Japan International Cooperation Agency (JICA)
Directorate General of Sea Transportation, Ministry of Transportation

No.

The Study for Development of The Greater Surabaya Metropolitan Ports in the Republic of Indonesia

GSMP

FINAL REPORT

Summary

November 2007

ALMEC Corporation
Japan Port Consultants, Ltd

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JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

DIRECTORATE GENERAL OF SEA TRANSPORTATION, MINISTRY OF TRANSPORTATION

THE STUDY FOR DEVELOPMENT OF THE GREATER SURABAYA METROPOLITAN PORTS IN THE REPUBLIC OF INDONESIA

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COMPOSITION OF GSMP REPORTS

Summary (English, Japanese and Indonesian)

Main Text

Volume 1: Existing Conditions and Issues

Volume 2: Future GSMP Development

The exchange rate used in the report is:

J. Yen 118 = US$ 1 = Indonesian Rupiah 9,200

(Average in 2007)

PREFACE

In response to a request from the Government of the Republic of Indonesia, the Government of Japan decided to conduct a study on Development of the Greater Surabaya Metropolitan Ports and entrusted to the study to the Japan International Cooperation Agency (JICA).

JICA selected and dispatched a study team headed by Mr. KUMAZAWA Ken of ALMEC Corporation, and consists of ALMEC Corporation and Japan Port Consultants, LTD. between November, 2006 and October, 2007.

The team held discussions with the officials concerned of the Government of the Republic of Indonesia and conducted field surveys at the study area. Upon returning to Japan, the team conducted further studies and prepared this final report.

I hope that this report will contribute to the promotion of this project and to the enhancement of friendly relationship between our two countries.

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of the Republic of Indonesia for their close cooperation extended to the study.

November, 2007

EIJI HASHIMOTO,
Deputy Vice President
Japan International Cooperation Agency

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ABBREVIATIONS

ADB	Asian Development Bank
ADPEL	[*Administrator Pelabuhan*] Port Administrator
ANDAL	[*Analisis Dampak Lingkungan]* Environmental Impact Assessment
ASEAN	Association Of SouthEast Asian Nations
BJTI	[*Berlian Jasa Terminal Indonesia*] Berlian Indonesia Terminal Service
BOR	Berth Occupancy Ratio
BOT	Build Operate Transfer
BPJT	[*Badan Pengatur Jalan Tol*] Toll Road Regulatory Agency
BPPLS	[*Badan Pelaksana Penanggulangan Lumpur Sidoarjo*] The Board of the Sidoarjo Mud Control
BPPPWS	[*Badan Pengelolaan Percepatan Pembangunan Wilayah Suramadu*] Suramadu Bridge District Development Acceleration Management Board
CD	Chart Datum
CDL	Channel Depth
CIQS	Custom, Immigration, Quarantine, and Security
CPO	Crude Palm Oil
CSD	Cutter Suction Dredger
DGST	Directorate General of Sea Transportation
DLKP	[*Daerah Lingkungan Kepentingan Pelabuhan*] Port Interest Area
DLKR	[*Daerah Lingkungan Kerja Pelabuhan*] Port Working Area
DUKS	[*Dermaga Untuk Kepentingan Sendiri*] Private Jetty
EDI	Electronic Data Interchange
EIA	Environmental Impact Assessment
EIRR	Economic Internal Rate of Return
EU	European Union
FDI	Foreign Direct Investment
FIRR	Financial Internal Rate of Return
FS	Feasibility Study
GKS	[GERBANGKERTOSUSILA] Gresik, Bangkalan, Mojokerto, Surabaya, Sidoarjo, Lamongan
GRDP	Gross Regional Domestic Product
GSMP	Greater Surabaya Metropolitan Ports
GRT/GT	Gross Register Tonnage / Gross Tonnage
IEE	Initial Environmental Evaluation
IMO	International Maritime Organization

JABODETABEK	Jakarta, Bogor, Depok, Tangerang, and Bekasi
JICA	Japan International Cooperation Agency
KODECO	Korean Development Corporation
KPLP	[*Kesatuan Penjagaan Laut dan Pantai*] Coast Guard
LWS	Low Water Spring
MISI	PT. Madura Integrated Seaport City
MSL	Mean Sea Level
NPV	Net Present Value
OD	Origin Destination
PANTURA	[*Pantai Utara*] North Java Coastal
PELINDO	[*PT. Pelabuhan Indonesia*] Indonesian Port Corporation
PELNI	[*Pelayaran Nasional Indonesia*] National Shipping Lines
PERTAMINA	State-Owned Oil Company of Indonesia
PIANC	The Permanent International Association of Navigation Congresses
PIER	Pasuruan Industrial Estate Rembang
PLN	[*PT. Perusahaan Listrik Negara*] State-Owned Electricity Company
PPP	Public Private Partnership
KAI	[*PT. Kereta Api Indonesia*] Indonesian Railway Company
PUSTRAL	[Pusat Studi Transportasi dan Logistik] Center for Transportation and Logistics Studies
RKL	[Rencana Pengelolaan Lingkungam] Environmental Management Plan
RORO	Roll On Roll Off
RPL	[Rencana Pemantauan Lingkungan] Environmental Monitoring Plan
STRAMINDO	Study on the Development of Domestic Sea Transportation and Maritime Industry in the Republic of Indonesia
SURAMADU	Surabaya – Madura
TGS	Total Ground Slot
THC	Terminal Handling Charge
TPKS	[*PT. Terminal Petikemas Semarang*] Semarang Container Terminal Branch
TPS	[*PT. Terminal Petikemas Surabaya*] Surabaya Container Terminal
TSHD	Trailing Suction Hopper Dredger
VAT	Value Added Tax
VTS	Vessel Traffic Management System

EXECUTIVE SUMMARY

GENERAL

For a long time, the port of Tanjung Perak has served as gateway to Surabaya city, the second largest city in Indonesia, serving vital sea connections with eastern Indonesia, western Indonesia and neighboring Asian countries. .Most of the key infrastructure for the Greater Surabaya Metropolitan ports (GSMP) were constructed in the late 19th century,, such as the Ujung Piring Lighthouse (in 1876), and in the early 20th century such as Tg. Perak (in 1910) and the training wall (pre-1937). These maritime infrastructures have been vital to the regional economy and trade until today, underscoring the long term vision of its planners..

The study area which is the direct hinterland of port development is the Gerbangkertosusila region or GKS, referring to the metropolitan area for Gresik, Bangkalan, Mojokerto, Surabaya, Sidoarjo and Lamongan. The GKS region is the second largest metropolitan setting in Indonesia, next to the capital region or JABODETABEK. While the population and GRDP of GKS is 39% and 28% of that of JABODETABEK, respectively, the economic gap is widening. Nonetheless, despite losing ground to the capital GKS has been able to sustain its share in seaborne traffic. Tanjung Perak Port handles more or less 40% of the international cargo of Tanjung Priok Port while it exceeds Tanjung Priok in domestic cargo throughput. It clearly shows that Surabaya's competitive edge stems from its seaborne trade.

After Tg Perak established its status as a national gateway port, some port facilities have been added to meet increasing and evolving shipping demand. These are concentrated along the coastline between Tg. Perak and Gresik in a rather fragmented manner. The port is clearly in need of further upgrading. Currently, there are several alternatives to meet development requirements and some are under active deliberation. So far, the Lamong Bay Container Port Project has been agreed upon; however with a limited scope of only 50 ha, being a compromise between environmental considerations and an urgent need to absorb increasing container traffic. Since a long-term port development blueprint has not been drawn yet, there is a strong need to develop one in an integrated way.

ISSUES RELATED TO METROPOLITAN PORTS DEVELOPMENT

The access channel at the Madura Strait has been historically revalued from the potent tool to the weak point in the regional maritime transport system. During the study's interview survey, many port users (shipping companies and forwarders) regarded the

access channel as a bottleneck in terms of depth, width, ATN, piloting service, and is a threat to ship safety. The study has calculated that the existing channel has a capacity to handle 27,000 ships per year. Amazingly, the channel traffic (29,558 ships in 2005, on both directions) has already exceeded its capacity. Therefore, sensitive channel operation is conducted by pilots such as one-way operation in the case of large ships.

The old terminals of Tg. Perak suffer from their century-old and antiquated infrastructure. Besides unproductive port services, many port users pointed out the costly and lengthy customs cargo inspection, e.g., red lane clearance of imported containers.

On the other hand, many port users appreciated the land-side accessibility to Tg. Perak by using mainly two toll roads and marginally freight rail at least before the mud flow disaster at Porong, Sidoarjo in June 2006. Since then, the shippers located southward beyond the site must bear additional port access cost and time. Based on the study's interview survey, all the respondent factories suffer longer port access time by 2.3 times with a trucking surcharge of 18%. The increased cost for land transport due to the mudflow is estimated to be US$ 36 per TEU.

The study has projected that port traffic would be increasing from the current 45 million tons to 115 million tons in 2030. The results highlight the following planning parameters:

- Even with the Lamong Bay project, a new container wharf will become necessary before 2020. The required additional container berth length is 2,550 m for handling 2.7 million TEU in 2030 at a third gateway port in the region.
- The required length of non-container wharves for general cargo, dry bulk and tanker will gradually increase from 1,920m in 2015 to 5,160m in 2030. Some committed projects such as expansion of Gresik Port, and a couple of new private jetties at Gresik will be able to meet the near future requirement.
- The number of overall ship calls is estimated to be 29,040 in 2030. It would then be impossible for the access channel to accommodate all the traffic even if it could be improved to accommodate very large vessels like Post Panamax vessels.

For identifying the suitable site for port development, the study comparatively analyzed six (6) candidate sites, as follows: (i) Lamong Bay in Surabaya City, (ii) Gresik South and (iii) Gresik North in Gresik Regency, (iv) Socah, (v) Tanjung Bulupandan, (vi) Tanjung Bumi in Bangkalan Regency. Considering various factors, it was determined that Socah and Tg. Bulupandan are the most suitable candidate sites, while other candidate sites are deemed to be unsuitable primarily due to limited land for port development in and near Surabaya City, and the unsuitable soft soil and pipeline installation at north Gresik or the northern

coast of the Mireng River. On the other hand, a wide waterfront areas with plentiful land is available at Socah and the north coastline of Madura Island Further considering the availability of deep water and land into account, Socah is the only site left underdeveloped along the Madura Strait. Meanwhile along the northern Madura corridor, Tg. Bulupandan is considered the best location for large-scale port development. In Madura Island, however, there has been almost no infrastructure development such as road, water, electricity except the on-going Suramadu Bridge project.

SHORT-TERM IMPROVEMENT PLAN

The study conducted several natural condition surveys and simulation works of channel siltation. In conclusion, the study proposes to improve the access channel to be -12 m deep and 200 m wide. The improvement plan requires an initial capital dredging of 6.9 million m^3 and an annual maintenance dredging of 2.4 million m^3 for sustainable operation. In addition, it is suggested that two shoals located besides the channel and in front of Gresik Port be removed for safe navigation, requiring a further 2 million m^3 of dredging. According to the proposed implementation plan, after some preparatory works, the initial capital dredging will be done in 2011, costing US$ 67 million. The plan also includes VTS installation to effectively control ship movement in two directions.

The study endorses the Jamrud Terminal rehabilitation project, facing the access channel at Tg. Perak. The project is expected to have a good synergy effect with the access channel improvement project, by reconstructing the existing old terminal with wider apron and deeper berth up to -12 m. The project cost is estimated at US$ 38 million.

Some important port access projects on the land transport side are identified for the short-term. They are (i) a diversion route between the Sidoarjo – Gempol Toll section (12 km), (ii) the Tg. Perak – Suramadu Bridge section (5 km as part of Surabaya Eastern Ring Road), (iii) two new toll roads of Waru – Mojokerto and Gempol – Pasuruan, and (iv) improved and new rail branch lines for port access to Tg. Perak and Lamong Bay, respectively. The first project (i) is deemed urgent while the others can be done by 2015.

LONG-TERM DEVELOPMENT PLAN

The study proposes that a new metropolitan gateway port be constructed at Tg. Bulupandan, Bangkalan, Madura. The site has several unique and highly advatnatageous features compared with other sites, including access to deep water with its own approach channel and breakwater, possible integrated hinterland development and thereby large regional development impact, sparsely inhabited local residents who are supportive and cooperative attitude towards port development, enough land for potential future expansion

and the provincial government efforts to promote the project through the provincial spatial plan and other means.

In the project, Ko'ol Bay will be fully reclaimed and eight (8) container berths (-14m or -15m deep) with a container yard of 203 ha will be developed. The total cost is calculated at US$ 870 million over 2 phases. With this plan, EIRR is estimated at 17.2% while FIRR is 6.9%. Initial Environmental Examination (IEE) of the project identified necessary mitigation measures for the physical, biological and social environments due to the project's large scale.

It is further suggested that Socah be developed as a non-container port, handling general cargo and others, with up to -12m depth. The development should be harmonized with the hydraulic properties of the Madura Strait.

The two port sites have enough potential for associated hinterland development, thus an elaborated land use and infrastructure plan would be needed, delineating port and logistics use, industrial activity, residential area and others in an orderly and functional manner. New port access roads from Suramadu Bridge are also a prerequisite to support such port and port city development.

RECOMMENDATIONS

The most urgent critical issue is not the ports in the case of Surabaya. The key issue is the access channel along the Madura Strait, and it is recommended that the proposed access channel improvement project be implemented. The study has confirmed the project's importance from both traffic management and shipping operators' view. The proposed project is doable and a high economic return for the regional economy is anticipated.

The study has further observed that the Madura Strait is at peril in terms of endowed maritime infrastructure because of uncoordinated port development, uncoordinated pipeline installation and poor access channel maintenance and operation. There is a strong need to synergize among the relevant agencies to keep its essential multi functions for the regional development. For a coordination body, the establishment of a "Madura Strait Management Committee" is recommended, consisting of related line agencies such as transport and energy, local governments, port operators and other users. As one of coordination principles, the study recommends to use the "hydraulic rule of the Madura Strait" identified by the study, to avoid negative development which affects ports and shipping.

In the long term, the study recommends the construction of the Tg. Bulupandan port project as a regional gateway port, which would take over the function of Tg. Perak port

group. As the next step towards this end, a feasibility study is needed. Since the port project has implications and opportunity in regional development, the next study should not be limited to the port development, It is suggested that the study encompass related regional development issues such as associated direct hinterland development.

During the study, it was increasingly recognized that Madura Island has momentum in terms of regional development in conjunction with the construction of Suramadu Bridge. The bridge project is designed to accelerate island development while addressing urban land scarcity at the Surabaya side, rather than merely replacing the present ferry service. Under such regional development context, Tg. Bulupandan new port will become another core infrastructure development benefiting container shipping and users at a wider scope and stimulating direct hinterland development.

The study showed that the Tg. Bulupandan Port project has enough economic viability, however, financial IRR is not sufficient to attract private investors. Nonetheless, with the project the public sector will not need to undertake further access channel improvement at the Madura Strait. The recommended approach is a Public-Private Partnership (PPP) scheme wherein the public sector is responsible for non-earning asset construction such as breakwater, approach channel, etc. and should be further studied and elaborated. It should be noted that while a PPP schemes is attractive to the government it often delays the schedule of development and thereby causes a slowdown of economy, thereby such pitfalls must be carefully avoided.

Development Image of Tg. Bulupandan Port (Target Year 2030)

1 INTRODUCTION

1. For a long time, the port of Tanjung Perak has served as the gateway to Surabaya city, the second largest city in Indonesia, connecting with eastern Indonesia, western Indonesia and neighboring Asian countries.

2. During the course of the study, the study team learned most of essential infrastructure for the Greater Surabaya Metropolitan ports (GSMP) were constructed in the late 19th century like Ujung Piring Lighthouse (in 1876) and the early 20th century like Tg. Perak (in 1910) and the training wall (unknown construction year but it was recorded on the map surveyed in 1937). Those major maritime infrastructure have firmly supported the regional economy and trade until today.

3. Thereafter, some port facilities have been added to meet increasing and changing shipping demand along the coastline between Tg. Perak and Gresik in a rather fragmented manner. At present, however, its century-old and antiquated maritime infrastructure system has critical issues such as unproductive port operation, restricted port access due to shallow access channel, increasing threats to safety and the environment. In addition, due to rising volume of port traffic, the metropolitan ports will surpass its design capacity in the near future.

4. Meanwhile, both the Central and East Java provincial governments are keen on attracting foreign and domestic investment in and around Surabaya City. Priorities are the development of infrastructure and industrial estates such as the Suramadu Bridge.

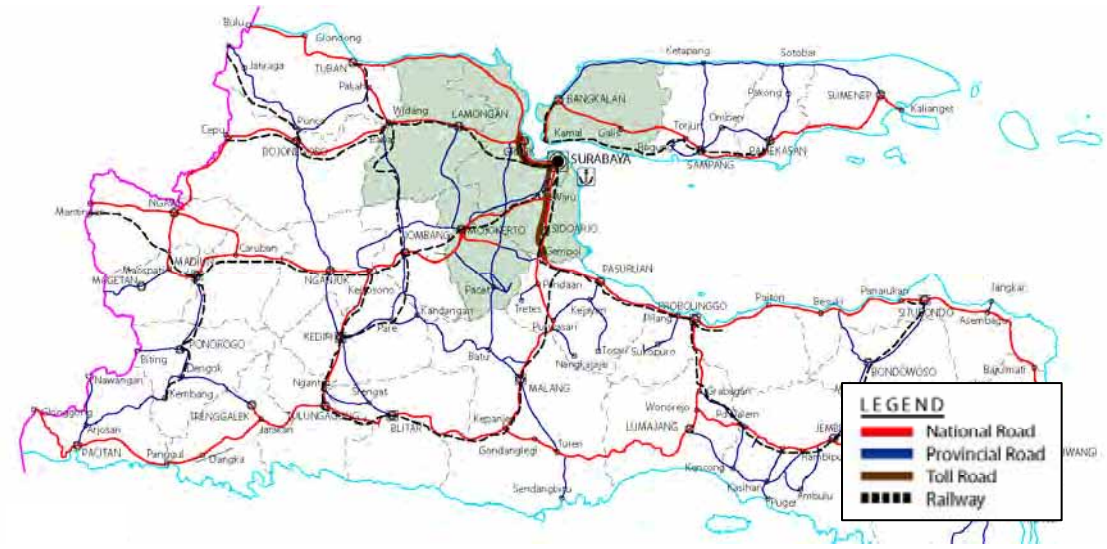
5. There are several candidate actions to meet development requirements and some are under deliberation. So far, Lamong Bay Reclamation Project has been agreed upon however with a limited scope of 50ha being a compromise between environmental considerations and an urgent need to absorb increasing container traffic. A long-term port development blueprint has not been drawn yet.

6. Given the above background, the Government of Indonesia requested the Government of Japan to provide technical assistance to formulate a long-term port development plan based on a long-term traffic demand forecast. In response, the Japan International Cooperation Agency (JICA) dispatched a preparatory survey mission in June 2006 and the Study's Scope of Work was signed at that time.

7. The objective of the Study is to formulate an integrated long-term port development plan for Surabaya and its adjacent areas including the western part of Madura Island to provide efficient port services for future maritime traffic. The target planning year is set as 2030.

8. The study area which refers to the direct hinterland of port development is the GERBANGKERTOSUSILA region or GKS, referring to the metropolitan area for Gresik, Bangkalan, Mojokerto, Surabaya, Sidoarjo and Lamongan (Figure 1.1).

Figure 1.1 Study Area (The GKS Region)



2 THE STUDY AREA

PHYSICAL AND NATURAL CONDITIONS

9. The GKS region is divided into 3 geographical areas: low plains, rolling hills and mountain area. The low plain areas with an elevation of less than 25m above sea level are located around the rivers, which include the center of Lamongan, the center of north Gresik, Bangkalan and Surabaya City. Coastal areas in Gresik, Surabaya and Sidoarjo, which are influenced by tides, are primarily used as fish ponds.

10. Figure 2.1 shows a satellite image of the study area. There are 3 sections where land pushes out towards the channel and are as indicated ①, ②, and ③ in Figure 2.1. As width of the strait is narrow, at those points, they are considered as "hydraulic control sections", where tidal current flows faster.

11. The study area has a tropical climate governed by the monsoon region in Southeast Asia. There are two main seasons in Surabaya City, i.e. the east monsoon from May to October, and the west monsoon from November to April. The former corresponds to the dry season and the latter to the wet season.

12. Data on tidal levels at several locations around the Madura Strait indicate that at the West Channel, the Mean Sea Level (MSL) is 1.10m above CD (Chart Datum) and while at Tg. Perak it is 1.50m above CD, based on the Z_0 value given by the Indonesian Hydrographic Office. In the Surabaya West Channel the water level can be expected to rise up to 1.9m above the CD at the pilot station and 2.6m at Tg. Perak. The tidal pattern is predominantly "diurnal" in the Java Sea.

13. According to the survey by PELINDO III and ITS in 2001, geotechnical conditions of the west side of the access channel, namely Lamong Bay and Mireng Bay, are as follows:

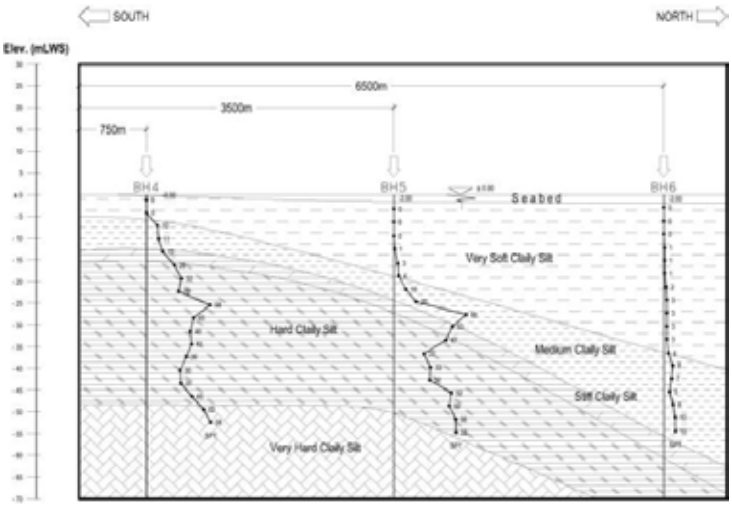
- From seabed, the soil foundation consists of very soft claily silt with thickness of 10-18m, soft claily silt of 1-5m, medium claily silt of 6-15m, stiff claily silt of 12-25m, and hard claily silt is located at LWS -40m - -60m. Figure 2.2 shows the soil profile north of Gresik.
- Their N-values are 0-5, 5-6, 8-26, 15-24, and 26-30, respectively.

14. Adequate support layer of piles appears more than 50-60m deep. Thereby, when the container berths of TPS were constructed, foundation steel piles were driven up to almost 70m depth.

15. On the other hand at the east side of the channel, i.e. Junganyar, Madura Island, the thickness of very soft claily silt and medium to stiff claily silt are thin, with thickness of 2-6m. Hard claily silt appears at LWS -6m - -17m.

Figure 2.1 Madura Strait from Satellite

Figure 2.2 Soil Profile at Mireng Bay (the northern part of Gresik)



Source: PELINDO III with ITS (2001)

DEMOGRAPHY AND ECONOMY

16. In year 2005, GKS has a population of 8.9 million, which is 25% of East Java population, and 7.0% of Java population. Since 1980, it has been growing at 1.35% per annum, which is the same growth rate of the national population However, the population growth did not occur mainly in Surabaya City but rather in areas adjacent to Surabaya, where remarkable industrialization took place in the 1990s. In the meantime, Surabaya City has a population of 30% of GKS and it has been growing at a modest rate, seemingly reaching to capacity. (Figure2.3).

17. With regards to sectoral profile of employment of the study area, two out of three are engaged in the agricultural sector in Lamongan and Bangkalan. Meanwhile, the manufacturing sector's share in Sidoarjo and Gresik was remarkably high, as they are strongly characterized as industrial towns. In Surabaya City, the trading sector dominantly stood at 34.5%.

18. The GKS economy has been steadily growing at a high rate between 6% – 10 % annually, except in 1998 where the 1997 financial crisis caused a sudden drop of 20% in 1998. After three or four years of stagnancy, the GKS economy as well as the national economy have fully recovered and seem to be poised for a sustained period of high growth. Historically, GKS is one of the growth centers in Indonesia, since it has always achieved higher growth than the national average. (see Figure 2.4) This is probably because the structural composition of the GKS economy is different with the secondary sector having a significantly higher share (48%) than the national average (35%).

19. Total investment since 1968 is US$ 62,668 million translating to an annual average of US$ 1,650 million, however most of investment occurred intensively during the period 1980 to 1997. Since 1998, the provincial economy received less investment every year compared with the historical average, except in 2001.

20. The GKS economy imports their materials or semi-processed products and export the same kind of products but with added value after processing. Surabaya economy depends heavily on imported energy, especially for oil and petroleum products for transport. The major industries of Surabaya economy at present are paper, chemicals, garments, mining, agro-industrial and consumable products. (Figure 2.5)

21. For exports, Japan and USA are the two biggest trading partners with a combined share of 47.8 %. For imports, Singapore has a dominant share of 35.2%, followed by China (18.3%).

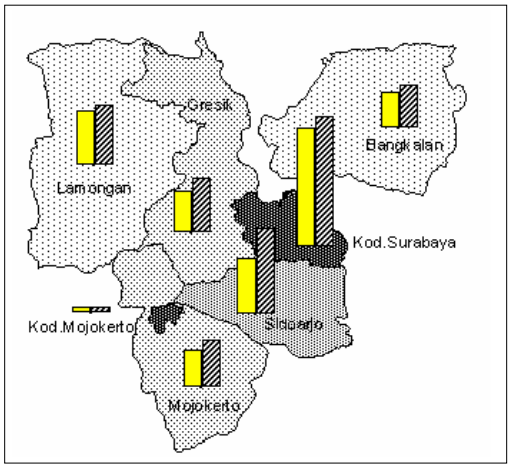


Figure 2.3 Population Growth and Density (above)

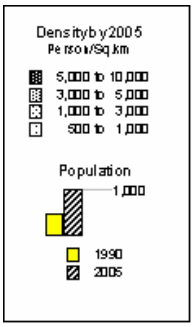


Figure 2.4 Economic Growth Trend (below)

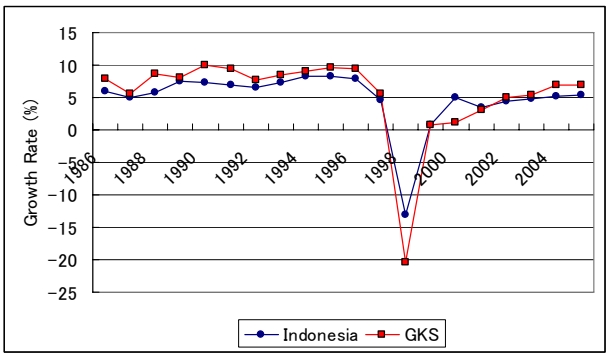
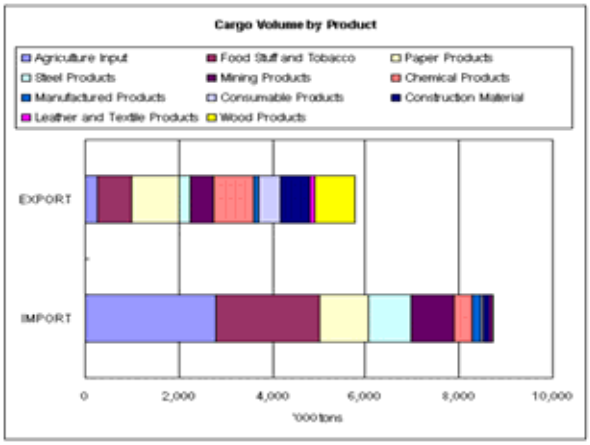


Figure 2.5 GKS Trade by Commodity



REGIONAL DEVELOPMENT TREND

22. The GKS region is the second largest metropolitan setting in Indonesia, next to the capital region or JABODETABEK. GKS population and GRDP is 39% and 28% of that of JABODETABEK, respectively, but the economic gap is widening. In 2006 GKS received an investment amount of Rp 10.6 trillion which is equivalent to only 12% of that of JABODETABEK in the same year.

