharges of Sewo River and other small rivers are estimated with the value of Cipunagara River and the ratios of catchment areas against the Cipunagara River.

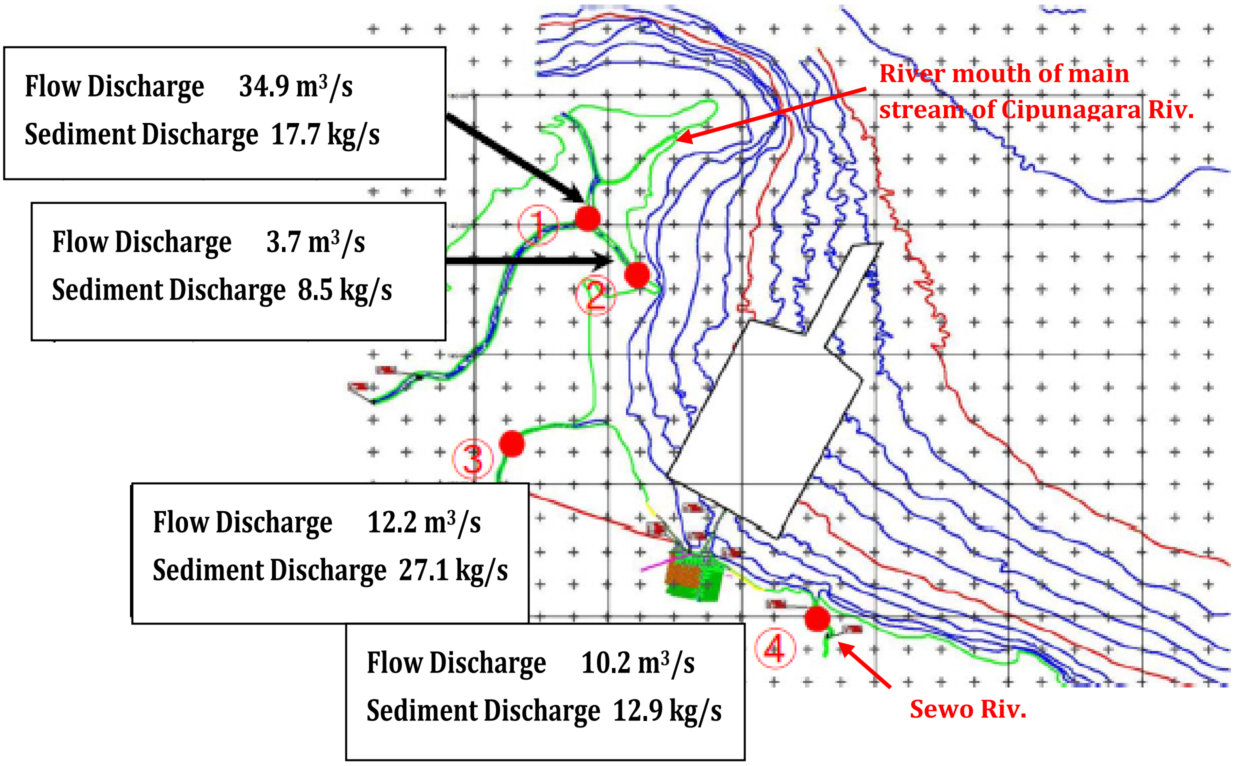
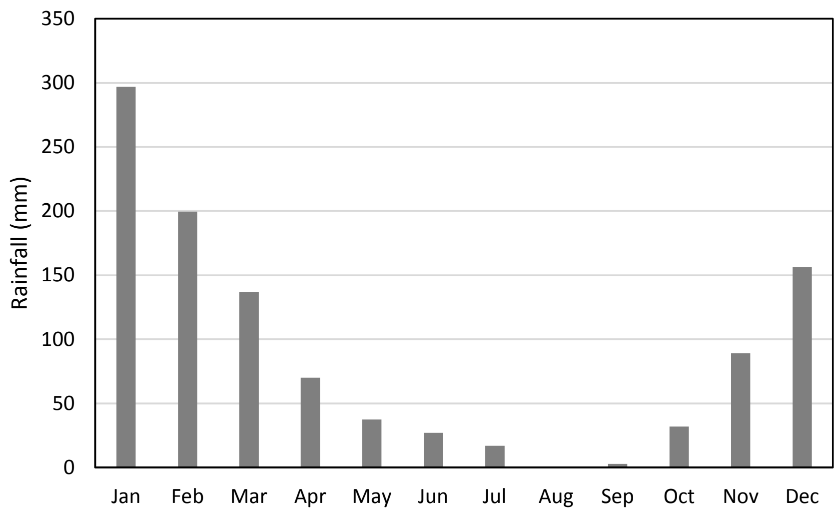


Figure 3.48. Local survey result of river dischargein May, 2016



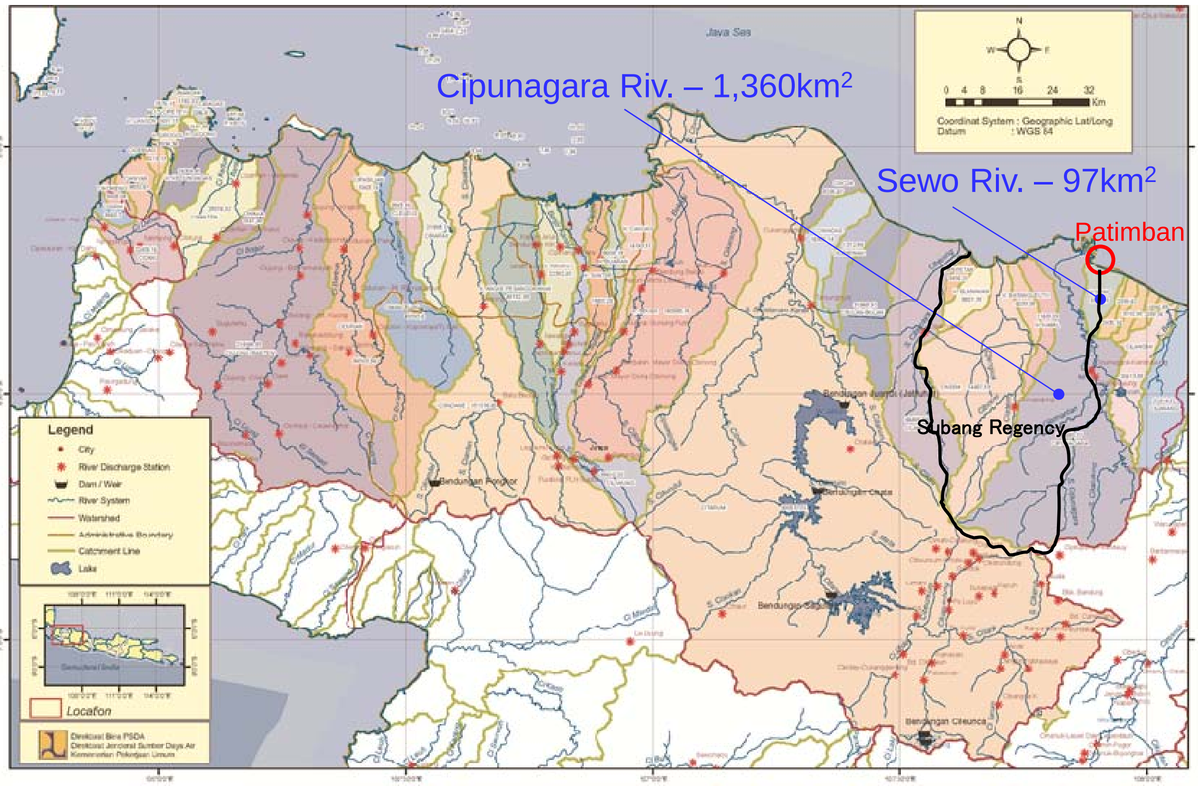
Source: BMKG

Figure 3.49. Monthly Rainfall at Pamanukan
(average for 2006- 2015)

Table 3.58 Estimated results of flow discharge (Q) and sediment discharge (L) of the Cipunagara River

Month	R(mm)	Q(m3/s)	SS(mg/l)	L(kg/s)	L(ton/yr)	L(ton/6months)
Jan	297	278	4041	1122.0		
Feb	200	187	2715	506.6		
Mar	137	128	1864	238.7		
Apr	70	65	953	62.3		
May	37	35	508	17.7		
Jun	27	25	369	9.3		
Jul	17	16	231	3.7		
Aug	0	0	0	0.0		
Sep	3	3	39	0.1		
Oct	32	30	435	13.0		
Nov	89	83	1215	101.4		
Dec	156	146	2125	310.1		
Ave.	89	83	1208	199	6,268,000	
rainy	158	148	2152	390		6,152,672
dry	19	18	264	7		115,328

Result of local survey



Source : Directorate of Water Resources Management, Ministry of Public Works

Figure 3.50. Catchment areas of the rivers around Patimban

Change of Current field by Numerical Analysis

b)-1 Computational Method

Finite difference method was used for the calculation of current field which was expressed by the combination of continuity equation and momentum equation. Basic equations are shown below.

Continuity Equation

【Total layer】

$$\frac{\partial \eta}{\partial t}+\frac{\partial}{\partial x}\left(\sum_{k=1}^{k=k\max} M_k\right)+\frac{\partial}{\partial y}\left(\sum_{k=1}^{k\max} N_k\right)=0 、 M=uh、 N=vh$$

【Each layer】

$$w_{k-1/2}+\frac{\partial}{\partial x}M_k+\frac{\partial}{\partial y}N_k=w_{k+1/2}$$

Where, η is water level、 u and v are horizontal velocity, w is vertical velocity, h is layer thickness、 $k_{\max}$ is number of layers and suffic k denote value at k layer.

Momentum Equations

【 x direction】

$$\frac{\partial M_k}{\partial t}+\frac{\partial Mu_k}{\partial x}+\frac{\partial Mv_k}{\partial y}+\frac{(wM)_{k-1/2}-(wM)_{k+1/2}}{h_k}$$

$$=fN_k-\frac{h_k\partial p_k}{\rho_k\partial x}+A_x\frac{\partial^2 M_k}{\partial x^2}+A_y\frac{\partial^2 M_k}{\partial y^2}$$

$$+h_k\left[\frac{\gamma^2(u_{k-1}-u_k)\Delta V_{k-1/2}}{h_{k-1/2}}-\frac{\gamma^2(u_k-u_{k+1})\Delta V_{k+1/2}}{h_{k+1/2}}\right]$$

【 y direction】

$$\frac{\partial N_k}{\partial t}+\frac{\partial Nu_k}{\partial x}+\frac{\partial Nv_k}{\partial y}+\frac{(wN)_{k-1/2}-(wN)_{k+1/2}}{h_k}$$

$$=fM_k-\frac{h_k\partial p_k}{\rho_k\partial y}+A_x\frac{\partial^2 N_k}{\partial x^2}+A_y\frac{\partial^2 N_k}{\partial y^2}$$

$$+h_k\left[\frac{\gamma^2(v_{k-1}-v_k)\Delta V_{k-1/2}}{h_{k-1/2}}-\frac{\gamma^2(v_k-v_{k+1})\Delta V_{k+1/2}}{h_{k+1/2}}\right]$$

$$\Delta V_{k-1/2}=\sqrt{(u_{k-1}-u_k)^2+(v_{k-1}-v_k)^2} 、 \Delta V_{k+1/2}=\sqrt{(u_k-u_{k+1})^2+(v_k-v_{k+1})^2}$$

$$\frac{1}{\rho}\frac{\partial p}{\partial x} = g\frac{\partial \eta}{\partial x} + \frac{g}{\rho}\int_z^\eta \frac{\partial p}{\partial x}dz \text{、} \frac{1}{\rho}\frac{\partial p}{\partial y} = g\frac{\partial \eta}{\partial y} + \frac{g}{\rho}\int_z^\eta \frac{\partial p}{\partial y}dz$$

Where, ρ is density, f is Corioli's parameter, p is pressure, A_x and A_y are horizontal eddy viscosities in x and y directions respectively, g is acceleration of gravity, γ^2 is friction coefficient and $\gamma_{k\max}^2 = gn^2 / h^{1/6}$ at the bottom layer、 $\gamma_k^2 = const.$ for middle layer. n is manning's roughness coefficient.

b)-2 Computational Conditions

Computational Domain and Grid Interval

Figure 3.43 shows the computational domain and grid interval.

