

**The Study
on
Formulation of Spatial Planning
for
GERBANGKERTOSUSILA (GKS) Zone
in
East Java Province, the Republic of Indonesia**

Final Report

Volume 1: Summary

February 2011

JAPAN INTERNATIONAL COOPERATION AGENCY

**Value Planning International, Inc.
Oriental Consultants Co., Ltd.
Yachiyo Engineering Co., Ltd.**

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USD1.0 = Rp. 9,000

JPY1.0 = Rp. 102

USD 1.0 = JYN 88.2

(Exchange rate of September 2010)

PREFACE

In response to a request from the Government of Indonesia, the Government of Japan decided to conduct a study on “The Study on Formulation of Spatial Planning for GERBANGKERTOSUSILA (GKS) Zone in East Java Province, the Republic of Indonesia”, and entrusted to the study to the Japan International Cooperation Agency (JICA).

JICA selected and dispatched a study team, headed by Dr. Katsuhide NAGAYAMA of Value Planning International, Inc between May 2009 and December 2010. The study team consists of Value Planning International, Inc., Oriental Consultants Co., Ltd. and Yachiyo Engineering Co., Ltd.

The team held discussions with the officials concerned of the Government 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 legal process for approval of the GKS Zone Spatial Plan in accordance with the Law No.26/2007 for Spatial Planning, and to the enhancement of friendly relationship between two countries.

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

February 2011

Motofumi Kohara
Chief Representative
Indonesia Office
Japan International Cooperation Agency

February 2011

To: Mr. Motofumi Kohara
Chief Representative
Indonesia Office
Japan International Cooperation Agency

Dear Sir,

Subject: Letter of Transmittal

We are pleased to formally submit herewith the final report of the Study on Formulation of Spatial Planning for GERBANGKERTOSUSILA (GKS) Zone in East Java Province, the Republic of Indonesia.

This report compiles the results of the study which was undertaken both in Indonesia and Japan from May 2009 to December 2010 by the Team, comprising of Value Planning International, Inc., in corporation with Oriental Consultants Co., Ltd., and Yachiyo Engineering. CO., Ltd.

We acknowledge many government officials and stakeholders involved in intensive research, investigations and discussions in the course of the study. We would like to express our sincere appreciation and special gratitude to those who extended their extensive assistance and cooperation to the study team, in particular Directorate General of Spatial Planning, Ministry of Public Works, and Department of Public Work, Human Settlement and Spatial Planning, East Java Province.

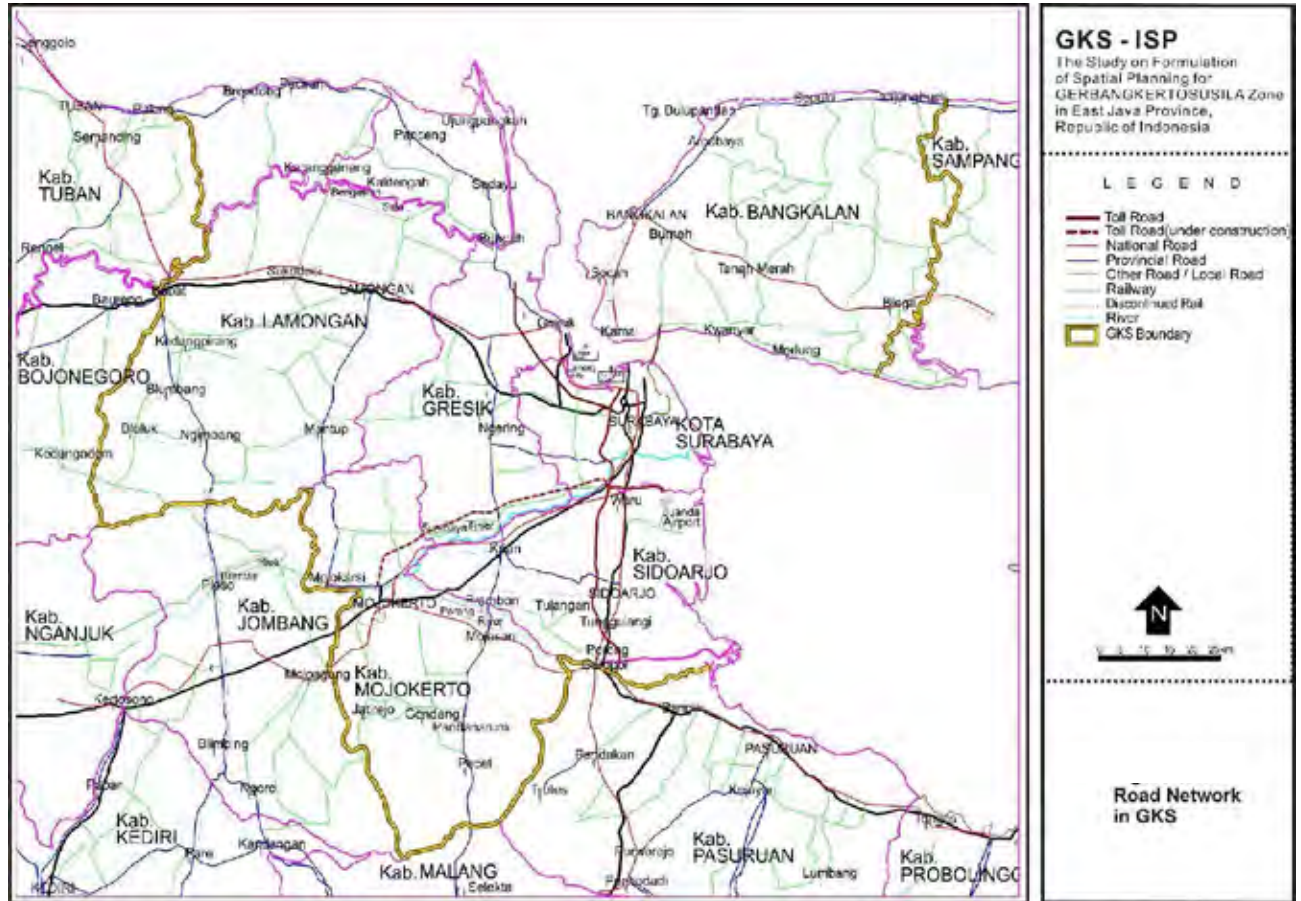
We also acknowledge the program officers of your agency, JICA Indonesia Office, and the Embassy of Japan in Indonesia for their kind supports and valuable advice in the course of the Study.

We hope the report would contribute to the long-term development of the GKS Zone that is endowed with great potentials for sustainable and environmentally balanced growth as the second largest leading economy in Indonesia.

Faithfully yours,

Katsuhide NAGAYAMA, Ph.D.

Team Leader,
The Study on Formulation of Spatial Planning
for GERBANGKERTOSUSILA (GKS) Zone in
East Java Province, the Republic of Indonesia



Study Area Map

C08 GKS Spatial Plan 2030

Legend

Land Use Plan (2030)

- Protected area
- Conservation area
- Agriculture (Irrigated)
- Agriculture
- Protected Forest
- Production Forest
- Conservation Forest
- Buffer
- Urban Development area (high)
- Urban Development area (mid)
- Urban Development area (low)
- Kampong
- Industrial area
- Spacial Zone (Military)

Proposed Environmental Sensitive Zone

- Mangrove Ecosystem

Land Stability

- Preservation Zone
- Conservation Zone
- Restoration Zone

Forest Ecosystem

- Preservation zone
- Conservation zone
- Restoration zone

Strategic Projects

- Project Identified by GKS-ISP
- Commercial area
- Green Area
- Public Facilities
- Industrial Zone
- Military Zone
- Other Strategic Projects

Urban Center

- Regional Center
- GKS Sub-Centers
- SMA Level Centers
- SMA Sub-Centers
- GKS Kab.Centers
- Other Kab.Sub-Centers
- Intermodal Gateway

Road Network

- Toll
- Arterial
- Collector
- Secondary Arterial
- Local
- Ferry

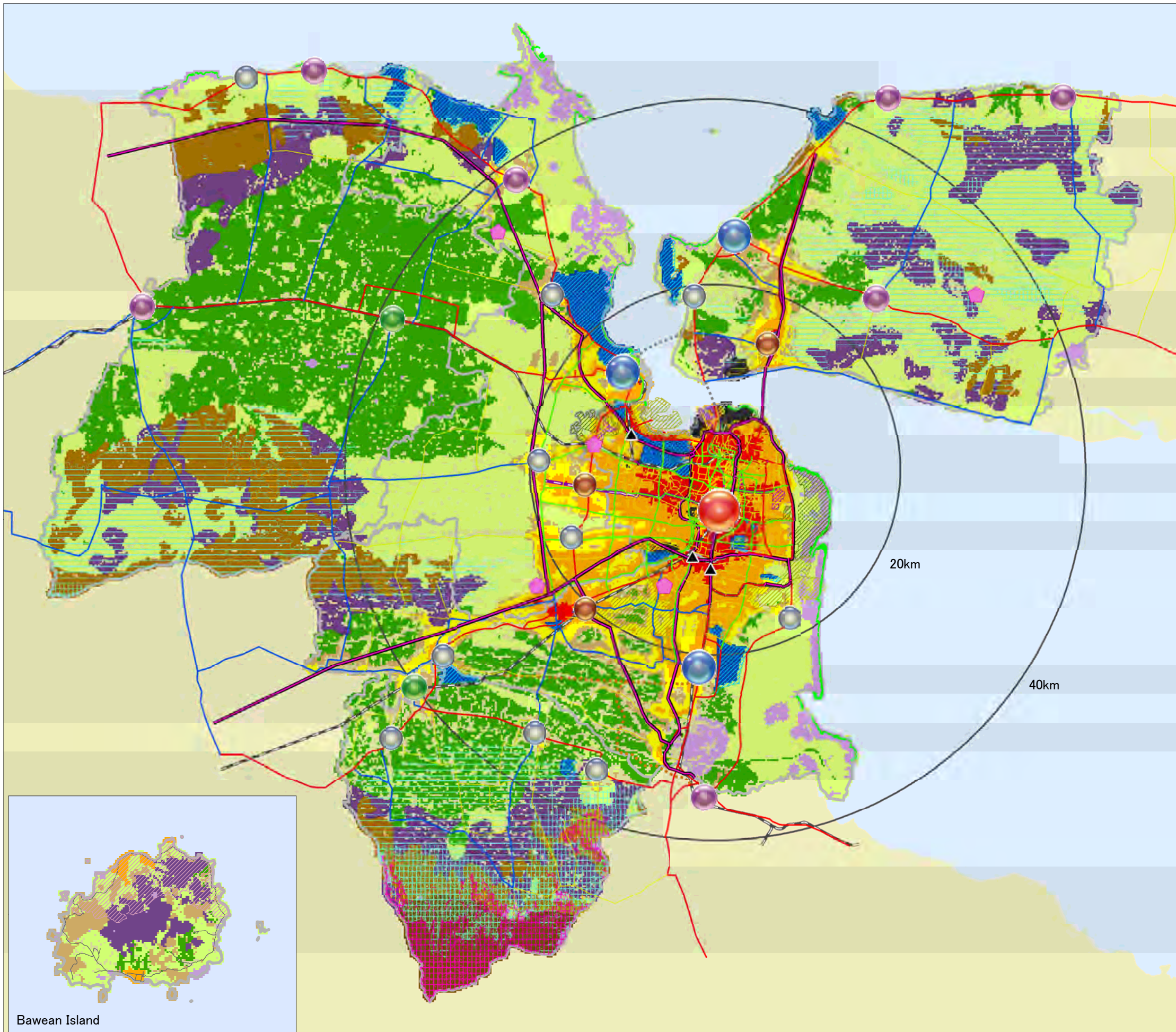
Railway

- Proposed Railway Network (Passenger)
- Freight SProposed Railway Network (freight)
- Railway (under Construction)
- New Mass Transit Corridor (NMTC)

0 5 10 20 30km



GKS-ISP
The Study on
Formulation of Spatial Planning
for GKS Zone



Bawean Island

**The Study
on
Formulation of Spatial Planning
For GERBANGKERTOSUSILA (GKS) Zone
In East Java Province,
The Republic of Indonesia**

**Final Report
Summary
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- ABBRIVIATIONS -

| | |
|---------------------|---|
| 3Rs | Reduce, Reuse, and Recycle |
| AGT | Automated Guideway Transit |
| AKDP | Antar Kota Antar Propinsi, or Inter-Provincial Intercity |
| AM | Automated Mapping |
| APBD I | Anggaran Pendapatan Belanja Daerah Provinsi, or Revenue and Expenditure of Province |
| APBD II | Anggaran Pendapatan Belanja Daerah Kabupaten/Kota, Revenue and Expenditure of Kabupaten/Kota |
| APBN | Anggaran Pendapatan Belanja Negara, National Revenue and Expenditure |
| ARSDS-GKS | Study for Arterial Road System Development in Surabaya Metropolitan Area |
| ATCS | Area Traffic Control System |
| BAKOSURTANAL | Badan Koordinasi Survei dan Pemetaan Nasional, or National Coordinating Agency for Survey and Mapping |
| BAPPEDA | Badan Perencanaan Pembangunan Daerah, or Local Planning and Development Board |
| BAPPEKO | Badan Perencanaan Pembangunan Kota, or Planning and Development Board of Municipality (Kota) |
| BAPPEPRO | Badan Perencanaan Pembangunan Propinsi, or Planning and Development Board of Province |
| BAT | Best Available Technology |
| BII | Indonesia International Bank |
| BKPRD | Badan Koordinasi Penataan Ruang Daerah, or Coordination Board of Local Spatial Plan |
| BKTRN | Badan Koordinasi Penataan Ruang Nasional, or Coordination Board of National Spatial Plan |
| BNI | Bank Nasional Indonesia or Indonesia National Bank |
| BPLS | Badan Penanggulangan Lumpur Sidoarjo, or Agency for the Mitigation of Sidoarjo Mud |
| BRI | Bank Rakyat Indonesia |
| BRT | Bus Rapid Transit |
| BTN | Bank Tabungan Negara, or National Saving Bank |
| BWK | Bagian Wilayah Kota, or Urban Area Section |
| Bank JATIM | East Java Bank |
| C-KIP | Comprehensive Kampong Improvement Program |
| CBD | Central Business District |

| | |
|---------------------------|---|
| CCTV | Closed Circuit Television |
| CDM | Clean Development Mechanism |
| CHP | Combined Heat and Power Production |
| CIS | Customer Information System |
| CPR | Medium Term Development Program and Policies (Five years) |
| DAOP | Daerah Operasi, or Operation Area |
| DAS | Automotic Distribution System |
| DCC | Distribution Control Center |
| DD | Detail Design |
| DKL program | Energy Demand and Load Forecast Program |
| DLLAJ | Dinas Lalu Lintas dan Angkutan Jalan, or Traffic and Road Transport Agency |
| DPRD | Dewan Perwakilan Rakyat Daerah, or Local People Representative Council |
| DSM | Demand Side Management |
| EIA | Environmental Impact Assessment |
| EJIIZ | East Java Integrated Industrial Zone |
| EMS | Energy Management System |
| EMU | Electric Multiple Unit |
| EPR | Extended Producer Responsibility |
| ERR | East Ring Road |
| FM | Facility Management |
| FS | Feasibility Study |
| GDP | Gross Domestic Product |
| GERBANGKERTOSUSILA | Gresik-Bangkalan–Mojokerto(Kota/Kabupaten)–Surabaya–Sidoarjo-Lamongan |
| GIS | Geographic Information System |
| GKS | GERBANGKERTOSUSILA-Gresik-Bangkalan-Mojokerto (Kota/Kabupaten)-Surabaya-Sidoarjo-Lamongan |
| GKS Plus | GKS + Kabupaten Pasuruan, Bojonegoro, Jombang, Tuban, and Kota Pasuruan |
| GOI | Government of Indonesia |
| GOJ | Government of Japan |
| GPRS | General Packet Radio Service |
| GPS | Global Positioning System |
| GRDP | Gross Regional Domestic Product |
| GWh | Gigawatt-hour |
| HIPPAM | Community-initiative water supply and sanitation program in rural |

| | |
|-------------------------|--|
| | area |
| IBRD | International Bank for Reconstruction and Development |
| IE | Industrial Estate |
| IFC | International Finance Corporation |
| IGES | Institute for Global Environment Strategies |
| IKK | Ibu Kota Kecamatan, District Capital |
| IPAL | Sewage Treatment Plant |
| IPLT | Septic Sludge Treatment Plant |
| IPP | Independent Power Producer |
| ISLF | Integrated Solid Waste Landfill |
| ISWM | Integrated Solid Waste Management |
| ITS | Institut Teknologi Sepuluh Nopember, or Sepuluh Nopember Institute of Technology |
| ITS | Intelligent Transport System |
| ITU | International Telecommunication Union |
| JABODETABEK | Jakarta Metropolitan Area : Jakarta – Bogor – Depok – Tangerang – Bekasi |
| Jamali | Jawa-Bali Madura |
| JBIC | Japan Bank for International Cooperation |
| JICA | Japan International Cooperation Agency |
| KAPET | Kawasan Pengembangan Ekonomi Terpadu, or Integrated Economic Development Area |
| KIP | Kampung Improvement Program |
| KKJS | Kawasan Kaki Jembatan Suramadu, or (Industrial&Mixuse) Development Zone at the Foot of Surabmadu Bridge |
| KKN | Korupsi, Kolusi, Nepotisme, or Corruption, Collusion, and Nepotism |
| kms | kilo meter span |
| KP Ruko | Kredit Pemilikan Rumah Toko, or Credit for Store and House Ownership |
| KPR | Kredit Pemilikan Rumah, or Loan for House Ownership |
| KPR BCA Xtra | Kredit Pemilikan Rumah dari Bank Central Asia Ekstra, or Extra Home Ownership Loan through Bank Central Asia |
| KPR Multiguna | Multifunction Home Ownership Loan |
| KPR Syariah | Kredit Pemilikan Rumah Syariah, or Credit for House Ownership through Muslim Role |
| Kredit Swa Griya | Loan for Self-built House |
| Kredit Swadana | Loan for Self-fund |
| kWh | Kilowatt-hour |

| | |
|-------------------|--|
| L/sec | Liter per second |
| LARAP | Land Acquisition and Resettlement Action Plan |
| LDF | Load Density Factor |
| LF | Load Factor |
| LIS / LISB | Lamongan Integrated Shorebase |
| LLF | Loss Load Factor |
| LRT | Light Rail Transit |
| LV | Low Voltage |
| Lcpd | Liter per capita day |
| MENDAGRI | Menteri Dalam Negeri, or Ministry of Home Affair |
| MERR | Middle East Ring Road |
| MV | Medium Voltage |
| MVA | Mega-volt-ampere |
| MW | Megawatt |
| MWRR | Middle West Ring Road |
| NIP | Ngoro Industrial Persada |
| NIP | Ngoro Industrial Persada, Mojokerto |
| NRW | Non-Revenue Water |
| NUSSP | Neighborhood Upgrading Shelter Sector Program |
| OD | Origin and Destination |
| OPLT | Time at Peak Load |
| P2KP | Program Penanggulangan Kemiskinan di Perkotaan, or Urban Poverty Alleviation Program |
| P2MPD | Program Pemberdayaan Masyarakat dan Pemerintah Daerah, or Community and Local Government Empowerment Program |
| PAD | Local Government Revenue |
| PBB | Pajak Bumi Bangunan, or Building and Land Tax |
| PCU | Passenger Car Unit |
| PDAB | Perusahaan Daerah Air Bersih, Provincial Clean Water Public Corporation |
| PDAM | Perusahaan Daerah Air Minum, or Local Water Enterprise |
| PDAM | Perusahaan Daerah Air Minum, Regional Water Supply Public Corporation |
| PDM-DKE | Pemberdayaan Daerah dalam Mengatasi Dampak Krisis Ekonomi, or Local Empowerment to Countermeasure Economic Crisis Impact |
| PERDA | Peraturan Daerah, or Local (Municipal/Regency/Province) Decree |
| PJT1 | Perum Jasa Tirta 1, River Management Public Corporation no.1 |
| PKK | Family Prosperity Empowerment |

| | |
|---------------------|--|
| PKL | Pusat Kegiatan Local, or Local Activity Centre |
| PKN | Pusat Kegiatan Nasional, or National Activity Centre |
| PKW | Pusat Kegiatan Wilayah, or Regional Activity Centre |
| PLN | Perusahaan Listrik Negara, or National Electric Company |
| PLTGU | Combined Cycle Power Plant |
| PLTU | Steam Power Plant |
| PNPM Mandiri | Program Nasional Pemberdayaan Masyarakat Mandiri, or National Program for Independent Community Empowerment |
| PPP | Public-Private Partnership |
| PTKA | PT Kereta Api, or Railway Company |
| PU | Public Works |
| PUCKTR | Public Works, Human Settlement & Spatial Planning Department, East Java Province |
| RAPERDA | Rancangan Peraturan Daerah, or Draft of Local Decree |
| ROW | Right-Of-Way |
| RP4D | Rencana Pembangunan dan Pengembangan Perumahan dan Permukiman Daerah, or Housing and Settlement Development and Improvement Plan |
| RPJM | Rencana Pembangunan Jangka Menengah, or Mid-term Development Plan |
| RPJP | Rencana Pembangunan Jangka Panjang, or Long-term Development Plan |
| RT | Rukun Tetangga or Smallest neighborhood unit under RW |
| RTRW | Rencana Tata Ruang Wilayah, or Spatial Plan |
| RUPTL | Rencana Usaha Penyediaan Tenaga Listrik, or Electrical Power Supply Business Plan |
| RW | Rukun Warga, or Neighborhood unit under Desa/ Kelurahan |
| Rusunami | Rumah Susun Sederhana Milik, or Owned Simple Walk-up Flat |
| Rusunawa | Rumah Susun Sederhana Sewa, or Rental Simple Walk-up Flat |
| SAIDI | System Average Interruption Duration Index |
| SAIFI | System Average Interruption Frequency Index |
| SCADA | Supervisory Control and Data Acquisition |
| SD | Sekolah Dasar, or Primary School |
| SDA2006 | Strategic Initiatives Water Resources Management to Overcome Flood And Drought Island In Java issued by Directorate of River & Irrigation, State Ministry Of National Development Planning & National Development Planning Agency in December 2006 |
| SIER | Surabaya Industrial Estate Rungkut, Surabaya |
| SKPD | Satuan Kerja Perangkat Daerah, or Guidelines for Local Government Offices/Institutions |

| | |
|---------------------|--|
| SMA | Sekolah Menengah Atas, or Senior High School |
| SMA | Surabaya Metropolitan Area |
| SME | Small and Medium Sized Enterprise |
| SMP | Sekolah Menengah Pertama, or Junior High School |
| SNCF | Société Nationale des Chemins de fer Français |
| SRRTS | Surabaya Regional Rail Transport System |
| SSO | Automatic Vacuum Gas Pole Switch Sectionalizer |
| SSWP | Sub Satuan Wilayah Pembangunan, or Area Development Sub Unit |
| SUDP | Surabaya Urban Development Project |
| SULAM | Surabaya – Lamongan Commuter |
| SUMO | Surabaya – Mojokerto Commuter |
| SUPAS | Survei Penduduk Antar Sensus, or Population Survey between Censuses |
| SUSI | Surabaya – Sidoarjo Commuter |
| SUTT network | 70-150 KV network |
| SWM | Solid Waste Management |
| SWP | Satuan Wilayah Pembangunan, or Area Development Unit |
| TAZ | Traffic Analysis Zone |
| TID | Telemetry |
| TK | Taman Kanak-kanak or Kindergarten School |
| TOD | Transit Oriented Development |
| TPA | Tempat Pembuangan Akhir, or Final Disposal Site |
| TRAFO | Transformer |
| TS | Transfer Station |
| UGR | Unit Waste Generation |
| UNEP | United Nations Environment Programme |
| UP | Unit Pengembangan, or Development Unit |
| USO | Universal Service Obligation |
| V/C | Volume-Capacity |
| VMS | Variable Message Signboard |
| WPUT | Wilayah Pelayanan Universal Telekomunikasi, or Telecommunications Universal Service Area |
| WRR | West Ring Road |
| WTE | Waste to Energy |

1. INTRODUCTION

1.1 Background

GERBANGKERTOSUSILA (GKS) in East Java province is the second largest economic zone in Indonesia. It is composed of five *kabupaten* (regency) and two *kota* (city), namely, Kabupaten Sidoarjo, Kabupaten Mojokerto, Kabupaten Lamongan, Kabupaten Gresik, Kabupaten Bangkalan, Kota Mojokerto, and Kota Surabaya. A regional development master plan for the GKS Zone was formulated with the assistance of JICA in 1983.