23. Despite losing ground to the capital, GKS has been able to sustain its share in seaborne traffic. Tanjung Perak Port handles more or less 40% of the international cargo of Tanjung Priok Port while it exceeds Tanjung Priok in domestic cargo throughput. It clearly shows that Surabaya's competitive edge stems from its seaborne trade.

24. In GKS, there are six major industrial estates developed before the Economic Crisis, with a combined scale of 2,791ha, which is 34% of that of JABODEATABEK, for comparison. To revive industrial activities, more industrial estate development is desirable in line with accelerating logistics infrastructure development and institutionalizing attractive investment regime.

25. Two toll roads form the GKS inland freight corridors. These are Surabaya – Gempol Toll Road (43 km) and Surabaya – Gresik Toll Road (20.7km). During the Economic Crisis, four toll road projects under BOT scheme were suspended, resulting in stagnancy in toll road network expansion. They are:

- SS Waru – Tanjung Perak (13.5 km)
- Gempol – Pandaan (14.0 km)
- Gempol – Pasuruan (32.0 km)
- Surabaya – Mojokerto (37.0 km)

26. Under such situations, only the cable-stayed Suramadu Bridge started its construction in August, 2003 (see Figure 2.6 for current progress). The bridge will have two lanes in each direction plus an emergency lane and a dedicated lane for motorcycles. The 5.4-kilometer bridge is scheduled to open by the end of 2008. The total cost of the project, including connecting roads, has been estimated at 2.38 trillion rupiah (US$320 million).

27. At present, the strait crossing ferries provide essential passenger and freight transport between Surabaya and Bangkalan in Madura Island. The bridge construction would particularly benefit vehicle users, estimated to be 4,115 two-wheel vehicles and 2,252 four-wheel vehicles daily in 2005. While there is appreciable traffic, the present traffic may not make the bridge project financially viable. Benefits thereby must be accrued through the development of Madura Island, and generating new traffic as a result of stimulated social and economic activities.

28. The recorded population of Madura Island in 2004 stood at 3.5 million larger than the 2.6 million population of Surabaya City. However, in Madura, people are almost evenly scattered over the island in agricultural villages and small towns. The population density of Surabaya City is thereby 13.5 times higher than that of Bangkalan Regency. In developing the island, local culture and economic disparity (poverty incident rate of 65.7%) must be duly considered.

29. Since the island has limited accumulation of capital investment, there has been almost no infrastructure development. The situation is outlined as follows: (i) very low density road network, (ii) no land public transport, (iii) limited supply of electricity (10.9% in Bangkalan) and (iv) almost no piped water service (1.3% in Bangkalan).

Figure 2.6 Progress of Sura-Madu Bridge Construction

Madura Side

Central Part

Surabaya Side

3 EXISTING PORTS AND SHIPPING SERVICES

METROPOLITAN PORTS SYSTEM

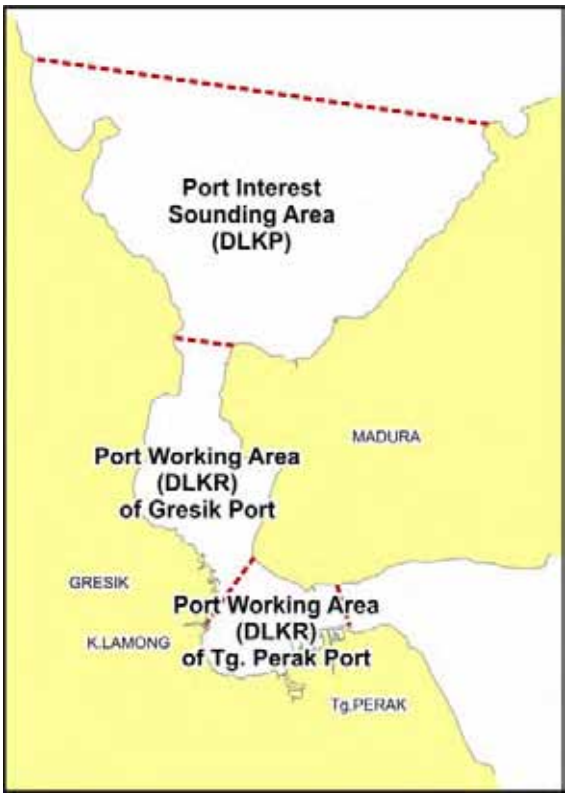
PORT ADMINISTRATION

30. In the Study Area, several public ports are operational, as follows in a hierarchical order: one International Hub Port (Tg. Perak), two National Ports (Gresik and Kamar), one Regional Port (Telaga Biru) and one Local Port (Sepulu).

31. Surabaya Port Area was designated for ship navigation and safety based on No.KM22 of 1990, which consists of land and water areas which are divided into the Port Working Area (DLKR) and the Port Interest Surrounding Area (DLKP) – although technically, DLKP includes the DLKR. Tg. Perak DLKR has a land area of 517ha and a water area of 4,675 ha; meanwhile, Gresik DLKR has a smaller land area of 96 ha but a larger water area of 8,149ha. The Surabaya Port DLKP exclusive of the two DKLR has an area of 35,125ha.

32. The Ministry of Transportation has two subordinate operation lines: ADPEL (port administrator) for port safety and security and NAVIGASI (navigation office) for aids to navigation. The SAR force (KPLP) is assigned under ADPEL.

FIGURE 3.1 PORT AREA



PORT OPERATION

33. Meanwhile the port management body of PELINDO III has two offices: Tg. Perak and Gresik, however the Tg. Perak Branch provides all pilotage and tug services. Tg. Perak Branch Office has 8 divisions with 485 regular staff and 198 outsourced staff. Within the port, there are two subsidiary port operators under PELINDO III: PT. TPS (corporatized in 1999) and PT. BJTI (established in 2002). PT. TPS, with 600 regular staff and 1,110 outsourced staff, completely manages TPS or Surabaya Container Terminal. On the other hand, PT. BJTI, employing 194 regular staff and 1,117 outsourced staff, operates Berlian Terminal but its berth allocation is controlled by Tg. Perak Branch Office. Finally, Gresik Branch Office is operated by over 50 staff.

34. The access channel at the Madura Strait is managed and operated by 3 organizations. ADPEL of Tg. Perak supervises the channel traffic through its KPLP patrol boats. Tg. Perak Branch Office of PELINDO III provides channel maintenance on behalf of DGST, pilot and tug services, noting that if a ship is greater than 500 GT, pilot service is obligatory. Lastly, District NAVIGASI is responsible for disseminating channel information and operating aids to navigation.

35. Port security and safety as well as sea traffic in territorial waters and in ports are under the supervision of ADPEL. Port state control, i.e. the inspection of foreign ships to verify compliance with IMO requirements, is under the safety department of ADPEL. Currently, ISPS code is in operation at Tg. Perak and Gresik ports.

TABLE 3.1 PORT CHARGES, BY COLLECTING BODY

Kind of Charge	Collecting Body	Note
Navigation Charge	Harbor Master (ADPEL)	Set up at 2000 Charge is based on GRT
Port Charge	PELINDO III	Charges are based on GRT
Harbor Berthing / Staying Charge		
Pilot Service Charge		
Tug Service Charge		
Quay / Pier Usage Charge	PELINDO III/TPS	Charges are based on ton / m^3 / box
Handling Charge	TPS / BJTI	
Warehouse / Opne Shed Usage Cahrge	PELINDO III	

Source: Interview result by the Study Team

PORT OF TANJUNG PERAK

PORT DEVELOPMENT

36. Port of Tanjung Perak is located along the strait of Madura, to the north of the city of Surabaya with Madura Island acting as a natural breakwater for the port. Port of Tanjung Perak started its activity from Kalimas Terminal in the middle of the 19th century and most of the existing terminals were constructed by 1910. The latest terminal is TPS which was initially opened in 1991.

37. Presently Tanjung Perak has a berthing length of 9,295m with 8 terminals, namely TPS, Jamrud Terminal, Ro-Ro Terminal (Perak Terminal), Mirah Terminal, Intan Terminal, Berlian Terminal, Nilan Terminal and Kalimas Terminal. The berth depth varies from -2.0m (Kalimas) to -12.0m (TPS).

PORT TRAFFIC

38. The container throughput at Tanjung Perak Port has been increasing gradually, and reached 1.85 million TEUs (1.51 million boxes) in 2006, including international and domestic containers. The growth of domestic containers is much higher than that of international containers.

39. Most of container handling is done at TPS, but since the inception of BJTI in 2003, it has rapidly increased its share of container cargo handling because of its cheaper charge than that of TPS. Interisland containers are mostly handled at BJTI, but because of lack of space, some of the interisland containers have to be handled at conventional terminals. (see Figure 3.2)

40. After the economic recession, the non-container trade through the port has been decreasing at a significant rate. The cargo throughput in 2006 is almost 11 million tons, less than 60% of the peak year volume. The international and domestic cargos account for 40% and 60% respectively; and, domestic inbound cargo exceeding domestic outbound cargo. Attributable factors on traffic decrease are regional economic recession particularly sluggish export industries, the transfer of bulk cargo handling to Gresik Port and other private jetties at Gresik. (Figure 3.3)

41. After the volume of maritime passengers peaked in 2000, i.e., 1,792 thousand, it has been decreasing year by year, though it has somewhat stabilized in recent years (863 thousand in 2006). (Figure 3.4) The reason is said to be the strong competition coming from airline services. On the other hand, the number of RoRo ships has been increasing in the last decade, carrying 197 thousand passengers in 2006.

42. The number of ship calls in 2006 was 15,467 units by Tg. Perak Branch Office while TPS received 1,471 container ships in 2006. Since 2001, increasingly larger ships for oceangoing have been assigned to call at Tg. Perak.

Figure 3.2 Container Throughput at Tg. Perak

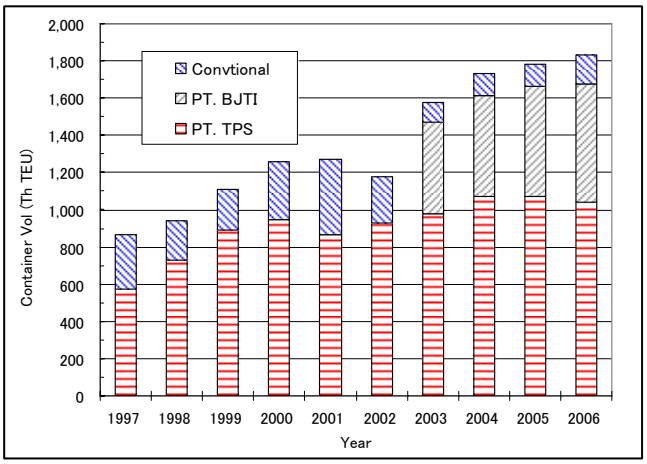


Figure 3.3 Non-container Cargo at Tg. Perak

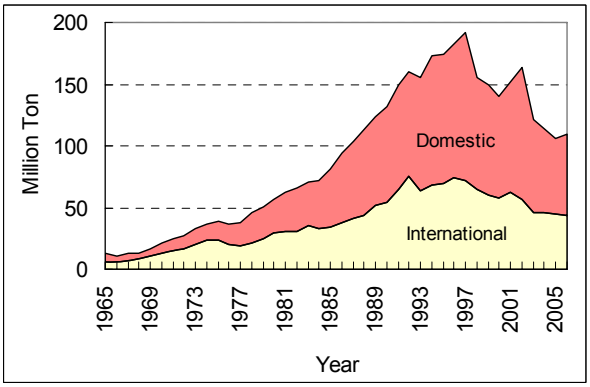
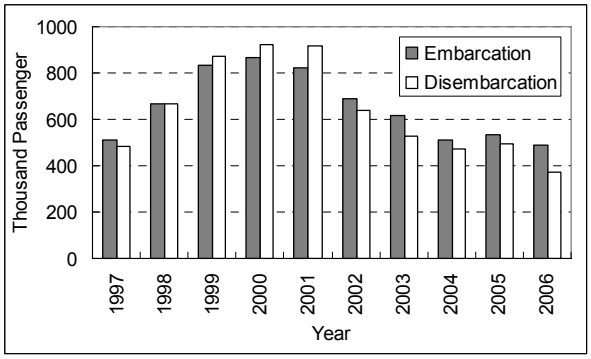


Figure 3.4 Passenger Traffic at Tg. Perak



OTHER PORTS

GRESIK

43. The management and operation of Gresik Port was transferred to PELINDO III in 1996. The port plays a significant role as a dry bulk terminal for goods such as coal and wood, handling nearly 5 million tons in 2006.

44. The port has a 1,315m berth length, with depths ranging from 3 to 6 m. Thus it is mostly suitable for domestic ships up to 3,500 GT and most of the port calls are made by interisland vessels and some by traditional ships. The average ship size is recorded at 500GT.

OTHER PUBLIC PORTS

45. Port of Telagabiru is located at Tanjung Bumi, a trading town at the northern coast of Madura Island, about 60km away from the Port of Kamal. Today, the port functions as a shipment port for live animals, e.g., shipping out over 30,000 cows in 2006, and a supporting port for submarine oil exploitation, handling 4,000 barrels in 2006.

46. Port of Sepulu is located along the same coast of Telagabiru, 10 km to the west. The port services only for local trade by small ships.

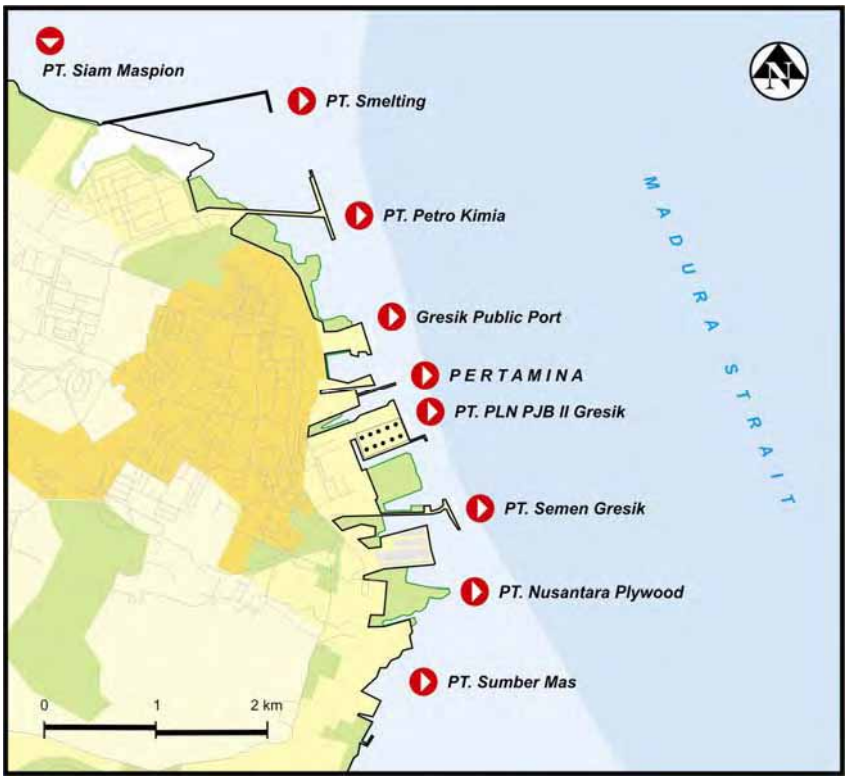
47. Both ports were constructed during the Dutch colonial era. Commonly, they have two breakwaters each to make an internal port basin. Currently both ports are severely constrained as a result of siltation arising from poor maintenance.

PRIVATE PORTS AND JETTIES

48. Around Gresik Port, there are 8 private ports and jetties. From the northern end, they are as follows:,(i) PT. Siam Maspion Terminal (chemical industry), (ii) PT. Smelting (iron and copper), (iii) PT. Petrokimia Gresik (fertilizer, urea, ammonia), (iv) PT. Pertamina Asphalt (asphalt), (v) PT. PLN (thermal power generation), (vi) PT. Semen Gresik (cement), (vii) PT. Indonesia Marina Shipyard (shipbuilding) and (viii) PT. Nusantara Plywood (plywood).

49. These ports hold a port operation right or DUKS (*dermaga untuk kepentingan sendiri*) for mostly dedicated use. The jetty of these ports varies in length and depth, among them, PT. Petrokimia Gresik owns the longest (675m) and deepest (12m) jetty. The total cargo throughput was 1.8 million tons in 2005.

Figure 3.5 Alignment of Public and Private Ports in Gresik



EXISTING SHIPPING SERVICES

CONTAINER SHIPPING

50. Container trading ports of Tg. Perak are mostly regional hub ports like Singapore, Tanjung Pelepas, Port Klang and Hong Kong. In recent years, trading ports have been diversified with increasing direct container shipping services such as Khor Fakkan (UAE), Mumbai (India) and other Asian countries. Due to capacity limitation at the port and channel, the largest ship has a capacity of 2000 TEU in 2006.

51. For inter-island container shipping, Tg. Perak has strong ties with Banjarmasin, Makassar, Jakarta and Benoa. Additionally, many other liner routes connect Tg. Perak with ports of East Indonesia.

NON-CONTAINER SHIPPING

52. International non-container shipping of Tg. Perak has a variety of trading ports within Asia and Oceania, with Singapore as the largest. However, non-conatinerized shipping is smaller compared to container shipping.

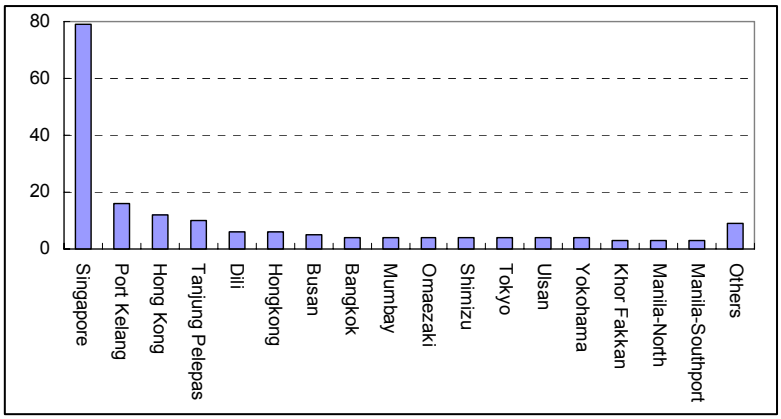
53. For domestic trade, the ports of Tg. Perak and Gresik handle large volume of cargoes to Jakarta, East Kalimantan and South Sulawesi. On the other hand, unloaded cargoes mainly come from East Kalimantan and Sumatra.

PASSENGER SHIPPING

54. PT. PELNI, a state-owned company, provides passenger shipping service all over the country. Since Tg. Perak is one of hub ports, PT PELNI assigns many ships and routes to call at Tg. Perak.

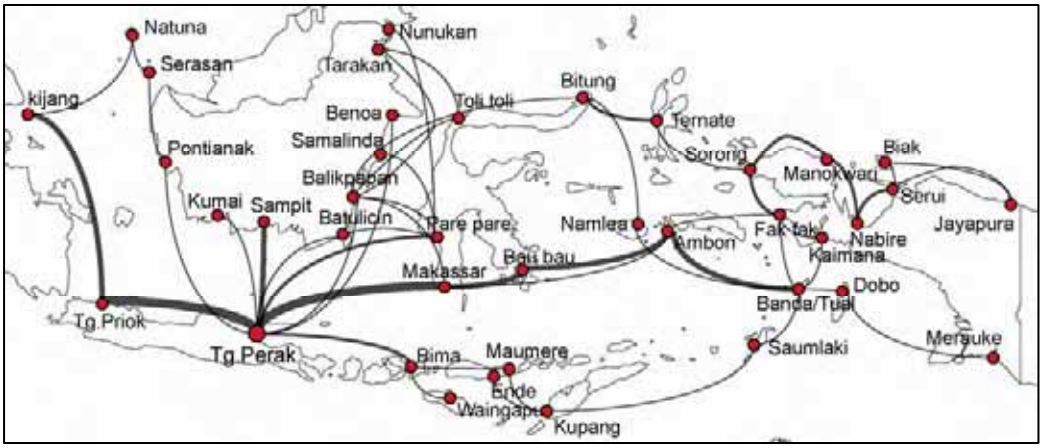
55. RoRo shipping services, transporting vehicles and passengers, are provided by two private operators, PT. Dharma Lautan Utama and PT. Prima Vista, connecting with Kalimantan and Sulawesi islands.

Figure 3.6 International Container Shipping Calls



Source: Indonesia Sailings January 2007

Figure 3.7 Domestic Passenger Shipping Routes



Source: PT. PELNI, 2007

4 EXISTING ACCESSIBILITY TO GSMP

EXISTING ACCESS CHANNELS

CHANNEL OPERATION

56. There are two channels that give access to the ports of Tg. Perak and Gresik: the Surabaya West Access Channel from the Java Sea and the Surabaya East Access Channel from the Bali Sea. Since the east channel is shallow (and wide), most of modern vessels use the west channel.

57. The west channel is 25 NM in length and the section between Buoy No. 2 and No. 7 has a narrow width of 100 m. Maintenance dredging is programmed to maintain a depth of 10.5 m and a width of 100 m. Five (5) anchorage zones are designated between Gresik and Tg. Perak.

58. The aids to navigation along the west channel and the anchorage zones are as follows 2: lighthouses, 24 lighted buoys, 13 unlighted buoys and 13 light beacons. So far no VTS is provided.

59. Maintenance dredging is necessary for the channel and the port, and dredging was done in 1997, 2002 and 2005. The latest dredging volume was 687,000 m^3. Also, both Tg. Perak and Gresik require periodical dredging. For example, the Tg. Perak's basin needs an annual dredging volume of 300,000 m^3.

60. Due to the narrow and shallow west channel, pilotage is compulsory for ships larger than 500 GT, and large ships over 8 m in draft could not pass or cross each other in the channel. Ship sailing speed along the channel is limited to less than 8 knots.

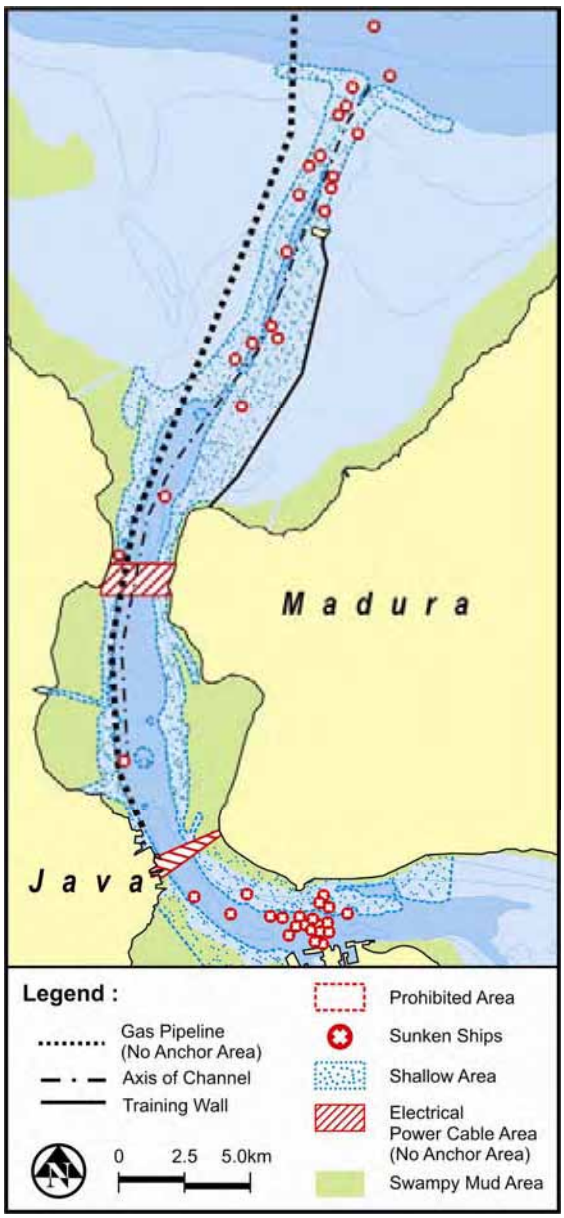
CHANNEL OBSTACLES

61. The west channel must also cope with many obstacles. On the navigation chart, there are 14 wrecks and 5 obstructions along the west channel. In addition, there are 24 wrecks are in front of Tg. Perak. Furthermore, there is a submarine gas pipeline that runs along the west channel at the Gresik side; a training wall of 13km was constructed during the Dutch era at the Madura side; and, the PLN power cable crosses the channel to provide electricity to Madura Island. Lastly, one hidden shoal of hard seabed material with a depth of only 4.7m lies in front of PT. Smelting Pier.

62. The Surabaya West Access Channel is thereby considered as one of the more dangerous routes for navigation. The most critical black spot lies at the entrance of the channel or between the buoys of No. 5 and No.7. Frequent accident types are brushing and crashing between two ships. Running aground also sometimes happen.

63. Moreover, the PLN's submarine power cables have been cut off by the anchors of drifting ships 10 times since its installation in 1987. The most serious incident happened in 1999, resulting in a complete blackout of Madura Island for almost 4 months.

Figure 4.1 Existing Obstacles against Seaborne Traffic at Madura Strait



Source: JICA Study Team

EXISTING LAND ACCESSIBILITY

ROAD TRANSPORT

64. The study conducted the truck counting and interview survey at several terminal gates of Tg. Perak during the period 16-20 December 2006, with the following sample sizes: (2,585 drivers of container trucks (sample rate: 5.3%), 1,255 drivers of non-container trucks (10.8%) and 153 drivers who use RoRo ships (5.3%).