Vertical grid division

Vertical grid division has been done by following 7 layers by taking into consideration of the planned channel water depth of DL.-17m.

1 layer：sea surface～2m(DL-)

2layer：2～5m

3 layer：5～9m

4 layer：9～13m

5 layer：13～17m

6 layer：17～25m

7 layer：25m or over

b)-3 Verification of the Modeling

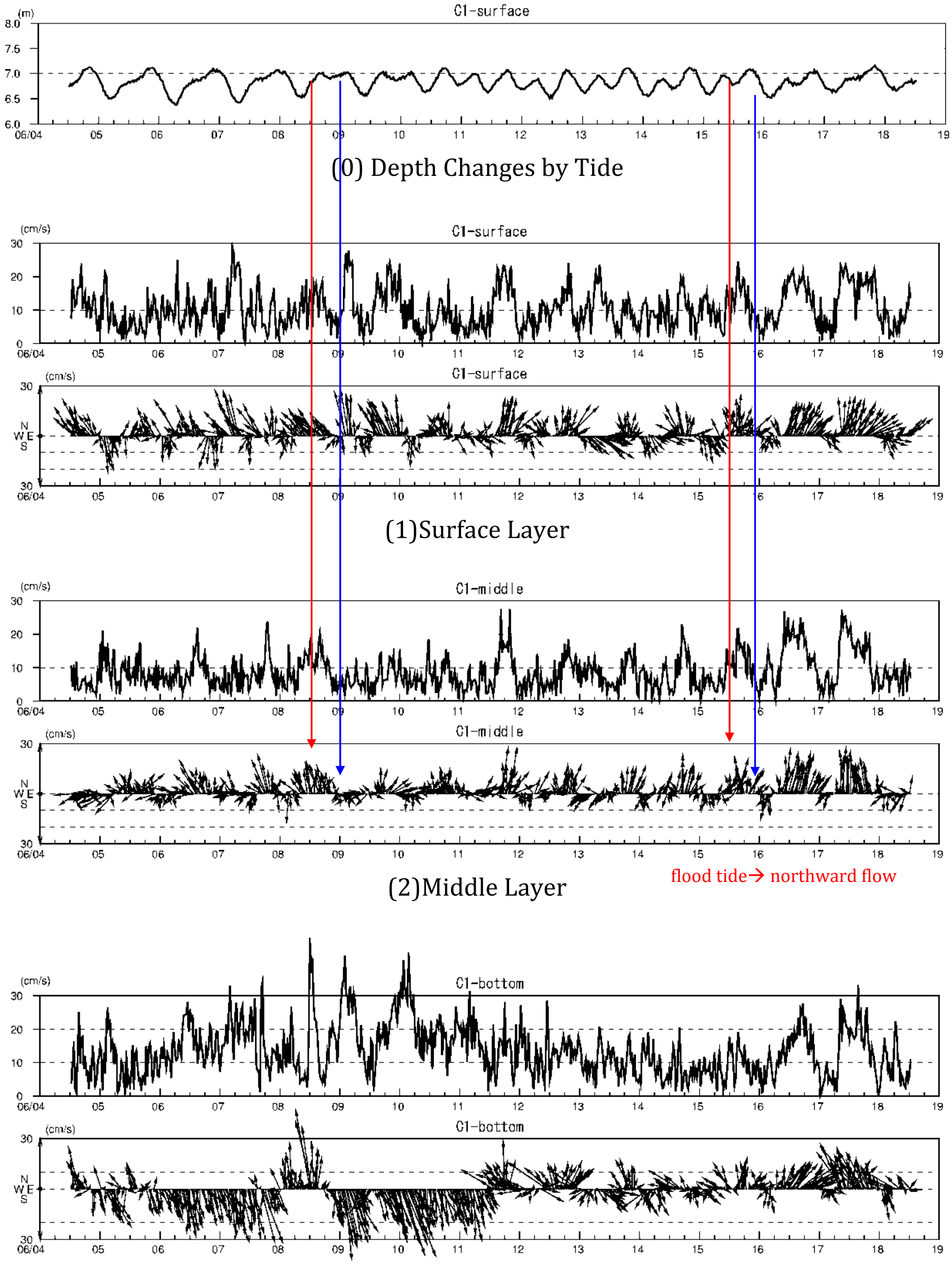
Field Survey Data

Field observation current data at the location C1 has been used for the verification of the modeling of current field. Figure 3.51 shows the local survey results of current measurement.

Verification of the simulated current field

Tidal current ellipse of major 4 components has been shown in Figure 3.52. With respect to the tidal current ellipse of the principal K1 component, although the predominant directionshows some difference, the magnitude of current amplitude shows good corresponding.

Range of the tide at the site is rather small and resultant tidal current is weak. Because of this reason, effect of wind induced current and fresh water inflow from the river becomes rather large. By considering that the detailed wind data and river discharge data are lacking in order for the detailed numerical simulation of current field, present numerical simulation results of current field can be considered to have shown the reasonable accuracy for the study purpose.



(3)Bottom Layer

Figure 3.51. Field survey results of current measurement (C1)

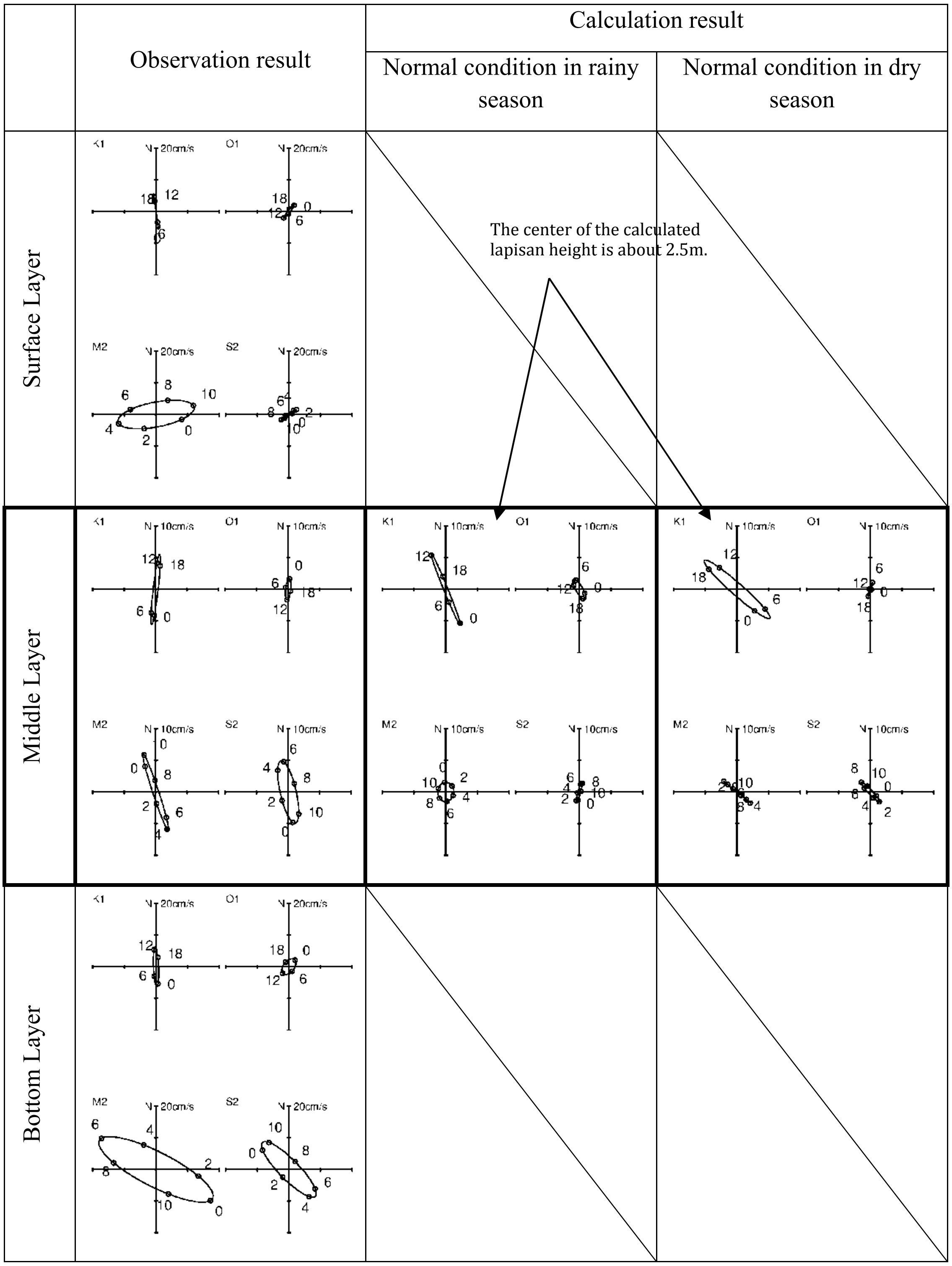


Figure 3.52. Comparison of the tidal current ellipse of major 4 tidal components at C1

Comparation with current raw data (Reference)

Currents monitoring in the field did from 4th – 19th June 2016. While wind condition is typical and steady, and river discharge in dry season and rainy season are used as input data in hidrology modeling because lack of detail information. Current patern is also calculated in typical condition for analysis purpose.
So that, it's not correct to compare simulation result with that current raw data, but scattering diagrams is made as refference (this is also as explanation why only the ebb and flow that summarized from data and compared with simulation result).

Survey result either in layer surface or middle layer show various result. It is considered as wind effect because ebb and flow currents is not too strong in this area (or data may include some sampling error). Calculation result are in the range of survey result variation. Because it is simulated in typical and steady wind condition, and river discharges in dry and rainy season, the difference between survey and calculation result are estimated caused by wind fluctuation and river discharges.

Based on the condition above simulation result can be considered as reasoning acuration for study purpose.

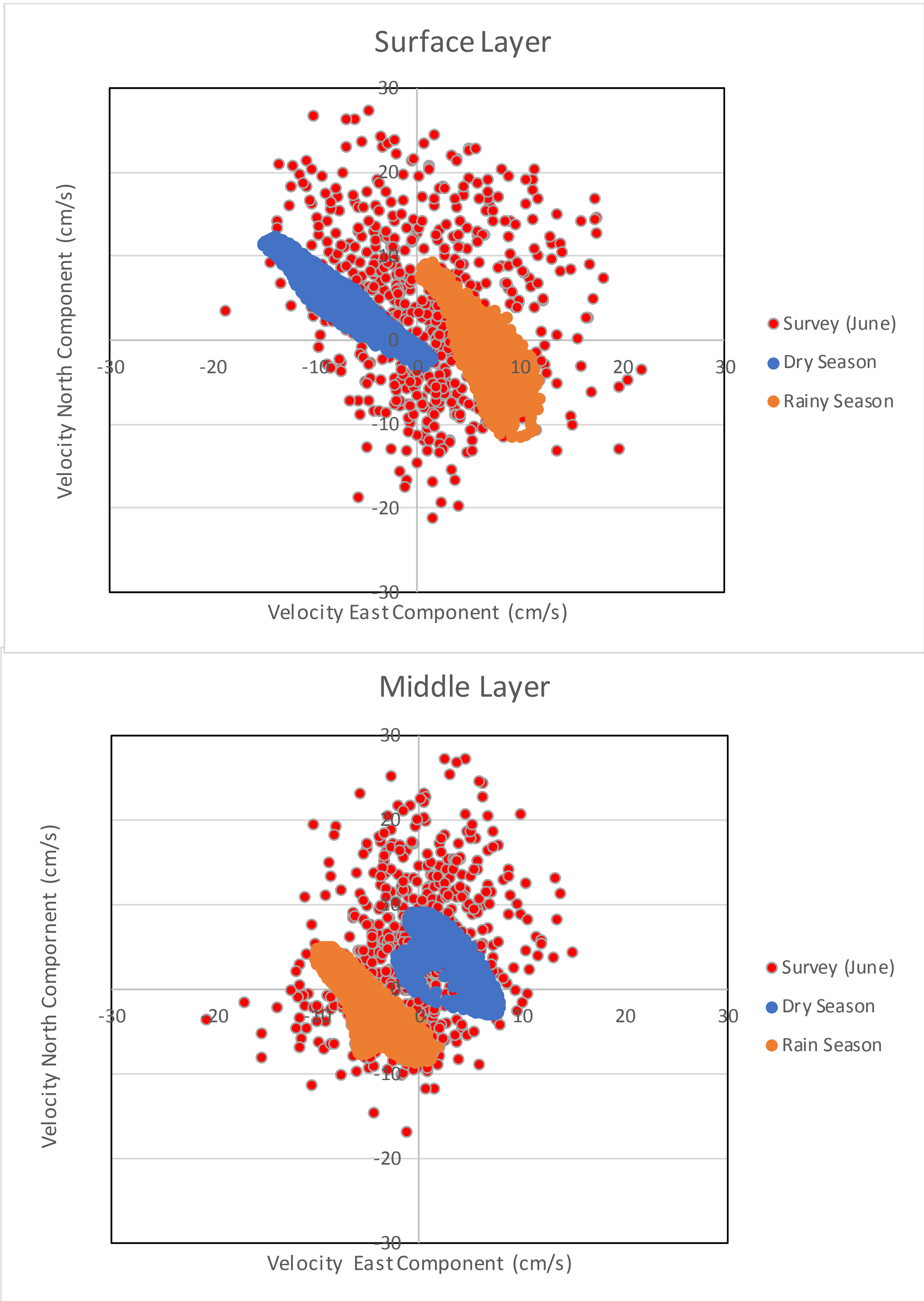


Figure 3.53. Comparation between Currents raw data and Simulation result

Model simulation that is made has consider the structure that will be built in phase II, in order to estimate maximum accumulation impact for whole activity.

