



### 3. Preliminary Design and Cost Estimate of Case Study Facilities

#### 3.1. Preliminary Design of Port Facilities

##### A. Present Conditions of the planned area

**539.** Subsequently after the JICA study was completed in 2003, IPC2 during 2004 to 2007 constructed a cargo berth of 102m in length, 30 m in width and 16m in depth, supported by steel pipe pile foundation on the same alignment of the berth face line as planned originally for the container berth by the JICA Study 2003. IPC2 plans to expand the berth length of 200m to 300m in total and to start the construction works from May, 2009. Large excavation works of stone quarry are being executed from the hills and slope of the mountain located around the new port hinterland area.

**540.** The port area along the sand beach area is used for anchorage of a barge 6000 to 8000 DWT to load stone quarry. The access road around the new port area is not rehabilitated yet by the reinforced concrete pavement.

**541.** The development of the new port at Bojonegara for the international container handling terminal as the case study for which facilities are planned and designed based on the design criteria as below requires the following construction works.

##### B. Design Criteria

**542.** The design criteria of marine and civil works conform to the following design standards and reference:

- Indonesian Standard PBI (Peraturan Beton Indonesia 90-91) 80, Indonesian Concrete Design;
- Standard National Indonesia 1991-63 Design Standards of Concrete Structure;
- Standards Design Criteria for Ports in Indonesia, 1984;
- Technical Standards and Commentaries for Port and Harbor Facilities in Japan, 2002;
- Indonesia Highway Capacity Manual in 1997 Ministry of Highways and Public Works.

##### (i) Design container ships

**543.** The dimensions of the ships used for the design of new port facilities are summarized in the table below taken from the JICA Study 2003.

**Table 3.1-1 Objective Ship Size of the Project Ports for 2025**

Project Port	Type of Vessel	DWT	LOA (m)	Draught (m)
New Bojonegara Port	Container ship International	50,000 GT	270	12.7



(ii) **Natural Conditions for Preliminary Design of Project Facilities**

a) **Tide, Current Wave Conditions**

	Bojonegara Port
<b>Tide (cm)<sup>1</sup></b>	
High Water Level (HWL)	+103.0
Mean Sea Level (MSL)	+58.00
Design Low Tide Level (DLT)	0.0
<b>Current (m/sec)<sup>2</sup></b>	
Maximum velocity	0.50
<b>Wave at Berth,</b>	
Significant Wave Height $H_{1/3}$ (m)	0.50
Significant Wave Period $T_{1/3}$	Less than 2 sec
<b>Wave at Breakwater</b>	
Significant Wave Height $H_{1/3}$ (m)	2.0 to 2.5
Significant Wave Period $T_{1/3}$	Around 4 sec

b) **Design Wind**

544. Design Wind is applied as same condition as described in Table 6.3-1 in Chapter II.

c) **Soil Conditions at Bojonegara Area**

545. According to the geotechnical investigation in the new Bojonegara port area, the following parameters are used for the preliminary design for the new Bojonegara port facilities.

<u>Deep Area</u>		<u>Shallow Area</u>	
-10.0 m	Sandy clay N = around 10 or more	0 m	Silty clay N= 1-3
-15.0 m	Sand clay N = around 10-28 $c = 30 \text{ kPa}, \phi = 25^\circ, \gamma' = 0.9 \text{ tf/m}^3$	-5 m	Silty Clay, N = 12 on average $c = 30 \text{ kPa}, \phi = 25^\circ, \gamma' = 0.9 \text{ tf/m}^3$
-20.0 m	Bedrock and Clay (Dense to very dense) N = more than 50 $c = 0 \text{ kPa}, \phi = 35^\circ, \gamma' = 1.0 \text{ tf/m}^3$	-10 m	Gravel and Bedrock N = around 30 and more than 50 $c = 0 \text{ kPa}, \phi = 35^\circ, \gamma' = 1.0 \text{ tf/m}^3$

(iii) **Design Conditions of Berthing Structure**

a) **Crown height**

546. The crown height of the berth is normally determined by the following formula:

$$H = \text{HWL} + (1.0 \text{ to } 2.0 \text{ m});$$

(large vessel with a water depth of 4.5 m or more and tidal range smaller than 3.0m)

$$H = \text{HWL} + (0.5 \text{ to } 1.5 \text{ m});$$

(small vessel with a water depth less than 4.5 m and tidal range smaller than 3.0m)



**547.** The crown height affects greatly the construction cost of the port. As a preliminary design of the container wharf structure at Bojonegara new port, the crown height is fixed at 3.5m above MLLW considering the ship size and required efficiency of cargo handling operation.

$$\text{HWL} + 2.0 \text{ m} + H_{1/3} = \text{DL} + 3.5 \text{ m}$$

**b) Surcharge Loads on the Wharf; 2.5 t/m<sup>2</sup>**

**548.** On the apron of the berths of the port, the following surcharge is considered as a dead load by assuming temporary stack of containers;

- Normal condition: 2.5 tf/m<sup>2</sup>
- Seismic Condition: 1.0 tf/m<sup>2</sup>. (50% of the normal condition)

**c) Seismic Coefficient**

**549.** The seismic coefficient for the proposed port facility and access road structure are computed by applying the following factors:

- The West Java Province is located in the zone 3 of the regional seismic coefficient under stiff soil,  $C = 0.05$
- Stiffness Factor of structures;  $K = 1.0$
- Importance Factor;  $I = 1.5$
- $K_h = K \times C \times I = 1.0 \times 0.05 \times 1.5$
- $= 0.075$  (for the Bojonegara and Tg. Priok port facility)
- $K_v = \text{not considered} = 0$

**550.** It is therefore recommended to adopt 0.1 for  $K_h$  for the Bojonegara port facilities.

**d) Wheel Load as live loads by gantry crane**

**Live Loads**

**551.** Quay wall structures of container berth are designed to sustain the following container cranes with the provisions of their foundation:

- Rail Gauge : 30 m
- Overall Weight : approximately 750 tf/unit;
- Nominal rated capacity: 41 tf under spreader.

**552.** In the design of the apron, only trailer trucks and standard trucks with full loaded containers are considered as handling equipment and the following wheel loads are considered:

- Standard Truck (H22 - 44) : 8.0 tf/wheel
- Tractor Trailer (40') : 5.8 tf/wheel



**Table 3.1-2 Loading Conditions of the Container Wharf at Bojonegara New Port**

Uniform Distributed Load	2.50 t/m <sup>2</sup> (without QGC)
Uniform Distributed Load	1.35 t/m <sup>2</sup> (with QGC)
The worst possible combination of live Load generated by cargo handling equipment and transporting equipment	Loads of equipment is shown in Table 10-H-15 of the JICA Study 2003 (Impact factor shall be considered)
Gantry Crane Load	50.0 trated load x 30 span x 36 to 38 m outreach

**e) Tractive Force and Berthing Force**

**Mooring**

**553.** Tractive force acting on mooring bitts is set at 100 tf per unit for the vessels from 10,000 to 50,000 DWT which are spaced at 35 m.

**Fender System**

**554.** For design of the fender system to absorb the shock of ship berthing energy, berthing speed of vessels to be adopted is as follows:

- 10,000 ~ 20,000 DWT    0.15 m/sec.
- 20,000 ~ 50,000 DWT    0.10 m/sec

**(iv) Design of Yard and Pavement**

**555.** Based on the operation planning inside the container terminal of the new Bojonegara port and selection of the pavement type to be adopted, the following wheel loads are the critical condition for each type and area of the pavements, on which the design will be conducted:

**556.** Special provision of pre-stressed concrete block slab pavement is adopted for the track of rubber transfer cranes (RTG), whose wheel loads exceed well enough 40 tf/wheel.

**557.** The pavement of the parking lots on the reclaimed land for container terminal and logistic area will be by interlocking concrete blocks.

**Table 3.1-3 Critical Wheel Load for Pavement Design**

Area Particulars	Access / Service Road	Container Terminal Area		Stock Yard		Passage Area	
		Berth / Apron	Road way	RTG passage way	Stock yard	Passage way	Yard Area
Critical Wheel Load Type	Standard Truck (H20-44)	Standard Truck (H20-44)	Forklift Truck (25 tf)	RTG (40ft)	Reach stacker (4.5 tf)	Standard Truck (H20-44)	Forklift Truck (25 tf)
Critical Wheel Load (ton)	8.0	8.0	12.8	40	8.1	8.0	12.8
Pavement Type	Concrete	Concrete	Concrete	PC slab	Inter-lock block	Concrete	Concrete

PC slab: pre-stressed concrete block slab



### 3.2. Major Facilities Design

#### A. Breakwater: 1,500 m

558. The breakwater is required to obtain sufficient calmness for container handling under the wave height over 50 cm during the rough weather season. According to the study of calmness of the basin and channel by the JICA study, the required length of the breakwater is estimated at 1,500 m.

559. The breakwater is planned to form an entrance channel from the north direction and to extend in parallel to the future container terminal development. The breakwater will be extended in line with the expansion of the container terminal by phased development.

560. The typical cross-section is shown in Figure 3.2-1. The total volume of materials for the breakwater is calculated 615,000 m<sup>3</sup> (including void volume). It is expected to take about 3-year's construction period for the breakwater.

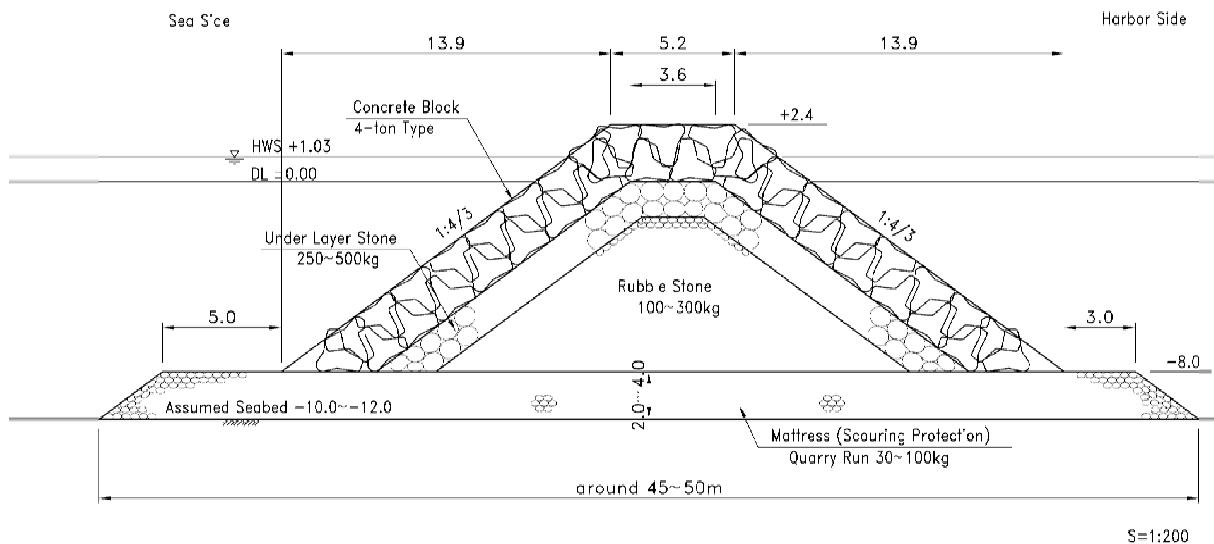


Figure 3.2-1 Typical Cross Section of Bojonegara Breakwater (Rubble Mound Sloping Type)

#### B. Channel and Basin

561. Based on the revised alignment of the channel and location of the breakwater, the required volume is estimated at 5,400,000 m<sup>3</sup>.

562. According to the Bojonegara Port Project Office of IPC2 in Cilegon, 400,000 m<sup>3</sup> of seabed soil has been dredged in front of the existing quay facility (102 m long) in 2004 - 2005. And further dredging volume (2,000,000 m<sup>3</sup>) is planned in the water area in front of the quay extension work (200 m long extension to the existing quay) which has been contracted already in March 2009.

