

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

# GSMF

FINAL REPORT

**Volume 1**

**Existing Conditions and Issues**



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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*Main Text Volume 1  
Existing Conditions and Issues*

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JAPAN PORT CONSULTANTS, LTD**

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## 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



## TABLE OF CONTENTS

### Volume I – Existing Conditions and Issues

<b>1 INTRODUCTION</b> .....	1-1
<b>PART I - EXISTING CONDITIONS AND ISSUES</b>	
<b>2 THE STUDY AREA</b>	
2.1. Physical and Natural Conditions .....	2-1
2.2. Demography, Economy, and Trade .....	2-16
2.3. Regional Development Trend.....	2-29
<b>3 EXSITING PORTS AND SHIPPING SERVICES</b>	
3.1. Overall Metropolitan Ports System .....	3-1
3.2. Tanjung Perak Port .....	3-18
3.3. Other Ports .....	3-35
3.4. Existing Shipping Services.....	3-42
<b>4 EXSITING ACCESSIBILITY TO PORTS</b>	
4.1. Existing Access Channels, Anchorages and Basins.....	4-1
4.2. Existing Land Access Transport .....	4-11
<b>5 ASSESSMENT ON GREATER SURABAYA METROPOLITAN PORTS</b>	
5.1. Cost and Services .....	5-1
5.2. Port Users' Assessment .....	5-8
5.3. Port Business and Investment.....	5-16
5.4. Environmental Considerations.....	5-26

## **LIST OF TABLES**

<b>Table No.</b>	<b>Title</b>	<b>Page No.</b>
Table 2.1.1	Major Meteorological Indicators of Surabaya City.....	2-5
Table 2.1.2	Wind Data of Surabaya City .....	2-5
Table 2.1.3	Tidal Levels around Madura Strait .....	2-6
Table 2.1.4	Components of Tidal Current in Madura Strait.....	2-7
Table 2.1.5	Wave Data Hindcast from 2002 to 2005 (112.5 E, 5.0S) .....	2-10
Table 2.2.1	Population Change in Study Area .....	2-16
Table 2.2.2	Labor Force and Unemployment Rate in Study Area.....	2-17
Table 2.2.3	Employment Composition by Industrial Sector in 2003.....	2-17
Table 2.2.4	GDRP at 2005 Constant Price and Annual Economic Growth of Study Area.....	2-19
Table 2.2.5	Gross Regional Domestic Product (GDRP) of the Study Area in 2004 at Current Market Price .....	2-21
Table 2.2.6	Labor Productivity by Industrial Sector .....	2-22
Table 2.2.7	Investment in East Java.....	2-23
Table 2.2.8	Domestic and Foreign Investment by Kota and Kabupaten .....	2-24
Table 2.2.9	Gross Fixed Capital Formation .....	2-24
Table 2.2.10	Surabaya-based Exports and Imports by Value and Volume .....	2-25
Table 2.2.11	Company and Labor Forces in East Java in the First Half of 2006.....	2-28
Table 2.3.1	Comparison between Gerbangkertosusila (GKS) and Other Areas .....	2-29
Table 2.3.2	Traffic Volume of Each Transport Corridor.....	2-32
Table 2.3.3	Industrial Estates .....	2-35
Table 2.3.4	Ferry Traffic.....	2-38
Table 3.1.1	Port Classification in the Study Area.....	3-1
Table 3.1.2	Area Size of DLKR.....	3-2
Table 3.1.3	Land Use of Port of Tanjung Perak.....	3-3
Table 3.1.4	Port Related Government Agency .....	3-3
Table 3.1.5	Number of Personnel of ADPEL Tanjung Perak .....	3-4
Table 3.1.6	Number of Personnel of Tanjung Perak Branch Office .....	3-6
Table 3.1.7	BJTI's Regular Member .....	3-7
Table 3.1.8	BJTI's Outsourcing Staff .....	3-7
Table 3.1.9	PT. TPS Regular Staff .....	3-8
Table 3.1.10	PT. TPS Outsourcing Staff .....	3-8
Table 3.1.11	Port Management Relationship between PELINDO III and Others at Tg. Perak .....	3-9
Table 3.1.12	Terminal Management of Tanjung Perak.....	3-10
Table 3.1.13	Responsible Body of Channel Management and Operation .....	3-11
Table 3.1.14	Necessary Information for Ship Service Procedure .....	3-14
Table 3.1.15	Kind of Charges and Collecting Body .....	3-15
Table 3.2.1	Berthing Facilities in Port of Tanjung Perak.....	3-19
Table 3.2.2	Container Terminals of Tanjung Perak .....	3-21
Table 3.2.3	Conventional Terminals of Tanjung Perak.....	3-21
Table 3.2.4	Direct Marine Activities of Main Companies in Tanjung Perak Port.....	3-22
Table 3.2.5	Largest Ships Called at Tanjung Perak Port in 2006 .....	3-30
Table 2.2.6	Ship Call Ratio by Terminal .....	3-31
Table 2.2.7	Ship Call & Container Flow at TPS.....	3-31
Table 3.2.8	Average Staying Time of Ships at Tanjung Perak Port (excl. TPS) .....	3-31
Table 3.2.9	RoRo Traffic (PT. Dharmala Lautan Utama).....	3-33
Table 3.3.1	Public Port Facilities at Gresik Port.....	3-35
Table 3.3.2	Facilities List of Telagabiru .....	3-37
Table 3.3.3	Private Facilities at Gresik Port.....	3-40
Table 3.4.1	Distribution of International Container Throughput at TPS .....	3-43
Table 3.4.2	Estimated Distribution of International Non-Container Throughput.....	3-43
Table 3.4.3	RoRo Shipping Service to/from Tg. Perak .....	3-46
Table 4.1.1	Maintenance Plan of Channels and Basins by Pelindo III.....	4-3
Table 4.1.2	List of Navigation Chart and Bathymetric Maps at Surabaya West Access Channel (1) .....	4-4



Table 4.1.3	List of Navigation Chart and Bathymetric Maps at Surabaya West Access Channel (2) .....	4-5
Table 4.1.4	List of Navigation Chart and Bathymetric Maps at Surabaya West Access Channel (3) .....	4-6
Table 4.1.5	List of Navigation Aid Arranged in Madura Strait .....	4-8
Table 4.1.6	Record of Maritime Accidents in Surabaya Port .....	4-10
Table 4.1.7	Record of Accidents of PLN Submarine Cables .....	4-11
Table 4.2.1	Estimated Container Volume Distribution .....	4-11
Table 4.2.2	Estimated Non-Container Volume Distribution .....	4-12
Table 4.2.3	Estimated RoRo Cargo Distribution .....	4-12
Table 4.2.4	Outlines of Industrial Estate in East Java .....	4-20
Table 4.2.5	Summary of Questionnaire Survey Result on Mudflow Disaster .....	4-22
Table 5.1.1	Revenue Detail from Services in PELINDO III .....	5-1
Table 5.1.2	Service and Revenue of TPS .....	5-1
Table 5.1.3	Per TEU Revenue by Container Handling and Vessel Navigation at TPS .....	5-2
Table 5.1.4	Operating Expense Detail in PELINDO III .....	5-2
Table 5.1.5	Per TEU Expense by Container Handling and Vessel Navigation at TPS .....	5-2
Table 5.1.6	Efficiency of Container Handling .....	5-5
Table 5.1.7	Comparison of Productivity of Container Handling (boxes/crane/hr) .....	5-5
Table 5.1.8	Cargo Handling Efficiency (ton/ship/day; 2006) .....	5-6
Table 5.1.9	Comparison of Productivity of Conventional Cargo Handling .....	5-6
Table 5.1.10	Average Productivity of Terminal (2006) .....	5-7
Table 5.1.11	Actual Working Hours of Longshoremen at Tg. Perak .....	5-7
Table 5.2.1	Vessel Waiting Time & Staying Time .....	5-8
Table 5.2.2	Misplacement of Containers at CY .....	5-9
Table 5.2.3	Productivity by Cargo Type .....	5-9
Table 5.2.4	Dissatisfaction Ratio of Each Factor .....	5-11
Table 5.2.5	Four Groups User's Expectations .....	5-11
Table 5.2.6	Bottlenecks at Surabaya Port .....	5-13
Table 5.2.7	Misplacement of Containers CY .....	5-14
Table 5.3.1	Balance Sheet of Pelindo III (Consolidated) .....	5-17
Table 5.3.2	Profit & Loss Statement of Pelindo III .....	5-17
Table 5.3.3	Financial Performance by Ports of Pelindo III .....	5-19
Table 5.3.4	Maintenance Dredging Cost by Pelindo III .....	5-20
Table 5.3.5	Dredging Schedule by the Central Government in 2007 .....	5-20
Table 5.3.6	Cash Flow Statement of Pelindo III .....	5-21
Table 5.3.7	Composition of Loan to PELINDO III for the Development of TPS .....	5-22
Table 5.3.8	Division of Fixed Asset at Privatization of PT TPS (as of April 30, 1999) .....	5-22
Table 5.3.9	Preliminary Estimate of Investment for the Phased Construction at Bojonegara .....	5-25
Table 5.4.1	Fisheries Production in Bangkalan Regency (2005) .....	5-27
Table 5.4.2	Maritime Accident Data (between 1999 to 2007) .....	5-28
Table 5.4.3	Oil and Gas Deposit in East Java .....	5-30
Table 5.4.4	Deposit of Oil and Gas Concession Block .....	5-31
Table 5.4.5	Crude Oil Production in East Java .....	5-31
Table 5.4.6	Natural Gas Production of East Java in 2004 .....	5-31
Table 5.4.7	Feature of Gas Transmission Pipelines in East Java .....	5-33

## **LIST OF FIGURES**

<b>Figure No.</b>	<b>Title</b>	<b>Page No.</b>
Figure 1.1	Study Area.....	1-2
Figure 1.2	Study Work Flow.....	1-3
Figure 2.1.1	Madura Strait from Satellite .....	2-1
Figure 2.1.2	Geological Condition of the Study Area .....	2-2
Figure 2.1.3	Existing Land Use 2005 in Study Area .....	2-3
Figure 2.1.4	Existing Land Use 2005 by Kabupaten/Kota .....	2-3
Figure 2.1.5	Existing Land Use Map of the Study Area (2005).....	2-4
Figure 2.1.6	Tidal Pattern at West Channel, Tg. Perak, and East Channel in Madura Strait.....	2-6
Figure 2.1.7	Tidal Current near Gresik in Madura Strait .....	2-7
Figure 2.1.8	Ocean Current off Madura Strait in the Java Sea .....	2-8
Figure 2.1.9	Old Map Showing the Solo River and the Training Wall .....	2-11
Figure 2.1.10	Present Condition of Existing Training Wall (12 June 2007).....	2-12
Figure 2.1.11	Location Map of Boring.....	2-13
Figure 2.1.12	Soil Profile at Lamong Bay (South Gresik) .....	2-14
Figure 2.1.13	Soil Profile at Mireng Bay (North Gresik) .....	2-14
Figure 2.1.14	Soil Profile at Junganyar (South of Socah) .....	2-15
Figure 2.1.15	Profile of Br. No.3 at Tanjung Bulupandan .....	2-15
Figure 2.2.1	Population Increase and Density of Study Area .....	2-16
Figure 2.2.2	Employment Composition by Industrial Sector in 2003.....	2-18
Figure 2.2.3	Economic Growth Trend of Study Area in Past Two Decades.....	2-18
Figure 2.2.4	Comparison of GDRP per Capita.....	2-20
Figure 2.2.5	Composition of Cargo Volume and Value in Surabaya-based Trade.....	2-26
Figure 2.2.6	Major Trading Countries with the GKS Region, 2005 .....	2-27
Figure 2.2.7	Past Trend of Investment in East Java .....	2-28
Figure 2.3.1	Present Primary Road Network .....	2-30
Figure 2.3.2	Priority Projects in Study for Arterial Road System Development in 1997 .....	2-31
Figure 2.3.3	Railway Network in East Java .....	2-33
Figure 2.3.4	Location of Industrial Estates.....	2-36
Figure 2.3.5	Surabaya-Madura Bridge Alternatives in the late 1980s.....	2-36
Figure 2.3.6	Suramadu Bridge Construction Sites.....	2-37
Figure 2.3.7	Composition of Dry and Wet Lands .....	2-38
Figure 2.3.8	Annual Rainfall and Blega Dam Location .....	2-40
Figure 3.1.1	Existing Ports Location in the Study Area.....	3-1
Figure 3.1.2	Port Area .....	3-2
Figure 3.1.3	Relationship between DGST and ADPEL.....	3-5
Figure 3.1.4	Organization Structure of Port Management Body .....	3-6
Figure 3.1.5	Organization Structure of PT. BJTI.....	3-6
Figure 3.1.6	Organization Structure of PT. TPS .....	3-7
Figure 3.1.7	Ship and Cargo Service Procedure .....	3-12
Figure 3.1.8	One Stop Service Procedure by the Branch Office .....	3-14
Figure 3.1.9	Operation of ISPS Code .....	3-16
Figure 3.1.10	AIS at ADPEL Tg. Perak.....	3-17
Figure 3.1.11	Radar Image at ADPEL Tg. Perak.....	3-17
Figure 3.2.1	Terminals in Port of Tanjung Perak .....	3-20
Figure 3.2.2	Arrangements of CCTV Cameras in Tg. Perak.....	3-23
Figure 3.2.3	Tg. Perak Cargo Throughput (1965-2006).....	3-24
Figure 3.2.4	Tg. Perak cargo Throughput in 2006 .....	3-24
Figure 3.2.5	Container Throughput at Tg. Perak (1997-2006).....	3-25
Figure 3.2.6	Increase of Container Handling per Terminal since 2003 .....	3-25
Figure 3.2.7	Ratio of 40 Footers at Tg. Perak.....	3-26
Figure 3.2.8	Average TEUs per Box at Tg. Perak.....	3-26
Figure 3.2.9	Empty Container Ratio at TPS in Aggregate .....	3-27
Figure 3.2.10	Empty Container Ratio at TPS by Traffic Movement .....	3-27

Figure 3.2.11	Empty Container Ratio at BJTI and Conventional Terminals.....	3-27
Figure 3.2.12	Number of Ships Calling at Tg. Perak (97-06).....	3-28
Figure 3.2.13	Number of Ship Call & Average Ship Size (97-06).....	3-28
Figure 3.2.14	Average Cargo Handled per Ship (97-06).....	3-29
Figure 3.2.15	Average Container Cargo Handled per Vessel (TPS).....	3-29
Figure 3.2.16	Container Handled Volume per Vessel (International and Interisland Traffic).....	3-30
Figure 3.2.17	Average Ship Size of Entering in Tanjung Perak Port.....	3-30
Figure 3.2.18	Ship Staying Average Time at TPS.....	3-32
Figure 3.2.19	RoRo Ship's Call & Average GT.....	3-32
Figure 3.2.20	RoRo Traffic (PT. Dharma Lautan Utama).....	3-33
Figure 3.2.21	Passenger Traffic Changes by Direction (from Surabaya).....	3-33
Figure 3.3.22	Number of Cars Carried by RoRo Ships.....	3-34
Figure 3.3.23	Number of Passengers and Passengers on Board a Ship (97-06).....	3-34
Figure 3.3.1	Cargo Throughput at Gresik Port.....	3-35
Figure 3.3.2	Throughput by Cargo Items at Gresik.....	3-36
Figure 3.3.3	Cargo Throughput at Public and Private Berth in Gresik.....	3-36
Figure 3.3.4	Number of Ship Calls and Average Ship Size at Gresik Port.....	3-36
Figure 3.3.5	Number of Passengers at Gresik Port.....	3-37
Figure 3.3.6	Telagabiru Port.....	3-38
Figure 3.3.7	Sepulu Port.....	3-38
Figure 3.3.8	Ship's Call & Average Ship Size of Local Port.....	3-39
Figure 3.3.9	Handling Volume at Two Local Ports (No.1).....	3-39
Figure 3.3.10	Handling Volume at Two Local Ports (No.2).....	3-40
Figure 3.3.11	Alignment of Private Jetties in Gresik.....	3-41
Figure 3.4.1	International Container Shipping Calls.....	3-42
Figure 3.4.2	Domestic Container Shipping Calls.....	3-44
Figure 3.4.3	Domestic Container Shipping Network.....	3-44
Figure 3.4.4	Domestic Cargo Distribution to/from East Java.....	3-45
Figure 3.4.5	Passenger Distribution to/from Tg. Perak.....	3-45
Figure 3.4.6	Passenger Ship Route to/from Tg. Perak.....	3-46
Figure 4.1.1	Anchorage Ares in Gresik and Tg. Perak Ports.....	4-1
Figure 4.1.2	Existing Obstacles against Seaborne Traffic at Madura Strait.....	4-9
Figure 4.2.1	Estimated Container Cargo Distribution Pattern in 2006.....	4-13
Figure 4.2.2	Estimated Non-Container Cargo Distribution Pattern in 2006.....	4-14
Figure 4.2.3	Estimated RoRo Cargo Distribution Pattern in 2006.....	4-14
Figure 4.2.4	Container Cargo by Origin & Destination Type.....	4-15
Figure 4.2.5	Non-Container Cargo of Origin & Destination Type.....	4-15
Figure 4.2.6	Vehicle Type to/from Major Berth in Tg. Perak.....	4-16
Figure 4.2.7	Railway Tracks in Tg. Perak.....	4-17
Figure 4.2.8	Disastrous Condition.....	4-18
Figure 4.2.9	Area-wide Restoration Scheme.....	4-19
Figure 4.2.10	Sidoarjo Mudflow Disaster Area and Industrial Zone.....	4-21
Figure 5.1.1	THC for 20' and 40' Container.....	5-3
Figure 5.1.2	Port Related Charges Compared (in US\$).....	5-4
Figure 5.1.3	Comparison of Berth Productivity among Container Terminal.....	5-6
Figure 5.2.1	Import/Export Container Dwelling Time.....	5-8
Figure 5.2.2	User's Satisfaction of Port and Trade Related Payments.....	5-10
Figure 5.2.3	Evaluation of the Service in Tanjung Perak Compared with Other Ports.....	5-10
Figure 5.2.4	Urgent Matters to be Improved.....	5-13
Figure 5.2.5	Import/Export container Dwelling Time.....	5-14
Figure 5.2.6	User's Satisfaction for Port and Trade Related Payments.....	5-15
Figure 5.2.7	Evaluation of the Service in Tg. Perak Compared with Other Port.....	5-15
Figure 5.2.8	Urgent Matters to be Improved.....	5-16
Figure 5.3.1	Financial Performance by Ports of Pelindo III (2005, in billion Rp.).....	5-18
Figure 5.3.2	Demand and Capacity of International Container at DKI Jakarta, West Java, and Banten.....	5-24
Figure 5.3.3	Future Bojonegara Development View (2015).....	5-25
Figure 5.4.1	Ecological Map of the Study Area.....	5-27
Figure 5.4.2	Gas Transmission Pipeline System in East Java.....	5-32
Figure 5.4.3	Existing and Planned Gas Transmission Pipeline in Madura Channel.....	5-33

## **ABBREVIATIONS**

ADB	Asian Development Bank
ADPEL	[ <i>Administrator Pelabuhan</i> ] Port Administrator
AIS	Automatic Identification System
AMDAL	[ <i>Analisis Mengenai Dampak Lingkungan Hidup</i> ] Environmental Impact Assessment
ANDAL	[ <i>Analisis Dampak Lingkungan</i> ] Environmental Impact Assessment
ASEAN	Association Of SouthEast Asian Nations
BAPEDAL	[ <i>Badan Pengendalian Dampak Lingkungan</i> ] Environment Impact Management Agency
BAPPEDA	[ <i>Badan Perencanaan Pembangunan Daerah</i> ] Regional Development Planning Agency
BAPPENAS	[ <i>Badan Perencanaan Pembangunan Nasional</i> ] National Development Planning Agency
BJTI	[ <i>Berlian Jasa Terminal Indonesia</i> ] Berlian Indonesia Terminal Service
BKSP	[ <i>Badan Kerja Sama Pembangunan</i> ] Development Coordinating Body
BOR	Berth Occupancy Ratio
BOT	Build Operate Transfer
BPJT	[ <i>Badan Pengatur Jalan Tol</i> ] Toll Road Regulatory Agency
BPPLS	[ <i>Badan Pelaksana Penanggulangan Lumpur Sidoarjo</i> ] The Board of the Sidoarjo Mud Control
BPPPWS	[ <i>Badan Pengelolaan Percepatan Pembangunan Wilayah Suramadu</i> ] Suramadu Bridge District Development Acceleration Management Board
BPPT	[ <i>Badan Pengkajian dan Penerapan Teknologi</i> ] Agency for Application and Assessment of Technology
BPS	[ <i>Badan Pusat Statistik</i> ] Central Statistics Bureau
BTP	Berth Throughput
CC	Container Crane
CCTV	Closed-Circuit Television (CCTV)
CD	Chart Datum
CDL	Channel Depth
CER	Capital Equipment Ratio
CFS	Container Freight Station
CHC	Container Handling Charges
CIQS	Custom, Immigration, Quarantine, and Security
CNOOC	China National Off-shore Oil Corporation
CPO	Crude Palm Oil
CSD	Cutter Suction Dredger
DGR	Directorate of Railways
DGST	Directorate General of Sea Transportation
DLKP	[ <i>Daerah Lingkungan Kepentingan Pelabuhan</i> ] Port Interest Area
DLKR	[ <i>Daerah Lingkungan Kerja Pelabuhan</i> ] Port Working Area
DMU	Diesel Motor Unit
DUKS	[ <i>Dermaga Untuk Kepentingan Sendiri</i> ] Private Jetty
DWT	Dead Weight Ton
EDI	Electronic Data Interchange
EIA	Environmental Impact Assessment
EIRR	Economic Internal Rate of Return
EJGP	East Java Gas Pipeline
EMU	Electric Motor Unit
EU	European Union

