No.

Ministry of Transportation
The Republic of Indonesia

The Study on Development of Regional Railway System of Central Java Region in The Republic of Indonesia

Final Report
(Summary Report)

February 2009

JAPAN INTERNATIONAL COOPERATION AGENCY

ORIENTAL CONSULTANTS CO., LTD.

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The foreign exchange rates applied in this study are:

USD$1.00 = Rp. 11,500
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（As of November 12, 2008）

PREFACE

In response to a request from the Government of the Republic of Indonesia, the Government of Japan decided to conduct "The Study on Development of Regional Railway System in Central Java Region" and entrusted to the study to Japan International Cooperation Agency (JICA).

JICA selected and dispatched a study team headed by Mr. Tomokazu Wachi of Oriental Consultants Co., Ltd. between January and December, 2008.

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

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

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

February, 2009

EIJI HASHIMOTO,
Vice President
Japan International Cooperation Agency

February 2009

Mr. Eiji Hashimoto
Vice President
Japan International Cooperation Agency
Tokyo, Japan

Letter of Transmittal

Dear Sir,

We are pleased to submit herewith the Final Report of the Study on Development of Regional Railway System of Central Java Region in the Republic of Indonesia.

The Study was undertaken in the Central Java region from January 2008 through December 2009 by the Study team organized by Oriental Consultants Co., Ltd. under contract with JICA.

The report consists of a Summary Report and a Main Report. Through analysis on the past and the existing socio-economic situation, the current condition of various modes of transportation and facilities and operation and regulatory issues of railway system, present railway transportation problems have been identified. Based on the understanding on the planning issues and railway development project ideas discussed with stakeholders, a long-term regional railway system development plan was established. Priorities were given to each project and projects were selected and arranged in time sequence: namely, short-term, intermediate-term and long-term implementation plans. The commuter railway services in the metropolitan areas, airport link and freight transport on the Semarang – Solo – Yogyakarta corridor were further examined in the case study.

We would like to express our sincere gratitude and appreciation to all the officials of your agency. We also would like to send our great appreciation to all those who extended their kind assistance and cooperation to the Study: in particular Ministry of Transportation as well as Governments of Central Java Province and Yogyakarta Special Province as well as the counterpart agency and counterpart personnel who assisted the Study team.

We hope that the result of this study will contribute to enhance the railway development in the Central Java region.

Very truly yours,

Mr. Tomokazu Wachi
Team Leader, JICA Study Team
The Study on Development of Regional

THE STUDY ON
DEVELOPMENT OF REGIONAL RAILWAY SYSTEM
OF CENTRAL JAVA REGION
IN THE REPUBLIC OF INDONESIA

FINAL REPORT
SUMMARY
TABLE OF CONTENTS

Executive Summary

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

AC	Air-conditioned
Acc.	Accumulated
B/C	Benefit-cost ratio
BEP	Break-even point
BPS	Statistical Bureau (*Badan Pusat Statistik*)
CBD	Central business district
CJR	Central Java Railway
CJRR	The Study on Development of Regional Railway System of Central Java Region in the Republic of Indonesia
CO2	Carbon dioxide
CTC	Centralized train control
DAOP IV	Regional Operational Division IV (Semarang) of PT. Kereta Api (Persero)
DAOP V	Regional Operational Division V (Purwokerto) of PT. Kereta Api (Persero)
DAOP VI	Regional Operational Division VI (Yogyakarta) of PT. Kereta Api (Persero)
DEL	Diesel electric locomotive
DGR	Directorate General of Railways
DHL	Diesel hydraulic locomotive
DIY	Yogyakarta Special Province (*Daerah Istimewa Yogyakarta*)
EIRR	Economic internal rate of return
GDP	Gross demestic product
GOI	Government of Indonesia
GRDP	Gross regional product
JICA	Japan International Cooperation Agency
JLSS	South-South Line Road (*Jalan Lintas Selatan-Selatan*)
KLH	Ministry of Environment (*Kementerian Negara Lingkungan Hidup*)
KRDE	Electric diesel train
LOE	Local government owned enterprise
MOT	Ministry of Transport (*Departmen Perhubungan*)
MOU	Memorandum of understanding
NPV	Net present value
NSTRR	North Semarang Toll Ring Road
O&M	Operation and maintenance
OD	Origin-Destination
PAX	Passenger
Pelindo III	PT. (Persero) Pelabuhan Indonesia III
Pertamina	PT. Pertamina (Persero)
PIU	Project implementation unit
PSO	Public Service Obligation
PT. KA	PT. Kereta Api (Persero)
ROW	Right of way
SEZ	Special economic zone
SP	Stated preference
S-S-W	Semarang - Solo - Wonogiri

S-S-Y	Semarang - Solo - Yogyakarta
TAC	Track Access Charge
TEU	Twenty-foot equivalent unit
Tg. Emas	Tanjung Emas port
Tg. Intan	Tanjung Intan port
TOD	Transit oriented development
TTS	Travel time saving
USD	United States dollar
VOC	Vehicle operating cost

1. BACKGROUND

The current railway transportation in the Central Java region has been facing various problems. The railway passenger transport has been decreasing in demand in competition with low cost air carriers and private passenger cars and buses on the expressway. Furthermore many customers of railway freight transport have also shifted to trucks and trailers due to longer travel time and unreliability of operation.