563. Hence, total dredging volume of 2,400,000 m<sup>3</sup> is deducted from the above estimate (5,400,000 m<sup>3</sup>), and the design volume of dredging is consequently calculated as 3,000,000 m<sup>3</sup>.



**564.** Basin in front of the planned container berth will be designed to dredge 540 m in diameter circular and depth up to -14m and turning basin in front of the multi-purpose berth will be designed to dredge 300 m dia circular and depth up to 10m.

**565.** The dredging works in front of the new jetty construction by IPC2 were carried out by using grab dredgers for removal of weather rock and alluvium material. The efficiency of dredging works by grab dredger was almost same monthly output as estimated for the JICA Study 2003. Therefore the dredging works are planned to be carried out by using grab dredgers.

**C. Container Terminal**

**a) Quay Wall**

- Design depth DL-14 m, length 600 m by Caisson; L: 20 m x W: 13.5 m x D: 15.5 m structure.

**566.** Considering the soil conditions and gentle slope of seabed topography, two alternatives types of berth foundation i.e. Caisson type and Steel Pipe Sheet Pile (SPSP) type are compared. Based on experiences in construction works of the berth designed by steel pile support, the SSP type requires a lot of time for pile driving and also driving anchor pile through the main steel pile to obtain the required bearing strength.

**567.** The process of pile driving begun with the removal of existing surface soil up to depth of -10 to -12 m. The main steel piles (dia 900 mm) were driven up to depth of - 21.7m, then anchor piles from the tip of the driven steel piles were driven up to -35m through the hard rock layer.

**568.** Based on experience with pile support berth structure by IPC2, the caisson type foundation as proposed in the JICA Study 2003 is adopted for the case study. Reference is made to Figure 3.2-2 for typical cross-section of the quay wall.

**569.** A month is assumed to be required for each step of caisson fabrication and installation.

**b) Quay Crane Foundation for Container Berth**

**570.** The rear container crane rail foundation piles are installed at 30 m span for the crane wheel gauge from the sea side foundation piles separately from caisson foundation for crane installation.

**c) On land Excavation**

- 2,500,000 m<sup>3</sup> area from Tanjung Awuran, and access road area of 60 m wide.

**d) Revetment (West end / East End) for the reclamation of the yard area**

- L=300 m.

**571.** The revetment wall is designed by Gravity Type (Concrete Block wall is placed on the stone mound from the shore to depth of-8 m).

**572.** Since the planned revetment is not used for berthing purpose by large vessels and considering the soil conditions of the revetment foundation on the sea bed, type of structure of the revetment is designed to be concrete blocks. Typical cross sections of the revetment are presented in Figure 3.2-3.

**e) Reclamation**

- 575,000 m<sup>3</sup> up to the formation level DL+3.5 m.



**f) Yard Pavement**

- 208,000 m<sup>2</sup> assuming 15 lanes x 23.5 m x (16 Bays + 17 Bays)

**g) Passage Pavement**

- 152,000 m<sup>2</sup>

**573.** The surface of the reclaimed area for container storage yard will be paved with interlock concrete block on the cemented treated sand fill. The runway of rubber tired gantry cranes and container trucks in the container stock yard area are paved with pre stress concrete blocks. The port road area is paved with concrete.

**h) Utility Facilities**

**574.** Power-supply, water-supply, communication, storm drainage and so on are considered as the utility facilities of the container terminal

**D. Buildings**

**575.** The following buildings and their dimensions are planned to be functioned the container terminal normally.

- Office Building: 3,500 m<sup>2</sup>
- Maintenance and Repair Shop; 2,800 m<sup>2</sup>, out of which for Equipment: plan to have 2,300 m<sup>2</sup> and; for container boxes having 500 m<sup>2</sup>
- Terminal Gate 2,700 m<sup>2</sup>
- Fuel Station 420 m<sup>2</sup>
- Miscellaneous 440 m<sup>2</sup>

**E. Port Related Area**

**576.** Port Related Area west of the container terminals are designed as follows:

- Revetment: Design depth DL-10m, length 180 m constructed by Gravity Type (Concrete Block) for retaining wall
- Reclamation (from the existing sea bed to +3.0 m) estimated volume will be 151,200 m<sup>3</sup> Average elevation of the planned yard = +1.5 m
- Wave-absorbing Work; 40,000 m<sup>3</sup> Rubble-stone Work is planned in front of the revetment walls of the Logistics area and container berth as wave absorbed facilities ;
- Yard Pavement 75,600 m<sup>2</sup> Area is 180 m x 420 m
- Container Freight Station; Floor area: 6,400 m<sup>2</sup>
- Utility Facilities

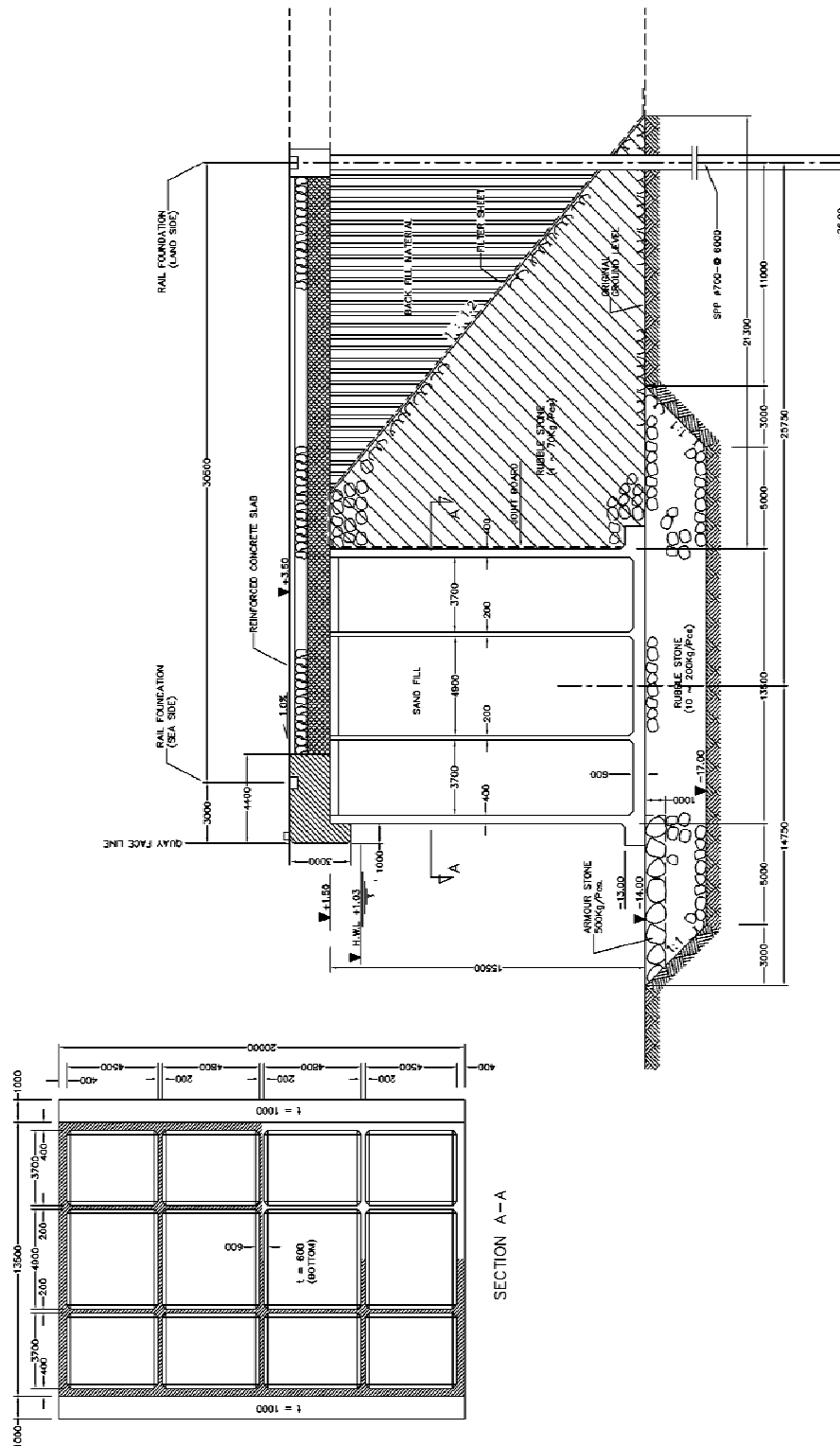
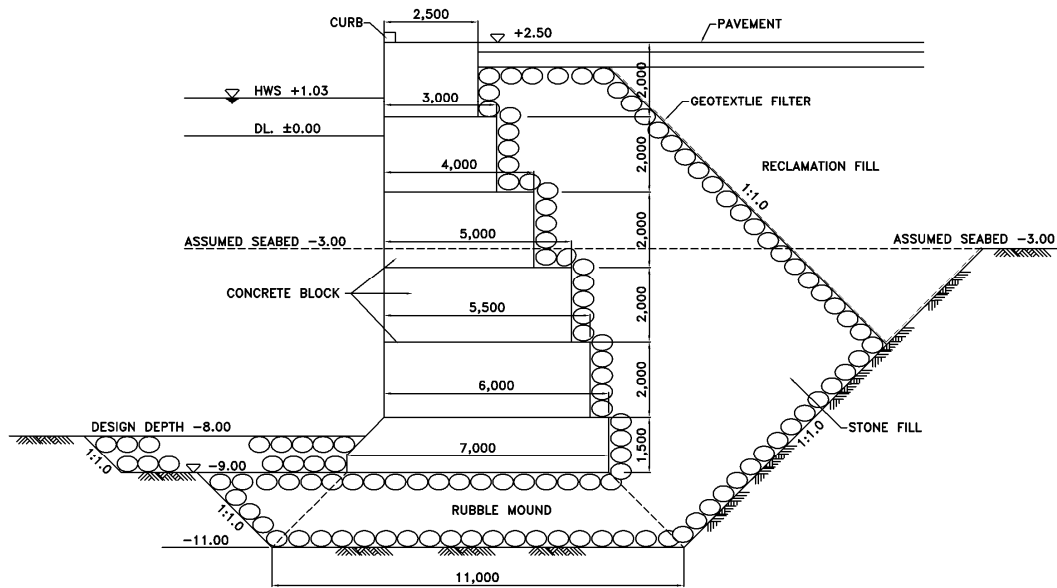
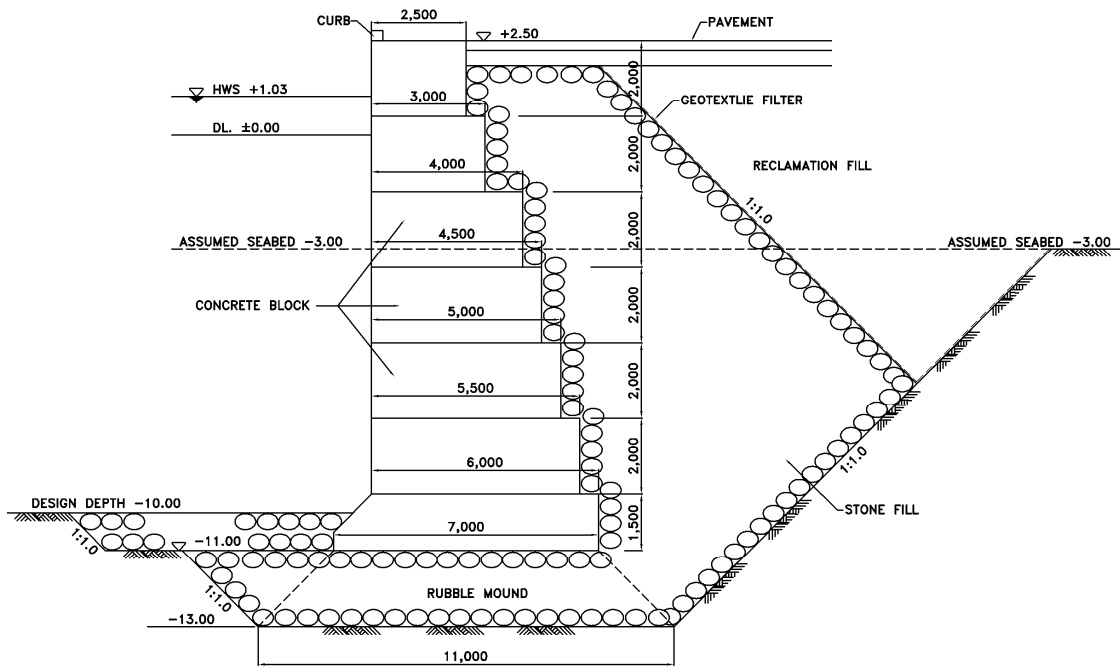


Figure 3.2-2 Typical Cross Section of Quay Wall (Bojonegara, Caisson Type, -14 m)





(Design Depth: -8 m)



(Design Depth: -10 m)

Figure 3.2-3 Typical Cross Sections of Revetment at Bojonegara (Concrete Block Type)

### 3.3. Preliminary Design of Access Road

577. At present the existing road is a provincial road. The provincial government of Banten proposed to the central government that the existing arterial road be upgraded to a national road. The access road will be planned by using the existing Provincial Road to the maximum extend possible,



therefore construction activities will include widening, paving and short-cutting in order that large container vehicles can move smoothly.