In Indonesia, the Spatial Planning Law, which was amended in April 2007, stipulates that the national, provincial, kabupaten, and city governments must prepare a spatial plan. The National Spatial Plan was formulated in March 2008, based on which provincial governments formulated their respective spatial plans. Subsequently, kabupaten and kota governments must have their spatial plans by April 2010 based on the provincial spatial plan. A spatial plan for a metropolitan area like GKS, when needed, can be formulated because GKS is **one of the national strategic areas**, and the planning work is supposed to be conducted through the initiative of Directorate General of Spatial Planning, Ministry of Public Works.

1.2 Objectives of the Study

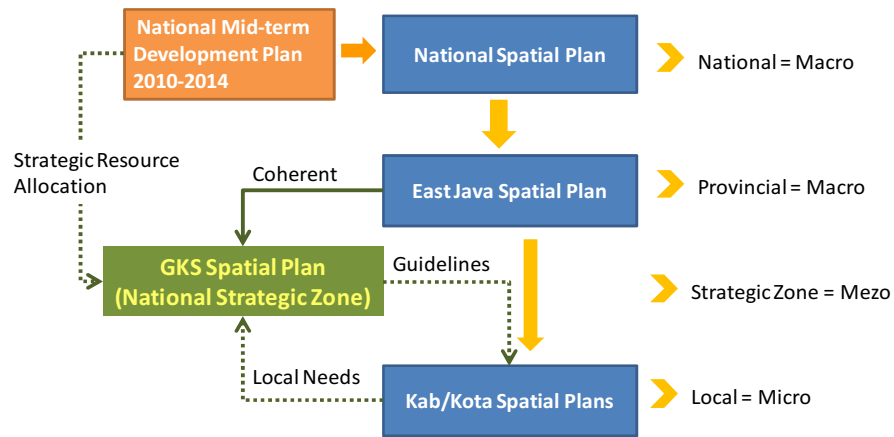
The objectives of the Study, which were mentioned in the Scope of Work agreed upon by both governments, are threefold, as follows:

- To formulate the GKS Spatial Plan 2030;
- To prepare an action plan for urban transportation in the area; and
- To strengthen the capacity of the counterpart personnel and institutions in the course of the Study.

The Study has formulated long-term visions (on a two-decade time horizon) with which the GKS national strategic zone should pursue a sustainable social and economic development and has identified priority short-term projects and programs for implementation within a five-year framework in line with the strategies to achieve the visions.

The spatial plan, as stipulated in the 2007 Spatial Planning Law, should ensure balanced land use, or spatial pattern, with sufficient considerations given to environmental preservation and conservation. The spatial plan should also depict the most economically efficient and functionally rational infrastructure network which will support the people's social and economic activities, and should include a comprehensive transportation system, water supply system, drainage and sewerage systems, a power and telecommunications network, solid waste management, etc.

Guidelines on implementing the spatial plan and managing the planned growth are the other focal issues which should be carefully addressed by the GKS spatial plan. For this purpose, the East Java provincial government should be empowered, in terms of budgetary and enforcement capacities. Moreover, coordination between the central and local governments is highly required.



Source: JICA Study Team

Figure 1.2.1 Overall Structure of the Spatial Planning System

The outcomes of the Study are compiled with a set of separated volumes of reports as follows:

- Volume 1: Summary (English, Indonesian and Japanese)
- Volume 2: Main Text (English and Indonesian)
- Volume 3: GIS Atlas: Key Maps and Drawings for GKS Spatial Plan (English)
- Volume 4: Development Action Plan for Transportation Sector (English)

Notes: The reports in English are official and referable, when Indonesian expressions and words are neither clear nor correct.

1.3 Vision and Missions

1.3.1 Vision

As a national strategic area, the spatial plan for the GKS Zone has the following vision:

“The realization of GKS as a global and sustainable growth center through the creation of a logistical and economic world window, as well as an intelligent and green metropolitan zone.”

This vision could be expressed in the short catchphrase: **Global, Green, Growing GKS.**

1.3.2 Missions and Objectives

The above vision is underpinned by key concepts which are interpreted into the corresponding missions:

Table 1.3.1 Missions and Objectives of GKS Development

| Key Vision Concept | Mission and Objective |
|---------------------------|--|
| Global / World Window | - Create a brand for GKS to attract world recognition, attention, and investments. |
| Sustainable | - Preserve resources based on carrying capacities and resources - Sustain society by protecting them through good governance, participative citizenry, and effective disaster management. |
| Growth Center | - Develop GKS as a national growth center with rapid economic growth and a high-standard built environment through the provision of proper infrastructure, housing, and social services. |
| Logistics | - Provide an efficient transportation network. |
| Economic | - Accelerate economic growth by attracting investment and vitalizing local economic activities in a balanced way. |
| Intelligent | - Create a knowledge society and develop skilled human resources. |
| Green | - Develop and maintain sustainable agricultural bases. - Create a green and eco-friendly region. |

Source: JICA Study Team

1.4 Major GKS Development Strategies

To achieve its stated vision, or “The Four Gs,” eight long-term strategies have been formulated, as follows:

- Strategy 1: Explore newly emerging development potentials such as the “Suramadu Bridge” and “Cepu Oil Field,” as strategic stimuli for the creation of a globally competitive economy.
- Strategy 2: Enhance the international logistics functions of the zone’s ports and airports.
- Strategy 3: Further develop the industrial sector as the leader in economic diversification.
- Strategy 4: Promote value-farming and value-fishery, including processing industries and post-harvest enterprises.
- Strategy 5: Promote tourism through the diversification of tourism products.
- Strategy 6: Enhance human resource development to sustain subsequent industrialization.
- Strategy 7: Strengthen agropolitan development which will link urban and rural areas and the value it will add to the economy.
- Strategy 8: Develop a metropolitan-wide green network comprising green streets, green riversides, open space, parks and recreational facilities, agricultural land, and forests.

Figure 1.4.1 shows the interrelationships between the components of the vision and the relevant strategies needed to achieve them. Strategies 1 and 2 are important to achieve the vision of a “Global GKS,” and Strategies 3 through 7 are relevant in achieving the vision of a “Growing GKS.” The vision for a “Green GKS” will require the exploration of Strategies 5 to 8, including tourism and agriculture-related strategies.



Figure 1.4.1 Vision and Key Strategies for GKS Development

1.5 Objective of Spatial Planning for GKS Zone

A spatial plan for the GKS Zone, one of the national strategic areas, with a target year of 2030 aims to:

- Provide a roadmap to achieve the long-term vision for the zone;
- Facilitate social and economic development of the country as a leading growth zone;
- Realize a balanced land-use system in consideration of environmental conservation;
- Plan a functionally rational infrastructure network that will include (1) transportation system, 2) water supply system, 3) drainage and sewerage systems, 4) power and telecommunication network, 5) solid waste management ; and other infrastructures; and
- Identify short-term projects and programs within a five-year framework (2015).

Spatial planning should be based on existing laws, such as the Spatial Planning Law, 2007, and should comply with a number of regulations relevant to infrastructure development, agricultural land conservation, and environmental resources protection, as well as be coherent with existing higher- and lower-level spatial plans, such as the following:

- National Spatial Plan (2008–2028);
- Provincial Spatial Plan (2009–2029);
- Kota Surabaya Spatial Plan (2009–2029);
- Kota Mojokerto Spatial Plan (2007–2027);
- Kab. Gresik Spatial Plan (2007–2027);

- Kab. Bangkalan Spatial Plan (2008–2028);
- Kab. Sidoarjo Spatial Plan (2009–2029);
- Kab. Mojokerto Spatial Plan (2007–2027); and
- Kab. Lamongan Spatial Plan (2008–2028).

1.6 Relevant Basic Laws and Regulations

Spatial plans should comply with existing laws and regulations which are relevant to spatial planning in terms of infrastructure development, agricultural land conservation, and environmental resources protection (see Annex of this volume). They should also include a legal basis for project management and institutional setting for intergovernmental coordination and cooperation.

2. RELEVANT POLICY AND DEVELOPMENT ISSUES

2.1 National Spatial Planning Policies and Strategies

2.1.1 National Medium-term Development Plan

The national spatial plan as stipulated in the long-term development direction 2005–2025 says that a “spatial plan is used as a spatial policy reference for development in every sector, across sectors, and regions so that spatial utilization can be synergistic, harmonious, and sustainable. Spatial plans are prepared hierarchically. In order to optimize spatial planning, it requires the improvement of (a) the competence of human resources and institutions in the spatial planning sector, (b) the quality of spatial plans, and (c) the effectiveness of implementation and law enforcement in the preparation, utilization, and control of spatial plans.”

According to Presidential Regulation No.5, 2010, Chapter 2.9, the **National Medium-term Development Plan (RPJMN)** for 2010 to 2014 should be carried out in order to reduce regional disparities and should be implemented in three policy directions and strategies:

- 1) *Control and implementation of spatial plans*: These are commonly carried out through
 - Strengthening of the database and spatial information and their analysis, as well as mapping of the entire national territory; and
 - Implementation of a sustainable spatial plan.
- 2) *Coordination and integration of both urban and rural areas, as well as among priority areas (strategic zones, lagging zones, border zones, and disaster-prone zones)*: These are implemented through:
 - Promotion of growth centers, increased attractiveness of the rural areas, and establishment of linkages between urban and rural areas;
 - Acceleration of the development of priority areas, such as strategic zones which serve as centers of national economic growth, lagging zones, and border areas; and
 - Mainstreaming of disaster risk reduction and disaster management across rural and urban areas.
- 3) *Decentralization and local governance management, which will be implemented in 12 priority sectors*: The overall implementation of regional development should be supported by the following:
 - Agrarian reform policies as an integral approach to land management;
 - Coordination policies between the provincial government and regency/ municipality; and
 - Enhanced policy-making capabilities for local government officials and financial capacities for local governments.

2.1.2 Implementation Direction and Strategies for Spatial Planning

The policy direction in ensuring sustainable spatial planning is toward the improvement of the quality of spatial plans, optimization of the role of institutions, and use of spatial plans as references for development implementation.

To this end, the target indicators of the National Medium-term Development Plan 2010–2014 are summarized in Table 2.1.1.

Table 2.1.1 National Medium-term Development Goals (2010–2014)

| No. | Development Aspect | Goal (2010–2014) | |
|-----------|---|----------------------------|-------------|
| 1. | Economic | | |
| a) | Economic Growth | Annual average: 6.3–6.8% | |
| b) | Inflation | Annual average: 4–6% | |
| c) | Unemployment Rate | 5–6% by the end of 2014 | |
| d) | Poverty Rate | 8–10% by the end of 2014 | |
| 2. | Education | | |
| | | 2008 | 2014 |
| a) | Average number of years of schooling for populations aged 15 and older (<i>no. of years</i>) | 7.50 | 8.25 |
| b) | Illiteracy rate among populations aged 15 and older (%) | 5.97 | 4.18 |
| c) | Elementary/Exceptional (SD/ SDLB/MI/Paket A) school enrollment (%) | 95.14 | 96.00 |
| d) | Junior/Exceptional high (SMP/ SMPLB/MTs/Paket B) school enrollment (%) | 72.28 | 76.00 |
| e) | Senior/Exceptional high (SMA/ SMALB/MA/Paket C) school enrollment (%) | 64.28 | 85.00 |
| f) | Undergraduate/University enrollment among 19-23 (<i>year</i>) | 21.26 | 30.00 |
| g) | Declining disparity in participation and educational quality among areas, genders, socioeconomic classes, and service providers organized by government and community | | |
| 3. | Health | | |
| a) | Life expectancy (<i>no. of years</i>) | 70.70 | 72.00 |
| b) | Maternal mortality / 100,000 live births | 228.00 | 118.00 |
| c) | Infant mortality / 1,000 live births | 34.00 | 24.00 |
| d) | Malnutrition among under-5s (%) | 18.40 | < 15.00 |
| 4. | Food Stock | | |
| a) | Paddy rice production | Annual growth: 3.22 % | |
| b) | Corn production | Annual growth: 10.02 % | |
| c) | Soybean production | Annual growth: 20.05 % | |
| d) | Sugar production | Annual growth: 12.55 % | |
| e) | Beef production | Annual growth: 7.30 % | |
| 5. | Energy | | |
| a) | Electric generator capacity | 3,000 MW/annum | |
| b) | Electrification rate | 80 % | |
| c) | Petroleum production | 1.01 million barrel/day | |
| d) | Geothermal energy utilization | 5,000 MW | |
| 6. | Infrastructure | | |
| a) | Causeway developments in Sumatera, Java, Kalimantan, Sulawesi, West | Up to 19,370 km until 2014 | |

| No. | Development Aspect | Goal (2010–2014) |
|-----|--|-------------------------|
| | Nusa Tenggara, East Nusa Tenggara, and Papua | |
| b) | Infrastructure network development and integrated intermodal and interisland transportation services provision in accordance with National Transportation System and Multimodal Transportation Blueprint | Will be completed |
| c) | Fiber optic network development in Eastern Indonesia | Will finish before 2013 |
| d) | Transportation network improvement in four metropolises (Jakarta, Bandung, Surabaya, and Medan) | Will be completed |

Source: Document of National Middle Term Development Plan 2010-2014, President Regulation No.05/2010-Attachment-1.

2.2 Java–Bali Spatial Planning Policy and Strategic Directions

The purpose of the Java–Bali Islands Spatial Plan is to implement the national spatial plan (RTRWN) and realize the unity and balance among such disparate factors as economic, social, cultural, environmental, and infrastructure developments in an area encompassing the Java–Bali island ecosystems. The following are the objectives of the Java–Bali Spatial Plan:

- 1) Maintain the Java–Bali islands as national food baskets;
- 2) Control the physical development of urban zones and urban sprawl;
- 3) Develop Java–Bali as the center of processing industries;
- 4) Utilize mineral resources, oil, and gas available in Java–Bali in a sustainable and appropriate manner;
- 5) Promote Java–Bali as a tourism and services center;
- 6) Maintain at least 30% of Java–Bali as a protected marine zone;
- 7) Accelerate development of the southern coastal region of Java island, taking into account the existence of protected and disaster-prone areas;
- 8) Encourage development of an intermodal transportation infrastructure to strengthen the competitiveness of Java–Bali; and
- 9) Enhance synergistic linkages between Java–Bali and other islands.

Moreover, policies that will realize the national spatial structure and the spatial pattern in the Java–Bali area will be conducted through the following principles:

- 1) Preserve agricultural lands;
- 2) Control agricultural land conversion;
- 3) Develop and control water infrastructure network to increase agricultural land areas;
- 4) Encourage vertical and compact development in metropolises and large urban areas;
- 5) Control urban sprawl and improve linkages between urban and rural areas;
- 6) Develop environmentally friendly, space saving, labor-intensive industries and services, as well as integrate industrial activities into development of industrial zones and industrial estates;
- 7) Control the utilization of natural resources such as minerals oil and gas;
- 8) Develop service centers;
- 9) Develop an integrated tourism zone based on the uniqueness of the local nature, culture, and economy;
- 10) Maintain protected zones and revitalize degraded protected zones;
- 11) Control spatial developments in upstream river areas and rehabilitate degraded upstream and infiltration areas to ensure water availability in the long term;

- 12) Accelerate the development of mainstay zones in southern Java and the interconnection between the southern coast with the central and northern coasts of Java;
- 13) Encourage the development of the southern crossroad network and southern coastal road network on Java island, and the northern crossroad to Bali to improve the accessibility of lagging and isolated zones within the limits of the area's environmental carrying capacity;
- 14) Encourage the development of new growth centers/urban areas in the southern coast of Java, taking account of the area's vulnerability to disasters;
- 15) Encourage the development of intermodal infrastructure to promote economic competitiveness and hasten interisland access (including small island);
- 16) Encourage nationwide interisland connections based on special approach to regional development; and
- 17) Maintain small peripheral islands to assert sovereignty claims of the Unitary Republic of Indonesia.

The operational strategies to realize the national urban system in Java–Bali islands will be undertaken through the following:

- 1) Manage the excessive development of residential, business/commercial, industrial facilities in suburban buffer areas and/or along primary arterial or collector roads;
- 2) Relocate industrial activities from urban areas to industrial zones;
- 3) Encourage the development of an urban zone based on sustainable marine and fishery development;
- 4) Develop the Greater Jakarta and **Gerbangkertosusila (GKS) urban zones** as world-class centers for higher education, finance, and health;
- 5) Develop the Greater Bandung and Yogyakarta urban zones as centers for higher education;
- 6) Develop Jakarta, Bandung, Yogyakarta, Surakarta, **Surabaya**, and Denpasar as centers of tourism;
- 7) Enhance mutually beneficial linkages and synergies between urban and rural areas; and
- 8) Mitigate urban disasters and the negative impacts of global warming.

2.3 East Java Spatial Planning Policies and Strategies

The main objective of East Java Province Spatial Plan is to determine the basis of the visions and missions of the East Java Long-term Development Plan 2005–2025.

The visions and missions which are envisioned in the committed spatial plans of each kota/kabupaten, as well as that of the East Java province, are summarized in Tables 2.3.1 and 2.3.2.

The East Java Spatial Plan addresses the following strategic issues:

- 1) Land capability / carrying capacity and land conversion;
- 2) Economic disparity, infrastructure and services, and human resources;
- 3) Natural disasters and vulnerability;
- 4) The Lapindo mudflow disaster and its socioeconomic implications;
- 5) Conversion of forest and agricultural lands, particularly irrigated ones;
- 6) Lack of integration in the agricultural sectors, and between production and distribution systems, taking into account the need to promote value-added agricultural production;
- 7) Globalization, urbanization, and urban growth leading to urban sprawl and megacities,

especially in major cities in East Java;

- 8) Food security; and
- 9) Potential development of strategic infrastructure for transportation, energy and telecommunications, including the Suramadu Bridge; port developments in Tuban, Lamongan, Gresik, Situbondo; and the development of alternative energy sources and their processing.

To solve the development issues identified above, development targets should be as follows:

- 1) East Java as an agribusiness center, globally competitive, sustainable, and prosperous;
- 2) Well-structured spatial and physical conditions, especially with optimal balance between green/open spaces and built-up areas, as well as spatial balance between land use and transportation;
- 3) Major growth centers which will be regionally and nationally functional;.
- 4) Protected water and forest resources, as well as air and soil quality from the negative impacts of development, and reduced technical irrigation reduction;
- 5) Globally competitive human resources especially to respond to the requirements for globalization so that East Java will be ready to become part of the global economy;
- 6) Stable food supply area, which will embody the great potential of East Java as food provider in support of national food security objectives; and
- 7) Balanced and equitable distribution of development over East Java.

Table 2.3.1 Visions of Spatial Plans for East Java Province and Its Regencies

| EAST JAVA | Kota Surabaya | Kota Mojokerto | Kab. Gresik | Kab. Bangkalan | Kab. Sidoarjo | Kab. Mojokerto | Kab. Lamongan |
|---|--|--|--|---|--|---|--|
| 2009–2029 | 2009–2029 | 2007–2027 | 2007–2027 | 2008–2028 | 2009–2029 | 2007–2027 | 2008–2028 |
| Perda /2009 | | | | Perda No.10/2009 | Perda No.06/2009 | | |
| A province that provides sustainable agribusiness and commercial services that are globally competitive | A city that provides services which are convenient, world-class, cultured, and equitable | A society characterized by prosperity, peace, and competitiveness within the Unitary State of Indonesia Republic | An area that accommodates culture, investment friendliness, and environmental sustainability | The Madura gateway area with strong urban functions of industrial, tourism, and services. | An area with developed industrial areas, trade, agriculture, and settlements characterized by harmony and sustainability | A spatially productive, responsive, integrated, and environmentally friendly area with improved living conditions anchored on participation and partnership | A regency marked by justice, equity, prosperity, and competitiveness |

Source: Spatial Plans of East Java Province and Regencies of GKS Zone

Table 2.3.2 Missions of Spatial Plans for East Java Province and Its Regencies

| EAST JAVA | Kota Surabaya | Kota Mojokerto | Kab. Gresik | Kab. Bangkalan | Kab. Sidoarjo | Kab. Mojokerto | Kab. Lamongan |
|--|---|--|--|--|---|--|--|
| Year 2009–2029 | Year 2006–2010 | Year 2007–2027 | Year 2007–2027 | Year 2008–2028 | Year 2009–2029 | Year 2007–2027 | Year 2008 - 2028 |
| Perda ... /2009 | | | | Perda No.10/2009 | Perda No.06/2009 | | |
| Protect and conserve natural and artificial resources. | Improve the quality of urban city planning and infrastructure to ensure public accessibility. | Develop Mojokerto into a regional growth center. | Realize a spatial plan that accommodates improvements of man-made resources. | Realize sustainable spatial patterns consistent with the Bangkalan community cultures which have paternalistic religious (Islamic) practices and are able to improve the welfare of society. | Support the spatial plan through the development of infrastructure to support economic and dynamic regency development. | Enhance programs and review development actions that guarantee the existence and sustainability of the environment, preservation of resources and reduction of environmental damage. | Realization of legal certainty creation in the business activities according to spatial planning and to encourage productive investment opportunities; |
| Provide regional facilities and infrastructure fairly and hierarchically, as well as with high added value. | Improve public access, awareness, participation, and control in policy formulation and implementation of public services. | Realize good and clean governance. | Realize a spatial plan that accommodates environmental management improvement. | Optimize human resources by providing facilities and infrastructure in urban and rural areas to improve the quality, productivity, independence, and competitiveness of human resources with the involvement of the community. | Develop good governance to realize the regency spatial plan. | Improve public welfare by leveraging resources in environmentally sound areas, such as by creating opportunities for enterprises, and expand employment opportunities to reduce poverty. | Realization of facilities and infrastructure provision in urban and rural areas to improve the quality of human resources more productive and independent, and high competitiveness; |
| Provide various facilities for local investment development and increase regional cooperation. | Develop cultural wisdom and empower the citizens. | Make Mojokerto beautiful and sustainable. | | Create a secure legal environment for businesses in compliance with the spatial plan and encourage productive investment opportunities. | | Encourage participation from and develop partnerships with all stakeholders, i.e. public, private and other institutions, in implementing the spatial plan. | |
| Integrate development programs supported by all stakeholders; Balance development and economic growth within the province. | Ensure just law enforcement and provide conducive and equitable business climate. | Realize a civilized society devoted to God Almighty. | | Formulate terms of spatial utilization and control that consist of general zoning regulations, permit conditions, incentives and disincentives, and sanctions. | | | |

Source: Spatial Plans of East Java Province and Regencies of GKS Zone

2.4 GKS SWOT Analysis

A SWOT analysis (strength, weakness, opportunity, and threat) looked into the overall feature of the socioeconomic activities in the GKS Zone. The summary of the analysis is described in Table 2.4.1. The weak factors inherent in the GKS should be mitigated, while its strong assets should be further enhanced, based which the GKS should take advantage of its opportunities and neutralize future threats. All considerations are integrated in the visions for development as envisioned in the preceding sections.