FDI	Foreign Direct Investment
FIRR	Financial Internal Rate of Return
GDP	Gross Domestic Product
GIE	Gresik Industrial Estate
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
ICOR	Incremental Capital Output Ratio
ICT	Information and Communication Technology
IEE	Initial Environmental Evaluation
IMO	International Maritime Organization
IRMS	Indonesia Road Management System
ISPS Code	International Ship and Port Facility Security Code
ITS	[ <i>Institut Teknologi Surabaya</i> ] Surabaya Institute of Technology
JABODETABEK	Jakarta, Bogor, Depok, Tangerang, and Bekasi
JAMALI	Java, Madura and Bali
JBIC	Japan Bank for International Cooperation
JICA	Japan International Cooperation Agency
JICT	Jakarta International Container Terminal
KODECO	Korean Development Corporation
KPLP	[ <i>Kesatuan Penjagaan Laut dan Pantai</i> ] Coast Guard
LARAP	Land Acquisition and Resettlement Action Plan
LIS	Lamongan Integrated Shore
LNG	Liquefied Natural Gas
LPG	Liquefied Petroleum Gas
LWS	Low Water Spring
MISI	PT. Madura Integrated Seaport City
MOT	Minister of Transportations
MSL	Mean Sea Level
NCP	New Container Port
NIP	Ngoro Industrial Park
NPV	Net Present Value
OD	Origin Destination
ORF	On-shore receiving facilities
PANTURA	[ <i>Pantai Utara</i> ] North Java Coastal
PELINDO	[ <i>PT. Pelabuhan Indonesia</i> ] Indonesian Port Corporation
PELNI	[ <i>Pelayaran Nasional Indonesia</i> ] National Shipping Lines
PERTAMINA	State-Owned Oil Company of Indonesia
PFCO	Port Facility Security Officer
PIANC	The Permanent International Association of Navigation Congresses
PIER	Pasuruan Industrial Estate Rembang
PLN	[ <i>PT. Perusahaan Listrik Negara</i> ] State-Owned Electricity Company
PPP	Public Private Partnership
PSC	Port Security Committee
KAI	[ <i>PT. Kereta Api Indonesia</i> ] Indonesian Railway Company
PUSTRAL	[ <i>Pusat Studi Transportasi dan Logistik</i> ] Center for Transportation and Logistics Studies
RKL	[ <i>Rencana Pengelolaan Lingkungan</i> ] Environmental Management Plan
RORO	Roll On Roll Off

RPL	[Rencana Pemantauan Lingkungan] Environmental Monitoring Plan
RTG	Rubber-Tyred Gantry
RUPS	Stakeholder Meeting
SIER	Surabaya Industrial Estate Rungkut
SPM	Single Point Mooring
SRRTS	Surabaya Regional Rail Transport System
SS	Suspended Solid
SSG	Ship to Shore Gantry Crane
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
TJP	PT. Trans Java Gas Pipeline
TKBM	[ <i>Tenaga Kerja Bongkar Muaf</i> ] Cargo Handling Workers Cooperation
TPKS	[ <i>PT. Terminal Petikemas Semarang</i> ] Semarang Container Terminal Branch
TPS	[ <i>PT. Terminal Petikemas Surabaya</i> ] Surabaya Container Terminal
TSHD	Trailing Suction Hopper Dredger
VAT	Value Added Tax
VICO	Virginia Indonesia Company
VOC	Vehicle Operating Cos
VTS	Vessel Traffic Management System
YOR	Yard Occupancy Ratio
YTP	Yard Throughput

# **1 INTRODUCTION**

## **1) Study Background**

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. At present, however, inefficient port operation which may be largely attributed to its century-old and antiquated port layout and restricted port access due to shallow access channel have become critical issues. In addition, the ADB-financed container terminal which started operation in the early 1990s will reach its design capacity in the coming couple of years.

As seaborne traffic grows, Tanjung Perak Port and its adjoining facilities such as shipyards are faced with ever growing difficulties in providing satisfactory maritime services. As a result, many vessels, more or less 80 vessels, at any given time experience long berthing time at anchorage area and partly on the access channel. This forces shipping lines to assign small thereby less efficient vessels to call at Tanjung Perak.

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

Under such circumstances, there are several candidate sites for a new port to meet further maritime traffic growth and some are under deliberation among stakeholders. So far, Lamong Bay Reclamation Project has been agreed upon with a limited scale of 50ha as a compromise solution considering environmental impact considerations and an urgent need to handle increasing container traffic. However, a long-term port development blueprint has not been drawn yet.

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

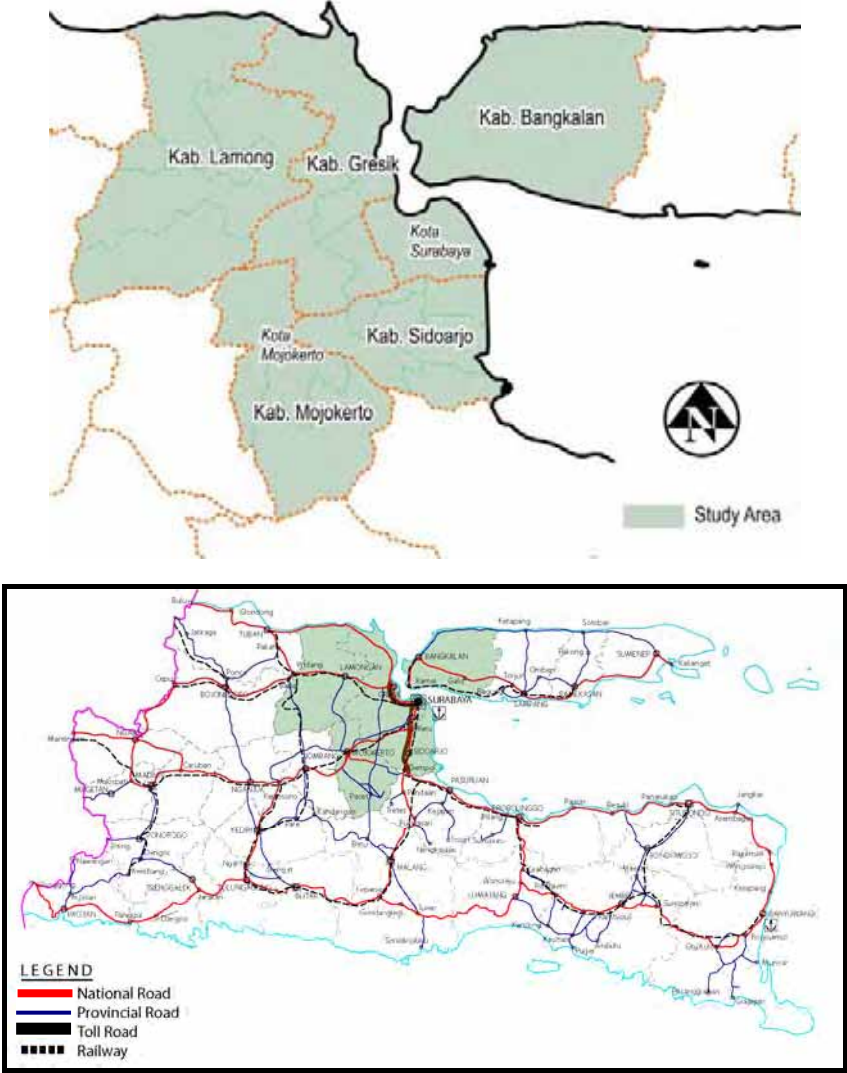
## **2) Study Objectives**

The objective of the Study is to formulate an integrated long-term port development plan for Surabaya and its adjacent areas including the west part of Madura Island to be able to serve future maritime traffic while providing efficient port services. The target planning year is 2030.

## **3) Study Area**

The study area which refers to the direct hinterland of port development includes Gresik, Bangkalan, Mojokerto, Surabaya, Sidoarjo and Lamongan, which is referred to as the GERBANGKERTOSUSILA region or the GKS region (refer to Figure 1.1).

Figure 1.1 Study Area



Source: JICA Study Team

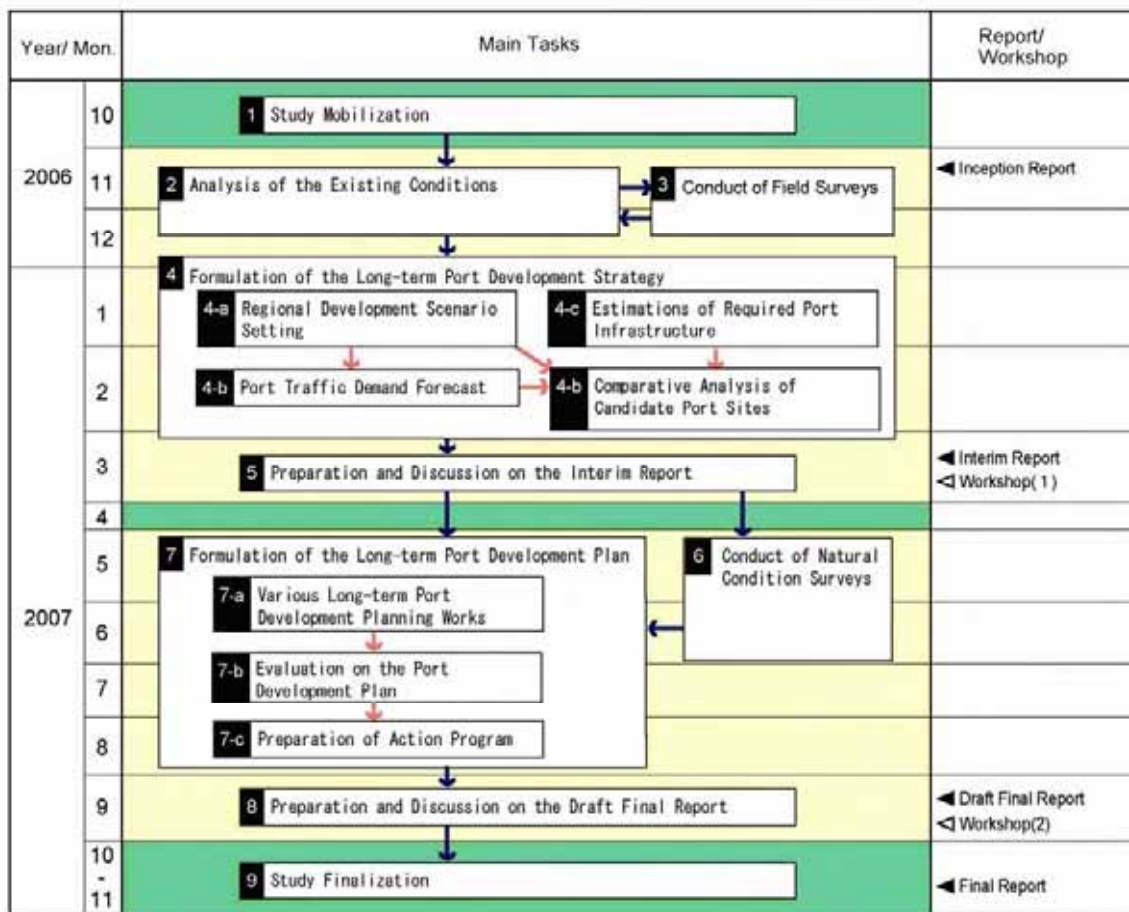


4) Overall Study Framework

As shown in Figure 1.2, the Study has undertaken the following two phases:

- i) Formulation of the long-term port development strategy based on the results of long-term regional development scenario and port traffic demand forecast.
- ii) Formulation of the long-term port development plan where various port planning works are done including project assessment and formulation of an implementation program.

**Figure 1.2 Study Work Flow**



Source: JICA Study Team

## 5) Study Organization

### **JICA Study Team**

- Mr. KUMAZAWA Ken : Team Leader
- Mr. NAGAI Kohei : Port Planning
- Mr. IBUKI Norihiko : Port Design/Cost Estimates
- Mr. INOUE Yoshitaka : Natural Condition Survey
- Mr. SASAKI Emiho : Natural Condition Assessment
- Mr. WAKUI Tetuo : Demand Forecast/Economic Analysis
- Mr. NAGAYA Toshiyaki : Financial Planning
- Mr. SUZUKI Yuzo : Port Management and Operation
- Ms. UENO Naomi : Environmental and Social Impact Assessment
- Mr. KOIKE Isamu : Logistic Planning
- Mr. SEKI Yosui : Study Coordinator
  
- Mr. SANUI Kazumasa : JICA HQ Officer-In-Charge

### **Steering Committee**

#### **I. Coordination Team**

- Leader I : Director General of Sea Transportation
- Leader II : Secretary Directorate General of Sea Transportation
- Vice Leader : 1. Director of Port and Dredging  
2. Managing Director of PT. (Persero) Pelindo III
- Member : 1. Head of Planning Bureau of Transportation Department  
2. Head of Legal and International Bureau of Transportation Department  
3. Head of Regional Planning and Development of East Java Province  
4. Head of Regional Planning and Development of Surabaya City  
5. Head of Regional Planning and Development of Gresik Regency  
6. Head of Regional Planning and Development of Bangkalan Regency  
7. Head of Transportation Department of East Java Province  
8. Head of Transportation Department of Surabaya City  
9. Tanjung Perak Port Administrator  
10. Director of Operation PT. (Persero) Pelindo III  
11. Director of Finance PT. (Persero) Pelindo III  
12. Director of Marketing and Business Development PT. (Persero) Pelindo III  
13. Director of Human Resources and General Affair PT. (Persero) Pelindo III

## **II. Implementation Team**

Leader - Mr. Ir. Suwandi Saputro, Msi : Directorate General of Sea Transportation (DGST)

Vice Leader - Mr. Ir. Harry Boediarto : Directorate General of Sea Transportation (DGST)

### **Member**

- Mr. Ir. Petrus Sumarsono : Board of National Planning and Development
- Mr. Ir. Bambang Isdianto, MM : Board of Regional Planning and Development - Gresik Regency
- Mr. Ach. Fatah Yasin, ST : Board of Regional Planning and Development - Bangkalan Regency
- Mr. Drs. Bambang Djatmiko, MT : Transportation Department of East Java Province
- Mr. Toat Tridjono, Msi : Transportation Department of East Java Province
- Mr. Ir. Bambang Ristianto, MSi : Planning Bureau of Transportation Department
- Mr. Wahyu Adjie, SH, DESS : Legal and International Cooperation Bureau of Transportation Department
- Mr. Drs. Eko Hadi Rumecko, MBA : Planning Division of Transportation Department
- Mr. Dede Masyud, ST, MT : Planning Division of Transportation Department
- Mr. Sahat, SH, MT : Legal Division of Transportation Department
- Mr. Priyono K, SH : Legal Division of Transportation Department
- Mr. Ir. Adolf Tambunan, MSc : Traffic Division of Transportation Department
- Mr. Amunsen Doda, S.Sos : Navigation Division of Transportation Department
- Mr. Ir. Sugiyono : Directorate General of Sea Transportation (DGST)
- Mr. Drs. Tri Pudiananta : Directorate General of Sea Transportation (DGST)
- Mr. Ir. Mauritz Sibarani, DESS : Directorate General of Sea Transportation (DGST)
- Mr. Ir. Paulus Erlano, DESS : Directorate General of Sea Transportation (DGST)
- Mr. Bambang Priyono, Msi : Directorate General of Sea Transportation (DGST)
- Mr. Abdullah Wahid, MT : Directorate General of Sea Transportation (DGST)
- Mr. Ir. Rismature S : PT. (Persero) Pelindo III
- Mr. Drs. Chaerul Anwar : PT. (Persero) Pelindo III
- Mr. Ir. Bangun Swastanto : PT. (Persero) Pelindo III
- Mr. Ir. Basori MMT : PT. (Persero) Pelindo III
- Mr. Ir. Danur Wasa : PT. (Persero) Pelindo III
- Mr. Ir. Fendi : PT. (Persero) Pelindo III
- Mr. Drs. Putu Irawan : PT. (Persero) Pelindo III

### **Secretariat**

- Mrs. Dra. Sumarlah : Directorate General of Sea Transportation (DGST)
- Mr. Lollan Andy S P, S.T : Directorate General of Sea Transportation (DGST)
- Mr. Drs. Boy Prasodjo, MM : Directorate General of Sea Transportation (DGST)
- Mrs. Atur Tetty Lubis : PT. (Persero) Pelindo III

## 6) Major Activities

**Phase 1:** The first phase of the study which was a period of four (4) months working in Indonesia between November 2006 and February 2007 composed of seven (7) major activities, as follows.

*Study mobilization:* The Study was initiated in Jakarta with the discussion of the Inception Report among steering committee and counterpart team members in the first half of November. The report was approved together with an agreed list of candidate sites for the port that would be looked into in the Study, i.e., Lamong Bay in Surabaya City, northern and southern coastal areas in Gresik Regency and three areas in Bangkalan Regency or Socah, Tanjung Bulupandan and Tanjung Bumi. Afterwards in Surabaya, the Study Team opened its project office at the Tanjung Perak branch office of PELINDO III.

*Analysis of the existing conditions:* To thoroughly assess the existing conditions and environments for port development in the Study Area, the Study Team examined socio-economic conditions, regional development policies and plans, port facilities and operation services, natural conditions affecting port operation, seaborne traffic and shipping services.

*Conduct of field surveys:* To supplement the existing available data and information and to familiarize the JICA Study Team with local conditions, a several field surveys were conducted. These include traffic count survey and truck drivers' interview survey at Tanjung Perak Port, port users interview survey within the GKS region, and reconnaissance survey at and around the port candidate sites.

*Assessment of regional development and port demand forecast:* Regional development achievements and future development issues have been assessed based on recent economic performance, investment/development trend and plausible socio-economic growth scenarios. Future port demand has been projected in terms of port traffic and required port infrastructure.

*Comparative analysis of port candidate sites:* The six (6) port candidate sites have been comparatively analyzed from the viewpoints of existing social and natural conditions, land availability for port and its associated development, port accessibility from sea and land, and environmental considerations in port construction and operation.

*Deliberation on the Interim Report:* The Study Team prepared and presented the Interim Report at the counterpart team meeting in Surabaya and at the steering committee meeting in Jakarta. To disseminate the study's interim results among port users, a workshop was also held in Surabaya.

**Phase 2:** The second phase of the study which was a period of five (5) months working in Indonesia between May 2007 and October 2007 is composed of six (6) major activities, as follows.

*Conduct of natural condition surveys:* A series of surveys were conducted by two sub-contracted local consultants, including bathymetric survey, current measurement survey, bottom material survey, and SS density survey for planning and designing of the access channel and the selected two port candidate sites of Socah and Tg. Bulupandan both in Madura Island.

*Conduct of IEE on the selected two sites:* Initial environmental examination (IEE) survey was conducted by a sub-contracted local consultant, covering social and natural environmental conditions by way of site surveys, key informant interviews and secondary data analysis.

*Planning coordination among the stakeholders:* Project identification was done not only within the study team but also with the participation of stakeholders including Surabaya port operators, local governments and the counterpart agency.

*Project formulation for the short-term improvement and the long-term development of GSMP:* For each project, project formulation works were done including traffic demand forecast, infrastructure planning, preliminary designing, cost estimate.

*Project assessment:* The proposed projects were assessed from economic, financial and environmental viewpoints. Both quantitative and qualitative analysis was done.

*Deliberation on the Draft Final Report:* The Study Team drafted the report at the end of the study work in Indonesia. For study finalization, the report was discussed with the counterpart team as well as at a steering committee meeting. To disseminate the study's draft results among port users, the second workshop was held in Surabaya.