Although the current business circumstance of railway transportation is not bright by any means, it is of great importance to revitalize railway transport to support social and economic activities in the Central Java region that consists of Central Java Province and Yogyakarta Special Province (DIY). The new Railway Law 23, 2007 allows local government and private sector participation in railway transportation business. Taking this opportunity given under the new law in order to revitalize the railway transportation in the region, the Study addresses the question of how regional railway system will be materialized and how efficient railway operation can be achieved. The role of each stakeholder in regional railway services was examined and the viable institutional arrangement was proposed.

2. SOCIO-ECONOMIC SITUATION OF CENTRAL JAVA REGION

(1) Current Socio-Economic Situation

According to the regional spatial plan (*Rencana Tata Ruang Wilayah*) in Central Java Province and Yogyakarta Special Province, Semarang, Solo, Yogyakarta, Kudus, Cilacap and Purwokerto are designated as priority cities, namely national activity centers. Of these, Semarang, Yogyakarta and Solo are the main cities in the Central Java region which are leaders in regional politics and economics. Semarang and Yogyakarta are capital cities of the provinces. Solo is also the center of the regional economy and a former capital city. In addition, these three cities play roles of gateway to/from other regions and countries because they have their own international airport. Owing to such circumstance, population is accumulating in these cities.

Urban areas tend to indicate large gross regional domestic product (GRDP) compared to other Kabupaten/Kota, but this difference depends upon the type of industry. Secondary and tertiary sectors such as trade, service, and manufacturing contribute to larger GRDP than primary sector which includes agriculture, fishery, and mining. In Semarang, trade is dominant because of the international port, Tanjung (Tg.) Emas. Yogyakarta is also the center of economic activities such as education, services and trade. Solo is one of core cities for the regional industry such as manufacturing, textiles, wood products, cement, and mining.

(2) Socio-Economic Framework

The Central Statistical Bureau (BPS) estimates that the population in Central Java Province and DIY is around 32.1 million and 3.3 million, respectively, totaling 35.4 million for the Central Java region. While the population growth in West Java is remarkable, the growth in the two provinces of the Central Java region is much lower, and nearly 0% growth is expected for 2020 and afterwards.

3. OVERVIEW OF EACH TRANSPORT SECTOR IN CENTRAL JAVA REGION

(1) Road

In Indonesia, there was little development of the railway after Independence. As a result, road traffic has become dominant in land transport in line with motorization, and the number of automobiles has been rapidly increasing except during the economic crisis. On average, the annual rate of increase of vehicles is as high as over 10% in both provinces. This rapid motorization has brought the major cities many urban problems such as traffic congestion and environmental pollution. Traffic congestion on the roads around and between the major cities such as the road connecting Semarang and Solo is becoming worse year by year. Traffic congestion seems to be most serious on Semarang – Yogyakarta, Semarang – Solo, Semarang – Rembang, and Solo – Yogyakarta corridors.

In the north Java corridor (Brebes – Tegal – Pemalang – Pekalongan – Semarang – Demak – Kudus – Pati – Rembang), some road sections already have four lanes. By the end of 2008, the section between Semarang and Losari (western border of Central Java Province) is planned to be all four-lane roads and

the work is currently underway. The remaining sections on the north corridor (i.e., Semarang – Kudus – eastern border of Central Java Province) are also planned to be widened in the near future, and will be four lanes or at least two lanes with 2 m hard shoulders.

In addition to the current toll roads in Semarang, there are plans for toll roads in the Central Java region with the following sections given high priority.

- Cirebon (West Java) – Tegal – Pekalongan - Semarang
- Semarang – Solo – Madiun (East Java)
- Yogyakarta－Solo

At present, in order to reduce the road damage caused by overloaded trucks, regulation against overloading is being enforced in accordance with the phased schedule. At each weighbridge, overloaded trucks within the designated maximum percentage are still allowed to go by paying retribution; however, overloaded trucks over the maximum percentage are forced either to reduce the load on the spot or to return to the origin place. The control of overloading is gradually being tightened, and no overloading (i.e., 0% overloading) will be allowed in 2009. As the regulation against overloading becomes stricter, the unit transport cost of goods is expected to increase. Along with the soaring fuel prices, it will be a disadvantage for trucks in terms of modal competition for freight transport. On the other hand, it will be a great opportunity for railways to draw attention of shippers and forwarders as a more cost-efficient mode of transport.

(2) Bus

Each city has intercity bus terminals from which relatively frequent bus services connecting the city with Jakarta or major cities in the region are operated. In the Central Java region, there are around 200 daily bus services connecting Tegal, Semarang, and Solo. While use of motorcycles is very popular for individual, short-distance travel, buses are major mode of travel for a longer distance because the fare is generally reasonable due to the high competition among bus companies. Furthermore, for intercity, inter-provincial bus service, upper and lower limits of the economy class fare have been regulated by the government.

In addition to the major developments for the intercity bus transportation including new bus terminals and intercity bus routes, a new bus rapid transit (BRT) system is being developed in the metropolitan regions of the Study area. The one in Yogyakarta, called Transjogja, began its operation in February, 2008, and a similar BRT system is planned for the cities of Semarang and Solo as well. In each city, development of BRT is designed to enhance the accessibility to the main transportation terminals including railway stations.