**578.** A new alignment of the access road should be studied by widening the existing access road and by minimizing the round-about way of the residential and factories areas.

**579.** The access road will be developed by improving the existing arterial road as follows:

- A 2-lane upgraded arterial road would be adequate for the local and port traffic until 2016.
- After 2016, widening to 4 lanes would be required.

**580.** The design criteria of civil works and access road should conform to the following design standards and reference:

- Indonesian Standard PBI (Peraturan Beton Indonesia 90-91) 80, Indonesian Concrete Design;
- Standard National Indonesia 1991-63 Design Standards of Concrete Structure;
- Indonesia Highway Capacity Manual in 1997 Ministry of Highways and Public Works.

**581.** The typical cross-section for the planned access road as a new road is shown in Figure 3.3-1. It is planned to provide the 2-lane access road for the short-term development plan. In order to facilitate future widening a 50m ROW is required. Such widening would utilize the median. The outside shoulder would be wide enough to accommodate immobilized vehicles without blocking the traffic lanes.

**582.** The pavement will be designed for 10-ton axle loads as recommended by the Heavy Loaded Road Improvement Program (HLRIP). The pavement structure is assumed to be similar to that used for Jakarta Inter Urban Toll way as follows:

- Asphalt Cement wearing course: 50 mm
- Asphalt Cement binder course: 100 mm
- Asphalt treated base: 350 mm
- Granular sub-base: 400 mm
- Select material for top of sub grade.

**583.** Grade-separated structures will be ultimately required where the new access road intersects the Jakarta-Merak Toll way and all river and road crossing. However the optimum number of grade-separations should be considered, especially at the road crossing in the early stages of the development when traffic is not heavy, which could minimize the initial investment cost. The typical overpass structures will be constructed with PC-I Girder Bridge. Alternative steel design should be considered for major river crossings.

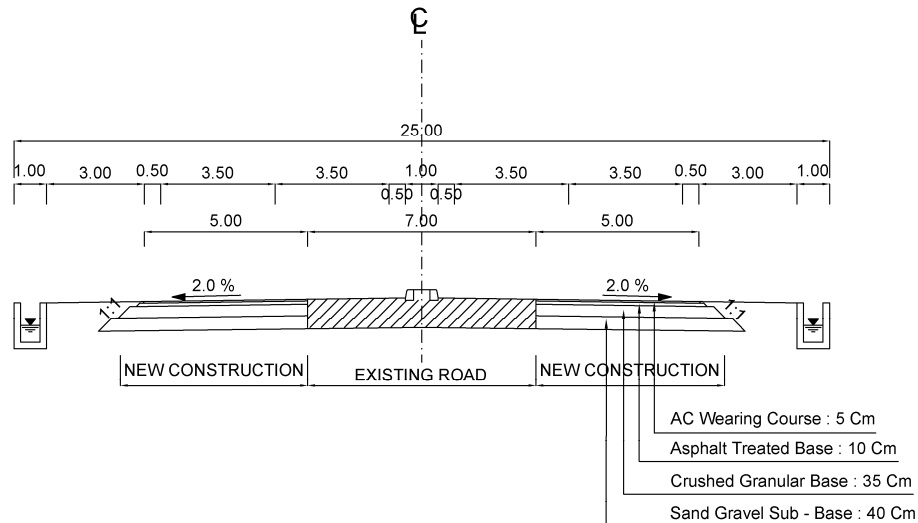


Figure 3.3-1 Typical Cross Section of Access Road to Bojonegara New Port

### 3.4. Cost Estimate of Port Facilities

#### A. Cost Hearings and Collection of Information

584. The development project of Bojonegara New Port was studied in the previous JICA Study 2003 in 2002 - 2003, and the cost estimate for the construction of the port and procurement has been carried out already.

585. The basic prices for cost estimate (unit prices of Construction Labor, Material and Equipment) have experienced big changes since the previous JICA Study 2003, and a 100-m quay wall construction was carried out at the project site of Bojonegara Port in 2004 - 2005.

586. In order to revise the cost estimate of the port construction, information collection and hearings were carried out by visiting the project offices of IPC2 in Cilegon and the contractor company of the quay wall at the Bojonegara site. The project offices visited by the Study Team were as follows.

- IPC2, Bojonegara Port Project Office, Cilegon, Banten Province
- PT Pembangunan Perumahan (PT PP), Marketing Division, Head Office, Jakarta

587. The information collected through those hearings was used to verify the estimated prices and the condition of the construction works based on the actual experience at the Bojonegara site.

#### B. Unit Prices of Cost Estimate

588. Unit prices of each element of construction works such as labor, construction material and construction equipment are determined on the basis of the information collected from the major local construction companies in Jakarta obtained in the field study (March 2009).

589. The basic wages of construction laborers and unit prices of construction materials are common with the prices of West Java Area which are already presented in Table 6.4-1 and Table 6.4-2 in Chapter II



**590.** Each unit price was split into foreign currency and local currency portions, both indicated in Rupiah, estimated in the following classifications;

- The foreign currency component consists of:
  - Imported construction materials
  - Foreign components of depreciation and operation/maintenance cost for construction equipment and plant
  - Foreign component of domestic materials
  - Salaries and costs of foreign personnel
- The local currency component consists of:
  - Local construction materials
  - Local components of depreciation and operation /maintenance cost for construction equipment and plant
  - Salaries and costs of local personnel
  - Import duty on imported materials
  - Indonesian taxes

**591.** The basic prices are as of April 2009 and the foreign exchange rate is given as follows considering the current trend in the market as of March and April 2009. Reference is made to Figure 6.4-1 in Chapter II for the fluctuation of the exchange rate between the Indonesia Rupiah and US Dollar

$$1 \text{ USD} = 11,000 \text{ Rupiah} = 100 \text{ Yen}$$

**C. Basic Cost of Construction Works**

**(i) Combined Cost for Major Works**

**592.** The breakdown of unit costs of the construction works are prepared by accumulating costs of labor, materials, equipment and also the indirect costs such as mobilization, general temporary works, overheads profit and so on.

**593.** While the cost of the works such as building works, fabrication of cargo handling equipment, supply of utilities and demolition works are hindcasted on the basis of the empirical prices collected from the major contractors which have experience in the fields.

**594.** Price of imported products such as cargo handling equipment, fender systems, bollard and navigation aids are to be estimated based on the CIF Jakarta price and adjusted considering import tax and some mobilization fee to the construction site.

**595.** The combined costs for major construction works are estimated from the costs of labor, required materials, required construction equipment, and the site expense of labor and equipment. Table 3.4-1 presents the combined cost of major work items for the development of Bojonegara New Port, Banten Province.



**Table 3.4-1 Combined Cost for Major Construction Works (Bojonegara)**

Work Item	Description	Unit	Unit Price
Breakwater	Rubble-mound type; DL-12 m	m	199.0 million Rp
Quay Wall	Caisson type; design depth DL-14 m	m	312.8 million Rp
Revetment	Gravity type; design depth DL-8 ~ -10 m	m <sup>2</sup>	139.3 million Rp
Dredging (Soft soil)	SPT-N< 15; Grab dredging	m <sup>3</sup>	56,000 Rp (5.09 USD)
Dredging (Medium)	15 < N < 40; Grab dredging	m <sup>3</sup>	100,200 Rp (9.11 USD)
Dredging (Hard Rock)	N > 40	m <sup>3</sup>	500,000 Rp (45.45 USD)
Buildings	Container Terminal	m <sup>2</sup>	200 ~ 500 USD
Port Access Road	At-grade Road with compensation	m	13.5 million Rp
Land Acquisition		m <sup>2</sup>	250,000 Rp

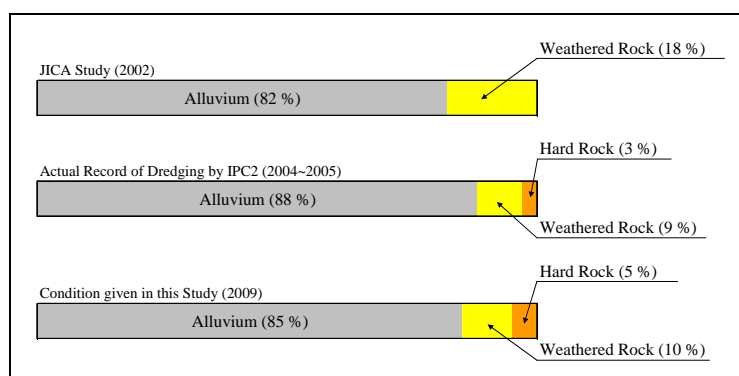
**596.** Particular local conditions were taken into consideration for the cost estimate of the work items reported in the following sub-sections.

**(ii) Dredging at Bojonegara**

**597.** A seismic survey for sub-seabed stratigraphy of the Bojonegara port development site was carried out in the JICA Study 2003. And based on the results of the survey and offshore boring surveys at the development site, the sub-seabed materials were classified into the two categories in accordance with working performance assuming the method of Grab Dredging. Reference is made to Table 3.4-2 and Table 3.4-1(Top).

**Table 3.4-2 Component of Dredging Materials conducted by JICA Study 2003**

Classification of Sub-seabed Material	Alluvium	Weathered Rock
Ratio of Dredging Volume by Material	82 %	18 %
Production per day	6,750 m <sup>3</sup> /day	1,290 m <sup>3</sup> /day



**Figure 3.4-1 Component of Dredging Materials at Bojonegara Site**

**598.** According to the hearing at the Project Office of IPC2, a 400,000m<sup>3</sup> dredging work of the seabed was actually carried out at the Bojonegara site accompanying the quay wall construction in 2004 - 2005, where the grab dredger encountered a layer of hard rock which was necessitated blasting. The firmness, volume of the seabed materials, and the productivity of dredging was advised as follows by the engineers from IPC2 and the contractor (PT PP). Reference is made to Table 3.4-1(Middle) and Table 3.4-3.