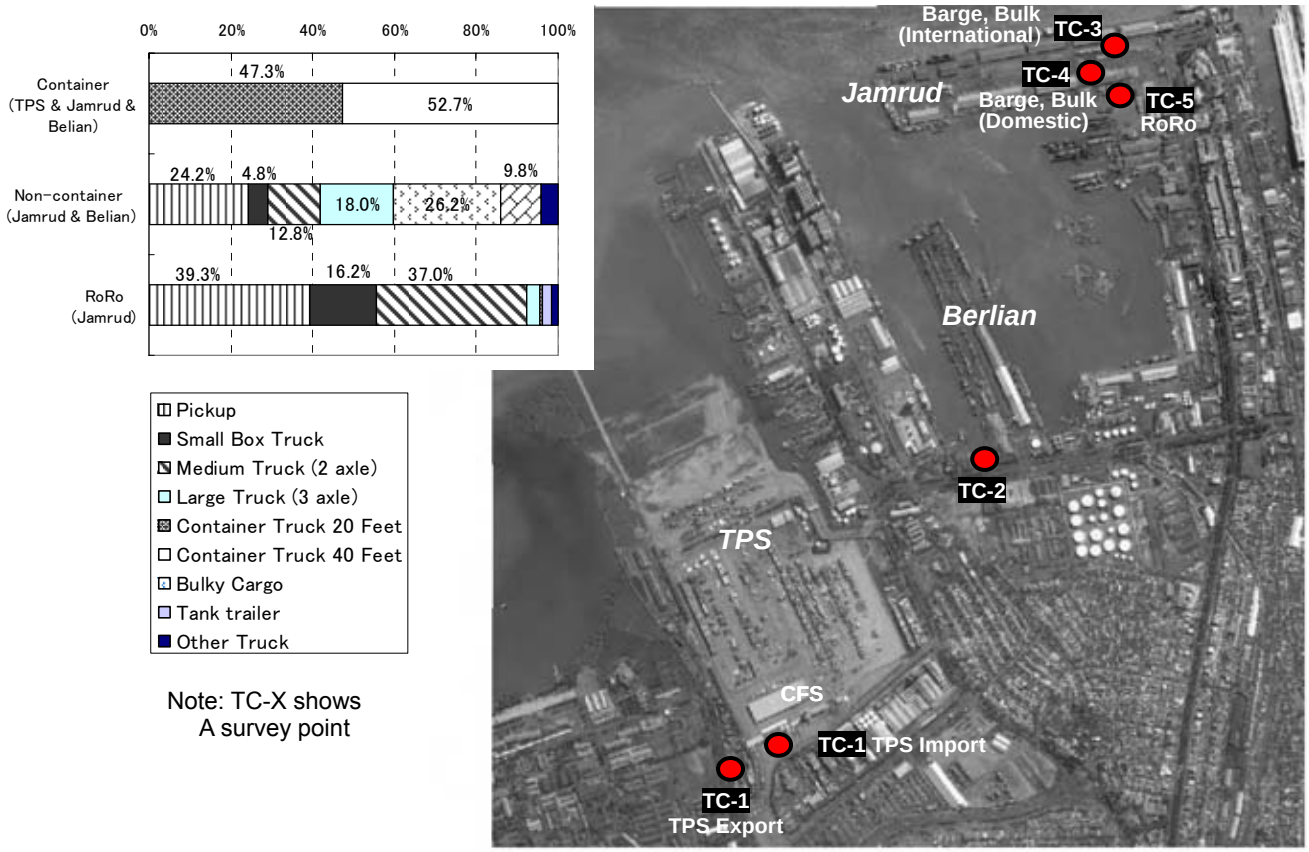
65. The survey locations and the vehicle count per type are illustrated in Figure 4.2. The results show that 20-foot trailers and 40-foot trailers were almost equally used. Non-containerized cargoes were carried by a variety of vehicles while Ro-Ro trucks are commonly medium trucks or smaller (92.5%).

66. The survey also included information on vehicle origin and destination (O-D) patterns. As for container haulage, Surabaya and Gresik account for 60% of outbound port cargo and 65% of inbound port cargo. Kota Mojokerto, Pasuruan, Malang and Probolinggo have larger outbound cargo than inbound. On the contrary, Sidoarjo has more inbound cargo than outbound. Meanwhile, Madura Island was not recorded to have any container haulage. As for non-container cargo and RoRo cargo, Surabaya is dominant as both cargo origin and destination. Finally, Gresik cargo does not seem to utilize Tg. Perak due to the existence of Gresik Port.

RAIL TRANSPORT

67. Two stations are important to serve port traffic: Kalimas Station for container cargo and Pasar Turi Station for other cargoes. The Directorate General of Railways has budgeted for rehabilitation and capacity expansion of the port branch line in 2007. When it is completed, PT. KAI will resume service at new double tracks.

Figure 4.2 Survey Points and Port Access Vehicle Types at Tg. Perak



PORT ACCESS HAMPERED BY MUDFLOW DISASTER

DISASTER DETAILS

68. The mudflow started on 29 May 2006 at the natural gas field operated by PT. Lapindo Brantas in Porong, Sidoarjo, along Surabaya-Gempol Toll Road. On 22 November 2006, the second incident occurred. The gas pipeline crossing over the area inundated by mud was broken and exploded, killing 12 persons.

69. The mudflow has completely choked the toll road operation in the area and sometimes causing temporary suspensions of the railway. A large number of people were also displaced, i.e., 3,300 families or 16,500 persons by October 2006. As of June 2007, the number of people affected directly by the mudflow disaster reached 30,000. So far, no effective technical solution to stop this mudflow has been found.

RESTORATION EFFORTS

70. Under the Presidential Office, the Board of the Sidoarjo Mud Control (BPPLS) was established in April 2007. The board has been coordinating the realignment of the toll road, railway, water and power transmission lines and gas pipeline under an area-wide restoration scheme to be delineated with dikes. The total cost for the relocation of transport infrastructure (only) are estimated at around Rp 2.05 trillion or US$ 230 million.

Figure 4.3 Disastrous Conditions

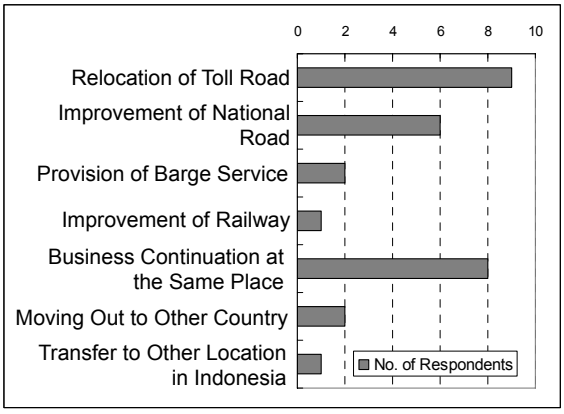
IMPACT ESTIMATE ON PORT ACCESS

71. It has been commonly recognized among the business persons who have an operation base at Tg. Perak that the mudflow disaster seriously affects port access, particularly export cargo to be dispatched from the southern industrial estates beyond Sidoarjo. In order to understand those cargo owners' port access conditions before and after the disaster, the study conducted a supplemental interview survey. All the 9 respondents are Japanese invested factories, 7 of which are located in Pasuruan Industrial Estate Rembang (PIER).

72. On the average, all the respondent factories suffer from longer port access time by 2.3 times with a trucking surcharge of 18%. The increased cost for land transport due to the mudflow is estimated to be US$ 36 per TEU. Taking the spatial distribution of industrial activities in the region into account, the increased container haulage costs passing this area would be around US$ 6.75 million per year, which could be considered as a direct financial loss shouldered by port users. If associated indirect economic losses were added to the direct financial loss to gauge the overall economic loss, in broad terms, the value of such economic loss could be 2-3 times higher than the direct loss, or US$ 13-20 million per year.

73. Clearly, the southern port users have been severely suffering from the disaster. Based on the interview result, however, most of them intend to continue operation, so therefore urgent transport infrastructure restoration and redevelopment is badly needed. It is also noted that only one respondent is contemplating to transfer to another location in Indonesia while two are contemplating to move to other countries.

Figure 4.4 Interview on Mud Flow Impact



5 ASSESSMENT ON EXISTING GSMP

COSTS AND SERVICES

REVENUE AND COST STRUCTURE

74. PELINDO III owns many assets and subsidiaries and directly provides various port related services. Its operational revenue is reported at Rp 1,783 billion in 2006. The largest revenue earner is the subsidiary container terminal operators (PT. TPS and PT. TPK in Semarang), having a share of 55%, followed by vessel navigation service (16%), and cargo handling service (10%).

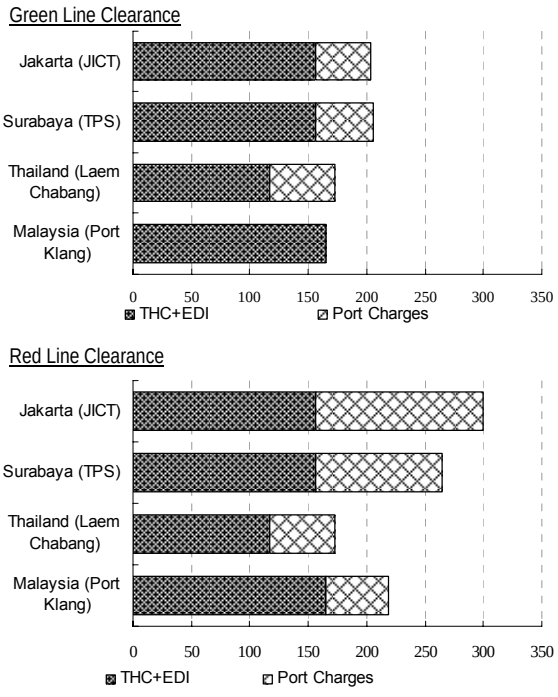
75. At TPS, per TEU revenue is calculated at Rp 749 thousand on the average over the period 2005 and 2006. On the other hand, per TEU expenditure is calculated at Rp 376 thousand excluding tax. The difference is a profit margin and a resource for dividend payment to shareholders including PELINDO III.

OPERATION PRODUCTIVITY

76. At TPS, the total working hour per gantry crane is 40 hours for an international ship and 23 hours for a domestic ship. The productivity is 25.35 boxes/crane/hour.

77. For non-container cargo handling, Tg. Perak shows lower productivity compared with Tg. Priok except dry bulk although berth occupancy rate (BOR) is already high, e.g., 58% at Jamrud and 65% at Nilam/Berlian. Cargo handling productivity should therefore be improved.

Figure 5.1 Comparison of Port Related Charges



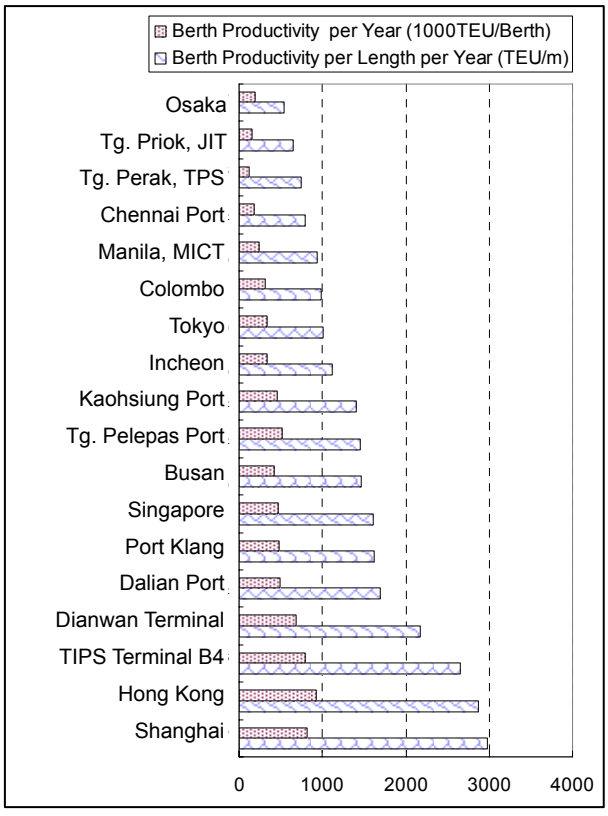
Source: JICA Study Team

INTERNATIONAL SERVICE COMPARISON

78. A uniform port tariff is applied to container shipping at all ports in Indonesia. Shipping companies also set a uniform terminal handling charge (THC), which is US$ 95 for 20-footers and US$ 145 for 40-footers which is not so different in comparison with that of neighboring countries. However, additional port charges such as lift-on/lift-off charges are sometimes expensive particularly in the case of red line clearance, and requiring several days for physical inspection. Such cost and time still lowers international competitiveness of Indonesian ports, nonetheless the government has declared to lower container handling charge by 25% in 2005.

79. The TPS berth productivity is calculated at 179,000 TEU/berth or 790 TEU/m which is not high compared with major international ports. Major factors are low BOR (36.9% in 2006), small ship size and small container handing volume per ship call.

Figure 5.2 Comparison of Container Berth Productivity



Source: Based on Containerization International 2007

PORT USERS' ASSESSMENT

FROM SHIPPING COMPANIES

80. A shipping company survey was conducted among 20 container shipping operators and 14 bulk and break bulk operators to analyze user's satisfaction of Tg. Perak port services. The following are key results:

81. Container ships wait relatively shorter time at anchorage point of less than 6 hours (for 44% of respondents) while bulk ships wait much longer for 1-2 days (50%) Similarly, container ships stay at berth shorter (1 day for 67%) than bulk ships (2-3 days: 40%). The respondents also pointed out that imported container inspection takes time, i.e., only half of containers are inspected within one day.

82. The shipping companies indicated varied satisfaction levels of port and trade related charges, though generally, container operators have higher levels of satisfaction.

83. The shipping companies show the highest dissatisfaction with customs cargo inspection (38% for container operators and 42% of bulk operators). Some companies also noted that longshoremen usually start to work late and leave early – thereby increasing port time.

84. A detailed interview survey was also conducted on 10 companies to identify their urgent improvement requirements and current constraints. All respondents pointed out problems in the antiquated features of Tg. Perak, as well as issues relating to the access channel such as poor navigational aids, shallow depth, narrow breadth and vessel operation or pilotage service (Table 5.1).

FROM FORWARDERS

85. A forwarder survey was also conducted with 32 respondents. Respondents are not satisfied with the old facilities, invisible costs and the access channel. The results mirror that of the shipping companies at most areas. Furthermore, the interviewed forwarders consider that port security and roads outside the port area are urgent matters for improvement.

Table 5.1 Bottlenecks at Tg. Perak

Items		No. of Answers	Comments
Navigation Aid System		9	• Sometimes No2 and No5 buoy lights do not work. They are not repaired at once. Straight channel is better.
Channel	Depth	7	• Current Depth -10.5m should be always maintained. • Desired depth is -12m.
	Breadth	6	• Narrow channel causes ship's delay and ship accidents. • Expected width is to allow 2 way navigation.
	Calmness	1	• Outer channel is not good during monsoon time.
Basin	Location	3	• Sometimes a pilot cannot board from a pilot boat to a ship.
	Area Size	1	• Inner anchorage area is not enough for waiting ships.
	Calmness	1	• Current speed is rather fast, so sometimes anchoring ships drift during strong wave.
Berth	Location	1	• TPS location is good. Half of interisland terminal of TPS cannot be used because of its shallow depth.
	Length	2	• Total length of conventional terminal is not enough for demand. • Some shipping companies have already cancelled some of their ship calls at TPS because of lack of available berths with necessary depth
	Depth	2	• Depth of conventional terminal is not enough for international/interisland ships.
Container Handling		2	• Handling speed is a little bit slow than users' expectation.
Vessel Operation		4	• Piloting service is not good and sometimes capacity of tug boat is enough for a large ship.
EDI System		5	• Vessel entry procedure is rather good. EDI system of customs clearance does not work well.
Port Security		1	• Port security of land area is good, but that of water area is not good. Sometimes commodities and equipments are stolen at anchorage area at night.

Source: Shipping Company Interview Survey by JICA Study Team

PORT BUSINESS AND INVESTMENT

FINANCIAL PERFORMANCE OF PELINDO III

86. Judging from published financial statements, PELINDO III has showed good financial performance in recent years. Fixed asset and total asset grew at 9% and 5% per year respectively, over the past five years. Operational revenue increased by 10% yearly over the past five years except in 2003.

87. The year end cash balance in 2006 is Rp 890 billion. In 2006, PELINDO III allocated Rp 311.8 billion for various investments. The current scale in cash balance is feasible for PELINDO III to shoulder its contribution to Lamong Bay Port Project, i.e. Rp 300 billion.

TPS EXPERIENCE

88. In 1984 PELINDO III started construction of TPS with ADB loan and a total equivalent amount of US$ 275.9 million. The terminal started operation in 1992, and soon after 1992, it became clear that container terminal operation was a lucrative business and the terminal capacity needed to be expanded. PELINDO III, with its own fund of Rp 340 billion, extended TPS quay from 500m to 1,000m during the period 1998 – 2002.

89. In 1999, PT. TPS was privatized, dividing the assets between PT. TPS and PELINDO III which still owns the port quay, land, roads, and building of TPS. P&O Australia was selected and became a business partner through acquisition of 49% equity or US$ 173 million equivalent. Besides dividend, PT. TPS makes lease and a revenue sharing contribution to PELINDO III based on the lease agreement. Today, Dubai Port World, after merging P&O Australia in 2006, receives dividend at an estimated return of 7-8% over the investment.

PPP SCHEME

90. The government now is keen on applying a public-private partnership (PPP) method to infrastructure development. Compared with power generation and toll road, PPP in ports seem lagged behind. Under such situations, Bojonegara as a new international port was recommended by a JICA study in 2004 and prepared by PELINDO II, then approved by the government.

91. The government has prepared the Phase I investment package (Rp 1,618 billion, inclusive of land, access road, channel dredging, breakwater, port quay and equipment). The tender process is underway.

92. Under a PPP scheme, government usually covers the non-profit earning infrastructure such as breakwater, channel dredging, and access road. In Indonesia, however, those items are subject to negotiation since the government expects such development to be covered by the private sector, as well.

93. One more discussion point is the hinterland development for an industrial estate. The initial plan for Bojonegara intends that the local government would acquire the port hinterland and later sell it off to the port investor for development into an industrial estate. Unfortunately, the land price soared to Rp 83,000 per m^2 in 2005 from Rp 20,000 per m^2 in 1994 due to the project announcement, making land acquisition difficult.

94. Port investment tends to be larger so that the risk premium is higher accordingly. On the other hand, port development is affected by land, social and environmental constraints under ineffective institutional arrangements. PPP is attractive to governments but often it delays the schedule of development and thereby causes a slowdown of the economy, if care is not exercised with its planning and execution.

Table 5.2 Cash-flow Statements of PELINDO III

(Rp Million)

	2005	2006
Cash Beginning	357,663	683,924
Operational Cash Inflow	1,286,006	1,247,828
Non-Operational Cash Inflow	955,853	1,549,428
Total Cash Available	2,599,522	3,481,180
Operational Cash Outflow	631,425	912,630
Investment on Routine work	71,911	283,675
Loan to outside	63	1,677
Non-Operational Cash-Outflow	1,212,200	1,392,704
Total Cash Utilized	1,915,598	2,590,685
Cash Ending Balance of the year	**683,924**	**890,495**

Source: Financial Statements, PELINDO III

ENVIRONMENTAL CONSIDERATIONS

95. Much of the coastline along the region is fringed with mangroves, which act as biological filters and buffers against coastal erosion; as repositories of high biodiversity and critical areas; and as spawning and nurseries for many kinds of fish. In particular, villagers along the coastline of Madura as well as North Gresik regency, being highly dependent on fishing (both aquaculture known as *tambak* or salty water pond and sea fishing) for livelihood, mangroves have long played key roles for their fisheries production and coastal protection. Mangroves trees have been planted along the riverbanks and dikes of the fishpond through a regreening program initiated by the villagers often with the support of the local government.

96. Coral reefs are identified around Karang Jumang area (5-11 km west of Bangkalan district, water depth: 1.5 m, to 6km, near pilot station). In other areas close by, such as Modung on Kangean Island on the utmost eastern Madura, live corals in good conditions can be identified.

97. The coastal area in the study area has been affected by land-based activities. Industrial and urban wastes and runoff containing chemicals have polluted coastal waters and impaired the ecological function of some of the precious marine biodiversity. Decline in fish catch from the sea is one of the prominent signals of the ecological changes that have taken place over the years. This was confirmed through interviews with the fishermen in the study area in Bangkalan Regency.

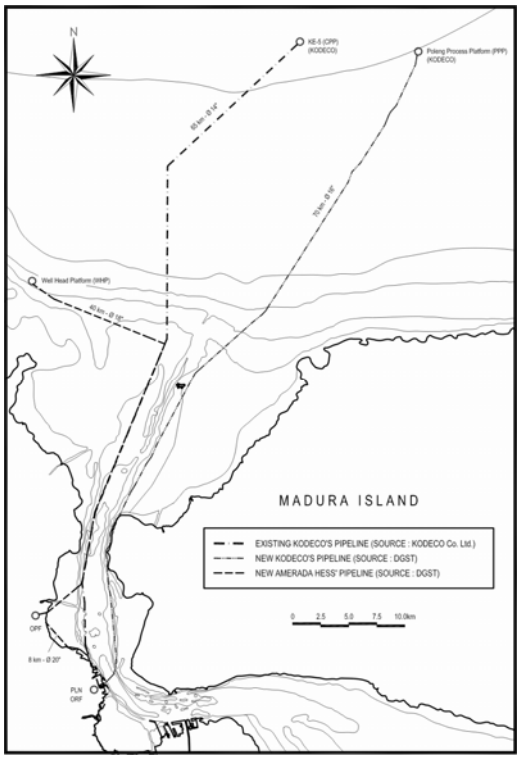
Figure 5.3 Ecological Map of the Study Area

98. The Madura Strait is busy but fortunately no accidents leading to serious human causalities or oil spills and other hazardous spills have occurred until now.

99. Oil and gas exploration activities have been active in East Java area over the years, as the province contains Indonesia's third largest oil reserve. Nowadays, more than 20 exploration blocks have been licensed to operate in the East Java's northern shore area, where over 13 million residents are said to be living in those block areas. Such development have high risk of accidents caused by hazards such as blowout and kicks, pipeline failure, spills during offshore bunkering and crude oil-tanker loading, ship collision etc. as well as natural and external hazards.

100. The Madura Strait would hardly sustain its environment because of a mixture of threats, viz: increasing seaborne traffic, installation of two more pipelines and probably construction of new ports. There is a strong need to coordinate all surface and underwater activities and usages over different sectors and local governments. In particular, the KODECO new pipeline, originally crossing the Strait and stretching to its offshore Poleng platform along the west coast of Madura Island, is dangerous and conflicting against shipping and new port development at Bangkalan, Madura. Thus the alignment must be altered in consultation with the port and shipping sector.

Figure 5.4 Existing and Planned Gas Pipelines



6 REGIONAL DEVELOPMENT PERSPECTIVE

REGIONAL AND AREA-WIDE DEVELOPMENT PLANS

Spatial Plans

101. Although many development plans exist, the most integrated development planning system in Indonesia is the spatial plan in accordance with the relevant law (No. 24/1992).

102. The provincial government of East Java authorized a new spatial plan in 2006 targeting the year 2020. At the metropolitan level, 'Gerbangkertosusila Plus' is conceptualized in the document.

103. Surabaya City made its spatial plan in 2006 with the target year of 2015. The plan aims at integrated and balanced development among residential, trade/commerce and industrial uses. The plan however does not project a considerable population growth, i.e. from 2.5 million in 2005 to 2.7 million in 2015.

104. Gresik Regency has its spatial plan made in 2004. It intends to develop its long coastline of 140 km for aquaculture and fishery and industrial lands. Currently swampy coastal lands are vastly used for fish ponds.

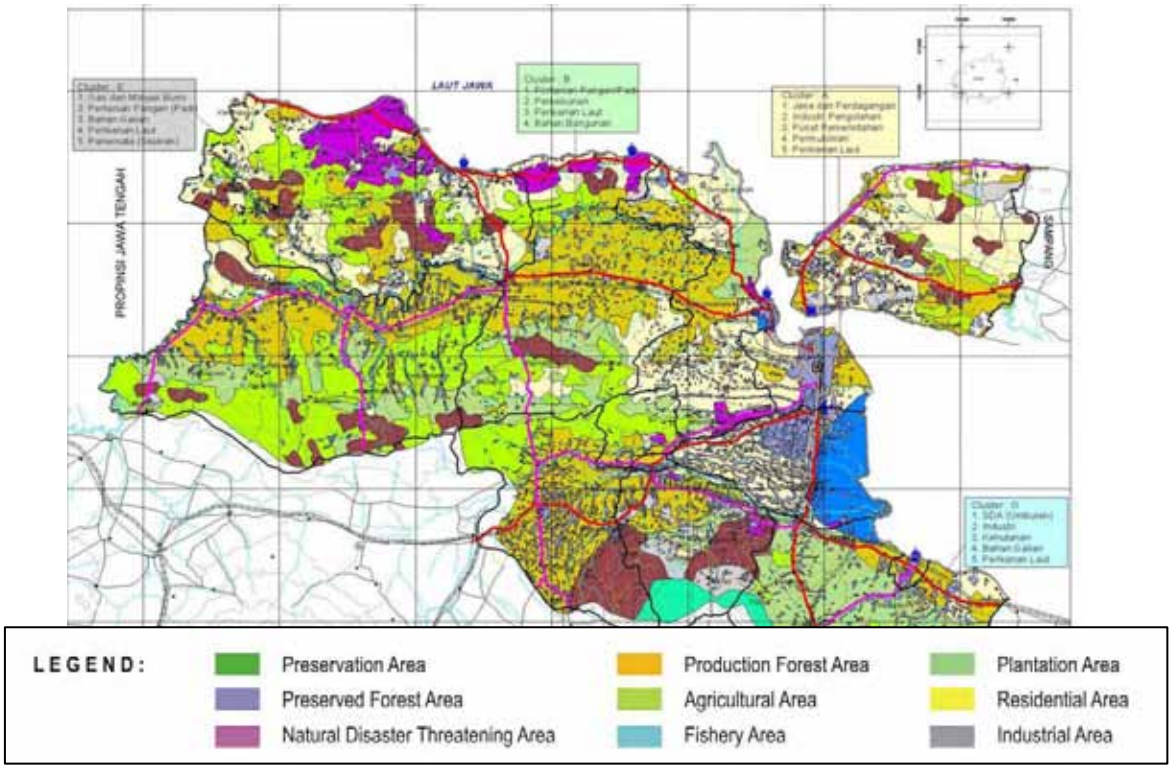
105. In Bangkalan Regency, the currently applicable spatial plan was made in 1999. Taking the opportunity of the Suramadu bridge project, the spatial plan prepares 15,000 ha for new development for industry, housing and public and social facilities. Those lands are mostly located between the bridge site and Kecamatan Bangkalan.

Suramadu Bridge related Developments

106. Together with the construction of Suramadu Bridge, access roads are under construction at both sides. In this connection, the provincial government informed that new sub-centers, 300 ha each, will be developed at both bridge terminals. Land acquisition will be done in 2008. In addition, a core development zone (600 ha) within the jurisdiction of Bangkalan Regency will be selected for prioritized development.

107. In order to incorporate the impact of Suramadu Bridge into regional development including the development of aforementioned strategic areas, the central government is going to establish a Suramadu Bridge District Development Acceleration Management Board (BPPPWS).

Figure 6.1 Land Use Plan for the GKS Region



Source: East Java Province

Private Development

108. There are many private development projects in the region, while they are mostly residential oriented. The most ambitious one is the so-called Madura Industrial Seaport City (MISI) which is located at the south-west end of Madura Island with several thousand ha. Although the project is at only a conceptual level, it is reported that the project has obtained the necessary development permit from Bangkalan Regency.

Coordinated Development Issues

109. The East Java spatial plan designates Tg. Perak as an international hub, and it states that a new international hub will be developed at Lamong Bay and, furthermore, the third new hub port will be constructed at the northern part of Bangkalan Regency from a middle-to-long term view without specifying a site. Although Tg. Perak is becoming to a saturated point in capacity, no clear scenario is available to develop new hub port(s) in the metropolitan port system.

110. All relevant spatial plans envisage large industrial developments even that of Surabaya City. According to the East Java spatial plan, the GKS region will have a lot of industrial estates with 15,510 ha in total, though compared with the present accumulation of less than 3,000 ha of industrial estates, it seems ambitious. The focus is to give priority to such candidate sites under clear industry development policy and in line with infrastructure development schedule.

REGIONAL LAND TRANSPORT SYSTEM

Toll Road Network

111. There are so far two toll roads in the region. After development, they have effectively provided high capacity and fast service which is a must for port access by heavy load vehicles in order to function as an internationally competitive port.