(3) Railway

As of 2006, total 4,675 km of railway is currently in service in Indonesia. Among others, 3,370 km (or 72%) of the railway in service is in Java Island. Including the railway lines that are not in service, total railway length in Indonesia is 8,067 km, 6,076 km (or 75%) of which are in Java Island. In the Central Java region, there are three Railway Management Bureaus, or DAOP (*Daerah Operasi*), which are under the control of PT. Kereta Api (PT. KA).

In the Central Java region, there is a plan to eventually double-track the entire sections of Java north trunk line (Cirebon – Tegal – Semarang – Surabaya), Java south trunk line (Kroya – Yogyakarta – Solo), and the linking north-south line (Cirebon – Purwokerto – Kroya). The section of Kutoarjo – Yogyakarta – Solo has already been double tracked, and double-tracking the section of Kroya – Kutoarjo is now underway with a yen loan. As for the Java north trunk line, most of the sections have been or will be double-tracked under the GOI's own budget. The sections of Brebes – Tegal and Pemalang – Petarukan have already been double-tracked, and double-tracking the sections of Losari – Brebes and Tegal – Pekalongan will be finished by 2011. Double-tracking the section of Cirebon – Losari is also planned in the near future.

1) Passenger Transport

Passenger transport in the Central Java region is mainly through the operation of long-distance trains, and it has been the core business for PT. KA. Meanwhile, in Central Java local (business or economy) trains also operate between Semarang – Solo (Pandanwangi), Semarang – Solo – Sragen (Banyubiru), Solo – Yogyakarta (Prameks), Tegal – Semarang (Kaligung), and Yogyakarta – Kutoarjo (Prameks). As for fare box ratios (i.e., ratio of revenue to operating cost) of the short-distance train services, Prameks and

Kaligung are showing a gain; in particular, the profitability of Prameks, which has the highest frequency of service (seven times a day with approximately 1.5-hour headway), is the most remarkable of all the short-distance train services. As a result, significant shares of local train passengers are observed in Semarang (DAOP IV) and in Yogyakarta/Solo (DAOP VI).

2) Freight Transport

Total volume as well as ton-km of goods transported by rail has been decreasing in Java Island. Reduced freight carrying capacity due to a policy of prioritizing passengers and poorer service because of aging rolling stock including locomotives have resulted in low utilization ratio of train cars, and the ratio of freight revenue is on the decline. The aged train cars, coupled with insufficient maintenance, have resulted in reduced operation speed, and the freight business is being taken away by trucks which are essentially more suitable for small-lot, door-to-door transportation service. As more toll roads are constructed and travel times between major cities in the Central Java region by road are shortened, the competitive position of the railway may be further weakened.

Another reason for the weakening of rail freight business is the low transportation tariff that is often negotiable; consequently, necessary improvements cannot be made due to insufficient revenue and profits. Furthermore, since the railway sector currently has fundamental problems such as train delays and frequent accidents, it is important to provide more reliable services by improving infrastructure, communication and signaling systems, shortage of rolling stock, institutions, human resources, etc.

Major commodities transported by railway in DAOP IV (Semarang) are sand and fertilizer. However, since the middle of 2006, fertilizer is no longer transported by rail to Tg. Emas Port. In DAOP V (Purwokerto), fuel and cement are the major commodities that are transported by railway. Significant amount of fuel is transported by railway from the refinery in Cilacap to Tegal. In DAOP VI (Yogyakarta), fuel is also a major commodity transported by railway as well as quartz sand. From Cilacap to Yogyakarta, aviation fuel is transported by railway. As for containers, although there are some transported by railway especially in DAOP IV, the volume is relatively small. It is also necessary to enhance the inter-modality by revitalizing railway facilities in Tg. Emas Port as well as dry ports at Yogyakarta and Kalijambe.

(4) Airport

Although there is some yearly fluctuation, the annual average growth of the number of passengers on the major air routes in the Central Java region between 2000 and 2006 is as high as 25%. Therefore, railway passenger demand for long distance train routes such as Jakarta – Semarang, Jakarta – Yogyakarta, and Jakarta – Solo is facing strict competition from lower airfares due to the deregulation of the airline sector. Annual volume of cargos handled at the three major airports in the Central Java region has also been remarkably growing since 2000.

According to the master plan of Adi Sutjipto (Yogyakarta) Airport, along with expansion and development of the runway, taxiways, and apron parking area, the passenger terminal is planned to be moved north toward the existing Yogyakarta – Solo railway line. A new railway station, taking over old Maguwo station, has been constructed and the station will be integrated with the new passenger terminal building. This plan is included in Phase 2 (2007 – 2008), and new Maguwo station started operation in June, 2008. In addition to the existing local business class train (Prameks), new railway services linking the airport and Yogyakarta/Solo are expected to be provided after completion of the new passenger terminal and railway station.

For Ahmad Yani (Semarang) Airport, there is also a master plan with two-phase development including extension the runway and construction of new terminal facilities. Although there is a railway track which passes by the airport, an extension railway line needs to be constructed in order to access the existing railway because the new passenger terminal building is planned on the north of the runway, that is, apart from the existing railway.

As for Adi Sumarmo (Solo) Airport, a master plan study has been done by PT. (Persero) Angkasa Pura I. New terminal building is planned to be constructed. At present there is no railway nearby the airport, and so far, there is no plan to link the airport by railway.