Table 2.4.1 SWOT Analysis of GKS Zone based on Overall Evaluation

| Strength | Weakness |
|---|---|
| <ul style="list-style-type: none"> • Second largest economic agglomeration in Indonesia as another potential growth center • Rich agricultural and fishery potentials with vast irrigated agricultural land • Functional port and airport linked with the world market • Strengthened gateway function to Madura Island with the Suramadu Bridge • Availability of well-educated persons and skilled labor force in a variety of cottage industries • Expectation of national government's special policies for infrastructure provisions | <ul style="list-style-type: none"> • Susceptible water resource • Chronic water shortage problems in dry season • Heavy traffic congestions in Surabaya and its vicinities, thereby leading to a massive daily economic loss • Overall water-related environment being degraded due to lack of sewerage systems • Many areas suffering from disasters such as floods and land sliding • Port logistic function, which is the lifeline of Surabaya Economy, reaching to the max capacity level, and unstable supply of electric power • Weak governance for legal enforcement and investment administration |
| Opportunity | Treat |
| <ul style="list-style-type: none"> • Be a world-recognized commercial, industrial and logistic center where attracts both domestic and international investors • Be a leading area for advanced food supply activities, agribusiness, and agro-processing industries • Be a human resource center to support value-added types of economies through trading, financing and tourism services • Be one of the Asian port, given a well functioning deep-sea port for sufficient container terminals. | <ul style="list-style-type: none"> • Disorderly and/or illegally land conversion from forest and agricultural land to housing and urban land use • Critical damage on water resource capacity and water supply crisis on agricultural, industrial and urban activities • Rapid urbanization, resulting in uneven distribution of people, proliferation of slums, and shortage of public service facilities • Increasing diseconomies of "agglomeration", due to congestions and environmental degradation, thereby losing the growth opportunity |

2.5 GKS Functions and Roles

Based on the SWOT analysis, the expected functions and roles of the GKS is to function as a national activity center¹ with the following characteristics:

- 1) An outstanding and leading center of economic growth in Indonesia;
- 2) A regional logistics center and ideal goods distribution and export-import gate, representing East Java province; and
- 3) Reputable economic center for agriculture, industry, and tourism.

At the provincial level, the GKS will function as the growth center of East Java which will encourage and spur its neighboring areas to reach higher social and economic growths as parts of a whole. At the local level, the GKS will create new local demand for agricultural, industrial, commercial, tourism, and consumer activities, as well as spur economic growth.

¹ A national activity center (Government Regulation No. 26/ 2008) is defined as one which can become an export-import activity node or international gateway and a major transportation hub, and has the potential for large-scale industrial activities.

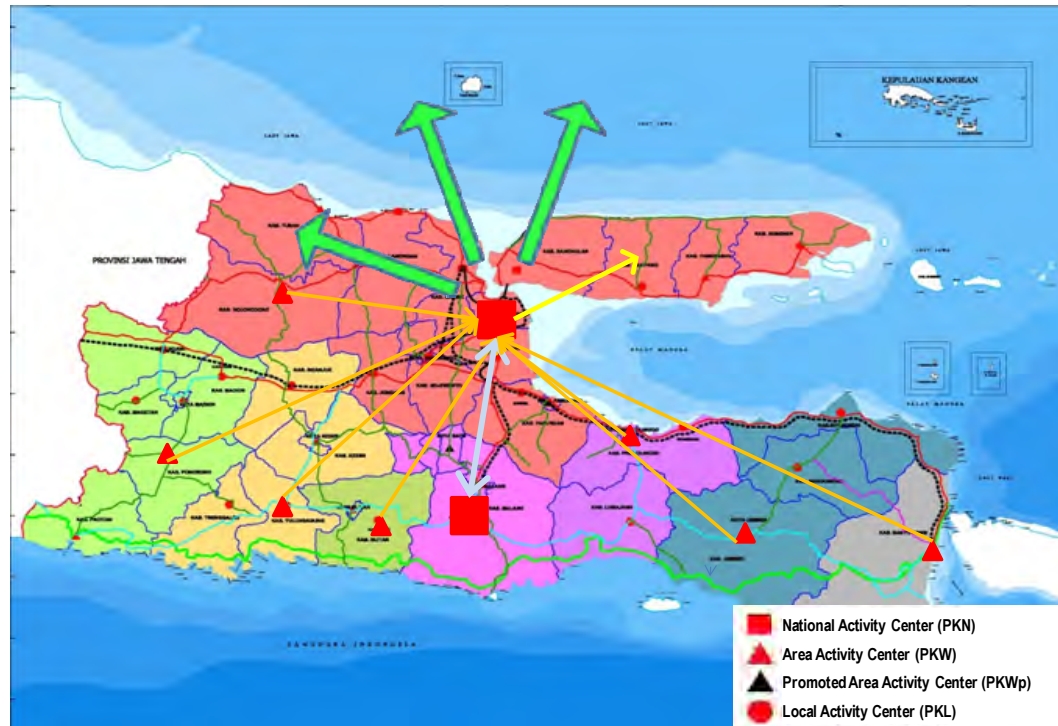


Figure 2.5.1 Strategic Position of GKS Zone in East Java Province

2.6 Development Issues, Policies and Strategies in GKS Spatial Plan

Development issues were identified through the SWOT analysis, as well as a series of baseline sanitary, utility, and transportation surveys, specifically in the aspects of social, economic, environmental, and infrastructural. The policies and strategies in the spatial plan for the GKS were set based on the recognition of these issues, as enumerated below. These policies and strategies are relevant to the realization of the vision and missions mentioned earlier.

2.6.1 Regional Economic and Social Development

(1) Development Issues

- 1) Increasing economic disparities between the urban and rural areas;
- 2) High unemployment rates, especially among the educated;
- 3) Increasing urbanization;
- 4) Poverty in the rural areas, and limited economic activities in the rural areas, lagging agricultural production and processing industries; and
- 5) High cost of industrial activities in the urban center due to traffic congestion, and environmental degradation.

(2) Policies and Strategies

The GKS should have a robust and sustainable economy being a major national growth center. The key policies to attain this objective are the following:

Policy 1: Strengthening of economic activities and the urban function of Surabaya as center of the metropolitan area.

Strategies:

- 1) Enhance the business environment for service and trade, industries, MICE functions, logistics, and urban amenities.
- 2) Develop the urban economy making the best use of local resources to attract investments and people;
- 3) Develop an infrastructure network at the international, national and regional levels;
- 4) Promote an eco-oriented region; and
- 5) Introduce high-tech industries and related R&D and human resource development.

Policy 2: Equitable development among parts of the GKS through development of an agropolitan and agri-based rural economy.

Strategies:

- 1) Develop agriculture and agri-based industries and their activity centers;
- 2) Strengthen the economic linkages between the rural economy and urban economies through agropolitan activities;
- 3) Develop physical infrastructure and services for agriculture and agri-business for production, marketing, finance, trading, transportation, etc.
- 4) Development infrastructure and services for agricultural production and marketing centers to open access to export markets; and,
- 5) Strengthen institutional capacities for agricultural development, including farmers' cooperatives, organizations and financing.

2.6.2 Spatial Structure Development

(1) Development Issues

There is a need to develop the GKS spatial structure to accommodate anticipated economic and social activities in the long term. In this aspect, the following are the spatial planning issues that should be tackled:

- 1) Overconcentration of economic resources and activities in the city of Surabaya, thereby requiring a hierarchical human settlement system to efficiently distribute economic resources and development benefits to other local communities all over the GKS Zone;
- 2) The increasing economic disparities between the urban and rural areas, thereby increasing the need to formulate a mechanism for "coexistence and co-prosperity" between urban and rural communities; and
- 3) The expansion of disorderly urbanization and conversion of irrigated farm lands into housing and urban uses, which require controlled urbanization with minimal disorderly land conversion.

(2) Policies and Strategies

The spatial structure should reflect the above regional development policies and strategies. Below are the basic policies on spatial structure:

Policy 1: Establishment of an attractive and efficient urban system.

Strategies:

- 1) Establish centers through a hierarchy of activities in the regional, regency, and district centers, not only in the GKS but throughout East Java province, including Malang, as well as create activity centers and regional centers in each district/city;
- 2) Revitalize and accelerate the development of the metropolitan area as a major growth center in East Java which will be supported by regional and local growth centers; and
- 3) Develop urban centers and areas in accordance with their functions and roles.

Policy 2: Development of a rural–urban linkage system.

Strategies:

- 1) Strengthen rural and urban linkages through an agropolitan system;
- 2) Develop growth centers in key rural areas; and
- 3) Improve the quality and quantity of infrastructure, especially roads to support an agropolitan system.

Policy 3: Creation of compact eco-oriented region.

Strategies:

- 1) Control urban sprawl and guided urbanization under a proper land use zoning system;
- 2) Facilitate the integration of urban development and public transportation;
- 3) Appropriate management and control of urban development in the urban fringe and urban redevelopment in built-up areas for more compactness; and
- 4) Create green and water-friendly spaces in built up areas.

2.6.3 Transportation Development

(1) Development Issues

The establishment of a comprehensive and efficient transport network is a key component in the GKS spatial framework. Development issues relative to this include the following:

- 1) Increasing vehicle numbers resulting in increased traffic;
- 2) Lack of a metropolitan road network capable of accommodating anticipated traffic demand;
- 3) Lack of a comprehensive public transport network to increase people's mobility;
- 4) Saturated capacity of Tg. Perak Port, thereby affecting economic growth;
- 5) Limited capacity of air port facilities (runway and terminal); and
- 6) Poor freight transportation system.

(2) Policies and Strategies

Policy 1: Mitigation of road traffic congestion through a structured and functional road network.

Strategies1:

- 1) Identify bottlenecks that cause road traffic congestions and mitigate them with provision of engineering facilities, traffic enforcement and demand management.;
- 2) Improve the metropolitan road network to meet future traffic demands;
- 3) Develop a regional trunk network;

- 4) Structure an intra-urban expressway system (i.e. toll roads) in Surabaya Metropolitan Area; and
- 5) Expand inter-city expressway system (i.e. toll roads) and integrate them with economic growth centers.

Policy 2: Improvement of people's mobility through a well-functioning public transportation system.

Strategies:

- 1) Further improve and strengthen the "Commuter Rail System", through the improvement of the existing railway in Surabaya Metropolitan Area;
- 2) Improve the inter-modal system and integrate it with the bus and rail systems; and
- 3) Encourage "Transit-oriented Development" in association with the Commuter Rail System.

Policy 3: Development of a functional freight transportation system.

Strategies:

- 1) Designate the freight corridors in association with development of the regional trunk road network;
- 2) Strengthen the capacity of major freight attractions/generation facilities related to port and railway systems; and,
- 3) Relocate good's distribution centers/facilities along with improving the Metropolitan toll way network.

Policy 4: Strengthening of port functions to support the growing local and international businesses in the GKS Zone.

Strategies:

- 1) Study alternative solutions to strengthen port capacity for containers to meet long-term demands and identify the best solution; and,
- 2) Implement a new port development based on the identified best solution.

Policy 5: Strengthening of airport functions to support the growing local and international businesses in the GKS Zone.

Strategies:

- 1) Study feasible solutions to expand the airport capacity to meet long-term demands and identify the best solution for creating the second runway and its relative terminals in the vicinity of Juanda Airport;
- 2) Implement the airport expansion project based on the identified best solution; and,
- 3) Further study an alternative second international airport in GKS Zone (i.e. Lamongan) to meet long-term demands.

2.6.4 Infrastructure Development for Utility Services

(1) Development Issues

Infrastructures for overall water management and utility/sanitary services are important in development paradigms. A limit on their carrying capacity implies a limit on development and economic growth. The following were the issues on water management and utility:

Water

- 1) Weak management of water resources;
- 2) Poor management of water supply systems with substantial water losses due to leakage, etc.; and
- 3) Shortage of clean water mostly in the urban areas during the dry season.

Wastewater and Urban Drainage

- 1) Water pollution in rivers caused by domestic and industrial waste;
- 2) Absence of a permanent water quality monitoring system for the rivers; and,
- 3) Occurrence of floods during rainy season in several rural areas and along the Bengawan Solo River.

Solid Waste Management

- 1) Absence of comprehensive long-term strategies to meet increasing demands for solid waste treatment;
- 2) Lack of land to serve as final disposal sites; and,
- 3) Weak public awareness on the serious problems regarding solid waste management (SWM), thereby leading to weak participation in the 3Rs movement (reduction, reuse and recycle)

Power and Energy

- 1) Lack of stable and quality electric power supply; and,
- 2) Expected increase in the long-term demand for power supply

Telecommunications

- 1) Lack of fair market and sound operation by private providers.

(2) Policies and Strategies

These are the policies and strategies for infrastructure development which aim to improve overall service levels and networks to support socioeconomic activities, taking account of the supply–demand balance through an environment-friendly manner. They cover the key sectors of transportation, water supply, wastewater and drainage, power and energy, telecommunications, and solid waste management.

Water Supply

| |
|--|
| <i>Policy: Provision of water for non-irrigation and irrigation uses</i> |
|--|

Strategies:

- 1) Expand water supply facilities;
- 2) Improve service coverage and water accessibility to 76% in 2030 from 47% in 2006
- 3) Ensure proper water resource management to keep demand-supply balance by establishing a river management public corporation, imposing charges for river water use, and allowing privately financed water projects, etc;
- 4) Manage groundwater, including wells and springs;
- 5) Reduce water losses in the water supply sector, which is more than 30 %, through the following measures:
 - Save water by recycling and efficient use of water;

- Promote demand side management to conserve water resource; and,
 - Introduce interprovincial, or interregency, water source diversion from the Solo River and Umbulan.
- 1) Enhance water management through administrative reforms, such as establishing an Inter-regency Infrastructure Development and Maintenance Regulatory Board, and introducing a performance indicator system (PIS) for the PDAMs and other water industries.

Wastewater and Urban Drainage

Policy: Promotion of a healthier environment in rural and urban areas.

Strategies:

- 1) Properly manage sanitation and wastewater, especially since there is public wastewater disposal service except for sludge disposal;
- 2) Improve the monitoring capacity for pollution control, especially for industrial wastewater, river water quality;
- 3) Improve the urban drainage system by enhancing the capacities of drain channels and properly maintaining them and improve emergency response capacities; and,
- 4) Improve the service coverage in the urban and rural areas.

Solid Waste Management

Policy: Create a sustainable material-recycling society and economy to reduce waste and build a well-organized solid waste management system.

Strategies:

- 1) Enhance institutional capacity for better waste management, including administration, financing, information management, etc.;
- 2) Improve the physical and technical aspects of waste management, including waste containers, storage, transportation equipment, landfill capacity and management system, and transportation time;
- 3) Enforce a paradigm shift from an "end of pipe" approach to the 3R movement;
- 4) Introduction appropriate SWM technologies, including recycling system and other advanced technologies;
- 5) Upgrade SWM quality and services, including rehabilitation of infrastructure, improvement of regulation and institutional capacities, and management of education curriculum;
- 6) Improve data management system for efficient and effective waste management; and,
- 7) Introduce new technologies for waste reduction, including incineration, etc., taking into account limited landfill sites.

Power and Energy

Policy: Creation of an energy-saving society.

Strategies:

- 1) Promote energy conservation and saving;
- 2) Improve and reinforcement the network for stable power supply, including transmission and

distribution networks;

- 3) Utilize demand side management; and,
- 4) Tighten control on non-technical losses (i.e. irregular/illegal connections, revamping kWh meters, etc.)

Telecommunications

Policy: Provision of support for telecommunications services by private operators.

Strategies:

- 1) Facilitate the growth of private telecommunication providers; and,
- 2) Implement the telecommunications universal service area (WPUT) program.

2.6.5 Environmental Management

(1) Development Issues

One ultimate goal in spatial planning is to strike a balance between economic development and environmental conservation. Since the GKS is endowed with invaluable environmental assets, an appropriate management of these is indispensable to ensure sustainable use of its water, forest, agricultural land, and coastal resources. The following are the development issues in this area:

- 1) Weak management of water resources;
- 2) Weak legal enforcement to protect environmental resources, ecosystems, and protected areas such as forests, mangroves, and other ecologically important resources;
- 3) Weak disaster management, leading to floods and landslides;
- 4) Economic, settlement, and environmental problems caused by the Porong mud flow; and,
- 5) Risk of vast land areas becoming submerged due to global warming in the long-term.

(2) Policies and Strategies

Policy: Identification of environmentally sensitive areas (ESA) and provision of measures against disorderly urban and industrial development.

Strategies:

- 1) Review concepts and analysis of ESAs depicted in this Study (see Section 5.3 in this report);
- 2) Formulation management guidelines for the usage of land and resources within the ESAs and the administration of permits;
- 3) Prepare a legal basis for ESAs related to the spatial planning laws, as well as environment- and forest-related laws; and,
- 4) Develop the enforcement capacities of local government officials against violators of environment-related laws and regulations.

3. SOCIOECONOMIC FRAMEWORK OF SPATIAL PLANNING FOR GKS ZONE 2030

3.1 Population Projections

3.1.1 Alternative Growth Scenarios

Two alternative scenarios of population growth were examined as follows:

Scenario A: (Moderate Growth): Expansion to suburban areas and maintaining a conservative population growth in Surabaya (based on the estimates from BAPPEDA Java Timur) and linked with Economic Scenario A, wherein the GKS will keep a moderate economic growth at par with that of the country.

Scenario B: (Pushed Growth): Managing an intensive urbanization process in strategic growth areas in the Surabaya Metropolitan Area, attracting social migrants from other areas (based on the JICA Study Team's analysis) and linked with Economic Scenario B, which pushes the GKS as a leading economic engine of national economic growth and performing at a high growth rate. This scenario was defined based on the national concept that regional economies should be further strengthened in order to mitigate economic disparities between Jakarta and other provinces.

3.1.2 Population Framework

Scenario A (Moderate Growth): Indicates that the population in the GKS by 2030 will be 12,645,000, out of which Surabaya's population will account for 3,212,900, followed by Sidoarjo at 2,977,400. Population increments in the GKS from 2008 to 2030 will be about 3.3 million. In this scenario, the population of Surabaya will increase at a minimal rate, 0.6 -0.7% p.a., which is lower than the national average, portending the onset of social decline or out-migration.

Scenario B (Pushed Growth): Indicates that the GKS population will be 14,117,500 by 2030, out of which Surabaya will have 3,723,700, followed by Sidoarjo's 3,257,400 people. The two will be the predominant urban areas in the metropolis. The population increase in the GKS from 2008 to 2030 will be about 4.8 million. In this scenario, Surabaya's population will increase by 1.3–1.5% p.a. minimizing its social decline and maintaining an encouraging growth.

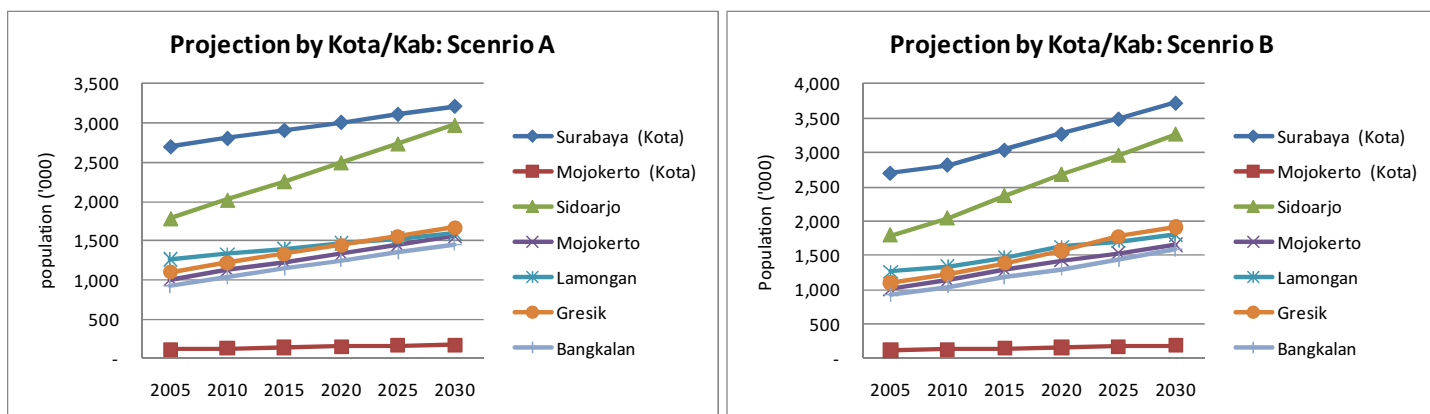


Figure 3.1.1 Population Projections in GKS by Growth Scenario

3.2 Economic Projections

3.2.1 National and Regional Economic Framework

The long-term perspective on economic growth is projected in two scenarios. The estimated growth rates of GKS, GKS Plus, East Java, and the nation are as shown in Table 3.2.1. In spite of the global financial crisis that hit the current decade, the Indonesian economy has enjoyed a relatively steady growth. However, looking at the long term, the country will not be able to sustain its robust growth rates but will plateau at a certain level, say, 2.0–3.0% p.a.

Scenario A (Moderate Growth Scenario): The GKS's growth will not significantly change even in the future and remain constant over time at the current position which represents the GKS's share of the national GDP of 6.5%.

Scenario B (Pushed Growth Scenario): The GKS's comparative position against the national economy will increase to 7.0% from the current share of 6.5%, even though this scenario assumes a slightly higher growth rate in the national economy than Scenario A. This means that the GKS economy will function as a strategic growth center of the country under Scenario B.