112. The GKS region has a toll road network plan, consisting of two existing routes, one under construction and seven being planned. The route between Waru and Juanda Airport, which is under construction, connects the two large industrial estates of Brebek in Sidoarjo and Rungkut in Surabaya (Figure 6.2).

113. Development priority is not clear among the planned routes, while some of them were once suspended due to the economic crisis. Surabaya Central Toll Road between Tg. Perak and Aloha is expected to have a high potential traffic demand passing through densely developed areas, making the project feasible. The route is designed to improve port access as well. From a port access viewpoint, the Surabaya Eastern Ring Road is strategic and it is designed to connect Suramadu Bridge with Tg. Perak in the shortest way. Lastly, besides the planned toll roads, the diversion of Sidoarjo – Porong segment, 12km, should be urgently developed to relieve the clogged port access service due to the mudflow disaster.

Ordinary Roads

114. In metropolitan freight transport, arterial roads take a collector role for most areas. Low-density developed areas such as Madura and Lamongan, however, arterial routes must accommodate heavy freight vehicles and trailers.

Railways

115. Tg. Perak branch line is now under rehabilitation. PT. KAI, the railway operator, plans to revive the operation of freight trains to transport container and bulk cargoes to TPS, Nilam and Berlian terminals within the port compound. In this connection, Kalimas Station can be used as a container marshaling yard.

116. A French technical assistance has conducted the Study on the Regional Rail System for Surabaya. It proposes the existing railways to be upgraded as a commuter rail. Although the study did not consider, there is a possibility to extend freight rail operation to Lamong Bay and Gresik, utilizing an abandoned track. In Madura Island, however, the existing abandoned track is too narrow with no connection with Java. If the rail could be rehabilitated, service would probably be limited to passengers.

Figure 6.2 Toll Road Network in Surabaya

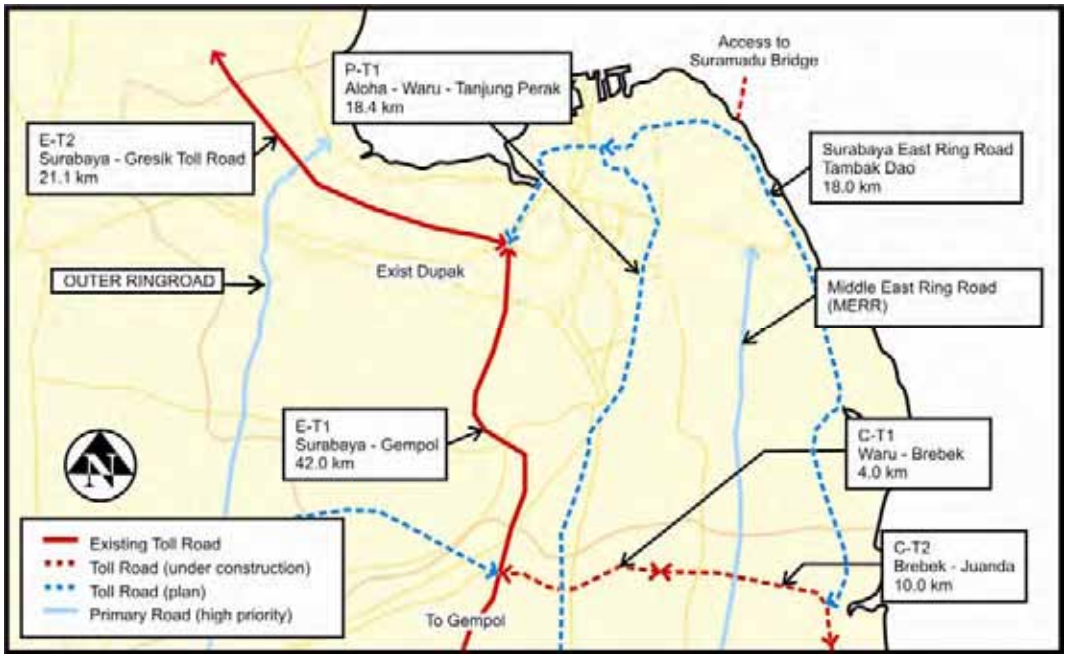
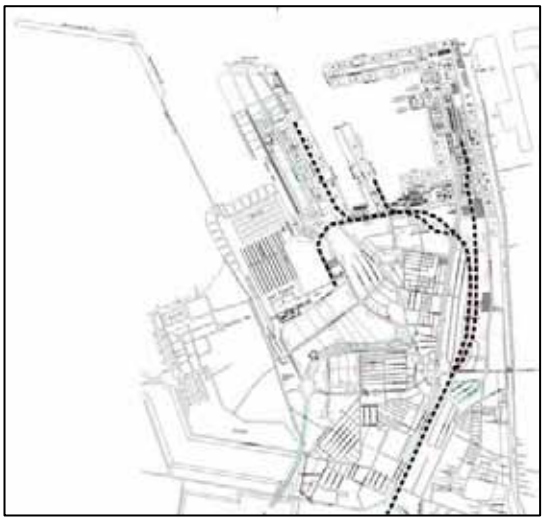


Figure 6.3 Toll Road Network in GKS

Figure 6.4 Tg. Perak Branch Rail Tracks



REGIONAL MARITIME TRANSPORT SYSTEM

Hydraulic Characteristics of Madura Strait

117. In order to understand the physical and hydraulic characteristics of the water areas along the Madura Strait, careful analysis is a prerequisite, and the study utilized a hydro-morphological as its analytical approach.

118. There could be a relationship between water depth , H, and width, B, of a channel under the dynamic equilibrium state as follows:

$$y = a\, x^{-b} \qquad (1)$$

where $y = H / Ho$ and $x = B / Bo$. The constants *Ho* and *Bo* are reference depth and width, respectively, while *a* and *b* are parameters. This equation implies the "Conservation Law of Hydraulic Sections" in a continuous channel under a certain flow condition. *Ho* and *Bo* are chosen at Tg. Sawo-Ujung Slempit Section.

119. A total of 21 sections are sampled and their r.m.s. approximation results in the diagram shown in Figure 6.5. The parameters are:

a = 1.16 and b = 0.814 (1)
with a correlation coefficient R^2 = 0.967 (2)

which means that the above equation (1) can be applied to the Madura Strait very closely and successfully and referred to as the "Hydraulic Rule of the Madura Strait."

120. The above rule suggests the following important points:

i) If water depth, for example 15.0m, should be maintained, the width of the channel shall be narrower than approximately 3,900m.

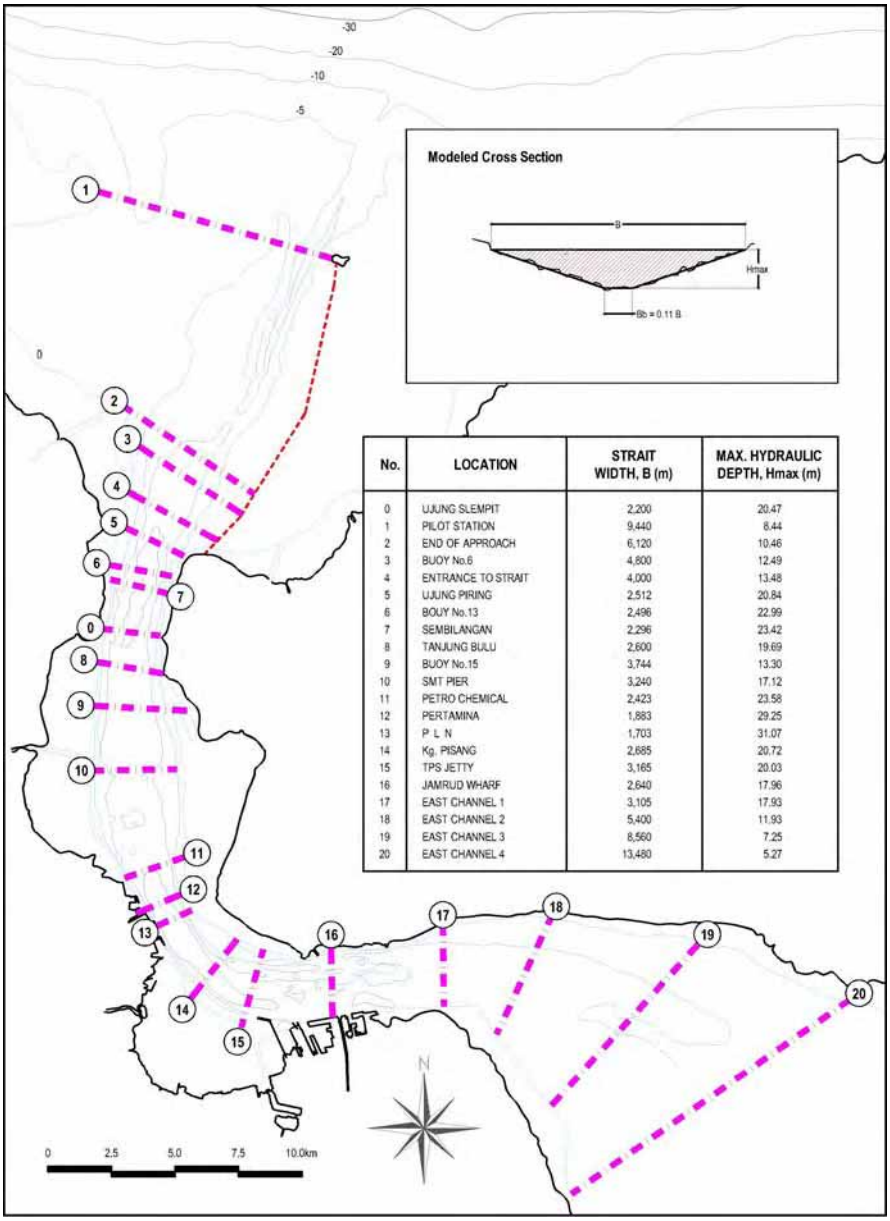
ii) If the present width or depth of the Strait were changed artificially, for example by reclamation or dredging at a water area to construct for example a wharf or a basin, it might result in a change in depth and width at not only the same section but also other sections downstream and upstream.

Allowable Port Development Patterns

121. In 2003, PELINDO III made the Master Plan for Tanjung Perak Port and Gresik Port toward 2025. It includes possible new port development sites along the Madura Strait. (Figure 6.7)

122. Considering the "Hydraulic Rule of the Madura Strait", it is not recommendable that a port be developed at a narrow section like Tg. Sawo - Ujung Slempit since the tidal flow would be faster and thus ship would face difficulty in berthing. Meanwhile, at a wide section like Kali Mireng South, it is recommended that a port be developed without considerable front dredging. However, it may cause the channel section to become shallower.

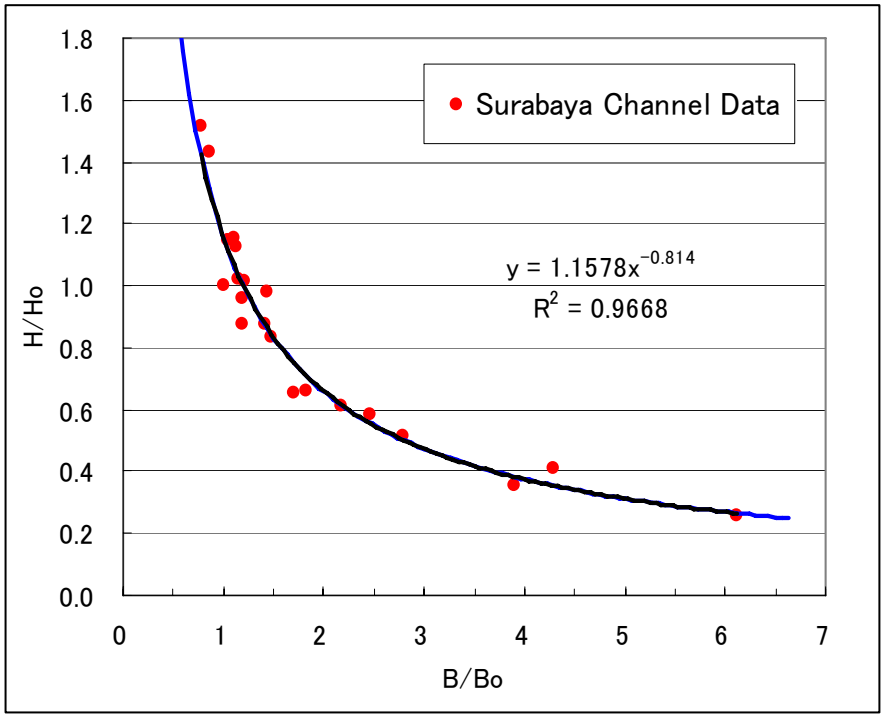
Figure 6.5 Analysis of Hydraulic Cross Sections in Madura Strait



No.	LOCATION	STRAIT WIDTH, B (m)	MAX. HYDRAULIC DEPTH, Hmax (m)
0	UJUNG SLEMPIT	2,200	20.47
1	PILOT STATION	9,440	8.44
2	END OF APPROACH	6,120	10.46
3	BUOY No.6	4,800	12.49
4	ENTRANCE TO STRAIT	4,000	13.48
5	UJUNG PIRING	2,512	20.84
6	BOUY No.13	2,496	22.99
7	SEMBILANGAN	2,296	23.42
8	TANJUNG BULU	2,600	19.69
9	BUOY No.15	3,744	13.30
10	SMT PIER	3,240	17.12
11	PETRO CHEMICAL	2,423	23.58
12	PERTAMINA	1,883	29.25
13	P L N	1,703	31.07
14	Kg. PISANG	2,685	20.72
15	TPS JETTY	3,165	20.03
16	JAMRUD WHARF	2,640	17.96
17	EAST CHANNEL 1	3,105	17.93
18	EAST CHANNEL 2	5,400	11.93
19	EAST CHANNEL 3	8,560	7.25
20	EAST CHANNEL 4	13,480	5.27

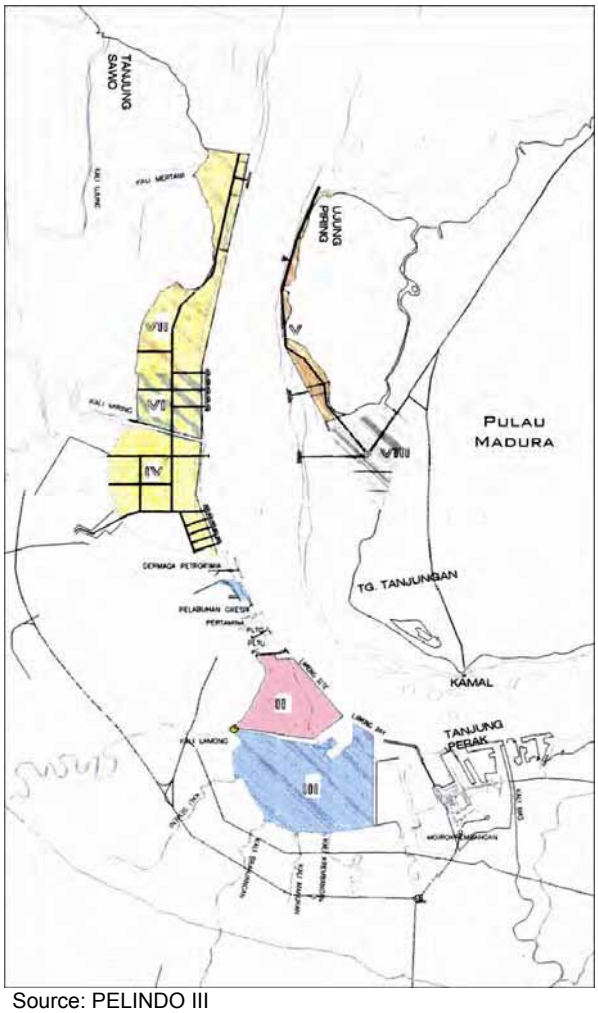
Source: JICA Study Team

Figure 6.6 Correlation between Depth and Width of Madura Strait



Source: JICA Study Team

Figure6.7 Port Development Master Plan



Source: PELINDO III

Relevant Port Plans

123. **Lamong Bay Port**: The project was originally formulated in 1997 and it was announced as a port PPP project by the central government at the Indonesia Infrastructure Conference in 2006. During the study period, however, no international bidding was conducted to select a project investor. There are two planning characteristics, i.e., limited yard area of 50 ha and required water depth of 14m.

124. **Rehabilitation at Tg. Perak**: Some rehabilitation plans are under discussion to keep and modernize operation capability. For example, PELINDO III and Surabaya City have a plan to revitalize Kali Mas Terminal for shipping, trade and tourism. Others are Nilam Terminal for bulk, general cargo and container shipping and Jamrud for dry bulk, interisland container and passenger shipping.

125. **Gresik Port**: The port plans to extend its berth length by 640m in order to increase dry bulk and general cargo handling capacity. Since the present high berth occupancy is over 70%, the port needs to address a congestion alleviation measure.

126. **Gresik Private Jetties**: Gresik Regency intends to issue a couple of DUKS to meet more private jetty needs which are mainly for bulk shipping.

7 TRAFFIC DEMAND FORECAST

FUTURE SOCIO-ECONOMIC FRAMEWORK

127. In compliance with the Bappenas forecast on future population by province, the GKS region is predicted at 10.9 million in 2030, an increase of approximately 2 million from the 2005 statistics. Meanwhile, the population of Sidoarjo and Gresik is expected to increase at a faster pace than the regional average.

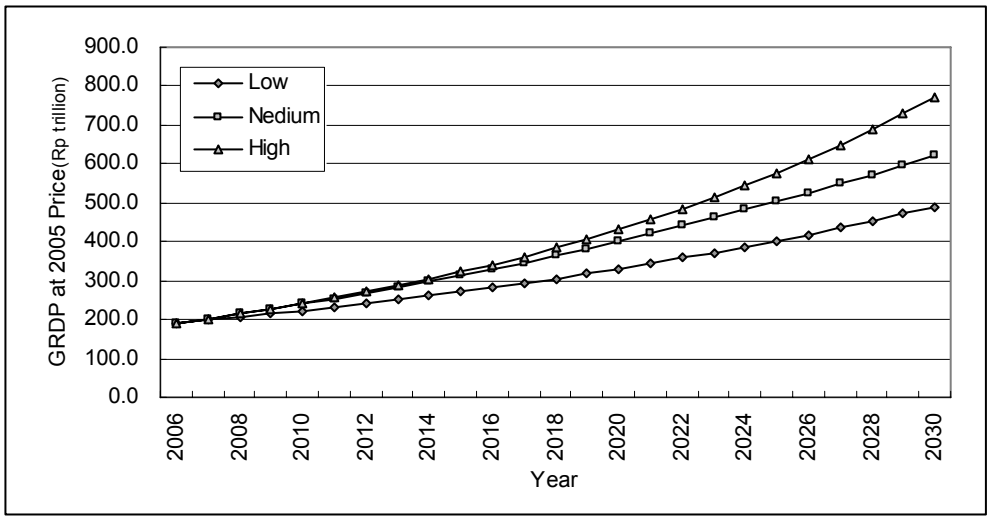
128. Taking account of the peculiar cohort pattern, increased women laborers and increased school attendance, the employment scale is predicted to increase from 4.2 million in 2005 to 5.9 million in 2030 with a faster growth rate than that of the population in the region.

129. The GKS region has attained a fairly high economic growth at an average of 5.7% per annum during the period 2000 – 2005. Regarding sectoral contribution, urban-type industries such as trade, restaurant and hotel accounted for nearly the half of the region's output. In the regencies of Sidoarjo, Gresik and Mojokerto, manufacturing was remarkable in local economic growth.

130. The study sets three (3) cases for regional economic scenarios by different growth rates: Case 1 – 4% per annum, Case 2 – 6%-to-4% (gradually decreasing during the period) per annum and Case 3 – 6% per annum with consideration of a historical economic structural change. (Figure 7.1)

131. In any case, growth will never be realized without efforts. Considerable capital investment is necessary, being equivalent to 13.4% of GRDP in Case 1 and 20.0% of GRDP in Case 2. In the past economic growth in Indonesia, FDI accounted for 55% in all investment and the manufacturing sector absorbed 90%. The GKS region must therefore provide attractive business opportunities to foreign and domestic manufacturers together with strengthening of historically accumulated urban industries, led by the trade sector.

Figure 7.1 Future Economic Growth, by Case



Source: JICA Study Team

PORT DEMAND FORECAST

Container Traffic

132. Container traffic in Surabaya ports has been increasing at a higher pace than the overall port throughput. This is mainly attributed to two factors: hinterland economic growth and increased containerization rate.

133. Containerization has been acute in the region. For example, there is a sharp increase of containerization rate from merely 23% in 1984 to 76% at present. Thus, potential for further containerization is not so large. The study estimates that this rate would continue to increase slowly up to 85% toward the target year of 2030.

134. Using the regression model calibrated by the Study Team, the study projects future container traffic: 3.3 million in 2015 and 6.4 million in 2030 under the Case 2. Considering the existing port container capacity, TPS's capacity expansion by additional equipment and the proposed Lamong Bay container terminal, the following can be pointed out: (Figure 7.2)

i) The demand will match the expanded capacity by 2011, at the earliest.

ii) Lamong Bay Port will be fully occupied within 6-10 years or by 2017 – 2023.

Other Cargo Demands

135. Other cargo types have been projected by means of the most suitable regression models which can explain the present and past traffic change accurately. As results, those cargo types will increase by 2-3 times during the projection period. Since Case 2 is the most plausible one, the regional port traffic demand under this case is aggregated into 70 million in 2015 and 119 million in 2030. (Figure 7.3)

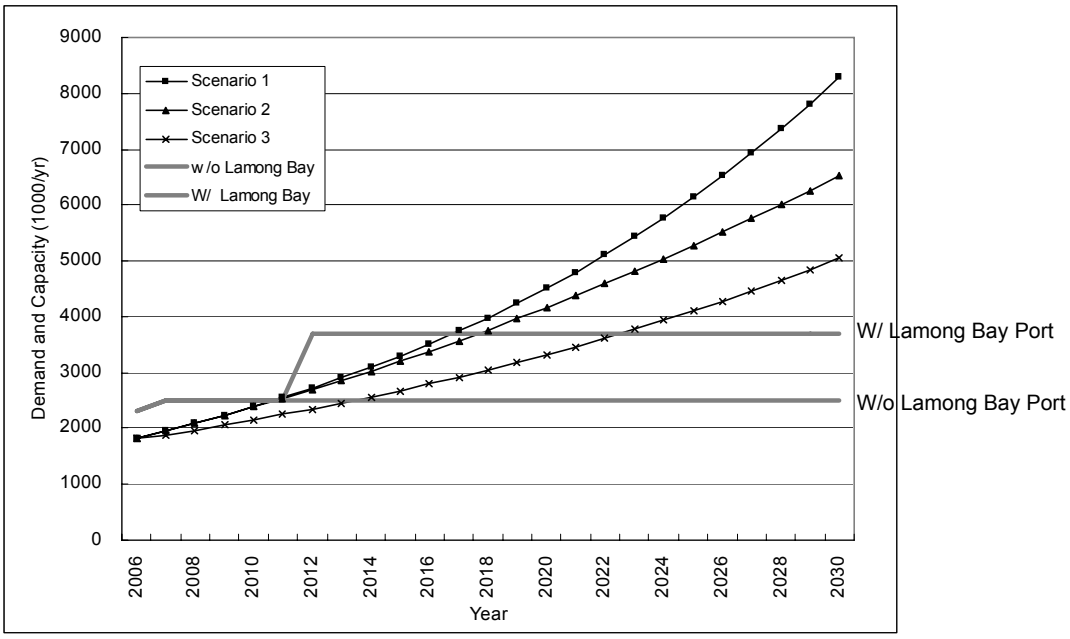
Passenger and Other Shipping Needs

136. Although Tg. Perak acts as the largest passenger shipping base, its volume has sharply dropped from 1.8 million passengers in 2000 to 863 thousand in 2006. This is mainly attributed to the competition with air services, particularly budget airlines, and income growth. To trace this downward trend by a logistic curve, the demand will bottom at a level of 685 thousand per annum.

137. RoRo shipping features an opposite trend vis-à-vis passenger shipping. After the economic crisis, private RoRo operators started their interisland service. To meet increasing demand, Tg. Perak Branch of PELINDO III opened a dedicated RoRo terminal in 2003. Since the number of shipcalls has been increasing at a constant pace, the study predicts this growth will continue steadily from 884 shipcalls in 2006 to 1,100 in 2015 and 1,280 in2030.

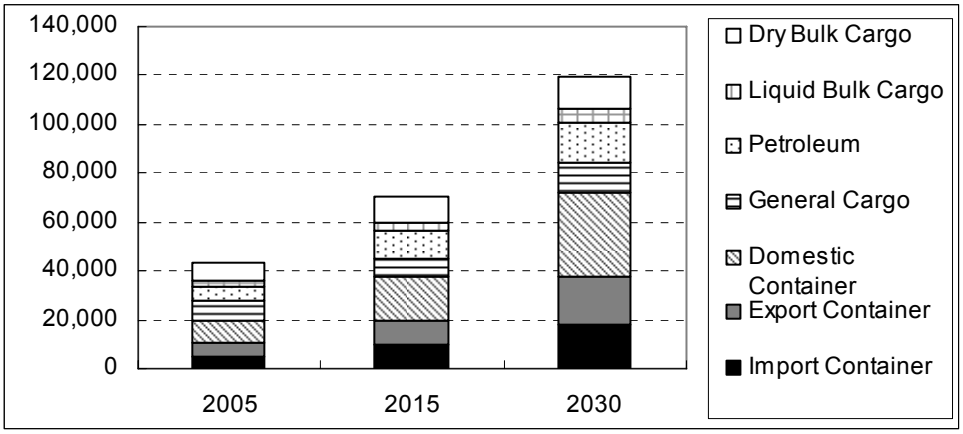
138. So far no international cruise ship calls at Surabaya although Benoa (Bali) and Semarang (near Jogjakarta) receives at least a monthly call. Nonetheless, Tg. Perak Branch intends to renovate the existing passenger terminal to accommodate international cruise ships. It may be possible with attractive onshore tour packages like 'karapan sapi' (bull race) in Madura. However, the number of ship calls would be marginal.

Figure 7.2 Demand and Capacity for Container Handling at Surabaya Ports



Source: JICA Study Team

Figure 7.3 Overall Port Cargo Traffic Demand Forecast at Surabaya Ports



Source: JICA Study Team

FUTURE SHIPPING NEEDS

Overseas Container Shipping

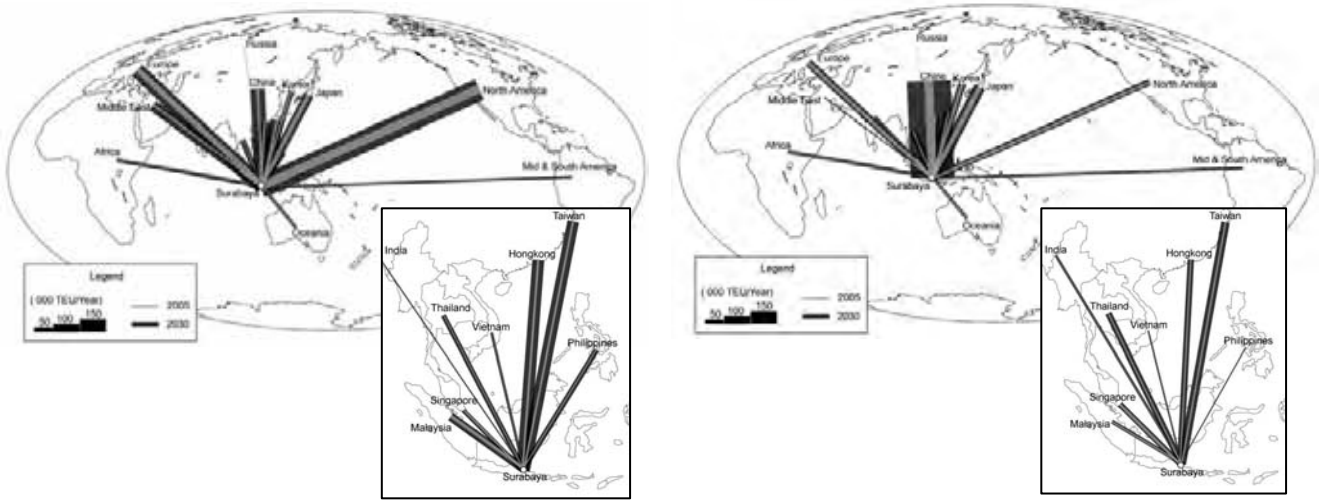
139. TPS has been receiving more direct ports-of-call, i.e. not via regional hub ports like Singapore, in recent years. To analyze future direct shipping opportunities, existing trading pairs have been analyzed and future trading pairs have been projected. As results, China which is the largest importing partner (105 thousand TEU or 24%) will increase its share in the GKS region to 521 thousand TEU or 33%). For export, USA is the largest partner at present and will continue to be in the future, and at the same time China and EU will become larger markets for exports.