**Table 3.4-3 Component of Dredging Materials conducted by IPC2**

Classification of Material	Alluvium	Medium Soil (Weathered Rock)	Hard Rock
Firmness	SPT-N < 15	15 < N < 40	N > 40
Ratio of Volume by Material	88 %	around 9 %	2.5 ~ 3 %
Production per day	6,000~7,000 m <sup>3</sup> /day	around 2,000 m <sup>3</sup> /day	200 m <sup>3</sup> /day with blasting

**599.** Based on the actual dredging records and the experience at the Bojonegara site, the component ratio of the seabed materials is given in Table 3.4-1(Bottom). The unit prices of the dredging are estimated in accordance with the dredging productivity of each component of the seabed material assuming grab dredging with blasting as presented in Table 3.4-4Table 3.4-4. Total work period of 30 months (2.5 years) is required for the dredging work of 3 million m<sup>3</sup>.

**Table 3.4-4 Productivity and Duration of Dredging Works (Bojonegara)**

Classification of Material	Alluvium	Medium Soil (Weathered Rock)	Hard Rock
Firmness	SPT-N < 15	15 < N < 40	N > 40
Ratio of Volume by Material	85%	10 %	5 %
Production per month (28 days)	6,750 m <sup>3</sup> /month	98,000 m <sup>3</sup> /month	5,600 m <sup>3</sup> /month with blasting
Design Volume	2,550,000 m <sup>3</sup>	300,000 m <sup>3</sup>	150,000 m <sup>3</sup>
Duration of Dredging Work	13.5 months	3.1 months	13.4 months by deployment 2 teams
Total Work Period	<b>30 months</b> for Total 3,000,000 m <sup>3</sup>		

**(iii) Container Handling Equipment**

**600.** The prices of the container handling equipment for the Bojonegara New Port are given as follows based on the survey of the recent market prices.

**Table 3.4-5 Unit Prices of Container Handling Equipment**

		Unit Price (USD)
Quay Gantry Crane	per unit	8.0 million
Rubber-tired Gantry Crane	per unit	1.9 million
Side Lifter for empty container handling	per unit	0.4 million
Tractor / Chassis	per set	0.2 million

**(iv) Siltation and Maintenance Dredging**

**a) Seabed condition at the Bojonegara site**

**601.** The distribution of the sediment materials at the seabed surface is understood from the soil investigation surveys and geological profile of the Bojonegara site in the JICA Study 2003. Reference is made to Pp. B-50 - B-55, Appendix B: Natural Conditions Survey, Supporting Report of Engineering Study, December 2003.

**602.** According to the study results, the seabed surface is covered by silt or clay where the points are located in the water area sheltered by the two islands (Pulau Kali) in front of the port development



site. On the other hand, the seabed consists of sand, gravel or coral where the points are located out of the sheltered area and exposed to the wave action.

**603.** Siltation will be sure to take place in the calm water area (channel and harbor basin; around 100 ha) sheltered by the breakwater of Bojonegara new port. However, the rate of siltation has not been studied

**b) Siltation study in Tanjung Priok**

**604.** The Supporting Report of the JICA Study 2003 provides the information on the seabed changes in the harbor basins (Kolam Pelabuhan I, II and III) of Tg. Priok. Reference is made to Pp. B-37 - B-39, Supporting Report of Engineering Study, December 2003.

**605.** According to the study results, the yearly changes of the seabed in the sheltered harbor basins are given as 0.12 ~ 0.18 m. The rate of siltation in the channel and basin of Bojonegara New Port (100 ha) is assumed as 0.2 m/year based on the record at Tg. Priok port. Hence, the annual volume of the siltation is calculated;  $0.2 \text{ m/year} \times 100 \text{ ha} = 200,000 \text{ m}^3/\text{year}$ .

**c) Cost of Maintenance Dredging**

**606.** The record of maintenance dredging and the cost are summarized as follows according to the JICA Study 2003. The cost of maintenance dredging in the following table is based on the contract between IPC2 and PT RUKINDO.

**Table 3.4-6 Cost of Maintenance Dredging at Tg. Priok Port**

Year	Volume of Maintenance Dredging (m <sup>3</sup> )	Cost of Dredging (1,000 Rp)	Unit Rate of Dredging (Rp/m <sup>3</sup> )	Remarks
1996	458,314	1,933,565.3	4,219	
1997	367,938	1,802,623.6	4,899	Economic Crisis
1998	147,418	1,302,602.0	8,836	Average 1998 - 2001 <b>12,241 Rp/m<sup>3</sup></b>
1999	95,157	1,875,154.0	19,706	
2000	646,057	5,627,728.0	8,704	
2001	538,955	6,315,369.0	11,718	

Source: Pp. B-35, Appendix B: Natural Conditions Survey,  
Supporting Report of Engineering Study, December 2003

**607.** Assuming that maintenance dredging at Bojonegara new port is carried out by PT RUKINDO, same as with Tg. Priok port; the unit rate of dredging is given as 12,500 Rp/m<sup>3</sup> for Bojonegara.

**608.** Hence, the cost of maintenance dredging at Bojonegara New Port can be estimated as follows;  $12,500 \text{ Rp/m}^3 \times 200,000 \text{ m}^3/\text{year} = 2.5 \text{ billion Rp/year}$ .

**609.** This value is equivalent to 1 % of the cost for capital dredging (3,000,000 m<sup>3</sup>) of the channel and basin at Bojonegara new port.

**(v) Port Access Road**

**610.** Cost estimate for construction of the Port Access Road (Cilegon ~ Bojonegara) was carried out referring to the estimate by the Ministry of PU (Pekerjaan Umum) in the report; Pekerjaan Penyusunan Studi Kelayakan dan Desain Tender Investasi Jalan Tol; Ruas Cilegon - Bojonegara, Januari 2006.



**611.** In the PU report, the dimensions of the port access road construction had been planned as follows:

- |  |                                    |
|--|------------------------------------|
| ➤ Length of construction division:           | 15.69 km                           |
| ➤ Right of Way (RoW):                        | 60 m                               |
| ➤ Total Land requirement:                    | 110 ha (1,101,363 m <sup>3</sup> ) |
| ➤ Construction Cost of Road:                 | 457 billion Rupiah                 |
| ➤ Cost of land acquisition and compensation: | 139 billion Rupiah                 |

**612.** Port Access Road (design length: 14.5 km) from Cilegon to Bojonegara is planned as the improvement of the existing Provincial Road, and cost estimate for the Port Access Road (Cilegon ~ Bojonegara) was carried out taking the following conditions into consideration.

- National Road At-grade L=14,500 m RoW = 38 m, 2 Lanes
- Compensation and rehabilitation of 5 river bridges (705 m<sup>2</sup>) for reinforcement
- Underpass and Box-culvert, 20 Nos are to be installed
- Utility Facilities (road lighting,

**613.** Land requirement for the construction of At-grade National Road was estimated as 342,494 m<sup>2</sup>. Reference is made to Pp. A-20 ~ 23 of Supporting Report of Engineering Study, JICA Study Report (December 2003).

**614.** The unit price for land acquisition and compensation is calculated as 126,207 Rupiah/m<sup>2</sup> (estimate as of 2005). However it was advised that the actual prices applied to the land compensation in the Bojonegara region were 200 ~ 250,000 Rupiah/m<sup>2</sup>. Hence, the unit price of 250,000 Rp/m<sup>2</sup> was adopted to estimate the project cost.

#### (vi) Project Cost

**615.** Project cost for the development of Bojonegara new port and construction of Port access road is estimated in Tables 3.4-7 and Table 3.4-8.

**616.** Total construction cost for the Bojonegara new port development is estimated at around 3,314.5 billion Rupiah (301 million USD) and can be broken down as follows.

- Construction of Container Terminals (CT1 and CT2; 2 berth x 300 m)
- 1,796.5 billion Rupiah (163.3 million USD)
- Container Handling Equipment (6 x QGC, 20 x RTG and miscellaneous)
- 1,106.6 billion Rupiah (100.6 million USD)
- Port Access Road (Cilegon ~ Bojonegara; 14.5 km)
- 283.9 billion Rupiah (25.8 million USD)
- Administration Cost and Engineering Fee
- 127.5 billion Rupiah (11.6 million USD)





Table 3.4-7 Project Cost Estimate of Bonjonegara Port Development(2015; 1/2)

Description	Unit	Quantity	Local Portion (1,000 Rupiah)		Foreign Portion (1,000 Rupiah)		Remarks
			Unit Price	Amount	Unit Price	Amount	
<b>1. General</b>				<b>52,251,550</b>		<b>85,992,815</b>	Total 5 % of the Direct Construction Cost.
(1) Mobilization / Demobilization	I.s.	1		20,900,620		34,397,126	2.0 % of DC
(2) Temporary Work Yard	I.s.	1		15,675,465		25,797,844	1.5 % of DC
(3) Benchmark and Preparation Works	I.s.	1		10,450,310		17,198,563	1.0 % of DC
(4) Testing Laboratory	I.s.	1		4,180,124		6,879,425	0.4 % of DC
(5) Submittals	I.s.	1		1,045,031		1,719,856	0.1 % of DC
<b>2. Breakwater</b>	m	1,500	111,681	167,521,986	87,282	130,923,725	Design depth in average: -12 m; 615,500 m <sup>3</sup>
<b>3. Channel and Basin</b>				<b>38,571,394</b>		<b>209,467,694</b>	After deducting the contract volume (2.4 million m <sup>3</sup> ) of dredging executed by IPC2
Dredging							
Alluvium Component	m <sup>3</sup>	2,550,000	7.5	19,212,300	48.5	123,763,325	85 %, Grab Dredging; 5.1 USD/m <sup>3</sup>
Weathered Rock Component	m <sup>3</sup>	300,000	14.5	4,359,093	85.7	25,704,369	10 %; Grab Dredging; 9.2 USD/m <sup>3</sup>
Hard Rock Component	m <sup>3</sup>	150,000	100	15,000,000	400	60,000,000	5 %, Grab Dredging after Blasting
<b>4. Container Terminals (CT1 and CT2)</b>				<b>589,204,621</b>		<b>324,031,790</b>	
(1) Quay Wall Construction (-14 m)	m	600	171,588	102,953,009	141,196	84,717,844	Caisson: L: 20 m x W: 13.5 m x D: 15.5 m
(2) Onland Excavation	m <sup>3</sup>	2,500,000	59	148,320,152	32	79,440,776	Tanjung Awuran, and road 60 m
(3) Revetment (West and East ends)	m	300	41,806	12,541,841	41,745	12,523,587	Gravity Type (Concrete Block; Shoreline ~8 m)
(4) Reclamation (+3.5 m)	m <sup>3</sup>	575,000	242	139,149,214	48	27,674,038	
(5) Stacking Yard Pavement	m <sup>2</sup>	152,000	540	82,080,000	360	54,720,000	15 lanes x 23.5 m x (16 Bays + 17 Bays)
(6) Passage Pavement	m <sup>2</sup>	178,000	360	64,080,000	240	42,720,000	
(7) Utility Facilities	I.s.	1		40,080,406		22,235,547	10 % of above construction cost of terminal
<b>5. Container Handling Equipment and Computer System</b>				<b>113,300,000</b>		<b>993,300,000</b>	
(1) Quay Gantry Crane	unit	6	8,800,000	52,800,000	79,200,000	475,200,000	8.0 million USD/unit
(2) Rubber-tired Gantry Crane	unit	20	2,090,000	41,800,000	18,810,000	376,200,000	1.9 million USD/unit
(3) Side Lifter	unit	8	440,000	3,520,000	3,960,000	31,680,000	0.4 million USD/unit; empty container handling
(4) Tractor and Yard Chassis	set	33	220,000	7,260,000	1,980,000	65,340,000	0.2 million USD/unit
(5) Terminal Management Sysytem	I.s.	1	4,400,000	4,400,000	39,600,000	39,600,000	0.4 million USD/set
(6) PCs and Office Fittings	I.s.	1	3,520,000	3,520,000	5,280,000	5,280,000	0.8 million USD/set



Table 3.4-8 Project Cost Estimate of Bonjonegara Port Development(2015; 2/2)