## 7) Structure of the Final Report

The Final Report is composed of eleven (11) chapters, each chapter contains the following results of analysis and planning works:

### **PART I Existing Conditions and Issues (Chapter 2 - 5)**

*Chapter 2:* This chapter provides an overview of the Study Area from a variety of viewpoints including land conditions, oceanographic conditions, population, economy, trade and regional development trend. The key objective of the chapter is to comprehensively examine and present development opportunities and constraints based on diversified development issues with updated information.

*Chapter 3:* This chapter profiles the existing ports and shipping operations within the Study Area. The existing ports system was analyzed with particular coverage on the port and shipping service.

*Chapter 4:* This chapter profiles the existing accessibility to ports in the access channel and land transport. Port access on the land side and port users' perception on port services are also outlined based on the results of two small-scale surveys; i.e., truck OD survey and port users' interview survey.

*Chapter 5:* The assessment on Greater Surabaya Metropolitan Ports is presented including the environment considerations, port users' satisfaction, cost and services.

### **PART II Future Development Perspectives (Chapter 6 - 8)**

*Chapter 6:* The future port system is to be developed in coordination with the statutory regional planning framework; thereby, relevant authorized spatial plans and large-scale development plans were analyzed and compared.

*Chapter 7:* This chapter presents the future traffic demand including port traffic and shipping needs based on the future socio-economic framework. In addition, the planning implications to Metropolitan Ports System are presented.

*Chapter 8:* Six (6) port candidate sites that were identified have been analyzed in a comparative manner resulting in the short listing of two candidate sites for further in-depth analysis. The criteria for short listing gave particular weight to project maturity or preparatory

works so far conducted, site conditions, environmental considerations, possible port development concepts and consistency with the overall metropolitan port strategy.

### **PART III Greater Surabaya Metropolitan Ports Development Plan (Chapter 9 - 11)**

*Chapter 9:* This chapter presents the short-term projects for GSMP development including the Surabaya West Access Channel Improvement Plan, the Jamrud Terminal Rehabilitation Plan and the Land Access Network Improvement Plan.

*Chapter 10:* The two selected port sites were further analyzed as candidates as a new gateway port. The study allocated its engineering resource for this purpose with sufficient project assessment and implementation planning works.

*Chapter 11:* The study's conclusions were illustrated as the GSMP blueprint with recommendations for effective implementation.

# **PART I**

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## **EXISTING CONDITIONS AND ISSUES**





## 2 THE STUDY AREA

### 2.1 Physical and Natural Conditions

#### 1) Land Conditions

##### a. Topography

The GKS region is divided into 3 geographical areas: low plain area, rolling hills and mountain area. The low plain areas with an elevation of less than 25m above sea level, are located around the river, which include the center of Lamongan, the center of north Gresik, Bangkalan and Surabaya City. Coastal areas in Gresik, Surabaya and Sidarjo, which are influenced by tides are primarily used for fish ponds. The rolling hill areas are located to the north and south of Lamongan, the north of Mojokerto, parts of Gresik, center of Bangkalan and parts of Surabaya city. The mountain area in GKS region is located the south of Kab. Mojokerto.

Figure 2.1.1 shows a photograph of the study area from satellite. There are 3 sections where solid ground thrusts from land side toward channel as indicated ①, ②, and ③ in Figure 2.1.1. As width of the strait is narrow, those points can be “hydraulic control sections”, where tidal current flows fast.

It is observed by satellite photographs that the Solo River flows out to the Java Sea, running through improved river channel. It is noted that the former tributaries, which directly lead to the Madura Strait, are all closed and the water is not running in them now.

**Figure 2.1.1 Madura Strait from Satellite**

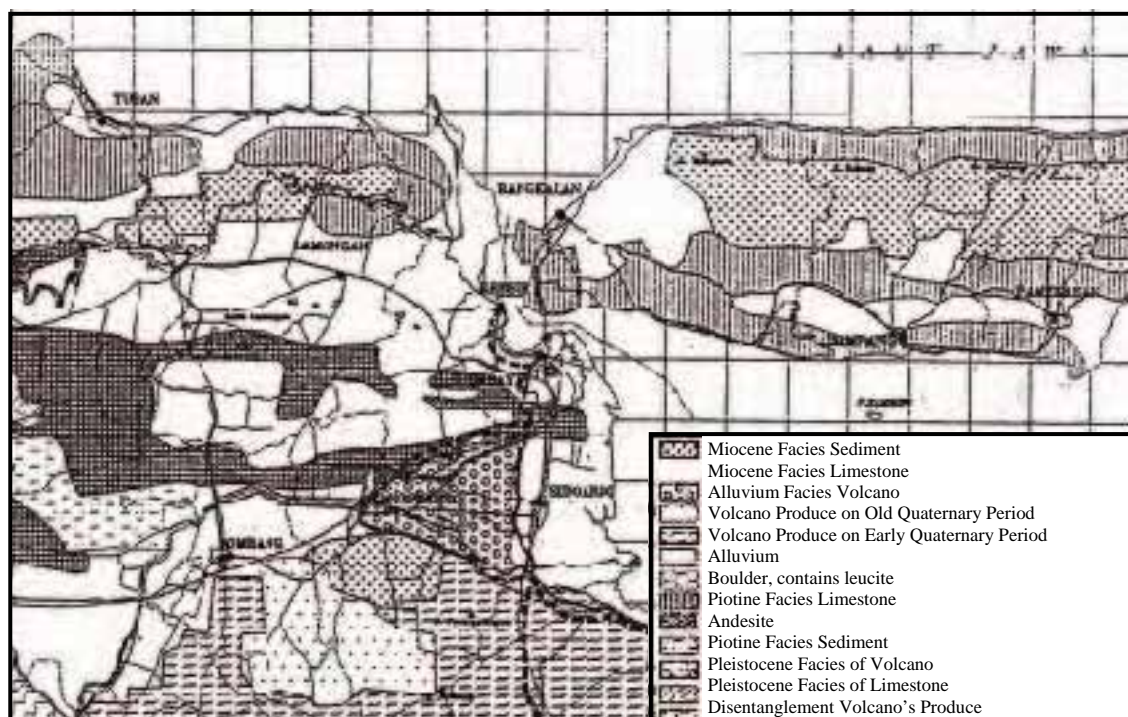


Source: Google Earth

## b. Geologic Features

Figure 2.1.2 shows the geological condition of the study area, indicating that east of Kab. Bangkalan is composed of harder materials than the coastal areas, where the former is mostly limestone and the coastal areas are mostly alluvium. The east part of Kab.Sidoarjo and southward have geological features that are volcanic. The area from Kab.Mojokerto to Kab.Sidoarjo is andesite, which is an igneous rock. Therefore, the geological condition of Surabaya and northward are different from that of Kab.Sidoarjo and southward.

**Figure 2.1.2 Geological Condition of the Study Area**



Source: RTRW East Java 1997/1998 – 2011/2012

## c. Land Use Condition

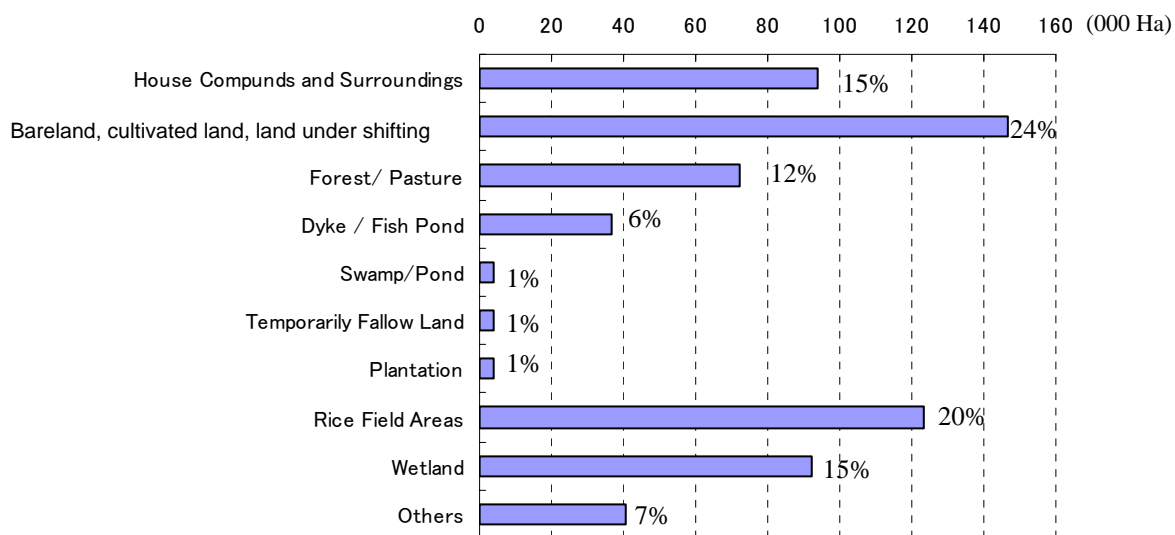
The bar chart below shows the overall land use of the study area in 2005. The existing land use was divided into ten types in the BPS statistics of Jawa Timur province, as follows: (i) house compounds and surroundings; (ii) bareland, cultivated land, land under shifting; (iii) forest/pasture; (iv) dyke; (v) swamp/pond; (vi) temporarily fallow land; (vii) estates; (viii) rice field areas; (ix) wetland; and, (x) others. However, land use significantly varies from one area to another.

In the center of the study area, i.e. Surabaya city, half of the area is categorized as “house compounds and surroundings”. It is similar in the case of Mojokerto city wherein half of the area is categorized as “house compounds and surroundings”. These two cities are the primary attractors of urbanization as reflected in their significantly residential land use.

The percentage of “house compounds and surroundings” of the Kabupaten is lower than that of the Kotas. However, it is a quarter of Sidoarjo, which is the neighboring Surabaya city and is highest among Kabupaten. In Bangkalan, a half of the area is categorized as “bareland, cultivated land, land under shifting”. In Gresik, a half of the area is categorized as “dyke” and “wetland”.

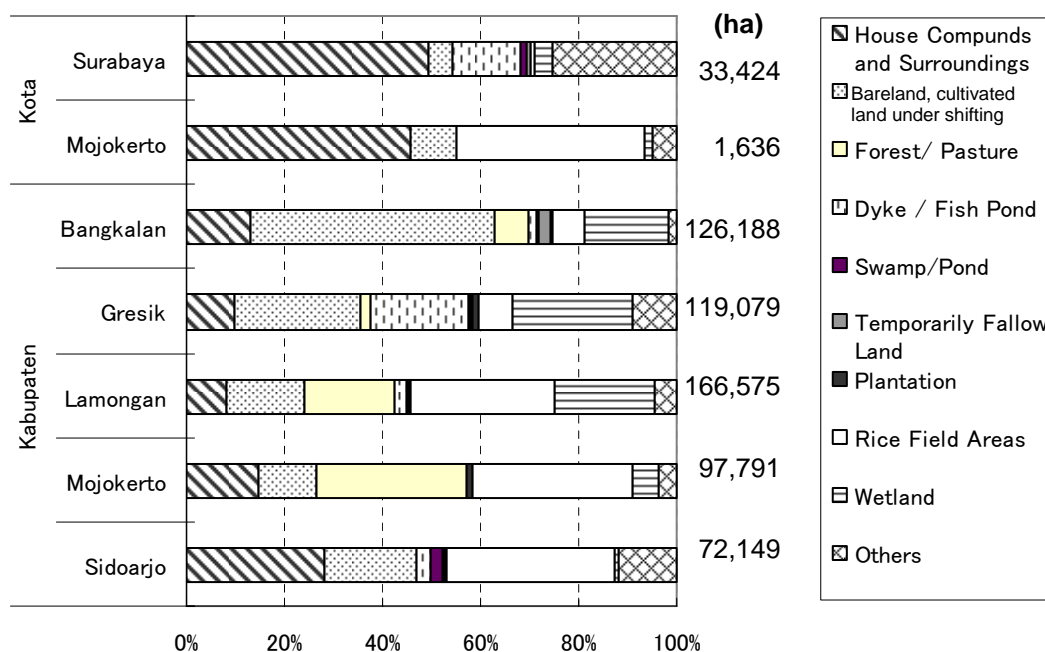
From the viewpoint of future regional development, Bangkalan has the most land that can be developed into new industrial estates or other similar functions. Gresik also has similar potential, but its soil condition is not so good.

**Figure 2.1.3 Existing Land Use 2005 of the Study Area**



Source: BPS Statistics of Java Timur Province

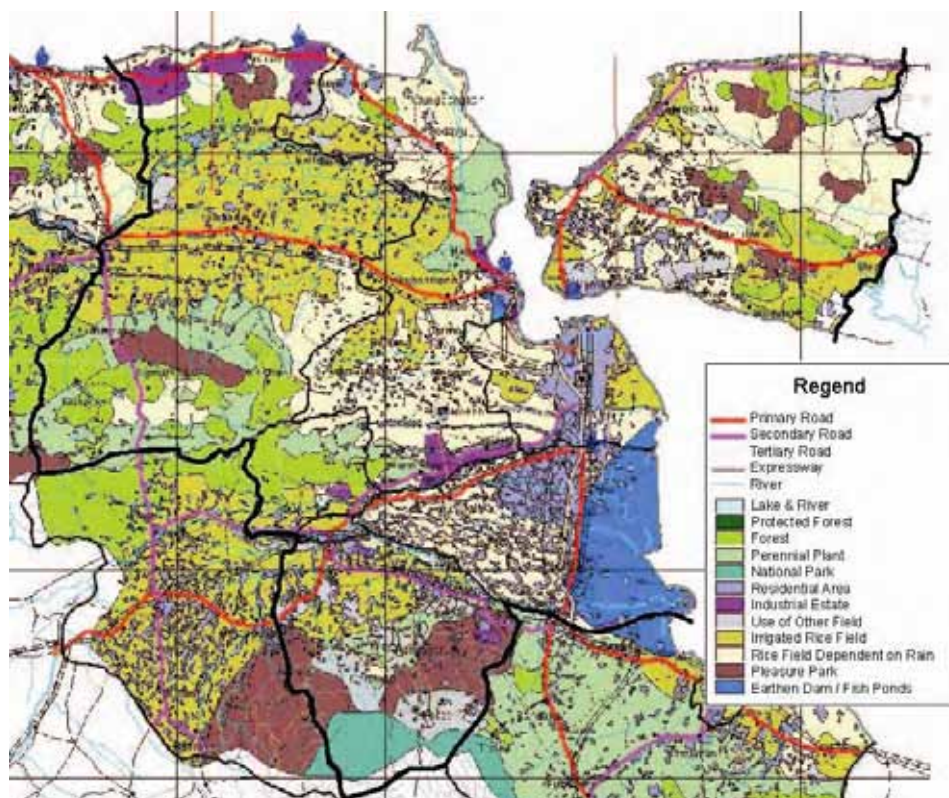
**Figure 2.1.4 Existing Land Use 2005 by Kabupaten / Kota**



Source: BPS Statistics of East Java Province

The following figure shows the existing land use in the study area. The coastal areas in Bangkalan are almost the rice field, thereby, it seems worthwhile to investigate its conditions as a potential site for an industrial estate in the future. On the other hand, the coastal areas in Gresik, in Surabaya city and in Sidoarjo are composed of residential areas, existing industry estates and fish ponds – which hold less promise as a site for a large-scale development. Thereby, with the above considerations, Bangkalan is a good candidate site for future industrial estate development in the coastal area.

**Figure 2.1.5 Existing Land Use Map of the Study Area (2005)**



Source: Spatial Plan of Java Timur Province, 2006

## 2) Meteorological Conditions

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. The maximum, minimum and average values of various meteorological data are summarized in Table 2.1.1.

**Table 2.1.1 Major Meteorological Indices of Surabaya City**

Meteorological Data	Case	Value	Observation Period	Data period
Wind (m/s)	Max.	20	Mar. & Dec. 2004	2002 – 2006 (Five years)
Air temperature (°C)	Max.	38.0	Nov. 2004	
	Min.	20.0	Jan. 2002	
	Ave.	28.5	-	
Rainfall (mm)	Annual max.	1,556	2004	
	Annual min.	1,322	2005	
	Annual ave.	1,390	-	
	Monthly max.	507	Mar.2004	
	Monthly min.	0	-	
	Monthly ave.	116	-	
Air Pressure (Mbs)	Daily max.	190	Jan. 2002	
	Max.	1,017.8	Oct. 2006	
	Min.	1,002.8	Dec. 2005	
Sunshine duration (%)	Monthly max.	99	Jul.-Sep. 2003, Aug.-Oct. 2006	
	Monthly min.	24	Dec. 2005	
	Monthly ave.	77	-	

Source: Meteorology and Geophysical Agency, Surabaya

Average monthly wind velocity at Surabaya varies from 2.3m/sec in March to 3.3m/sec in August. It is found that average monthly wind velocity does not change much throughout the year; on the other hand, maximum monthly wind velocity during the rainy season is higher than that during the dry season.

**Table 2.1.2 Wind Data of Surabaya City**

Wind Velocity	Month												Annual Average
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	
Average (m/s)	2.4	2.8	2.3	2.5	2.4	2.6	2.6	3.3	3.1	2.9	2.5	2.5	2.7
Maximum (m/s)	26	37	40	28	22	24	23	22	22	20	24	40	27
Direction	W	W	W	W	SE	E	E	E	E	E	W	N	-

Source: Meteorology and Geophysical Agency, Surabaya

### 3) Oceanographic Conditions

#### a. Tide and Tidal Current

The tidal levels for several locations around the Madura Strait are shown in Table 2.1.3. It is characteristic that the variation of tidal levels in the Java Sea is smaller than that in the Bali Sea. The Mean Sea Level (MSL) is at 1.10m above CD (Chart Datum) at the West Channel and 1.50m above CD at Tg. Perak, 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.

**Table 2.1.3 Tidal Levels around Madura Strait**

Item	Sub-item	Ug. Pangkah	Pulau Kg. Jombang	Tg. Bulupandan	Semliangan	Surabaya Tg. Perak	Karang Kleta
Location*	Lat. S	6°50'	6°56'	6°54'	7°3'	7°12'	7°20'
	Long. E	112°33'	112°44'	112°49'	112°41'	112°44'	112°52'
Tidal Level* (in m above CD)	MHHW	1.5	<b>1.6</b>	1.4	1.7	<b>2.3</b>	2.4
	MLHW					1.6	1.9
	MHLW					1.5	1.3
	MLLW	0.6	<b>0.4</b>	0.6	0.7	<b>0.9</b>	0.5
Tidal Components** (in cm)	M <sub>2</sub>		<b>8</b>			<b>44</b>	59
	S <sub>2</sub>		5			26	29
	K <sub>1</sub>		<b>54</b>			<b>47</b>	45
	O <sub>1</sub>		26			28	27
	P <sub>1</sub>		15			14	14
	Z <sub>0</sub>		<b>110</b>			<b>150</b>	180
Remarks (Place)		Mouth of Ben. Solo	Pilot St.	NW of Madura Is.	Center of West Ch.	Existing Port	Out of East Ch.

Source: \* British Admiralty Chart, No.975, 2005

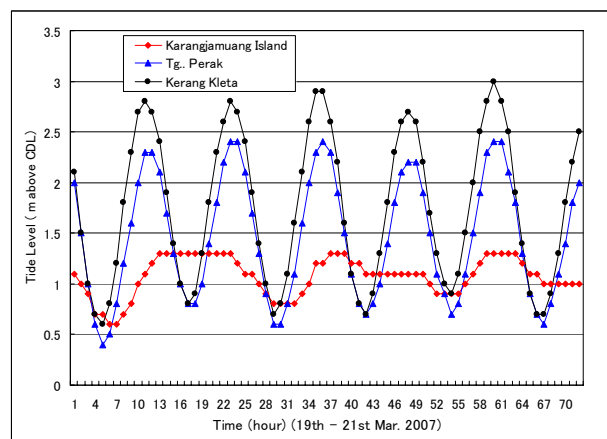
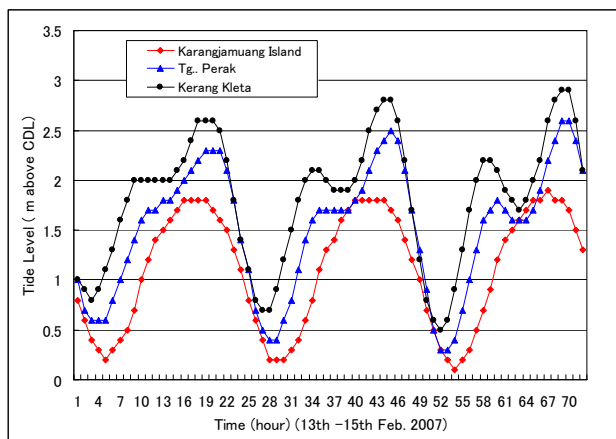
\*\* TNI AL: Daftar Pasang Surut, Kepulauan Indonesia, Tahun 2007

As shown in Figure 2.1.6, the tidal pattern is predominantly “Diurnal” in the Java Sea, and “Semi-diurnal” in the Bali Sea. The pattern is mixed at Tg. Perak Surabaya and its water level is just averaged between the values at Karang Jombang Island in the Java Sea and Karang Kleta out of the East Channel.