(5) Port

As of 2006, total annual container throughput at Tg. Emas (Semarang) Port is about 370,000 TEUs, and the volume has been increasing year by year. Meanwhile, the total volume of non-container cargos which

mainly consist of domestic inter-island cargos is about 3.7 million tons (as of 2006) excluding fuel, and recently the volume has also been growing. More than 90% of the inter-island cargos are unloaded cargos including oil fuel, timber, fertilizer, cooking oil, cement, and so on. However, Tg. Emas Port was damaged by submergence in 2003. No drastic measures have been taken yet since then, and the railway to the container yard is no longer used. However, it is hoped that the railway transportation will be revived for handling cargos, more specifically, containers.

A master plan of Tg. Emas Port has recently been prepared for the next 25 years along with phased improvement plans considering national port affair regulations, regional/city spatial plans, and environmental aspects. Bulk cargo area including coal is planned to be moved to the west of the port (toward the existing marina) in order to expand the existing container terminal and general cargo area. In the short-term development plan (2008 – 2012), the development area includes additional berths (2 x 150 m) and a container yard (6 ha). In accordance with the port expansion and improvement, growth in the handling volume is expected for most commodity types. Among others, rapid and stable growth of container volume is expected for both import and export.

4. ANALYSES ON PRESENT RAILWAY FACILITY AND OPERATION

(1) Operational Problems and Countermeasures

	Problems	Countermeasures
Line capacity	* Insufficient line capacity	* Providing efficient and reliable train control system * Improving facilities in bottlenecked sections * Double tracking
Safety	* Frequent railway accidents (collisions, derailment, etc.)	* Controlling travelling speed at bottlenecked sections * Introducing efficient and reliable train control system * Improving deteriorated facilities
Time Punctuality	* Frequent delays of departure and arrival	* Improving facilities in bottlenecked sections * Introducing efficient and reliable train control system * Procuring rolling stocks in good condition * Optimizing train operation schedule and management
Travel Time of Freight Train	* Long travel time	* Increase line capacity * Change priority on freight train in rural section
Integration with Port, Dry port	* No railway in Tg. Emas Port. * No dry port	* Installing railway line in Tg. Emas Port and Solo dry port in cooperation with freight forwarders
Business Promotion	* Passive approach * Few resources for marketing	* In cooperation with private companies * Installing competition among railway operators
Comfort	* Dirty inside the train * Noise * Temperature and lack of air circulation * Shaking and unsteadiness * Lack of Air conditioner * Inadequate lighting apparatus * Large steps between train and platform * Vendors	* Renovating or replacing rolling stock * Improving track facilities * Installation of air conditioner * Frequent maintenance of lighting apparatus * Raising level of platform
Security	* Accidents due to illegal crossing and structures * Broken window	* Prohibiting illegal crossings and improving fencing * Frequent maintenance
Frequency	* Low frequency	* Installation of a train composed with 3 class coaches
Timetable	* Low service level for local trains * Classed service * Ignorance of intermediate stations * Ignorance of transfer passengers	* Improve line capacity * Stops all trains at terminal stations * Installation of a train composed with 3 class coaches * Timetable in consideration of transfer passengers
Ticket Sales	* A few outlets * Inconvenient telephone booking system	* Increase of travel agencies * Internet booking system with variety of options of payment
Information Service	* Only station-based information service	* Up to date information service with variety of media
Mode Integration	* No integration with intercity bus services	* Cooperation w/ local authority to allow bus to stop at stations

Source: JICA Study Team

(2) Facility Problems and Countermeasures

	Problems / Bottlenecks	Countermeasures
Track	* Insufficiently and inadequately maintained tracks * Aged or disordered tracks	* Introducing sufficient and adequate maintenance program * Rehabilitating aged or disordered tracks
Signal & Telecom.	* Disorder of signaling facilities due to inadequate and insufficient maintenance * Difficulties in procuring spare parts from overseas * Inefficient operation with manual signaling system	* Rehabilitating signaling facilities * Developing maintenance skill * Standardizing signaling system * Introducing automatic signaling system
CTC	* Absence of CTC system in Tegal – Jerakah * Different CTC system between two Semarang stations	* Introducing CTC system * Standardizing CTC system
Level Crossing	* Unsecured illegal crossings * Dangerous crossings without surveillance	* Prohibiting illegal crossings * Surveillance at accident-prone level crossings
Bridge	* Constraints in travel speed to pass aged bridges	* Rehabilitating aged bridges
Station	* Waterlogging at Semarang Stations	* Introducing efficient drainage and pumping system * Elevating critical section of the line
Rolling Stock	* Slow travel speed (long distance and freight trains) * Frequent disorder (aged cars) and low operating rate * Insufficient rolling stock to provide frequent operation * Ground pollution and contamination due to leaked fuels and lubrication oils	* Reorganizing operation schedule * Introducing sufficient and adequate maintenance program * Procuring additional rolling stock * Optimizing train operation schedule * Cleaning up and renovating maintenance yards
Maintenance Facilities and Activities	* Aged or disordered maintenance equipment * Aged or disordered tracks in maintenance yards * Insufficiency of preventive maintenance works	* Providing necessary maintenance equipment * Rehabilitating aged or disordered tracks * Introducing a periodic maintenance environment
Structures	* Illegal structures invading structure gauge	* Prohibiting illegal structures
Mode Integration	* Abandoned spur lines	* Rehabilitating access lines (if required to be integrated)

Source: JICA Study Team

(3) Regulatory Problems and Countermeasures

While there is the PSO (Public Service Obligation) system of compensation to PT. KA for operation of non-profitable passenger services by the central government, due to lack of financial resources the government is unable to fully compensate PT. KA for the losses incurred in operating these services. This shortfall must be compensated by cross-subsidy from other PT. KA services. The study also found that many goods are moved for long distances by road because of poor railway freight services, cited by several customers during interviews as long transit times, insufficient freight wagons and locomotives and outdated infrastructure that results in frequent delays. Many industries are paying higher transport prices for road transport, because of the absence of reliable and efficient rail freight service. The rail freight tariff is not controlled by government, though most of PT. KA's customers are parasitical organizations.