Description	Unit	Quantity	Local Portion (1,000 Rupiah)		Foreign Portion (1,000 Rupiah)		Remarks
			Unit Price	Amount	Unit Price	Amount	
<b>6. Terminal Buildings</b>				<b>31,020,000</b>		<b>7,755,000</b>	
(1) Office Building	m <sup>2</sup>	3,500	4,400	15,400,000	1,100	3,850,000	500 USD/m <sup>2</sup>
(2) Maintenance and Repair Shop	m <sup>2</sup>	2,800	3,080	8,624,000	770	2,156,000	Equipment: 2,300 m <sup>2</sup> ; container: 500 m <sup>2</sup>
(3) Terminal Gate	m <sup>2</sup>	2,700	1,760	4,752,000	440	1,188,000	200 USD/m <sup>2</sup>
(4) Fuel Station	m <sup>2</sup>	420	3,960	1,663,200	990	415,800	450 USD/m <sup>2</sup>
(5) Miscellaneous	m <sup>2</sup>	440	1,320	580,800	330	145,200	Garage for motor biles, workers' huts, etc.
<b>7. Logistics Area</b>				<b>105,412,991</b>		<b>54,378,082</b>	
(1) Revetment (-10 m)	m	180	69,677	12,541,841	69,575	12,523,587	Gravity Type (Concrete Block)
(2) Reclamation (+3.5 m)	m <sup>3</sup>	151,200	242	36,590,193	48	7,277,069	Average elevation = +1.5 m
(3) Wave-absorbing Work	m <sup>3</sup>	40,000	119	4,761,958	195	7,809,965	Rubble-stone Work;
(4) Yard Pavement	m <sup>2</sup>	75,600	360	27,216,000	240	18,144,000	A: 180 m x 420 m
(5) Container Freight Station	m <sup>2</sup>	6,400	2,300	14,720,000	575	3,680,000	250 USD/m <sup>2</sup>
(6) Utility Facilities	I.s.	1		9,582,999		4,943,462	10 % of above construction cost
<b>Direct Construction Cost (DC) of Port</b>	I.s.	1		<b>1,045,030,993</b>		<b>1,719,856,292</b>	<b>Total (2 ~ 7)</b>
<b>8. Port Access Road</b>				<b>64,165,500</b>		<b>132,217,313</b>	14.5 km from Cilegon to Bojonegara
(1) General	I.s.	1		3,055,500		6,296,063	Mobilization, temporary works, site clearance
(2) National Road At-grade	m	14,500	2,700	39,150,000	6,300	91,350,000	RoW = 38 m, 2 Lanes
(3) Bridges	m <sup>2</sup>	705	10,000	7,050,000	15,000	10,575,000	5 River bridges; JICA Study (2003)
(4) Underpass and Box-culvert	Nos	20	600,000	12,000,000	900,000	18,000,000	
(5) Utility Facilities	I.s.	1		2,910,000		5,996,250	5 % of above Construction Cost
<b>Land Acquisition and Compensation</b>	m <sup>2</sup>	350,000	250	<b>87,500,000</b>			14.5 km from Cilegon to Bojonegara
<b>Total Project Cost (TC)</b>				<b>1,248,948,042</b>		<b>1,938,066,419</b>	<b>Total (1 ~ 8)</b>
<b>9. Project Related Expenses (PE)</b>				<b>49,957,922</b>		<b>77,522,657</b>	
(1) Administration Cost	I.s.	1		12,489,480		19,380,664	1 % of TC
(2) Engineering Fee	I.s.	1		37,468,441		58,141,993	3 % of TC
<b>10. Grand Total Cost (TC +PE)</b>				<b>1,298,905,964</b>		<b>2,015,589,076</b>	<b>3,314,495,040</b>
VAT (10 %)				129,890,596		201,558,908	<b>331,449,504</b>



## **4. Investment and Implementation Plan**

### **4.1. Investment Plan for Port Development**

**617.** In order to apply PPP scheme to the investment on case study facilities, public sector will basically invest in infrastructure and private sector will invest in superstructure for the container terminal.

**618.** Investment by public sector is planned as follows:

- Construction of Breakwater (1,500 m length)
- Entrance Channel and Harbor Basin
  - - Design Depth DL-14 m for entrance channel and basin in front of the Container Terminals
  - - Design Depth DL-10 m around Multi-purpose Terminals area
- Construction of Container Terminals
  - - 300 m length Quay Wall; Design depth DL-14 m x 2 berths
  - - Reclamation of Container Yards; Width:300 m x Land depth:600 m x 2 berths
  - - Utility Facilities; Electric power supply, water supply, communication, drainage, etc.
- Quay Gantry Cranes
  - - 6 units of Panamax crane for 2 berths of container terminal
- Port Related Area
  - - Reclamation; Width 180 m x Land depth 420 m
  - - Wave-absorbing Work
- Construction of Access Road
  - - 14.5 km from Cilegon to Bojonegara

**619.** Investment by private sector is planned as follows:

- Development of Container Terminals
  - Yard pavement of 2 container terminals (Width:300 m x Land depth:600 m x 2 berths)
  - Construction of Terminal Buildings
- Container Handling Equipment
  - Rubber-tired Gantry Cranes (RTGs) and miscellaneous equipment
- Terminal Operating System
  - Computer System
  - Container Terminal Operating Software

**620.** Summary table of the investment for Bojonegara Port Development as a base case is presented in Table 4.1-1 dividing the investment into Public Portion and Private Portion. Specifically, 2/3 of the cost shall be borne by the Public Sector while 1/3 of the cost shall be borne by the Private Investor.



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**Table 4.1-1 Summary of Bojonegara Port Development by PPP**

Description	Unit	Quantity	Public Investment (1,000 Rupiah)	Private Investment (1,000 Rupiah)	Remarks
<b>1. General</b>			94,275,614	43,968,750	5 % of the Direct Construction Cost.
<b>2. Breakwater</b>	m	1,500	298,445,712		Design depth in average: -12 m
<b>3. Channel and Basin</b>	m <sup>3</sup>	3,000,000	248,039,088		Dredging
<b>4. Container Terminals (CT1 and CT2)</b>			669,636,412	243,600,000	
(1) Quay Wall Construction (-14 m)	m	600	187,670,852		Caisson Structure
(2) Onland Excavation	m <sup>3</sup>	2,500,000	227,760,928		Tanjung Awuran
(3) Revetment (West and East ends)	m	300	25,065,427		Gravity Type (Concrete Block)
(4) Reclamation (+3.5 m)	m <sup>3</sup>	575,000	166,823,251		
(5) Stacking Yard Pavement	m <sup>2</sup>	152,000		136,800,000	
(6) Passage Pavement	m <sup>2</sup>	178,000		106,800,000	
(7) Utility Facilities	l.s.	1	62,315,953		10 % of construction cost of terminal
<b>5. Container Handling Equipment / Computer System</b>			528,000,000	578,600,000	
(1) Quay Gantry Crane	unit	6	528,000,000		8.0 million USD/unit
(2) Rubber-tired Gantry Crane	unit	20		418,000,000	1.9 million USD/unit
(3) Side Lifter (empty container)	unit	8		35,200,000	0.4 million USD/unit
(4) Tractor and Yard Chassis	set	33		72,600,000	0.2 million USD/unit
(5) Terminal Management Sysytem	l.s.	1		44,000,000	4 million USD/set
(6) PCs and Office Fittings	l.s.	1		8,800,000	0.8 million USD/set
<b>6. Terminal Buildings</b>				38,775,000	
<b>7. Logistics Area</b>			141,391,074	18,400,000	
(1) Revetment (-10 m)	m	180	25,065,427		Gravity Type (Concrete Block)
(2) Reclamation (+3.5 m)	m <sup>3</sup>	151,200	43,867,262		Average elevation = +1.5 m
(3) Wave-absorbing Work	m <sup>3</sup>	40,000	12,571,923		Rubble-stone Work;
(4) Yard Pavement	m <sup>2</sup>	75,600	45,360,000		A: 180 m x 420 m
(5) Container Freight Station	m <sup>2</sup>	6,400		18,400,000	250 USD/m <sup>2</sup>
(6) Utility Facilities	l.s.	1	14,526,461		10 % of above construction cost
<b>Direct Construction Cost (DC) of I</b>	l.s.	1	<b>1,885,512,285</b>	<b>879,375,000</b>	<b>Total (2 ~ 7)</b>
<b>8. Port Access Road</b>			196,382,813		14.5 km from Cilegon to Bojonegara
<b>Land Acquisition and Compensati</b>	m <sup>2</sup>	350,000	87,500,000		
<b>Total Project Cost (TC)</b>			<b>2,263,670,711</b>	<b>923,343,750</b>	<b>Total (1 ~ 8)</b>
<b>9. Project Related Expenses (PE)</b>			127,480,578		
(1) Administration Cost	l.s.	1	31,870,145		1 % of TC
(2) Engineering Fee	l.s.	1	95,610,434		3 % of TC
<b>10. Grand Total Cost (TC +PE)</b>			<b>2,391,151,290</b>	<b>923,343,750</b>	<b>3,314,495,040</b>
VAT (10 %)			239,115,129	92,334,375	
Share between Public and Private Investments			72%	28%	

Grand Total = around 301 million USD (316 million USD including VAT)



#### 4.2. Investment Plan for Access Road

**621.** According to the Ministry of Public Works<sup>1</sup>, the construction of the port access road for the development of Bojonegara new port is planned to be realized by the concept of Toll Road, for which governmental approval has already been obtained by the Ministry Decree in August 2005. The route of the toll road is planned along the different alignment of the existing provincial road, and is different from the plan by the JICA Study 2003 that aimed at widening and improving the existing road.

**622.** Two years earlier, Bina Marga had announced the public tender for the construction of the toll road on the condition that all the necessary procedures such as detailed design and cost estimate of the construction works, obtaining EIA approval for the construction, land acquisition and compensation should be carried out by the private investor. The concession period was set at over 30 years. Although there were expressions of interest from the private investors, no applicant came forward.

**623.** As for the plan to realize the port access road to Bojonegara new port by the Toll Road scheme it was difficult to attract private investors due to the insufficient volume of road traffic and the construction length of the road. It was also clarified in the study of Bina Marga that a good financial return could not be expected by the Toll Road plan connecting between Cilegon and Bojonegara; estimated FIRR on the project: 12.16 %<sup>2</sup>.

**624.** Therefore, it is preferable that the port access road should be realized as the project borne by the Government (Ministry of Public Works), where the road construction should be planned integrally with the port development project, and the construction works of port construction and port development should be executed separately by each executive agency.

**625.** For the development of an international port, the responsibility to plan and realize the port access national road or toll road belongs to the government authority of road construction, i.e., Bina Marga. The corridor shall be prepared by the central government in cooperation with the local government. Land acquisition and compensation will be carried out by the provincial government of Banten, and the assistance and support by the central government will be necessary.

#### 4.3. Preliminary Implementation Schedule

**Preliminary implementation schedule of the Bojonegara Port development and the disbursement schedule are presented in Table 4.3-1 and**

**626.** Table 4.3-2. The main points of the implementation are as follows.

##### A. Public and Private Partnership

**627.** Investment scheme of the Bojonegara new port development by Public-Private Partnership (PPP) as a base case is conceived as follows; development and construction of the infrastructure of the port shall be borne by the public sector side, while the super-structure of the port and port operation shall be borne by the private sector side.

**628.** Another possible PPP schemes for the project are; (a) breakwater, channels and basins to be used commonly by vessels using all terminals in the port are provided by the public sector and terminal facilities and equipment are provided by the private sector on BOT system, and (b) all the facilities including breakwater, channels and basins and terminals are provided by the private sector under so called master concession.

<sup>1</sup> Departemen Pekerjaan Umum, Direktorat Jenderral **Bina Marga**, Direktorat Bina Program

<sup>2</sup> Source: Pekerjaan Penyusunan Studi Kelayakan dan Pra Desain Tender Investasi Jalan Tol, Ruas Cilegon - Bojonegara, Laporan Final, Januari 2006; Departemen Pekerjaan Umum, Direktorat Jenderral Bina Marga



**629.** These three cases of PPP scheme will be analyzed in the following chapter.

**B. Financial Arrangement**

**630.** A one year period will be required for the process of financial arrangement which consists of Feasibility Study and subsequent Loan Agreement.