Result

Wave change is predicted only occur limited in the area around the structure and most of it show that change velocity will not exceed 2 – 3 cm/s in the distance of 5 km except when there are shortly fast wave, so the impact of wave change to the fishery is considered as non significant.

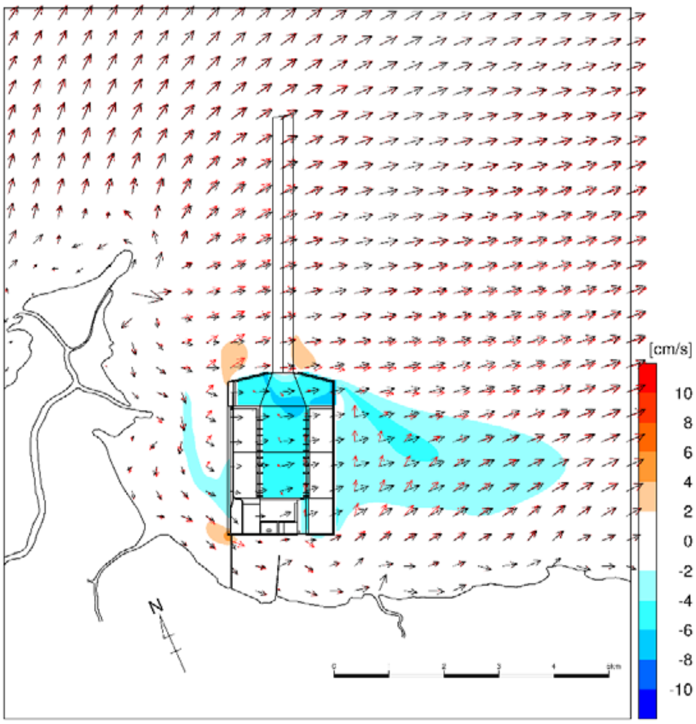
Therefore, Patimban fishing ground area has closed by reclamation since construction phase. The others fishing ground locations are not disturbed by reclamation or seaport massive building, because the wave change limited only in the distance of 5 km around project location.

Impact magnitude with the operational of seaport/massive building can be seen in this following table.

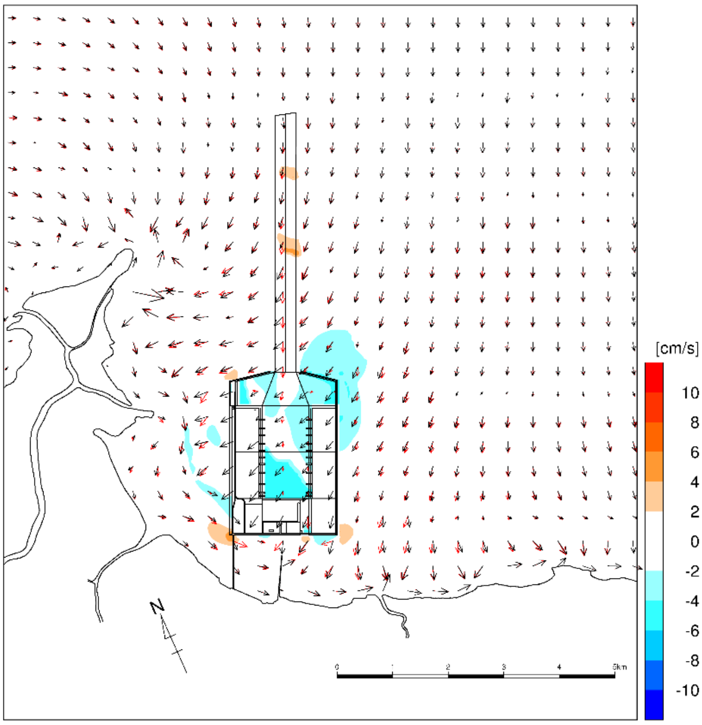
Table 3.59 Analysis of Fishing Ground Impact EstimationWith and Without Project

Item	***Without the Project***	***With the Project* (After 5 years)**	**Magnitude**
Water stream (residual stream)	12 – 16 cm/s	8 – 20 cm/s	-4 - +4 cm/s
Fishing Ground	Total 5 fishing ground around location	Total 4 fishing ground around location	1 fishing ground change

Source : JICA Survey Team, 2017



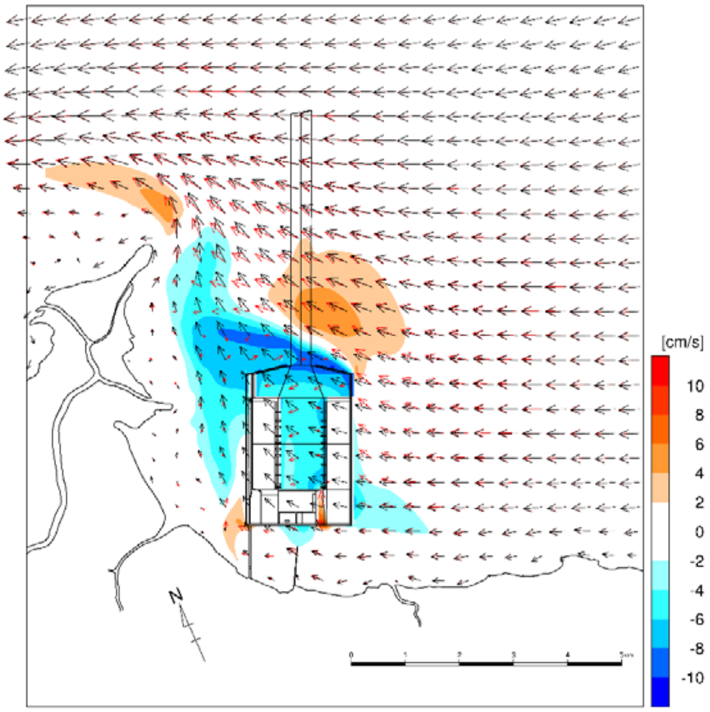
(1) Surface Layer



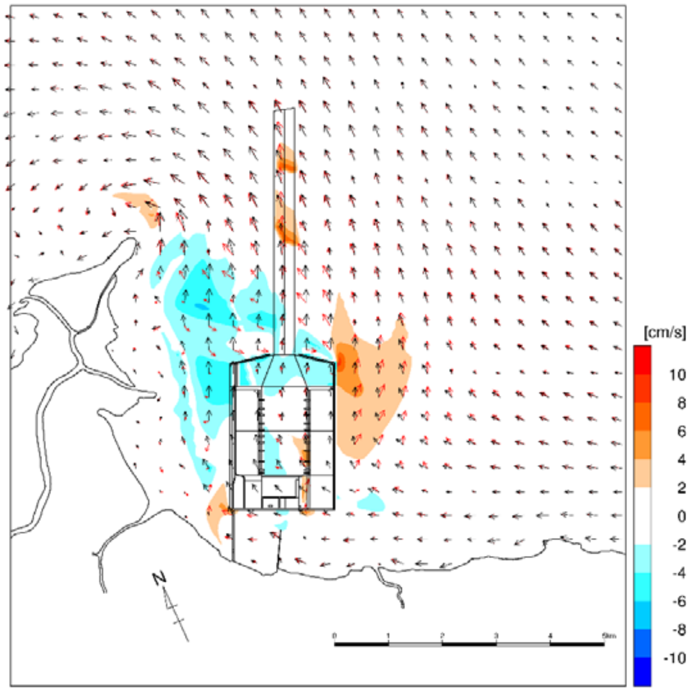
(2) Bottom Layer

→ Present without the Port, →Future with the Port, Color Shade: Current Velocity Changes

Figure 3.54. Numerical simulation results of the current vectors of surface and bottom layer and the current velocity difference between the present and future topographies as the residual current in rainy season (with west wind)



(1) Surface Layer



(2) Bottom Layer

→ Present without the Port, →Future with the Port, Color Shade: Current Velocity Changes

Figure 3.55. Numerical simulation results of the current vectors of surface and bottom layer and the current velocity difference between the present and future topographies as the residual current in dry season (with east wind)

Rate of this impact significance is categorized as **negative significant impact (-P)** based on consideration :

1. **The Number of People Affected**

   People affected by fishing ground change are fishermen whom use Patimban fishing ground. So based on this criteria, it is categorized as **significant impact (P).**
2. **Impact Spread Area**

   Impact spread area limited only for Patimban fishing ground area, so the impact is **non significant impact (TP).**
3. **Duration and Intensity of Impact**

   The duration of impact is forever, so the impact become **significant (P).**
4. **Other Component Affected**

   The others component affected by fishing ground change are social economy component, so the impact become **significant (P).**
5. **Cummulative Nature of Impact**

   Impact is non cummulative, so the impact is estimated as **non significant impact (TP).**
6. **Reversible or Irreversible Impact**

   Impact will be reversible, the movement of fishing ground to the new location will be occur so the impact is estimated as **non significant impact (TP).**

3.3.2.5. Public Unrest

Fishing ground change that occur since construction phase and continue in the operational phase has potency to cause public unrest mainly the fishermen. It because operational cost change of fishermen activity who are fishing farther than before.

Table 3.60. Analysis of Public Unrest Impact Estimation from Fishing Ground Change Continuation in Operation

No	*Parameter*	*without project condition*	*With project condition*	**Magnitude Impact (Rupiah)**
1	Fishing ground change cause public unrest to the people because operational cost will increase then the income decrease	Income (fishermen that have ship) : • 34,800,000 • 31,540,000 • 46,800,000	Income (fishermen that have ship) : • 24,360,000 • 22,078,000 • 32,760,000	(-) 10.440.000 (-) 9.462.000 (-) 14.040.000

Source : Analysis result, 2017

As seen in the table before, considering significance rate of impact, public unrest is **negative significant impact (-P),** as describe below :

1. **The Number of People Affected**

   Fishermen who fishing around the seaport are people affected, so the impact is predicted as **significant impact (P).**

2. **Impact Spread Area**

   The impact spread can be disperse to the out of seaport area, so the impact is predicted as **significant impact (P).**

3. **Intensitas dan Lama Dampak**

   Intencity of public unrest is limited but occur in the longterm, so the impact is predicted as **significant impact (P).**

4. **Other Component Affected**

   There is no other component that affected by public unrest impact, so the impact is predicted as **non significant impact (TP).**

5. **Cummulative Nature of Impact**

   Public unrest is non cummulative, so the impact is categorized as **non significant impact (TP).**

6. **Berbalik dan Tidak Berbaliknya Dampak**

   Impact of public unrest would be reversible if primary impact management has been done, so the impact is rated as **non significant impact (TP).**

3.3.3. Operation of Onshore Facilities

3.3.3.1. Increasing of Run-off

The increasing of water run-off rate is continuation from sosial facilities, public facilities, and Patimban port utility develompent activity in back up area. As has been stated in the on-shore facility construction phase, the high of water run-off increase for flood period 50 years to the land after opened is 0,21 m^3/second.