Transport regulatory reform is one way to improve this situation and to attract additional capital investments to railways and to permit more innovative railway management structures to more effectively deal with attracting freight traffic to the railways. Passage of Law 23 of 2007 and the subsequent draft enabling legislation is the first step towards developing a stronger railway system in the country and eliminate many of the economic distortions now present.

With regard to passenger services, there will continue to be the need to compensate operators for losses incurred in operating economy passenger trains. It is proposed that there should be a greater involvement of private sector railway operators/managers that would be responsible for operating some passenger services on regional railways. With a properly-structured performance and incentive contract (these contracts would be tied to the payment of a management fee), a private railway operator should be able to operate passenger services efficiently at minimum cost, and attracting the maximum number of passengers.

In fact, the participation of the private sector in operating passenger trains may result in increased financing sources for the passenger rail subsidy. One of the criteria for selecting the private railway manager/ operator could be the level of operating subsidy required; the qualified bidder requiring the lowest level of subsidy may be selected. This technique could actually reduce the level of operating subsidy, by inviting private sector operators to manage passenger services, with one of the criteria for selection the subsidy required. The qualified company requiring the lowest subsidy (consistent with service standards) may be selected.

5. OBJECTIVES FOR REGIONAL RAILWAY SYSTEM DEVELOPMENT

The railway is a more economically efficient mode of transport than road, in terms of fuel efficiency and utilization of economic resource costs; there are potentially large economic benefits if the movement of goods and passengers can be diverted from road to rail transport. In the Revitalization Program on Indonesian Railways by the Ministry of Transport (MOT), the following were included as stated goals:

- Increase the role of railway in freight transport
- Increase the role of railway in passenger transport
- Reduce the burden on road transport

The analysis of the present transportation problems and the planning issues in the Central Java region have resulted in the identification of four major principles, which the railway transportation system development needs to pursue. These principles include: (i) efficiency improvement; (ii) equity to all members of society; (iii) environment betterment and (iv) safety enhancement.

(1) Efficiency in Transportation System

For improvements of the energy efficiency of total transportation system in the Central Java region, it is effective to promote railway transportation and facilitate modal shift from passenger cars and various types of buses to trains. Even though mass transit system consumes more energy for operation of each unit, it can save the energy consumption per person-km, because of its higher transport capacities and greater energy efficiency than private vehicles.

In Semarang, Solo and Yogyakarta metropolitan areas, development of efficient transport system is of great importance to support economic activities. Railway transit system has an advantage over private modes of transport in terms of travel costs and lesser consumption of space in the context in urban area.

Traffic congestion in the metropolitan areas has not been severe but the situation will get worse as urbanization proceeds. It is proposed to establish an efficient and convenient public transportation network to prevent shifting to private modes of transportation. Railway transportation should play the primary role in the public transportation network. The following two integrations should be taken into consideration for developing railway system development:

- Integration with Other Modes of Public Transportation
- Integration with Urban Development

(2) Equity in Transport to All Members in the Society

1) Low Income Household

A minimum level of transportation service should be provided to all members of the society. In the Central Java region, the mobility of the low-income group is limited due to their insufficient income. Railway transport has been playing a role for providing transportation service for the poor. The tariff for economy class passenger trains is determined by the Central government and the current railway operator PT. KA receives a subsidy as PSO to compensate for the operation loss of an economy class train.

The service level of economy class train, however, is very low with deteriorated and badly maintained train cars. This decreases the attractiveness of railway service and results in reducing railway passenger demand. The service standard should be clearly defined and the gap between fare revenues and cost to fulfill the service in accordance with the standard should be paid to the railway operator from the government. If this cannot be committed to by the government, it will be difficult to attract private sectors to railway business.

2) Physically Challenged

At present availability of the railway facilities for the physically challenged is still vey limited in the region. It is sometimes difficult to ride on the trains due to the gap between floor of train and ground even for able-bodied people. Since it is essential to provide a satisfactory mode of transportation for all members in the society, it is recommended to develop transportation facilities for the physically challenged.

(3) Environmental Betterment: Global Warming

Global warming is an urgent issue in the world, and many countries have been making efforts to reduce greenhouse gases. In the transportation sector, passenger cars, buses and trucks are producing the greatest amount of greenhouse gases. To deal with this problem, a common countermeasure is promoting diversion from passenger cars, buses and trucks to more environment-friendly to mode of transport such as railway.

(4) Transportation Safety

Causes of railway accidents occurring from January 2004 up to May 2006 were examined. Although more than half of the railway accidents were made by internal and external human errors, 22% of the accidents were caused by failure of infrastructure and 19% by disordered rolling stock.