**Figure 2.1.6 Tidal Pattern at West Channel, Tg. Perak, and East Channel in Madura Strait**

(1) 3-15 February 2007

(2) 19-21 March 2007



Source: Daftar Pasang Surut, Kepulauan Indonesia, Tahun 2007

The tidal current at the middle of the West Channel near Gresik has characteristics as shown in Table 2.1.4. The maximum speed of the tidal current reaches 2.1 knots both in ebb and flood currents as shown in Figure 2.1.7. The current speed can be generally considered strong during spring tides thereby hindering ship navigation and ship mooring at anchorages. The phase of the current speed is different by approximately 90 degrees from that of tidal level.

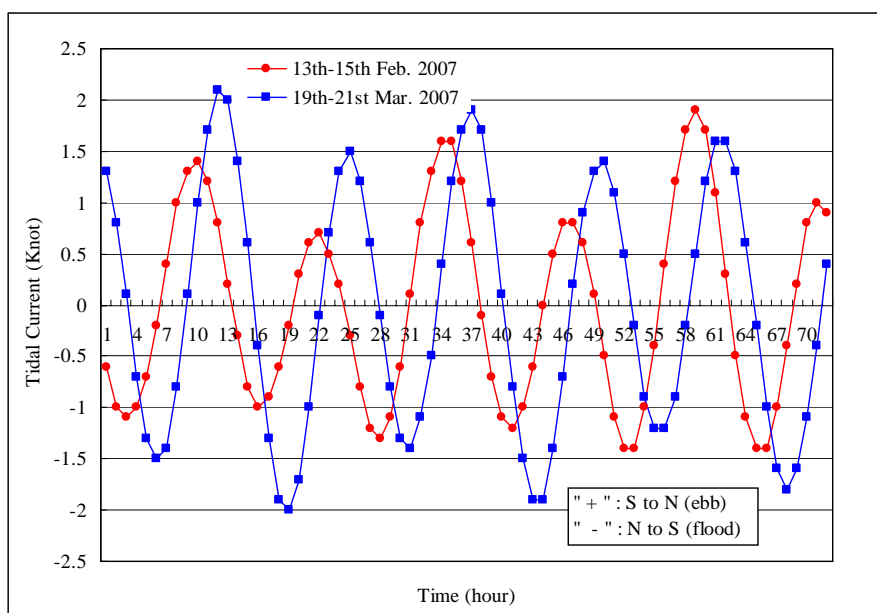
**Table 2.1.4 Components of Tidal Current in Madura Strait**

(Location: 07.1°S, 112.6°E)

Tidal Constant	M <sub>2</sub>	S <sub>2</sub>	N <sub>2</sub>	K <sub>2</sub>	K <sub>1</sub>	O <sub>1</sub>	P <sub>1</sub>
Amplitude (knot)	1.16	0.42	0.22	0.07	0.36	0.06	0.00
Phase (degree)	351	005	021	354	133	230	000

Source: TNI AL: Daftar Arus Pasang Surut , Kepulauan Indonesia, Tahun 2007

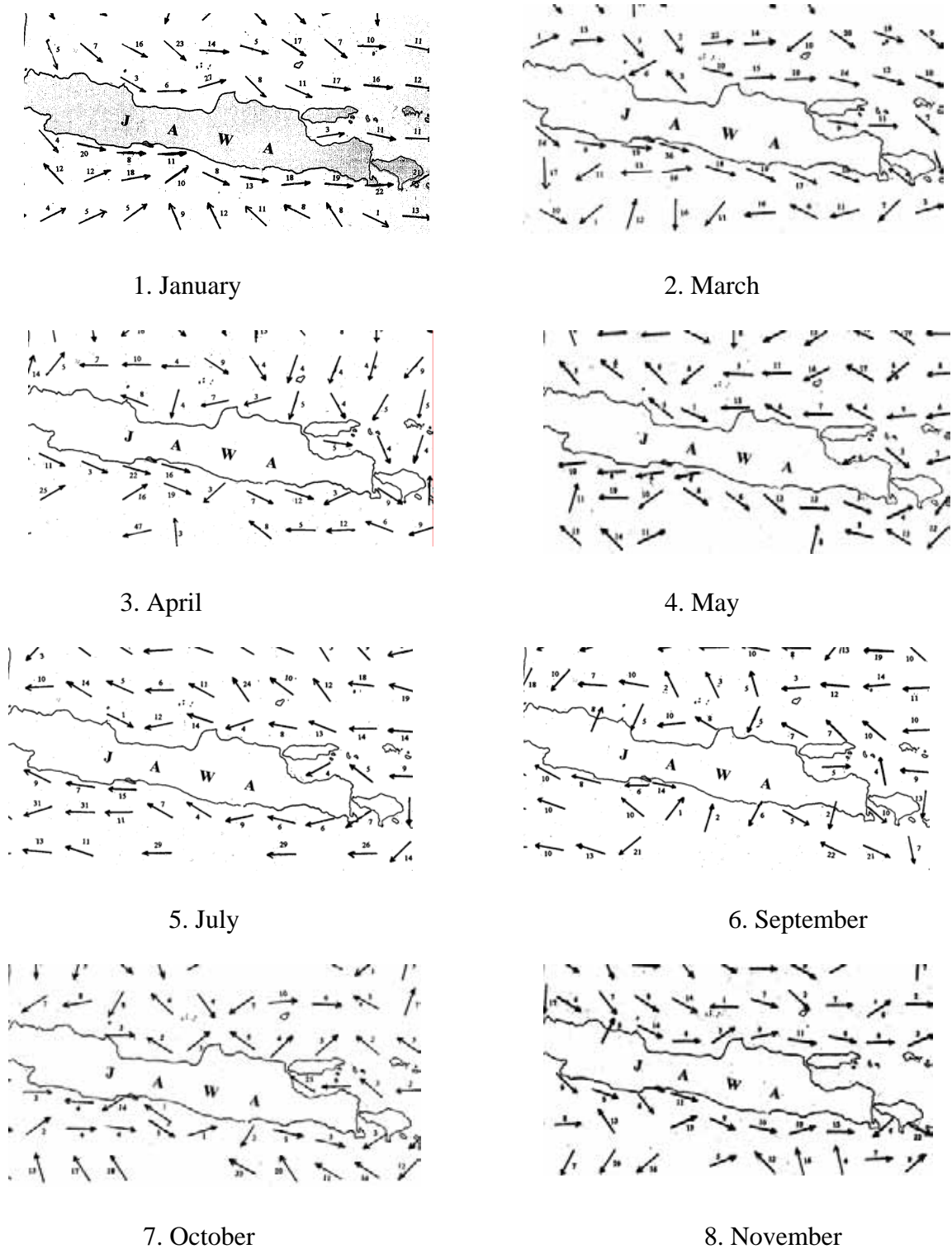
**Figure 2.1.7 Tidal Current near Gresik in Madura Strait**



Source: Daftar Arus Pasang Surut, Kepulauan Indonesia Tahun 2007

The surface ocean current off the Madura Strait in the Java Sea is completely alternate, from the west in November to March and from the east in May to September, as shown in Figure 2.1.8. April and October are transition months. The maximum speed is about 0.5 knots (13 miles/day) for both east current in February and west current in August. The current speed is rather slow.

Figure 2.1.8 Ocean Current off Madura Strait in the Java Sea



Source: TNI-IL: Peta Arus Perairan, Indonesian Kawasan Barat, 1997



## b. Waves

Generally speaking, waves along the coastline of the Java Sea are not high usually. However, sometimes waves become unusually high particularly during the monsoon period from December to March, as a result of strong wind blowing from the west. From June to October the wind blows mostly from the east and waves during this period are not so high as those during the northeast monsoon season.

The regular or frequent measurement of waves is not made in this region of the Java Sea. However, wave measurements were carried out at Tg. Emas Semarang Port in Central Java Province from 1980 to 1984 during the northwest monsoon season. The highest height of significant waves recorded was from 1.5m to 2.0m in November 1983 and the maximum wave height was 2.8m. A few years after the measurement, very unusual waves were reported with a significant wave height of 3.4m from the northwest direction were generated at Semarang Port on 17 January 1986.

In the case of Semen Gresik Harbor at Tuban in East Java Province, a maximum wave height assumption of 7.0m was adopted as the design wave height for construction of an underwater sill at depths from 6m to 8.5m, which was built in 2000.

In the study of "Container Port Development in Bangkalan" by Gadjah Mada University in 2005, a design wave of 5.3m with a recurrence period of 10 years was employed based on visual wave observations recorded by Dutch ships.

Waves in the Madura Strait can be considered not high owing to protection by Java and Madura Island.

In order to strengthen the understanding of wave conditions off the Madura Strait, waves are hindcast based on the past meteorological data by means of "Global Wave Hindcast Method" provided by the Japan Meteorological Agency. The location of hindcast is Longitude 112.5 degrees east and Latitude 5.0 degrees south. The period of calculation is for five years from January 2002 to December 2006.

The results are summarized in Table 2.1.5 for the five year period. Waves are dominantly from the east during the dry season (May to October) and from WNW during the rainy season (January to April). Wave heights can be less than 3m and 3.5m in the dry and rainy seasons, respectively.

**Table 2.1.5 Wave Data Hindcast from 2002 to 2005 (112.5 E, 5.0S)**

Wave Height (m)	Dry Season				Rainy Season					Calm	Total
	E	ESE	SE	SSE	W	WNW	NW	NNW	N		
- 0.24	448 6.42%	25 0.36%			140 2.00%	72 1.03%	11 0.16%	1,145 16.40%	1,461 20.92%	0 0.00%	3,302 47.29%
0.25 - 0.49	297 4.25%	26 0.37%	3 0.04%	1 0.01%	137 1.96%	35 0.50%	24 0.34%	234 3.35%			757 10.84%
0.50 - 0.74	372 5.33%	225 3.22%	26 0.37%	6 0.09%	143 2.05%	40 0.57%	48 0.69%	39 0.56%			899 12.87%
0.75 - 0.99	350 5.01%	306 4.38%	26 0.37%	7 0.10%	87 1.25%	14 0.20%	28 0.40%	8 0.11%			826 11.83%
1.00 - 1.24	245 3.51%	172 2.46%	11 0.16%		35 0.50%	10 0.14%	4 0.06%	2 0.03%			479 6.86%
1.25 - 1.49	153 2.19%	116 1.66%			45 0.64%	15 0.21%	4 0.06%				333 4.77%
1.50 - 1.74	63 0.90%	81 1.16%			22 0.32%	14 0.20%					180 2.58%
1.75 - 1.99	46 0.66%	31 0.44%			23 0.33%	6 0.09%					106 1.52%
2.00 - 2.49	22 0.32%	20 0.29%			39 0.56%	5 0.07%					86 1.23%
2.50 - 2.99	1 0.01%	2 0.03%			10 0.14%						13 0.19%
3.00 - 3.49					1 0.01%	1 0.01%					2 0.03%
<b>Total</b>	1,997 28.60%	1,004 14.38%	66 0.95%	14 0.20%	682 9.77%	212 3.04%	119 1.70%	1,428 20.45%	1,461 20.92%	0 0.00%	6,983 100.00%

Source: Japan Meteorological Agency

#### 4) Siltation and Sedimentation

##### a. Phenomena to be considered

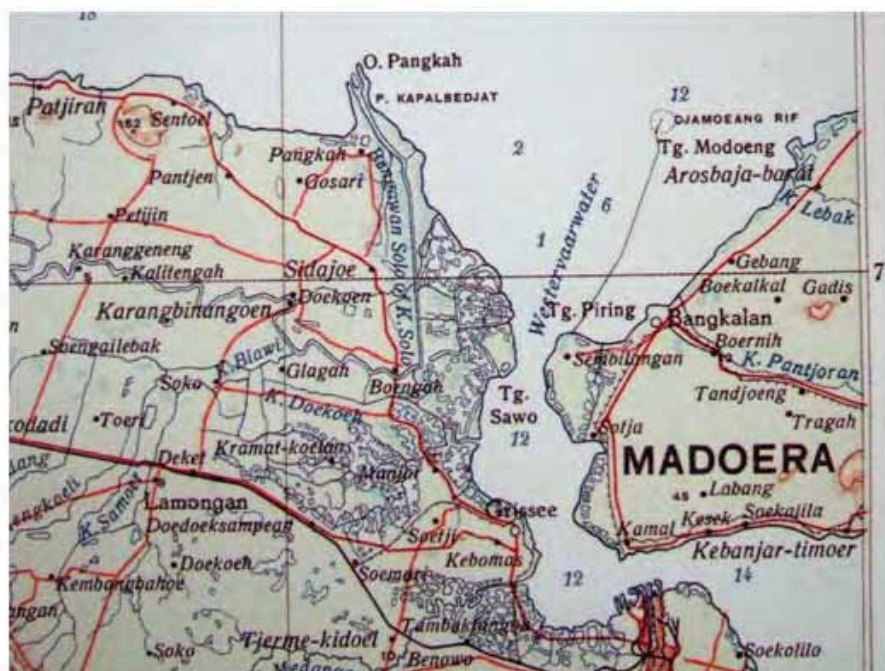
The phenomenon of settlement and floatation of small particles under the influence of water flow in the sea is called siltation. In the Madura Strait very small soil particle, consisting mostly of clay and silt, has been accumulated on the seabed for a long period of time. The origin of the sediment is mainly the Bengawan Solo and its tributaries. The Madura Strait can therefore be considered in a state of dynamic equilibrium between the action of tidal currents and siltation/erosion of fine mobile bottom materials.

On the other hand, along the northern coastline of Madura Island, the shore consists of dominant sand, coral debris and rock. Clay and silt can be found only in the swamp areas behind the shore and the front shore that is vegetated by mangroves. In such a coastline, alongshore movement of seabed materials can occur due to the action of waves, which is called "littoral drift" or "sand drift" if the material is sand. It is to be seriously considered that the sand drift phenomenon could cause accumulation of sand in specific locations of a port such as the root portion of a breakwater and inside of breakwaters. An example of such sand drift can be found at the present port of Tg. Bumi, where most of the harbor area in the port is buried by sand. This can be avoided, if the breakwater could be extended into a deeper depth, where bottom materials do not move due to lessened influence of wave action.

##### b. Alignment of Solo River and Training Wall

In discussing sedimentation and siltation at the Surabaya West Channel, there are two facts which should be noted from the viewpoint of hydraulic engineering, i.e. re-alignment of the Solo River and existence of the training wall. Their construction works were carried out before 1937, as illustrated on a 1937 map below (Photo 2.1.1 Atlas van Tropisch Nederland, Java Middenblad, KNAG 1937).

Figure 2.1.9 Old Map Showing the Solo River and the Training Wall



Source: Atlas van Tropisch Nederland, Java Middenblad, KNAG 1937

According to old maps prepared in the 19th and early 20th centuries, the Solo River originally flowed to the east direction into the West Channel Delta. The orientation of the river was realigned to the north and the remaining tributaries were closed by dikes. This work had a significant effect in decreasing the volume of river sediments coming into the West Channel.

Meanwhile, the training wall extends from the northern end of Ujung Piring at the west Madura Island to Pulau Karang Jamuang (the Pilot Station) as shown in Photo 2.1.1 and Figure 2.1.9-1. This training wall has a total length of 12.36 km. Its southern section was constructed with concrete plates on coral rock mound as seen from Photo 2.1.2, which was taken when the water level was low, or CDL+ 0.6m . Most sections of the training wall have been damaged by actions of waves and currents, and the crown level is now between CDL +1.60m and CDL -1.10m. The central portion with a length of 5.50km has crown levels lower than CDL zero. Nevertheless, it is apparent that the training wall still has an effect to block the movement of sediments from the east side of the delta to the Channel. Another effect is that the training wall substantially narrows the lateral width of the delta from the west shore to the training wall.

**Figure 2.1.10 Present Condition of Existing Training Wall (12 June 2007)**



Source: JICA Study Team

## 5) Geotechnical Conditions

A soil investigation study of Madura alongside Madura Strait Access Channel was carried out in “Engineering and Environmental Study on Navigation Channel, Sedimentation and Reclamation Phase at Madura Strait Coast” (“Kajian Teknis dan Lingkungan Terhadap Alur Pelayaran, Sedimentasi, dan Tahapan Pelaksanaan Reklamasi di Pesisir Selat Madura”). Figure 2.1.9 shows the location of bore holes of the study; and, Figures 2.1.10, 2.1.11, and 2.1.12 illustrates the soil profiles at Lamong Bay (south Gresik), Mireng Bay (north Gresik), Junganyar (south of Socah), and Tg. Bulupandan, respectively.

According to this study, geotechnical conditions of the west side of the access channel, namely Lamong Bay and Mireng Bay, are as follows:

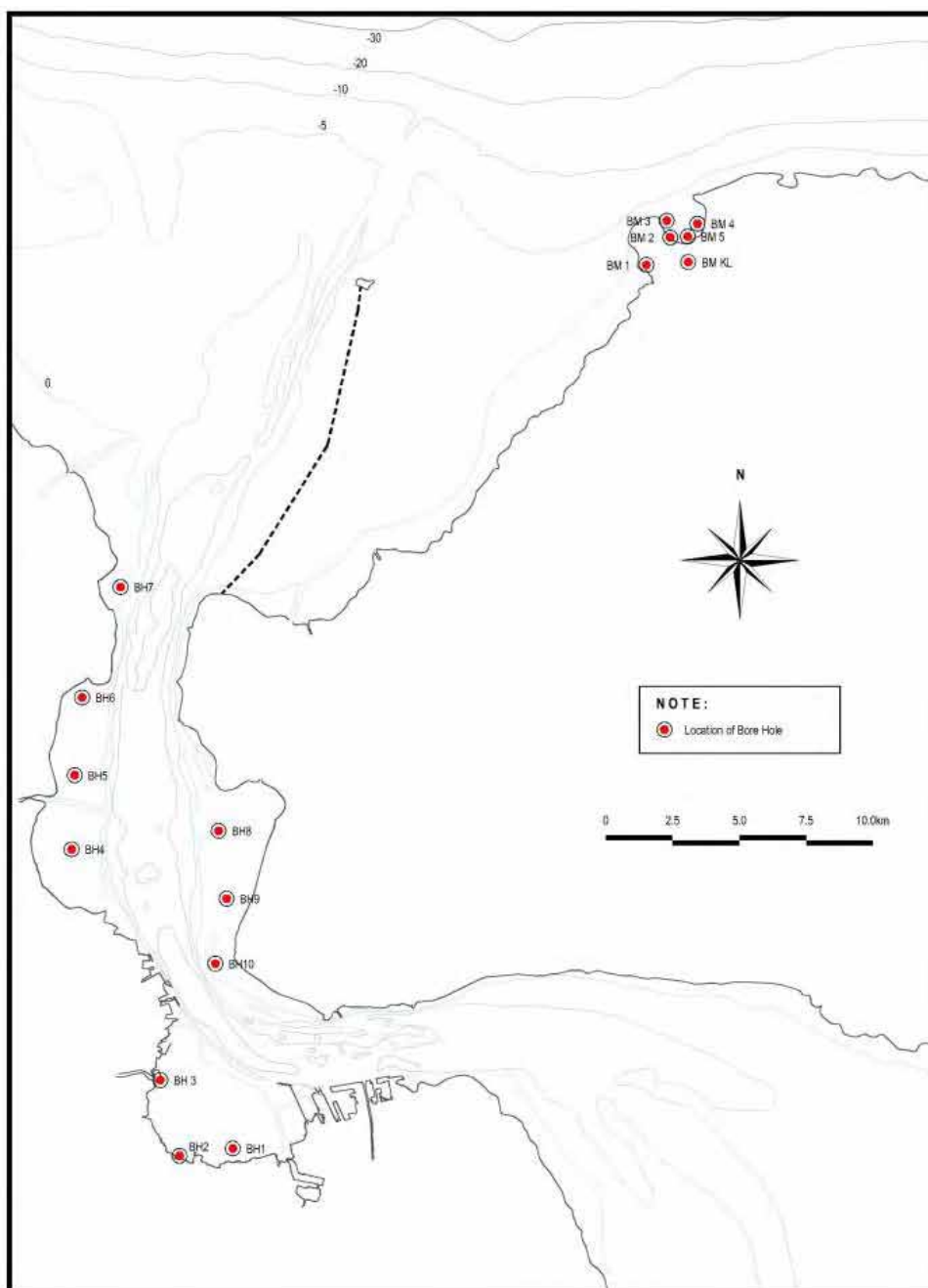
- From seabed geological layers, the foundation consists of very soft claily silt with thickness of 10-18m, soft claily silt of 1-5m, medium claily silt of 6-15m, stiff claily silt of 12-25m, and hard claily silt located at LWS -40m - -60m.
- Their N-values are 0-5, 5-6, 8-26, 15-24, and 26-30, respectively.