140. In line with increasing container traffic, container ship sizes are constantly getting bigger. For inter-continental service, over Panamax ships are popular nowadays, and mega carriers are developing bigger fleets, e.g., 31% of built container ships are over 8,000 TEU. Even regional feeder operators such as PIL and Wan Hai are going to assign vessels over 2,000 TEU. If the same access channel depth, more or less 10m below sea level, would continue, Surabaya would be left behind and lose competitiveness, except for short-distance feeder routes.

141. Considering traffic volume by trading partner and assignable ship size, without physical limitations, Surabaya ports would receive vessels of around 4,000 TEU to/from China by 2015. By 2030, Surabaya port would receive more direct calls by over 4,000 TEU vessels, for Japan/Korea routes. Furthermore, Surabaya ports will have sufficient demand for direct services to EU and USA by 2030.

Figure 7.4 Trading Pairs of Container Shipping, 2005 and 2030

(Export) (Import)



Domestic Container Shipping

142. Domestic shipping would also be able to take advantage of economy of scale by assigning larger vessels especially considering that Indonesia is a long country, but compare to international shipping its scope is limited, as bigger vessels would also entail long port downtime, which is magnified in shorter voyage distances.

143. A recent JICA domestic shipping study (STRAMINDO 2004), analyzed such a breakeven point, and the most profitable ship size was determined to be 15,000 – 20,000 dwt between Surabaya and Makassar and 15,000 dwt between Surabaya and Banjarmasin.

144. The study also projected that the most popular domestic container ship size will be shifted from 4,000 – 8,000 dwt currently to 12,000-18,000 dwt in future.

Other Shipping

145. In Surabaya, tanker fleets are divided into Pertamina fleet and others such as those transporting CPO. The Pertamina tanker fleet accounts for roughly 80%, consisting of various tankers ranging from 3,500 dwt to 37,000 dwt. Pertamina does not have a plan to assign larger ships in Surabaya. Instead, a new pipeline between Tuban and Tg. Perak will reduce the tanker fleet's role.

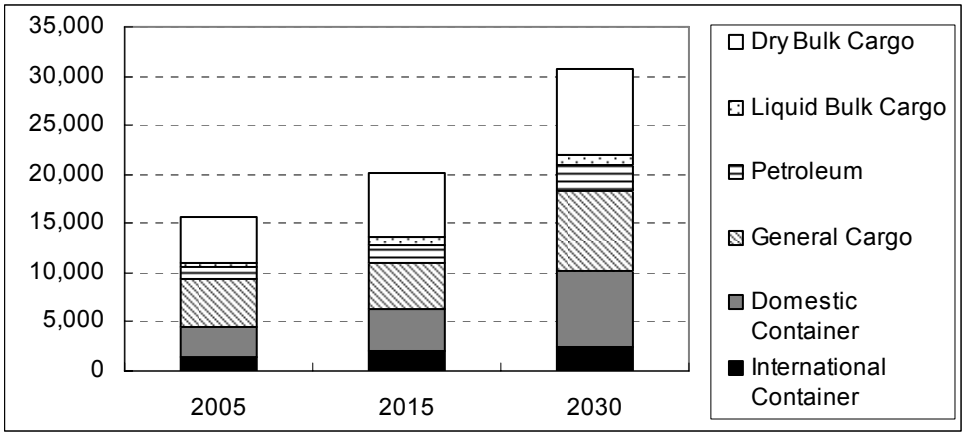
146. Other liquid bulk carriers vary in shipping route and ship size, and Tg. Perak has experienced to accommodate a vessel of 50,000 dwt at the largest in this category. There seems to be no reason to assign a larger tanker in the future.

147. At Tg. Perak, two Cape-size bulk carriers called in 2006. There sizes were recorded at around 87,000 dwt. They are considered the largest ship size for dry bulk in the ASEAN region and thus the port is likely to accommodate such Cape-size vessels in the future, as well.

Estimated No. of Shipcalls

148. As results, the study projects the number of shipcalls to Surabaya ports: 19,800 in 2015 and 29,450 in 2030. In 2005, 14,689 shipcalls were recorded, thus ship calls would increases by 2.0 times, which is smaller than the increase in cargo volume during the same period (i.e., 2.6 times). This reflects the progressive enlargement of ship size, particularly container fleet. (Figure 7.5)

Figure 7.5 Present and Projected Shipcalls by Shipping Type, 2005, 2015 and 2030



Source: JICA Study Team

8 COMPARISON OF PORT CANDIDATE SITES

COMPARISON METHODS AND PORT CANDIDATE SITES

CANDIDATE SITES

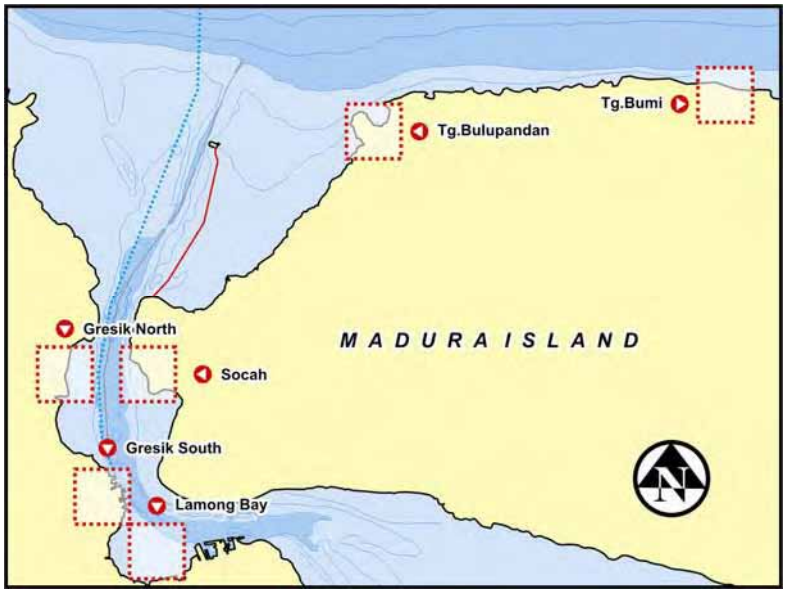
149. At the inception of the study, six (6) port candidate sites were selected which are subject to the study's physical assessment and, furthermore, planning when necessary. They are (i) Lamong Bay in Surabaya City, (ii) Gresik South and (iii) Gresik North in Gresik Regency, (iv) Socah, (v) Tanjung Bulupandan, (vi) Tanjung Bumi in Bangkalan Regency.

150. To undertake comparative analysis in an effective manner, the port candidate sites are divided into three (3) groups in relation with the Surabaya West Access Channel, i.e., (A) inner access channel sites including Lamong Bay and Gresik South, (B) middle-distance access channel sites including Gresik North and Socah, and (C) access channel free sites including Tg. Bulupandan and Tg. Bumi.

151. Comparative assessment works in this section have the two (2) objectives:

- To assign a suitable role to each port site taking into account location, development opportunity, physical conditions and environmental conditions in a comprehensive way, and
- To select two candidate sites for a deep water container seaport for further detailed analysis and since it is a capital intensive project; it must positively and significantly impact regional development.

Figure 8.1 Location of 6 Port Candidate Sites in the Study



INNER ACCESS CHANNEL SITES

LOCATION AND DEVELOPMENT TREND

152. .The two port candidate sites of Lamong Bay and Gresik South are lined along the coastline between Tanjung Perak Port and Gresik Port. Because of their location, if they were fully developed as public ports, the structure of GKS would be further mono-centric.

153. Individual investments in development may prefer a mono-centric structure since investors can easily access to existing accumulated infrastructure and economy. However singular sprawling activities may gradually generate economic losses externally and internally such as traffic congestion and environmental degradation. The inner access channel sites would bring about such peculiar mono-centric pattern related issues and thus careful coordination is necessary.

154. The development of Lamong Bay Port was authorized by the relevant government

bodies on the condition that the development of a container yard is limited to 50 ha in the middle of the bay with a long causeway (2,686m) for access path. The site is 12 km west from Tg. Perak. Urbanization and industrialization is going at the direct hinterland (303 thousand persons or 30.4 persons/ha) including Tandes Industrial Estate.

155. Gresik South is a former plywood factory site of 68 ha facing the channel water. Since the site is a bankrupted factory land, no resettlement and land development is required. It is located 19 km from Tg. Perak, but the access road has only a 2-lane width, running through the already congested downtown Gresik. The site is located in the midst of Gresik District which is mostly urbanized (157 persons/ha).

SITE CONDITIONS

156. Both the sites are located in the central and northern sides of Lamong Bay or the east and west coasts of the Lamong River, thus they have similar physical conditions as follows:

- The two sites are located on muddy swamp outside of the mouth of the Lamong River. The foundation consists of clayey silt, i.e., very soft clayey silt on the surface and hard clayey silt about 50m deep.
- The water depth in the central stream in front of the bay exceeds 20m, providing a sufficient water depth for berthing, unberthing, turning and navigating.
- Huge initial and maintenance dredging works would be required at the access channel when Lamong Bay Port would have a 14m deep berth as planned.

157. On the contrary to Lamong Bay, Gresik South has no opportunity to construct a trestle structure or reclamation quay at the front water because of neighboring lands such as PT. Sumber Mas Indah Plywood and PT. Indonesia Marina Shipyard own their jetties for daily operation. Only the site can extend a longer jetty trestle to touch deeper water.

ENVIRONMENTAL CONSIDERATIONS

158. Container port development will be carried out 1.2 km off the coastline at the shortest. During the construction phase, environmental impacts are expected on ecological resources and shipping and fishing activities. During the operation phase, the port will allow the existing waterways to flow into the bay and the fishermen to catch fish around the bay. The coastline vegetation including protected mangrove areas may be preserved. Furthermore, environmental and social impact assessment studies such as EIA (ANDAL) and environmental management and monitoring plan (RKL/RPL) are necessary to minimize the anticipated adverse impacts.

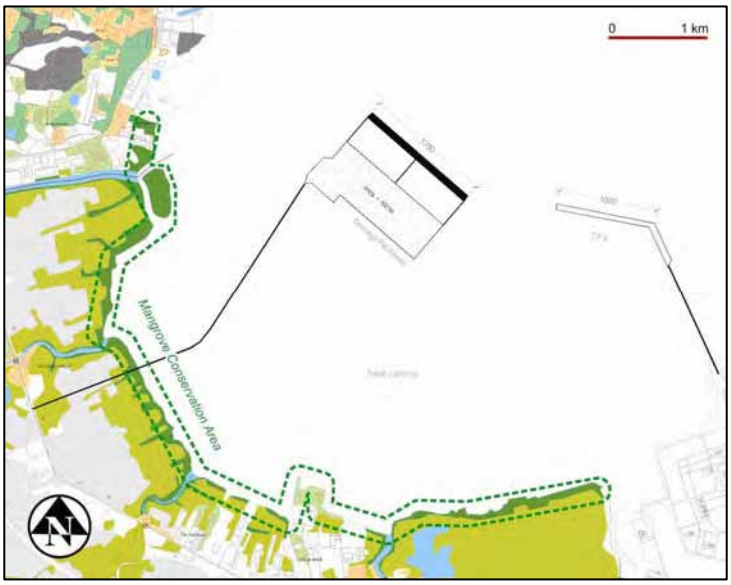
159. The port development at Gresik South would bring about similar apprehensions against the environment. However, since it is an abandoned factory, no resettlement is required. However, the access road is too narrow. The port would become a nuisance during its operation phase. In addition, the land acquisition for access road widening would raise serious resettlement issues in the district because the area is already inhabited.

ROLES IN METROPOLITAN PORTS STRATEGY

160. In the study scope, the Lamong Bay Port project is treated as a given condition. The project intends to build a new international hub container port next to TPS. However, there is no access channel improvement project plan to guarantee that the new Lamong Bay Port could fully operate its 14m deep berths as planned.

161. It is suggested that bulk port operation be resumed at Gresik South by either public or private management. It seems impossible to use the area of 68 ha as a public container port for the metropolitan ports system, it is thus suggested that the coastline between the Lamong River and Maspion Industrial Estate become a bulk cargo center with more or less 10 public and private ports and jetties.

Figure 8.2 Port Plan and Mangrove Conservation Area at Lamong Bay



Source: JICA Study Tea

MIDDLE-DISTANCE ACCESS CHANNEL SITES

LOCATION AND DEVELOPMENT TREND

162. Two candidate sites, Gresik North and Socah, are facing each other at the middle of the access channel. Thus, both the sites have almost the same distance from Tg. Perak, 31-32 km. Other similarities are the availability of abundant direct hinterland and poor land transport infrastructure.

163. However, port development impact on regional development may generate quite different directional momentum. If Gresik North were developed, it might promote the northern coast of Java Island (so-called PANTURA) from Gresik, Lamongan, Tuban and Bojonegoro. On the other hand, if Socah were developed, it might accelerate Madura Island development in line with the intent of the Suramadu bridge project.

SITE CONDITIONS

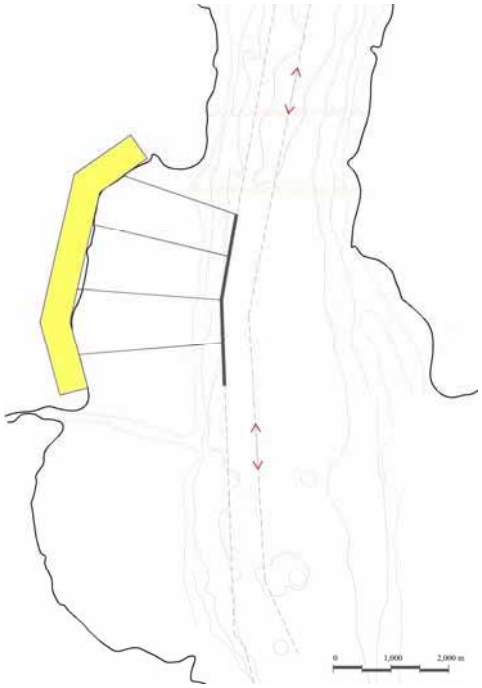
164. Both sites are located at a place where the hydraulic cross section is widening or the down stream portion of the narrower Tg. Sawo – Ug. Slempit line. In order to maintain the present cross section and water depth, the structure of the berthing facilities shall be permeable such as pile-type platform.

165. The water area of Tg. Bulu, Socah District, and its downstream is relatively wide, hence it is designated as the anchorage for large vessels. The distance from the centerline of the channel to the shore is about 1.5km. There is enough space for berthing facilities and operations. Although no boring data is available, the site seems to have rather thin and very soft surface clayey silt layer and underneath it, deep medium-hard mud layer.

166. At Gresik North, a gas pipeline is laid in front of the site. The berthing facility should be located beyond the pipeline. Since the distance from the pipeline to the present channel centerline is about 500m, if the face line is a strait-line with a 3,000 m long pier, the distance would be as short as 200m.Such a narrow space can't guarantee safe channel navigation and berthing/unberthing operations concurrently. Moreover, the site has unfavorable subsoil conditions, i.e., very deep soft clayey silt layer (deeper than 50m) to support port infrastructure. (Figure 8.3)

167. On both sides, land use and habitation is similar, i.e. as sparse population density (9.7 persons/ha at Manyar and 10.3 persons/ha at Socah) and vast lands for fishponds and farming.

Figure 8.3 Idea of Possible Port Development at Gresik North



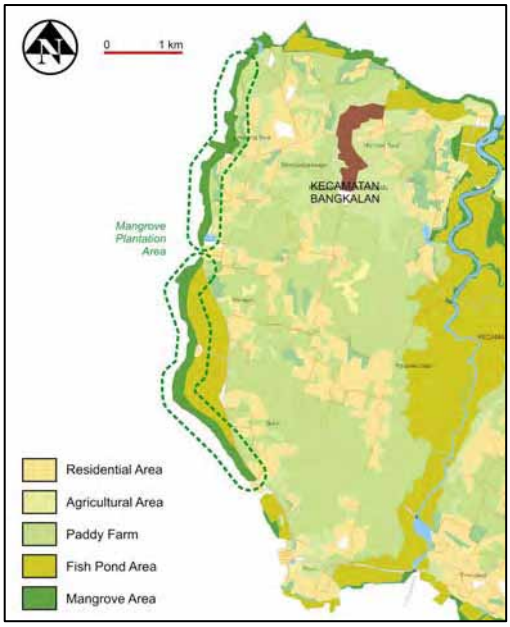
Source: JICA Study Team

ENVIRONMENTAL CONSIDERATIONS

168. The coastal area of Gresik North is mainly occupied by wetlands, fishponds and mangroves. Fishermen represent the largest population and it is traditionally famous for brackish water pond aquaculture. Manyarejo to Ujung Pangkah has been designated as conservation area by the Gresik Regency Spatial Plan and the coastline of the site is included. With port development, its damage to the coastal natural environments and local economic structure change must be duly considered.

169. The local folk of Socah are mostly engaged in fisheries, farming and overseas work. In recent years, the volume of fish catching has decreased due to seawater quality degradation. The land productivity in farming is lower in comparison with the provincial average. The coastlines are occupied by a couple of fishermen villages, fishponds and mangroves. The natural and social environments of the site are under similar conditions in Gresik North. There is no port and no port development plan so far and thus their social perception to port development is non-existent. This understanding was obtained after the consultation meeting with villagers in March 2007.

Figure 8.4 Land Use and Ecological Resources at Socah



Source: JICA Study Team

ROLES IN METROPOLITAN PORTS STRATEGY

170. The study does not recommend Gresik North to be the site for an international container port. Soft soil conditions and the existing of pipeline are main reasons. To cross the existing pipeline, long access path(s), either bridge or causeway, is required and the port would compromise maritime safety. In addition, soft subsoil would require longer piles to make port substructure stable. Private jetties could be allowed as long as they would not hamper the access channel traffic.

171. Socah has better location conditions for port development. Therefore the site will be further elaborated in the latter stage of the study.

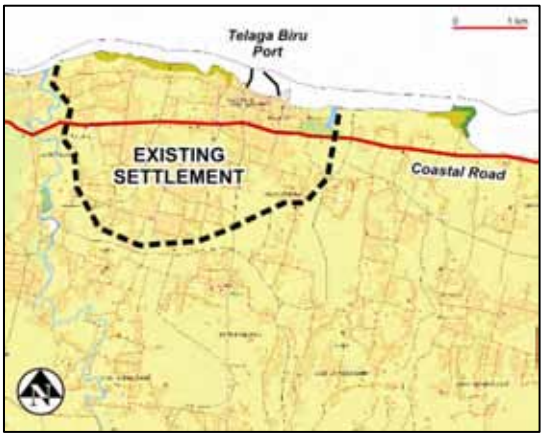
ACCESS CHANNEL FREE SITES

LOCATION AND DEVELOPMENT TREND

172. Two candidate sites, Tg. Bulupandan and Tg. Bumi are located on the northern coast of Bangkalan Regency. It is the corridor for a regional gateway port determined by the provincial spatial plan. Tg. Bulupandan is advantageous in terms of the proximity to Tg. Perak, since it is shorter by some 20km compared with Tg. Bumi.

173. Both sites have space for associated hinterland development and port expansion. However, habitation pattern is different. Tg. Bumi is a historical trading town with some industrial (mostly traditional clothing and handicraft) and commercial accumulation is observed while sparse habitation among fishermen and farmers is only observed at Tg. Bulupandan.

Figure 8.5 Existing Land Use at Tg. Bumi



SITE CONDITIONS

174. Both the sites are facing the Java Sea and exposed to severe oceanographic conditions, including strong wind and high waves during the west and the east monsoons. Thus, breakwaters are required to shelter the harbor, channel and basin.

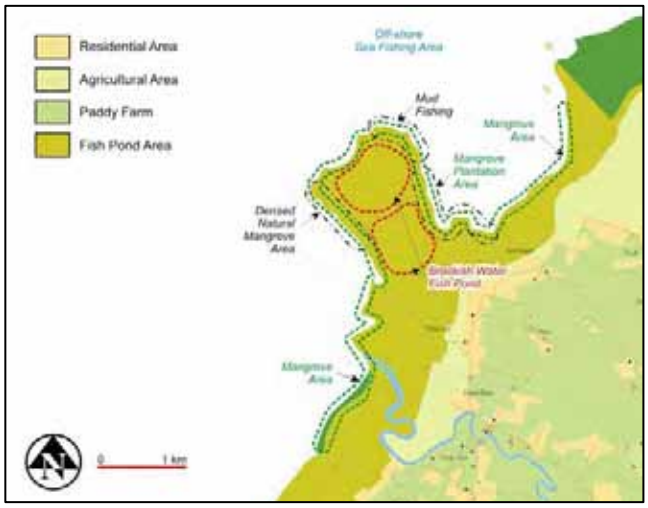
175. The seabed of the coastline of Madura Island consists originally of coral and hard rock, and, on the surface, sand, silt and coral debris. Littoral drift of the seabed materials cause sedimentation of shallow harbor such as the existing problematic condition of Tg. Bumi Port. It is necessary to extend the breakwaters to a deeper depth where seabed materials can not move under the action of high waves.

ENVIRONMENTAL CONSIDERATIONS

176. Tg. Bulupandan: There are densely natural mangroves at Tg. Modung. Mangroves have been planted around fishponds for erosion prevention and those will be affected by port development. Both sea fishermen and land fishermen will be affected during and after port construction because their fishing grounds will be impacted by the reclamation of Ko'ol Bay. However, as long as the result of the consultation meeting, the villagers have positive perception towards port development on the condition that

their livelihood would be improved and that they would be provided with new job opportunities and skills.

Figure 8.6 Land Use and Ecological Resources at Tg. Bulupandan



177. Tg. Bumi: Since the port area is mainly composed of residential and commercial area, no endangered or protected species were identified through field observation. As long as the consultation meeting at Telaga Biru village, the perception toward new port development is positive, as well. They have long co-existed with the existing port activity through inter-island trading.

ROLES IN METROPOLITAN PORTS STRATEGY

178. The study selected Tg. Bulupandan to be further studied in the next phase. The selection is based on its short distance from Suramadu Bridge, sparse inhabitants, calm seawater, suitable seabed materials for construction and some distance between the bay and the main island road.

179. Tg. Bumi is a historical trading town and its Telaga Biru Port has substantial live animal shipment. However, the breakwater is damaged and basin sedimentation is serious for the port to function as expected. It is suggested that the port be improved as a vital local trading port.

RESULTS OF COMPARISON ANALYSIS

REGIONAL DEVELOPMENT VIEWS

180. GSMP must support regional economy, particularly increasing shipping traffic from less than 50 million tons in 2005 to 115 million tons in 2030. Therefore all the port candidate sites are required to undertake port development or improvement as long as their inherent natural and social environments are considered.

181. Another regional development issue is to transform a historical mono-centric structure to a multi-nucleus structure to attract more investment with minimal negative externalities. In this sense, Gresik North, Socah, Tg. Bulupandan and Tg. Bumi have potential for associated hinterland development because of land spaciousness. Especially, Tg. Bulupandan and Tg. Bumi are located on the northern coast corridor of Bangkalan Regency as the provincial spatial plan designates the site for a regional gateway port.

ENGINEERING VIEWS

182. The four candidate sites are located along the Madura Strait and have similar natural conditions such as swampy muddy delta and deep soft soils. It is necessary to construct long trestles or causeways to reach deep water and repeated maintenance dredging. The candidate sites on the northern coast of Madura have sandy/silty materials in the foundation. It is necessary to construct breakwater to protect the basin against waves generated in the Java Sea during the west and east monsoons. (Table 8.1)

183. Natural conditions along the Madura Strait are characterized as high tidal current, low wave, soft seabed and siltation. On the other hand, along the Madura northern coast, current is low, wave is high, bed material is sandy, and littoral drift occurs at near-shore water. (Table 8.2)

ENVIRONMENT IMPACT POINT OF VIEW

184. The environmental considerations made at each candidate site are summarized with issue groups including physical environment/pollution, biological environment, land use, social environment and safety. As result, Lamong Bay, a limited permeable structure within the bay, is considered a less environmentally impacted site except safety as long as the plan is implemented as it is. Land spacious sites like Gresik North, Socah, Tg. Bulupandan and Tg. Bumi, when it is largely developed, must pose danger to the natural and social environments. (Table 8.3)

Table 8.1 Technical Characteristics of the Port Candidate Sites

Comparison Items	Java Island			Madura Island		
	Inner Access Channel Sites		Middle-distance Access Channel Sites		Access Channel Free Sites	
	Lamong Bay	South Gresik	North Gresik	Socah	Tg. Bulupandan	Tg. Bumi
Location	Lamong Bay In the Madura Strait		Miring Bay In Madura St.	Tg. Bali in Madura Str.	Ko'ol Bay facing the Java Sea	Tg. Bumi facing the Java Sea
Coastal Geology	Muddy river delta of the Lamong River		Muddy river delta of the Miring Riv.	Muddy delta in the Madura St.	Sandy/silty coral beach	
Coastal land Utilization	Fish/Salt ponds and fishing activities					Town
Underwater Obstacles	None	Power cable line on the upstream	Gas pipeline along the shore	Old mines	Shallow bed rock shall be confirmed	
Restricted/ Prohibited Area	None			None	Offshore Gas Station to the East	Offshore Gas Station to the West
Required Facilities	Long trestles/ Causeways				Breakwater	
Required Maintenance	Maintenance dredging of West Channel				Maintenance dredging of Approach Channel	
Port Dev Plan	Available	None			Available	None

Source: JICA Study Team

Table 8.2 Natural Conditions of the Port Candidate Sites

Comparison Items	Java Island			Madura Island		
	Inner Access Channel Sites		Middle-distance Access Channel Sites		Access Channel Free Sites	
	Lamong Bay	South Gresik	North Gresik	Socah	Tg. Bulupandan	Tg. Bumi
Rainfall	Tropical monsoon (Annual rainfall = 1,390 mm / year)				Tropical monsoon	
Wind	East and west monsoons				E and W monsoons>25 kt	
Tide	Semi-diurnal (MHHW=2m)				Diurnal (MHHW<1.4m)	
Tidal Current	Maximum 2 knots				Not strong (< 2 knots)	
Wave	Always relatively calm				High in Dec. to Apr.> 6m.	
Sea Bed	Silty clay				Silty sand	
Foundation	Deep soft mud				Shallow rock or coral	
Sedimentation	Siltation				Sand drift at near-shore	
Vegetation	Mangrove				Poor	

Source: JICA Study Team

Table 8.3 Summary of Environmental and Social Impacts

Comparison Items	Java Island			Madura Island		
	Inner Access Channel Sites		Middle-distance Access Channel Sites		Access Channel Free Sites	
	Lamong Bay	Gresik South	Gresik North	Socah	Tg. Bulupandan	Tg. Bumi
Physical Environment/Pollution	A	A	B	C	C	C
Land Use	C	C	B	A	A	A
Biological Environment	A	C	A	A	A	B
Social Environment						
- Resettlement	B	B	B	B	B	A
- Economic activities /Labor	C	C	B	A	A	A
Maritime Safety Issues	A	A	A	A	A	B

Source: JICA Study Team

Note: A – Significant environmental and social impact is expected, B – Environmental and social impact is expected to some extent, C – Environmental and social impact is minimum, D – Environmental and social impact is less significant, U – Environmental impact unknown.