Since railway accidents are caused by various kinds of factors, various countermeasures should be taken to reduce them. The majority of the existing rolling stock of PT. KA is not in good condition since they are old and maintenance is insufficient. Due to the limited revenue, PT. KA cannot afford to buy new rolling stock or tools/equipment. To tackle the railway safety issue, not merely rolling stock, but also infrastructure should be upgraded and improved. Despite efforts in improving railway infrastructure by the central government, the railway facilities still need further upgrading and rehabilitation. Many railway accidents have occurred at level crossings due to lack of careful driving practices of public road transport and so on. In this regard, railway crossings in urbanized areas, where commuter railway services are proposed, should be elevated as much as possible to reduce conflict with road traffic.

6. FORECAST OF FUTURE RAILWAY DEMAND

(1) Forecast of Railway Passenger Demand

Future growth rates of railway passenger demand are targeted at around 3.8% - 4.4% per annum. In 2030, the annual number of railway passengers in the Central Java region is expected to increase from the current 9.5 million (as of 2007) to 24.4 million passengers.

While an overall great modal shift to the railway may be unrealistic, growth of the passenger demand caused by the modal shift can be well expected from individual railway projects focusing on certain railway corridors due to the population and economic growth in the Study area. The modal shift that will be caused by individual railway projects is expected to add to the above-mentioned number of railway passengers. For modal shift, the Study Team assumes that, for intercity trips with both origin and destination along the new railway project corridor, some 70%, 10%, and 10% of the existing bus, car, and motorcycles users respectively will shift to the new railway service after its operation. Actual modal shift from each mode may vary depending on the type of service (e.g., with or without air-conditioning) provided by the new railway. Furthermore, a considerable number of additional intercity trips may be induced by the new railway service. As for commuter railways, detailed modal shift is analyzed based on the stated preference (SP) Survey, and is discussed in the Case Study.

(2) Projection of Container Volume by Railway

There is a potential of utilizing the railway for freight transport, if the necessary construction and rehabilitation of the railway facilities are conducted including the access to Tg. Emas Port. Among other reasons, if a new dry port in Solo and the dry port in Yogyakarta are planned to be connected to the railway, it can be assumed that a significant share of containers from/to Solo and Yogyakarta will be transported by railway. In this Study, achievable railway market shares for containers have been set as 50% for Solo dry port and 70% for Yogyakarta inland port.

(3) Projection of Other Freight Volume by Railway

1) Cement

Among the three major cement companies, at present, only Holcim has a plant in the Central Java region. Transport route goes via the south Java corridor from Cilacap, where the cement plant is located, east to Yogyakarta, Solo, and towards Surabaya. Not only truck but also railway is utilized to transport the cement. Some wagons that are used to transport cement to Solo and Semarang areas are utilized to transport quartz sand on the way back to the plant in Cilacap. In this Study, future demand growth of

cement in the Central Java region has been set as 3% including the volume of cement transported by railway.

2) Quartz Sand (Silica)

Quartz sand (silica), which is another important raw material for cement, is mined in the region. Railway is also used to transport quartz sand. It is usually transported from the place of mining to the place where it is consumed. PT. KA regards the route of Bojonegoro – Gundih – Solo – Yogyakarta – Cilacap as the main corridor to transport sand. For projection of the future growth in the demand of sand transported by railway, trend of GRDP in the mining and quarrying sector in the Study area was considered. As such, an annual growth rate of 6% (and 5% from 2013) has been assumed for projection of future demand of sand transported by railway.

3) Fertilizer

As for the future demand, while transport of fertilizer from Semarang may not be expected, the Study Team assumed that the current fertilizer transport from Cilacap by railway would be maintained in the future as well. For projection of the future growth in the demand of fertilizer transported by railway, trend of GRDP in the agriculture sector in the Study area was considered. An annual growth rate of 3% (and 2.5% from 2013) has been assumed for projection of future demand of fertilizer transported by railway.

4) Fuel

Most fuel consumed in the region is refined in Cilacap by PT. Pertamina (Persero), a state-owned oil and gas company, and transported between the depots by pipeline, railway, truck, or ship. As for future fuel transport, since PT. Pertamina plans to connect all the depots by pipeline, the remaining possibility of fuel transport by railway tank wagon (RTW) is aviation fuel. Assuming that aviation fuel transport from Cilacap to Rewulu (and to Adi Sutjipto and Adi Sumarmo Airports by special truck called Bridger) will continue in the future as well, the Study Team estimates the future transport volume in accordance with the growth in air travel demand that is planned by each airport.

5) Coal

In the Central Java region, coal is not actually transported by railway at present. However, the potential for transporting coal by railway is possible in three conceivable cases. One is transporting coal from Tg. Emas Port (Semarang) to Solo by railway in order to supply coal to be used for small power plants of the textile factories in Solo and its vicinities. A second case is transporting coal from Kendal Port (near Semarang) to Kabupaten Kulonprogo (near Wates) via Solo and Yogyakarta for a planned steel/iron factory targeting start of the production in 2015. Third, there is potential to transport coal from Tg. Intan (Cilacap) Port to Karangkandri, where a coal steam power plant with a capacity of 600 MW is in operation.