Table 3.61. Analysis of water run off rate impact estimation in the operational activity of on-shore facility

No	***Parameter***	***without project condition***	***With project condition***	**Magnitude of Impact**
1	Water run off debit	Q_{awal} = 0,278 x 0,21 x 21 x 0,1 = 0,12 m^3/second	$Q_{akhir\ total\ terbangun}$ = 0,33 m^3/second	0,33 m^3/second – 0,12 m^3/second = 0,21 m^3/second

This impact is rated as negative non significant impact based on consideration :

1. **The Number of People Affected**

   The people affeccted by the increasing of run off debit are the settlements around Kali Genteng and/or its creek and Kali sewu and/or its creek. Activity plan site is very near to the shoreline, people are in the south part of site area so they are not affected by water run off from both of rivers. Thus, the impact is **non-significant (TP)**.

2. **Luas Sebaran Dampak**

   The impact spread area involve area around the both rivers which is near to the shoreline, so the impact is **non significant (TP)**

3. **Duration and Intensity of Impact**

   Impact will occur in the rainy season with average rain intensity is 21 mm/hour or 0,33 m^3/second on the area as big as back up area 10 Ha for flood plan period 50 years. So the impact is **non significant (TP)**

4. **Other Component Affected**

   The increasing of water run off will not cause flood in both of rivers and directly connected to the off shore, So the impact is **non significant (TP)**

5. **Cummulative Nature of Impact**

   Impact that occur mainly with rainy day intensity, beside increase run off volume it also bring sediment because of soil erosion which can rise the impact to the other environmental component, so the impact is **non significant (TP)**

6. **Reversible or Irreversible Impact**

   The impact will reverse (stop) when the rain stop, so the impact is **non significant negative (TP)**.

Based on the analysis of significant impact criteria, so the impact of on-shore facility development to the increasingg of water run off is categorized as **non significant negative impact (-TP).**

3.3.3.2. Public Unrest

Impacts that appear from on-shore facilities development activities are the increasing of water run off and public unrest. That impact is in accordance with quesioner distribution result to the people around Patimban seaport development location who feel worried, such as : 1 % respondents feel worried of Patimban seaport development.

Data analysis method to calculate public unrest is done by comparing attitude/argument/negative perception as the result of public unrest to the occupation with positive perception to the occupation. Public unrest appear when %Urs is bigger than 100% as seen in this following formula:

$$\%Urs = \frac{Negative\ perception\ (disagree)}{Positive\ perception\ (agree)} * 100\%$$

%Urs = Restless percentage

P(+) = Positive perception to the activity

P(−) = Negative perception to the activity

Restless rate calculation based on that formula :

$$\%Urs = \frac{Negative\ perception\ (0,38)}{Positive\ perception\ (0,62)} * 100\% = 61,29\%$$

Based on that calculation, it can be conclude that Patimban seaport plan activity doesn't make significant public unrest. It is shown by Urs calculating result as many as 61,29% that smaller than 100%.

Seen from the impact of interest based on significant impact criteria, so heavy equipment and materials mobilization impact to the public unrest parameter can be described as follow:

1. **The Number of People Affected**

   People who will be feel restless as the result of on-shore facility development activity in the construction phase are people live around the seaport mainly on 10 ha area. Based on questionaire result, only 1 % who feel worried, so the impact is predicted as **non-significant impact (TP)**.

2. **Impact Spread Area**

   Impact spread area of public unrest is only in the settlements on Patimban village. So, the impact is predicted as **non significant impact (TP).**

3. **Duration and Intensity of Impact**

   Water run off impact to the public unrest is predicted only temporary, so the impact is predicted as **non significant impact (TP)**.

4. **Other Component Affected**
   Public unrest is not affected to other component, so the impact is categorized as **non significant impact (TP).**
5. **Cummulative Nature of Impact**
   Public unrest is derivative impact of water run off increase but non cummulative. so the impact is categorized as **non significant impact (TP)**.
6. **Reversible or Irreversible Impact**
   Public unrest reversible when primary impact management is done, so the impact is categorized as **non significant impact (TP).**

Based on the analysis above, so the impact of public unrest in the on-shore facility development activity is predicted as **non significant impact (-TP)** and not managed because of derivative impact, so the management is optimized in its primary impact.

3.3.4. Maintenance of Basin and Access Channel

3.3.4.1. Decreasing of Sea Water Quality

Prediction of impact without Patimban Seaport Development Activity (without project)

Sea water quality without Patimban Port development activities is assumed as equal with environmental baseline because there is no other significant development in activities location that lead to decreasing in sea water quality. While the TSS levels in basin and shipping lanes are represented by sampling points in CW4 with a maximum value of 15.8 mg / L at low tide conditions in the rainy season.

Prediction of impact with Patimban Seaport Development Activity (with project)

With maintenance activities in basin and navigation channel such as dredging will result in increased levels of TSS and will decreased of sea water quality. As mentioned in the previous discussion of sedimentation, total volume by maintenance dredging up to 2,065,039 m^3 and will be done every four to 15 years. Comparing with dredging volume in the construction phase with a volume of 26,050,000 m^3 (Phase I-1 and Phase I-2), the volume of maintenance dredging is only about 10% of its.

Thus, TSS which generated will be smaller than when the dredging in construction phase is currently underway. If it is assumed that turbidity which generated in maintenance dredging is the same as in construction phase, then turbidity which result is estimated as in the following table.

Table 3.62 Analysis Of Sea Water Quality Decrease Impact Estimation With And Without Project In The Basin And Sailing Line Maintenance Activity

Area	*Without Project*	*With Project*	Unit
Dumping Site	10,2 – 11,25 mg/L (at CW7)	15,2 – 16,25 mg/L (maximum at 3km)	5 mg/L
Dredging Site	12,0 – 15,8 mg/L (at CW4)	14,5 – 18,3 mg/L (maximum at 3km)	2,5 mg/L

Source : Analyzed Result by JICA Survey Team, 2017

Impact is rated as non significant negative impact based on consideration :

1. **The Number of People Affected**

   There are no people affected by sea water quality decrease, but marine life. So the impact is categorized as **non significant impact (TP)**.
2. **Impact Spread Area**

   Impact spread area is limited in sea area around the port. So with the breakwater and seawall surround it, the spread impact become small. So the impact is categorized as **non significant impact (TP)**.
3. **Duration and Intensity of Impact**

   Duration of impact is limited only in maintenance activity, around once in 5 years. So the impact is categorized as **non significant impact (TP)**.
4. **Other Component Affected**

   Other component affected is marine life, but because the abundance of marine life can move to the surrounding sea. So the impact is categorized as **non significant impact (TP)**.
5. **Cummulative Nature of Impact**

   Impact is non cummulative. So the impact is categorized as **non significant impact (TP)**.
6. **Reversible or Irreversible Impact**

   Impact will be reversible because the impact occur temporary during the maintenance. So the impact is categorized as **non significant impact (TP)**.

3.3.4.2. Disturbance of Marine Life (Nekton and Benthos)

a. Plankton

<u>*Estimation of Impact without Patimban Seaport Development Activity (without project)*</u>

Based on the baseline, phytoplankton abundance in the rainy season are around 64.000 – 231.000 cell/litre. While zooplankton are between 4.000 – 75.000 cell/litre.

Bacillariophyta phylum have the highest abundance and species number such as *Synedra acus*. There are total of 31 kinds of plankton which consist of 22 kinds of phytoplankton that devided into 9 classes, and 15 kinds zooplankton that devided into 9 classes. Shannon – Wiener diversity index is around 1 – 2 for phytoplankton, while for zooplankton is around 0,41 – 1,40. Based on that value, it can be said that current conditions in the activity plan location are categorized as moderate untill heavy polluted.

<u>*Estimation of Impact with Patimban Seaport Development Activity (with project)*</u>

Maintenance of basin and shipping lanes can cause decreasing of sea water quality that impact with disruption of aquatic biota such as plankton. The effects that can occur such as increasing of turbidity in around project site until a certain distance, considering the sea water quality can affect to interaction of environmental components in marine area. However, given the impact of turbidity were relatively small and unimportant then it will not have a significant effect as well on marine biota.

<u>*Impact Magnitude*</u>

Environmental baseline for plankton in the rainy season showed that the abundance of phytoplankton was dominated by Bacillariophyta class with an abundance ranged from 28000-140000 cells/liter. Distribution of turbidity that arised from maintenance activities (dredging) is limited and will not have a significant impact on the marine plankton.

b. Benthos

<u>*Estimation of Impact without Patimban Seaport Development Activity (without project)*</u>

Based on baseline, current condition at the activity plan location there are 8 kinds of benthos which consist of 3 kinds of Gastropods and 5 kinds of Bivalves. Benthos diversity index at the activity plan location is between around 0 – 1,26. According to Barbour *et al* (1987), Shannon Wiener diversity index classification shows that diversity index at the activity location is very low. Sampling station location S10 has the highest diversity index as many as 1.26, while S1, S3, S4, S7, S8, and S11 have low diversity index as many as 0. Those results show that S10 is categorized to moderate contaminated, while S1, S3, S4, S7, S8, and S11 are heavy contaminated. The kinds of Benthos that the most commonly found in the sampling location are *Anadara* sp. (Bivalves) and *Melanoides* sp.(Gastropods). Both of them can be one of indicators of water pollution, because of its ability in absorbing the pollutant.

Estimation of Impact with Patimban Seaport Development Activity (With Project)

Maintenance of basin and shipping lanes can cause decreasing of sea water quality and disrupted to aquatic biota such as benthos. The impact that arised from these activities such as increasing of turbidity in water around project site until a certain distance. Increased of sedimentation rate and suspended solid contents as well as increasing in turbidity which can also cause death in benthic biota. However, because the impact of turbidity were relatively small and unimportant then it will not have a significant effect as well on water biota.

Estimation of Impact Magnitude

The baseline for benthos in the rainy season shows that benthos abundance is varied from 0 – 205,88 Induvidualal/m^2. In the rainy season, in some location are not found benthos. There are two classes of benthos in the activity location, which are Gastropods and Bivalves. The most dominating spesies from Gastropods class is *Melanoides tuberculata*, while from Bivalve is *Anadara grandis*. Both of gastropods and bivalves commonly live in the substrat base.

Spread of turbidity which occur from maintenance activity (dredging) will not significant affected to marine biota (benthic).

c. Necton

Estimation of Impact without Patimban Seaport Development Activity (Without Project)

Based on the baseline, current condition at the activity plan location there are 9 kinds of necton which consist of 5 species of fishes (Pisces) and 4 spesies of shrimps (Crustaceae). The amount of catch fish are more commonly found in rainy season, while in the dry season are less. The amount of Induvidualal of each fish species found in all sampling location is varied. In the number of catches, the species that most commonly found is petek fish (*Leiognathus equulus*) with 66 Induvidualal in all of sampling location. This species is often found in others location, which is 4 locations. So does jerbung shrimp (*Litopenaeus vannamei*) that found in the sampling location

Estimation of Impact without Patimban Seaport Development Activity (Without Project)

The decreasing of environment quality from maintenance basin and shipping lanes has direct and indirect impact to the necton. Activity can cause the decreasing of sea water quality that affect to marine life (especially necton) which use that area as nursery ground, feeding ground, and spawning ground.

Benthos is main food for sea fish. If benthos is disturbed so the sea fish will has the impact. The increasing of turbidity in the waters will disturb fish respiratory system generally because the increasing of suspended particle that stick to the gill. Beside the mature Induvidualal, the increasing of suspended particle will also affected to the spawns. The spawns in the waters with high turbidity and sediment rate will have high mortality rate. Dissolved particles can also cause the death of non benthic egg through absorbtion in the eggshell surface. Both of influence make the decreasing of water current and dissolved oxygen into the egg. Both of influence to the fish behavior occur in fish refusal to the turbid water, eating disoreder, and the increasing of finding shelter. Other than that, turbidity that occur from maintenance activity (dredging) is relatively small and not significant to marine biota (necton).

Magnitude of Impact

The baseline show that there are 9 kinds of necton, with majority are kinds that become consumption or livelyhood source of fishermen around the location. Patimban beach is one of fishermen fish cathcing area. Patimban beach area give a quite big contribution to the fishermen catch in that area. Necton species that give big contribution is Petek fish (*Leiognathus equulus*).