Supporting layer of piles appears more than 50-60m deep. Thereby, when the container berths of Surabaya Container Terminal (TPS) were constructed, foundation steel piles were driven up to almost 70m depth.

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

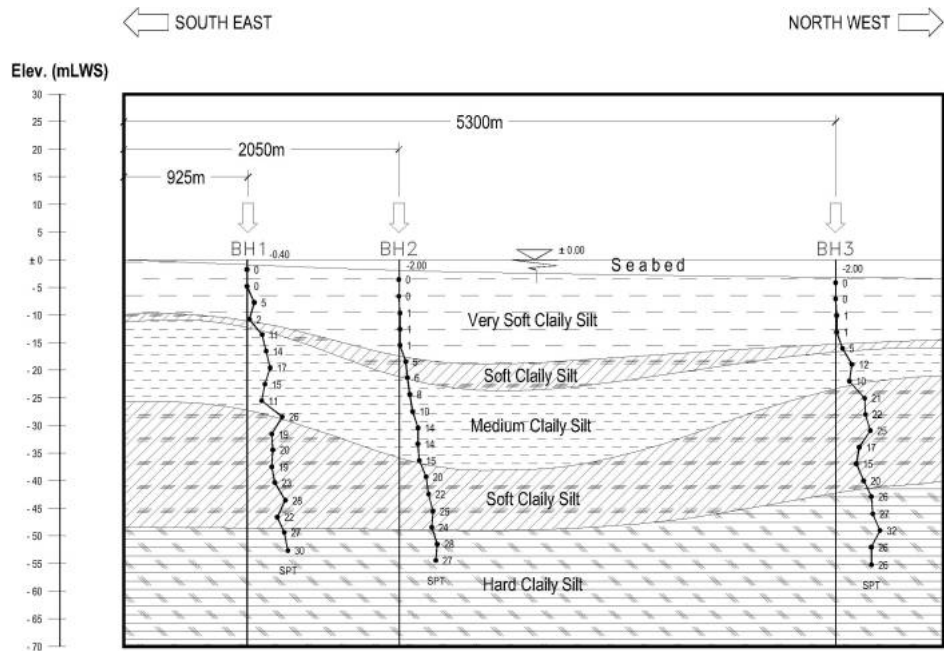
Another soil investigation at Tanjung Bulupandan was carried out in “Pre-Feasibility Study on the Construction of Container Seaport on the North Shore of Bangkalan Regency” (“Studi Kelayakan Pengembangan Pelabuhan Peti Kemas di Pantai Utara Kabupaten Bangkalan”). Locations of borings are confined to the land beach areas only, with none in the water areas. According to this study, stiff layer of N-value more than 50 appears at shallow depth of around 8m under the seabed. Figure 2.1.13 illustrates the borehole profile at Br. No.3, which is located at the most seaward point.

**Figure 2.1.11 Location Map of Boring**

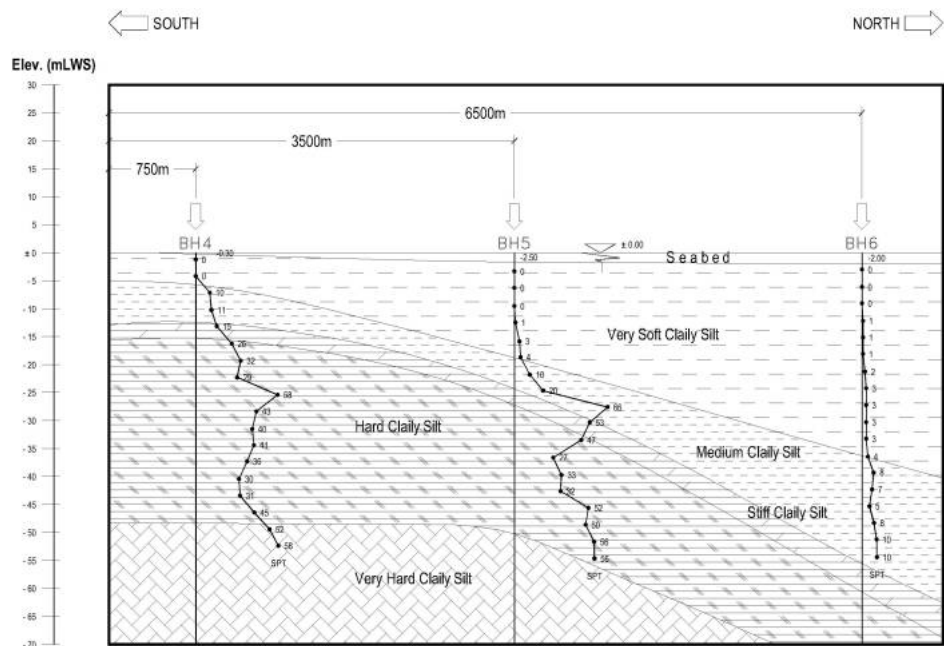


Source: JICA Study Team

**Figure 2.1.12 Soil Profile at Lamong Bay (South Gresik)**

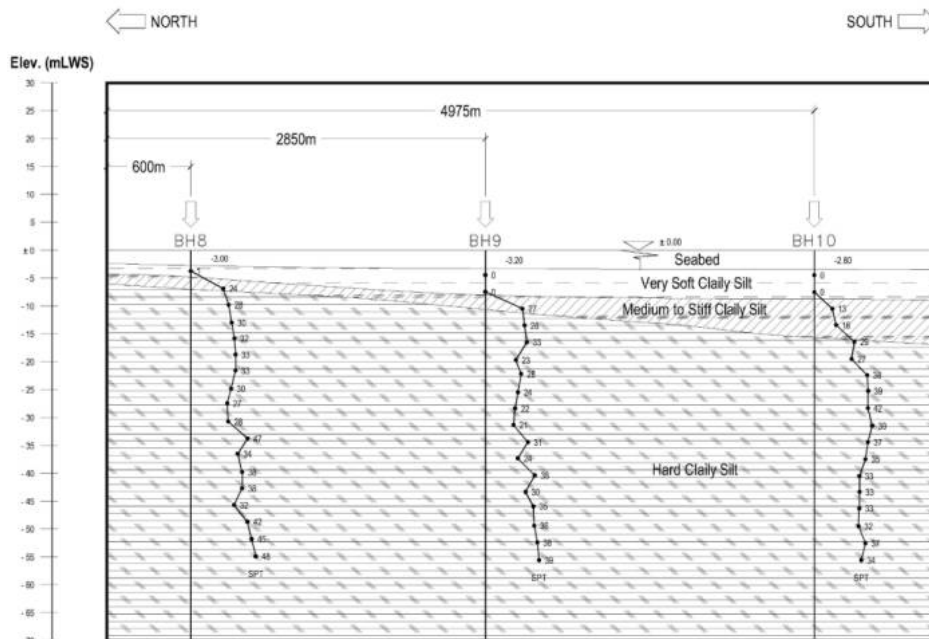


**Figure 2.1.13 Soil Profile at Mireng Bay (North Gresik)**



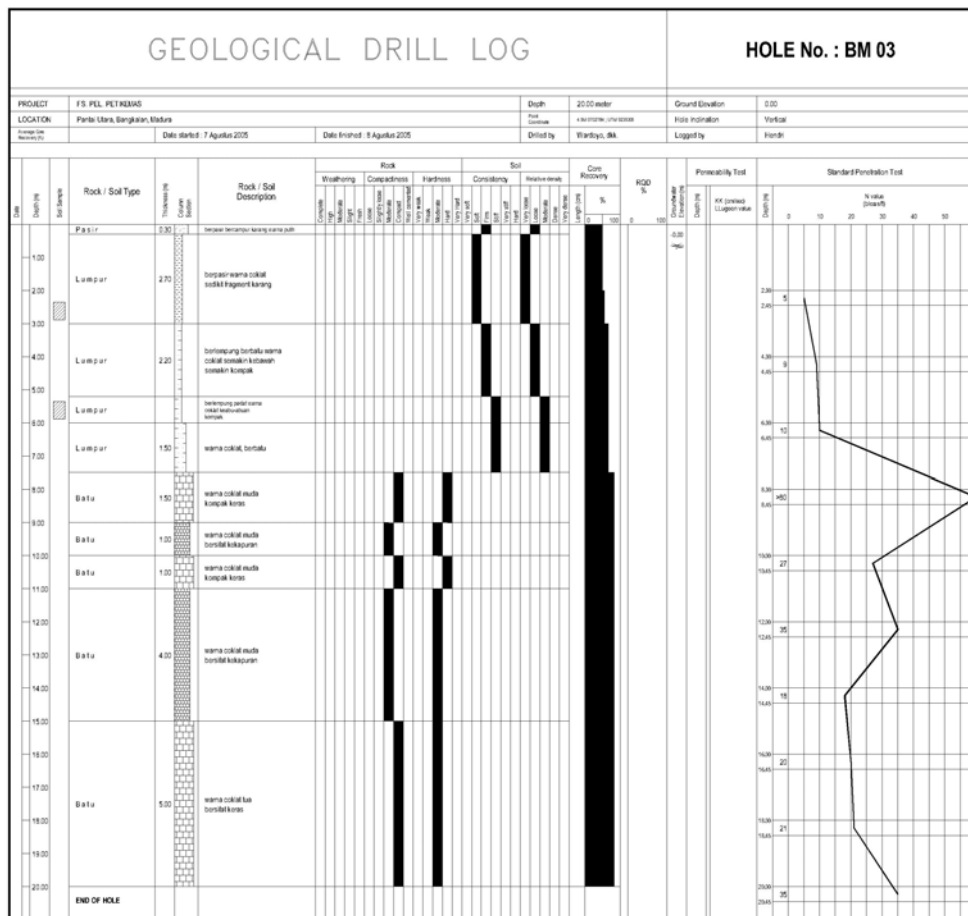
Source: Pelindo III "Kajian Teknis dan Lingkungan Terhadap Alur Pelayaran, Sedimentasi, dan Tahapan Pelaksanaan Reklamasi di Pesisir Selat Madura"

**Figure 2.1.14 Soil Profile at Junganyar (South of Socah)**



Source: Pelindo III "Kajian Teknis dan Lingkungan Terhadap Alur Pelayaran, Sedimentasi, dan Tahapan Pelaksanaan Reklamasi di Pesisir Selat Madura"

**Figure 2.1.15 Profile of Br. No.3 at Tanjung Bulupandan**



Source: East Java Province and Gadjah Mada Univ. "Pengembangan Pelabuhan Petikemasdi Kabupaten Bangkalan," 2006

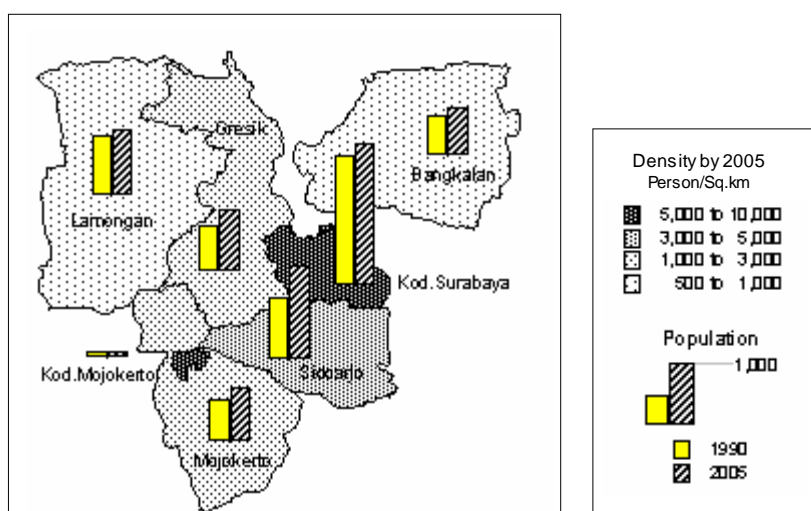
## 2.2 Demography, Economy and Trade

### 1) Demography

#### a. Population

In year 2005, the Study Area (GERBANGKERTOSUSILA) 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 at a higher rate than that of Java (1.16% p.a.), but is at the same rate as the national average population growth (Table 2.2.1). The population growth occurred mainly not in Surabaya City but in the areas adjacent to Surabaya, where a remarkable industrialization took place in the 1990s. Surabaya City has a population of 30% of the Study Area and it has been growing at a modest rate, seemingly reaching to capacity, where population density of Surabaya is almost 100 persons per hectare (Figure 2.2.1).

**Figure 2.2.1 Population Increase and Density of Study Area**



Source: JICA Study Team

**Table 2.2.1 Population Change in Study Area**

Region/Area	Area (km <sup>2</sup> )	Population (1000)				Density in 2005 (person/km <sup>2</sup> )	Growth Rate 1990-05 (% p.a.)
		1980	1990	2000	2005		
Indonesia	1,919,443	146,776	179,248	205,132	219,205	114.2	1.35
Java	132,187	91,217	107,526	121,293	127,793	966.8	1.16
East Java	47,913	29,154	32,281	34,766	35,550	742.0	0.65
Study Area	5,803	6,114	7,277	8,309	8,902	1534.0	1.35
Kab. Sidoarjo	592	854	1,167	1,551	1,788	3022.3	2.89
Kab. Mojokerto	827	706	787	929	1,009	1220.8	1.67
Kab. Lamongan	1,813	1,050	1,143	1,221	1,262	696.2	0.66
Kab. Gresik	1,137	729	856	1,012	1,101	968.3	1.69
Kab. Bangkalan	1,145	688	751	864	927	809.8	1.41
Kod. Mojokerto	17	69	100	110	116	7030.3	0.99
Kod. Surabaya	274	2,018	2,473	2,621	2,699	9846.8	0.58

Source: Statistical Yearbook of Indonesia (BPS), 1985/86 – 2005/2006, Jawa Timur in Figures, 2006



## b. Labor Force and Employment

Productive age population (defined in Indonesia as population aged over 10) is 82% in the Study Area while it is 86% in East Java Province. Labor force is the sum of people working and who have a will to work. The ratio of the labor force to the productive age population is in the range of 58 – 63%, which is rather low due to the definition. According to a 1998 survey, in the Study Area the labor force has a 6% unemployment rate. The unemployment rate was especially high in two cities of Mojokerto and Surabaya. (note: unemployment in rural areas tends to be disguised.) The same kind of survey in 2003 withheld the unemployment rate which might be higher than in 1998.

**Table 2.2.2 Labor Force and Unemployment Rate in Study Area**

Province/Area	Population (1000)	Productive Age Population (1000)	Labor Force (1000)	Labor Force Ratio (%)	Unemployment Ratio* (%)
East Java	35,234	30,287	19,086	63.0	4.7
Study Area	8,687	7,161	4,397	61.4	6.0
Kab. Sidoarjo	1,689	1,397	838	60.0	7.3
Kab. Mojokerto	976	808	491	60.8	4.6
Kab. Lamongan	1,245	1,039	693	66.7	2.2
Kab. Gresik	1,117	860	519	60.4	3.3
Kab. Bangkalan	901	714	465	65.2	4.6
Kod. Mojokerto	114	93	54	57.9	11.5
Kod. Surabaya	2,643	2,251	1,336	59.4	8.6

Note: Unemployment rate is in 1998.

Source: National Social and Economic Survey in 2003, East Java Province, BPS

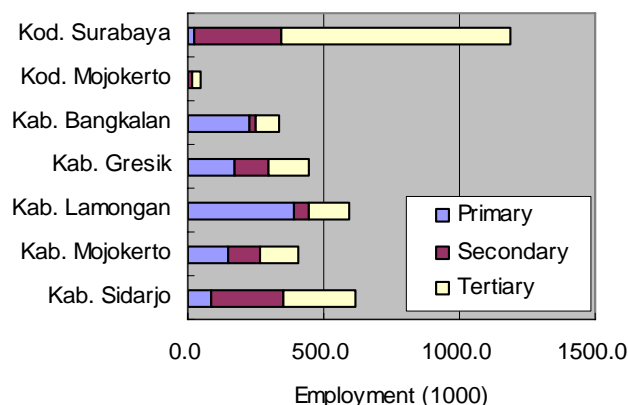
Table 2.2.3 and Figure 2.2.2 show the employment distribution among industrial sectors. In Lamongan and Bangkalan, two out of three persons were engaged in the agricultural sector. Manufacturing sector's share in Sidoarjo was remarkably high, followed by Gresik and Mojokerto, as they are strongly characterized as industrial towns. In two cities, transportation and communication sector stood for over 10%. The unusually high rates were presumably due to "becak" drivers which is an informal sector.

**Table 2.2.3 Employment Composition by Industrial Sector in 2003**

Province/Area	Agriculture	Mining & Quarrying	Manufacturing	Public Utility	Construction	Trading	Transp & Comm.	Finance	Service	Others	Total
East Java	49.1	0.6	12.1	0.2	3.8	17.9	5.0	0.8	10.4	0.2	100.0
Study Area	28.6	0.4	21.3	0.4	3.7	22.6	7.0	1.6	14.3	0.1	100.0
Kab. Sidoarjo	13.7	0.2	38.4	0.4	4.9	20.2	7.2	1.3	13.5	0.2	100.0
Kab. Mojokerto	34.5	2.2	24.4	0.2	4.5	15.7	5.3	1.4	11.9	0.0	100.0
Kab. Lamongan	65.8	0.2	7.5	0.1	1.3	15.4	2.7	0.4	6.6	0.0	100.0
Kab. Gresik	39.1	0.3	25.4	0.5	2.1	16.7	6.1	1.3	8.5	0.2	100.0
Kab. Bangkalan	67.2	0.3	3.8	0.0	2.7	13.4	4.4	0.1	8.2	0.0	100.0
Kod. Mojokerto	5.2	0.1	25.0	0.6	3.7	28.6	10.0	2.6	23.8	0.3	100.0
Kod. Surabaya	1.9	0.1	21.7	0.8	4.8	34.5	10.5	3.0	22.9	0.0	100.0

Source: National Social and Economic Survey in 2003, East Java Province, BPS

**Figure 2.2.2 Employment Composition by Industrial Sector in 2003**



Source: National Social and Economic Survey in 2003, East Java Province, BPS

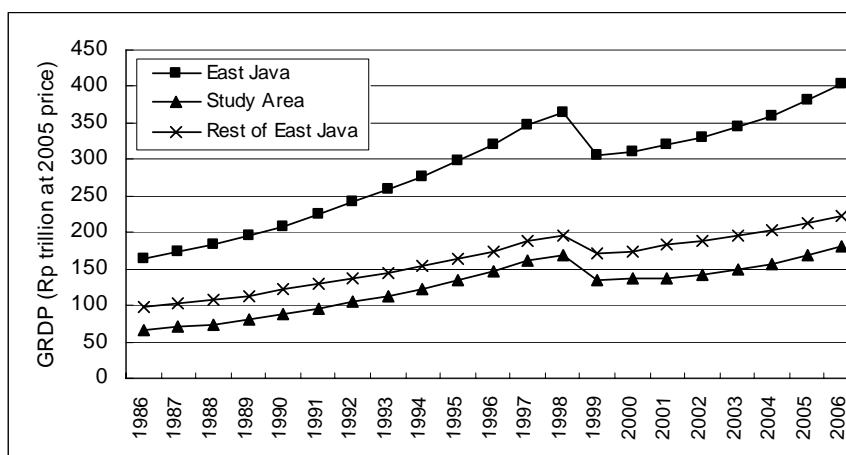
## 2) Economy

### a. Economic Growth

Table 2.2.4 details the study area's GRDP at 2005 constant price and GRDP annual growth rate in the past 20 years while Figure 2.2.3 illustrates a comparison of GRDP of the Study and East Java Province over time.

The regional economy has been steadily growing at a high rate between 6 – 10 % annually, except for a sudden drop of 20% in 1998 after the 1997 financial crisis stated. After three or four years of stagnancy, the regional economy as well as national economy have fully recovered and seem to be poised for sustained high growth. The financial crisis impacted more significantly the urban economy than the rural economy, nevertheless, the Study Area more or less has the same economic trend as other parts of East Java.