Table 3.2.1 Projections of Economic Growth Scenarios

| Scenario A: Moderate Growth (Getting along with the National Growth) | | | | | | | | | |
|--|------|------|------|------|------|------|------|------|------|
| | 2005 | 2006 | 2007 | 2008 | 2010 | 2015 | 2020 | 2025 | 2030 |
| GKS | 7.1% | 6.3% | 6.4% | 5.9% | 4.7% | 4.3% | 3.5% | 3.0% | 2.7% |
| GKS Plus | 6.6% | 7.1% | 8.0% | 8.0% | 4.3% | 4.6% | 3.7% | 3.1% | 2.7% |
| East Java | 5.8% | 5.8% | 6.1% | 5.9% | 4.2% | 4.0% | 3.4% | 2.9% | 2.5% |
| Rest of Java | 5.8% | 5.8% | 6.1% | 5.9% | 3.7% | 3.7% | 3.1% | 2.7% | 2.4% |
| National Total | 5.7% | 5.5% | 6.3% | 6.1% | 4.8% | 4.3% | 3.5% | 3.0% | 2.6% |
| Scenario B: Pushed Growth (Leading Economy of the National Growth) | | | | | | | | | |
| | 2005 | 2006 | 2007 | 2008 | 2010 | 2015 | 2020 | 2025 | 2030 |
| GKS | 7.1% | 6.3% | 6.4% | 5.9% | 5.8% | 5.6% | 5.0% | 3.8% | 3.5% |
| GKS Plus | 6.6% | 7.1% | 8.0% | 8.0% | 5.9% | 5.8% | 4.8% | 3.5% | 3.5% |
| East Java | 5.8% | 5.8% | 6.1% | 5.9% | 6.0% | 5.0% | 4.0% | 3.5% | 3.2% |
| Rest of Java | 4.6% | 5.1% | 5.5% | 5.5% | 6.2% | 5.4% | 4.2% | 3.6% | 3.5% |
| National Total | 5.7% | 5.5% | 6.3% | 6.1% | 6.0% | 5.0% | 4.0% | 3.5% | 3.2% |

Source: JICA Study Team

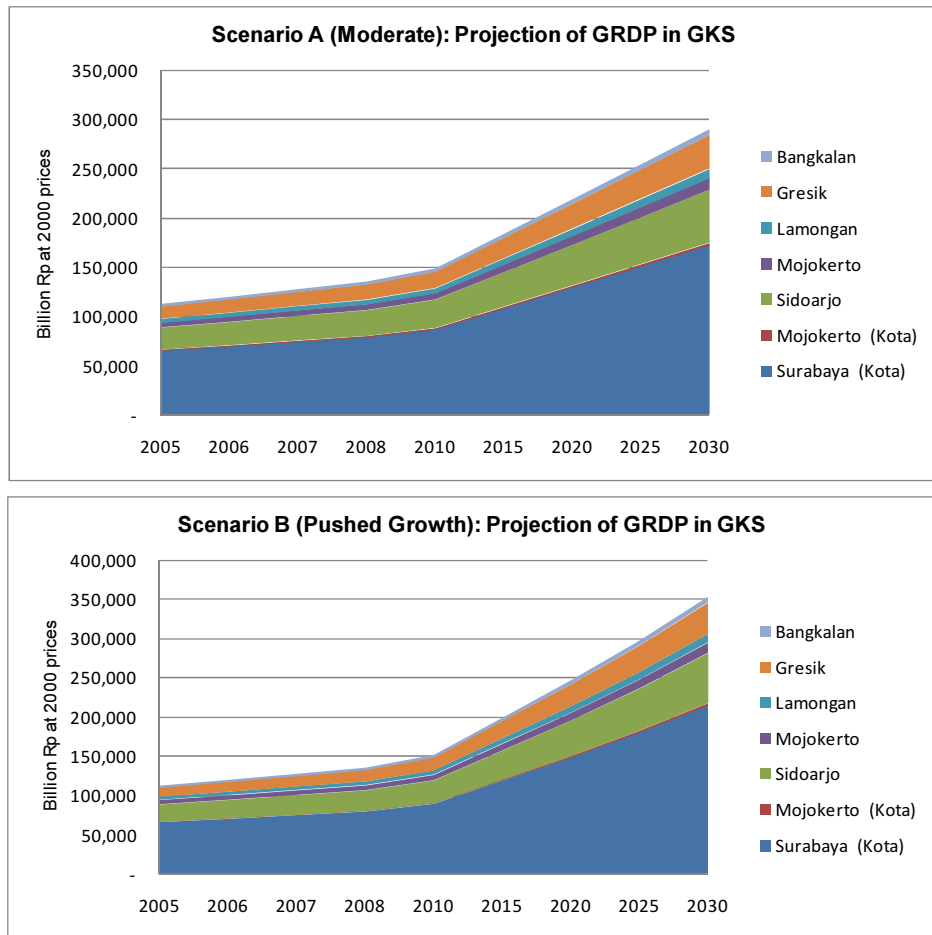
3.2.2 GKS Economic Framework: Growth Rates and GRDP at Constant Prices (Year 2000)

Economic growth rates in terms of GRDP in the GKS were assumed in the long term. From 2007-2008, Gresik had the highest growth rate at 6.8% p.a., followed by Surabaya with 6.3% p.a., Lamongan with 5.9% p.a., and Mojokerto with 5.5% p.a.. Economic growth is related to industrial activities and the accumulation of urban services. Thus, the degree of industrialization is one criterion with which to evaluate economic growth and potentials.

Projected growth rates under **Scenario A**, are implied in the quote "Analisa Penyusunan Kinerja Makro Ekonomi dan Sosial Jawa Timur, 2008" which briefly translates to "moderate growth."

For **Scenario B**, the growth rates in each kabupaten/kota were examined by the JICA Study Team, taking into account the potential endowments for agro-processing and value-farming promotion, as well as further industrialization potentials. In the regard, it was assumed that the three economies of Surabaya, Gresik, and Sidoarjo would continuously enjoy relatively high growth rates, followed by Mojokerto where proactive agro-processing activities are expected in the future.

Figure 3.2.1 indicates the long-term projections of GRDP at constant (year 2000) prices in GKS under the two scenarios.



Source: JICA Study Team

Figure 3.2.1 Projections of Economic Growth in GKS Zone by Scenario

3.2.3 Per Capita GRDP Growth in GKS Zone

Changes in “per capita GRDP at 2000 constant prices”, as an affluence index, were examined in the time horizon up to 2030. As of 2008, the current per capita GRDP in the GKS was Rp.13.7 million as of 2008. For 2030, under Scenario A, this will increase to be Rp.20.1 million, and to Rp.21.0 million for in Scenario B in 2030. No significant differences between both scenarios were found, because the population increase is taking place along with the enhanced economic activities in Scenario B. People’s affluence level by 2030 will rise 1.53 times compared with that in 2008.

3.2.4 Coherence of the Spatial Planning Framework

Spatial planning was carried out based on the socioeconomic growth scenarios discussed above. The higher economic growth scenario, **Scenario B (Pushed Growth)**, implies better economic and employment stability for the local people. However, if the necessary measures are not undertaken, this scenario will mean more environmental loads, diseconomies, and social costs for society and the government. This scenario underscores the need to pursue a balanced spatial plan to minimize these negative impacts.

As a result of such analysis as summarized in Table 3.2.2, **Scenario B** or **Pushed Growth Scenario** was applied in the socioeconomic framework in spatial planning, simply because the GKS Zone shall be a leading economy in Indonesia, which is coherent with the crucial policy issue to achieve equitable national growth. The GKS is the second largest economy with great potential for social and economic development, as the regional center of not only East Java, but also the eastern part of Indonesia. This latent potential shall be stimulated to achieve a long national goal to realize a balanced and equitable development structure. For the sake of this goal, Scenario B is assessed most suitable for the spatial planning framework.

Table 3.2.2 Comparison and Evaluation of Alternative Scenarios

| | Scenario A (Moderate Growth) | Scenario B (Pushed Growth) |
|---|---|---|
| Economic Position of the GKS Zone over the Nation in 2030 | Comparatively same as the current position | To be a leading economy of the nation with a higher growth than the national average |
| Urbanization Process | Keeping continuous urbanization process with the same pace as before (sub-urbanization) | Controlled urbanization with intensification of built-up areas and minimizing urban sprawl (a compact city concept) |
| Economic Growth | Moderate | Slightly progressive |
| Environmental Burden | Increasing along with development pressures and urbanization process. | Need to establish a more practical management system to lessen environmental negative impacts |

Source: JICA Study Team

4. SPATIAL STRUCTURE IN GKS ZONE

4.1 Urban System

4.1.1 Review of East Java's RTRW

In formulating the GKS spatial plan, the broad regional spatial structure envisioned in East Java's RTRW was adopted since the latter is the higher-level plan.

Surabaya's assets can be used to achieve the development vision and missions of the GKS Zone, following the objectives of the spatial structure and urban development of the GKS as follows:

- To form a spatial structure that will balance development in the GKS Zone;
- To make clear delineations of protected and cultivation areas for sustainable land utilization in the GKS Zone; and
- To manage urban growth and avoid uncontrolled urbanization by creating compact and eco-oriented cities..

(1) Development Zone System Planned in East Java's RTRW

Several zone combinations were considered, as shown in Figure 4.1.1, which indicates the relationships among development zones. The GKS Zone is part of the GKS Plus Zone and within the GKS Zone is a hierarchy of urban centers, as follows:

- Level 1: Surabaya (service center, trade, industry, settlement, education, etc.)
- Level 2: Sidoarjo, Gresik, Bangkalan (subcenters in SMA as service center for trade, industry and education)
- Level 3: Lamongan (agriculture, industry, tourism); Kabupaten Mojokerto (service, agriculture, trade); Kota Mojokerto (trade, service, government)

The development of the kabupaten and kota will be done along main sectors, such as industrial, tourism, **agropolitan**, and other strategic developments reflected in the development concept of spatial distribution and corridors. The plan focuses on industrial development, especially along development corridors shown in Figure 4.1.2. The GKS Zone has a strong industrial development potential, as reflected in the spatial structure and these are summarized in Table 4.1.1.

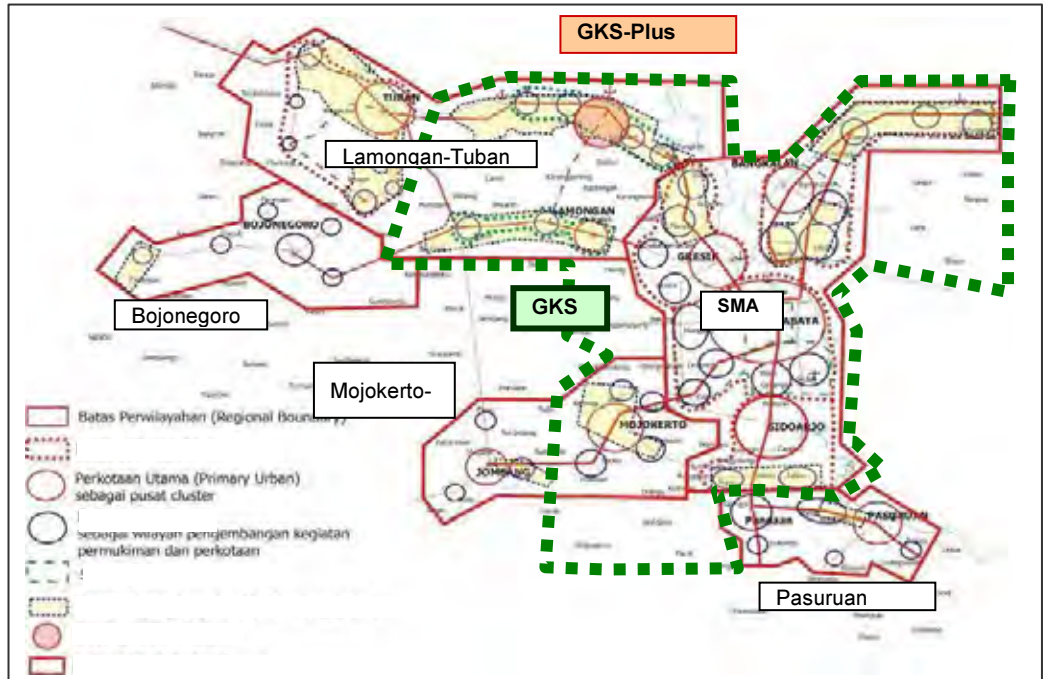


Figure 4.1.1 Composition of GKS and GKS Plus Zones in the RTRW of East Java

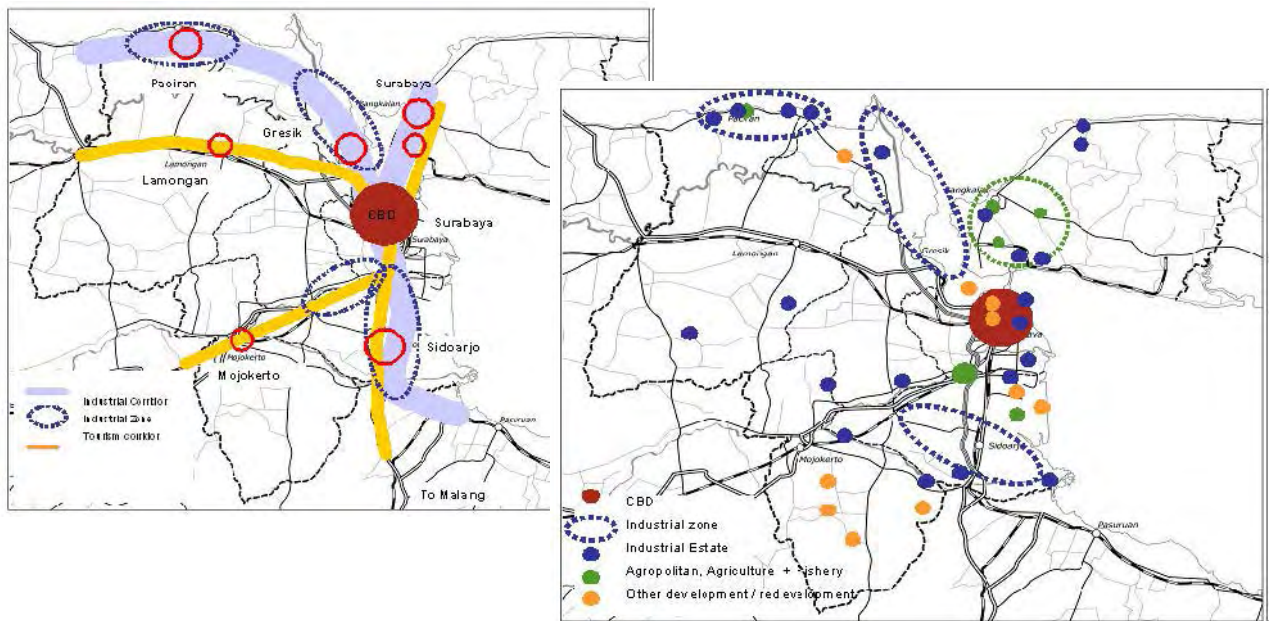


Figure 4.1.2 Strategic Industrial Corridors and Areas in GKS Zone

Table 4.1.1 Role of GKS Zone in Regional Development

| Area | Role |
|-------------|--|
| Surabaya | Serve as a collection center, as well as a distribution and manufacturing subcenter. |
| Lamongan | Serve as a collection and distribution sub-center, sub-center for processing industries in LIS (Lamongan Integrated Shorebase) in Paciran district and for tourism development in Paciran. |
| Gresik | Serve as a collection and distribution, as well as industrial processing sub-center. |
| Sidoarjo | Serve as a collection and distribution, as well as manufacturing sub-center. |
| Mojokerto | Serve as a collection and distribution, as well as industrial processing sub-center. |
| Bangkalan | Serve as a sub-center for collection and distribution (in Bangkalan), trade and services (in Labang at the foot of Suramadu Bridge), industries (in Kamal, Labang, Tragah, Burneh and Socah), and tourism development (in southern coastal Bangkalan). |

Source: East Java RTRW

(2) Development Directions for Kota and Kabupaten in the GKS Zone

Reflecting such development directions mentioned above, all kabupaten and kota had industrial and core plans in their respective development strategies, as summarized in Table 4.1.2. This included the creation of industrial estates, agropolitan areas, fishery related development, etc..

Table 4.1.2 Summary of Development Plans in the RTRW of East Java

| Area | Strategic Development Sector | Main sector | Industrial | Agropolitan | Tourism | Other Strategic Area |
|----------------|--|---|---|--|---|--|
| Surabaya | <ul style="list-style-type: none"> Development at the foot of Suramadu Bridge Port development | <ul style="list-style-type: none"> Suramadu Bridge: Warehousing | <ul style="list-style-type: none"> SIER (Surabaya Industrial Estate Rungkut) Surabaya Hi-tech Industrial Zone | <ul style="list-style-type: none"> Main Outlet | <ul style="list-style-type: none"> International Gateway Corridor A Service Center High Growth | <ul style="list-style-type: none"> Surabaya metropolitan CBD Center for national & international market including at the foot of Suramadu Bridge |
| Sidoarjo | <ul style="list-style-type: none"> E/JIZ: Polluting industry (Jabon), city cargo terminal Agri-business terminal development | <ul style="list-style-type: none"> Industrial area Commercial area Fishery | <ul style="list-style-type: none"> Sidoarjo Industrial Zone (hi-tech) Bebek Industrial Zone | <ul style="list-style-type: none"> Agri-business terminal development | <ul style="list-style-type: none"> Corridor A | <ul style="list-style-type: none"> Porong-Gempol Zone Puwodadi-Lawang Commercial Zone |
| Gresik | <ul style="list-style-type: none"> E/JIZ: Heavy industry, industrial port + bonded zone, industrial estate, bonded zone, city cargo terminal (2), EPZ | <ul style="list-style-type: none"> Fishery Industrial area | <ul style="list-style-type: none"> Gresik Industrial Zone Gresik Hi-tech Industrial Zone (west of Surabaya) | | <ul style="list-style-type: none"> Corridor A High growth | |
| Kota Mojokerto | | <ul style="list-style-type: none"> Commercial and service for local needs | | | <ul style="list-style-type: none"> Corridor B | |
| Mojokerto | | | | | <ul style="list-style-type: none"> Corridor B | |
| Bangkalan | <ul style="list-style-type: none"> Madura Island's poverty alleviation E/JIZ: International port and bonded zone Development at foot of Suramadu Bridge | <ul style="list-style-type: none"> Industry and transportation, warehousing at Suramadu Bridge | <ul style="list-style-type: none"> Local resource integrated industry = local resource (technology and material) based industry for industrial linkage for Madura Island | <ul style="list-style-type: none"> Regional distribution and connection center (RDCC) at Bangkalan, to cover all of Madura Island | <ul style="list-style-type: none"> Corridor A Gate (Suramadu Bridge) | <ul style="list-style-type: none"> Center for national & international market at Suramadu Bridge |
| Lamongan | <ul style="list-style-type: none"> E/JIZ: Paciran: fishery industry, and non-polluting processing industry, port development, industrial estate, oil and gas industry development | <ul style="list-style-type: none"> Industry, shore-base, fishing port, fishery at north coastal area | <ul style="list-style-type: none"> Integrated industry = local resource (technology and material) based industry for industrial linkage & FTZ & Port | | <ul style="list-style-type: none"> Corridor A Gate and service center (Paciran) | <ul style="list-style-type: none"> FTZ |

Notes: **EJIZ**=East Java Integrated Industrial Zone
 Tourism Development: **Corridor A** = 3 routes, i.e., Lamongan-Gresik-Surabaya, Surabaya-Bangkalan, and Surabaya-Sidoarjo-Malan for religious tourism; and **Corridor B** = Surabaya-Mojokerto-Jombang-Madiun for historical tourism.

4.1.2 Proposed Urban Hierarchical System

Based on East Java's spatial plan, the spatial structure for the GKS Zone was formed as a multicentered area with the following hierarchical order of development centers:

| | | |
|----------|---------------------------|---|
| Level 1: | Regional Center | Surabaya |
| Level 2: | SMA Center | Sidoarjo, Gresik, and Bangkalan (20km radius from Surabaya) |
| Level 3: | GKS Kabupaten Center | Mojokerto, Lamongan, (40km radius from Surabaya) |
| Level 4: | GKS Subcenter | Paciran, Babat (Lamongan); Sidayu (Gresik); Gempol (Sidoarjo); Tanah Merah, Klampis, Tj. Bumi (Bangkalan) |
| Level 5: | SMA Subcenter | Menganti (Gresik); Krian (Sidoarjo); Labang (Bangkalan) |
| Level 6: | Other Kabupaten Subcenter | Brondong (Lamongan); Manyar, Cerme, Driyorejo (Gresik); Tarik, Sedati (Sidoarjo); Sooko, Mojosari, Ngoro (Mojokerto); Socah (Bangkalan) |
| Other | Intermodal Cente | Tambakoso Wilangan (Greik); Sepanjang & Waru (Sidoarjo) |

The area within a 20-km radius from Surabaya's center forms the Surabaya Metropolitan Area (SMA), and the linkages of this center spreads out to areas within a 40-km radius from the city, reaching Lamongan, Mojokerto, Bangkalan, and even Pasuran, outside the GKS Zone. This area forms the "**Greater Surabaya Economic Integration Area**".

In the outer area are the GKS subcenters, SMA subcenters, and other kabupaten subcenters which are strategically located on transportation nodes or along industrial corridors within the GKS. Intermodal gateways will be established on the fringe nodes connecting Surabaya with Gresik, Mojokerto, and Sidoarjo.

In the regional context, each urban center has its own function, as seen in Table 4.1.3. With these urban centers, the GKS was conceptually structured, as illustrated in Figure 4.1.3. The strategic urban centers were all configured to form five radial industrial corridors centered on Surabaya, and three circumferential corridors to integrate them with the suburban centers. Figure 4.1.4 shows a proposed hierarchical urban road network with the major administrative centers situated in a spatial structure. The Level 3 regency centers of Lamongan and Mojokerto were characterized as agropolitan areas.