Table 3.63. Analysis of Marine Life Disruption Impact From Operation Activity

No	***Parameter***	***Without project condition***	***With project condition***	**Magnitude of impact**
1	Plankton	Phytoplankton abundance in rainy season range 64.000 – 231.000 cell/litre. While zooplankton 4.000 – 75.000 cell/litre	Slightly disrupted, but not occur decreasing of significant abundance	Relative small
2	Bhentos	Benthos abuncance 0 – 205,88 Induvidual/m^2	Slightly disrupted, but not occur decreasing of significant abundance	Relative small
3	Necton	9 kinds of necton consist of 5 fishes species (Pisces) and 4 shrimps species (Crustaceae)	Slightly disrupted, but not occur decreasing of significant abundance	Relative small

Source : Analysis result, 2017

This impact is rated as **negative non significant impact (-TP)** based on consideration :

1. **The Number of People Affected**
   There are no people affected by marine life disruption, because the intensity of impact is quite small and limited, so the impact is predicted as **non significant impact (TP).**
2. **Impact Spread Area**
   Impact spread area is limited mainly in port basin and sailing lane area**.** so the impact is predicted as **non significant impact (TP).**
3. **Duration and Intensity of Impact**
   Because the impact intensity of the decreasing sea water quality impact only occur shorrtly and limited, so the intensity of disruption on marine life also small. so the impact is predicted as **non significant impact (TP).**
4. **The Other Component Affected**
   No other component affected**,** so the impact is predicted as **non significant impact (TP)**.
5. **Cummulative Nature of Impact**
   Marine life disruption impact is non cummulative with other activity. so the impact is predicted as **non significant impact (TP).**
6. **Reversible or Irreversible Impact**
   Impact can be reverse, with the finishing of port basing and sailing lane maintenance. so the impact is predicted as **non significant impact (TP).**

Based on the description above, so the impact of marine life disruption in the maintenance activity is predicted as **non significant negative impact (-TP) and no managed** becaues it is derivative impact, so the management is optimized in primary impact only.

3.3.5. Operation of Access Road

3.3.5.1. Decreasing of Air Quality

Air Pollution

Traffic passing through the access road will increase air pollutant in the ambient air. Air quality during operation phase along the proposed access road was predicted quantitatively based on the estimation of emission from vehicles and the pollutant dispersion.

Prediction method in the “Technical Handbook for Environmental Impact Assessment of Roads” is used to predict pollutant rate in the air ambient based on the traffic volume that has been projected.

Average gas pollutant emision is count with following equation :

$$Q_t = V_W \times \frac{1}{3600} \times \frac{1}{1000} \times \sum_{i=1}^{2} (N_{it} \times E_i)$$

Q_t : Gas pollutan emision average at hour t (mg/ m·s)

E_i: Type of vehicle emision factor at-i (g/km·vehicle)

N_{it}: Traffic volume per hour vehicle type at – i (vehicle/hour)

V_W: Conversion coeffision (mL/g or mg/g)

Emision factor of vehicle type at-i, *Ei* counted by following formula :

$$E_i = {}^{a}/_{V} + bV + cV^2 + d$$

Which:

V is average velocity of vehicle type at- i

a, *b*, *c*, and *d* is regression coefficient

Table berikut ini menunjukan faktor emisi terhitung untuk kendaraan ringan maupun berat pada kelajuan

Following table shows calculated emision factor either for light or heavy vehicle in the rate of 60, 70, 80 km/hour

Table 3.64. Pollutant Emision Factor

Pollutants	Vehicle size	*a*	*b*	*c*	*d*	Average velocity [km/hr]		
						60	70	80
NO_x	Light	-0.902	-0.00578	4.39E-05	0.261	0.0572	0.0586	0.0683
	Heavy	-7.12	-0.0895	0.000735	3.93	1.0873	1.1648	1.3850
PM_{10}	Light	-0.069	-0.00039	2.87E-06	0.017	0.0031	0.0031	0.0037
	Heavy	0.0318	-0.0031	2.27E-05	0.158	0.0543	0.0527	0.0557
CO	Light	-12.5	-0.0559	0.000448	2.2	0.2505	0.3036	0.4390
	Heavy	10.9	-0.0168	0.000115	1.19	0.7777	0.7332	0.7183
SO_2	Light	0.0783	-0.00016	1.31E-06	0.0112	0.0075	0.0074	0.0076
	Heavy	0.0411	-0.0007	5.51E-05	0.0424	0.1995	0.2640	0.3396

Source: Based on Technical note of National Institute for Land and Infrastructure Management 1

Emision calculation based on traffic volume that has been projected in this following table :

Table 3.65. The Number of Vehicle Predicted Pass Access Road

Year	2019	2025	2037
Amount of small vehicle (/day)	227	2.710	6.017
Amount of heavy vehicle (/day)	2.271	27.104	60.171

Beside of the calculation above, it is also calculated pollutant concentration in the ambient air using *Plume Model*, that shows emited pollutant dispersion from the moving ships when the wind velocity is above 1 m/s. Emision from ships is estimated as source of point. If distance back and forth to the centre point is 200 meter, so the total length will be 400 meter. Based on that count, pollutant concentration in the point (*x, y, z*) is given by:

$$C(x,y,z) = \frac{Q}{2\pi \cdot u \cdot \sigma_y \cdot \sigma_z} \exp\left(-\frac{y^2}{2{\sigma_y}^2}\right)\left[\exp\left\{-\frac{(z+H)^2}{2{\sigma_z}^2}\right\} + \exp\left\{-\frac{(z-H)^2}{2{\sigma_z}^2}\right\}\right] \times 10^9$$

Which:

$C(x, y, z)$: Pollutant concentration in all of prediction points (*x, y, z*) (µg/m^3)

Q : Air pollutant emision rate (kg/s)
u : average wind rate (m/s)
H : Emision source height*, determined 30 (m)*
x : *distance from emision source to the prediction points along the wind direction (m)*
y : Horizontal distance from the prediction points perpendicular with axis x- (m)
z : Vertical distance from the prediction points perpendicular with axis x- (m)
σ_y, σ_z : dispersion width from dimension of y and z (m)

Which,

$\sigma_y = W/2 + 0.46L^{0.81}$ (dalam hal *x*<*W*/2: $\sigma_y = W/2$)

$\sigma_y = \sigma_{z0} + 0.31L^{0.83}$ (dalam hal *x*<*W*/2: $\sigma_z = \sigma_{z0}$)

σ_{z0}: lebar dispersi vertikal awal [m]

- Tanpa penghalang suara $\sigma_0 = 1.5$
- Dengan penghalang suara (tinggi> 3 m) $\sigma_0 = 4.0$

L : Jarak dari tepi jalan ke titik perkiraan dampak [m]
W : Road width [m]

In the calculation of pollutant dispersion above, direction and wind speed are determined as follow :

P1: Wind direction; Northeast, wind speed; 3.0m/s

P2 dan P3: Wind direction; west, wind speed ; 5.3m/s

The increasing of pollutant concentration is counted at the specified point that is same point as seen in the Figure 3.13 above. Width and height road from given source emision are 30 m and 2 m with the assumption that pile slab structure is in the condition of without sound barrier.

Table 3.66. Description Location of Prediction Impact Point

Location	P1	P2	P3
Description	Patimban village	Gempol village	Crossing in Nasional Pantura Road
Height prediction on the road	9m	0m	0m
Distance from road	700m	300m	50m
Average speed	40km/hour	60km/hour	40km/hour

Simulation models are made has to consider of the structure that will be built on stage II, in order to forecast the accumulation of maximum impact to the overall activities.

Pollutant rate from the ambien air is predicted by adding counted increase to the beginning pollutant concentration which is observed in the baseline survey. The result can be seen in these following table and figure.

Table 3.67 Prediction of Ambien Air Quality (µg/m^3)

St.		P1	P2	P3
NOx	Condition without project	< 9.97	< 9.97	24.77
	Condition with project			
	2019	9.98	9.99	25.85
	2025	10.04	10.25	37.66
	2037	10.12	10.59	53.39
	Quality Standard	150		
TSP	Condition without project	16.28	16.28	175.42
	Condition with project			
	2019	16.28	16.28	175.48
	2025	16.28	16.30	176.17
	2037	16.29	16.31	177.08
	Quality Standard	230		
CO	Condition without project	1,143	1,143	9,144
	Condition with project			
	2019	1143.00	1143.02	9144.7
	2025	1143.04	1143.18	9152.0
	2037	1143.10	1143.40	9161.8
	Quality standard	10000		
SO_2	Condition without project	88.26	88.26	100.34
	Condition with project			
	2019	88.26	88.26	100.4

St.		P1	P2	P3
	2025	88.27	88.28	101.3
	2037	88.27	88.31	102.5
	Quality standard	365		

Source : Analisis, 2017

Based on the table above, pollutan concentration in the ambien air from vehicle emision in the acces road still comply quality standard as illustrated in the following figure.

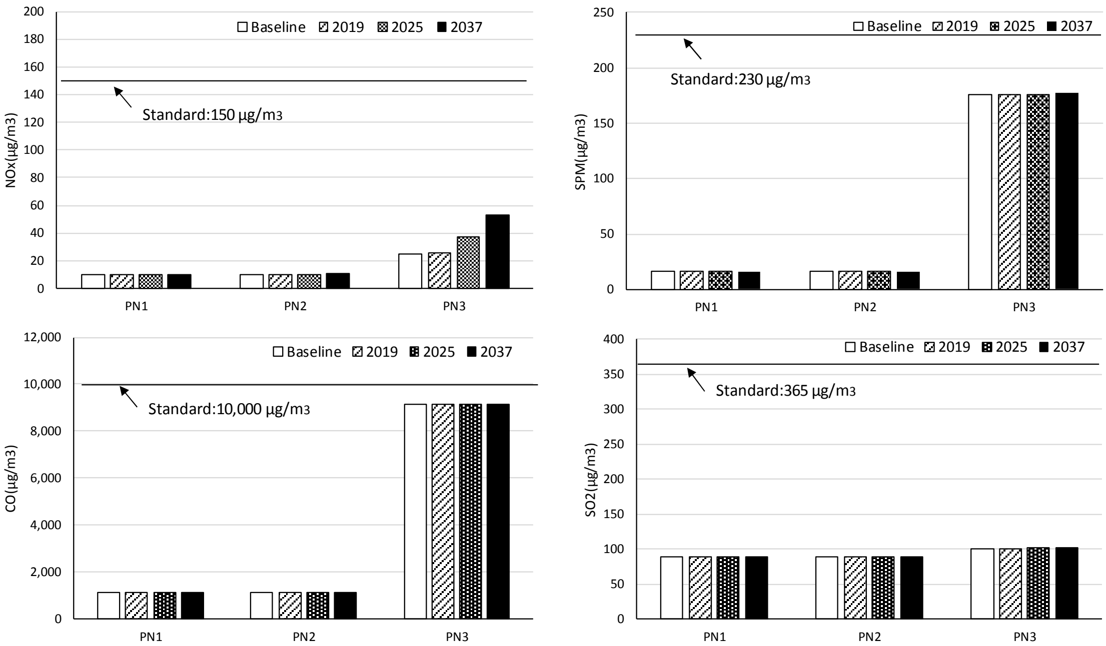
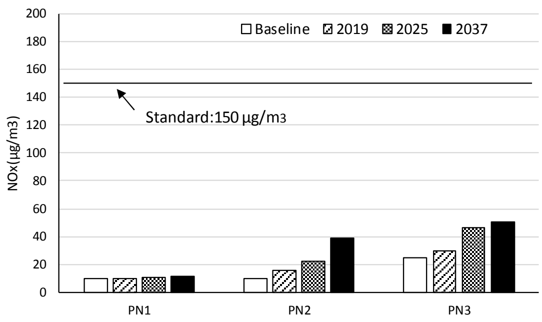


Figure 3.56. Estimated of Ambien Air Quality from Access Road

The increasing of pollutant level both the port operation and access road are integrated to predict cummulative impact that occur when both activity are running. Result of prediction is shown in the table below.