**Figure 2.2.3 Economic Growth Trend of Study Area in Past Two Decades**



Source: Elaborated by Study Team using Table 2.2.4

**Table 2.2.4 GRDP at 2005 Constant Price and Annual Economic Growth of Study Area**

**(1) GRDP**

(Rp. billion at 2005 price)

Year	Nation	East Java	Study Area	Kab. Sidoarjo	Kab. Mojokerto	Kab. Lamongan	Kab. Gresik	Kab. Bangkalan	Kod. Mojokerto	Kod. Surabaya
1985	1079588	163812	65323	12182	3653	3005	6079	2597	529	36026
1986	1143823	173902	70456	12954	3856	3199	6847	2705	581	38898
1987	1201056	182373	74330	13769	4048	3267	7247	2738	617	41422
1988	1270480	194459	80815	14890	4363	3436	8317	2896	669	44844
1989	1365215	208958	87359	16689	4503	3451	8840	2960	715	49546
1990	1464085	225704	96145	18897	4827	3658	10022	3151	791	54264
1991	1565842	241712	105197	21691	5074	3914	10874	3322	851	59398
1992	1666987	258702	113296	23039	5345	4150	11829	3442	909	64686
1993	1790173	277146	122812	25010	5615	4322	12773	3558	975	70869
1994	1939116	297184	133985	27735	5882	4420	13691	3669	1049	78110
1995	2098511	321494	146859	30691	6309	4645	14757	3808	1148	86318
1996	2262577	348052	160557	33103	6672	4847	16368	4009	1261	95244
1997	2368915	365530	169598	34979	6851	4987	17166	4111	1305	101352
1998	2057954	306605	135194	27824	5837	4522	13925	3752	1142	78674
1999	2074235	310326	136354	28118	6046	4616	14441	3754	1165	78479
2000	2176289	320457	137933	28500	6281	4725	15020	3768	1191	78520
2001	2251398	331130	142139	29334	6531	4878	15713	3843	1251	80575
2002	2349911	343724	149159	30651	6798	5080	16533	3984	1348	84751
2003	2464486	360138	157334	32661	7172	5295	17435	4137	1424	89203
2004	2590897	381035	168193	34863	7709	5540	18492	4328	1510	95749
2005	2729708	403392	179814	37258	8166	5845	19802	4543	1597	102605

**(2) Annual Growth Rate**

(%)

Year	Nation	East Java	Study Area	Kab. Sidoarjo	Kab. Mojokerto	Kab. Lamongan	Kab. Gresik	Kab. Bangkalan	Kod. Mojokerto	Kod. Surabaya
1986	5.95	6.16	7.86	6.33	5.56	6.49	12.63	4.14	9.82	7.97
1987	5.00	4.87	5.50	6.29	4.99	2.13	5.84	1.21	6.23	6.49
1988	5.78	6.63	8.72	8.14	7.78	5.16	14.78	5.78	8.42	8.26
1989	7.46	7.46	8.10	12.08	3.19	0.45	6.29	2.21	6.93	10.49
1990	7.24	8.01	10.06	13.23	7.20	5.99	13.36	6.45	10.51	9.52
1991	6.95	7.09	9.41	14.79	5.12	7.00	8.50	5.45	7.63	9.46
1992	6.46	7.03	7.70	6.21	5.34	6.02	8.78	3.60	6.87	8.90
1993	7.39	7.13	8.40	8.55	5.05	4.15	7.98	3.36	7.21	9.56
1994	8.32	7.23	9.10	10.90	4.76	2.28	7.18	3.12	7.55	10.22
1995	8.22	8.18	9.61	10.66	7.25	5.08	7.79	3.79	9.45	10.51
1996	7.82	8.26	9.33	7.86	5.75	4.35	10.92	5.29	9.87	10.34
1997	4.70	5.02	5.63	5.67	2.69	2.90	4.87	2.54	3.53	6.41
1998	-13.13	-16.12	-20.29	-20.46	-14.80	-9.32	-18.88	-8.75	-12.52	-22.38
1999	0.79	1.21	0.86	1.06	3.58	2.06	3.71	0.06	1.98	-0.25
2000	4.92	3.26	1.16	1.36	3.88	2.36	4.01	0.36	2.28	0.05
2001	3.45	3.33	3.05	2.92	3.98	3.25	4.61	2.01	5.01	2.62
2002	4.38	3.80	4.94	4.49	4.09	4.14	5.22	3.66	7.74	5.18
2003	4.88	4.78	5.48	6.56	5.50	4.23	5.46	3.83	5.69	5.25
2004	5.13	5.80	6.90	6.74	7.49	4.62	6.06	4.62	6.01	7.34
2005	5.36	5.87	6.91	6.87	5.93	5.50	7.09	4.97	5.72	7.16

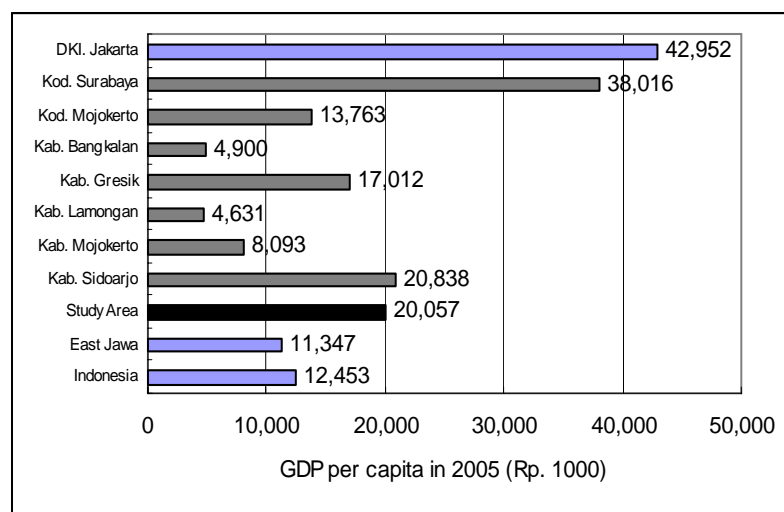
Source: Tabulated using BSP Year Books, National, Provincial and Kota & Kabupaten Editions

**b. Per Capita GRDP**

GRDP per capita of the Study Area was Rp. 20.0 million (US\$ 2,020) in 2005, which was 1.6 times higher than the national average. However, East Java Province has a lower GRDP per capita (Rp. 8.4 million) than the national average.

In the Study Area, GRDP per capita in Surabaya City was very high at Rp.38.0 million which was only 10% lower than that of DKI Jakarta. Sidoarjo was second high at Rp. 20.8 million and all others were below the Study Area average. Bangkaran and Lamongan, which are not industrialized areas have especially low GRDP per capita, not even reaching half level of the national average.

**Figure 2.2.4 Comparison of GRDP per Capita**



Source: Year Book of BPS, 2005

**c. GRDP by Sector**

Composition of GRDP by industrial sector in 2004 is shown in Table 2.2.5. In the Study Area, the primary sector produced 6% of GRDP, the secondary sector 46% and the tertiary sector 48 %. Comparing with those of Indonesia, the share of the secondary sector is significantly high because of industrialization in the past two decades, especially in Sidoarjo and Gresik as well as Surabaya. The share of the secondary sector is high particularly in Sidoarjo (61%) and Gresik (59%). Meanwhile, the primary sector is the main source of GRDP in Bangkalan and Lamongan.

**Table 2.2.5 Gross Regional Domestic Product (GRDP) of the Study Area in 2004 at Current Market Price**

(Rp. billion)

Industrial Sector		Indonesia	Study Area (GERBANG- KERTOSUSILA)	Kab. Sidoarjo	Kab. Mojokerto	Kab. Lamongan	Kab. Gresik	Kab. Bangkalan	Kod. Mojokerto	Kod. Surabaya
1	Agriculture	331,553.0	7,332.1	1,105.8	1,284.0	2,047.5	1,659.3	1,109.5	14.0	112.0
2	Mining & Quarrying	196,117.7	451.8	33.4	88.1	14.7	288.8	16.9	-	9.9
3	Manufacturing	639,655.0	49,842.6	14,969.2	2,157.5	287.3	7,116.1	118.2	146.6	25,047.7
4	Public Utilities	22,066.7	3,540.3	539.5	73.5	72.0	706.3	76.3	40.1	2,032.6
5	Construction	143,052.3	7,796.1	396.3	155.0	161.2	952.1	22.6	72.7	6,036.2
6	Trade, Hotel, Restaurant	369,361.1	39,878.0	5,718.0	1,352.3	1,383.3	2,966.1	641.3	470.6	27,346.4
7	Transportation & Communication	142,292.0	10,260.1	2,138.3	249.6	90.3	387.6	331.4	189.2	6,873.7
8	Financing, ownership & Business Service	194,429.3	6,548.6	384.8	231.9	149.9	540.4	127.3	88.1	5,026.2
9	Services	234,620.4	7,864.5	847.0	484.1	630.3	289.8	351.3	153.1	5,108.9
Total GRDP		2,273,147.5	133,514.1	26,132.3	6,076.0	4,836.5	14,906.5	2,794.8	1,174.4	77,593.6

**Composition (%)**

1	Agriculture	14.6	5.5	4.2	21.1	42.3	11.1	39.7	1.2	0.1
2	Mining & Quarrying	8.6	0.3	0.1	1.4	0.3	1.9	0.6	-	0.0
3	Manufacturing	28.1	37.3	57.3	35.5	5.9	47.7	4.2	12.5	32.3
4	Public Utilities	1.0	2.7	2.1	1.2	1.5	4.7	2.7	3.4	2.6
5	Construction	6.3	5.8	1.5	2.6	3.3	6.4	0.8	6.2	7.8
6	Trade, Hotel, Restaurant	16.2	29.9	21.9	22.3	28.6	19.9	22.9	40.1	35.2
7	Transportation & Communication	6.3	7.7	8.2	4.1	1.9	2.6	11.9	16.1	8.9
8	Financing, ownership & Business Service	8.6	4.9	1.5	3.8	3.1	3.6	4.6	7.5	6.5
9	Services	10.3	5.9	3.2	8.0	13.0	1.9	12.6	13.0	6.6
Total GRDP		100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
A	Primary Industry	23.2	5.8	4.4	22.6	42.6	13.1	40.3	1.2	0.2
B	Secondary Industry	35.4	45.8	60.9	39.3	10.8	58.9	7.8	22.1	42.7
C	Tertiary Industry	41.4	48.4	34.7	38.1	46.6	28.0	51.9	76.7	57.1
Total GRDP		100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Statistical Yearbook of Indonesia (BPS), 1985/86 – 2005/2006, Jawa Timur in Figures, 2006

#### d. Labor Productivity

Labor productivity (GRDP per worker) was analyzed using employment data and sector-wise GRDP data. Productivity varies widely by industrial sector and also by Kota & Kabupaten as shown in Table 2.2.6. Overall average is Rp. 36.9 million per worker in 2004. The secondary industry (manufacturing, utilities and construction) is the highest, which is almost double the average, The tertiary industry productivity is slightly higher than the average, while the primary industry productivity is only around one fifth of the average. This big gap also shows that the past economic growth was attained by investment mainly in the secondary sector.

Geopgraphically it is difficult to analyze labor productivity because employment data is based on the workers resident place while GRDP is based on the location of production base. If ignoring this problem, wide variations are observed among Kabupaten of Sidoarjo, Gresik and Mojokerto show comparatively high productivity in the primary sector. This may be partly because of difference of crop type and partly because many farmers engage in an auxillary business.

In the secondary industry, Surabaya City shows the highest productivity, followed by Sidoarjo and Gresik. Industries in those areas are highly capital-intensive while in other areas industries are small-scale and labor intensive.

Surabaya City also has the highest productivity in the tertiary industry. Surabaya is the center of finance, trade and services and large scale investment concentrate in the city. Therefore, there are many capital-intensive industries in Surabaya.

**Table 2.2.6 Labor Productivity by Industrial Sector**

(Rp. 1000 at 2004 price)

Kota/ Kabupaten	Primary	Secondary	Tertiary	Average
Study Area	7,409.9	66,532.3	39,174.8	36,904.9
Kab. Sidoarjo	13,325.8	59,428.0	34,860.4	42,573.0
Kab. Mojokerto	9,289.8	20,373.7	16,768.6	15,075.4
Kab. Lamongan	5,286.7	9,815.1	15,224.6	8,181.6
Kab. Gresik	11,136.4	70,740.9	28,828.3	33,565.6
Kab. Bangkalan	4,986.5	10,040.9	16,645.4	8,350.2
Kota. Mojokerto	5,665.6	18,885.0	29,451.0	25,094.0
Kota. Surabaya	5,095.5	102,729.4	52,936.6	65,525.1

Source: Elaborated based on Table 2.2.3 and Table 2.2.5

#### e. Investment

Table 2.2.7 summarizes the investment in East Java Province since 1968 and job creation by investment. Assuming the exchange rate at Rp. 2,000/ 1 US\$ during 1968-95 and applying actual exchange rate since 1996, total domestic investment would be equivalent to US\$ 28,534 million and the ration of domestic and foreign investment would be approximately 45%:55%. Total investment since 1968 is US\$ 62,668 million and annual average is US\$ 1,650 million, but most investment occurred intensively from the period 1980 to 1997 and after the financial crisis investment dipped considerably with unclear indication of possible rebound in the near future..

The investment created job opportunities of 1,243,587, 99% of which were for Indonesians. Average investment amount per employment (capital equipment ratio) is estimated at about US\$ 32,000 for domestic investment and US\$ 96,300 for foreign investment or threefold of the former. Overall average investment per employment is US\$ 50,400.

**Table 2.2.7 Investment in East Java**

Year	Domestic	Foreign	Workers by Domestic Inv.		Workers by Foreign Inv.	
	(Rp. Billion)	(US\$ million)	Indonesian	Foreigner	Indonesian	Foreigner
1968-95	37056	22146	683277	4221	192117	4825
1996	12683	2837	61317	386	24645	825
1997	12011	4886	48001	305	22372	541
1998	3623	671	8958	79	18697	480
1999	1100	203	18748	47	13750	346
2000	1534	319	17294	89	18062	229
2001	710	1595	8178	36	6664	310
2002	813	109	5500	25	6373	274
2003	1533	456	9849	199	16717	390
2004	4055	358	10257	34	17230	339
2005	5516	554	12348	3	9068	182
Total	80634	34134	883727	5424	345695	8741

Source: East Java Year Book of BPS

Table 2.2.8 presents the investment by Kota and Kabupaten in the Study Area since 1993 (on approval base). Investment has been concentrated to some particular Kabupaten: Sidoarjo, Gresik, Kota Surabaya and Pasuruan (although located outside of the Study Area) while Kab. Mojokerto was much not invested in and investment in Kab. Bangkalan and Mojokerto City were almost non-existent.

#### f. Fixed Capital Formation

BPS estimated the capital formation of Indonesia and East Java Province as shown in Table 2.2.9. The amount fixed capital formation of East Java Province in 2005 was Rp. 71,200 billion (approximately US\$ 8.0 billion) or 12% of the national capital formation. This amount is equivalent to 18% of GDP in that year. The Government sector contributed 20 – 25% of the total fixed capital formation which was rather low in order for the public sector to lead economic growth.

**Table 2.2.8 Domestic and Foreign Investment by Kota and Kabupaten**

Year	Indonesia			East Java			Study Area (incl. Pasuruan)			Kab Sidoarjo		
	Domestic (Rp. Billion)	Foreign (us\$ million)	Total (Rp. Billion)	Domestic (Rp. Billion)	Foreign (us\$ million)	Total (Rp. Billion)	Domestic (Rp. Billion)	Foreign (us\$ million)	Total (Rp. Billion)	Domestic (Rp. Billion)	Foreign (us\$ million)	Total (Rp. Billion)
1993	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	3439	684	4881	307	33	376
1994	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	7528	1730	11334	3435	141	3745
1995	69853	39914	161975	5285	10207	28843	4788	3108	11961	1231	171	1625
1996	100715	29931	172041	6512	2401	12234	9240	986	11589	3656	54	3784
1997	119872	33832	277191	11704	4216	31308	9423	1102	14549	373	63	667
1998	60749	13563	169592	3883	563	8401	3461	579	8110	481	69	1033
1999	53550	10980	131508	1588	274	3533	832	187	2157	242	11	320
2000	17496	6087	75901	1360	124	2550	1310	272	3922	593	155	2083
2001	58816	15055	215388	3229	1680	20701	387	319	3702	186	229	2568
2002	25307	9789	112821	1673	271	4096	267	118	1320	0	4	38
2003	48484	13207	160281	1078	418	4616	559	266	2810	0	26	220
2004	37140	10279	132632	4050	325	7069	3752	212	5720	693	25	922
2005	50577	13579	185009	5471	527	10688	5297	451	9757	520	93	1445

Year	Kab Mojokerto			Kab Lamongan			Kab. Gresik			Kab. Bangkalan		
	Domestic (Rp. Billion)	Foreign (us\$ million)	Total (Rp. Billion)	Domestic (Rp. Billion)	Foreign (us\$ million)	Total (Rp. Billion)	Domestic (Rp. Billion)	Foreign (us\$ million)	Total (Rp. Billion)	Domestic (Rp. Billion)	Foreign (us\$ million)	Total (Rp. Billion)
1993	45	22	91	0	0	0	1799	63	1932	0	0	0
1994	806	15	840	0	0	0	1069	712	2635	0	0	0
1995	11	59	147	48	0	48	1811	2127	6719	10	2	14
1996	19	172	429	92	36	178	2561	284	3238	0	0	0
1997	158	55	414	350	0	350	5906	132	6519	0	0	0
1998	0	16	131	0	0	0	476	339	3194	0	0	0
1999	0	11	80	0	0	0	77	99	783	0	0	0
2000	0	18	175	0	0	0	186	36	530	0	0	0
2001	0	28	295	1	1	14	44	1	56	0	3	27
2002	97	4	134	0	0	0	0	29	260	0	29	260
2003	56	8	120	0	0	0	243	59	739	0	0	0
2004	469	20	652	4	1	13	721	42	1107	0	0	0
2005	328	15	475	0	0	0	555	193	2463	0	0	0

Year	Kab Mojokerto			Kab Surabaya			Kab. Pasuruan		
	Domestic (Rp. Billion)	Foreign (us\$ million)	Total (Rp. Billion)	Domestic (Rp. Billion)	Foreign (us\$ million)	Total (Rp. Billion)	Domestic (Rp. Billion)	Foreign (us\$ million)	Total (Rp. Billion)
1993	0	0	0	1197	489	2229	91	78	255
1994	0	0	0	1803	264	2384	415	598	1730
1995	0	0	0	1424	574	2748	253	176	659
1996	0	0	0	2370	194	2831	542	246	1128
1997	0	0	0	2328	305	3745	308	548	2854
1998	0	0	0	2379	120	3344	125	35	408
1999	0	0	0	448	39	721	65	27	253
2000	0	0	0	271	19	449	260	44	686
2001	0	0	0	168	45	631	-12	12	111
2002	0	0	0	119	10	212	51	41	417
2003	0	0	0	200	93	988	60	81	742
2004	0	0	0	261	82	1020	1604	43	2005
2005	0	0	0	3367	93	4288	527	57	1087

Source: ibid.

**Table 2.2.9 Gross Fixed Capital Formation**

Year	Indonesia		East Java	
	(Rp. trillion)	(Rp. trillion)	(Rp. trillion)	(Rp. trillion)
1992	n.a.	n.a.	12.7	12.7
1993	86.6	86.6	12.9	12.9
1994	105.4	105.4	15.8	15.8
1995	134.1	134.1	18.5	18.5
1996	158.6	158.6	22.6	22.6
1997	177.7	177.7	25.6	25.6
1998	220.4	220.4	28.8	28.8
1999	237.6	237.6	30.3	30.3
2000	313.9	313.9	31.1	31.1
2001	305.9	305.9	44.5	44.5
2002	353.9	353.9	50.8	50.8
2003	392.7	392.7	54.9	54.9
2004	492.7	492.7	61.9	61.9
2005	591.2	591.2	71.2	71.2

Source: Year Book, BPS



### 3) Trade

#### a. Trade Volume.

East Java imported 15.6 million tons in 2004. The cargo amount accounts for 19.2 % in national trade. Taking the provincial share of population in the country, i.e., 16.2% in 2005, into account, East Java shows active importation for domestic and industrial purposes. On the contrary, the provincial export and its national share are limited to 7.3 million tons and 3.2 %, respectively. The greater Surabaya ports, currently consisting of two public ports: Tanjung Perak and Gresik, take a gateway role in the provincial trade. They handled 10.8 million tons for import and 6.4 million tons for export in 2004, having shares of 68.8 % and 87.6 %, respectively.