7. REGIONAL RAILWAY MASTER PLAN

(1) Long Term Regional Railway System Development Plan

1) Commuter Trains

To support efficient urban functions of the major cities of the Central Java region, commuter trains should be introduced on the existing or new railway lines. When commuter rail service starts, it would be better to avoid level crossings in the urbanized area, since traffic volume on the crossing streets is large and frequent train operation may lead to traffic congestion on the road network in the city. Track elevation inside the city of Semarang would be the first priority to get the line functioning as commuter rail. In the Semarang metropolitan area the following lines have been proposed: a) Semarang – Kendal Commuter Line, b) Semarang – Demak Commuter Line, and c) Semarang – Brumbung Commuter Line. Also in Solo the following lines have been proposed: a) Solo – Klaten Commuter Line and b) Solo – Sragen Commuter Line, while in Yogyakarta a) Yogya – Klaten Commuter and b) Yogya – Wates Commuter.

2) Urban Railways

In city areas three rail systems are proposed: Semarang Monorail, Solo Tramway and Bantul Tramway.

3) Airport Links

Two airport rail links are proposed to enhance convenient access to the airports in the region. These are Semarang airport link which will provide 4 km branch line to the planned relocated location of a new air

terminal. Solo airport link connects the existing railroad and the airport terminal and allow “direct-through” operation to Solo and Yogyakarta. .

4) Intercity Trains

Redevelopment of this intercity train on the Semarang – Magelang - Yogyakarta corridor basically traces the old alignment between Semarang and Yogyakarta. The corridor consists of: a) Yogyakarta – Magelang Line, b) Magelang - Ambarawa Line, c) Ambarawa – Kedungjati Line, d) Semarang – Tegal Line, e) Semarang – Cepu Line and f) Demak – Rembang Line. Improvement of the Semarang –Solo existing line has also been proposed and this line would be utilized for freight transport as well.

5) Freight Trains

The project aims to improve the reliability of freight service by track rehabilitation and improvement of overall traffic control system over the whole alignment, including: a) Semarang – Solo Freight Corridor (109 km) and b) Solo – Wonogiri Freight Corridor. In addition, four accesses to important freight facilities are proposed. These access lines include: a) Semarang Port Access, b) Kendal SEZ Access, c) Kalijambe dry port Access and d) Yogyakarta Dry Port Access.

6) Tourist Train

The railway lines for tourism in the region are proposed. Improvement of railway system and railway museum in Ambarawa would attract more railway amateurs and also the development of a branch line to Borobudur from the proposed intercity railway corridor between Yogyakarta and Magelang provides better access to the world heritage site.

(2) Railway-Related Development Projects

Integrated development of railway system and urban/housing development along the commuter railway line is recommended to strengthen the financial viability of the railway system development by: a) internalizing development benefits of improving railway service from increase in land value in housing development and b) increasing fare box revenue which is brought about by increase of railway passenger demand by developing housing along the railway line.

(3) Preliminary Evaluation of the Projects

Sequence of the proposed railway projects have been examined from technical point of view. Some projects have to be started after the completion of other projects and some projects partially share railway tracks or stations. This sequence of the projects has been taken into consideration when giving priority to the projects. Considering these relationships and also features of these projects, they are consolidated into 20 packages.

The benefits of railway system development projects estimated in this preliminary evaluation include Vehicle Operating Cost (VOC) saving, Travel Time Cost Saving, Reduction of Traffic Accidents, Reduction of CO_2 and reduction of road damage. VOC and travel time cost savings from both railway passengers and drivers of parallel road are included. The results of preliminary economic evaluation are presented in the following table and implementation of several projects seems difficult to justify from economic point of view under the current condition of the projects.

Preliminary environmental impact evaluation shows negative impacts to social environment are expected from development of commuter and intercity train operation based on the survey on air quality, noise, vibration, water quality and right of way (ROW) and public hearing. In addition, serious or some pollution would be brought about by commuter train, intercity train, urban railway and airport link development projects.

Preliminary Economic Evaluation

Project Name	NPV (Mill. Rp.)	EIRR	B/C	Priority
Commuter Train				
1-1 Semarang Commuter	-	8.6%	0.765	A-
1-2 Solo Commuter	-	8.2%	0.870	A-
1-3 Yogya Commuter	728,457	15.0%	1.355	A+
Urban Train				
2-1 Semarang Monorail	-	-	0.365	B
2-2 Solo Tramway	-	2.3%	0.437	B
2-3 Bantul Tramway	-	1.0%	0.339	B
Airport Link		-		
3-1 Semarang Airport Link	-	-	0.229	C
3-2 Solo Airport Link	-	-	0.047	C
Freight Train				
4-1 Semarang Solo Yog Freight Corridor	131,932	13.1%	1.078	A
4-2 Solo Wonogiri Freight Corridor	-	-	0.253	B
4-4 Kendal SEZ	-	-	0.305	B
Intercity Train				
5-1 Yogya - Magelang Intercity	-	0.3%	0.265	B
5-2 Borobudur Access	-	-	0.125	C
5-3 Magelang – Ambarawa Intercity	-	-	0.141	C
5-4 Ambawara - Kedungjati Intercity	-	-	0.212	C
5-5 Semarang-Tegal Intercity	-	-	0.476	B
5-6 Semarang-Cepu Intercity	-	-	0.160	C
5-7 Demak-Rembang Intercity	-	3%	0.433	B

Source: JICA Study Team

*: 'Demak-Rembang Intercity' includes benefit of freight transport between Demak-Rembang transportation.