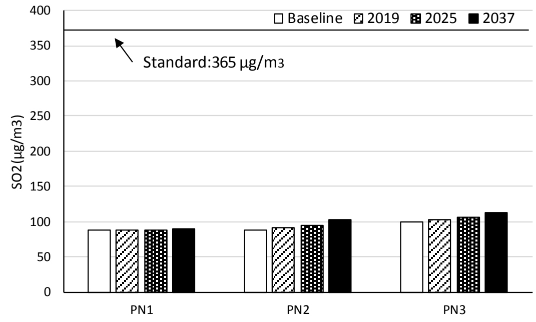


Figure 3.57. Estimated of Ambien Air Quality from Seaport operation and Access Road

Green House Gas

Green House Gas (CO2) will be emitted by the vessels and vehicles visited to the new port. If the new port is not developed, all of the vessels and vehicles are going to Tanjung Priok Port (assuming Tanjung Priok Port has enough capacity), which causes severe traffic jam and generate more CO2. Therefore CO2 emission from port related vehicles is estimated in the case with new port and without new port. Number of calling vessels to the new port is only shifted from a part of calling vessels to Tanjung Priok Port and the changes of travel distances depend on where the vessels from, hence only emission from the vehicles is estimated.

Figure 3-58 shows the result of CO2 emission from the vehicles in case with the new port and without. The CO2 emission will be reduced by 2,430 ton/day in case with the new port because the travel distance will become shorter and the CO2 emission rate will be reduced due to smooth traffic.

Table 3.68 CO2 Emission from the Vehicles at the Access Road in the case With and Without New Port

Emision	With the Seaport	Without the Seaport
Amount of small vehicle (per day)	6.017	6.017
Amount of heavy vehicle (per day)	60.171	60.171
Average speed (km/hour)	60	30
Emission rate from small vehicle (g/km/vehicle)	98,6	127,6
Emission rate from heavy vehicle (g/km/vehicle)	1.552,5	1.903,5
mileage (km)	60	70
Emision (kg/day)	5.640.525	8.071.229

Predicted year : 2030
Emission factor based on Technical Note of National Institute for Land and Infrastructure Management No. 671, 2012

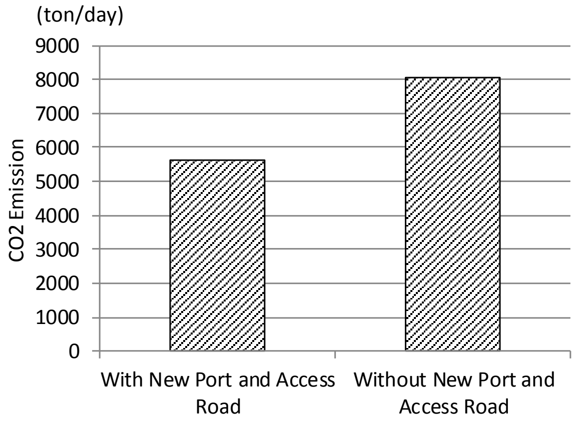


Figure 3.58. CO2 Emission from the Vehicles at the Access Road in the case With and Without New Port

This impact is considered as **non significant negative impact (-TP)** based on the following considerations :

1. **The number of people who will be affected**

   The Number of People Affected are peopple who live around access road which are Pusakanagara district residents. There are so many residents that live around the road but from calculation result it is estimated that air quality decline non significant, so the impact is categorized as **non significant impact (TP)**.

2. **The total area of the impact spread**

   Impact Spread Area include settlements around access road based on the administration there area covers six villages namely Pusakaratu, Gempol, Kalentambo, Kotasari and Patimban, District Pusakanagara, Pusakajaya village district Pusakajaya. But from calculation result it is estimated that air quality decline non significant, so predicted as a **non significant impact (TP)**.

3. **Intensity and Duration of the impact**

   The duration of the impact is longterm, but because prediction result is nit significant so the impact is predicted as **non significant impact (TP)**.

4. **Many other environmental components affected**

   Other component affected is public health but as stated in the point 1 so the impact can be categorized as **non significant impact (TP**).

5. **The nature of cumulative impacts**

   The impact of decreasing air quality is cummulative, but because the intensity is small so it is predicted as **non significant impact (TP)**.

6. Reversible or irreversible impact

The impact is reversible because once the emission of cars is reduced, the air quality will be improved. So the impact is considered as **non significant impact (TP)**.

3.3.5.2. Increasing of Noise

Traffic at the access road will generate traffic noise. Noise level during operation phase along the proposed access road was predicted quantitatively based on the estimation of noise generated by the passing vehicles.

Mathematic model *''ASJ RTN-Model 2008'' that improved by* Acoustical Society of Japan is used to predict noise level based on projected traffic volume.

Principle and basic formula which are used in estimation model :

First, obtain time variation of noise level that have weight A L_A (unit patern), observe prediction point data for one single vehicle that pass along the road in consideration.

Then, count the value that is integrated with time from passing duration, such as LAE (noise exposure level single occurence).

$$L_{AE} = 10\, log_{10}\left(\frac{1}{T_0}\sum_{i=1} 10^{L_{A,i}/10} \cdot \Delta t_i\right)$$

$L_{A,\,i}$: Weighed noise pressure level at prediction phase that emited from road part-i (dB)

Δt_i: $\Delta D_i/V$

ΔD_i: Length of road part-i (m)

V : Average of vehicle velocity part - i (m/s)

Pressure noise level that have weight A $L_{A,I}$ for noise propagation from source at – i to the prediction point is calculated with considering noise in the hemi-free fields from all direction source point with :

$$L_{A,i} = L_{WA,i} - 8 - 20\, log_{10}\, r + \Delta L_{cori}$$

Where:

$L_{WA,\,I}$: *Weigh noise pressure level A at the single vehicle at source - i* (dB)

r_i: Direct distance from source –i to the prediction point (m)

Termcorrection $\Delta L_{cor,i}$ (dB) connected to various attenuation such as correction for difraction and correction for atmosfer absorption; it was ignored in this simplification prediction. This simplification provides conservative estimation such as quite high noise level.

Power level of noise that have weigh A from land vehicle $L_{WA,\,i}$[dB] is given by :

$$L_{WA,i} = a + b\,log_{10}V + C$$

Which are V is vehicle velocity (km/h), a and b are regression coefficient, and c is termcorrection like correction of pavement condition, road gradient, etc. In this prediction, C termcorrection is eliminated for simplification. Then, noise pressure level that have weigh A in the single vehicle $L_{WA,I}$ along trafic flow is as follow:

Light vehicle : $L_{WA,i} = 46.7 + 30\,log_{10}V$

Light vehicle : $L_{WA,i} = 46.7 + 30\,log_{10}V$

In the end, time average value from noise at prediction point, L_{Aeq} (noise pressure level that have weigh A which equal and continuous is obtained by calculating traffic condition such as traffic volume (N; vehicle amount per hour) and types of vehocle (light or heavy).

$$L_{Aeq} = 10\,log_{10}\left(10^{L_{AE}/10} \cdot \frac{N}{3600}\right)$$

Noise level that will be inflicted in the acces road is shown in the Table 3.69. Based on the result, the increasing of noise level around survey baseline can be predicted in the future. Although noise intensity when development activity does not exceed standard quality for settlement and housing, considering measurement result in the baseline, noise in the point P3 has surpassed standard qualtiy while point P1 and P2 will surpass standard quality after 2025.

Calculation of noise increasing prediction has included possibility after seaport and road operated, so it is recommended to do noise monitoring at present condition.

Table 3.69. Generated Noise Level by the Access Road (dB)

Location	P1	P2	P3
2019	43.4	50.5	54.1
2025	54.2	61.3	64.9
2037	57.7	64.8	68.3

Simulation models are made has to consider of the structure that will be built on stage II, in order to forecast the accumulation of maximum impact to the overall activities.

Table 3.70. Predicted Noise Level by Summing up Present Baseline condition and the Generated Noise (dB)

Location		P1	P2	P3
Baseline		50.7	50.7	72
Year	2019	51.4	53.6	72.1
	2025	55.8	61.7	72.8
	2037	58.5	64.9	73.6
Standard	Housing and Settlements	55		
	Government and Public Facilities	60		
	Offices and Trade	65		
	Trade and Services	70		
	Industry	70		
	Sea port	70		

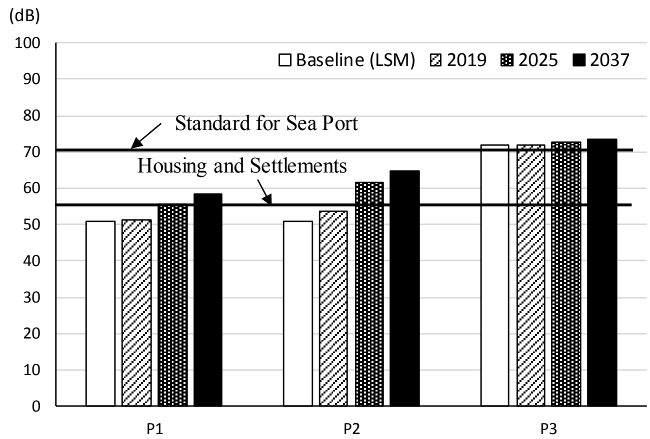


Figure 3.59. Predicted Ambient Air Quality at the Prediction Points

This impact is considered as **significant negative impact (-P)** based on the following considerations :

1. The number of people who will be affected

The number of people affected is people who stay around the access road which is the resident of District Pusakanagara. There area so many residents who live around the road, so this impact is categorized as **significant impact (P)**

2. The total area of the impact spread

The total area of the impact spread is covers resident settlements around the road, based on the administration there area covers five villages namely Pusakaratu, Gempol, Kalentambo, Kotasari and Patimban, District Pusakanagara. Therefore, it is predicted as a **significant impact (P)**

3. Intensity and Duration of the impact

The duration of the impact is longterm, so the impact of a increasing noise will occur continuously during that time. Based on the prediction results, the noise at P3 is still above the standard and at P1 and P2 will be above the standard after 2025. Therefore, the impact is predicted as a **significant impact (P).**

4. Many other environmental components affected

There are no other environmental components affected, so the impact is considered as **not-significant impact (TP).**

5. The nature of cumulative impacts

The impact of increasing noise is cumulative. For the effects of those predicted as **significant impact (P).**

6. Reversible or irreversible impact

The impact is reversible because once the emission of cars is reduced, the noise will be improved. So the impact is considered as **non significant impact (TP).**

3.3.5.3. Road Traffic Disruption

The number of traffic passing through the access road is predicted as Table 3.10. At the junction of the existing national road to be connected with the access road, one lane for each way is increased to be two lanes for each. Therefore, traffic congestion of the national road at the junction caused by connecting with the access road will be avoided. However, the load on traffic volume on the National load No.1 is assumed to be increased.

Table 3.71. Number of Vehicles Passing through the Access Road

Year	2019	2025
Number of Light Vehicles (/day)	227	2,710
Number of Heavy Trucks (/day)	2,271	27,104

From the table above, it is changed into smp per hour 1581 smp per hour (with assumption 24 hours operational and truck calibration 1,3), So traffic volumes with operational activity are in the following table :

Table 3.72. VCR Value in the Operational Phase

Time	Location	Existing (Year 2017)			Year 2025 Without Project				Year 2025 With Project			
		Volume (smp/hour)	Capacity	VCR Existing	Volume (smp/hour)	VCR	Service rate	Impact /Change from existing to operasional (%)	Volume (smp/hour)	VCR	Service rate	Impact /Change from existing to operasional (%)
Morning peak hour (07.00-08.00)	1	536	**1576**	0.34	628	0.40	C	17.17	2257	1.43	F	321.20
	2	827	**1576**	0.52	969	0.61	C	17.17	2598	1.65	F	214.12
Afternoon peak hour (12.00-13.00)	1	585	**1576**	0.37	685	0.43	B	17.17	2314	1.47	F	295.60
	2	779	**1576**	0.49	912	0.58	B	17.17	2541	1.61	F	226.41
Evening peak hour (16.00-17.00)	1	899	**1576**	0.57	1053	0.67	C	17.17	2682	1.70	F	198.45
	2	1083	**1576**	0.69	1269	0.80	C	17.17	2898	1.84	F	167.62
Night peak hour (18.00-19.00)	1	432	**1576**	0.27	507	0.32	B	17.17	2136	1.36	F	393.94
	2	642	**1576**	0.41	753	0.48	B	17.17	2382	1.51	F	270.77

Source : Survey and analysis, 2017

Description :

1. Jalan Pantura Pusakanagara arah Cirebon , 06º17.086’ S dan 107º52.533’ T
2. Jalan Pantura Pusakanagara arah Pamanukan , 06º17.080’ S dan 107º52.50’ T

Based on the table above, it will be occur significant extra traffic volume as big as 1581 smp per hour. In that condition, Pantura road service rate become F, it’s mean the flow that separated or jam, low speed, under capacity volume, long queue, and big obstruction occurance.