Table 4.1.3 Roles and Functions of Major Urban Centers in GKS Zone

| Major Urban Center | | Role and Function |
|---|-------------------------|--|
| Level 1: Regional Center | Surabaya | <ul style="list-style-type: none"> Primary urban center, gateway and model city of the region the GKS being the regional center for political, administrative, economic and social activities, with good business, services, education, health, commercial, administrative, and cultural-tourism functions. |
| Level 2: Metropolitan Urban Center | Sidoarjo | <ul style="list-style-type: none"> Metropolitan Urban Center with good industrial and commercial functions and supported by education, health and tourism, with strong linkage with Surabaya and Pasuran to enhance the economy |
| | Gresik | <ul style="list-style-type: none"> Metropolitan Urban center of northern SMA with industrial and commercial activities; and supported by education, health and tourism, with strong linkage with Surabaya, Lamongan and Paciran/Brondong economic zone |
| | Bangkalan | <ul style="list-style-type: none"> Metropolitan Urban center of Madura Island to accommodate the island's economy; with main activity on agro-industry, commercial, education, supported by health and tourism as well as government. |
| Level 3: GKS Urban Center | Kota Mojokerto | <ul style="list-style-type: none"> GKS urban center to accommodate Mojokerto and Jombang Zone with strong highway linkages with Jombang, and Surabaya; and a center of agribusiness as well as district industrial and commercial activities; supported with education, tourism and health. |
| | Lamongan | <ul style="list-style-type: none"> GKS urban center to accommodate agricultural-based district economy, with strong linkage with Surabaya, Paciran/Brondong, Babat, Bojonegoro, with supporting activities for commercial and service, industry, health and tourism. |
| Level 4: Metropolitan Sub-center | Labang (Bangkalan) | <ul style="list-style-type: none"> Metropolitan subcenter with a trade and service area development at the foot of Suramadu Bridge, instead of industry and warehouse, agriculture and animal husbandry. |
| | Menganti (Gresik) | <ul style="list-style-type: none"> Metropolitan subcenter as human settlement development center in suburban area along railway transportation and truck road, supported by education, health and commerce facilities. |
| | Krian (Sidoarjo) | <ul style="list-style-type: none"> Metropolitan subcenter of industrial and settlement of Siborian Industrial development, instead of trade and service and agriculture. |
| Level 5: GKS Sub-center | Sidayu (Gresik) | <ul style="list-style-type: none"> GKS-sub center as a waterfront city with industrial development along the Solo River. |
| | Paciran (Lmgn.) | <ul style="list-style-type: none"> GKS subcenter as special economic zone composed of industrial, port, logistics and tourism development with environment countermeasures and other main activities: such as commercial, services, large industries, and shore-based industry, and education. |
| | Babat (Lmgn.) | <ul style="list-style-type: none"> GKS subcenter in the middle of Lamongan on the border to Tuban; with commerce, services, agro-industry, and water resource conservation. |
| | Gempol (Sidarjo) | <ul style="list-style-type: none"> GKS subcenter located on the corridor to Pasuruan and Malang |
| | Tanah Merah (Bangkalan) | <ul style="list-style-type: none"> GKS subcenter for agricultural activities, especially livestock and poultry, and agropolitan function |
| | Klampis (Bangkalan) | <ul style="list-style-type: none"> GKS subcenter of international port at Tj. Bulupandan Port which will play an important role in cargo transportation in the long-run, with hinterland development for industry and warehouse, tourism, agriculture and fishery. |
| | Tj. Bumi (Bangkalan) | <ul style="list-style-type: none"> GKS subcenter as sea transportation, trade and services, local industry, agriculture, animal husbandry, and also connecting the eastern part of Madura island. |

| Major Urban Center | | Role and Function |
|--|-----------------------------|--|
| Level 6: Local Major Center | Brodong (Lmngn) | • Local major center with the national fishing port. |
| | Manyar(Gresik) | • Local major center with a large industrial development. |
| | Cerme (Gresik) | • Local major center with human settlement development to accommodate increasing population along with trunk road. |
| | Driyorejo (Gresik) | • Local major center with settlement and industrial development. |
| | Socah (Bangkalan) | • Local major center with port and hinterland development. |
| | Tarik(Sidoarjo) | • Local major center of a new water front residential town development. |
| | Sedati (Sidoarjo) | • Local major center of a new town of Gem-polis (marine city) is planned close to Juanda International Airport. |
| | Sooko (Mijkt) | • Local major center of non-polluting industry and settlement center. |
| | Mojosari (Mijkt.) | • Local major center with an industrial development and settlement. |
| | Ngoro (Mijkt) | • Local major center with an Industrial estate development. |
| Intermodal Gateway | Tambakoso Wilangon (Gresik) | • Intermodal gateway center to connect Lamongan and Surabaya. |
| | Waru (Sidoarjo) | • Intermodal gateway center to connect Sidoarjo and Surabaya. |
| | Sepanjang (Sidoarjo) | • Intermodal gateway center to connect Mojokerto and Surabaya. |

Source: JICA Study Team

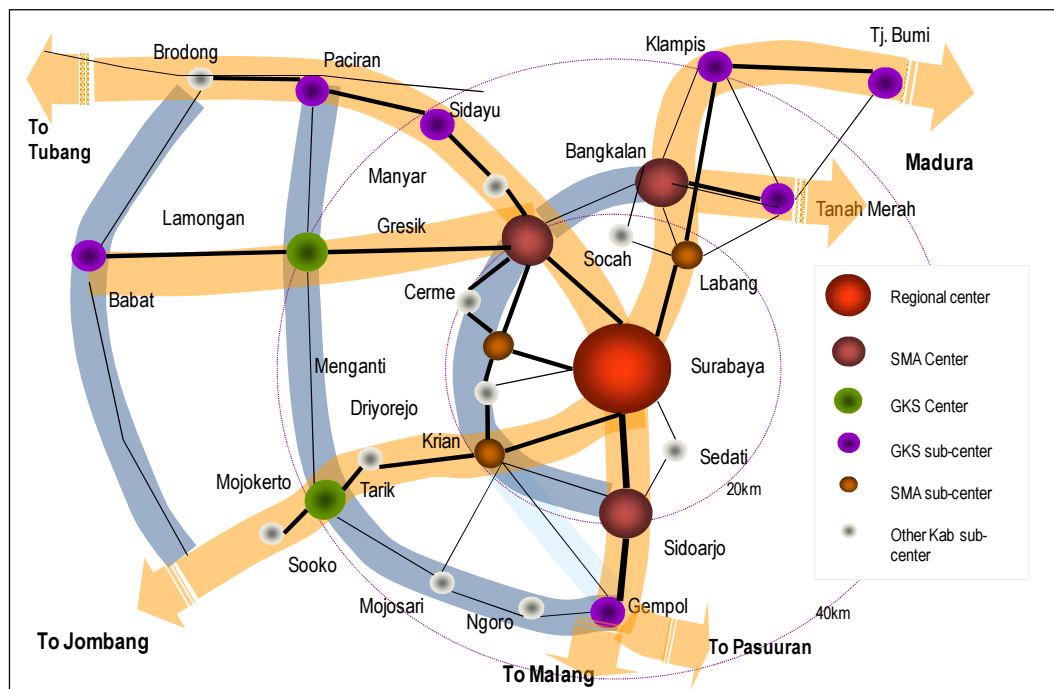


Figure 4.1.3 Conceptual Structure of the GKS Urban and Settlement Center Hierarchy

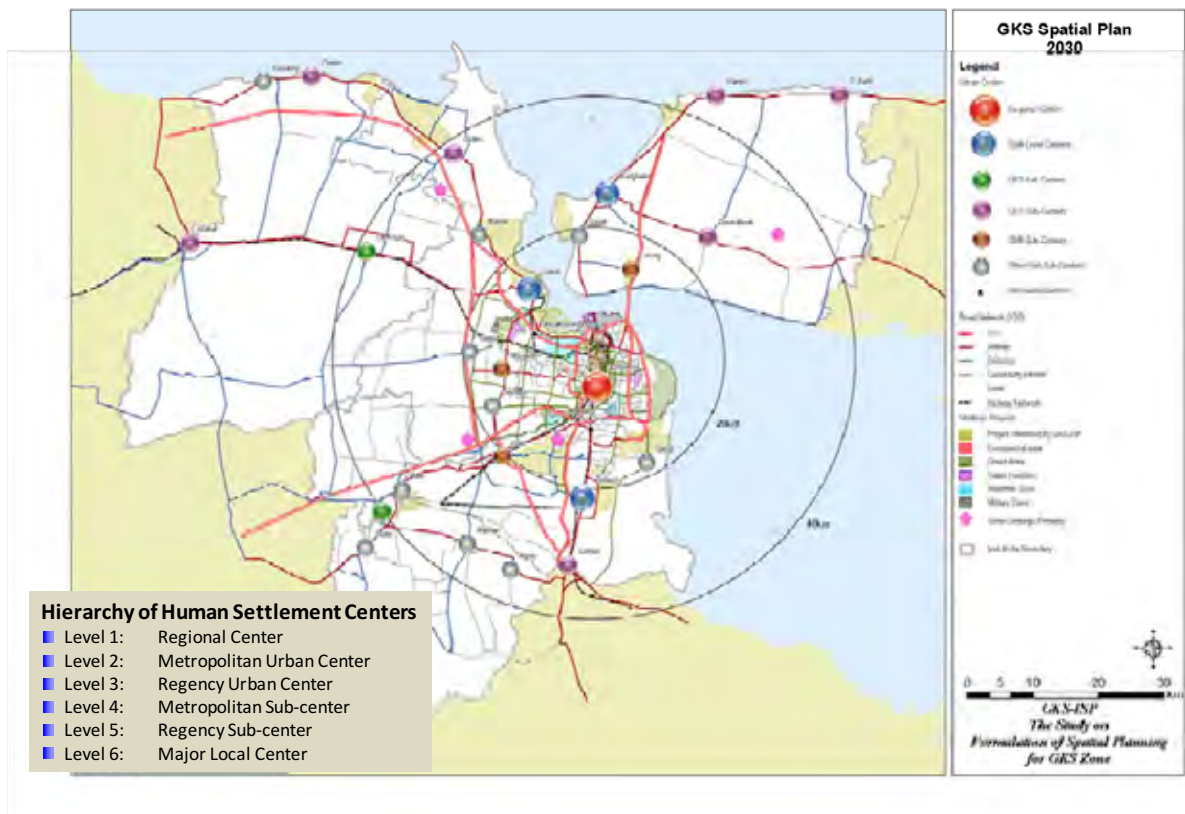


Figure 4.1.4 Spatial Structure of Strategic Urban Centers and Road Network in GKS Zone

4.1.3 Development Strategies for the Urban and Functional Centers

(1) Central Business District (CBD): Center of Surabaya

The CBD of Surabaya is the gateway of the GKS Zone. This area has become more attractive through urban rearrangement with services that are at par with international standards. Other congested built-up areas should be redeveloped in a similar manner. This redevelopment, together with the Suramadu Bridge, will help Surabaya become an international business and tourism destination complete with MICE functions (meeting, incentive, convention and event/exhibition).

Traffic congestion will be worse off without the proper traffic improvement plans including traffic management, traffic calming, etc. In addition to the improvement of the business environment, raising the living conditions in the central area of Surabaya is also important.

(2) Existing Built-up Areas around the CBD

The existing built-up area in Surabaya is highly populated and lacks essential urban facilities, such as educational facilities, green open spaces and parks, and feeder roads. The priority in this zone, was the improvement of living conditions, especially in the creation of green open spaces and educational facilities. For this purpose, redevelopment or land readjustment projects should be planned through a bottom-up and participatory approach.

(3) Suburban Development Zone (Suburban) Surabaya

This is a key urbanization component and needs careful control to avoid sprawl and ensure sufficient public facilities and good living conditions, thus making the urban area as compact as possible.

This zone encompasses Sidoarjo, Gresik, and Mojokerto, areas within a 20-km radius from Surabaya, which can be considered within commuting distance to the city. New town developments in this area are expected to provide quality residential and working areas together with nearby industrial developments. This zone is also expected to serve as transportation nodes with logistics and intermodal exchange functions.

(4) GKS and SMA Sub-centers

After Surabaya, GKS subcenters also provide essential urban services like business, commercial, trade and others which link Surabaya with subregional centers and wherein other urban centers, in turn, link up with the hinterland. In effect, these subcenters function as significant parts of the whole, which is the Greater Surabaya Integrated Economy. These subcenters should be linked through well-formed transportation networks.

(5) Industrial Zones

On existing industrial areas, emphasis was given to the mitigation of adverse environmental impacts through such actions: (i) Clustering industries to deal with them in a collective way; and/or (ii) Relocating polluting industries from built-up areas.

Environmental sustainability is critical because in the future massive land areas will be developed to accommodate new industries. Each kabupaten/kota RTRW had a proposed industrial estate in the GKS Zone. Most of them are located along existing industrial corridors and a ring road that arches on a 20-km radius. Accommodating these industries will require a good road network, the development of a proper logistics base, and other essential infrastructure and utilities, such as water supply, etc. In the introduction of industries in industrial estates, which Bangkalan, Gresik and Lamongan are considering, it was suggested that resource-based industries, i.e., agriculture, fishery, local technology and human resources, should be selected for better economic impacts.

4.1.4 Urban–Rural Linkage

Backward rural areas in the GKS will be strengthened by linking the centers and urban areas through vibrant socioeconomic activities, which led to idea that the rural areas should likewise be grouped in a hierarchical manner linked by efficient infrastructure.

(1) Strengthening Rural Service Centers

The formulation of the rural system in East Java's spatial plan establishes a three-tier village hierarchy, as shown below and in Figure 4.1.5.

1. Inter-village service centers (PPL);
2. Service center of each village (PPD); and
3. Service center in one, or several, hamlets or groups of settlements (PPD).

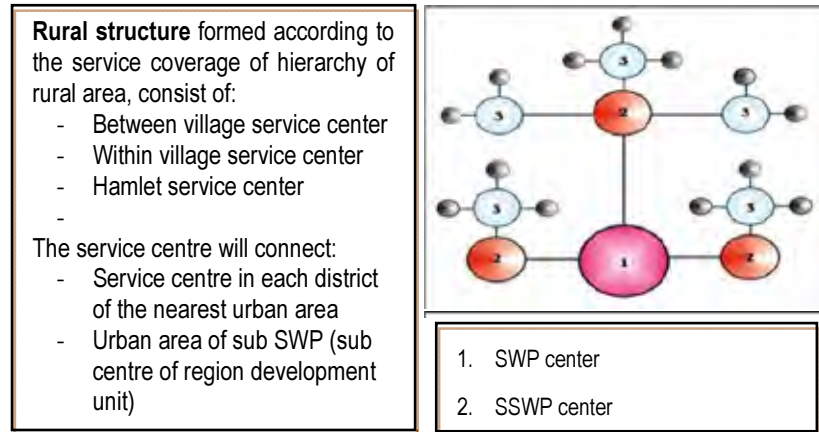
In this hierarchy rural service centers should have economic inter-relationships with urban centers. The structure of rural space is an effort to accelerate the growth of WP centers.

(2) Enhancement of Agricultural Productivity

So that the whole rural economy will be vitalized, not only the subcenters, development of the *desa* is essential. The Dynamic, Diverse *Desa* Economy, or "3D Economy," will be pursued for this purpose. To achieve this, the following policies will be carried out:

- Enhancement of farmers cooperatives;

- Provision of financial support;
- Provision of information and technical advice; and
- Improvement of seed productivity, irrigation, fertilizer use, post-harvest activities, etc.



Source: RTRW of East Java Province

Figure 4.1.5 Conceptual Rural Spatial Structure in East Java

(3) Diversification of Agri-business

Improvement of agricultural productivity and agro-industry development also entails a need for diversification. The Japanese model has two examples: one village one product (*satu desa satu produk*) and roadside station (*jalan stasium*).



Figure 4.1.6 Urbanization Policies and Urban Development Strategies for GKS Zone

4.2 Transportation Network

4.2.1 Transportation Demand Scenarios

(1) Increase in Registered Vehicles

The continuing annual increase in the number of registered vehicles is a ready assumption. The total number of registered vehicles in the future can be calculated as shown in Table 4.2.1. The total number of registered motorcycles will be six million, 2.5 times more than the current number, while passenger cars will be 697,000, twice as many as at present.

Table 4.2.1 Estimates of Future Vehicle Registration

| Item | 2009 | 2010 | 2020 | 2030 |
|---------------------|-------|-------|-------|-------|
| Passenger Car (000) | 366 | 381 | 539 | 697 |
| Increase Rate (%) | 1.0 | 1.0 | 1.5 | 1.9 |
| Motorcycle (000) | 2,424 | 2,596 | 4,308 | 6,021 |
| Increase Rate (%) | 1.0 | 1.1 | 1.8 | 2.5 |

Source: JICA Study Team

(2) Estimated Vehicle Ownership among Households

The Commuter Survey showed a strong link between household income and vehicle ownership. The household income distribution patterns by 2030 were projected based on the assumption that the 2030 household income will be 1.41 higher than current levels as obtained from the increase of GRDP per capita. Changes in vehicle ownership in the future are shown in Figure 4.2.1, which is based on the increases in household incomes. The number of households owning a passenger car will increase 2.5 times, or 542,000, and that for households owning a motorcycle will grow 1.5 times.

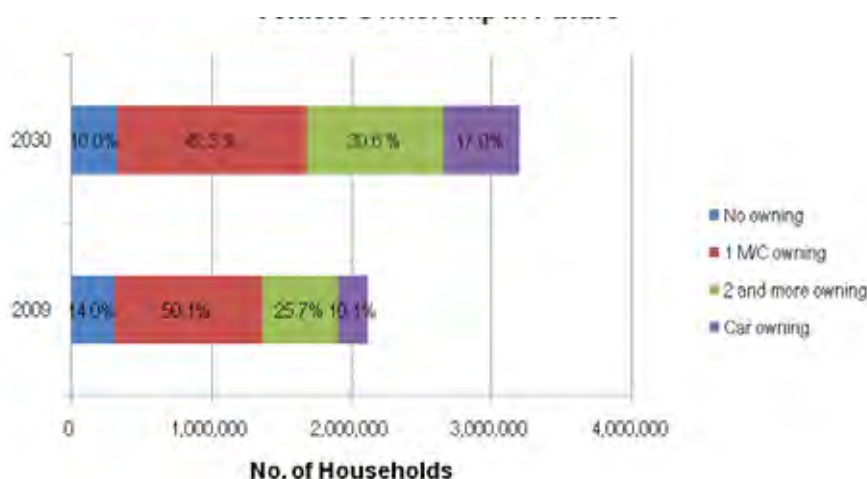


Figure 4.2.1 Estimates of Future Vehicle Ownership

(3) Traffic Demand Projections

Traffic demand forecasts were done by applying the conventional four-step models: trip production and attraction, trip distribution, modal share, and traffic assignment. The methodology was

grouped into two steps: (1) the step to build models for estimating future OD matrix, and (2) the step to estimate traffic volumes on the network. The former step comprises the following: trip production and attraction, trip distribution, and modal share models, while the latter comprises the traffic assignment model.

Total Trips Estimates in the Future

The first step in forecasting was to identify the total number of trips in the study area. For this task, the trip rate by travel purpose was applied, as shown in Table 4.2.2. By 2030 the number of trips generated in the GKS would be **31 million person trips** per day, which is 1.5 times that of the current level.

Table 4.2.2 Future Trip Estimates

| Trip Purpose | Trip Rate | No. of Trips (000) | | | |
|----------------------------|-----------|--------------------|-------------|-------------|-------------|
| | | 2009 | 2010 | 2020 | 2030 |
| To work | 0.34 | 3,154 | 3,282 | 4,056 | 4,764 |
| To school | 0.26 | 2,459 | 2,559 | 3,162 | 3,714 |
| Business | 0.13 | 1,226 | 1,276 | 1,577 | 1,852 |
| Private | 0.37 | 3,497 | 3,639 | 4,497 | 5,282 |
| To home | 1.11 | 10,336 | 10,756 | 13,293 | 15,613 |
| Total | 2.21 | 20,672 | 21,512 | 26,587 | 31,226 |
| <i>Increase (2009=1.0)</i> | | <i>1.00</i> | <i>1.04</i> | <i>1.29</i> | <i>1.51</i> |

Source: JICA Study Team

Base Year Road Network Development

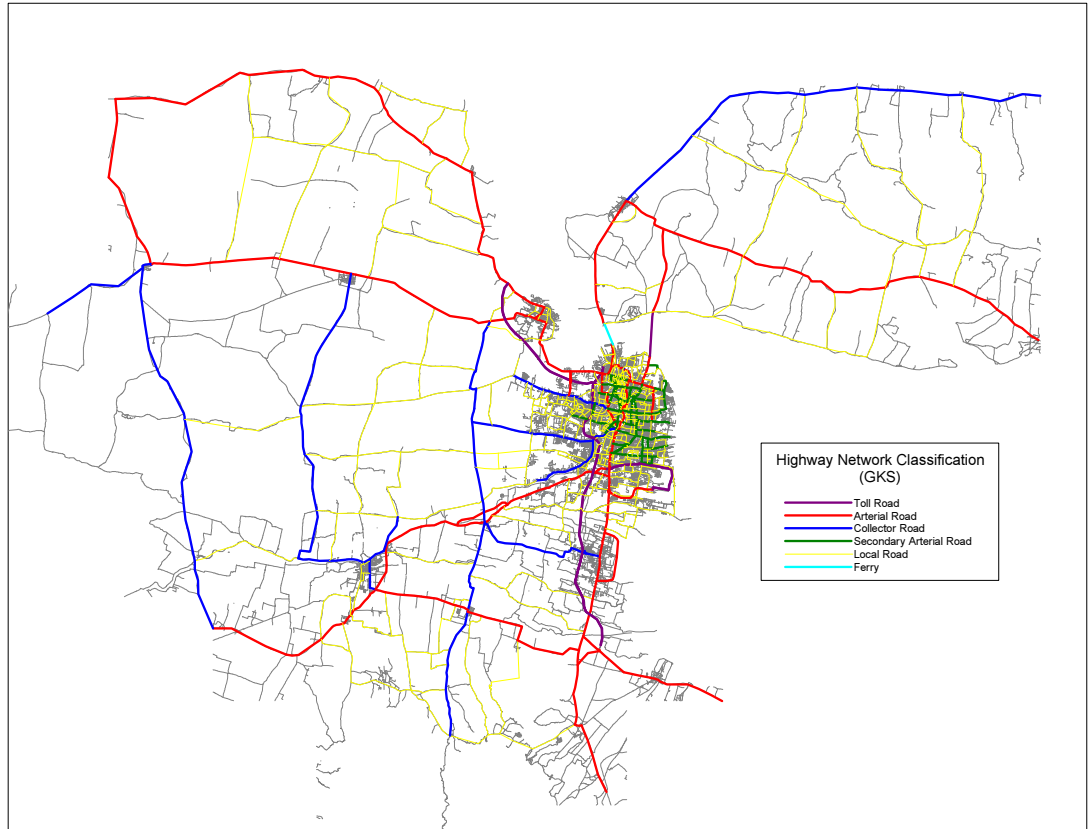
Two categories were developed in the network database for the Study: a highway network and a public transportation network (transit network). A highway network comprises nodes, representing intersections or junctions, and links with nodes at both ends, representing road segments. Each link has attributes such as travel speed, link length, possible capacity, etc., which were used for searching the minimum-cost routes in the network. The attributes were specified according to road class: toll, arterial, collector, secondary arterial, and local roads. The developed highway network represents the current conditions (i.e., 2009) or base year, as illustrated in Figure 4.2.2.

Increase of Congestion on the Network

Network traffic was forecasted by estimating travel demand, thereby creating an origin-destination (OD) matrix. The resulting estimates were based on the following cases:

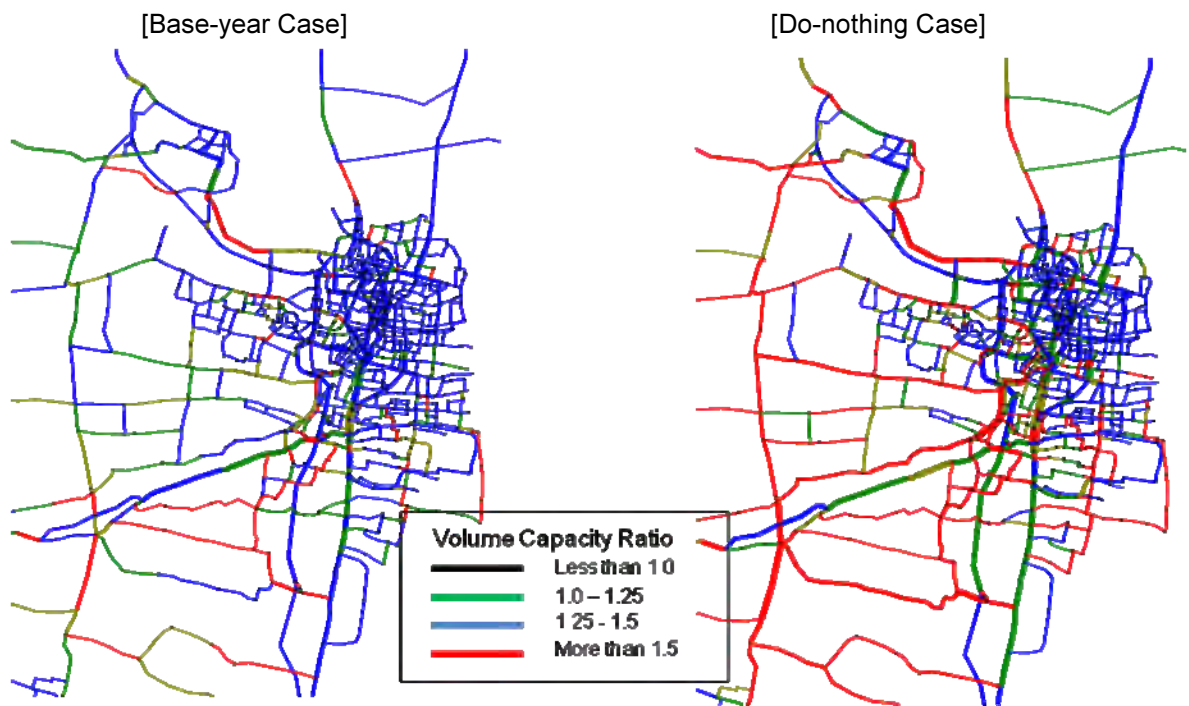
- **Base-year Case:** Assigns current travel demand on the base-year network. This will be the basis wherein the other alternatives can be evaluated.
- **Do-nothing Case:** Assigns future travel demand on the base-year network. This is an imaginary case, which can indicate the necessity for road construction and improvement to meet future demand.