9 SHORT-TERM IMPROVEMENT PLAN

PLANNING SCOPE

Projects for Short-term Improvement Plan

185. The study works out a short-term improvement plan to meet shipping and related transport demand in the coming eight-year period or between 2008 and 2015. In the period, existing problems should be clearly addressed since increased seaborne traffic with larger fleets is anticipated without a modern port outside the channel.

186. For short-term improvement planning, the study put the highest priority on the existing West Surabaya Access Channel since it is the biggest bottleneck in the regional port system. The study identified the urgent rehabilitation need of Jamrud Terminal, Tg. Perak. Last, there is some urgent improvement/development needs for the land access network in relation with Suramadu Bridge and others. It should be noted that the Lamong Bay Container Port Project which would be the largest capital investment during the period is out of the study's scope, particularly for project preparation.

Seaborne Traffic and Capacity at Madura Strait

187. The study aggregated the number of ship calls at Surabaya ports: 14,779 ship calls in 2005 exclusive of traditional wooden-hull ships and no merchant marine fleets. Thus, the strait traffic is doubled or 29,558 ships. The number of future strait traffic will be 38,800 ships in 2015 and 58,080 ships in 2030 in accordance with the study's demand forecast.

188. There are internationally authorized technical standards for designing an appropriate approach channel such as the PIANC Guidelines and the Japan's Standards. The DETEC Study in 2001 concluded that the channel was required to have a width of 200m and a water depth of 12m, supported by the PIANC Guidelines. The Japan's Standards uses the maximum ship length (LOA) to a channel width. However, even the average LOA of the ships which called at Tg. Perak in 2006 of 132m, already exceeds the existing width.

189. The existing channel has enough width for only one-way traffic. In order to meet the future traffic, the channel is required to be widened up to 300 m, providing that Panamax-type ships and Post Panamax-type ships would use the channel, by applying any of the PIANC Guidelines and Japan's Standards.

190. The existing channel has a capacity of 27,000 ships per year. Amazingly, the channel traffic (29,558 ships) has already exceeded capacity. Therefore, sensitive channel operation is actually conducted by pilots such as partially one-way operation in the case of large ships.

191. The study calculates the channel capacity under different improvement plans. The calculation result indicates the following: (Table 9.1)

- The improvement case (12m depth and 200 width) satisfies year 2015 traffic but not year 2030. If large container ships over Panamax-type come in, the discrepancy is as large as approx. 11,000 ships in 2030 due to partially one-way operation.
- The improvement case (14m depth and 300 width) satisfies year 2015 traffic but also not year 2030. The discrepancy is approx. 4,000 ships in 2030.
- The first improvement case is good for a short-term solution until the year 2015.
- At least, by the year 2025, one more access channel or a modern seaport outside the channel must be developed.

Table 9.1 Seaborne Traffic Demand and Channel Capacity

	Channel Condition		Access Cannel Capacity (ships / year)			Seaborne Traffic Volume (ships / year)		
	Depth	Width	2005	2015	2030	2005	2015	2030
Existing Condition	10.5m	100m	27,000	-	-	29,558	38,800	58,080
Improvement Alternatives	12.0m	200m	54,000	48,400*	47,100*			
	14.0m	300m	54,000					

*: Partially one-way operation is conducted when Panamax-Type and Post Panamax Type are passing through the channel, resulting in decreased capacity by 10% in 2015 and 13% in 2030, respectively.
Source: JICA Study Team

APPRECIATION OF THE ACCESS CHANNEL

National Conditions

192. To develop an original database for access channel planning, the following surveys were conducted:

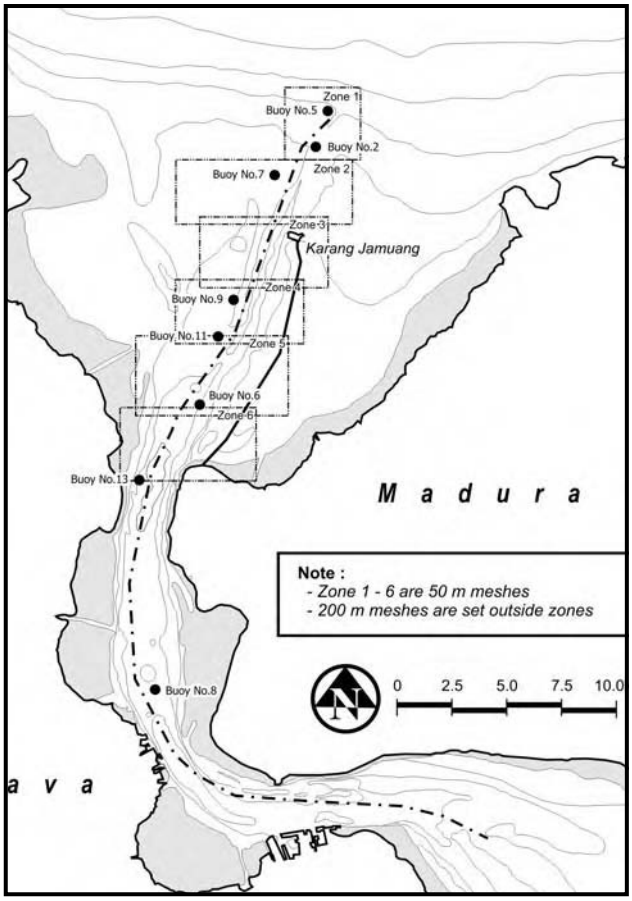
(In-situ surveys)

- Bathymetric survey at the Madura Strait sections
- Bathymetric survey at the Access Channel from the buoys No. 5 to No. 6
- Bathymetric survey at the shallow area near Buoy No. 8
- Current measurement at the buoys No. 5 and No. 6
- Bottom material survey
- Suspended solid (SS) density

(Others)

- Collection and analysis of wave data in the recent 5 years

Figure 9.1 Calculation Areas with Grid Intervals of 200m and 50m



193. The survey results show that the channel depth mostly ranges from -12m to -10m CDL. However some short sections are at around -9.5m due to sedimentation. The gradient on the side slopes ranges from 1 on 50 to 100. Other data are all useful particularly for sedimentation simulation works.

Simulation Works for Channel Siltation

194. Channel siltation has been simulated by using the "PHRI-JPC" model in which a particular set of conditions is created artificially based on the calculation of existing currents, waves and SS density. The output is an annually accumulating siltation volume. Taking the suitable depth for navigation into account, a yearly dredging volume for maintenance is estimated (Figure9.2).

195. As results, the occurrence of considerable soil siltation has been calibrated by the model at the entrance of the access channel (Zone 1 to Zone 6) with the following reasons:

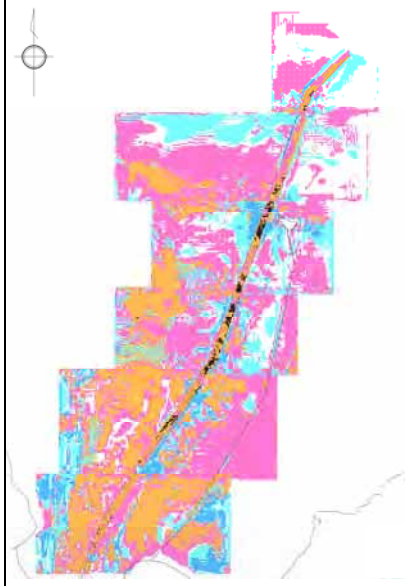
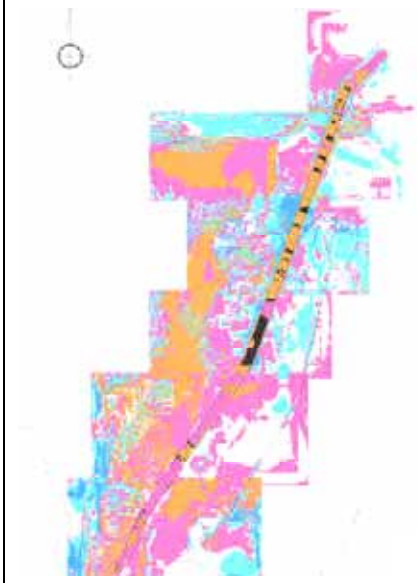
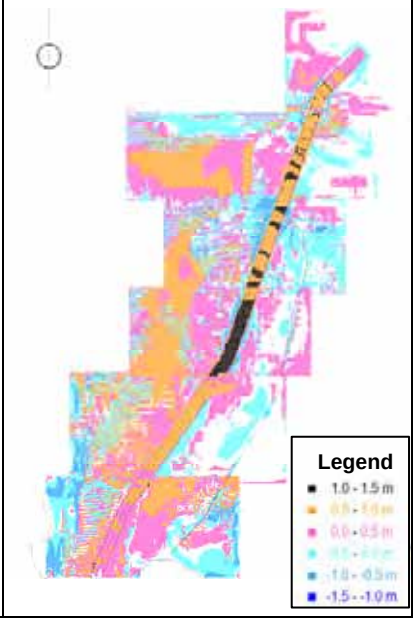
- The composition of the bed materials is mostly clay, and floating/movement of the particles is easy to occur.
- The current slows down and loses power to keep the suspended particles in the outer channel.

196. The simulation results show necessary annual dredging volumes under different initial dredging cases in depth as well as in width.

Table 9.2 Estimates of Annual Soil Volume Deposited in the West Surabaya Access Channel

Zone	Required Maintenance Dredging Volume (Million m^3/year)		
	W: 200m	W: 300m	W: 350m
	D: -12m	D: -14m	D: -16m
1	0.3	0.5	0.7
2	0.4	0.9	1.2
3	0.6	1.0	1.4
4	0.6	0.9	1.5
5	0.5	0.8	1.10
6	0.01	0.1	0.3
Total	2.4	4.2	6.2

Figure 9.2 Simulated Annual Water Depth Change at the Outer Channel and Its Surroundings

Depth: -12m, Width: 200m	Depth: -14m, Width: 300m	Depth: -16, Width: 350m
		

Source: JICA Study Team

ACCESS CHANNEL IMPROVEMENT PLAN

Initial and Maintenance Dredging Plan

197. The present West Channel has a length of about 16km with a planned depth of 10.5m and width of 100m. In order to exploit the present channel to a larger size, for example a depth of 12.0m and a width of 200m, dredging is required with a volume of 6.9 million cubic meters. For post-Panamax ships with a channel depth of 14.0m and a width of 300m, the required volume increases to 23.0 million cubic meters. For super post-Panamax ships with a channel of 16.0m deep and 350m wide, the dredging volume is 40.2 million cubic meters.

198. There are two shoals just beside the channel in front of Gresik Port, which constitute a hindrance for safe and efficient navigation of ships. The volume of the shoals to be dredged up to CDL -12 is about 2 million cubic meters. It is not practical to cut these shoals to a deeper depth, say CDL – 14m or -16m, because the depth of the skirt areas or periphery of the shoals is about -12m. As the material of the shoals is expected to be stiff, a CSD with a pump capacity of 3,200 PS may be most suitable and economic type of dredgers. The dredged materials shall be dumped at nearby shallow waters by barges. The dredging work could take about one year.

199. Sedimentation volume is assessed by means of computer simulations. The model employed is "PHRI-JPC Model" accounting for siltation by suspension, dispersion and settling of mud. The required volumes of maintenance dredging in the West Channel are summarized in the table below. It should be noted that these assessment are made for average sea conditions in the past 5 years with the usual condition (energy wave height < 1m) as the basic conditions and unusual conditions (wave height = 2m) for 10 days/year.

Table 9.3 Required Volume of Maintenance Dredging

Case No.	Channel Depth (CDL)	Channel Bottom Width	Sedimentation Volume	Duration of Dredging*
1	-12m	100m	1.3 million m^3 p.a.	4 months
2		200m	2.4 million m^3 p.a.	7 months
3	-14m	300m	4.2 million m^3 p.a.	12 months
4	-16m	350m	6.2 million m^3 p.a.	18 months

* by a TSHD with 5,000m^3 hopper capacity
Source: JICA Study Team

Improvement Plan

200. Among the four cases, the study concludes that Case 2 is the most appropriate as an urgent improvement project with the following considerations:

- The study has confirmed that the existing seaborne traffic exceeds the designed capacity of the access channel. Under such situations, it is understandable that almost all shipping companies raised this critical issue during the study's interview survey. Thus, the existing narrow channel operation should not be continued. Case 1 is not a remedial measure in this sense. However, Case 2 will be able to meet future traffic by 2025.
- Initial capital dredging would be done within a short period if productive dredging equipment could be brought in even from an advanced maritime engineering country. However periodical maintenance dredging must be done by domestic resources (equipment and fund). Case 2 may take 7 months yearly by assigning a standard TSHD dredger in Indonesia. The annual volume of 2.4 million m^3 is almost equivalent to that of Banjarmasin Port along the Barito River. Thus, this magnitude of maintenance dredging though is not easy but is manageable in Indonesia.
- New Lamong Bay Port is designed to have 14m deep berth and thus the port must favor the access channel of 14m depth (Case 3). In the short-term by 2015, however, the number of Panamax-type container ships is not large. Provided that Case 2 is selected, it is suggested for shipping operators to come in the port with less than full load condition and using high tide.

201. There are about 10 sunken ships around the West Channel and two ships in front of the planned Tg. Bulupandan Port. Most of them are submerged in the seabed. Still some of them can be hindrances for safe navigation of ships. Detailed surveys and diver's checks on their depths and shapes shall be carried out in the detailed design stage, so that discussions can be made on necessity and method of removal as well as arrangement of funds.

PROJECT IMPLEMENTATION AND OPERATION PLAN

Project Implementation Plan

202. The implementation body of Access Channel Improvement Plan should be DGST in consideration of past understandings among the parties concerned and its public nature.

203. Necessary dredger for implementation of dredging works are as follows:

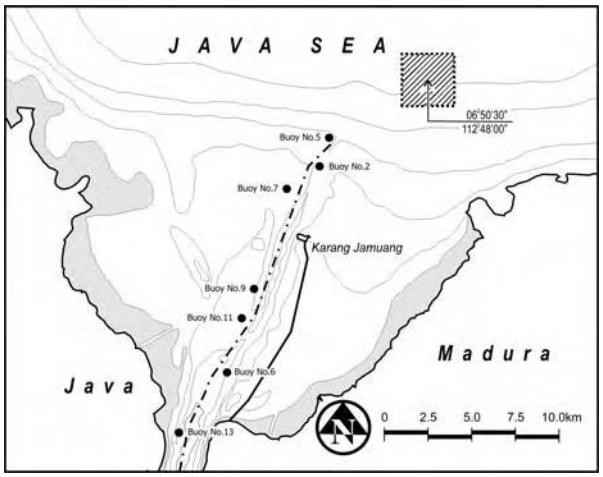
i) Capital dredging of Access Channel: TSHD with 8,000m^3 hopper capacity

ii) Maintenance dredging of Access Channel: TSHD with 5,000m^3 hopper capacity

iii) Capital dredging of Shoals: CSD with 3,200 PS pump capacity

204. In order to carry out dredging works in the channel while allowing vessel traffic, TSHD is the only dredger suitable to such condition. The dumping site of dredged soils is the designated offshore area, the center of which is located 15 km from the center of the West Channel as shown in the map below. The dredging would take about one year, if a TSHD of 8,000 m^3 is introduced from abroad. This size is most suitable to the site conditions such as dredging depth, and is rather popularly used in Asia.

Figure 9.3 Dumping Area of Dredging Materials



Channel Operation Plan

205. Rehabilitation of the following navigation aids is required:

(1) Light houses: Karang Jamuang, Sembilangan

(2) Light beacons: Ug. Piring and others

206. In order to control orderly ship movement through two directions, VTS system is to be introduced with the following specifications:

i) Location: Radar site at the roof of the light house at Sembilangan (Height: 55m), Control room in ADPEL office at Jamrud Wharf

ii) Radar: Wide range (30km) high resolution radar

iii) Microwave transmission/receiving antenna

iv) Control room:Consoles, displays, UPS, emergency generators, and other devices

v) Radio: VHF radio communication devices

207. In order to operate and manage the system smoothly and efficiently, the following institutional and technical measures should considered:

i) Organizational set up and man power arrangement,

ii) Preparation of "Operation and Maintenance Manual,"

iii) Training of officers and operators, and,

iv) Establishment of "Madura Strait Management Committee" among the related organizations..

208. In order to secure costs for operation and maintenance of new channel, including those for O/M of VTS and maintenance dredging, a new tariff system should be introduced to charge channel users, i.e. vessels calling ports in the Madura Strait.

Table 9.4 Proposed Implementation Plan for Urgent Access Channel Improvement Project

	Volume (Million m^3)			Estimated Cost (US$ million)			
	Channel		Shoal Removal	Channel		Shoal Removal	Total
	Out*	In*		Out*	In*		
Initial Dredging	6.9	0.01	2.1	39.7	0	24.3	64.0
Maintenance Dredging	2.4			5.5			5.5
Installation of VTS							3.3

Work Item	2008	2009	2010	2011	2012	2013	2014	2015
L/A	▲							
D/D & Tender Document		▬						
Bidding & Selection		▲	▬					
Contraction			▲					
Implementation				▬				
Maintenance						▬	▬	▬

*Out: Area of Outer Channel is from Bouy No. 5 to No.6.
**In: Area of Inner Channel is from Bouy No.6 to No.8.
Source: JICA Study Team

EVALUATION OF THE ACCESS CHANNEL IMPROVEMENT PROJECT

Economic Analysis

209. A cost and benefit stream was prepared for economic analysis where economic costs consists of initial and maintenance dredging and VTS installation while economic benefits to be accrued from the project are the following three (3) in the 'with' and 'without' comparison:

- Reduction in sea transportation cost by larger vessels;
- Savings in port staying cost of vessels and cargoes waiting for high tide and channel clearance when large vessels come from the opposite direction; and
- Reduction in maritime accident occurring in the channel

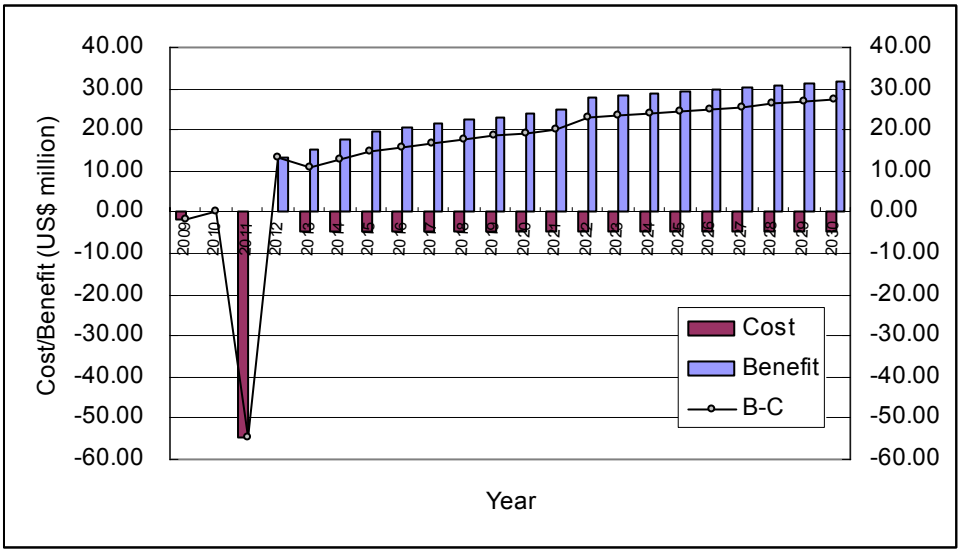
210. Considering the project's nature as an urgent solution of the present bottleneck, the project life is set as short as 20 years. As results, EIRR is estimated at 23.2% and thus the project is judged highly feasible from the economic point of view.

211. It is noted that the project has an inherent vulnerability inside and it would be realized if the project implementation plan could not be practiced accordingly. Concretely speaking, the annual maintenance dredging volume of 2.4 million m^3 is substantial compared with the initial dredging of 6.9 million m^3, excluding removal of shoals. It means that the initial dredging would be useless if maintenance dredging is neglected only for three years. And there is no reason to consider that the maintenance dredging will properly continue.

Financial Analysis

212. Since the project is undertaken by the government without profit making, FIRR calculation is not required in this case. In project implementation, however, a stable and sustainable resource for maintenance dredging is crucial. If this cost could be transferred to port users, an adequate tariff would be US$ 0.08 per registered ton, which covers maintenance dredging cost plus administration cost for this charge (30% of the dredging cost). It would be charged at the ports located at the Surabya West Access Channel.

Figure 9.4 Flow of Economic Cost and Benefit



EIRR	(%)	23.2
NPV	US$ million	44.1
B/C	-	1.60

Source: JICA Study Team

JAMRUD TERMINAL REHABILITATION PLAN

Rehabilitation Needs

213. This old terminal requires urgent rehabilitation. In line with the access channel improvement project, thus a synergy effect can be expected to accommodate larger ships. Therefore, the study has analyzed Jamrud Terminal as part of the short-term improvement plan.

214. The rehabilitation and improvement needs of Jamrud Terminal are identified and justified as follows:

- The old structure built around 1910 is seriously damaged, thus it must be urgently rehabilitated.
- The layout is not suitable for modern shipping. For example, the apron width of 12m is very narrow for cargo handling.
- The berths of North Jamrud Pier are allocated for international dry bulk and general cargo vessels except the berth in front of the passenger terminal. If the berths could be made deeper, larger international vessels would call at this port.
- The passenger terminal located at the east edge of Jamrud is obsolete. PELINDO III intends to replace it with a new one which meets not only domestic passengers but also international cruisers. Five large warehouses are also operational, but they are old and not popular nowadays. Therefore, any superstructures on Jamrud can be demolished and replaced.

Rehabilitation Plan

215. Since the study proposes the access channel improvement project at -12m depth, the same water depth will be provided at Jamrud North Pier. The new north pier layout has five berths. They are lined as 300m (length) x 12m (depth), 250m x 12m, 200 m x 12m, 200m x 11m and 200m x 11m from the west edge.

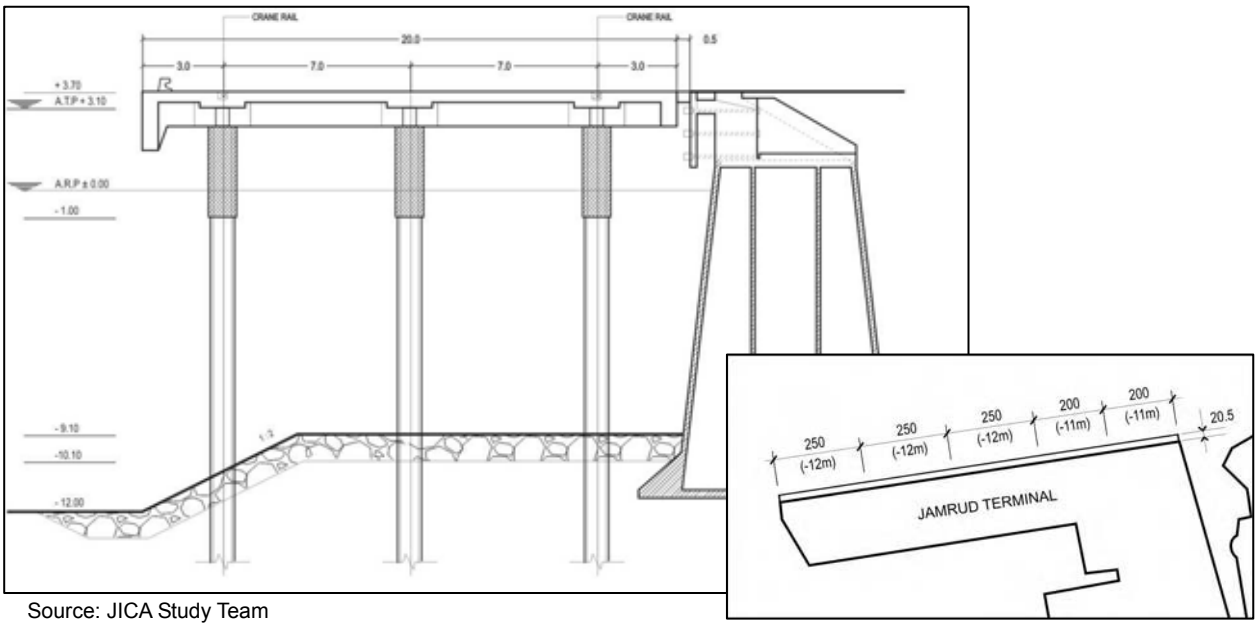
216. The apron will be widened from 12m to 20.5m, which is suitable for modern dry bulk and general cargo shipping, using open hopper bin or directly loaded/unloaded by truck.

217. The direct construction cost is estimated at Rp 242 billion exclusive of superstructure. Thus, the total project cost is Rp 348 billion.

218. Existing warehouses will be re-arranged and be partially demolished for efficient lift-on/lift-off operations and hopper bin usage.

219. For accommodating international cruise ships, a new passenger terminal is required to add CIQS (customs, immigration, quarantine and security) related facilities, tourism desk, bank (for money exchange), .post office, international telecommunication services, and so on. Singapore Cruise Centre is a good example where international cruise terminal is located in the same building with regional/domestic ferry terminals.

Figure 9.5 Rehabilitation Plan of Jamrud Terminal



Source: JICA Study Team

LAND ACCESS NETWORK IMPROVEMENT PLAN

220. The improvement and reinforcement of access roads and railways to the ports in GKS is imperative to ensure smooth flow and inter-connection of cargo. The study strongly feels the necessity of land access improvement at several sections.

221. **The Sidoarjo – Gempol Toll Section**: Since May 2006, the mudflow disaster in Porong, Sidoarjo has suspended the toll operation between Porong and Gempol. Based on survey and analysis on its impacts, the toll road suspension has substantially and negatively affected the shippers southwards beyond Porong and use Surabaya ports. The diversion route is situated 3.5 km west from the outer dike and its length is 12km long.

222. The Tg. Perak – Suramadu Bridge section: Although the Suramadu Bridge construction will be completed at the end of 2008, the existing road between Tg. Perak and the bridge end is not suitable for port access due to its zigzag alignment on some ordinary roads and traffic congestion even at present. The proposed alignment of Surabaya Eastern Ring Road, 18km long between Juanda Airport and Tg Perak, includes this section with a shortcut route of 5km. This linkage between Tg. Perak and Madura is strategically important for the overall metropolitan ports system thus it should be implemented in the short-term.

223. **The new toll roads of Waru – Mojokerto and Gempol – Pasuruan**: Some FDI accumulated industrial estates around these toll road alignments. Such port users would benefit from the projects. Moreover, the projects are also attractive to expand the hinterland of Surabaya ports from a port marketing viewpoint. The projects were once suspended due to the economic crisis but, lately, BPJT (Toll Road Regulatory Agency) has revived private toll road development including those roads, which deserve consideration as high priority.