**C. Engineering Study and Selection of Contractors**

**631.** The engineering study (surveys and detailed design of port facilities) and the preceding selection of consultants will require at least 1.5 ~ 2 years.

**632.** Selection of contractors (port construction and equipment) and selection of the private investor (development of container terminal, operation and management of the port) as well will follow the engineering study.

**D. Construction of Port Infrastructure**

**633.** Subsequent to the process of financial process, engineering study and selection of contractors, the construction of port infrastructure is assumed to be implemented from the beginning of the 5th year (the 3 month of the 4th year is assumed for the mobilization and preparation works).

**634.** Requirement for construction period is estimated 3 years for the breakwater (1,500 m) and 2.5 years for the dredging of channel and harbor (3,000,000 m<sup>3</sup>) up to completion.

**E. Development by the Private Investor**

**635.** Development of the super-structure of the container terminal could be started in the beginning of the 6th year following the construction of quay wall and the reclamation of the land area for the terminal.



Table 4.3-1 Bonjonegara Port Construction Schedule and Disbursement(toward 2015; 1/2)

Description	Unit	Quantity	Public Investment (1,000 Rupiah)	Private Investment (1,000 Rupiah)	2009	2010	2011	2012	2013	2014	2015	2016
<b>0. Administrative Procedures</b>												
<b>(1) Public Sector</b>												
Feasibility Study												
Loan Agreement												
Procurement of Consultants												
Survey and Detailed Design for Port Construction												
Selection of Contractor (Port Construction)												
Construction of Port and Procurement												
Selection of Terminal Operator												
<b>(2) Private Sector</b>												
Detailed Design of Terminal Facilities												
Selection of Contractor (Terminal)												
Development of Container Terminal												
Procurement of Cargo Equipment												
<b>1. General (Indirect Cost)</b>			94,275,614	43,968,750			28,282,684		14,141,342	14,141,342	37,710,246	
<b>2. Breakwater</b>												
Dredging	m	1,500	298,445,712									
<b>3. Channel and Basin</b>												
Dredging	m <sup>3</sup>	3,000,000	248,039,088									
<b>4. Container Terminals (CT1 and CT2)</b>												
(1) Quay Wall Construction (-14 m)	m	600	187,670,852									
(2) Onland Excavation	m <sup>3</sup>	2,500,000	227,760,928									
(3) Revetment (West and East ends)	m	300	25,065,427									
(4) Reclamation (+3.5 m)	m <sup>3</sup>	575,000	166,823,251									
(5) Stacking Yard Pavement	m <sup>2</sup>	152,000		136,800,000								
(6) Passage Pavement	m <sup>2</sup>	178,000		106,800,000								
(7) Utility Facilities	l.s.	1	62,315,953									



Table 4.3-2 Bonjonegara Port Construction Schedule and Disbursement(toward 2015; 2/2)

Description	Unit	Quantity	Public Investment (1,000 Rupiah)	Private Investment (1,000 Rupiah)	2009	2010	2011	2012	2013	2014	2015	2016
<b>5. Container Handling Equipment / Computer System</b>												
(1) Quay Gantry Crane	unit	6	528,000,000						105,600,000	211,200,000	211,200,000	
(2) Rubber-tired Gantry Crane	unit	20		418,000,000						229,900,000	188,100,000	
(3) Side Lifter	unit	8		35,200,000						22,000,000	13,200,000	
(4) Tractor and Yard Chassis	set	33		72,600,000						44,000,000	28,600,000	
(5) Terminal Management System	I.s.	1		44,000,000						44,000,000		
(6) PCs and Office Fittings	I.s.	1		8,800,000						8,800,000		
<b>6. Terminal Buildings</b>				38,775,000						38,775,000		
<b>7. Logistics Area</b>												
(1) Revetment (-10 m)	m	180	25,065,427							10,026,171	15,039,256	
(2) Reclamation (+3.5 m)	m <sup>3</sup>	151,200	43,867,262								43,867,262	
(3) Wave-absorbing Work	m <sup>3</sup>	40,000	12,571,923								12,571,923	
(4) Yard Pavement	m <sup>2</sup>	75,600	45,360,000								45,360,000	
(5) Container Freight Station	m <sup>2</sup>	6,400		18,400,000							18,400,000	
(6) Utility Facilities	I.s.	1	14,526,461								14,526,461	
<b>Direct Construction Cost (DC) of Port</b>	I.s.	1	1,885,512,285	879,375,000								
<b>10. Port Access Road</b>			196,382,813						117,829,688	78,553,125		
<b>Land Acquisition and Compensation</b>	m <sup>2</sup>	350,000	87,500,000				87,500,000					
<b>11. Project Related Expenses (PE)</b>												
(1) Administration Cost	I.s.	1	31,870,145					7,967,536	6,374,029	6,374,029	6,374,029	
(2) Engineering Fee	I.s.	1	95,610,434					23,902,608	19,122,087	19,122,087	19,122,087	
<b>12. Grand Total Cost (TC +PE)</b>			2,391,151,290	923,343,750								
VAT (10 %)			239,115,129	92,334,375								





5. Possible PPP schemes and Financial Analysis

5.1. Premises on the Project

A. Initial Investment Costs

636. Initial investment costs are estimated in Table 5.1-1.

**Table 5.1-1 Initial Investment Costs (Public + Private)**

Item	Approx. Q'ty	Total Cost '000 US\$
<b>Construction Cost for Bojonegara Port</b>		<b>263,921</b>
1. General Cost	1 l.s.	12,568
2. Breakwater	1,500 m	27,131
3. Channel and Basin	3,000,000 m3	22,549
4. Container Terminal		83,021
5. Container Handling Equipment and Computer System		100,600
6. Terminal Building	1 l.s.	3,525
7. Port Related Area		14,526
8. Port Access Road	15 km	-
9. Land Aquisition / Compensation	25 ha	-
11. Price Escalation		5,278
<b>Total Construction Cost</b>		<b>269,199</b>
13. Tender & Selecting Operator Assistance and Supervision		7,918
<b>Total Construction Cost &amp; Consulting Services</b>		<b>277,117</b>
14. Interest During Construction (IDC)		348
<b>BJN Total Direct Project Cost-1</b>		<b>277,465</b>
10. Physical Contingency		27,747
<b>BJN Total Direct Project Cost</b>	<b>1.15645</b>	<b>305,212</b>
15. Local Cost (Adiministration Cost + VAT)		30,785
<b>BJN Total Project Cost</b>		<b>335,997</b>

Notes. 1US\$=100Yen, 1US\$=11,000Rp

637. Equipment to be installed is shown in Table 5.1-2.

**Table 5.1-2 Equipment to be Installed**

TOC Equipment Item	Required nos. of Unit	Remarks
Quay cranes	3+3	
RTG 1-20	20	
Yard Tractor 1-33	33	
Yard Chassis 1-33	33	20/40/45 correspond
Top Handler	2	4 high
Side Handler 1-9	9	5 high for empty cont.
Tank Lorry	1	for fueling
Bus for Worker	1	shuttle service
M/R Service car	1	with A.&W.M.
Forklift 10t	1	for M/R
Forklift 3t-5t	2	for M/R
Forklift for CFS	6	
Yard Vehicle	15	Operation management
Computer System	1	For Operation



B. Management and Operation Costs

638. Manning schedule of the port authority and terminal operator are shown in Table 5.1-3 and in Table 5.1-4.

Table 5.1-3 Manning schedule of PA

PA Staff	2016	2017
General Manager	1	1
Deputy General Manager	1	1
Secretary	2	2
Manager	2	2
Assist. Manager	4	4
Stuff	8	8
<b>Total</b>	<b>18</b>	<b>18</b>

Table 5.1-4 Manning schedule of TOC

Office	nos.	Labour Cost	nos.
<b>Concessionair (Office)</b>	<b>nos.</b>	<b>Concessionair (Worker)</b>	<b>nos.</b>
GEO (general manager)	1	Ship, Yard Operation	
CFO (assis. GM, cheif)	1	Forman	16
Corporate Secretary	1	G.C.Operator	29
Operation Stuff		RTG & Heavy	54
Manager	2	Lift Equip. Operator	
Stuff	13	Tractor Driver	42
Maintenance & Repair		Longshore Worker	100
Manager	1	Marine Clerk	45
Assist. Manager	2	Lift Equip. Operator	
Administrative Dep.		Boss	4
Manager	1	R Stacker driver	42
Stuff	6	Electrician	7
Labor Management		CFS Operation	
Manager	1	Boss	1
stuff	7	Driver & Worker	40
<b>Total</b>	<b>36</b>	Clerk	13
		<b>Total</b>	<b>393</b>

639. Management and operation costs of the port authority and terminal operator are shown in Table 5.1-5.

Table 5.1-5 Operation Cost

	PA	TOC
Personnel Cost	37,500,000 Rp/person/year	Manager class: 135,000,000 Rp/person/year Stuff class: 47,250,000 Rp/person/year Skilled Labor: 67,500,000 Rp/person/year



		Unskilled labor: 33,750,000 Rp/person/year
Administration and Other Cost	-	100% of Personnel cost
Maintenance Cost	Infrastructure: 1% of the total project cost Equipment: 3% of the equipment cost Electric, fuel & utilities: 2% of the equipment cost Maintenance dredging: 200,000m <sup>3</sup> , 1.14US\$/m <sup>3</sup>	
Depreciation	Civil structure: 40 year Equipment: 20 year	

### C. Tariff and Duties

**640.** Tariff and duties are set as in Table 5.1-6 and in Table 5.1-7 taking the current level into consideration.

**Table 5.1-6 Tariff set by the Government**

Port Tariff		International (US\$)
PA	Light Due	0.027/GRT-arrival
	Harbor Due	0.092/GRT-arrival
	Anchorage service	0.092/GRT- call

**Table 5.1-7 Samples of Terminal Charges**

Container Handling Charge: TOC	International	
	20ft	40ft
Stevedoring charge, QGC	L: US\$ 66.0/box E: US\$ 49.5/box	L: US\$ 99.0/box E: US\$ 74.25/box
Opening/closing ship hatch	US\$ 30.77/hatch-cover	
Wharfage for vessel	US\$ 0.122/GRT-day	
Lift on/off charge	L: Rp 187,500/box E: Rp 93,700/box	L: Rp 281,300/box E: Rp 140,600/box
Container storage charge	L: Rp 27,200/box E: Rp 13,600/box R: Rp 62,900/box	L: Rp 54,400/box E: Rp 27,200/box R: Rp 125,800/box
Reefer service	Rp 200,000/8-hour	
Mooring/unmooring service	US\$ 33.8/ movement	

Notes, L: Laden container, E: Empty container, R: Reefer container.

### D. Estimated Scale of Business

**641.** Maximum capacity of the terminal (2 berths) is presumed as 900,000 TEU/year (see Table 5.1-8), considering the scale of the terminal and estimated vessel type (see Table 5.1-9) and productivity of the terminal is shown in Table 5.1-10.

**Table 5.1-8 Demand of Container**

Year	TEU	Box			Reefer	
		20ft	40ft	Over 40ft	20ft	40ft
2016	850,000	195,754	287,449	32,531	3,629	5,329
2017	900,000	193,965	310,345	35,122	3,596	5,753
2045	900,000	46,506	376,701	42,632	862	6,983

Note: TEU/ Box rate increasing 0.02 per year, as of year 2016 set its 1.62



Table 5.1-9 Vessel Type and Calling Number

International vessel	Ship size (GRT)		
	1600TEU (20,000)	4000TEU (46,000)	6000TEU (72,000)
Year 2016 – 2045	416 call/year	312 call/year	104 call/year

Table 5.1-10 Bojonegara port Productivity

Productivity	No-working hours	No.Crane	Productivity( Box/hour)
Average Ship Size(6,000TEU)	2	4	30
Average Ship Size(4,000TEU)	2	3	30
Average Ship Size(1,600TEU)	1	2	30

## 5.2. Possible PPP Schemes for Development and Operation of Bojonegara Container Terminal

**642.** The most popular form of PPP for the development and operation of container terminal is that basic infrastructure of the port including breakwater, channel and terminal infrastructure is provided by the port authority while superstructure of the terminal is provided by the terminal operator.