The estimates are shown in Figure 4.2.3. If no action is taken to improve traffic capacity, traffic concentrations with a volume capacity ratio of over 1.5 will occur on many roads that connect to central Surabaya and the suburban areas.



Source: JICA Study Team

Figure 4.2.2 Base-year Network for Demand Forecast (Kota Surabaya)



Source: JICA Study Team

Figure 4.2.3 Traffic Congestion Estimates in SMA

4.2.2 Road Development

(1) Road Development Corridors

Regional and metropolitan spatial structures are formed through major road corridors that usually form radials and rings. Ring and radial roads should be composed of primary arterial roads or toll roads if they are economically and financially viable. A proposal for a long-term regional road development network is shown in Figure 4.2.4 for the whole GKS Zone, and in Figure 4.2.5 and Figure 4.2.6 for Surabaya. The numbers in parenthesis in the figures in the text below refer to the corridors' codes.

(2) Radial Corridors

Currently, the GKS has five radial corridors, namely Paciran–Tuban corridor [1], Lamongan corridor [2], Mojokerto corridor [4], Sidoarjo corridor [5], and Bangkalan corridor [6]. Each corridor is served by at least one primary arterial road. In addition to these five radial corridors, a westward corridor [3] which runs from Surabaya to southern Kabupaten Gresik and southern Kabupaten Lamongan should be added as one of the major road corridors. Large housing and industrial developments are planned in this corridor.

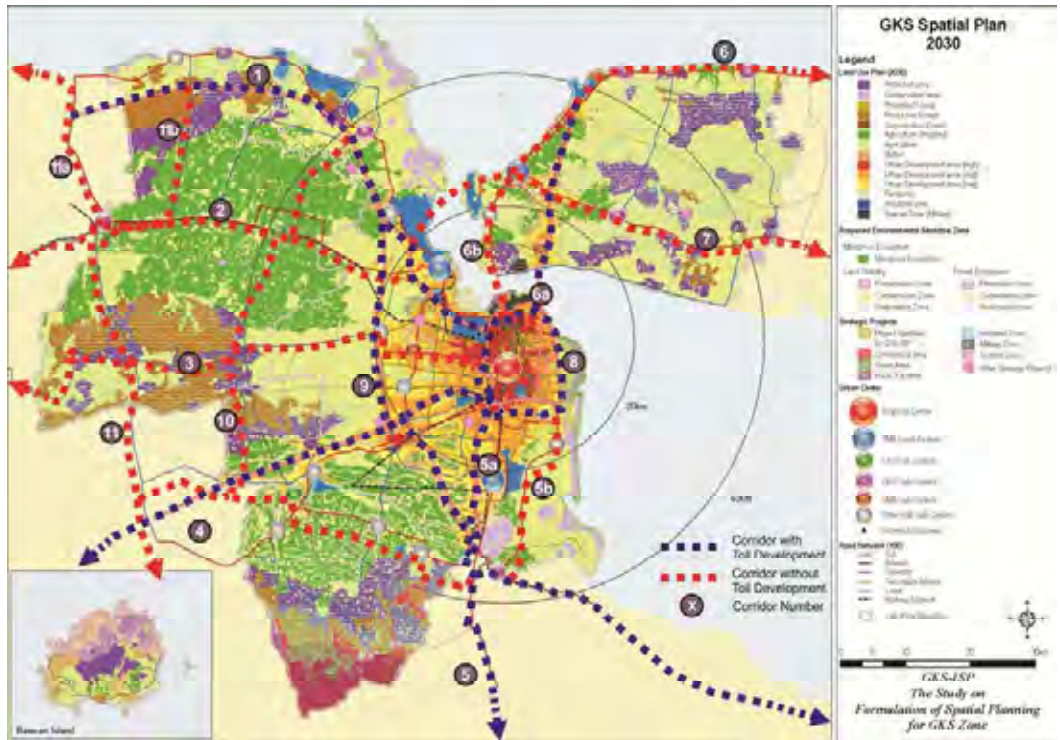
Another corridor [5b], which runs from the east coast of Sidoarjo and directly connects Kota Surabaya and Kabupaten Pasuruan without going through the center of Sidoarjo should be added especially for transporting freight. A new toll development which directly connects Krian and Porong/Gempol (i.e., south of [9]) has also been added to the corridor network.

(3) Ring Corridors

There are three major ring corridors in East Java, namely the Surabaya ring corridor [8], the SMA corridor [9] running near the periphery of SMA, and the Trans-GKS corridor [10] running through the GKS outside the SMA. Another corridor, the Tuban–Malang corridor [11], will function as a regional trunk road in the GKS Plus and the areas in Malang.

For Surabaya Metropolitan Area (SMA), taking all the existing development plans into consideration, two cases of road corridors were presented for the SMA, specifically for Surabaya. These were: a moderate case (Figure 4.2.5), and an expressway-intensive case (Figure 4.2.6). In both cases, roads will be developed in a grid pattern. This structure needs further strengthening through the provision of arterial roads, as shown in Figure 4.2.5. There are several north-south corridors that will constitute part of the ring roads and combine with Surabaya–Gresik, Surabaya–Mojokerto, Waru–Juanda, and Perak–Suramadu (planned) toll roads. Those new corridors are called in the order from east to west as:

- i) Outer East Ring Road [8a];
- ii) Middle East Ring Road (MERR) [8b];
- iii) Inner East Ring Road [6a];
- iv) Middle West Ring Road (MWRR) [12];
- v) Outer West Ring Road I [13]; and
- vi) Outer West Ring Road II [14].



Source: JICA Study Team

Figure 4.2.4 Road Development Corridors in GKS Zone



Source: JICA Study Team

Figure 4.2.5 Road Development Corridors in Surabaya (Moderate Case)



Source: JICA Study Team

Figure 4.2.6 Road Development Corridors in Surabaya (Expressway-Intensive Case)

(4) Comparison of Planned Toll Roads in Surabaya

In Surabaya’s inner city, in the expressway-intensive case, two parallel toll roads namely MERR toll road [8a] and Surabaya East Ring Road (SERR) [8b], which is located on the Outer East Ring Road, have been planned. The planned Waru–Wonokoromo–Tg. Perak (WWTP) toll road was also included for comparison, as shown in Figure 4.2.7.

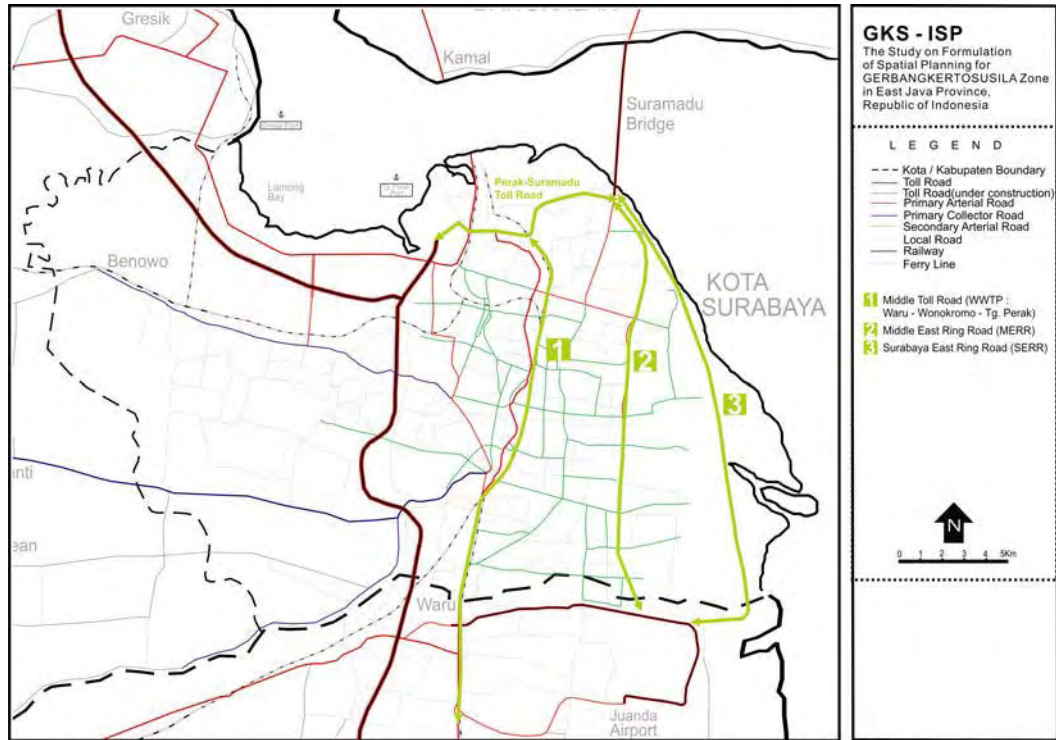
In assessing the viability of these alternative toll roads, a cost–benefit analysis was conducted to calculate the B/C ratio, as well as the financial internal rate of return (FIRR) on assumptions that only one of the above toll roads was constructed and that a distance-proportional toll tariff of Rp.1,000/km was applied. Results are shown in Table 4.2.3. Even under the assumption of a robust traffic, the elevated WWTP and MERR toll roads were considered not viable due to the high construction costs. Only the SERR toll road [8b] would be viable with a B/C ratio well over 1.0 and a decent FIRR.

Table 4.2.3 Demand Forecast and Project Viability of Planned Toll Roads

| Alt.No. | Corridor No. | Toll Road | Cost (bil. Rp.) | B/C Ratio | FIRR | Remarks |
|---------|--------------|----------------|--------------------|-----------|--------|----------|
| 1 | 5c | WWTP Toll Road | 5,177 (or more) | 0.68 | (2.0%) | Elevated |
| 2 | 8b | MERR Toll Road | 4,522 | 0.42 | - | Elevated |
| 3 | 8a | SERR Toll Road | 1,386 | 1.51 | 11.0% | At grade |

Source: JICA Study Team

Notes: WWTP: Waru–Wonokoromo–Tg. Perak, MERR: Middle East Ring Road, SERR: Surabaya East Ring toll Road



Source: JICA Study Team

Figure 4.2.7 Planned Alternative Toll Roads in Surabaya

On the other hand, traffic demand on the major north-south roads was forecasted from the analysis of the effects of the traffic volume reduction due to the toll road(s). Demand forecasts on corridors 5c, 8b, and 8a, for the years 2015, 2020, and 2030 are presented in Table 4.2.4. While the WWTP would reduce significant traffic (i.e. 32,000 pcu/day) on the major arterial roads, a relatively small traffic volume reduction (i.e. 6,000 pcu/day) is expected on MERR, which means that the MERR toll road will not benefit from a traffic volume reduction scheme. For this reason, it was dropped from the alternatives.

Table 4.2.4 Demand Forecast of Existing and Planned Toll Roads

| Year 2030 | | Traffic Volume (PCU/day) | | | | | | | Total (PCU/day) | | Total (PCU/day) |
|-----------|-----------------------|--------------------------|-------------|--------|-----------|-----------|-----------|--------|-----------------|---------------|-----------------|
| Case | Toll Road Combination | Toll Sur-Gem | A Yani (5c) | WWTP | MERR (8b) | Toll MERR | OERR (8a) | SERR | Toll Road | Arterial Road | Total (PCU/day) |
| A | SERR | 174,377 | 130,190 | - | 51,987 | - | 56,009 | 48,594 | 222,971 | 238,186 | 461,157 |
| B | MERR | 173,094 | 126,312 | - | 49,772 | 54,061 | 55,592 | - | 227,155 | 231,676 | 458,831 |
| C | WWTP | 161,265 | 111,338 | 58,133 | 50,444 | - | 55,621 | - | 219,398 | 214,403 | 436,801 |
| D | SERR, WWTP | 160,141 | 110,759 | 45,063 | 50,091 | - | 54,063 | 29,153 | 234,356 | 214,913 | 449,269 |
| E | MERR, WWTP | 159,237 | 110,246 | 44,263 | 50,680 | 32,026 | 53,620 | - | 235,526 | 214,546 | 450,072 |
| F | SERR, MERR, WWTP | 159,283 | 110,333 | 43,976 | 49,551 | 27,053 | 53,345 | 10,617 | 240,929 | 213,229 | 454,158 |
| G | None of the above | 200,375 | 136,170 | - | 55,501 | - | 57,564 | - | 200,375 | 249,235 | 449,610 |

| Year 2020 | | Traffic Volume (PCU/day) | | | | | | | Total (PCU/day) | | Total (PCU/day) |
|-----------|-----------------------|--------------------------|-------------|--------|-----------|-----------|-----------|-------|-----------------|---------------|-----------------|
| Case | Toll Road Combination | Toll Sur-Gem | A Yani (5c) | WWTP | MERR (8b) | Toll MERR | OERR (8a) | SERR | Toll Road | Arterial Road | Total (PCU/day) |
| A | SERR | 142,063 | 91,986 | - | 44,729 | - | 54,212 | 7,690 | 149,753 | 190,927 | 340,680 |
| B | MERR | 142,109 | 92,095 | - | 43,838 | 8,028 | 53,891 | - | 150,137 | 189,824 | 339,961 |
| C | WWTP | 136,360 | 90,596 | 11,928 | 44,416 | - | 50,757 | - | 148,288 | 185,769 | 334,057 |
| D | SERR, WWTP | 133,088 | 90,153 | 10,802 | 43,871 | - | 52,046 | 6,665 | 150,555 | 186,070 | 336,625 |
| E | MERR, WWTP | 133,638 | 90,319 | 10,686 | 42,930 | 6,574 | 51,762 | - | 150,898 | 185,011 | 335,909 |
| F | SERR, MERR, WWTP | 133,281 | 90,287 | 10,597 | 42,600 | 5,038 | 51,548 | 3,817 | 152,733 | 184,435 | 337,168 |
| G | None of the above | 146,863 | 92,515 | - | 44,156 | - | 53,595 | - | 146,863 | 190,266 | 337,129 |

| Year 2015 | | Traffic Volume (PCU/day) | | | | | | | Total (PCU/day) | | Total (PCU/day) |
|-----------|-----------------------|--------------------------|-------------|-------|-----------|-----------|-----------|-------|-----------------|---------------|-----------------|
| Case | Toll Road Combination | Toll Sur-Gem | A Yani (5c) | WWTP | MERR (8b) | Toll MERR | OERR (8a) | SERR | Toll Road | Arterial Road | Total (PCU/day) |
| A | SERR | 100,950 | 90,766 | - | 38,657 | - | 50,228 | 2,746 | 103,696 | 179,651 | 283,347 |
| B | MERR | 100,602 | 90,727 | - | 44,172 | 2,808 | 49,751 | - | 103,410 | 184,650 | 288,060 |
| C | WWTP | 97,931 | 89,057 | 5,127 | 38,528 | - | 49,115 | - | 103,058 | 176,700 | 279,758 |
| D | SERR, WWTP | 97,362 | 88,957 | 4,854 | 38,500 | - | 49,815 | 2,247 | 104,463 | 177,272 | 281,735 |
| E | MERR, WWTP | 97,308 | 89,049 | 4,768 | 43,509 | 2,125 | 49,399 | - | 104,202 | 181,957 | 286,159 |
| F | SERR, MERR, WWTP | 97,239 | 89,050 | 4,761 | 43,439 | 1,860 | 49,633 | 1,319 | 105,178 | 182,122 | 287,300 |
| G | None of the above | 102,214 | 90,853 | - | 38,528 | - | 49,418 | - | 102,214 | 178,799 | 281,013 |

Source: JICA Study Team

Note: Shaded cells indicate non-toll roads.

Furthermore, demand forecast was revised again taking into account traffic diversions from the parallel non-toll arterial roads (i.e., Jl. A. Yani, MERR, OERR) to the remaining two alternative toll roads, i.e., the SERR and the WWTP. A 0.8 volume-capacity (V/C) ratio was applied to assume the "cap volume" on these non-toll arterial roads. In an equilibrium situation, these non-toll roads

were nearly saturated, and the exceeding traffic were assumed to be diverted to the toll roads (i.e., from Jl. A. Yani and MERR to the WWTP, and from OERR to the SERR) which were considered as potential traffic to be added to the volume on the toll roads. Thus, construction of the WWTP could be supported from the traffic diversion point of view. In conclusion, both the SERR and the WWTP toll roads are included in the transportation action plan.

Nevertheless, it should be noted that high traffic volumes (23,000 pcu/day in Case D) is already expected on the WWTP even for 2015 (i.e., short term), as shown in Table 4.2.5, and that the development of the WWTP is classified as short term. This means that the alleviation of the current traffic congestion on Jl. A. Yani should urgently be solved. If construction of the WWTP is not implemented soon, the Study Team recommends the construction of continuous flyovers on Jl. A. Yani to help to increase traffic capacity and alleviate congestion by securing through traffic on the main road.

Table 4.2.5 Revised Traffic Demands with Toll Road Diversion Schemes

| 2030 | | | | | | | | | | | | | | | | | | | | |
|------|--------------|------|------------|----------------------------|-----------|------|------------|----------------------------|-----------|------|------------|----------------------------|-----------------|-----------------------------|--------------|-----------------|-----------------------------|--------------|---|---|
| Case | A. Yani (5c) | | | | MERR (8b) | | | | OERR (8a) | | | | WWTP | | | SERR | | | | |
| | Capacity | V/C | Cap Volume | Potential Traffic for WWTP | Capacity | V/C | Cap Volume | Potential Traffic for WWTP | Capacity | V/C | Cap Volume | Potential Traffic for SERR | Original Volume | Additional Potential Volume | Total Volume | Original Volume | Additional Potential Volume | Total Volume | | |
| A | 101,000 | 0.8 | 80,800 | - | 56,000 | 0.8 | 44,800 | - | 56,000 | 0.8 | 44,800 | 11,209 | - | - | - | 48,594 | 11,209 | 59,803 | | |
| B | | 0.8 | 80,800 | - | | 0.8 | - | - | | 0.8 | 44,800 | 10,792 | - | - | - | - | - | - | - | - |
| C | | 0.8 | 80,800 | 30,538 | | 0.8 | 44,800 | 5,644 | | 0.8 | 44,800 | 10,821 | 58,133 | 36,182 | 94,315 | - | - | - | - | - |
| D | | 0.8 | 80,800 | 29,959 | | 0.8 | - | - | | 0.8 | 44,800 | 9,263 | 45,063 | 29,959 | 75,022 | 29,153 | 9,263 | 38,416 | - | - |
| E | | 0.8 | 80,800 | 29,446 | | 0.8 | 44,800 | 5,880 | | 0.8 | 44,800 | 8,820 | 44,263 | 35,326 | 79,589 | - | - | - | - | - |
| F | | 0.8 | 80,800 | 29,533 | | 0.8 | - | - | | 0.8 | 44,800 | 8,545 | 43,976 | 29,533 | 73,509 | 10,617 | 8,545 | 19,162 | - | - |
| G | | 1.62 | 136,170 | - | | 0.99 | 55,501 | - | | 1.03 | 57,564 | - | - | - | - | - | - | - | - | - |
| 2020 | | | | | | | | | | | | | | | | | | | | |
| Case | A. Yani (5c) | | | | MERR (8b) | | | | OERR (8a) | | | | WWTP | | | SERR | | | | |
| | Capacity | V/C | Cap Volume | Potential Traffic for WWTP | Capacity | V/C | Cap Volume | Potential Traffic for WWTP | Capacity | V/C | Cap Volume | Potential Traffic for SERR | Original Volume | Additional Potential Volume | Total Volume | Original Volume | Additional Potential Volume | Total Volume | | |
| A | 101,000 | 0.8 | 80,800 | - | 56,000 | 0.8 | 0 | - | 56,000 | 0.8 | 44,800 | 9,412 | - | - | - | 7,690 | 9,412 | 17,102 | | |
| B | | 0.8 | 80,800 | - | | 0.8 | 0 | - | | 0.8 | 44,800 | 9,091 | - | - | - | - | - | - | - | |
| C | | 0.8 | 80,800 | 27,681 | | 0.8 | 0 | 0 | | 0.8 | 44,800 | 5,957 | 11,928 | 27,681 | 39,609 | - | - | - | - | |
| D | | 0.8 | 80,800 | 27,401 | | 0.8 | 0 | - | | 0.8 | 44,800 | 7,246 | 10,802 | 27,401 | 38,203 | 6,665 | 7,246 | 13,911 | - | - |
| E | | 0.8 | 80,800 | 27,167 | | 0.8 | 0 | 0 | | 0.8 | 44,800 | 6,962 | 10,686 | 27,167 | 37,853 | - | - | - | - | |
| F | | 0.8 | 80,800 | 26,832 | | 0.8 | 0 | - | | 0.8 | 44,800 | 6,748 | 10,597 | 26,832 | 37,429 | 3,817 | 6,748 | 10,565 | - | - |
| G | | 1.1 | 92,515 | - | | 0.79 | 44,156 | - | | 0.96 | 53,595 | - | - | - | - | - | - | - | - | |
| 2015 | | | | | | | | | | | | | | | | | | | | |
| Case | A. Yani (5c) | | | | MERR (8b) | | | | OERR (8a) | | | | WWTP | | | SERR | | | | |
| | Capacity | V/C | Cap Volume | Potential Traffic for WWTP | Capacity | V/C | Cap Volume | Potential Traffic for WWTP | Capacity | V/C | Cap Volume | Potential Traffic for SERR | Original Volume | Additional Potential Volume | Total Volume | Original Volume | Additional Potential Volume | Total Volume | | |
| A | 101,000 | 0.8 | 80,800 | - | 56,000 | 0.8 | 0 | - | 56,000 | 0.8 | 44,800 | 5,428 | - | - | - | 2,746 | 5,428 | 8,174 | | |
| B | | 0.8 | 80,800 | - | | 0.8 | 0 | - | | 0.8 | 44,800 | 4,951 | - | - | - | - | - | - | - | |
| C | | 0.8 | 80,800 | 17,699 | | 0.8 | 0 | 0 | | 0.8 | 44,800 | 4,315 | 5,127 | 17,699 | 22,825 | - | - | - | - | |
| D | | 0.8 | 80,800 | 18,026 | | 0.8 | 0 | - | | 0.8 | 44,800 | 5,015 | 4,854 | 18,026 | 22,880 | 2,247 | 5,015 | 7,262 | - | - |
| E | | 0.8 | 80,800 | 17,616 | | 0.8 | 0 | 0 | | 0.8 | 44,800 | 4,599 | 4,768 | 17,616 | 22,385 | - | - | - | - | |
| F | | 0.8 | 80,800 | 17,844 | | 0.8 | 0 | - | | 0.8 | 44,800 | 4,833 | 4,761 | 17,844 | 22,605 | 1,319 | 4,833 | 6,152 | - | - |
| G | | 1.08 | 90,853 | - | | 0.69 | 38,528 | - | | 0.88 | 49,418 | - | - | - | - | - | - | - | - | |

Source: JICA Study Team

Notes: Assumption the V/C ratio is maximum 0.8

Capacity of Frontage Roads on Jl. A. Yani = 17,000 PCU/day

(5) Road Development Projects

In proposing road development projects, the JICA Study Team reviewed not only the roads listed in the ARSDS-GKS Master Plan (1997) but also the new road and flyover plans prioritized by each local government, reviewing them in light of the corridor developments and road network hierarchy. The road development projects are shown in Figure 4.2.8. These projects were included in the future road network and were tested in terms of future demand in the process of sorting them into projects for the short term, 2015.