224. **Rail branch lines for port access**: The branch line that connects between Tg. Perak and a marshal yard located east of Tg. Perak is under rehabilitation and would resume operation with a double- track rail. To provide efficient container freight service, it is suggested that Kalimas Station and its compound be transformed into a modern container depot for arranging long-distance container rail operation. Since the new Lamong Bay port is going to exclusively handle containers, the project is an opportunity for PT. KAI to provide rail container services at a nearby station like Kandongan Station with a branch line.

Figure 9.6 Diversion Plan of Porong-Gempol Section

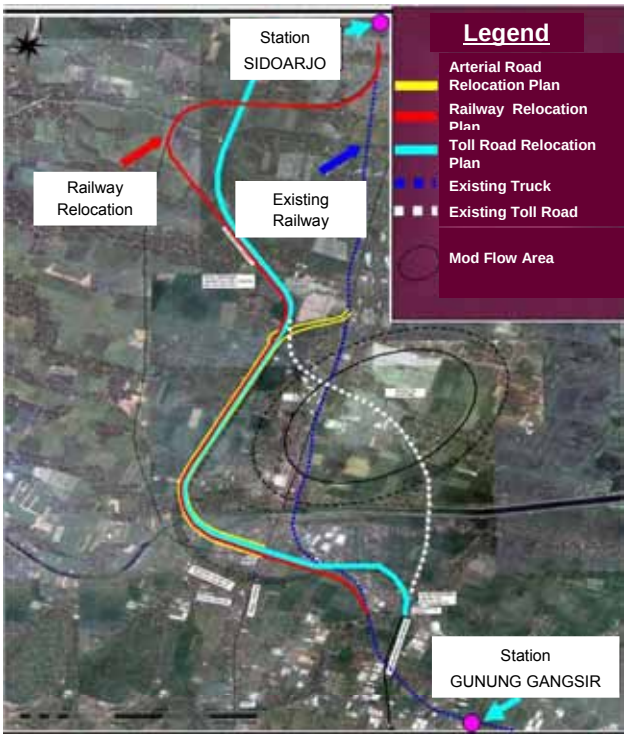
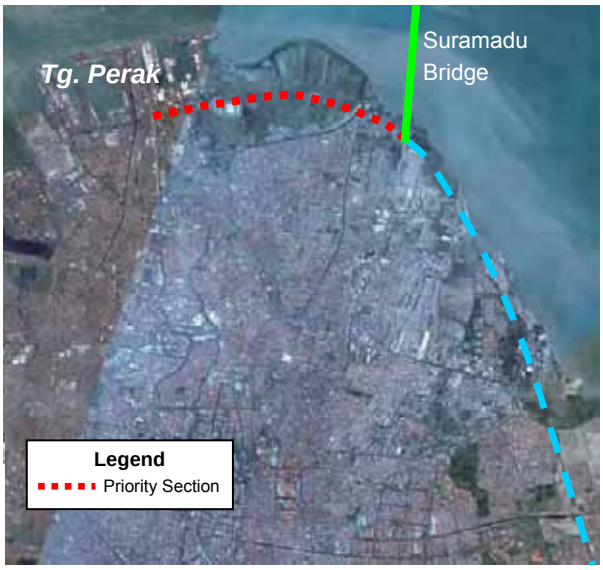


Figure 9.7 Aerial View of the Planned Eastern Surabaya Ring Road



10 LONG-TERM DEVELOPMENT PLAN

PLANNING SCOPE

Projects for Long-term Development Plan

225. Two sites, Tg. Bulupandan and Socah, have been selected for further detailed comparison as a gateway container port. A long-term development plan is formulated to pave the way for effective gateway port development under the regional development context, through comparison of the the two candidate sites factoring in port design and construction method, sea and land port access, associated direct hinterland development, initial environmental examination and economic and financial analysis. and seawaters and spacious hinterlands.

New Port Infrastructure Need

226. Provided that new Lamong Bay port would start operation in the early 2010s and no further expansion, a new container port will have to be developed around 2020. By 2030, the regional economy will require a large-scale container port to handle 2.7 million TEU per year.

227. The study predicts much more direct container services within Asia and some longer distance voyages from US, India, the Middle East and EU (refer to Chapter 7). Therefore, deep berths will become a prerequisite to accommodate Panamax-type ships and larger in the region.

228. In conformity with the study's traffic demand forecast, the necessary berth length of a new container port is 600m in 2020, 1,850m in 2025 and 2,550m in 2030.

229. More non-container port infrastructure will be necessary in the future. The study has also projected necessary berth length by cargo type. Although general cargo operation is usually undertaken at public ports, no port project has been prepared like Lamong Bay port for container. Hence, it is also projected that there will be a shortage of general cargo berth of 720m in 2015 to 2,160m in 2030.

230. In many cases, private ports handle dry and liquid bulk cargoes since many kinds of bulk cargoes request exclusive and specialized treatment. This is the committed project that Gresik Port under PELINDO III is going to extend its dry bulk berth by 640m. Although berth length should be extended as dry cargo demand increases, thereby no serious burden on the public sector finances is expected.

Table 10.1. Required Container Berths

Year	Required Capacity (TEU)	Accumulated Berth Length (m)	Berth Depth (m)	Remarks
2020	500,000	300m x 2 berths = 600m Total 600m	14m	Panamax
2025	1,600,000	300m x 5 berths = 1,500m 350m x 1 berths = 350m Total 1,850m	14m 15m	Panamax Largest Panamax
2030	2,700,000	300m x 5 berths = 1,500m 350m x 3 berths = 1,050m Total 2,550m	14m 15m	Panamax Largest Panamax

Source: JICA Study Team

Table 10.2 Required Berth Length for Non-container Cargo by Type

Year	Shipcall				Required Berth Length (m)			
	General Cargo	Bulk	Tanker	Total	General Cargo	Bulk	Tanker	Total
2015	1,200	1,700	800	3,700	720	840	480	1,920
2020	2,000	2,600	1,200	5,800	1,080	1,320	600	2,880
2025	3,000	3,400	1,500	7,900	1,560	1,800	840	4,080
2030	4,100	4,400	1,900	10,400	2,160	2,160	960	5,160

Source: JICA Study Team

NEW PORT DEVELOPMENT PLAN AT TG. BULUPANDAN

Natural Conditions

231. The study conducted (i) bathymetric survey, (ii) tide measurement, (iii) soil investigation, and (iv) bottom material sampling at Tg. Bulupandan area.

232. From the survey results, the study obtained several important technical implications to port planning and designing works. They are as follows:

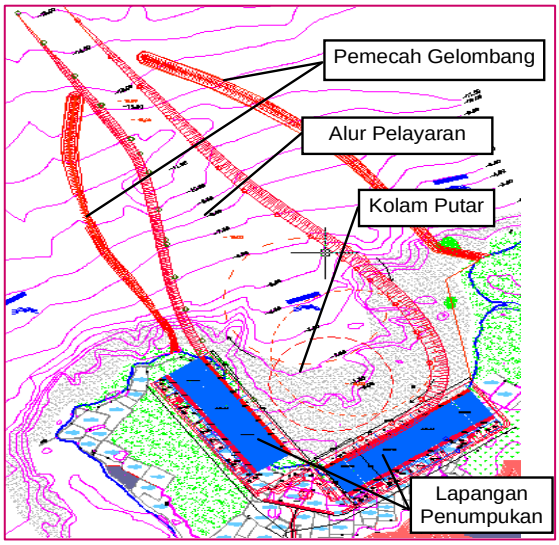
- Breakwater will be necessary of the almost same level as those at Tg. Priok and Tg. Emas;
- For economic dredging, a cutter suction dredger with cutter power of more than 1,500 ps will be needed.
- Although sub-soil layers are expected to be rather hard, construction of wharves in pile structure will be possible with auxiliary measures such as usage of a rock auger and adopted for pile driving.
- Sandy materials or coral debris for reclamation will be likely obtained from the seabed adjacent to the Tg. Bulupandan project site.
- Soil improvement will not be necessary for reclaimed ground, since in-situ soft cohesive soil layers are expected to be thin (some 1 to 5 m)

Port Development Plan

233. The port development plan prepared by the study is to meet transport requirements by 2030 such as berth length (2,550m by 8 berths) and depth (14-15m), apron width (64.5m), marshalling yard (30.4ha) and backyard (0.9ha). Taking into account local conditions, port position, container yard, approach channel, breakwater and anchorage area is adequately determined. (Figure 10.2)

234. **Port Position:** The most prominent feature of the port site is that it can touch a deep water of 15m with its own breakwater and navigation channel. To take advantage of this point, the shortest access to deep water has been planned. For this purpose, Ko'ol Bay will be totally reclaimed mostly by the dredging materials. It is the largest difference from the previous plan of which East Java Government commissioned PUSTRAL, Gadjah Mada University to prepare.

Figure 10.1 Previous Port Development Plan



Source: PUSTRAL, Gadjah Mada University, 2005

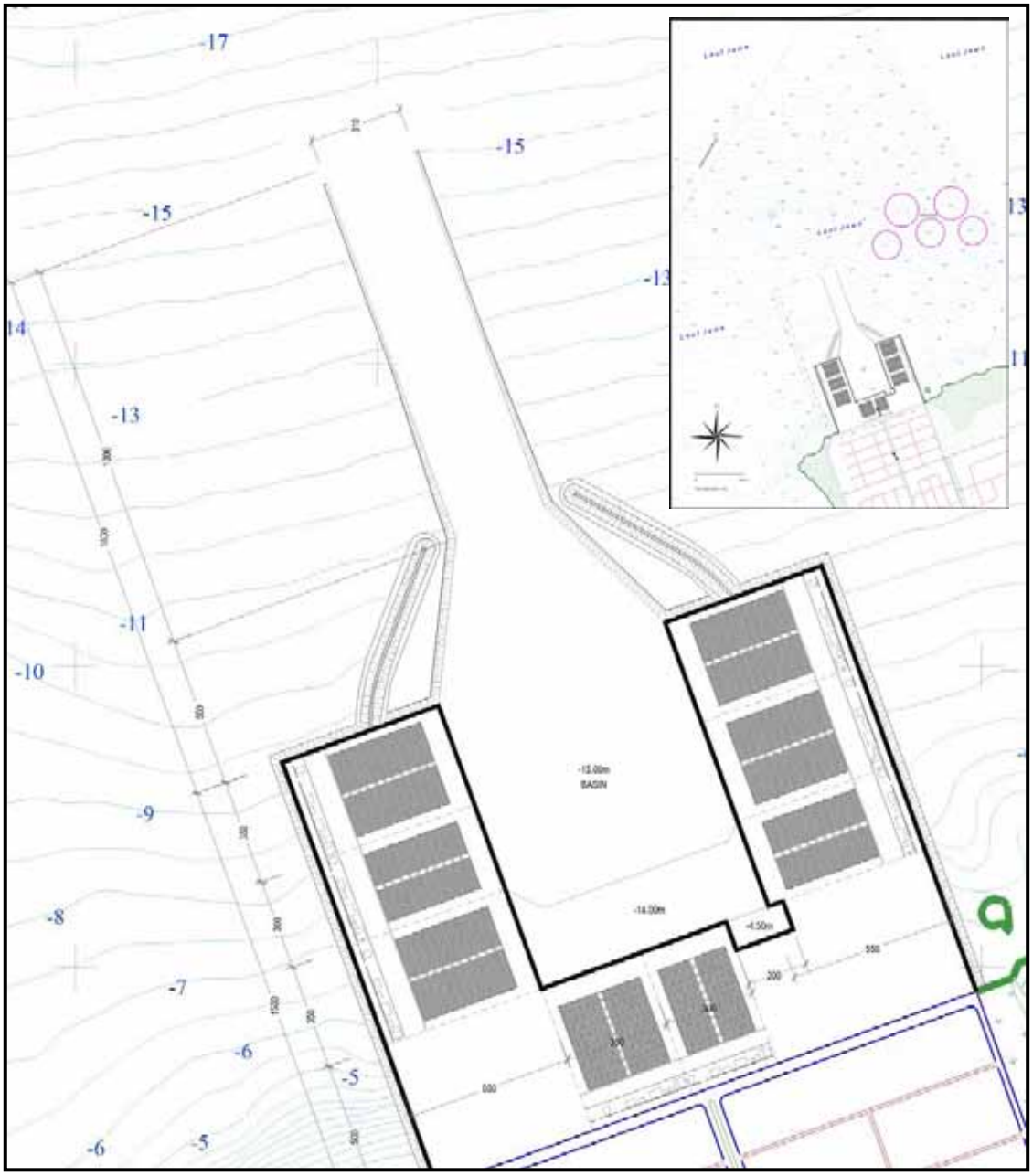
235. **Container Yard:** The container yards is planned to have enough areas for modern cargo handling methods such as Transfer Crane (RTG) method. The width of the yard is planned to be 550m, including spaces for the apron, marshaling yards, administration area, and the access/inner road. If a width of 50m is excluded for the road, the area for one berth is (300m or 350m) x 500m, which enables to secure a total ground slot (TGS) of 3,500 TEU to 3,900 TEU per berth with transfer cranes of 6 rows. The total land area is 203 ha for the yard and inner road areas.

236. **Approach Channel:** The access channel dimensions are planned to have a depth of CDL-15.0m (Phase 2) and width of 310m. The orientation of the channel is N 20 degrees W (20 degrees from the north to the west, counter-clock wise).

237. **Breakwaters:** The breakwaters are extended to a depth of CDL -10m to protect the basins from incident waves and the channel from drifted sand. As the waves come mostly from both east and west directions by season, the mouth of the breakwaters should not be overlapped to one direction.

238. **Anchorage Area:** The port development plan does not assume congested operation by productive equipment and comfortable BOR setting between 50%-55%. Five anchorages are designated at the east side of the port.

Figure 10.2 Layout Plan of Tg. Bulupandan New Port



Source: JICA Study Team

Implementation Plan and Cost Estimates for New Tg. Bulupandan Port

Preliminary Port Design

239. **Quay wall Structure:** According to the surveyed sub-soil data, there exist hard coral rock layers under a few meters of soft surface. Taking such soil condition and gentle slope of seabed topography into account, the most suitable construction method is selected, i.e., steel pipe pile foundation. It is suitable to manage cost and work period. The pile should be driven up to -33m into the sand stone, which is a very dense layer.

240. **Breakwater Structure:** The breakwater is planned to secure the calmness of the container handling quay wall during rough weather season. The breakwater is designed by placing gravel and riprap stones on the seabed, and concrete cups are placed on top of the gravel stone mound. The large concrete blocks around 5 ton units will be placed on the seaside slope as armour stone protection.

241. **Dredging and Reclamation Works:** The existing seabed depth of the planned berthing area and entrance channel and basin is -4m to -15m. It is necessary to deepen the channel and basin areas to obtain the required water depth of -14 to -15m. Considering the results of soil investigation, the dredging works is planned to be carried out by cutter suction dredgers.

Cost Estimates

242. The project cost is estimated in line with the stage development plan of the new port at Tg. Bulupandan. The project cost is summarized in Table 10.3. In the table Office/Gate/Workshop/ Others means superstructures such as administration buildings, gates, maintenance shops, electric sub stations, water towers, and utility facilities of electric supply and water supply works.

Implementation Plan

243. The scope of wharf construction works in the Phased Development up to 2030 is as follows;

Phase1 (up to 2025): New construction of 6 berths including 5 berths (300m long and -14m deep) and 1 berth (350m long and -14m deep)

Phase2 (up to 2030): New construction of 2 berths (350m long and -15m deep) and deepening 1 berth (350 long and -15m deep from initially -14m)

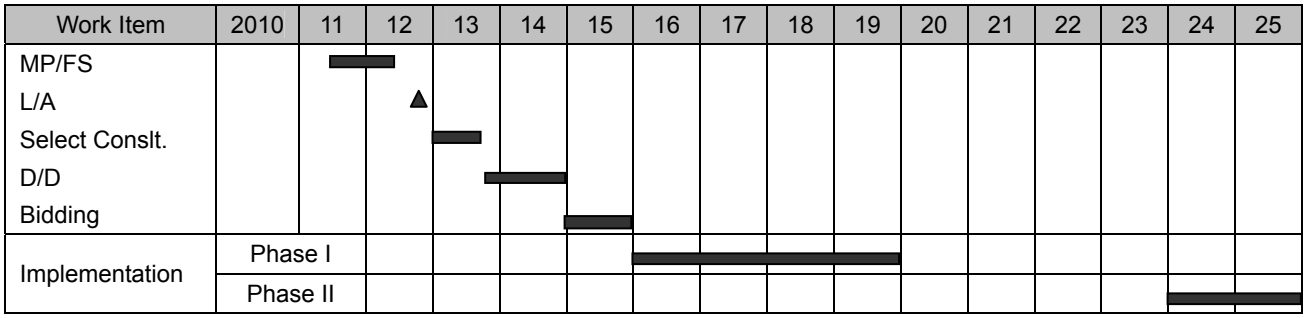
Total: 5 berths (300m long and -14m deep) and 3 berths (350m long and -15m deep)

Table 10.3 Summary of Project Cost of Tg. Bulupandan Port

Cost (1,000 USD)	Phase 1	Phase 2
Wharf	77,400	29,400
Container Yard	64,000	19,700
Office/Gate/Workshop/Others	34,600	11,700
Breakwater	41,300	24,500
Revetment	15,300	3,400
Dredging	66,000	9,300
Reclamation	24,100	13,100
Access Road	10,000	0
Container Handling Equipment	121,500	59,300
(a) Direct Construction Cost	**454,200**	**170,400**
Consulting Services	36,300	13,700
Contingency*	49,000	27,600
(b) Total Direct Project Cost	**539,500**	**211,700**
TAX and Duties**	8,100	5,300
VAT (Value Added Tax)***	59,400	23,300
Administration Cost****	16,200	6,400
Sub Total	83,600	34,900
(c) Total Project Cost	**623,100**	**246,600**

*: 10% of Const+Coslt Services
**: 5% of Foreign Portion
***: 11% of Foreign Portion and Local portion
****: 3% of (b)

Figure 10.3 Investment Schedule of New Port



IEE AT NEW TG. BULUPANDAN PORT DEVELOPMENT PROJECT

Table 10.4 Summary of IEE

	Construction Phase	Operation Phase
A. Physical Environment		
1. Land	C	C
2. Water	A	A
3. Air	B	B
4. Noise and Vibration	B	B
5. Bottom Sediment	A	A
B. Biological Environment		
1. Terrestrial	A	A
2. Marine	A	A
C. Land Use		
1. Land Use Zoning	B	B
2. Aesthetics and Visual Effects	B	A
3. Archeological and Historical Sites	B	B
D. Socio-cultural, Economic		
1. Resettlement	B	B
2. Economic Activities	A	A
3. Labor and Employment	A	A
4. Housing and Social Services	C	C
5. Infrastructure and Public Utilities	C	C
6. Public Health and Safety	C	C
7. Culture, Lifestyle and Values	B	B
8. Women and Vulnerable Groups	B	B
9. Conflict of Interests	B	B
10 Equity of benefits and losses	B	B
11. Accident	B	A

Note: A – Expected significant environmental and social impact
B – Expected environmental and social impact to some extent
C – Environmental and social impact is minimum
D – Environmental and social impact is less significant
U- Environmental and social impact
Source: IEE Survey Report for the Study by ITS

Mitigation Measures

244. The reclaimed land will alter the flow of wave and current. Such change will induce alternation of sediment transportation and change in seabed condition. The impact may be minimized by decreasing the reclamation area, and enabling the seawater flow into the bay.

245. Proper drainage system should be considered to avoid possible surface water runoff.

246. Mangroves along the bay will be directly affected by the reclamation work. Moreover, the hydrological changes in the bay may have secondary impacts on the existing mangroves. Several protected species of water birds are identified around the mangroves. Rehabilitation or remedial action should be taken.

247. Present land use and landscape will be altered due to the project. Its untamed and rural aesthetic feature, consisting of fishponds and farming land will be altered due to change in land use pattern.

248. Resettlement impact may not be significant under present project design. However, in case small scale resettlement is not avoidable, resettlement planning should be carried out under three principles: (i) proper compensation for lost assets, (ii) assistance for relocation, and (iii) assistance for rehabilitation to achieve at least the pre-project level of well-being.

249. Non-resettlement, economic-displacement impact of the local people should be carefully considered. Since most of the locals are small-scale fishermen/farmers, and their livelihood restoration measures should be taken into account and incorporated into resettlement planning.

250. 63 % of the population is considered “poor” in the area. Special consideration should be addressed to vulnerable groups, whose livelihood may be affected due to loss of access to natural resources / income generating activities.

251. Social survey result indicates that the local communities in general have positive perceptions towards port development. However, concerns over impact on resettlement, and fisheries activities are to be addressed. On-going continuous consultation with the local community is essential in order to incorporate their views and options into project planning.

252. Local human resource should not be undermined and priority should be given to them when there are employment opportunities. Provision of proper trainings and social awareness programs will be given.

253. Pipelines installed/to be installed posses a high risk for maritime accident. These risks should be incorporated into port planning.

NEW PORT DEVELOPMENT PLAN AT SOCAH

Natural Conditions

254. The study conducted (i) bathymetric survey, (ii) tide measurement, and (iii) soil investigation at Socah area.

255. From the survey results, the study obtained several important technical implications to port planning and designing works. They are as follows:

- Breakwater is not necessary since the peripheral sea can be considered calm.
- Platform-type wharf parallel to the channel centerline could be the most suitable berthing facility in view of hydraulic characteristics in this area.
- Although foundation soil layers are rather hard, construction of wharves and trestles with pile structure can be considered possible. It may be necessary at some locations to use a rock auger for pile driving through a lime stone (coral) layer.
- In front of the wharf it will be necessary to dredge the seabed to secure basin depth of -14m for Phase 1 and -15m for Phase 2. For economical dredging cutter suction dredger(s) of cutter power more than 1,500ps will be introduced. Enclosed dumping (reclamation) area will be necessary to accept the dredged material.
- To utilize the dumping area as container yards, soil improvement works might not be necessary, since the foundation consists of a thin soft layer on the surface, thickness of which is only about 5m, and a sandy non-consolidation layer of 30m thick beneath it on the lime stone bearing stratum.
- It might be difficult to obtain suitable sandy materials enough for reclamation from the sea reasonably adjacent to the Socah area. The sandy materials can be obtained from the coastal area of Madura Island.
- Soil improvement works will not be necessary for reclaimed ground with sand, since in-situ soft cohesive soil layers are relatively thin as described above.

Port Development Plan

256. The port development plan prepared by the study is to meet transport requirements by 2030 as the same specifications for the new port of Tg. Bulupandan.

257. Planning considerations to address the peculiar site conditions are mainly three-fold:

- To minimize the affect on the “hydraulic rule of the Madura Strait” (discussed in Chapter 5) by means of permeable structure and limited front water dredging;
- To make compatible between minimal use of the land at Tg. Bulu to meet the first principle and designing of economic infrastructure; and

258. The layout plan is illustrated with the access channel and existing and planned gas pipelines at Gresik, respectively. With the new port, water width between the quay frontage and the centerline of the access channel will range from 1,400 to 1,500m. Advanced traffic management must come in to secure maritime safety even under such densely developed situations. (Figure 10.4)

IMPLEMENTATION PLAN AND COST ESTIMATES FOR NEW SOCAH PORT

Preliminary Design

259. **Quay wall Structure:** The wharf will be constructed at the deep water area to make dredging cost low, while the container yard will be constructed at the shallow area to minimize reclamation cost. The wharf and container yard is connected by trestle. As backyard of the wharf is not reclaimed area, the steel pipe pile type foundation is adopted to the adjacent berth structure at Socah new port.

260. **Dredging and Reclamation Works:** The existing seabed depth of the planned berthing area and entrance channel and basin is -12m to -15m. It is necessary to deepen the channel and basin areas to obtain the required water depth -14 to -15m. The dredging area is close to the existing channel, thus a dredger, which requires anchoring is not adequate for safety purposes of channel passing vessels. Thereby the dredging works is planned to be carried out by trailer suction dredgers.

Cost Estimates

261. The project cost is estimated in line with the stage development plan of the new port at Socah. The project cost is summarized in Table 10.5. In this table Office/Gate/Workshop/ Others means superstructures such as administration buildings, gates, maintenance shops, electric sub stations, water towers, and utility facilities of electric supply and water supply works.

Implementation Plan

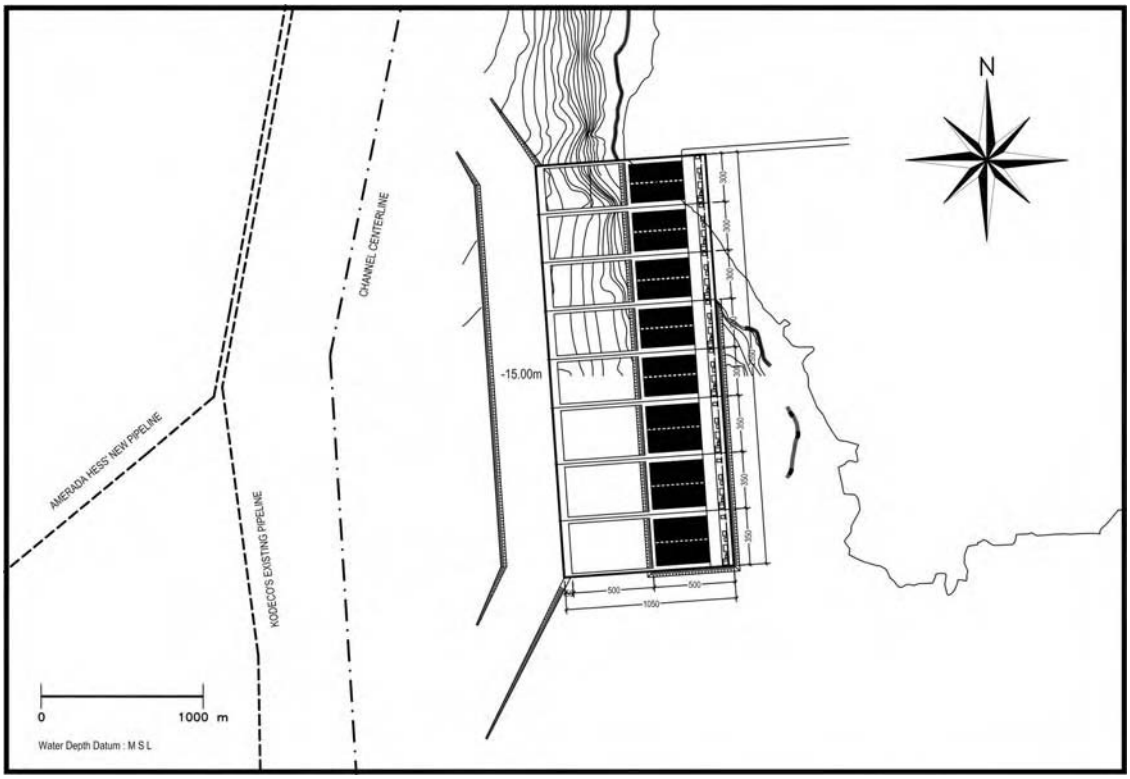
262. The schedule of wharf construction works in the phased development up to 2025 is the same as Tg. Bulupandan New Port.