**643.** The rationale behind this scheme is that the fundamental infrastructure such as breakwater and channel are used all the vessels calling various terminals in the port and difficult to specify the benefit of specific terminal and breakwater functions not only for safe navigation of vessels but also for protecting the properties of the hinterland of the port, and the design of the superstructure of the terminal will vary with the operation policy and method applied by each operator.

**644.** In some case of small scale port or the port where break water is not required such as river port, all the facilities and equipment are provided by the private sector and management and operation of the port is entrusted to the private sector under the so called master concession scheme.

**645.** In case of master concession, it often leads to monopolistic operation of the port by the concessionaire and it is technically difficult to oversee such a monopolistic behavior and hence it is not a desirable scheme.

**646.** In the case of master concession, public sector holds more than 51% share of the company for development and management of the port forming the joint venture company with potential concessionaire to practically control the management of the company.

**647.** Partial concession scheme is often seen in the case of container terminal development, and it includes BOT and joint development by the public sector and private sector.

**648.** Considering the characteristics mentioned above, following three cases are evaluated for the selection of PPP scheme in the green field port development of Bojonegara.

### (i) Case-1: (partial concession/ joint development)

- Port authority provides the fundamental infrastructure (breakwater, channels and basins, quay wall and reclamation of the terminal with gantry cranes and access road)
- Terminal operator (concessionaire) provides the superstructure of the terminal and other equipment for the operation of the container terminal including RTGs
- PPP scheme applied is the concession to develop, manage and operate the container terminal which the port authority concede the concessionaire the rights to develop the



superstructure and commercial operation of the terminal.

- Concession fee consists of fixed fee for the recovery of necessary repayment amount for the investment on the terminal by the port authority, land and water rent and variable fee in terms of revenue share.

(Duration of the concession period should be decided based on the financial assessment under relevant concession conditions such as initial investment, reinvestment for renewal of equipment and facilities, maintenance obligation and concession fee etc. A 25~30 year period or more is common. Therefore, duration of the concession period in this case study is set at 30 years.)

**(ii) Case-2: (partial concession /BOT)**

- Port authority provides only fundamental infrastructure (breakwater, channel and basin, access road etc.)
- Concessionaire provides all the terminal facilities and equipment for the operation of the container terminal.
- PPP scheme applied is the BOT for the development, management and operation of the container terminal
- Concession fee consists of land and water rent and variable fee in terms of revenue share

**(iii) Case-3: (master concession)**

- Port authority give the authorization to develop, manage and operate the container port including breakwater, channel and basins and access road to the concessionaire
- Concessionaire invests on whole project under the scheme of master concession
- Concession fee consists of land and water rent and variable fee in terms of revenue share

### 5.3. Financial Conditions of the Port Authority and the Concessionaire

**649.** For the purpose of financial analysis, financial conditions of the port authority and the concessionaire are set as shown in Table 5.3-1.

Discount rates of all cases are set as follows;

Port Authority: 1.44% (calculated from the interest rate of an international financial organization (0.1%) and market interest rates (15.0%) of Indonesia for local cost portion (shared 9% of total loan). However, the discount rate of case-3 is 0.0% because there is no initial investment.)

Terminal Operator: 10.5% (calculated from market interest rates (15.0%) of Indonesia and debt-equity ratio (70:30))

(One of the criteria for evaluating the financial viability of a project is that the FIRR which is one of the financial indicators should exceed the discount rate.)



**Table 5.3-1 Financial Conditions of Port Authority and Terminal Operator**

Case-1	Port Authority	Terminal Operator (Concessionaire)
<b>1. Cost Allocation</b>	Invest on infrastructure (breakwater, channel & basins, quay wall & Gantry Crane, land reclamation)	Superstructure and equipment
<b>2. Financial Resource</b>	International financial organization and bank (local portion)	bank (70%) and own equity (30%=\$32mill)
<b>3. Tax</b>	non taxable	20% income tax
<b>4. Maintenance</b>	infrastructure & maintenance dredging	superstructure & other equipment
<b>5. Depreciation</b>	Infrastructure and Gantry Cranes	Superstructure and equipment
<b>6. Concession fees</b>	Fixed fee for terminal facilities equivalent to repayment of loan + lease fee for GCs +land & water rent +variable fee in terms of 5% revenue share	
<b>7. Renewal cost for equipment</b>	GCs by bank loan	other equipment by bank loan
Case-2	Port Authority	Terminal Operator (Concessionaire)
<b>1. Cost Allocation</b>	Investment on breakwater and channels	Investment on other infrastructure, superstructure and equipment
<b>2. Financial Resource</b>	International financing organization and bank loan (local portion)	bank (70%) and own equity (30%=\$81mill)
<b>3. Tax</b>	non taxable	20% income tax
<b>4. Maintenance</b>	breakwater, channel	other infrastructure & superstructure
<b>5. Depreciation</b>	breakwater, channel	other infrastructure & superstructure
<b>6. Concession fees</b>	variable fee of 5% revenue share+land & water rent	
<b>7. Renewal cost for equipment</b>	not applicable	equipment by bank loan
Case-3	Port Authority	Terminal Operator (Concessionaire)
<b>1. Cost Allocation</b>	non initial investment	investment on all facilities and
<b>2. Financial Resource</b>	not applicable	bank (70%) and own equity (30%=\$101mill)
<b>3. Tax</b>	non taxable	20% income tax
<b>4. Maintenance</b>	not applicable	maintenance of all the facilities and equipment
<b>5. Depreciation</b>	not applicable	Depreciation of all the facilities and equipment
<b>6. Concession fees</b>	Land and water rent + variable fee of 5% revenue share	
<b>7. Renewal cost for equipment</b>	not applicable	equipment by bank loan

#### 5.4. Evaluation of PPP Scheme

##### A. Table of Financial Indicators and Financial Statements for the concession evaluation

**650.** In case-2 and case-3, in addition to the table of the financial indicators, the financial statements are attached to show that the cash flow of the terminal operating company will remain in red for a long time.

##### B. Result of Evaluation

**651.** Bojonegara Port Development Project was once tendered under the master concession scheme and resulted with no bidder. As is shown in the financial analysis for case-3, it is the green field port requiring huge amount of initial investment including fundamental infrastructure including breakwater (total investment about \$330 mil.).



**652.** In the case study, it is assumed that debt/equity ratio of the concessionaire is 70/30 and hence for the case of master concession, concessionaire will require paid up share capital of more than \$100 million which is such a huge amount to make concessionaire to hesitate to participate (see Table 5.4-5~Table 5.4-7).

**653.** In the case-1 where the key infrastructure is provided by the port authority financed by international financing body with fairly favorable condition, estimated financial statements both for the port authority and the concessionaire show reasonably sound throughout the concession term and it is said that this is the reasonable partnership between public and private (see Table 5.4-1).

**654.** In the case-2 where fundamental infrastructure is provided by the port authority and terminal is provided by the concessionaire on BOT system, financial indicators show that financial conditions both for the port authority and the concessionaire seem to be sound (see Table 5.4-2).

**655.** Cash flow statement shows, however, rather severe condition for initial 6 years for the concessionaire recording more than \$10 million/year shortage. This is caused by rather huge amount of initial investment to be financed by unfavorable bank loan and the assumption of the limited handling capacity of 900,000TEUs/year compared with rather fully equipped terminal (see Table 5.4-4).

**656.** It is, however, considered to overcome the situation by other possible countermeasures such as giving tax holidays for the initial stage of operation or decreasing the concession fee by the port authority.

**657.** Considering the results of case studies, it can be said that for the green field port which requires huge amount of initial investment for fundamental infrastructure like breakwater and channel, master concession is not suitable for PPP scheme, and either BOT for only terminal or joint development scheme is desirable.



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Table 5.4-1 Result of Financial Analysis (Case-1): Bojonegara Port

Year of No.4-6 Q. Crane added	2016			OUTPUTS	
Year of No.7 Q. Crane added	3000				
Concession Fee	1st Prd	2nd Prd	3rd Prd	1000\$	
Fixed	4.628	4.628	4.628	RTG Lease for 15 years 0	
Variable	3.065	3.173	3.119	GT Crane lease for 25 years 2,380	

TOC	Financial Indicators			2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027		
	<b>PROFITABILITY (Net Operating Income/ Net Fixed Assets)</b>	Rate of Return on Net Fixed Assets (Criterion: over %)			8.00%	0.00%	0.00%	0.00%	0.00%	30.92%	34.50%	35.39%	36.35%	37.08%	38.06%	39.27%	40.59%	37.33%	38.97%	40.22%	42.18%	44.01%
<b>OPERATIONAL EFFICIENCY</b>	Operating Ratio (Criterion: under 0.7- 0.75)			0.07	0.07	0.07	0.07	0.42	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.43	0.43	0.43	0.43	0.44	0.44	
	Working Ratio (Criterion: under 0.5- 0.6)			0.07	0.07	0.07	0.07	0.37	0.35	0.35	0.35	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	
<b>LOAN REPAYMENT CAPACITY</b>	Debt Service Coverage Ratio (Criterion: over 1.0)			0.00	0.00	0.00	0.00	2.16	2.42	2.60	2.81	3.06	3.33	3.67	4.13	78.74	16.72	17.63	18.66	19.71		
	concessionn fee rate (fixed)			0%	0%	0%	0%	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
	concession fee rate (variable)			0%	0%	0%	0%	0%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	
	total concession fee/revenue			5%	5%	5%	5%	17%	17%	17%	17%	17%	17%	17%	17%	17%	17%	17%	17%	17%	17%	
	MAXIMUM CONCESSION FEE RATE NPV(Profit/Revenue)			81.53%																		
	Financial Indicators			2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	
<b>PROFITABILITY (Net Operating Income/ Net Fixed Assets)</b>	Rate of Return on Net Fixed Assets (Criterion: over %)			8.00%	46.43%	49.18%	32.18%	30.85%	32.24%	33.75%	35.41%	36.51%	38.46%	40.63%	43%	40.72%	43%	45.66%	48.76%	51.79%	55.81%	67.09%
<b>OPERATIONAL EFFICIENCY</b>	Operating Ratio (Criterion: under 0.7- 0.75)			0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.34	
	Working Ratio (Criterion: under 0.5- 0.6)			0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.33	
<b>LOAN REPAYMENT CAPACITY</b>	Debt Service Coverage Ratio (Criterion: over 1.0)			19.50	20.74	23.13	3.93	3.45	3.66	4.30	4.57	4.73	5.08	5.52	5.99	4.95	12.13	18.93	20.12	19.99	22.71	
<b>FINANCIAL INTERNAL RATE OF RETURN</b>	concessionn fee rate (fixed)			100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
	concession fee rate (variable)			5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	
	total concession fee/revenue			17%	17%	17%	17%	17%	17%	17%	17%	17%	17%	17%	17%	17%	17%	17%	17%	17%	13%	
	MAXIMUM CONCESSION FEE RATE NPV(Profit/Revenue)			81.53%																		
	Retained Earnings Total			764,587	(\$1,000)																	