Priority Roads

Also in the short term, four prioritized east–west arterial road projects were proposed together with two road projects along the north–south corridor. Four toll roads to be prioritized in the short term are the following:

- Widening and improvement of Surabaya–Gempol and Surabaya–Gresik road sections;
- New toll road connecting Kabupaten Gresik up to Kabupaten Tuban;
- New toll road connecting Kota Surabaya and Kabupaten Mojokerto; and
- New toll road connecting Waru–Wonokoromo–Tg. Perak (WWTP).

In Kabupaten Bangkalan, there is a plan to improve the access road between Suramadu Access Road and that in Socah Industrial Estate in Kota Bangkalan. These access roads are also important for port development in Socah (Madura Seaport City).

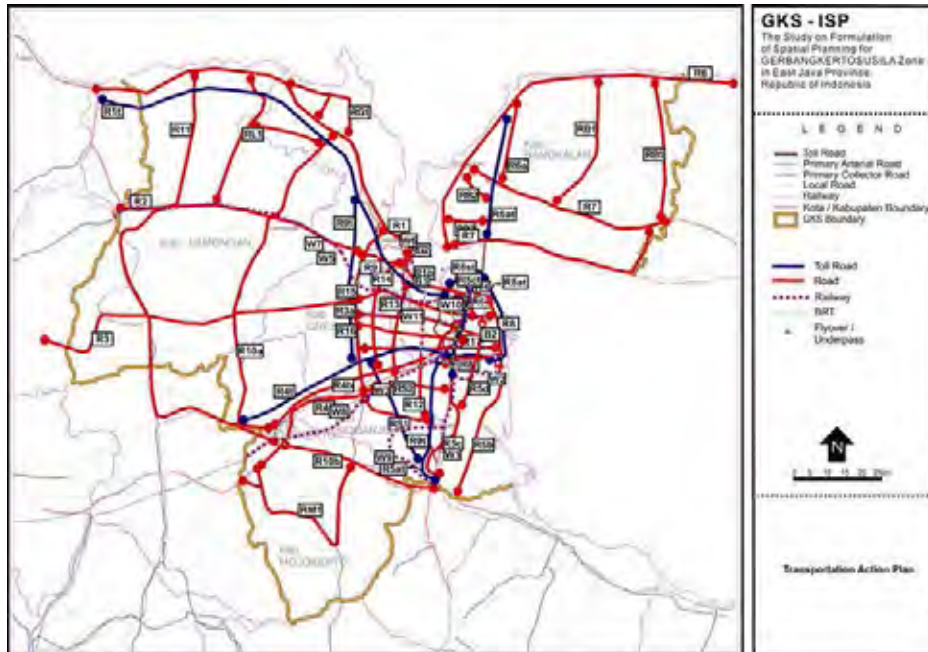
Also proposed are primary arterial roads to connect Kabupaten Mojokerto to Kabupaten Pasuruan, road connecting Kabupaten Mojokerto to Kota Surabaya [R4a] and [R4b], and an arterial road [R8] that will connect Waru-Juanda through the “frontage road” of SERR (Surabaya East Ring Road). The importance of road project [R8] in the short term is the preservation of the right-of-way (ROW) to avoid future land acquisition complications for the SERR toll road, which is a medium-term (2020) project. .

These priority projects, shown in Figure 4.2.9, will be implemented by 2015. Their attributes are summarized in Table 4.2.6.

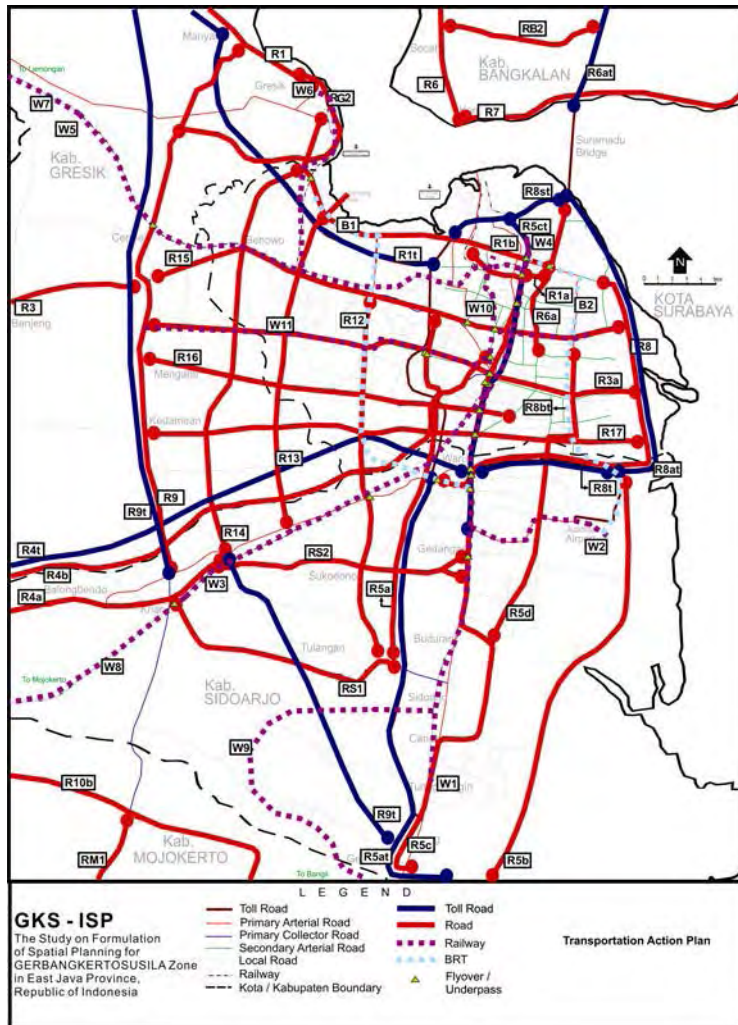
Flyover/Underpass Projects

The Study Team has recommended the construction of flyovers and underpasses as an effective countermeasure in solving congestion in major intersections and railway crossings, especially in urban areas. The proposed flyovers and underpasses for Surabaya are shown in Figure 4.2.10. These projects will require coordination between relevant agencies because, while some flyovers are to be constructed over the existing railway, there are also plans to elevate some of the railway tracks, as proposed in the public transport development. If the construction of the WWTP is not implemented soon, a series of flyovers, or underpasses, are alternatively planned for the short term along Project R5c (Jl. A. Yani) to help to smooth traffic flow along the major north-south existing corridor.

[GKS]



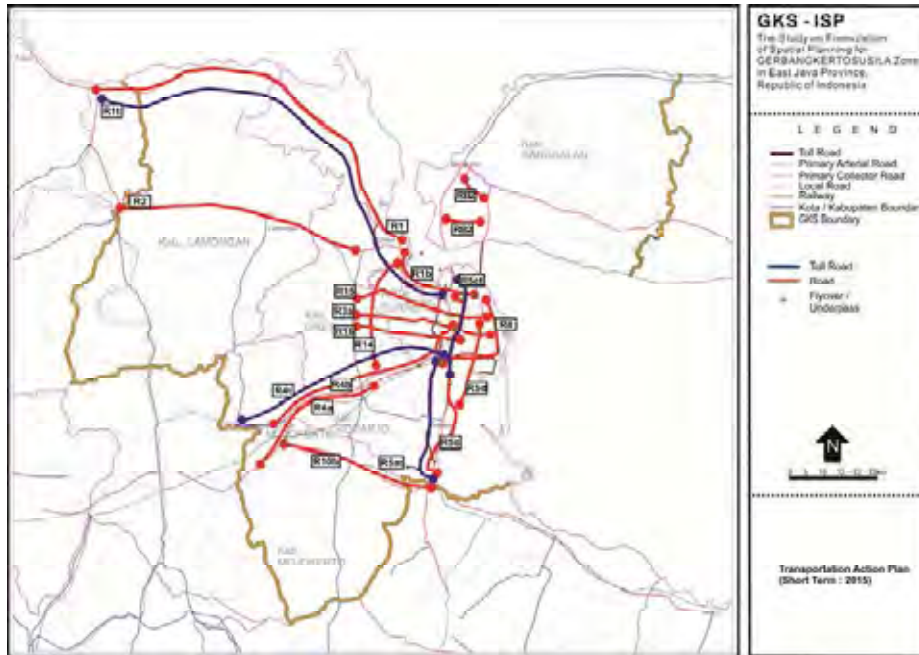
[SMA]



Source: JICA Study Team

Figure 4.2.8 Road Development Projects in GKS Zone and Surabaya

[GKS]



[SMA]



Source: JICA Study Team

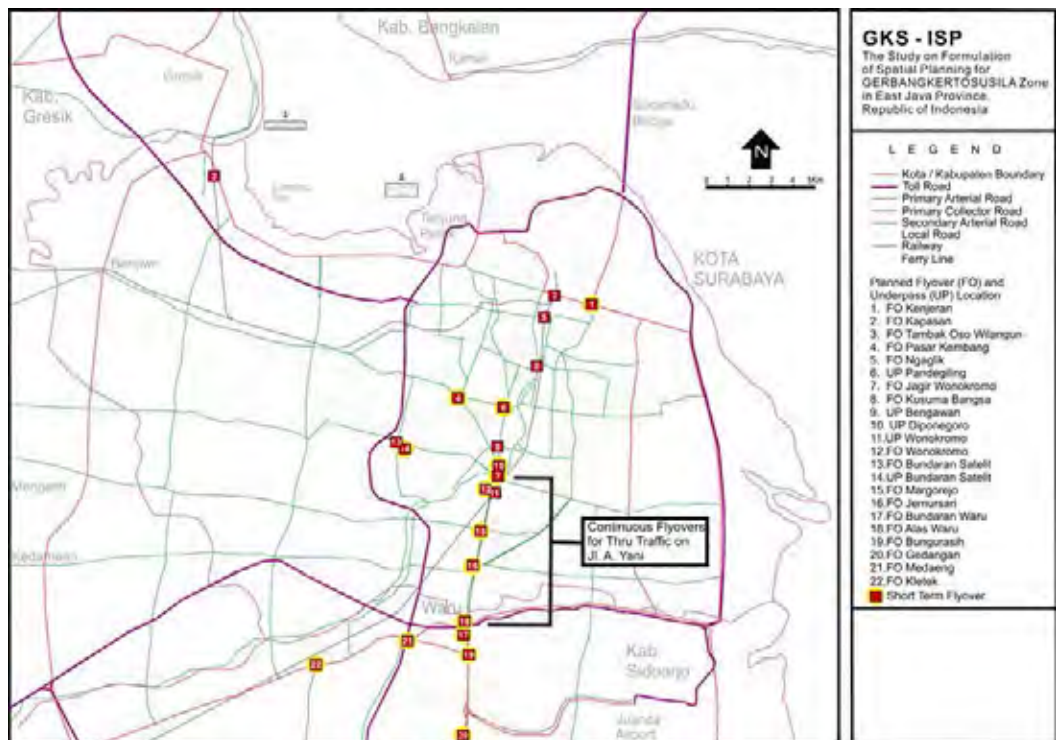
Figure 4.2.9 Short-term (2015) Priority Road Projects

Table 4.2.6 Short-term (2015) Priority Road Projects

| Package No. | Project Cost (mil. Rp) | Annual O&M Cost (mil. Rp) | Description |
|-------------|------------------------|---------------------------|--|
| 1 | 847,696 | 11,646 | This is an existing provincial road which functions as a primary arterial road passing through the northern coast of East Java where the industrial and port development is planned as a national policy. This road should be upgraded to a national road, to support the industrial development program. |
| 1b | 123,246 | 1,693 | This road includes a national road connecting Surabaya (Jl. Gresik) and Gresik City on the northern coast of Surabaya. It needs to be widened from 2 to 4 lanes, and the work is ongoing. Existing Jl. Rajawali and Jl. Kenjeran roads serve as one of the main east-west corridors connecting "East Surabaya" and "West Surabaya" in the north of Surabaya. This road also goes through Margomulyo industrial and warehouse area, and the access road development is also planned for Lamong Bay port. |
| 1t | 2,382,145 | 49,091 | This package includes development of Surabaya - Gresik toll road (widening from 4 to 6 lanes) and its extension with a total length of 80.6 kilometers. This road development will contribute to the northern coastal development of East Java as a national policy. It will also reduce the burden of existing truck traffic on Corridor 2 and will serve as an alternative freight transport route connecting Tuban with Surabaya and south of GKS. |
| 2 | 259,644 | 3,567 | This is an existing national road connecting Surabaya, Gresik, Lamongan and Babat and it currently serves as an important freight corridor as part of northern Java trunk road. Current road widening work from 2 to 4 lanes is under way. Ring roads are also planned to bypass the center of Lamongan and Babat. |
| 3a | 370,023 | 5,084 | This road is one of the important east-west corridors to be developed through Jl. Adityawarman, Jl. Jagir Wonokromo and Jl. Wonorejo (Outer East Ring Road). The Study Team proposes a new flyover connecting Jl. Adityawarman and Jl. Jagir Wonokromo in order to facilitate through traffic. Though it is a secondary arterial road, it needs to be developed as a 6-lane road with sufficient width. The Study Team also proposes a new corridor of MRT (Mass Rail Transit) in the west of Surabaya. |
| 4a | 319,918 | 4,395 | This is a national and primary arterial road connecting major sub-centers of Krian, Mojokerto, and Sooko and extending to Jombang. While Surabaya-Mojokerto Toll Road is planned parallel to this road, it is still expected to serve regional traffic as well as the industrial estate on Corridor 4, and it needs to be widened from 2 lanes into 4 lanes. |
| 4b | 487,568 | 6,698 | This is a provincial road in Surabaya while it is a kabupaten road outside Surabaya. It is an alternative road for serving traffic between Surabaya and Mojokerto and thus it should be developed as a secondary arterial road. In Wringinanom, many factories have been plotted, generating truck traffic. |
| 4t | 1,463,410 | 30,157 | This Surabaya – Mojokerto Toll Road is currently under construction (4 lanes). The total length is 33.8 kilometers with 8 lanes/2 ways in urban area and 6 lanes/2 ways in rural area as future widening. The toll road extension is planned toward Jombang and Kediri as part of Trans-Java Toll Road. |
| 5c | 371,097 | 5,098 | This is an arterial road development along the of North-South corridor from Surabaya City up to Gempol sub-center detouring the Sidoarjo mud flow. In Surabaya, frontage roads are currently being constructed on both sides of this road, and continuous flyovers are planned for through traffic. Existing railway along this corridor is planned to be developed and elevated as commuter railway service (first stage), and at-grade railway crossings will be removed. The Sidoarjo Ring Road which bypasses the center of Sidoarjo is also planned, and a relocation and reconstruction of a primary arterial road detouring Sidoarjo mud flow is in progress. |
| 5ct | 5,177,000 | 50,700 | This toll road is a national initiative toll road to alleviate traffic congestion in Jl. A. Yani. It is an elevated toll road from Waru-Wonokromo-Tg. Perak (WWTP) along 19.75 kilometers. |
| 5d | 476,170 | 6,542 | This road serves not only as an access road to the center of SIER (Surabaya Industrial Estate of Rungkut) but also as an alternative road connecting Surabaya and Sidoarjo as an extension of MERR (Middle East Ring Road), which is currently under construction. The Study Team proposes BRT (bus rapid transit) connecting Juanda Airport and Sidotopo by making use of the centermost lane of the MERR. |
| 5at | 625,908 | 12,899 | Surabaya – Gempol toll road is the first toll road in East Java, completed in 1986, and originally with 4 lanes/2 ways with a length of 43.8 kilometers. Widening to 6 lanes/2 ways have been completed in the section of Dupak – Waru, and the rest of the section needs to be widened to 6 lanes. Relocation/reconstruction of a toll road detouring Sidoarjo mud flow is in progress. |
| 8 | 645,074 | 8,862 | This is a primary arterial road development to connect Suramadu bridge and Juanda Airport, serving as a ring road (Outer East Ring Road). ROW for a toll road (SERR: Surabaya East Ring Road) has been reserved in the center of the road. This road will also serve as the boundary for development control. |

| Package No. | Project Cost (mil. Rp) | Annual O&M Cost (mil. Rp) | Description |
|--------------|------------------------|---------------------------|---|
| 10b | 160,525 | 2,205 | This is an existing national and primary arterial road with 5.5 to 6.0 meters width. Since industrial estates such as the PIER(Pasuruan Industrial Estate Rembang) and Ngoro are being developed, direct connection between Mojokerto, Mojosari, and Gempol is necessary to support industrial activities. |
| 14 | 1,497,682 | 20,576 | This primary arterial road is planned by the central government as the main North-South Corridor. The Study Team calls this road Outer West Ring Road II (OWRR II) with a total length of 22.3 km. It will pass Surabaya and will also go partly through Kabupaten Gresik and Kabupaten Sidoarjo, serving as a major bypass for passenger/freight traffic. |
| 15 | 347,102 | 4,769 | This road functions as one of the major east – west secondary arterial roads to be developed to form a grid-like road network. Box culvert construction is currently ongoing to widen the road to 4 lanes. Flyovers have been planned on Jl. Pasar Kembang and Jl. Pandegiling. The planned commuter railway development of Surabaya-Sumari-Lamongan is along this road, and the Study Team also proposes a new corridor of MRT (Kertajaya – ITS) along this road (east of Surabaya). |
| 16 | 634,769 | 8,721 | Jl. Menganti and its extension to Jl. Margorejo function as one of the major east – west secondary arterial roads to be developed. The missing link between Jl. A. Yani and Jl. Mastrip needs to be developed as a 4-lane road. |
| B2 | 335,533 | 4,610 | These primary collector roads are planned to connect the Suramadu Bridge footage area with new Socah industrial estate and port (Kabupaten sub-center). |
| Total | 16,524,508 | 237,313 | |

Source: JICA Study Team



Source: JICA Study Team

Figure 4.2.10 Proposed Flyovers and Underpasses in Surabaya

4.2.3 Public Transportation Development

(1) Rail-based Transportation Improvement

Proper public transportation should satisfy various types of transportation demand in the city. It implies that the level of the existing railway service should be improved to attract people who currently use private cars, and that improving existing railway lines and constructing new MRT lines will significantly increase passenger capacity and service coverage.

An analysis of service coverage was made in terms of commuter coverage of the existing railway stations, using such basic attributes as commuters living within 350 m (preferred walking distance), 650 m (average walking distance), or 2,000 m (easily accessible by feeder mode) from the stations. The results are summarized in Table 4.2.7 and illustrated in Figure 4.2.11. The analysis revealed that the population ratio within the 2,000-m radius is about 40% in Surabaya, 29% in the SMA, and 22% in the GKS (excluding Kabupaten Bangkalan).

Furthermore, if the rail-based network system is developed as proposed later in this section, the ratio of population covered within 2,000m is expected to be even greater, or about 53% in Surabaya, 37% in the SMA, and 28% in the GKS, as shown in Table 4.2.7 and Figure 4.2.12. Coverage within 350m and 650m is expected to increase double or even more. The analysis implies that the railway will have greater potential to attract more passengers. The coverage of the rail-based transport network will expand further if people living as far as 2,000m from a station can be served by some kind of feeder transport.

Table 4.2.7 Population Coverage by Rail-Based Transport

[Existing: 2008]

(Unit:1,000)

| Area | Total Pop. | 350 m | | 650 m | | 2000 m | |
|----------|------------|-------|-------|-------|-------|--------|--------|
| SURABAYA | 2,764 | 56 | 2.02% | 138 | 4.99% | 1,088 | 39.38% |
| SMA 1) | 5,854 | 99 | 1.69% | 236 | 4.03% | 1,692 | 28.91% |
| GKS 2) | 8,355 | 107 | 1.28% | 258 | 3.09% | 1,874 | 22.43% |

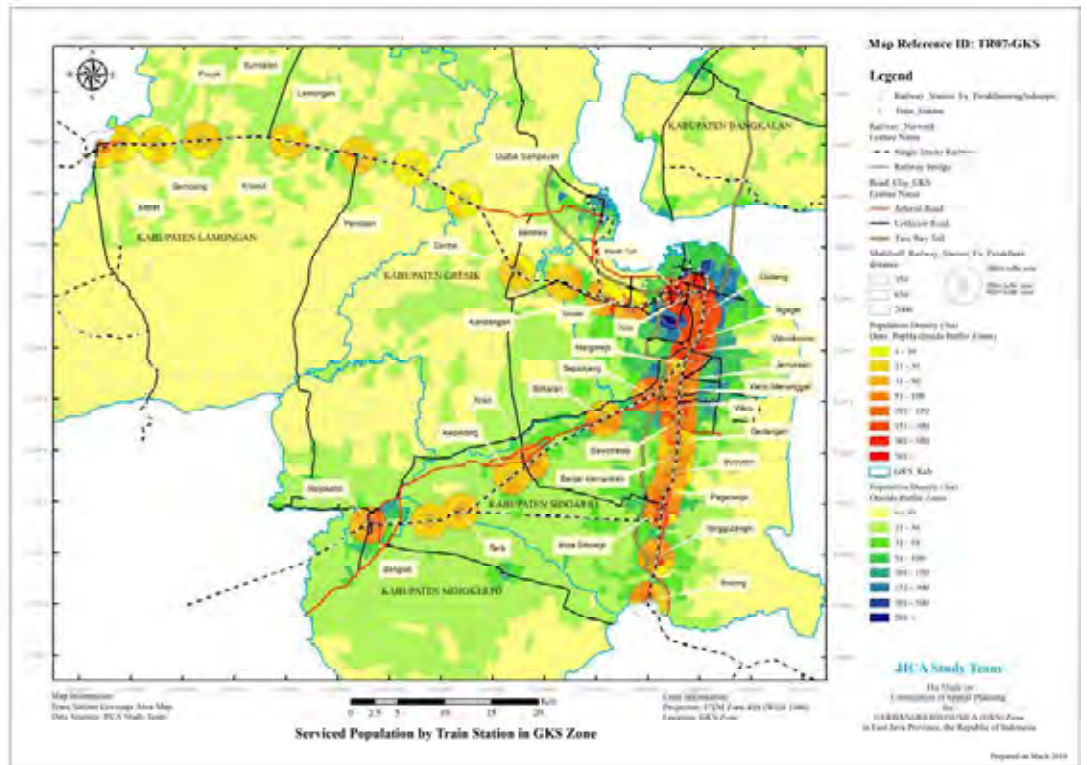
[Future: 2030]

(Unit:1,000)

| Area | Total Pop. | 350 m | | 650 m | | 2000 m | |
|----------|------------|-------|-------|-------|--------|--------|--------|
| SURABAYA | 3,574 | 266 | 7.43% | 577 | 16.14% | 1,881 | 52.61% |
| SMA 1) | 8,880 | 364 | 4.10% | 807 | 9.08% | 3,271 | 36.84% |
| GKS 2) | 12,618 | 373 | 2.96% | 829 | 6.57% | 3,518 | 27.88% |

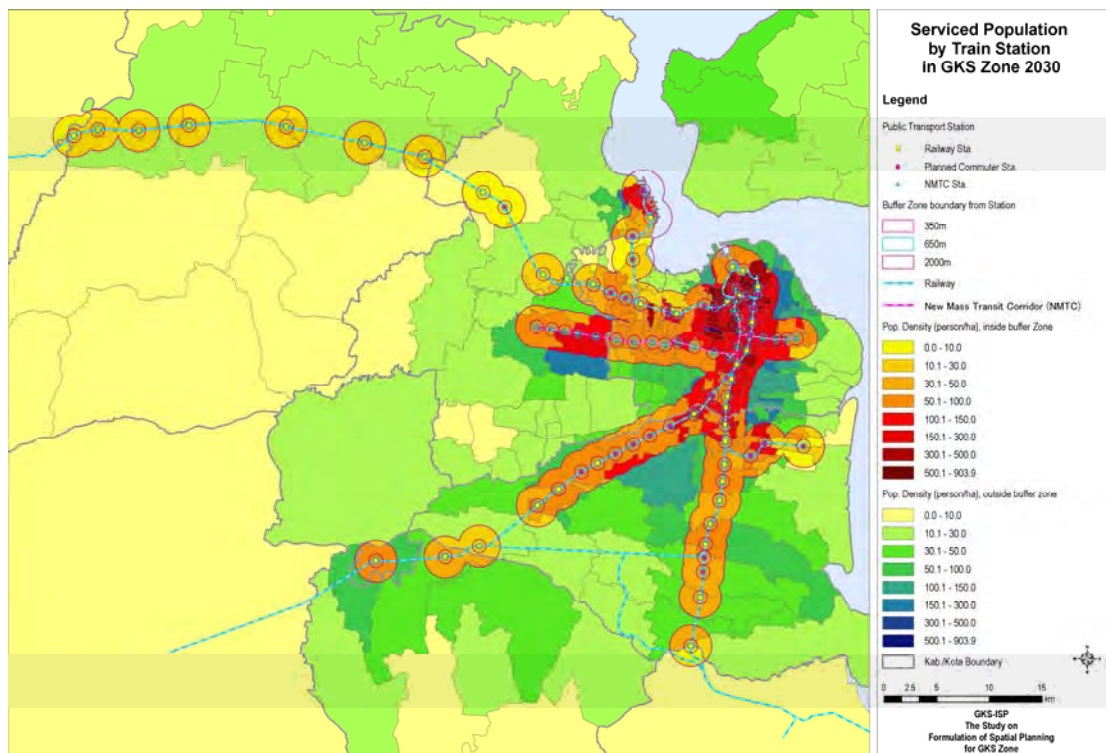
Source: JICA Study Team

Notes: 1) SMA includes Kota Surabaya, Kab. Sidoarjo, and SWP II and SWP III of Kab. Gresik.
2) Kab. Bangkalan is not included in the GKS total, because there is no railway at present.