Table10.5 Summary of Project Cost of Socah Port

Cost (1,000 USD)	Phase 1	Phase 2
Wharf	89,400	33,900
Container Yard	90,900	30,300
Office/Gate/Workshop/Others	34,600	61,200
Breakwater	33,800	12,200
Revetment	7,700	3,800
Dredging	23,000	0
Reclamation	9,500	12,000
Access Road	7,000	0
Container Handling Equipment	121,500	59,300
(a) Direct Construction Cost	**454,200**	**171,200**
Consulting Services	35,500	13,700
Contingency*	48,000	18,400
(b) Total Direct Project Cost	**539,500**	**203,300**
TAX and Duties**	7,900	3,100
VAT (Value Added Tax)***	58,000	22,400
Administration Cost****	15,800	6,100
Sub Total	81,800	31,500
(c) Total Project Cost	**609,300**	**234,800**

*: 10% of Const+Coslt Services
**: 5% of Foreign Portion
***: 11% of Foreign Portion and Local portion
****: 3% of (b)

Figure 10.4 Layout Plan of New Socah Port



IEE ON NEW SOCAH PORT DEVELOPMENT PROJECT

Table 10.6 Summary of IEE

	Construction Phase	Operation Phase
A. Physical Environment		
1. Land	C	C
2. Water	A	A
3. Air	B	B
4. Noise and Vibration	B	B
5. Bottom Sediment	B	B
B. Biological Environment		
1. Terrestrial	B	B
2. Marine	A	A
C. Land Use		
1. Land Use Zoning	B	B
2. Aesthetics and Visual Effects	B	B
3. Archeological and Historical Sites	B	B
D. Socio-cultural, Economic		
1. Resettlement	B	B
2. Economic Activities	A	A
3. Labor and Employment	A	A
4. Housing and Social Services	C	C
5. Infrastructure and Public Utilities	C	C
6. Public Health and Safety	C	C
7. Culture, Lifestyle and Values	B	B
8. Women and Vulnerable Groups	B	B
9. Conflict of Interests	A	A
10. Equity of benefits and losses	B	B
11. Accident	B	A

Note: A – Expected significant environmental and social impact
B – Expected environmental and social impact to some extent
C – Environmental and social impact is minimum
D – Environmental and social impact is less significant
U- Environmental and social impact
Source: IEE Survey Report for the Study by ITS

Mitigation Measures

263. The reclaimed sea-area may block the water flow in between the coastal land and the reclamation area. Such blockage of water flow will aggravate water circulation, affecting the fishpond /net fishing activities in the area. Reclamation methodology should be considered to minimize such impacts.

264. Marine and terrestrial fauna and flora will be adversely affected during construction. In particular, part of the fringed mangroves facing the strait will be damaged. Rehabilitation or remedial action should be taken.

265. Among four site alternatives, the present alternative was selected, to minimize the resettlement impacts. However, in case small-scale resettlement is necessary, proper resettlement planning should be carried out under three principles: (i) compensation for the lost assets, livelihood and income, (ii) assistance for relocation, (iii) assistance for rehabilitation to achieve at least the pre-project level of well-being.

266. Socah has relatively high fishpond aquaculture productivity in the regency. Fishponds affected by the project will lead to loss of income and livelihood for those engaged in such fisheries activities. Non-resettlement impacts of the fishermen during construction and post-construction stages should also be considered.

267. However, negative sentiment has been prevailing in Socah area regarding the project, which was clearly expressed during the consultation meeting. Several other project development plans are underway in the area, but the absence of proper information disclosure, and locals' participation in the planning process has lead to their dissatisfaction and distrust towards such development planning. Information disclosure in a timely manner, local participation in decision-making process for the project is a must.

268. Local human resource should not be undermined and priority should be given to them when there are employment opportunities. Provision of skill trainings and social awareness programs should also be given.

269. Pipelines installed /to be installed at the bottom of the strait posses extremely high risk of maritime accidents. Project planning should consider these risks. Maritime safety and road safety should be enhanced.

INTEGRATED PORT HINTERLAND DEVELOPMENT

Planning Rationale

270. Gateway port development would have a profound impact on regional development. Particularly, when a gateway port is developed at an underdeveloped area and if direct hinterland development is coordinated, greater benefits can be expected through synergy than individual developments. Such synergy effect has been demonstrated in Laem Chabang in Thailand, Busan in Korea and other port cities. One of the reasons why the study selected the two candidate sites for a gateway port is spaciousness not only for port but also direct hinterland development.

271. As already stated, Tg. Bulupandan and Socah have different characteristics in many aspects such as dependence on the access channel, local socio-economic conditions and natural environments. Regarding area-wide development project like new town and industrial estate, no commitment has been done so far at Tg. Bulupandan but one large-scale development project developer has already obtained development permit from Bangkalan Regency in Socah, i.e., Madura Integrated Seaport City (MISI).

272. The study has conceptualized an integrated port hinterland development plan adjoining the proposed Tg. Bulupandan port, creating a self-containing port city. In the case of Socah, however, only a logistics center has been allocated near the proposed Socah port. This is because of the MISI project and thus the study doesn't need to draw a blueprint for area-wise development in this case. However one of point of port competitiveness is the availability of supporting logistics lands nearby.

Land Uses

273. **Logistics Land**: One of the strengths of Tg. Perak lies in its large compound of 517.6ha under PELINDO III. The PELINDO III's Tanjung Perak land is divided into port terminal (43%) and other port related lands (57%) such as port related industries, maritime business complex and private cargo depot and distribution centers. Without such a configuration, Tg. Perak might not have sustained its competitiveness against other rival ports. Thereby, in the plan, a port logistics complex area of 200 ha is allocated just behind the port. Possible development types are office buildings, container depots, warehouses and private terminals.

274. **Industrial estate**: This is a good tool to attract FDI. The location is especially valuable for export processing industries. Under the future socio-economic framework of the study, the magnitude of future industrial development has been projected by several aspects including investment requirement, job creation and industrial estate land. In conclusion, Bangkalan Regency has a large opportunity in industrial estate development, e.g., 670ha with 98,000 job opportunities.

275. **Residential lands**: A gateway city is functionally a sleepless city where port and most of logistics facilities and factories operate in a 24 x 7 system. Thus, residential area is desirably located near the working place, though some will commute from other areas in Madura Island and Surabaya City. In Madura, good job opportunities are insufficient. Many people are forced to work abroad or bear a hand-to-mouth existence. Therefore, a self-contained city or totally balanced day and night population is not required.

Tg. Bulupandan Zoning Plan

276. The study has proposed a conceptual layout plan constituting of 1,600 ha lands except port area. The plan has an industrial estate of 320 ha which is half of the potential development area in Bangkalan Regency. Open space and massive greenery is allocated around the industrial estate and the coastline. A historical site of Tg. Modung will be partly preserved. On the opposite side, Tg. Bulumodung will be kept because of a strategic reason, which is that there is a possibility in the far future that this area will be the site for port expansion.

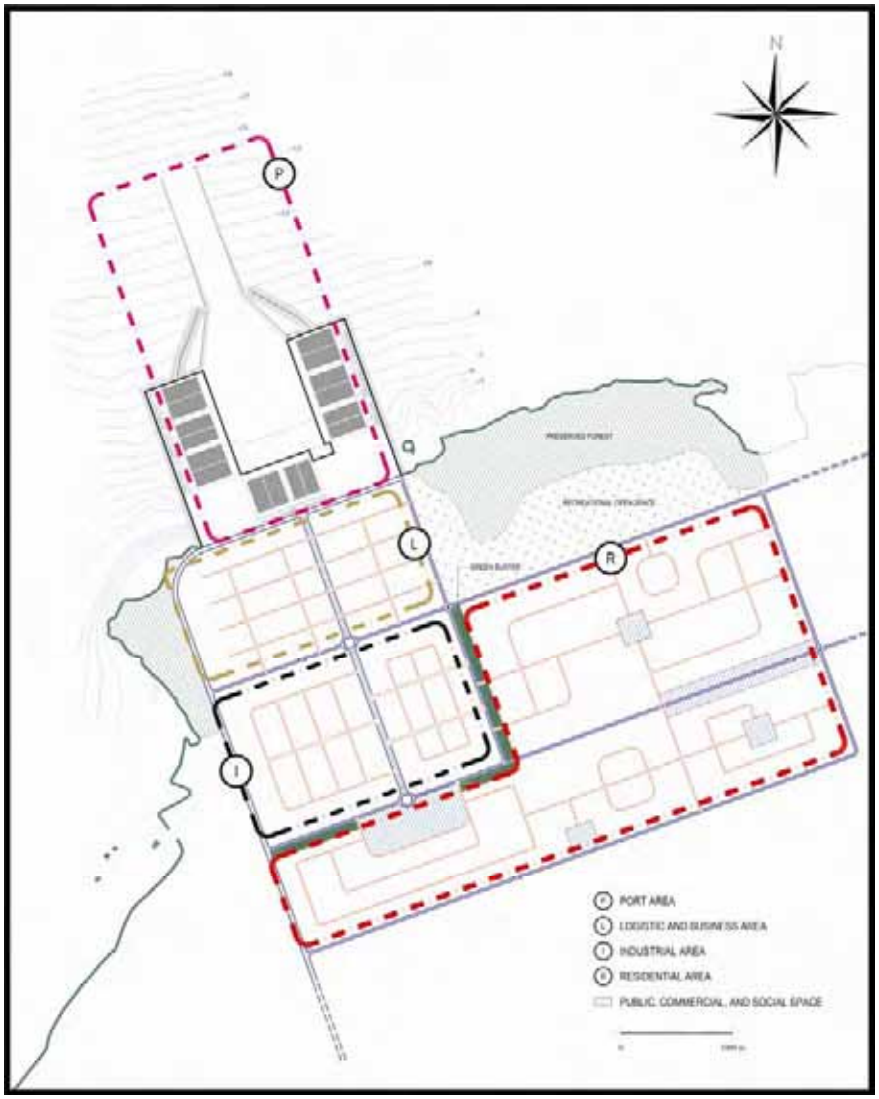
277. The conceptual layout plan assumes that this port city will be home for 96,000 residents and the workplace for 70,000 persons including 7,000 port and related logistics service workers.

Table 10.7 Land Use Plan for Integrated Port Hinterland Development at Tg. Bulupandan

Land Use	Area (ha)	Composition (%)
Industrial Land	320	20
Logistics Land	200	13
Residential Land	800	50
Public, and Commercial Lands	50	3
Port Access and Artery Roads	80	5
Open Space	150	9
Total	1,600	100

Source: JICA Study Team

Figure 10.5 Land Use Plan for Integrated Port Hinterland Development at Tg. Bulupandan



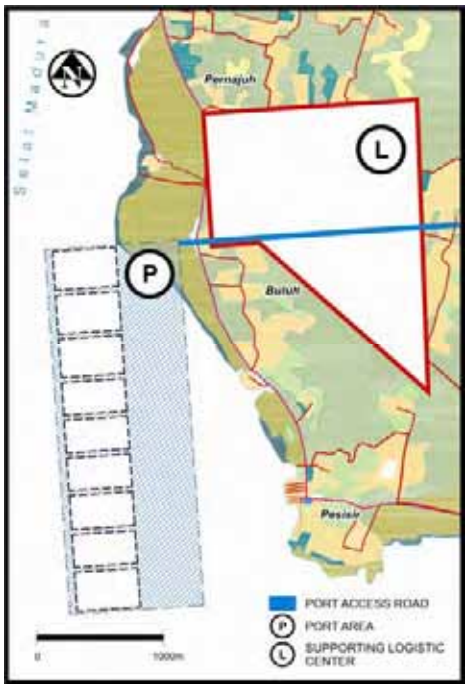
Socah Zoning Plan

278. The proposed Socah Port is mostly located on water because of a combined trestle and reclamation structure. Since a logistics supporting area is desirably located next to the port, and taking account of the existing habitation pattern and port access road, a logistics center site of 200 ha is delineated.

Access Road

279. For ensuring port vehicular traffic, the Suramadu Brdge access road (6-lane width) up to Burneh will be extended to Tg. Bulupandan by 22 km while a short-cut road to the access road will be constructed from Socah by 9 km.

Figure 10.6 Location of Logistics Center supporting Socah Port (right)



COMPARATIVE ANALYSIS FOR A NEW GATEWAY PORT

Economic Analysis

280. The new port to be developed at Bulupandan or at Socah in Madura after saturation of Lamong Bay port was evaluated from the viewpoint of regional economy. The economic cost and benefit were measured by comparison of "with" and "without" project. It is apparent, however, that the economy of the Study Area can hardly survive without new port. To avoid overestimation of the economic benefit, the most likely future was drawn in without case.

281. The financial cost of the project was converted into economic cost by deducting transfer cost (import duties and VAT) and price contingency (50% of total contingency). This, economic cost corresponds to about 86% of the financial cost.

282. In the case of Socah, without the access channel improvement up to 14m depth during the phase I and 16m depth during the phase II, the port will not be able to fully perform by using its deep berths of 14m and 15m. A further channel improvement project is assumed and part of initial and maintenance dredging costs is covered, which is based on an adequate portion among all beneficiary ports is allocated to Socah Port, i.e., US$ 31 million for the phase I and US$ 55 million for the phase II at economic prices.

283. As the economic benefit of the new port project, the study estimated:

a) savings in sea transport cost by larger vessels
b) reduction in port stay cost of vessels and cargoes due to port congestion
c) reduction in land transport cost by using alternative port under "without" case

284. As results, aggregated annual economic benefit is almost equivalent to 20% of the total economic costs. There is almost no difference between two alternative ports except a slight change in benefit c).

285. E-IRR was estimated to be 17.2% for Tg. Bulupandan Port and 15.4% for Socah Port, thus there is no significant difference between two. Both of them are (marginally) feasible because the threshold is pegged at 12% in Indonesia.

286. However, the suppression of transport demand will severely deteriorate the regional economy and high economic growth will not be attained. If this diseconomy is taken into account as a benefit of the new port, the E-IRR would much higher.

Table 10.8 Result of Economic Evaluation of New Port Project

Evaluation Index		Tg Bulpandan	Socah
E-IRR	%	17.2	15.4
NPV	US$ million	140.8	86.2
B/C	-	1.44	1.25

Source: JICA Study Team

Financial Analysis

287. Financial analysis also shows almost the same FIRR for the two projects, with a marginal difference of 0.4%. Generally speaking, it is not attractive for the private investor. As sensitivity analysis shows, a port tariff increase by 15% hikes FIRR by 1.9% or, in the case of Tg. Bulupandan, 8.8%.

288. A more attractive investment package may be prepared by adopting a PPP scheme. For example, if the public sector were responsible for non-earning assets such as breakwater, navigation channel and access road, the Private sector's FIRR would be 10.2% in the case of Tg. Bulupandan. In the case of Socah, non-earning asset is only access road. A different PPP scheme must be therefore devised.

Table 10.9 Result of Financial Evaluation of New Port Project

Scheme	Private	PPP (Private Portion)
Tg. Bulupandan	6.9%	10.2%
Socah	6.5%	7.3%

Source: JICA Study Team

Site Selection

289. Two candidate sites are compared in a comprehensive manner in Table 10.10. In conclusion, Tg. Bulupandan is a more suitable site for a regional gateway port judging mainly qualitative assessment. If an attractive PPP scheme is offered to a private investor, Tg. Bulupandan Port would become an economically and financially feasible project, while it develops its own breakwater and approach channel instead of depending on the Surabaya West Access Channel.

290. In the region, however, Socah has also good potential to develop into a seaport. Taking account of role sharing between the two sites, the study suggests that a Socah new port deal with non-container cargo such as general cargo with a berth depth up to 12m be considered.

Table 10.10 Comparative Assessment of the Two Candidate Sites

	Tg. Bulupandan	Socah
Qualitative Indicator		
Provincial Spatial Plan	The same location as specified	No site endorsement in the plan
Regional Development Impact	Expected considerable impact together with Sura-madu Bridge Inducement of synergy effect by associated direct hinterland development	(the same as left)
Future Expansion Potential	The adjoining coastline can be used for capacity expansion	Difficulty in further quay extension
Sea Access	Favorable	Not easy due to fast tide flow and too near to the access channel
Land Access	49 km from Tg. Perak through bridge	31 km from Tg. Perak through bridge
Natural Environmental Considerations	Great impact by port reclamation to Kool Bay and coastal land	Great impact by port reclamation to Socah Bay and limited impact to land
Social Environmental Considerations	More supportive and cooperative attitude towards port development due to economic difficulty by mostly farming and fishing and the local government' propaganda	A mixture of positive and suspicious attitude during the IEE survey
Quantitative Indicator		
Direct Construction Cost	Phase I – US$ 454 million Phase II – US$ 170 million	Phase I – US$ 444 million Phase II – US$ 171 million
Burden on Access Channel Usage	Negligible	US$ 49 million for initial dredging (-14m) US$ 3 – 3.8 million for annual dredging
EIRR	17.2%	15.4%
FIRR	6.9%	6.5%

Source: JICA Study Team

11 CONSOLIDATED GSMP DEVELOPMENT PLAN

GSMP BLUEPRINT

Spatial Framework

291. The most urgent critical issue does not lie in ports in the case of Surabaya. The key issue is the access channel along the Madura Strait. After a series of civil engineering and transport planning works, the study has obtained the following conclusions:

- The access channel shall be improved to be 12m deep and 200m wide in the short-term. Further improvement is not realistic due to difficult maintenance dredging.
- In the long-term, even with further channel improvement, the channel traffic capacity will not be able to expand over 54,000 ships per year. But seaborne traffic will exceed the maximum capacity in 2025. Therefore, new port(s) being located free from the access channel is necessary.

292. Nowadays, the role of container shipping has ever been increasing for regional development at the both scopes of international and domestic trading in Indonesia. In order to strengthen regional competitiveness, the new Lamong Bay project has already been put on the implementation track. The study was requested to identify a new port project next to the Lamong Bay project. In response, the study has formulated a new container port project at Tg. Bulupandan, Bangkalan Regency, facing the Java Sea.

293. During the study, it is increasingly recognized that Madura Island gathers momentum in regional development in conjunction with the construction of Suramadu Bridge. The bridge project is designed to accelerate island development, addressing urban land scarcity at the Surabaya side, rather than merely converting the present ferry demand. Under such regional development context, Tg. Bulupandan new port will become another core infrastructure development because of benefiting container shipping and users at a wider scope than ever and stimulating direct hinterland development.

Timeframe

294. The study proposes the access channel improvement project, the Jamrud Terminal rehabilitation project and some land access network improvements in the short-term.

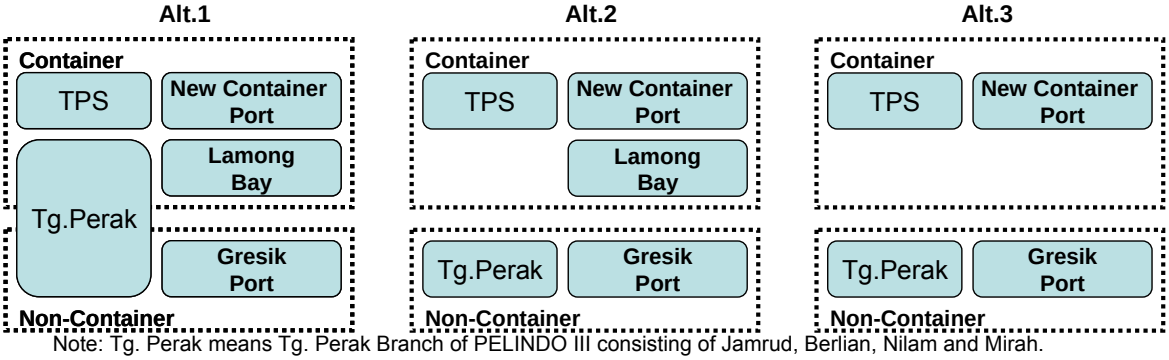
295. The study also quoted some on-going efforts such as Lamong Bay Container Port, Gresik Port expansion, rehabilitation and revitalization of other Tg. Perak terminals including Kali Mas and Nilam and a couple of new private jetties at Gresik. With a combination of the proposed projects and the on-going efforts, the GSMP demand by 2015 will be met.

296. The study proposes the Tg. Bulupandan container port project in the long-term. Further, it is recommended that Socah site be developed as a non-container port, handling general cargo and others, with up to 12m depth. In addition, the associated hinterland development with Tg. Bulupandan Port and the port access roads to the two sites in Madura Island are conceptualized. The demand increase between 2015 and 2030 will be met by mostly the two proposed ports and some capacity expansion efforts of the other metropolitan ports.

297. Under different situations from the study's assumption, the Tg. Bulupandan project would have to appear in an early turn. The plausible differences are (Alternative 2 or Alt. 2) introduction of full container fleet totally in the domestic shipping, and (Alternative 3 or Alt. 3) cancellation of the Lamong Bay project. Under the (Alt. 2) situation, historical terminals at Tg. Perak may not keep pace with full-scale container shipping and thus container traffic would be handled at TPS, Lamong Bay and Tg. Bulupandan. If the situation (Alt.2) occurred, Tg. Bulupandan Port would have to be constructed 5 years in advance or the target opening year of 2015 and furthermore if situation (Alt. 3) happened, the project needs to be accelerated by 10 years' earlier from the original schedule or the target opening year of 2010 or at least the early 2010s. Therefore the project implementation should be determined adequately taking account of such factors. (Figure 11.1 and Table 11.1)

298. At the final of part of the GSMP blueprint, far future vision beyond the target year of 2030 is expressed. It is Tg. Bulupandan Port that will be able to serve for the region as a long-life gateway port beyond 2030 by way of expansion. Expansion site should be preserved when port hinterland is developed.

Figure 11.1 Alternatives of GSMP Development – Allocated Port Roles



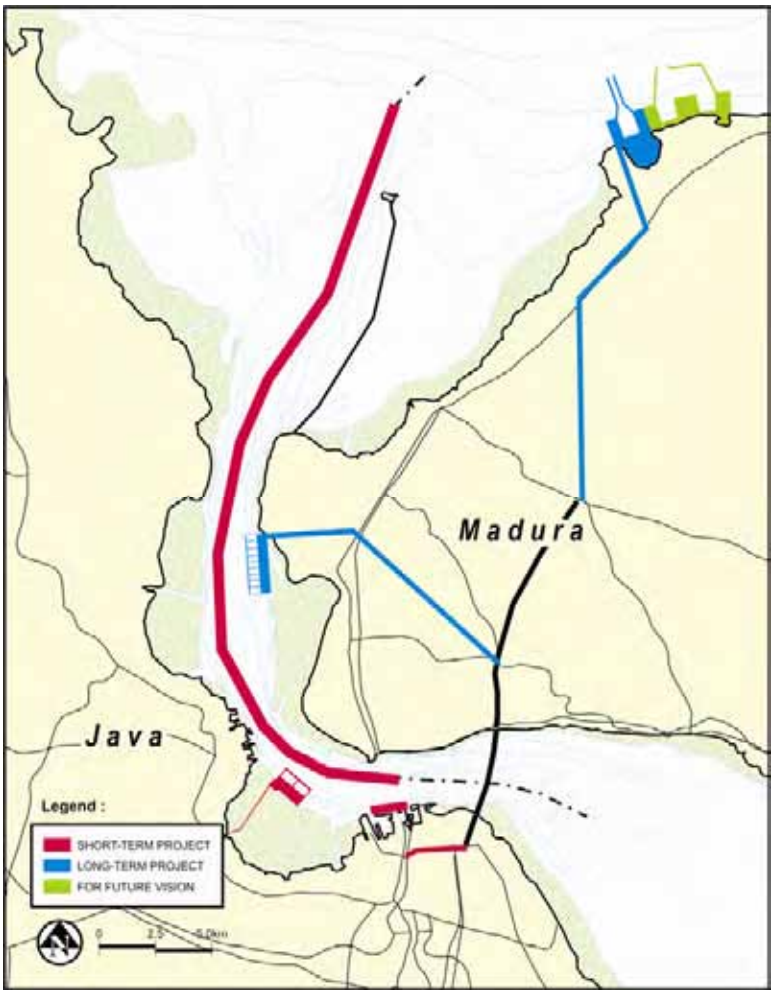
Note: Tg. Perak means Tg. Perak Branch of PELINDO III consisting of Jamrud, Berlian, Nilam and Mirah.

Table 11.1 Alternatives of GSMP Development – Required Berth Length

Year	Required Berth Length (m) To the New Container Port			Required Berth Length (m) for General Cargo		
	Alt.1	Alt.2	Alt.3	Alt.1	Alt.2	Alt.3
2015	-	900	1,800	600	-	-
2020	600	1,500	2,700	1,080	360	600
2025	1,850	2,450	3,650	1,560	840	1,500
2030	2,550	3,750	4,650	2,040	1,320	2,600

Source: JICA Study Team

Figure 11.2 Consolidated GSMP Development Plan (Blueprint)



Source: JICA Study Team

RECOMMENDATIONS FOR EFFECTIVE IMPLEMENTATION

Infrastructure Development

299. It is recommended that the proposed access channel improvement project be implemented urgently. The study has confirmed the project's importance from both traffic management and shipping operators' view. The proposed project is doable in the implementation scheme and a high economic return to the regional economy is anticipated.

300. The study has identified the Jamrud Terminal rehabilitation project which has a good synergy effect with the access channel improvement project, by reconstructing the existing obsolete terminal with wider apron and deeper berth. The possibility of joint implementation should be pursued.

301. The study recommends the Tg. Bulupandan port project to be constructed as a regional gateway port in the long run, which is to be transferred from the Tg. Perak ports group. As a next step, a feasibility study is necessary. Since the port project has a great opportunity for regional development, the next study should not be limited to port area. It is suggested to encompass related regional development issues such as associated direct hinterland development.

302. Siltation assessment is one of the most difficult subjects in port and coastal engineering. When the proposed access channel improvement project is implemented, there is a need to review and verify the results of the study particularly on the channel maintenance issue for the sake of better understanding of the access channel and technology improvement in the field of port and coastal engineering.

Institutional Development

303. The study has further observed that the Madura Strait is at peril in terms of endowed maritime infrastructure because of uncoordinated port development, uncoordinated pipeline installation and poor access channel maintenance and operation. There is a strong need to synergize among the relevant agencies to keep its essential multi functions for the regional development. For a coordination body, the establishment of a "Madura Strait Management Committee" is recommended, consisting of related line agencies such as transport and energy, local governments, port operators and other users. As one of coordination principles, the study recommends to use the "hydraulic rule of the Madura Strait" identified by the study, to avoid negative development which affects ports and shipping.

304. At the level of access channel operation, some measures are necessary including, among others, installation of VTS with personnel training and introduction of navigation fee which is charged over access channel users based on a beneficiaries' pay principle.

305. Regarding the Tg. Bulupandan port project, the study showed that the project have enough economic viability. However, financial IRR is not sufficient to attract private investors. With the Tg. Bulupandan project, the public sector will not need to undertake further access channel improvement. In this sense, a PPP scheme where the public sector is responsible for non-earning asset construction such as breakwater, approach channel, etc. should be further elaborated. It should be noted that PPP sounds attractive to governments but often it delays the schedule of development and thereby causes a slowdown of economy. Such pitfalls must be carefully avoided.

306. In Indonesia, not only port PPP scheme but also land acquisition and social and environmental management often meet difficulties under ineffective institutional arrangements. It is reported that the Bojonegara port project experiences land acquisition problem due to land price hike although the project envisions an associated industrial development. In the Tg. Bulupandan port project, it is important to involve the local stakeholders in the planning process. Thanks to the local governments' campaign about port development, the majority of residents showed supportive attitude to the study. They definitely wish for better job opportunities and to continue to reside in the area. A more socially acceptable land development method like short-distance displacement without land acquisition such as land readjustment method should be studied through public participation.

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