#### b. Surabaya Economy in Trade.

According to the trade statistics in 2005, the industries of Surabaya economy imports their materials or semi-processed products and export the same kind of products but with added value after processing them. Surabaya economy depends heavily on imported energy, especially for oil and petroleum products for transport although a limited amount of crude oil is exported. However, Surabaya and its surroundings is endowed with a considerable size of gas deposit and the gas produced has been used as a feed-stock of the chemical industry and source of energy. Table 2.2.10 and Figure 2.2.5 indicate that the major industries of Surabaya economy at present are paper, chemical, garment, mining, agro-industrial and consumable products. This means that the East Java's economy is based on the processing industry of primary materials but not export oriented assembling or processing industry as other major cities of ASEAN country.

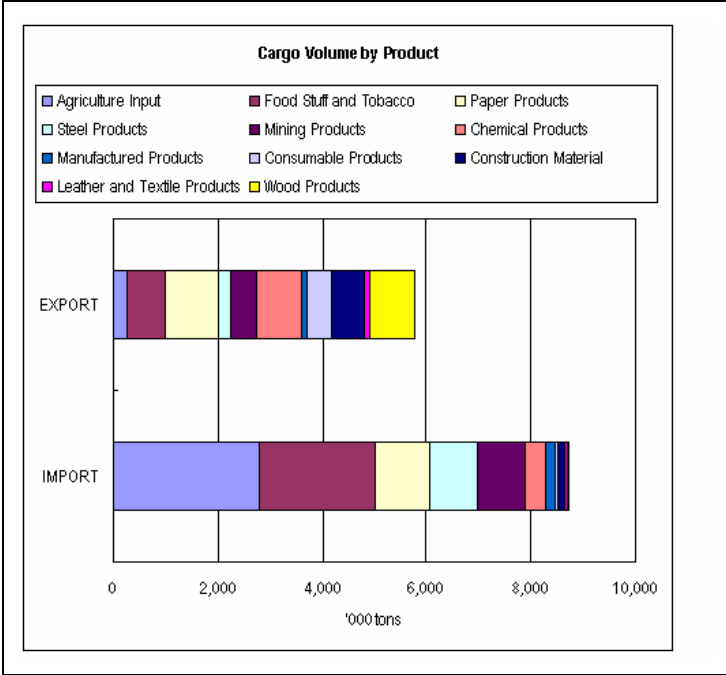
**Table 2.2.10 Surabaya-based Exports and Imports by Value and Volume**

Product	Value (US\$ Million)		Volume ('000 MT)	
	IMPORT	EXPORT	IMPORT	EXPORT
Agriculture Input	477	40	2,790	272
Food Stuff and Tobacco	740	1,049	2,244	723
Paper Products	280	701	1,024	1,007
Steel Products	305	111	920	245
Mining Products	230	561	908	500
Chemical Products	413	514	394	851
Manufactured Products	700	262	176	93
Consumable Products	103	782	64	463
Construction Material	69	55	127	645
Wood Products	21	958	52	86
Leather and Textile Products	109	242	37	886
Sub-total of Non Oil Product	3,445	5,276	8,737	5,771
Oil and Petroleum Product	5,418	333	1,461	10
Total	8,863	5,608	10,197	5,781

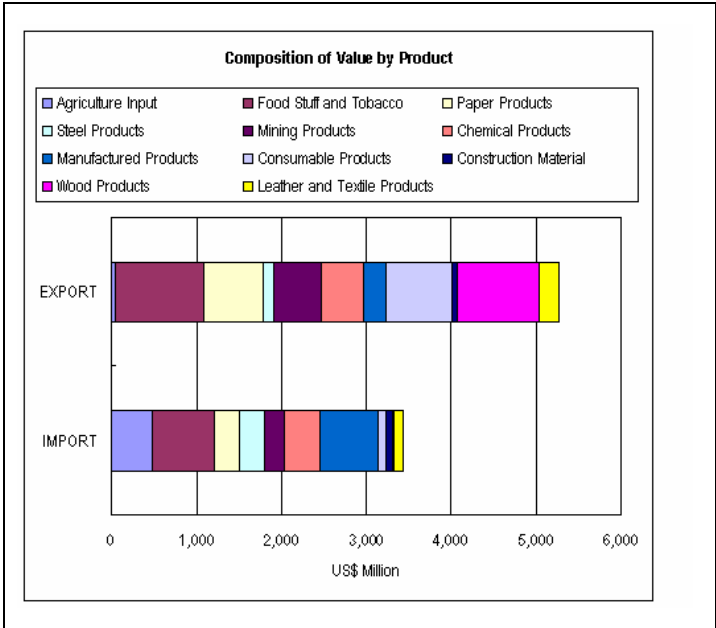
Source: Ministry of Trade, 2005

**Figure 2.2.5 Composition of Cargo Volume and Value in Surabaya-based Trade**

Cargo Volume



Cargo Value

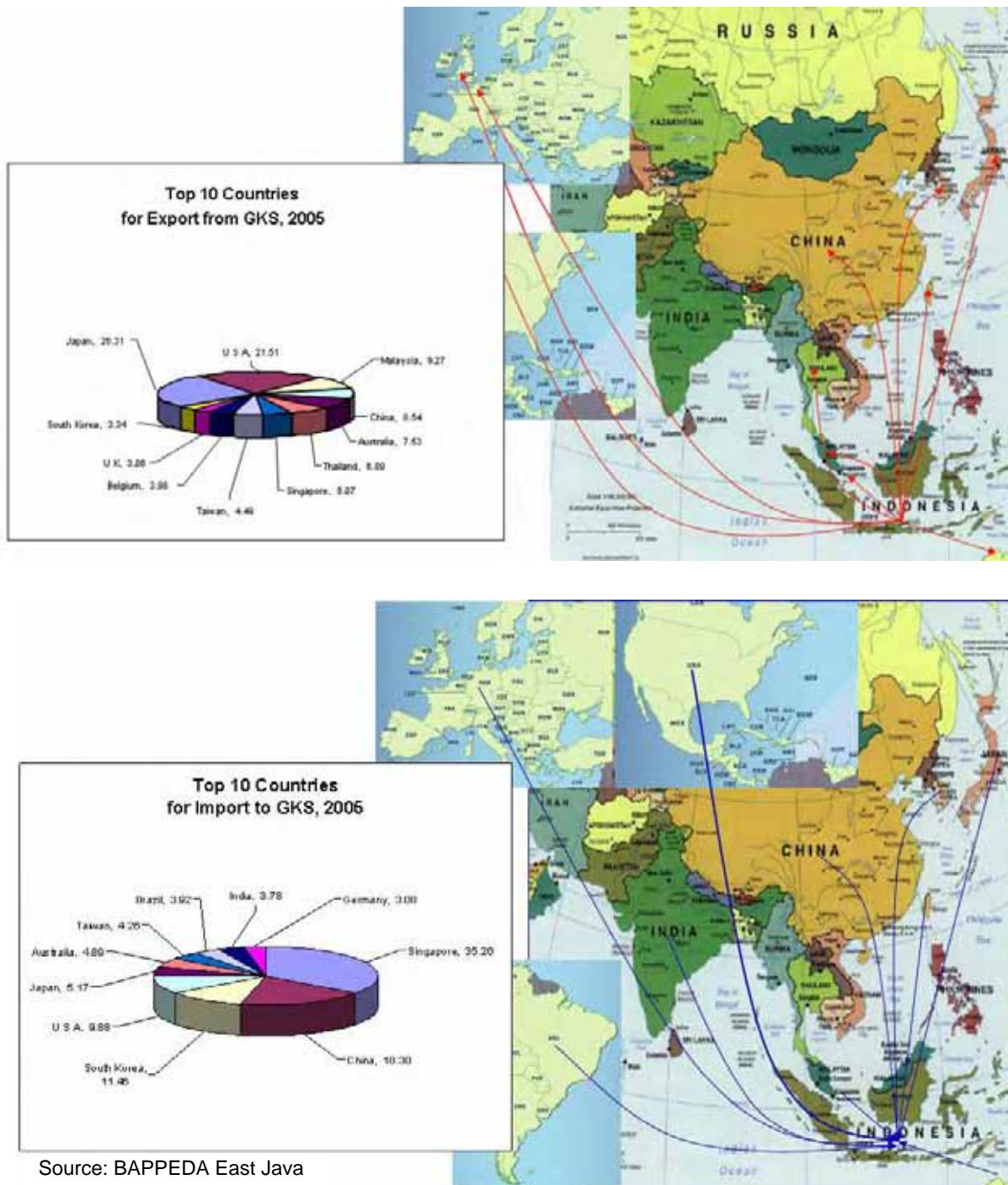


Source: BPS Statistics of Java Timur Province

c. Trading Countries.

In export, Japan and USA are the two biggest trading partners with a combined share of 47.8 %. Major export products include wooden products, pulp and paper products, cooper, food stuff and tobacco and various machines. Other major trading countries are located in the Asian and Oceania regions. In import, Singapore has a dominant share of 35.2%, followed by China, (18.3%) and South Korea (11.5%). Major import products are various refined oil products, petrol, and kerosene. (Refer to Figure 2.2.6)

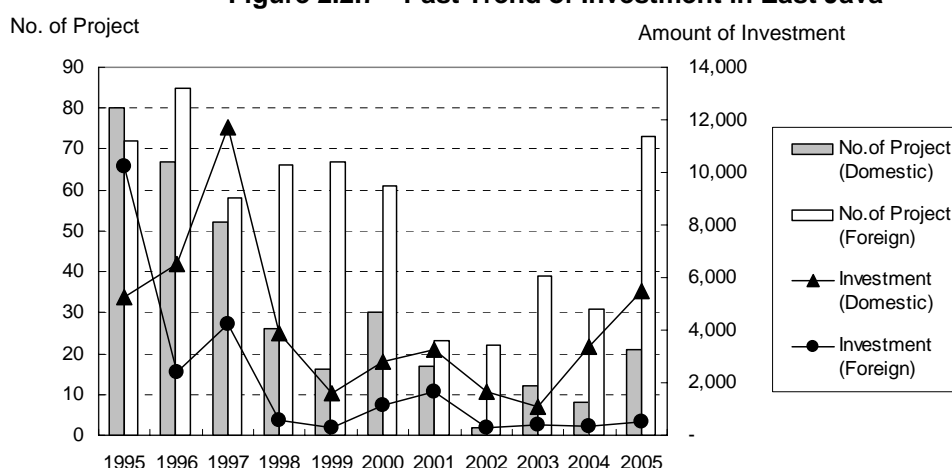
**Figure 2.2.6 Major Trading Countries with the GKS Region, 2005**



**d. Recent East Java Economy**

The following table shows the trend of investment by domestic and foreign companies in East Java over a 10-year period. In general, the investment has been low lately, especially, from 2001 to 2004. The number of domestic project decreased in this period. So did the number of foreign investment but it has shown signs of recovery in 2005, but the amount of investment still low. Therefore, the scale of foreign investment has decreased currently. If these conditions become a medium to long term trend, it would lead to stagnancy in the region.

**Figure 2.2.7 Past Trend of Investment in East Java**



Source: BPS Statistics of Java Timur Province

#### e. Recent Woes of the Export Industry

There are two recent problems, particularly in the export industry, which has yet to manifest in official statistic data, such as indicators on provincial economy in 2006. One is fuel price and electricity tariff increase which has increased production costs and transportation costs wherein export industries are particularly vulnerable due to international competition. The other is the mud outflow incident in May 2006 which has choked the transport linkage between Tanjung Perak and the southern industrial areas beyond Sidoarjo Regency.

According to the labor observation unit of the provincial government, the number of companies and labor population has decreased in the first half of 2006, i.e. 549 companies and 2,799 workers. Sidoarjo Regency represents one among 38 regencies that experienced the most decrease in the number of operating companies. For Sidoarjo Regency, at the beginning of the year still have 1,772 companies, but in June 2006 only 1,119 units remain. In all, there was a decrease of 549 companies and 2,799 workers in the first of 2006 alone. (Refer to Table 2.2.11)

**Table 2.2.11 Company and Labor Forces in East Java in the First Half of 2006**

No.	Regency/City	Company		Difference	Employee		Difference
		January	June		January	June	
1	Sidoarjo	1,772	1,119	-653	215,459	215,459	0
2	Pasuruan	1,200	1,171	-27	114,016	110,855	-3,131
3	Banyuwangi	1,121	1,121	0	54,400	53,938	-462
4	Kota Batu	165	165	0	5,549	5,689	140
5	Lamongan	614	615	1	9,511	9,511	0
6	Situbondo	596	598	2	11,886	11,886	0
7	Bojonegoro	683	688	5	27,015	27,434	422
8	Ponorogo	618	626	8	7,020	7,062	42
9	Lumajang	561	573	12	19,154	19,320	166
10	Madiun	618	661	43	7,808	7,862	54
11	Blitar	890	950	60	15,296	15,296	0
	<b>Total</b>	<b>28,172</b>	<b>27,623</b>	<b>-549</b>	<b>2,216,556</b>	<b>2,213,757</b>	<b>-2,799</b>

Source: Dermaga, October 2006 (published by Pelindo III)

## 2.3 Regional Development Trend

### 1) Metropolitan Growth

**GKS Compared with Jabodetabek:** The Jakarta metropolitan area is referred to as “Jabodetabek” while the Surabaya metropolitan area is referred to as “Gerbangkertosusila (GKS)” which are abbreviations of the names of respective local governments. In terms of area, Jabodetabek is slightly bigger than GKS.

Historically there was fierce competition between Jakarta and Surabaya for supremacy in the 19<sup>th</sup> century. In the 20<sup>th</sup> century, Surabaya decreased its position against Jakarta as typified in its decreasing ratio of population against Jakarta, i.e., 60% in 1930 and 30% in 1980.

Today, both cities cannot sustain their economic activities and commuting behaviors within their boundary. Thus urban conurbation inevitably happened and metropolitan growth management has become a critical issue.

It is observed that population and local economy is much concentrated in Jabodetabek. The population of GKS accounts for approximately 36% of that of the Jabodetabek region, while the GKS has a 27% share of the Jabodetabek in terms of GRDP. Such economic gap is expanding. In 2006 GKS received an investment amount of Rp 10.6 trillion which is equivalent to only 12% of that of Jabatabek in the same year.

Although regional disparity in economic scale has been widening between the two metropolitan regions, GKS has exceptionally kept its seaborne traffic share. Tanjung Perak Port deals with more or less 40% of the external trade cargo of Tanjung Periok Port and it exceeds Tanjung Priok in domestic cargo throughput. It clearly shows that Surabaya is endowed with excellent location as a trading port. Tanjung Perak Port serves not only its direct hinterland, i.e, the GKS region, but also other islands forming East Indonesia.

**GKS Compared with the Other Areas:** The GKS region is the second largest metropolitan setting in Indonesia, next to the capital region or JABODETABEK. GKS however has the tendency to have large import cargo volumes, relative to exports. Also, the scale of investment at GKS is not so big compared with other areas.

**Table 2.3.1 Comparison between Gerbangkertosusila (GKS) and Other Areas**

Metropolitan Area	Area	Population	GRDP	Per Capita GRDP	Export Cargo	Import Cargo	Investment
	km <sup>2</sup>	000	Billion Rp.	000 Rp.	000 tons	000 tons	Billion Rp.
<b>GKS</b>	<b>5,118</b>	<b>7,895</b>	<b>94,294</b>	<b>11,944</b>	<b>6,954</b>	<b>16,425</b>	<b>10,632</b>
Jabodetabek	6,139	22,030	352,295	15,992	18,051	28,223	87,342
Mebidang	1,637	3,409	34,353	10,076	8,021	3,717	5,907
Palembang	6,075	3,381	26,653	7,883	2,321	320	6,787
Bandung	3,384	6,893	43,540	6,317	1,377	184	72,974
Semarang	936	3,882	25,317	6,522	1,335	1,389	7,998
Sarbagita	540	1,702	5,291	3,109	175	9	5,254
Mamminasata	4,547	1,996	10,755	5,388	1,056	1,079	1,338
Yogyakarta	3,186	3,122	14,715	5,165	0.3	0.1	1,229

Source: Statistic Book of each Kota/Kabupaten 2002, Statistics Indonesia 2002, Gross Regional Domestic Product Regencies/Municipalities in Indonesia 2002, Indonesia Foreign Trade Statistics Export and Import 2005, Economic Indicators 2006, Ministry of Public Works Statistical Info 2000

## 2) Land Transport Development

### a. Road Network.

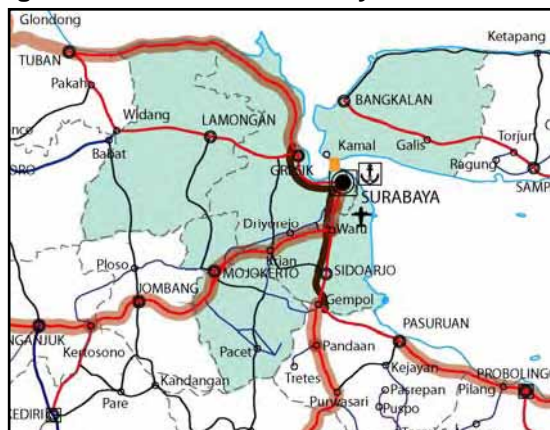
The length of national and provincial roads in East Java is 1,564.2km and 1,946.3km, respectively. This primary road network of 3,500 km is mostly of bitumen treated surface. In the GERBANKERTOSUSILA (GKS) region, the length of national and provincial road is 303.2km and 318.3km, respectively (621.5km in total) most of which is also bitumen treated.

Besides these national and provincial roads, there are two toll roads. These are Surabaya – Gempol Toll Road with a length of 43 km (opening year in 1986 by PT. Jasa Marga) and Surabaya – Gresik Toll Road with a length of 20.7km (partly opened in 1993 and fully opened in 1996 by PT. Margabumi Matraraya); and both have two lanes per direction. During the Economic Crisis, toll road projects under Build Operate Transfer scheme were suspended, as follows, resulting in stagnancy in toll road network expansion:

- SS Waru – Tanjung Perak (13.5 km by PT. Citra Margatama Sby)
- Gempol – Pandaan (14.0 km by PT. Margabumi Adhikaraya)
- Gempol – Pasuruan (32.0 km by PT. Jasa Marga)
- Surabaya – Mojokerto (37.0 km by PT. Marga Nujyasumo Agung)

The primary road network in the GSK region at present is illustrated in Figure 2.3.1.

**Figure 2.3.1 Present Primary Road Network**



Source: JICA Study Team

**Comparison with JICA Study for Arterial Road System Development in 1997:** This study formulated a master plan for arterial road system, which is comprised of primary arterial, primary collector and secondary arterial roads in GKS. In addition, this study undertook a feasibility study on priority road projects selected through the evaluation by the master plan development study. The year 2008 was set as an intermediate year of the planning time horizon. Five (5) routes of highest priority projects were selected eventually in this study as follows:

Route1: Gresik –Diyorejo Toll Road and the paralleled arterial road

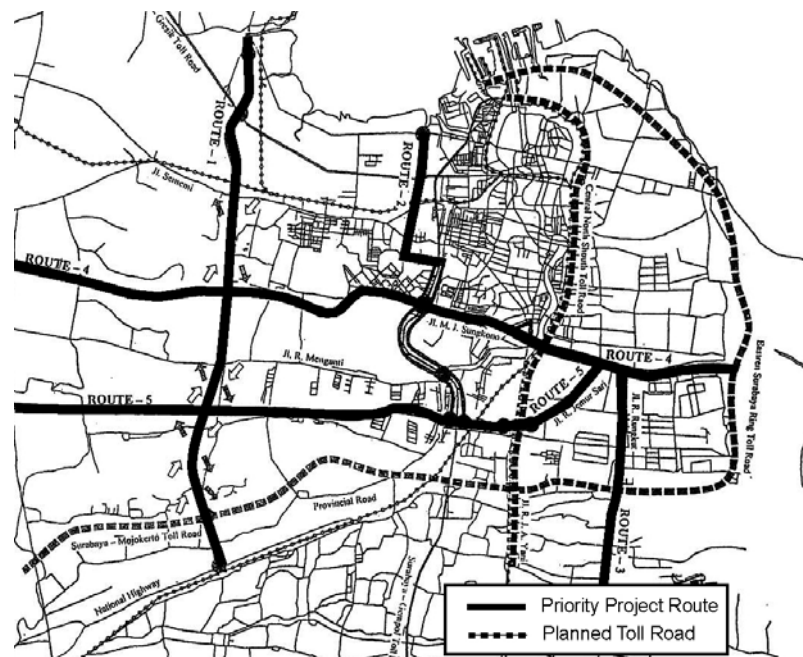
Route2: Frontage arterial road along Tg.Perak –Waru Toll Road

Route3: Jl. Raya Rungkut –Jl. J. Suprato Route

Route4: South of Creme –Jl. R. Darmo Permai – Wonokromo –Jl. Jagir Wonokromo –Jl. R. P. Jiwo –New Route

Route5: Kedamen –Jl. Jemur Sari Route

**Figure 2.3.2 Priority Projects in Study for Arterial Road System Development in 1997**



Source: JICA Study for Arterial Road System Development in 1997

Route 3 and 4 are identified as priority projects in the spatial plan of East Java province, and parts of these routes were completed in 2007, while other routes are not included, as priority or otherwise. It seems that the urbanization momentum is not extending towards the western parts of Kota Surabaya, therefore, the priority of Route 1, Route 4 and Route 5 are low.