Source: JICA Study Team

Figure 4.2.11 Serviced Population by Train Station in GKS Zone (Existing: 2008)



Source: JICA Study Team

Figure 4.2.12 Serviced Population by Train Station in GKS Zone (Future: 2030)

(2) Improvement of the Commuter Rail

New, comfortable, safe, and air-conditioned commuter trains should be operated in intervals of at

least 30 minutes to avoid long waiting time. Improving the existing railway lines and the construction of new MRT lines, as shown below, will significantly increase railway's passenger capacity and service coverage (refer to Figure 4.2.14 for line number).

Stage I (up to 2018): The existing PT. KA railway network should be improved to enhance capacity and commuter convenience, especially in the Surabaya–Sidoarjo corridor, including the Juanda Airport access. In this stage, the following actions should be implemented:

- Track elevation (and double-tracking and electrification) to remove grade crossings on the frequently used lines, i.e., between Kota/Sidotopo and Sidoarjo (and up to Tunggulangun: W1). Major stations such as Gubeng and Wonokromo, will remain at grade due to the physical constraints of the railway tracks and existing roads;
- Reactivation of the Tarik and Sidoarjo line, which is now under construction as an at-grade single, long-haul track;
- Relocation of the Sidoarjo–Porong line to Sidoarjo–Tulangan–New Porong line (single track the alignment of which is shown in W9) to skirt the mud flow areas. While the existing Porong Station will be relocated, the Sidoarjo to Tunggulangun line will continue operation, and the Tunggulangun station will be renovated to remain serving as a commuter terminal station;
- Increase of the maximum running speed to 120 km/h by replacing manual spacing of trains with an automatic block system and signaling system that can space the trains three minutes apart with a better level of safety for New Kota/Sidotopo – Tunggulangun (W1). In particular, a centralized signal substation will be developed in Gubeng to manage all the lines in the SMA, including Stages II and III;
- Modernization of the stations in New Kota/Sidotopo–Sidoarjo–Tunggulangun (W1) as part of **intermodality** with more appropriate track layout and improvements of station facilities for better passenger services (e.g., information system, length, width and height of platforms, and track crossing);
- Construction of the elevated railway between Waru and Juanda Airport (W2) to enable a direct run from the Gubeng/Kota/Sidotopo station through the renovated existing line (W1); and
- Purchase of a high-performance, electrified, and self-propelled unit (EMU) to service New Kota/Sidotopo–Sidoarjo–Tunggulangun (W1) and Waru–Juanda (W2) lines.

Although the tracks for the New Kota/Sidotopo–Tunggulangun (W1) will be elevated, the existing railway track will remain at grade to serve freight trains. Nevertheless, although the impact of freight operation on road crossings might be minor, freight tracks should also be elevated if they show economic viability in further studies.

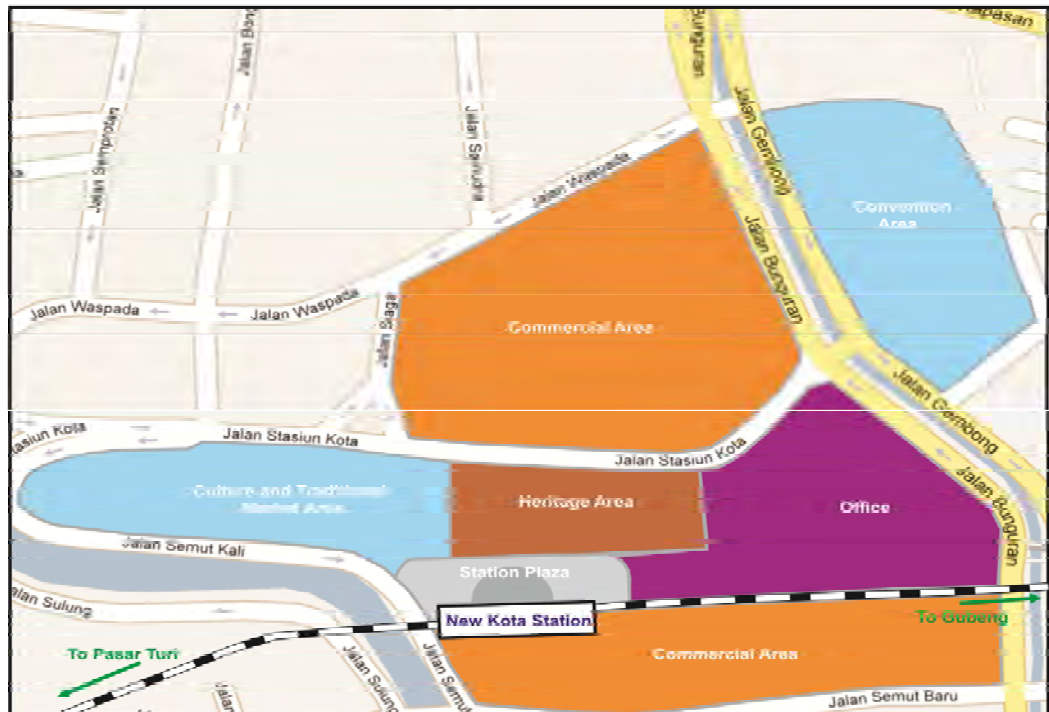
Stage II (up to 2020): After Stage I, the development of commuter railway services should be applied to other existing lines within 20 km of the Surabaya Metropolitan Area. Direct railway operation through the Pasar Turi, New Kota, and Gubeng stations should be implemented by connecting the railway tracks near the kota station to improve frequency and travel time. The following actions should be implemented in this stage:

- Double-track connection between Pasar Turi–New Kota–Gubeng and Sidotopo–Gubeng stations (W4) to enable direct train operation between northwest and south Surabaya;
- The kota station should be relocated to a new site as a commuter shelter, and long-distance trains should be operated to and from Gubeng station. The kota station and its vicinity will be redeveloped, as illustrated in Figure 4.2.13;
- Double-tracking (and electrification and partial track elevation) of existing lines in the SMA, namely Surabaya and Krian (W3), Sumari (W5), where the Bunder bus terminal is planned to

be relocated), and Indoro (W6);

- Modernization of train operation by replacing old signal substations with a centralized signal substation in Gubeng to manage all lines in the SMA, thereby improving performance and safety;
- Electrification of all lines (except Sidoarjo–Tarik) to reduce travel time, improve performance, reduce energy consumption, and improve equipment availability; and,
- To enhance **intermodality**, continued modernization of the existing train stations, while train operations should be pursued in the same manner as in Stage I.

The completion of these projects will mean that other railway services in East Java can also be improved including long-distance freight and passenger services. In addition, the double-tracking project of the Java north trunk line connecting Semarang and Surabaya will soon be implemented. Therefore, for the double tracking project for Sumari (Duduksampeyan)–Pasar Turi section (W5), coordination between relevant agencies will be necessary, especially in deciding which section will be elevated.



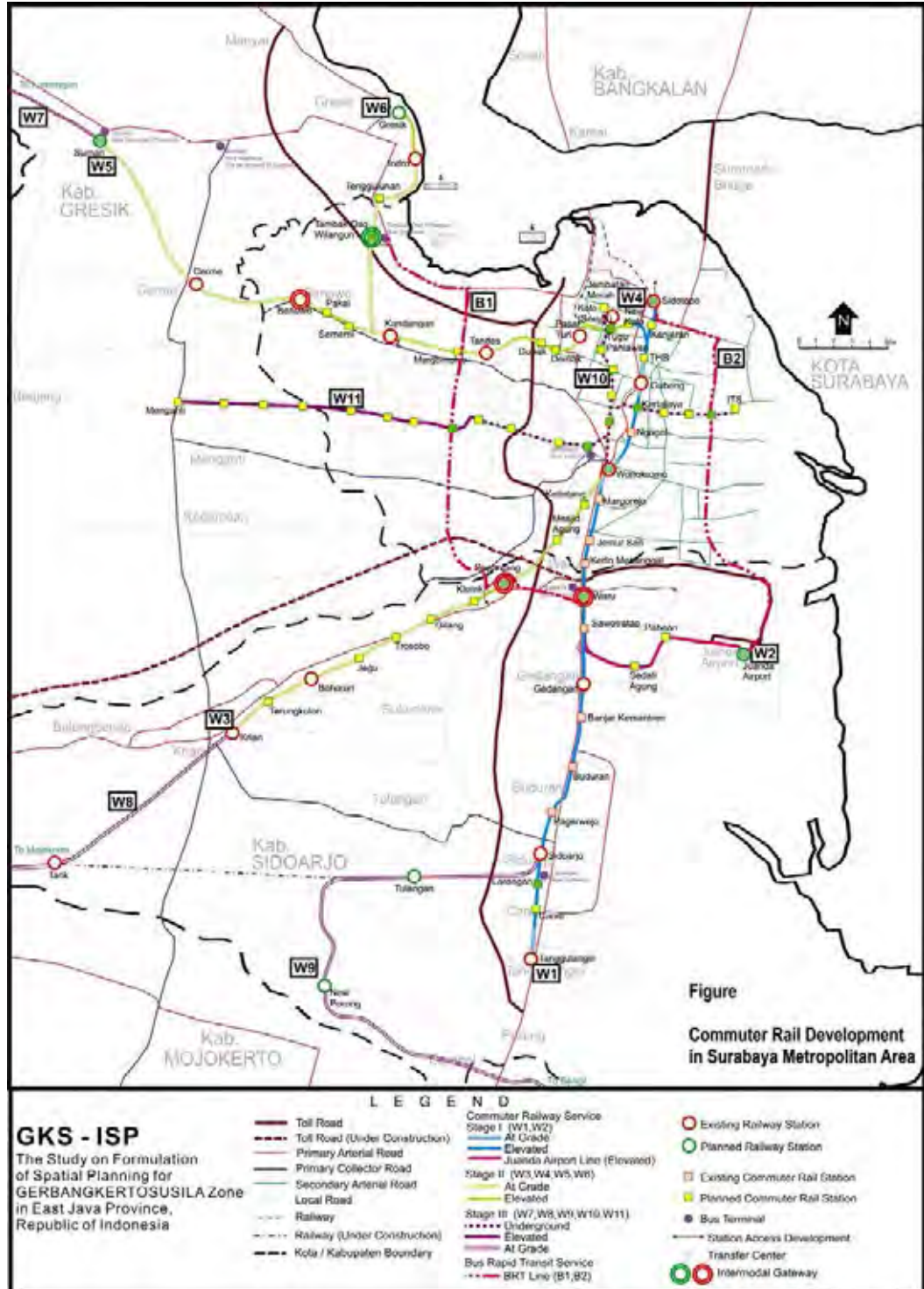
Source: JICA Study Team

Figure 4.2.13 Redevelopment Concept for the Old Kota Station

Stage III (up to 2030): In the final stage, railway development should link major cities in the GKS (approximately within 40 km of Surabaya). Furthermore, since the existing railway runs in the periphery of the CBD, a mass rapid transit (MRT) system will be needed to serve the CBD.

- Extension of double-tracking and electrification up to Lamongan (W7), Mojokerto (W8), and Bangil (W9) and increasing of the maximum running speed to 120km/h through an automatic block and signaling system;
- In a north–south direction (W10) to support business and commercial activities in the CBD and to run through Wonokromo to Old Kota via Jl. Raya Darmo, Jl. Basuki Rahmad, Jl. Tunjungan and Jl. Pahlawan up to Jembatan Merah. Avoiding at-grade crossing with roads, this line will be constructed as an underground railway.;
- In an east-west direction (W11) between ITS and Menganti in Kab. Gresik through Jl. Kertajaya,

and Jl. HR Muhammad, along the new development corridor toward southern Gresik, where it will connect with the existing railway line at Kertajaya station. This line will serve the planned large-scale residential development in the area and will be constructed underground between ITS and the end of Jl. HR. Muhammad, or about 13 km in length.



Source: JICA Study Team

Figure 4.2.14 Public Transportation Development in the Surabaya Metropolitan Area

(3) Bus Transportation Improvement

Intra-city Bus Transportation

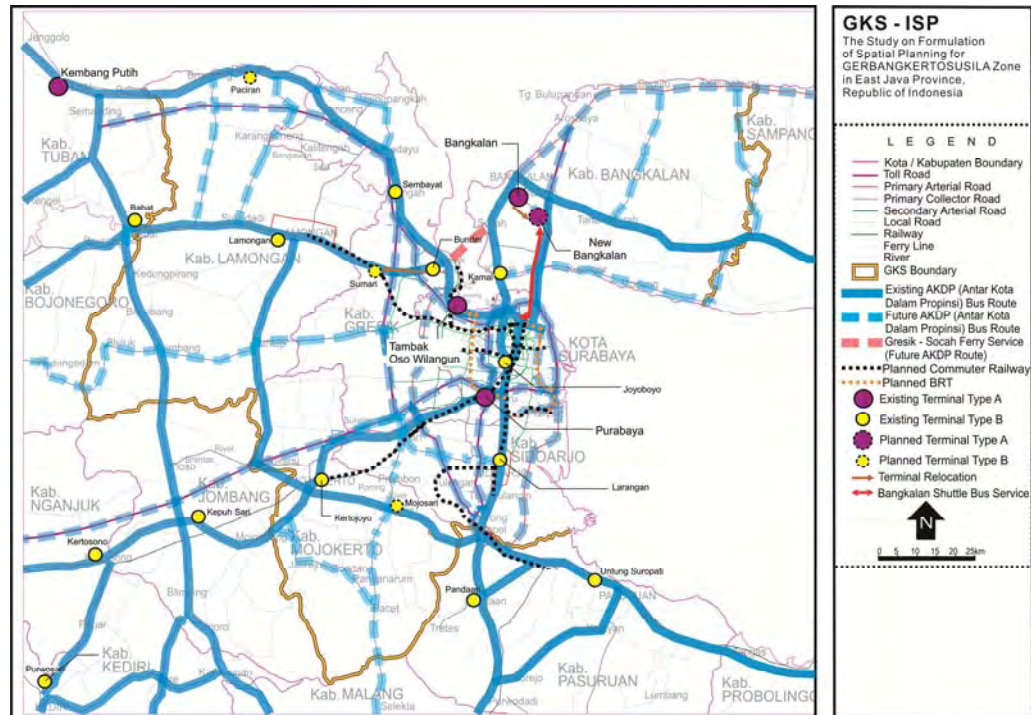
There is a need to improve bus transportation, taking into account declining ridership and bus services. Improvement measures will include taking stock of the following aspects:

- In Surabaya, minibuses (*angkot*) with a total fleet of over 5,000 vehicles and due to their frequency and flexibility, have taken on the role of city bus rather than conventional large buses (about 400 vehicles). In the future, it will be desirable to gradually shift to new, larger air-conditioned buses. The minibuses could be shifted to new feeder routes which will serve rail-based transportation and station vicinities;
- To maintain stable bus speeds in heavy road traffic, current dedicated lanes for public transportation vehicles and motorcycles should be sustained and implemented in continuous sections of other trunk roads.
- In addition to new feeder bus routes serving train stations, new types of bus service should be introduced including “commuter express bus” and “CBD circular bus.” Commuter express buses provide comfortable and limited-stop services especially for corridors that are not served by rail. The CBD circulator bus, serves as a feeder bus service for railway stations in the CBD.
- Bus rapid transit (BRT), which takes the centermost lane of the road as a dedicated bus lane, just like Transjakarta, would be ideal only if the ROW is wide enough. The Study Team proposes two BRT lines, i.e., one connecting Tambak Oso Wilangun Interprovincial Bus Terminal, Sepanjang station, Purabaya Interprovincial Bus Terminal, and Waru station via the Middle West Ring Road (MWRR) (B1), and another connecting Juanda Airport, Kenjeran, and Sidotopo station via the Middle East Ring Road (MERR) (B2). The CBD circular bus will serve as feeder bus for railway stations in the CBD, as well.

Intercity Bus Transportation

While interprovincial, intercity (AKAP: *antar kota antar propinsi*) bus services are for interprovincial travel only, intra-provincial intercity (AKDP: *antar kota dalam propinsi*) bus services are used for travel within the GKS or East Java. Each kabupaten/kota has inter-city bus terminal(s) from which bus services connect major cities in and outside of the GKS. Type A terminals are for both inter- and intraprovincial inter-city bus services, and Type B terminals are mainly for intraprovincial inter-city bus services, as well as local transportation services.

In the GKS, most intraprovincial inter-city (AKDP) bus routes connect Surabaya with its surrounding cities. Although a rail-based transportation projects is proposed by the Study Team, the existing AKDP network is essentially larger and more comprehensive than the planned commuter railway network, as seen in Figure 4.2.15. The inter-city bus services should thus be maintained and complemented by public transportation in the GKS. Roads to be used for intraprovincial inter-city bus services in the GKS are national and provincial roads, as shown in Figure 4.2.14. Both the two Type A terminals in Surabaya, namely Purabaya and Tambak Oso Wilangun, are located close to the toll road, so most of the inter-city buses, as well as interprovincial buses will go through the toll road network and through the planned national (i.e., primary arterial), or provincial (i.e., primary collector) roads. In addition, since there is no commuter railway development planned for Kabupaten Bangkalan, the Study Team proposes intensive shuttle bus services to connect the center of Surabaya with Bangkalan. New ferry (and AKDP) services connecting Gresik–Socah should also be studied as another access to Bangkalan.



Source: JICA Study Team

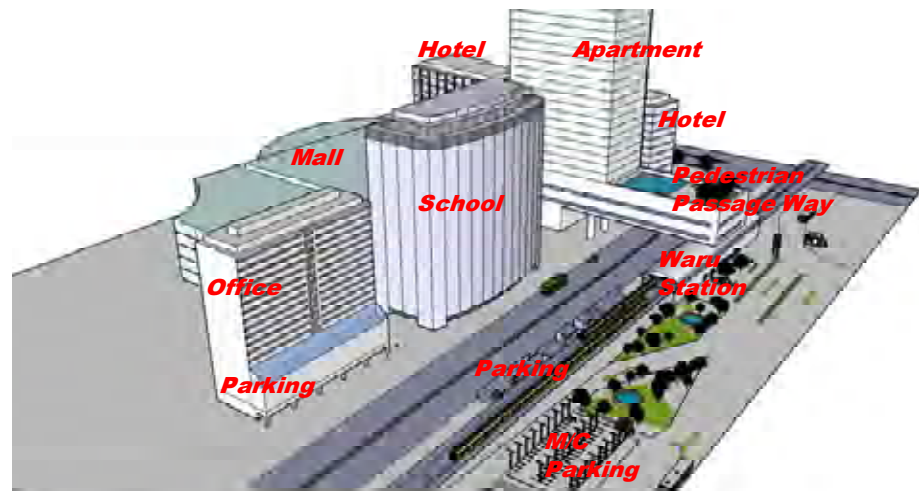
Figure 4.2.15 Proposed Intercity Bus Transport Network

(4) Intermodal Development

Attention should also be paid to intermodal transfer functions between different rail-based transport modes, between feeder bus and railway, and between private transport modes and railway. Since railway is a network utility, intermodal transfers at railway stations should be improved to ensure convenience. The following measures deserve to be implemented for this purpose:

- To improve the user-friendliness of transportation facilities, provide pedestrian walkways, vehicle parking lots, and other transportation services;
- To enhance the convenience of transferring, improve physical conditions of transfer points such as shortening the walking distances for example for transferring from railway to another mode, provide information on timetables and operating conditions, and provide station plazas; and
- Prepare safe and comfortable waiting spaces for transferring passengers.

As an alternative to the feeder system, a car and motorcycle **park-and-ride system** should be used to access stations, through the provision of parking facilities near railway stations, especially in the outskirts. This is important especially in areas without feeder bus services. Major candidate stations with relatively large parking facilities are Tambak Oso Wilangun (Surabaya–Gresik line), Benowo (Surabaya–Lamongan line), Sepanjang (Surabaya–Mojokerto Line), and Waru (Surabaya–Sidoarjo line) stations. These stations will serve as gateways to the CBD, where private vehicle users can park their vehicles and take the commuter train to go to work or for other trip purposes to the city center. An example is Waru Station in Figure 4.2.16.



Source: JICA Study Team

Figure 4.2.16 Intermodal Gateway Development around Waru Station

(5) Transit-oriented Development

To effectively use public transportation to combat urban traffic problems, the improvement of the railway system is not the only concern. Ensuring that the surrounding lands are used to encourage the use of the railway system is also important. Both land use and transportation infrastructure should be integrated under the transit-oriented development (TOD) concept. The promotion of high-density commercial land use around stations will benefit both the urban economy and the transportation business. The Waru station, as illustrated in Figure 4.2.16, will be one of the TOD models.

(6) Public Transportation Fare System Development

Especially for low- and middle-income commuters, one obstacle in the usage of public transportation is the intermodal costs involving train and bus fares, parking fees, etc. A reduction in the total public transportation fares will lead to an increase in public transportation ridership. One possible cost reduction method is the introduction of transfer discount tickets between different bus and railway operators. It has widely been proven that the introduction of a **common ticket system** (or a smart card system) greatly improves user convenience.