This following table present magnitude of public unrest estimation magnitude in the operation of access road:

Table 3.73. Analysis of Land Traffic Disruption Impact estimation in Operational Access Road

No	*Parameter*	*Without project*	*With project (2025)*	Magnitude impact
1	Amount of vehicle passing on access road	< 100 /day	Small vehicle/day: 2.710 Big vehicle/day:27.104	+ 2.610 + 27.104
2	Amount of vehicle passing on Pantura road	Evening peak hour (17.00-18.00) 1053smp/hour 1269smp/hour	Evening peak hour (17.00-18.00) 2682smp/jam 2898smp/jam	+1629
3	Service rate in Pantura Road	Service rate B and C	Service rate F	B/C to F

This impact is consider as **negative significant impact (-P)** based on :

1. **The Number of People Affected**

   The number of people affected are people and road users around Pantura Pusakanagara road that become operational channel. Many residents that live near to the road make this impact become **significant impact (P).**

2. **Impact Spread Area**

   Impact spread in the access road fork area with Pantura Pusakanagara road. So the impact is estimated as **significant impact (P).**

3. **Duration and Intensity of Impact**

   During operational phase at the peak hours (morning, afternoon, evening, and night). At those times will occure the increasing of traffic volume in the access road and Pantura Pusakanagara road from the operational activity of Patimban seaport. This traffic volume causes quite big impact intensity, such as speed decline in the fork of access road with Pantura Pusakanagara road which is originaly the vehicle can drive more than 30 km per hour, so it will decrease to less than 10 km per hour when in the fork of access road with Pantura Pusakanagara road. The decreasing of vehicle speed will affect to traffic disruption. Thus, the impact become **significant impact (P).**

4. **Other Component Affected**

   Other Component Affected adalah keresahan masyarakat, oleh karena itu dampak dinilai sebagai dampak **penting (P)**.

5. **Cummulative Nature of Impact**

   Impact of traffic generation is cummulative because it will continuously occur during Patimban seaport operation mainly in the morning hour (06.00-10.00) and evening hour 16.00-20.00), impact is categorized as **significant impact (P).**

6. **Reversible or Irreversible Impact**

   Impact is not reversible because vehicle volume will increase along with access road operation. So the impact is rated as significant impact.

3.3.5.4. Public Unrest

Type of activity that include in access road operation is road operation. Access road is planned starting to operate in 2019 to support materials mobilization to the port area. In the early operation period, access road trafic frequency is low, because it is located on the land acquisition area in the ricefield-line area. However, with the passing of population growth and development in the whole area, vehicle volume will be rise than before, which is estimated will induce road service quality.

Access road operational activity are predicted will cause the impact such as the decreasing of air quality, the increasing of noise level, increasing of water run off rate, land conversion, land traffic disruption, road damage and public unrest.

Public unrest that appears in the access road operation is derivative impact from land traffic disruption in the longterm. That impact is in accordance with quesioner distribution result to the people around Patimban seaport development location who feel worried, such as : 8 % respondents feel worried of traffic jam and 7 % respondents argue that it can cause reduction of their income because of disturbance of their activity in earn the living.

Data analysis method to calculate public unrest is done by comparing attitude/argument/negative perception as the result of public unrest to the occupation with positive perception to the occupation. Public unrest appear when %Urs is bigger than 100% as seen in this following formula:

$$\%Urs = \frac{Negative\ perception\ (disagree)}{Positive\ perception\ (agree)} * 100\%$$

%Urs = Restless percentage

P(+) = Positive perception to the activity

P(−) = Negative perception to the activity

Restless rate calculation based on that formula :

$$\%Urs = \frac{Negative\ perception\ (0{,}38)}{Positive\ perception\ (0{,}62)} * 100\% = 61{,}29\%$$

Based on that calculation, it can be conclude that Patimban seaport plan activity doesn't make significant public unrest. It is shown by Urs calculating result as many as 61,29% that smaller than 100%.

The following table shows magnitude of public unrest impact to the access road operational :

Table 3.74. Analysis of Public Unrest Impact Estimation in the Acces Road Operation

No	***Parameter***	***without project***	***With project***	**Magnitude of Impact**
1	Unrest Level	0%	61,29%	+ 61,29%

Seen from the impact of interest based on significant impact criteria, so the access road operational activity impact to the public unrest parameter can be considered as **negative significant impact (-P)** based on consideration :

1. **The Number of People Affected**
   People who feeling restless are people who live along Pantura National road and road user. So, public unrest it **significant impact (P).**
2. **Impact Spread Area**
   Impact will spread in access road area and crossroad with Pantura road, also surrounding settlement, so the impact is estimated as **significant impact (P).**
3. **Duration and Intensity of Impact**
   The impact of access road activities to the public unrest is predicted to persist for longterm, so the impact is predicted as **significant impact (P).**
4. **Other Component Affected**
   There are no other components are affected by public unrest, so the impact is considered to be **non significant impacts (TP).**
5. **Cummulative Nature of Impact**
   The public unrest impact does not accumulate. Because of that the impact is considered to be **non significant impact (TP).**
6. **Reversible or Irreversible Impact**
   The public unrest impact is reversible because of development of social process that occurs in the local resident. That development accordance with the people's understanding of environmental changes. So the impact is considered to be **non significant impacts. (TP).**

CHAPTER 4

SIGNIFICANT IMPACT EVALUATION

4.1. Study on Significant Impact

Evaluation of significant impacts which are obtained from result of hypothetic significant impact with the impact source. Various environmental components deemed to affect a significant impact (positive or negative), it was studied as a single entity related and influence each other, so that it can be seen how far the balance between positive and negative impacts.

To facilitate understanding of the impact from the project plan on the environment component, the significant impact as a results from impact assessment on chapter 3 presented on matrix as below (Table 4.1).

Based on the matrix, evaluation of significant impacts conducted holistically between component activities that cause impacts and affected environment parameters and the relation between the parameters affected by these critical.

The relation of major impact (primary) which cause the continued impact (secondary) and so on as a result from each activity is using a flow chart on the image below (Figure 4.1).

Table 4.1 List of Significant Impact from Predicted Impact Result

No	Environmental Aspect	Activity Component											
		Pre – Construction Phase	Construction Phase						Operational Phase				
		1	2	3	4	5	6	7	8	9	10	11	12
A	**Physic – Chemical**												
1	Decreasing of Air Quality (TSP and Exhaust Gas)			**-P**						-TP			-TP
2	Increasing of Noise Level			-TP									**-P**
3	Decreasing of Surface Water Quality												
B	**Hidrology**												
1	Increasing of Run Off Water						**-P**				-TP		
C	**Oceanography**												
1	Sedimentation									**-P**			
2	Change of Shoreline									**-P**			
3	Decreasing of Sea Water Quality				**-P**	**-P**						-TP	
D	**Space, Land, and Transportation**												
1	Land Conversion												
2	Land Traffic Disruption			**-P**									**-P**
3	Marine Traffic Disruption			**-P**									
4	Road Damage												
E	**Biology**												
1	Disturbance of Marine Life (Nekton and Benthos)				-TP	-TP						-TP	
2	Disturbance of Terrestrial Fauna (Bird)												
3	Disturbance of Terrestrial Flora												
F	**Social, Economic, and Culture**												
1	Opened Employment and Bussiness Opportunities		**+P**						**+P**				
2	Loss of Land Productivity	**-P**											
3	Change of Fishing Ground				**-P**					**-P**			
4	Loss of Livelihood and Income	**-P**											
5	Social Unrest	**-P**		**-P**	**-P**		**-P**			**-P**	-TP		**-P**
G	**Public Health**												
1	Incidence of Communicable Diseases												

Note

Pre – Construction Phase
1. Land Acquisition

Construction Phase
2. Mobilization of Workers and Operational Basecamp
3. Mobilization of Heavy Equipment and Material
4. Reclamation and Marine Facility Construction
5. Dredging and Disposal
6. Onshore Facility Construction
7. Access Road Construction

Operational Phase
8. Employment of Workers
9. Marine Facility Operational
10. Onshore Facility Operational
11. Maintenance of Basin and Shipping Line
12. Operational Access Road

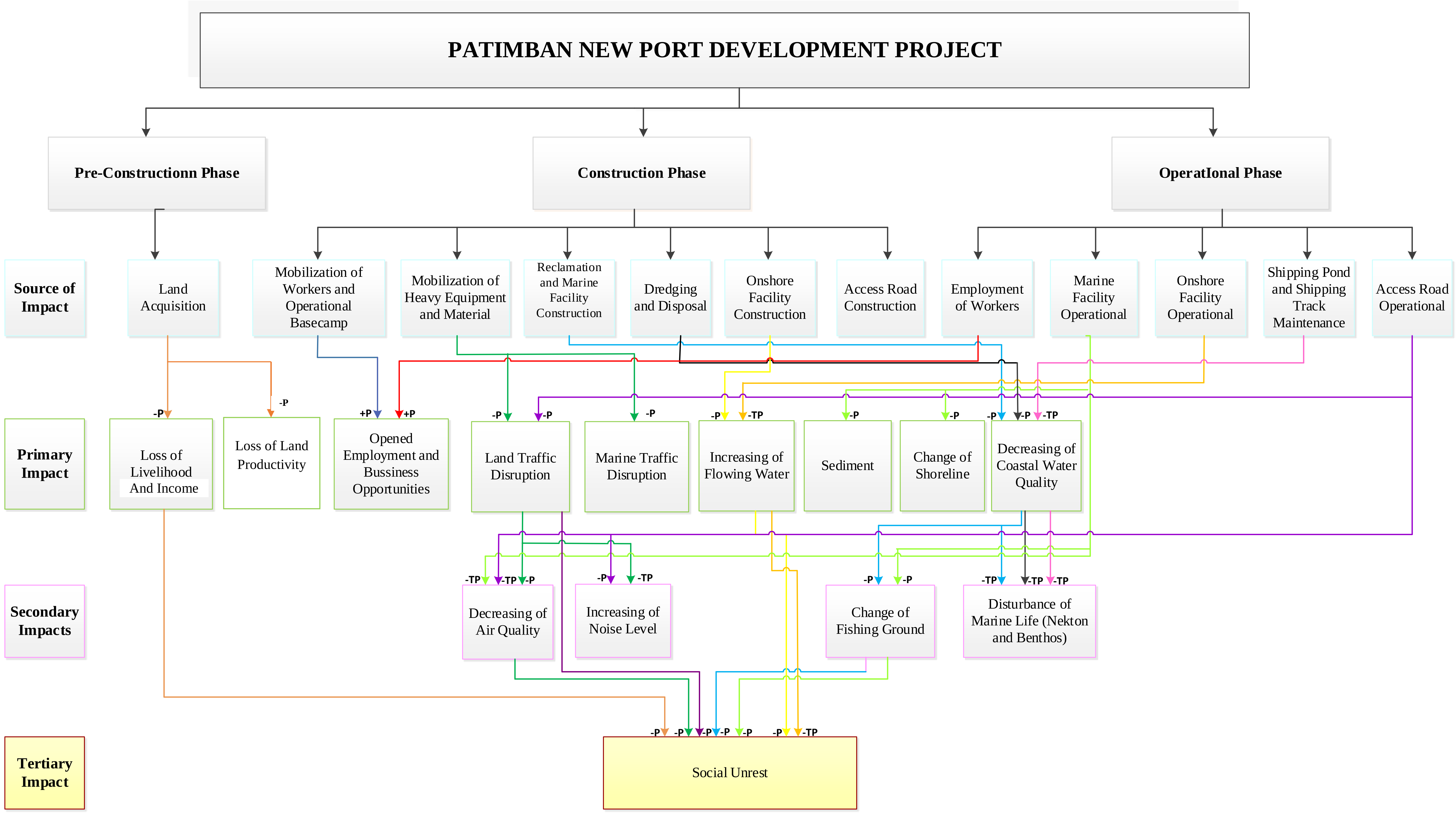


Figure 4.1. Flow Chart of Significant Impact

There is one activity cause significant impact in pre-construction phase, that is land acquisition. There are three significant impact on this phase, those are loss of livelihood, loss of land productivity and public unrest that are declared as negative significant impact.