PA	Financial Indicators			2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027		
	<b>PROFITABILITY (Net Operating Income/ Net Fixed Assets)</b>	Rate of Return on Net Fixed Assets (Criterion: over %)			1.59%	0.00%	0.00%	0.00%	4.10%	4.86%	4.99%	5.13%	5.28%	4.79%	5.60%	5.78%	5.97%	6.17%	5.63%	6.63%	6.88%	
<b>OPERATIONAL EFFICIENCY</b>	Operating Ratio (Criterion: under 0.7- 0.75)			0.00	0.00	0.00	0.00	0.46	0.38	0.38	0.38	0.38	0.46	0.38	0.38	0.38	0.38	0.46	0.38	0.38		
	Working Ratio (Criterion: under 0.5- 0.6)			0.00	0.00	0.00	0.00	0.11	0.03	0.03	0.03	0.03	0.11	0.03	0.03	0.03	0.03	0.11	0.03	0.03		
<b>LOAN REPAYMENT CAPACITY</b>	Debt Service Coverage Ratio (Criterion: over 1.0)			0.00	0.00	0.00	0.00	4.29	4.84	4.99	5.15	5.32	1.53	1.68	1.70	1.71	1.73	1.62	1.77	1.79		
	Financial Indicators			2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	
<b>PROFITABILITY (Net Operating Income/ Net Fixed Assets)</b>	Rate of Return on Net Fixed Assets (Criterion: over %)			1.59%	7.15%	7.45%	6.85%	8.14%	8.54%	8.98%	9.46%	8.80%	10.60%	11.29%	12.06%	12.96%	6.85%	8.14%	8.54%	8.98%	9.46%	0.00%
<b>OPERATIONAL EFFICIENCY</b>	Operating Ratio (Criterion: under 0.7- 0.75)			0.38	0.38	0.46	0.38	0.38	0.38	0.38	0.46	0.38	0.38	0.38	0.38	0.46	0.38	0.38	0.38	0.38	0.00	
	Working Ratio (Criterion: under 0.5- 0.6)			0.03	0.03	0.11	0.03	0.03	0.03	0.03	0.11	0.03	0.03	0.03	0.03	0.11	0.03	0.03	0.03	0.03	0.00	
<b>LOAN REPAYMENT CAPACITY</b>	Debt Service Coverage Ratio (Criterion: over 1.0)			1.81	1.84	1.72	1.88	1.91	1.93	1.96	1.84	2.01	2.04	2.07	2.10	2.16	1.27	1.27	1.27	1.27	0.00	
	Retained Earnings Total			268,705	(\$1,000)																	
	FINANCIAL INTERNAL RATE OF RETRUN			5.5%																		





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Table 5.4-2 Result of Financial Analysis (Case-2): Bojonegara Port

Year of No.4-6 Q. Crane added	2018	OUTPUTS			
Year of No.7 Q. Crane added	3000				
Concession Fee	1st Prd	2nd Prd	3rd Prd		1000\$
Fixed	0	0	0		RTG Lease for 15 years
Variable	3.204	3.311	3.257		QT Crane lease for 25 years

	Financial Indicators	2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025 2026 2027																					
		2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027					
TOC	<b>PROFITABILITY (Net Operating Income/ Net Fixed Assets)</b>																						
	Rate of Return on Net Fixed Assets (Criterion: over %)	8.00%	0.00%	0.00%	0.00%	0.00%	14.42%	15.88%	16.27%	16.69%	17.05%	17.49%	18.00%	18.55%	18.03%	18.68%	19.28%	20.05%	20.81%				
	<b>OPERATIONAL EFFICIENCY</b>																						
	Operating Ratio (Criterion: under 0.7- 0.75)		0.07	0.07	0.07	0.07	0.36	0.34	0.34	0.35	0.35	0.35	0.35	0.35	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	
	Working Ratio (Criterion: under 0.5- 0.6)		0.07	0.07	0.07	0.07	0.23	0.22	0.22	0.22	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	
	<b>LOAN REPAYMENT CAPACITY</b>																						
	Debt Service Coverage Ratio (Criterion: over 1.0)		0.00	0.00	0.00	0.00	1.35	1.45	1.49	1.53	1.57	1.61	1.65	1.70	1.76	1.70	1.76	1.83	1.90				
	concessiann fee rate (fixed)		0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
	concession fee rate (variable)		0%	0%	0%	0%	0%	0%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	
	total concession fee/revenue		5%	5%	5%	5%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	
MAXIMUM CONCESSION FEE RATE	NPV(Profit/Revenue)	82.91%																					
PA	<b>PROFITABILITY (Net Operating Income/ Net Fixed Assets)</b>																						
	Rate of Return on Net Fixed Assets (Criterion: over %)	8.00%	21.73%	22.74%	19.17%	19.17%	20.06%	21.04%	22.12%	23.07%	24.38%	25.84%	27%	27.48%	21%	21.51%	22.61%	23.73%	25.08%	29.61%			
	<b>OPERATIONAL EFFICIENCY</b>																						
	Operating Ratio (Criterion: under 0.7- 0.75)		0.37	0.37	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.37	0.37	0.37	0.37	0.37	0.37	0.27		
	Working Ratio (Criterion: under 0.5- 0.6)		0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	
	<b>LOAN REPAYMENT CAPACITY</b>																						
	Debt Service Coverage Ratio (Criterion: over 1.0)		1.97	2.06	2.17	1.64	1.63	1.72	1.89	2.01	2.12	2.28	2.46	2.67	2.62	2.41	3.64	3.85	4.04	4.30			
	<b>FINANCIAL INTERNAL RATE OF RETURN</b>		15.0%																				
	concessiann fee rate (fixed)		0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
	concession fee rate (variable)		5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	
total concession fee/revenue		6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%		
MAXIMUM CONCESSION FEE RATE	NPV(Profit/Revenue)	82.91%																					
<b>Retained Earnings Total</b>		605,211	(\$1,000)																				
PA	<b>PROFITABILITY (Net Operating Income/ Net Fixed Assets)</b>																						
	Rate of Return on Net Fixed Assets (Criterion: over %)	1.59%	0.00%	0.00%	0.00%	0.00%	6.92%	8.87%	9.05%	9.24%	9.44%	7.50%	9.88%	10.11%	10.36%	10.62%	8.45%	11.19%	11.50%				
	<b>OPERATIONAL EFFICIENCY</b>																						
	Operating Ratio (Criterion: under 0.7- 0.75)		0.00	0.00	0.00	0.00	0.42	0.24	0.24	0.24	0.24	0.41	0.24	0.24	0.24	0.24	0.41	0.24	0.24	0.24	0.00		
	Working Ratio (Criterion: under 0.5- 0.6)		0.00	0.00	0.00	0.00	0.22	0.05	0.05	0.05	0.05	0.22	0.05	0.05	0.05	0.05	0.22	0.05	0.05	0.05	0.00		
	<b>LOAN REPAYMENT CAPACITY</b>																						
	Debt Service Coverage Ratio (Criterion: over 1.0)		0.00	0.00	0.00	0.00	5.41	6.95	7.16	7.39	7.63	1.99	2.45	2.47	2.50	2.52	2.09	2.58	2.61				
	<b>FINANCIAL INTERNAL RATE OF RETRUN</b>		8.6%																				
	concessiann fee rate (fixed)		0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
	concession fee rate (variable)		5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	
total concession fee/revenue		6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%		
MAXIMUM CONCESSION FEE RATE	NPV(Profit/Revenue)	82.91%																					
<b>Retained Earnings Total</b>		147,744	(\$1,000)																				









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Table 5.4-5 Result of Financial Analysis (Case-3): Bojonegara Port

Year of No.4-6 Q. Crane added	2016	OUTPUTS			
Year of No.7 Q. Crane added	3000				
Concession Fee	1st Prd	2nd Prd	3rd Prd		1000\$
Fixed	0	0	0		RTG Lease for 15 years
Variable	3.383	3.491	3.437		GT Crane lease for 25 years

TOC	Financial Indicators		2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	
	<b>PROFITABILITY (Net Operating Income/ Net Fixed Assets)</b>																			
	Rate of Return on Net Fixed Assets (Criterion: over %)	8.00%	0.00%	0.00%	0.00%	0.00%	12.55%	14.17%	14.51%	14.88%	15.20%	15.18%	16.05%	16.53%	16.17%	16.74%	16.78%	17.94%	18.62%	
<b>OPERATIONAL EFFICIENCY</b>																				
	Operating Ratio (Criterion: under 0.7- 0.75)		0.07	0.07	0.07	0.07	0.37	0.34	0.34	0.34	0.35	0.36	0.35	0.35	0.36	0.36	0.38	0.37	0.37	
	Working Ratio (Criterion: under 0.5- 0.6)		0.07	0.07	0.07	0.07	0.23	0.21	0.21	0.21	0.21	0.23	0.21	0.21	0.21	0.21	0.23	0.21	0.21	
<b>LOAN REPAYMENT CAPACITY</b>																				
	Debt Service Coverage Ratio (Criterion: over 1.0)		0.00	0.00	0.00	0.00	1.22	1.33	1.37	1.41	1.44	1.45	1.52	1.57	1.62	1.58	1.60	1.70	1.77	
	concessionn fee rate (fixed)		0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
	concession fee rate (variable)		0%	0%	0%	0%	0%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	
	total concession fee/revenue		5%	5%	5%	5%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	
	MAXIMUM CONCESSION FEE RATE NPV(Profit/Revenue)	83.79%																		
	<b>Retained Earnings Total</b>	<b>601,015</b>																		
	<b>PROFITABILITY (Net Operating Income/ Net Fixed Assets)</b>		2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045
	Rate of Return on Net Fixed Assets (Criterion: over %)	8.00%	19.41%	20.28%	17.12%	17.73%	18.55%	19.45%	20.44%	20.72%	22.55%	23.89%	25%	25.61%	19%	20.86%	21.98%	23.15%	24.54%	28.18%
<b>OPERATIONAL EFFICIENCY</b>																				
	Operating Ratio (Criterion: under 0.7- 0.75)		0.37	0.37	0.39	0.37	0.37	0.37	0.37	0.39	0.37	0.37	0.37	0.37	0.39	0.37	0.37	0.37	0.37	0.29
	Working Ratio (Criterion: under 0.5- 0.6)		0.21	0.21	0.23	0.21	0.21	0.21	0.21	0.23	0.21	0.21	0.21	0.21	0.23	0.21	0.21	0.21	0.21	0.23
<b>LOAN REPAYMENT CAPACITY</b>																				
	Debt Service Coverage Ratio (Criterion: over 1.0)		1.84	1.92	1.97	1.59	1.58	1.67	1.83	1.91	2.06	2.21	2.39	2.60	2.51	2.50	3.92	4.15	4.35	4.53
<b>FINANCIAL INTERNAL RATE OF RETURN</b>		13.4%																		
	concessionn fee rate (fixed)		0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	concession fee rate (variable)		5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
	total concession fee/revenue		6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%
	MAXIMUM CONCESSION FEE RATE NPV(Profit/Revenue)	83.79%																		
	<b>Retained Earnings Total</b>	<b>601,015</b>																		

PA	Financial Indicators		2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
	<b>PROFITABILITY (Net Operating Income/ Net Fixed Assets)</b>																		
	Rate of Return on Net Fixed Assets (Criterion: over %)	1.59%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
<b>OPERATIONAL EFFICIENCY</b>																			
	Operating Ratio (Criterion: under 0.7- 0.75)		0.00	0.00	0.00	0.00	0.06	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.06
	Working Ratio (Criterion: under 0.5- 0.6)		0.00	0.00	0.00	0.00	0.06	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.06
<b>LOAN REPAYMENT CAPACITY</b>																			
	Debt Service Coverage Ratio (Criterion: over 1.0)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	concessionn fee rate (fixed)		0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	concession fee rate (variable)		0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	total concession fee/revenue		0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	MAXIMUM CONCESSION FEE RATE NPV(Profit/Revenue)	111.330																	
	<b>Retained Earnings Total</b>	<b>111,330</b>																	
	<b>FINANCIAL INTERNAL RATE OF RETRUN</b>																		