#### b. Freight Vehicle Traffic.

Table 2.3.2 shows the vehicular traffic along key corridors in the GKS, based on a 1997 study. Although available data is a bit old, and, since 1997 private vehicles, particularly motorcycles, would show an increasing share. Nevertheless, the traffic data indicate some insights as follows, which may remain more or less valid:

- The Southern Corridor is the busiest corridor followed by the Southwestern Corridor.
- Less trafficked corridors such as the Northern Corridor and others show a higher portion of freight traffic of over 50%, except the Madura Corridor.
- The Madura Corridor has modest traffic with the least freight vehicles' share. It is located out of the metropolitan industrialization.

**Table 2.3.2 Traffic Volume of Each Transport Corridor**

Corridor by Direction	16-hours Traffic	Truck Composition
<b>Northern Corridor (Tuban/Babat – Gresik)</b>	10,960	50%
Tuban – Borondong – Gresik	1,624	50%
Babat – Lamongan	9,123	54%
Lamongan - Gresik	9,336	50%
<b>Southwestern Corridor</b>		46%
Mojokerto – Krian	21,494	44%
Krian – Surabaya	36,074	47%
<b>Southern Corridor</b>		
Gempol - Sidoarjo	46,178	45%
Sidoarjo - Surabaya	80,443	34%
<b>Madura Corridor (Bangkalan – Kamal)</b>	6,377	31%
<b>Other Linkages</b>		
Babat - Jaombang	2,251	63%
Lamongan - Mojokerto	2,134	60%
Gresik - Mojosari	16,822	60%
Mojokerto - Gempol	12,273	62%
Mantup - Cerme		

Source: A Study for Arterial Road System Development in Gerbankertosusila Region (Surabaya Metropolitan Area) Final Report, JICA, July 1997

### c. Railway Network.

The history of railway development in Java Island or Indonesia goes back to 1868 the year the first railway track opened for operation by the Dutch colonial administration, which is 4 years earlier than that of Japan. Today, the total operational length is around 4,500km. The standard gauge of railway track is 1,067 mm except for a minor part of the network.

The population of Java Island is around 120 million and its land area is around 150,000 square km. Thus, the population density of this island is rather high; and,, considerable sized cities forms a chain with similar interval distance. Thus, Java Island is suited to railway transportation.

The trunk lines connects most cities with Jakarta; and in all, there are three major trunk lines; namely, Java North Line along the northern coast facing the Java Sea connecting Jakarta and Surabaya; Java South Line stretching from Cirebon to Solo via Jogjakarta; and Bandung Line connecting between Jakarta and Bandung.

The railway network in East Java extends to 986 km, of which consists of 865 km trunk lines and 121 km branch lines. However, 590 km of the network are non-operational including the Madura line. Furthermore, although the tracks extend from Pasar Turi to Tanjung Perak, no railway operation is currently provided.

A number of freight trains are composed of 12 – 20 units of 15 meter length wagon having axle load 20 tons drawn by diesel engine locomotive and is used mostly for container. Trip frequency is 3 times a day for Surabaya – Jakarta and vice versa, with the trip taking about 16 hours to travel from Surabaya to Jakarta (700km). The central container handling station is located at Pasar Turi in Surabaya City.

Under certain conditions, for the effective and safe transport of import and export commodities especially containerized goods, a “dry port” is utilized which is basically an intermodal facility connecting rail with the seaport, and the road network. The dry port in Jember was developed in the past but it is non-operative at present. The other locations where the dry port developments were considered were Malang, Kediri, and Madiun.



A number of freight trains composed of liquid tanker are operated in and around Surabaya especially for Pertamina's petroleum product delivery. Passenger service is also provided. Travel for passenger train between Surabaya and Jakarta is 10 – 14 hours depending on the service type.

**Figure 2.3.3 Railway Network in East Java**



Source: JICA Study Team

### 3) Industry Estate Development

Like other ASEAN founding countries, Indonesia took a policy package of deregulation to facilitate more foreign direct investment (FDI) inflow since 1985. New industrial estate projects were proposed along the east-west corridor except in Jakarta.

Industrial estates located within 60 km from Surabaya CBD are the following six (6) projects: (Refer to Table 2.3.3 for project profile and Figure 2.3.4 for location)

- Tandas Industrial Estate (800 ha) in Surabaya City
- Surabaya Industrial Estate Rungkut (SIER, 476 ha) in Surabaya City
- Gresik Industrial Estate (GIE, 315 ha) in Gresik Regency
- Maspion Industrial Estate (450 ha) in Gresik Regency
- Pasuruan Industrial Estate Rembang (PIER, 500 ha) in Pasuruan Regency
- Ngoro Industrial Park (NIP, 250 ha) in Pasuruan Regency

Although Pasuruan Regency is located beyond the GKS region, those two industrial estates are located 60 km away from Tanjung Perak Port and it is functionally considered as part of the metropolitan industrial activities. Their locations also manifest land scarcity for a suitable industrial estate within the GKS region in terms of massive undeveloped land, good soil and good transport accessibility particularly to the port.

As the previous section already stated, the economy of East Java has been lead by manufacturing and trading sectors. Nowadays, sluggish provincial economy, particularly export-oriented industries, severely affects trading activities and the local maritime transport community.

In order to revive robust industrial activities, the following observations have been noted from various sources:

- i) **More industrial estate development.** The Jabodetabek region has 41 industrial estates with 8,144 ha. The GSK region (6 industrial estates with 2,791 ha) accounts for 34% of the Jabodetabek region in terms of accumulated industrial estate area. Since the GKS region has a 33% share of the Jabodetabek's manufacturing GRDP or almost the same share of accumulated industrial estate lands, industrial land development must come first to lead further regional industrialization.
- ii) **Accelerating logistics infrastructure development.** In the Jabodetabek region, PT. Jasa Marga continued to construct toll roads to the west (Jakarta – Tangerang, 27 km, started in 1984), to the airport (Cengkareng Access, 14 km, started in 1985), and to the east (Jakarta – Cikampek, 72 km, started in 1988), starting from the north-south corridor (Jagorawi, started in 1976). These inter-city toll roads strongly promoted industrial estate development. In the case of the GKS region, only the toll road Surabaya – Gresik promoted corridor-wise industrialization and Pasuruan Regency has not been included in the metropolitan toll road network. It is of great importance to connect air and sea gateways with a well-developed toll road network. In this sense, Bangkalan Regency has a chance to boost industrialization together with the Suramadu bridge and its access toll project.
- iii) **Attractive investment regime.** Available land with logistics infrastructure is not enough to attract industrial investment. Institutional framework building becomes more crucial to financially justify industrial investment. Indonesia suffers from limited investments while other emerging economies have recently enjoyed large capital inflow such as China, India and Vietnam. Once, Indonesia successfully attracted such inflow when the government took a policy package of deregulation to facilitate more foreign direct investment (FDI) inflow since 1985 up to the Economic Crisis of 1998. A new policy package must come in where seamless logistics services, single window port service and other efforts must be addressed.

**Table 2.3.3 Industrial Estates**

Name	Area Size and Location	Existing Conditions and Development Progress
Tandes Industrial Estate	800 ha, Surabaya City	<ul style="list-style-type: none"> <li>This is an industrial zone nearby Kali Lamong and Lamong Bay. Since the overall development plan has 2,500 ha, this location is strategic to support port development in Lamong Bay. Geographically, however, the area is composed of fish ponds, salt lands and sedimentation from Kali Lamong. Therefore considerable soil reinforcement is necessary.</li> <li>The area has been developed by several developers and investors including PT. Suri Mulya Permai, PT. Pergudangan Margomulyo Permai and PT. Altap Prima Industrial Estate.</li> </ul>
Surabaya Industrial Estate Rungkut (SIER)	476 ha, Surabaya City	<ul style="list-style-type: none"> <li>It is a publicly initiated and fully developed estate with 290 companies and 50,000 workers. The developer, PT. SIER, is co-shared by central, provincial and city governments.</li> </ul>
Gresik Industrial Estate (GIE)	315 ha, Gresik Regency	<ul style="list-style-type: none"> <li>This industrial estate is a joint venture project of two state-owned companies, PT. Semen Gresik and PT. Petrokimia. It is located in the central part of Gresik Regency, near to Gresik Port and the Surabaya-Gresik Toll Road.</li> </ul>
Maspion Industrial Estate	450 ha, Gresik Regency	<ul style="list-style-type: none"> <li>It is under development with a few factories and it is 30 km away from Tanjung Perak Port. It has an estate land of 450 ha (321ha for industrial area and 129 ha for supporting facilities) with a private jetty (holding DUKS right).</li> </ul>
Pasuruan Industrial Estate Rembang (PIER)	500 ha, Pasuruan Regency	<ul style="list-style-type: none"> <li>Located in Rembang, Pasuruan Regency, PIER is 60 Km from Tanjung Perak Port. It has been developed by PT. SIER/Berbek to meet industrial need of the Surabaya Metropolitan area. PIER has a container yard, export processing zone, and open space for public facilities.</li> </ul>
Ngoro Industrial Park (NIP)	250 ha, Pasuruan Regency	<ul style="list-style-type: none"> <li>NIP is currently being developed by PT. Dharmala-RSEA in Ngoro, Pasuruan Regency. It is located at south of Surabaya-Gempol Toll Road with 60 km from Tanjung Perak Port. It consists of industrial supporting facilities and an export processing zone.</li> </ul>

Source: Various sources compiled by JICA Study Team

**Figure 2.3.4 Location of Industrial Estates**



Source: JICA Study Team

#### 4) Suramadu Bridge Project under Regional Development Context

##### a. Bridging Madura and Java

Despite of its proximity, Surabaya City and Madura Island had been economically and socially developed separately from at least before the independence war after the World War II. However, taking increasing strait crossing movement of people and goods into account, discussion on bridge development started in the early 1960s. The first political decision was made in 1986 by the then President, thereafter BPPT in collaboration with JIF selected the bridge alignment and conducted the feasibility study together with the planning of Madura Island development. The bridge alignment, i.e., the 3<sup>rd</sup> option in the figure below, was finally selected with consideration to (i) low seaborne traffic with small vessels, i.e., less than 2,000 GRT at the east access channel; (ii) relatively less urbanized areas at both the bridge access areas; and (iii) not too long bridge length.

**Figure 2.3.5 Surabaya – Madura Bridge Alternatives in the late 1980s**



Source: BPPT

After several project preparations and suspensions, the cable-stayed Suramadu Bridge started its construction on August 20, 2003. In July 2004, a girder collapsed, killing one worker and injuring nine others. Work on the bridge halted at the end of 2004 due to lack of funds, but was restarted in November 2005. The bridge will have two lanes in each direction plus an emergency lane and a dedicated lane for motorcycles. When complete by the end of 2008 (as scheduled), the 5.4-kilometer bridge will be the first land link between the two islands and the longest bridge in Indonesia. The total cost of the project, including connecting roads, has been estimated at 2.38 trillion rupiah (US\$320 million). The project employs a Public Private Partnership scheme in project financing where the central portion is financed by the central government through China's assistance and both the access sections by PT. Jasa Marga. After completion, PT. Jasa Marga will operate the toll bridge.

**Figure 2.3.6 Suramadu Bridge Construction Sites**



*Surabaya Side*

*Central Part*

*Madura Side*

Source: Suramadu.com (as of September 2007)

At present, the strait crossing ferries provide essential transport services to local people and economies between Surabaya and Bangkalan in Madura Island. Several small RORO vessels provide shuttle services 24 hours a day between Ujung and Kamar. It takes more or less 30 minutes sailing per trip with additional average waiting time and rolling-in and rolling-out time, of 30 minutes. Fare setting is relatively low for passenger (Rp 3,000) and motor bicycle (Rp 4,500) while car is charged at Rp 50,000. It is reported that during the Lebaran period daily ferry users become double of vessel capacity.

Even though the fare system of Madura Bridge is not yet fixed, the fare of passenger car probably will be more than Rp. 50,000 based on interviews of related officers in East Java. It will be planned to be set cheaper than the fare of the existing ferry to promote the development in Madura Island.

Meanwhile, ferry traffic has grown as the ferry patronage of 2/4-wheel vehicles has increased in the Madura Strait during the last quarter-century. The bridge construction would particularly benefit those vehicle users, estimated to be 4,115 two-wheel vehicles and 2,252 four-wheel vehicles on a daily basis in 2005. However the present traffic demand may not make the bridge project financially viable. Meanwhile non-motorized passengers may still prefer conventional ferry in the future due to more convenient access.

**Table 2.3.4 Ferry Traffic**

(x 1,000)

	Year 1980 (a)	Year 2005 (b)	(b) / (a)
Passengers	4,802	5,595	1.17
2-wheel Vehicles	375	1,502	4.01
4-wheel Vehicles	416	822	1.98
Population in Surabaya	2,017	2,699	1.34
Population in Bangkalan	688	927	1.34

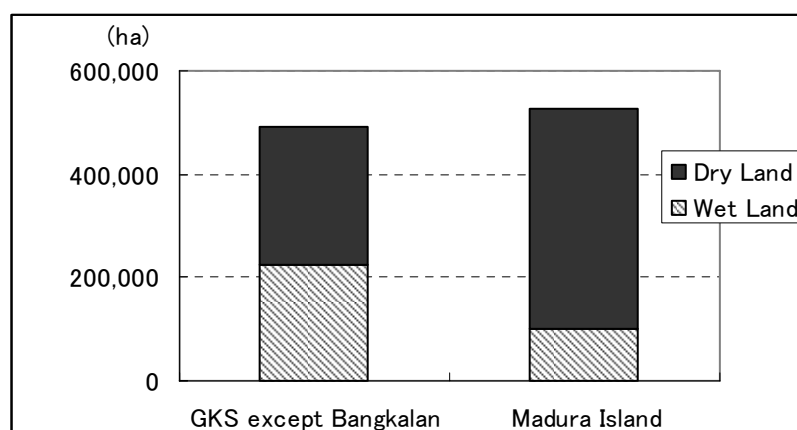
Source: Urban Development Planning Study on Gerbangkertosusila Region (1983, JICA)  
 Jawa Timur Dalam Angka 2006, Bangkalan Dalam Angka 2005

### b. Madura Island as a New Development Area

One of the prominent features of the island potentials lies in its solid soil and dry land over the island. According to the land statistics<sup>1</sup>, wet lands such as technical irrigation, semi-technical irrigation and other wetlands account for 45.7 % in the GKS region except Kabupaten Bangkalan. Thus the GKS region at the Java side is mainly characterized for its wetland nature especially when compared to the provincial average of 23.0%. On the other hand, Madura Island has wet lands of 98,809 ha or 18.7% of the overall island area. Therefore the island is characterized as dry land dominantly.

As an urbanization and industrialization pattern, it is natural to expand from Surabaya City to adjoining coastal areas. In fact, past development has been done in such a way to some extent. But the adjoining coastal areas including huge wetlands have hampered dynamic coastal development in the GKS region, as land statistics show that the existence of huge wetlands, mostly located at low and coastal areas, in kabupatens of Sidoarjo (40.7% of the total land), Gresik (52.3%) and Lamongan (52.8%). Therefore the availability of vast and undeveloped dry land in Madura Island presents an opportunity for regional development.

**Figure 2.3.7 Composition of Dry and Wet Lands**



Source: BPS Statistics of Jawa Timur Province 2006

The recorded population of Madura Island in 2004 stood at 3.5 million compared to 2.6 million in Surabaya City. However, in Madura, this population is almost evenly scattered over the island in the form of agricultural villages and small towns. The population density of Surabaya City is thus 13.5 times higher than that of Bangkalan Regency, i.e., 9,079 persons per km<sup>2</sup> and

<sup>1</sup> BPS Statistics of East Java Province 2006

671 persons per km<sup>2</sup>, respectively. The Madura societies and people have the following distinct characteristics:

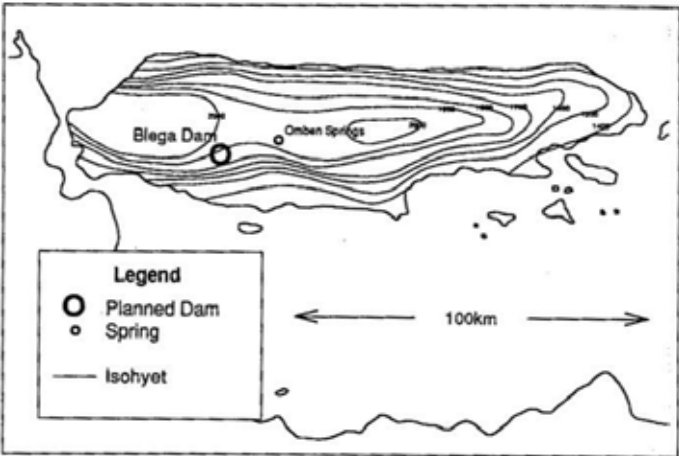
- **Local Culture:** The existing society in Madura belongs to an independent vernacular group, distinct from Javanese. It features a highly stable and closely knit social order with customs based on the Islamic faith. Effort should be made within the development program to respect such cultures in harmonization with island development.
- **Rural Occupations:** The existing society on Madura consists mostly of farmers and fishermen. Although there are some commuters working in Surabaya in Bangkalan Regency, this middle income group still remain in the minority. It is important that island development must benefit such rural residents by way of provision of better market access, creating job opportunities and so on. Meanwhile adverse social impact must be minimized like land right and fishing right disputes.
- **Economic Discrepancies:** Education and income level is low compared with the rest of Indonesia and particularly Surabaya citizens. According to the provincial statistics (2000), the number of poverty families are 131,477 in Bangkalan Regency and 115,735 in Surabaya City and thus Bangkalan Regency shows a higher poverty family incident rate of 65.7% compared with Surabaya City (20.9%). There is a need to undertake adequate mitigation measures to avoid a plausible social conflict between traditional villagers and new immigrants.

Madura is therefore an island of large population and yet remains relatively underdeveloped. The island economy has not experienced large-scale investments triggering industrialization and urbanization except some middle-scale tourism and shipyard investments. Since the island has limited accumulation of investment, almost no infrastructure development has been made in preparation for such development. Taking the opportunity of the Suramadu bridge project, the following infrastructure and public utility development issues must be addressed:

- **Roads:** Although the existing road configuration evolved over centuries it is surprisingly logical but can presently only serve marginal rural needs. Due to its network density, the existing roads cannot support considerable urbanization and industrialization. New roads must be proposed with clear functional designation such as the roads to carry cargo or people and the roads to meet regional or local needs.
- **Public Transport:** It is not provided in the island although a type-C bus terminal was newly constructed in Bangkalang. To avoid excessive public spending on roads, environmental degradation and road traffic accidents, public transit oriented urbanization should be pursued in a combination with frequent inter-city bus service between Bangkalan and Surabaya. An abandoned rail road track with an extremely narrow right of way should be reviewed to meet islanders' travel needs.
- **Electricity:** Being an isolated island, Madura is handicapped by the availability of energy supply. Electric power to the island is supplied by the Gresik power plant and amounted to 160 million kwh to the Bangkalan side. The electric power is supplied to only 100,710 residents or 10.9% in the regency. Many villages do not have access to electricity. Although several companies are exploiting for oil off the shores of Madura, there is so far no plan to build a power plant within the island. Without a plant, the island will have to rely on electricity supply from Java Island.
- **Water Supply:** Long regarded as a dry land island, Madura Island has almost no modern water supply system in place. Villages on the island obtain their potable and

domestic water by storing rainwater and drawing from shallow wells. Statistics shows that merely 11,619 residents or 1.3% can access piped water in Bangkalan Regency. Future projection for supplying water includes deep wells and reservoirs. Previous studies have shown water supply is no longer considered a problem in the development of Madura. For example, Blega dam which is located 8 km from the Suramadu bridge is expected to meet foreseeable industrial water needs within its influence area. (Refer to Figure 2.3.8) To meet potable and domestic use, small reservoirs concept was once recommended. These ponds could be used for fishing, landscaping and other recreational purposes also. However, the above-mentioned are quite conceptual and thus a detailed hydrological study is required to map out a future water supply plan where potential resources are utilized with an alternative consideration of water pipeline development from Surabaya.

**Figure 2.3.8 Annual Rainfall and Blega Dam Location**



Source: BPPT, JIF 1992