There are five activities cause significant impact in construction phase, those are Procurement of Labor and Operation Basecamp (1 impact), Mobilization of Heavy Equipment and Materials (5 Impacts). Reclamation and Marine Facility Construction (4 Impacts), Dredging and Disposal (2 Impacts) and Onshore Facility Construction (2 Impacts).

There are **11 significant impact** in construction phase, those are 1 positive impact of job and bussiness opportunity in procurement of workers and operation basecamp, 1 negative impact of decreasing air quality, 1 negative impact of road traffic disruption, 1 negative impact of sea traffic disruption in mobilization of heavy equipment and materials, 1 negative impacts of increase of run-off in construction of onshore facilities, 2 negative impacts of decreasing of sea water quality in reclamation; dredging and disposal, 1 negative impact of fishing ground changes in reclamation and marine facility construction, and 3 negative impacts of public unrest as derivative impact from mobilization of heavy equipment and materials, reclamation and marine facilities construction, and onshore facilities construction. Beside that, there are **3 non significant impact** consist of 1 negative impact of increasing noise, 2 negative impact of marine life (nekton and benthos) disruption in reclamation; dredging and disposal.

There are 5 activities cause significant impact on operational phase, those are procurement of workers (1 impact), marine facility operational (5 impacts), onshore facility operational (2 impacts), maintenance of basin and access channel (2 impacts) and operation of access road (4 impacts).

There are **8 significant impact** in operational phase, those are 1 negative impact of increasing noise and 1 negative impact of road traffic disruption in operation of access road; 1 negative impact of sedimentation, 1 negative impact of coastline change and 1 negative impact of fishing ground changes in marine facility operational ; 2 negative impact of public unrest in marine facility operational and access road operational ; and also 1 positive impact of job and business opportunity in workers recruitment. Beside that there are **6 non significant impact,** those are 2 negative impact of decreasing air quality in marine facility operational and access road operational, 1 negative impact of increasing of run-off in operation of onshore facilities, 1 negative impact of decreasing sea water quality, and 1 negative impact of marine life (nekton and benthos) disruption in maintenance of basin and access channel, and 1 negative impact of public unrest in operation of onshore facilities.

The loss of livelihood impact for the people who depend on the land acquired an area of 356.23 ha is the important thing to be considered before and after the land acquisition process is done. Improper handling of the impact will lead to problems of public dissatisfaction and negative perceptions that could lead to public unrest.

Public unrest if there since the beginning of land acquisition will have implications for the next stage of development activities, especially the construction process of building the port itself. The impact that occurred at the stage of construction will accumulate to the impact of previously incurred and may continue in the next development phase.

Disruption to fishermen activities (fishing ground) due to the project plan will further burden the lives of fishermen around, beside that with the loss of livelihood for the people who depend on the land acquired, making the potential for public unrest will be higher.

Disruption to the fishing ground will also occur continue until the operational phase and it is irreversible, because one of fishing ground locations has change become an area of sea port facilities. So that, this impact will occur continously and strengthen the probability for public unrest that may occur.

But on the other hand, the project plan will also bring employment opportunities for local residents, estimated at more than 1,000 workers required for the implementation of the port construction, and 900 workers needed during the operation. This is the number of employment opportunities are very large and open for local residents to participate in accordance with the qualifications possessed.

Business opportunities that arise with the project plan is also a huge positive impact for the benefit of local people. Balancing the positive impact that occurs is expected to reduce the potential negative impacts. Appropriate management to reduce the impact and minimize the negative impacts that will occur is indispensable.

4.2 Study as Management Principal

4.2.1 Component of Environment and Sensitive Area

According to previous elucidation, it can be seen that Development of Patimban New Port Plan will decrease some environmental parameters, but other than that, it also will opening chance of job and bussiness opportunity. Based on the significant impact flow chart (figure 4.1) , it can be seen that derivative impacts that occur in many times so primary impact must be really noted and managed wisely, so the negative impact can be minimalized or overcome, while positive impact can be optimalized.

A. **The activities that most causing significant impact** is the activity in the construction phase, where there are 11 significant impacts. That construction activities is a mobilization heavy equipment and material that causes 4 significant impact there are decreasing of air quality, road traffic disruption, sea traffic disruption and public unrest.

   Activity components that is rated potentially to inflict impact from the biggest to the tiniest in the project location are :

   1. Mobilization of Heavy Equipment and materials in construction phase, that includes of activity of material transporter vehicle that can inflict negative significant impact in form of : decreasing of air quality ,road traffic disruption, sea traffic disruption, and public unrest (4 significant impacts).
   2. Operation Of Marine Facilities that inflict negative significant impact in form of: sedimentation, coastline changes, fishing ground changes and public unrest as result of fishing ground changes (4 significant impact)
   3. Reclamation and Construction of Marine Facilities (construction phase) that inflict negative significant impact in form of: decreasing of sea water quality, fishing ground changes and public unrest especially fishermen as result of fishing ground changes occurs (3 significant impacts).
   4. The land acquisition that inflict 3 significant impact those are loss of land productivity, loss of lovelihood and income, and public unrest (3 significant impact).
   5. Operation of access road that inflicts negative significant impact : increasing of noise, road traffic disruption and public unrest (3 significant impacts).
   6. Procurement of Labor in construction and operational phases that inflicts negative significant impact : Job and Bussiness Opportunity (2 positive impact)
   7. Construction Of Onshore Facilities that inflicts negative significant impact there is increasing of run-off and public unrest (2 significant impacts).
   8. Dredging and Disposal (construction phase) that inflict significant impact in form of decreasing of sea water quality (1 significant impact)

B. **Component of environment that the most inflicted by impacts** is social economy, and culture component, inflicted by 10 significant impact those are 6 negative significant impacts as public unrest in construction and operational phase, 2 positive significant impacts as job and bussiness opportunity, 2 negative significant impact of fishing ground changes, 1 negative significant impact as loss of livelihood and 1 negative significant impact as loss of land productivity at pre construction phase.

C. **The region that is the most inflicted by impact** is especially to residences that are brodering with Port Project and access road project which are covering 6 villages, those are Patimban village, Pusakaratu village, Kotasari village, Gempol village, and Kalentambo village, Pusakanagara District and also Pusakajaya Village, Pusakajaya District.

D. **Environment component and sensitive area** according to elucidation above as following :

   a. Public unrest formed, especially resident around project site
   b. Seawater quality in terminal area and port marine facility and around dumping site
   c. Patimban beach fishing ground areas that direct bordering with project site
   d. Noise and entrance and along the access road that direct bordering with residences
   e. Volume of run off in water channel receiver around project site
   f. Traffic generation and road damage in entrance access road to project site
   g. Livelihood of farmer and fishermen around project site
   h. Chance of working and entrepreneur at construction and operational phases for residence around project site

4.2.2. Direction as Environment Management

Impact that inflicted from development of patimban new port covers pre-construction, construction, and operational phase. In pre-construction and construction generally, impacts that are inflicted are temporary, while impacts of operational are long-term.

Direction as environment management as follow :

<u>Pre-Construction</u>

- ✓ Give alternative livelihood for ex-farmer, i.e prioritize in construction workers recruitment
- ✓ Accommodate public aspiration by doing discussion
- ✓ Develop a livelihood recovery program

Construction

- ✓ Prioritize local workers
- ✓ Cooperate with local government officer in recruitment
- ✓ Using decent transporter vehicle and heavy equipment
- ✓ Keep the cleanliness of the road that passed by near residence
- ✓ Prevention of increase of parameter content of TSS especially in seawater so it does not exceed the environment quality standard
- ✓ Place officer to arrange traffic in entrance access road
- ✓ Limit tonnage of transporter vehicle
- ✓ Repair damaged road

Operational

- ✓ Optimalize the managements of the impacts
- ✓ Optimalize local worker potential for operational of the port
- ✓ Cooperate with local government officer in recruitment
- ✓ Maintain the breakwater and revetment/seawall
- ✓ Coordination with head of TPI and other party the related to TPI about fishing ground
- ✓ Install the silt protection for restrict sediment spreading in sea water
- ✓ Place the officer to arrange the circulation of ship flow and ship parking
- ✓ Create wetland to replace previous wetland for avifauna new habitat
- ✓ Mangrove cultivation and many types of trees to the available land

4.3 Recommendations of Environmental Feasibility Assessment

1) Consideration of Spatial Plan

As mentioned before at chapter 1, Patimban Port has been appointed as National Strategic Project as in President Decree No. 47 year 2016 on Establishment of Patimban Port in Regency of Subang, West Java Province as National Strategic Project as stipulated in President Decree No. 3 Year 2016 on Acceleration of Implementation of National Strategic Project. According to recommendation letter from Ministry of Agricultural and Spatial / National Land Agency No. 40/200/1/2017, that the Patimban Port Development Plan has accommodated in Government Regulation Draft No. 26 Year 2008 about National Spatial. And also based on Surat Badan Litbang (Research and Development

Body Letter) of Ministry of Transportation Number UM.007/5/5-BLT-2016 dated August 30th 2016, Patimban Port has been Appointed as Main Port.

2) ***Consideration of Policy in Environmental Protection and Management and Natural Resources***

There is no policy in environmental protection and management that have been violated by the activities of the port Patimban.

3) ***The interests of Defense and Security***

Patimban port location is not included in the location that was used for defense and security interests.

4) ***Assessment of Magnitude and The Importance Of Impacts***

The assessmemt of magnitude and importance of impact from Patimban Port activities is already conducted at chapter 3. There are a lot significant impact identified. However, the magnitude and importance of impacts that occur can still be managed.

5) ***Holistic Evaluation***

Based on holistic evaluation is showed that the Patimban Port development activities generate a positive impact that is opening employment and business opportunities for around residents during the construction and operational stages, but there are also negative impacts. As described before, that there are direction as environment management for all impacts, where negative impacts can be minimized with the right implementation of the environmental management, while the positive impact can be improved to obtain the balance of the positive significant impacts with negative impact.

6) ***Initiator capability to overcome the impacts***

Initiator of the project is capable to implement management and monitoring of environment related to the development of Patimban New Port Plan and environment significant impacts that occur with entire approaches that have been mentioned in sub-chapter 4.2.

7) ***Plan of Business and/or activity that does not disrupt social values or people views (emic view)***

Patimban port is not a new thing for the people around, because at the existing location had previously been awakened causeway and trestle port Patimban as a feeder port. So the plan became the main port will not **disrupt social values or people views** that means for such perception is not new for the people around, because from the beginning of these locations have been planned as a place for the boat was docked, although not up to the operational stage. Nevertheless, the perception of the community was ready to support the plan.

8) ***Plan of Business and/or activity that does not disturb Ecological Entity***

   Same with things that have been explained in Environment Baseline in Chapter II, location of Patimban Port is bordering with paddy field and fishpond. In this area there are 5 species of birds that are protected, those are javan pond heron, Chinese egret, little egret, blue kingfisher, and olive-backed sunbird. But, land side development (back up area) Patimban Port in Phase I just only will constructed in < 3% from land which acquired, and also mangrove cultivation in beach area. Therefore, Patimban Port development can protected all of ecological in local concerned area.

9) ***Plan of Business and/or activity that does not disturption to activity around***

   Plan of activity will not disturb to activity near the project because it has been planned the management of impact that are possible occur, so disturbance that occurs, can be overcome. It is included with the Oil and Gas activities in the surrounding area shipping lanes, where this has been done in coordination with various stakeholders so that activity around that there will not be disturbed

10) ***The non-exceed the carrying capacity and contain capacity of environment***

    With environment management plan that will be applied, development of Patimban new Port is expected not to exceed carrying capacity and contain capacity. Although until now the assessment of carrying capacity and contain capacity of port location is still unknown.

Based on those ten criteria of environment feasibility above and considering negative significant impact that are inflicted, still can be managed technologically by technical engineering, and objectives of this project is for national strategic project so the project plan is **feasible environmentally**.