Based on the project sequence in terms of technical aspects, preliminary economic evaluation and initial environmental examination, priorities were given to the proposed projects and the projects were divided into short-term, medium-term and long-term implementation programs as listed in the table below.

Project Phasing of Central Java Region (million USD in 2008 Price)

Project Packages	Route (km)	Project (km)	Capital Cost	Cost per km
Short Term Projects				
1-1 Semarang Commuter	43	34	106.2	3.1
1-3 Yogya Commuter	58	58	129.5	2.2
Sub Total	101	92	235.7	2.6
Medium Term Projects				
1-2 Solo Commuter	58	58	143.9	2.5
3-1 Semarang Airport Link	9	4	32.7	8.2
4-1 Semarang – Solo – Yogya Freight Corridor	115	101	121.6	1.2
4-3 Kendal SEZ Access	5	5	20.9	4.2
5-5 Semarang - Tegal Intercity	150	150	45.0	0.3
5-6 Semarang - Cepu Intercity	140	140	36.0	0.3
Sub Total	477	458	400.1	0.9
Long Term Projects				
2-1 Semarang Monorail	12	12	181.0	15.1
2-2 Solo Tramway	6	6	51.9	8.6
2-3 Bantul Tramway	15	15	111.1	7.4
3-2 Solo Airport Link	7	8	69.3	8.7
4-2 Wonogiri – Solo Freight Corridor	36	36	25.8	0.7
5-1 Yogya – Magelang Intercity	47	47	177.7	3.8
5-2 Borobudur Access	7	7	11.7	1.7
5-3 Magelang – Ambarawa Intercity	37	37	125.4	3.4
5-4 Ambarawa – Kedungjati Intercity	37	37	76.3	2.1
5-7 Semarang – Demak – Rembang Intercity	110	107	360.3	3.4
Sub Total	314	312	1190.4	3.8
Grand Total	892	862	1826.1	2.1

Source: JICA Study Team

(4) Institutional Setup for Regional Railway Company

1) Types of Travel Flow and Responsibility of Central / Local Governments

Roles and responsibilities of central, provincial and kota/kabupaten governments are as follows: The central government is responsible for inter-provincial traffic, provincial governments are responsible for inter-kabupaten/kota traffic, and kota and kabupaten governments are for traffic within their territory.

2) Privatization of Railway Transportation Industry

Six different techniques/models for improving the efficiency of railway operations, ranging from minimal private sector involvement (improving the operating efficiency of freight trains by PT. KA) to total control over railway operations and maintenance (railway concessions), are listed by increasing intensity of private sector involvement:

- Operation of more efficient freight trains
- Separation ("outsourcing") of non-core activities from the national railway
- Private companies (typically freight forwarders) contracting trains operated by the national railway
- Private trains operating on infrastructure of the national railway ("Open Access")
- Private sector operation of light density railway lines
- Railway operating concession

3) Establishment of Regional Railway Company

A Central Java Railway (CJR), which is responsible for railway operations over regional lines on the corridor of Semarang – Solo – Yogyakarta, is proposed. The primary functions to be undertaken by CJR would be train operation (with train and engine crews as CJR employees) while infrastructure maintenance and train control would remain with PT. KA.

Management of CJR will be a joint public – private partnership. The railway manager would likely be a partnership between an Indonesian freight forwarder and an overseas railway operator for freight railways. In the case of commuter railways, a private sector partner will include a property developer. The presence of government representatives will be reflected primarily in the definition of the passenger train service CJR must provide; the railway will be essentially managed and operated by the private sector railway manager. PT. KA is shown as an optional participant in the organization.

Financing of needed capital improvements in the track and signaling systems would be from a combination of central and provincial government sources. Funding for rolling stock and some minor infrastructure improvements would be from the railway operator (CJR). CJR would reimburse PT. KA for track maintenance and train dispatching through payment of a track access charge (maintenance and train control fee) and for the capital improvements to the infrastructure paid by the provincial government, a track access charge would be paid. PSO from central government and a possible additional amount from the provincial government will cover any remaining shortfall.

4) Recommended Approach to Improve Railway Efficiency

We recommend a dual approach: (i) begin the process to create CJR by drafting the MOU between MOT and the provinces of Central Java and Yogyakarta to create a regional railway organization; and (ii) establish the pro-rail policy in the Directorate General of Railways (DGR). This pro-rail transport policy by MOT will be designed to increase public awareness of the efficiencies of rail transport as well as to provide some financial incentives for companies to use rail transport to a greater extent. With regard to the operation of more efficient freight trains, a joint task force should be established between DGR and PT. KA to investigate the steps that need to be taken to improve the efficiency of freight train operation.

8. CASE STUDY: SEMARANG – SOLO – YOGYAKARTA CORRIDOR

(1) Commuter Railway Service Development Plan

1) Yogya Commuter Railway Service

Yogya commuter railway is a high priority project. Since the section between Wates and Klaten of the Yogya commuter railway has been double tracked, additional investment is relatively small compared to the other projects and this project does not have illegal occupants in the ROW of the railway line.

2) Semarang Commuter Railway Service

Semarang commuter railway indicates high priority in economic evaluation. However, due to the required double tracking work and the proposed track elevation, it will take time for implementation. Urban drainage project is now being implemented and after six years from now, the areas enclosed by east and west *Bajir Kanal* and the harbor road will be flooding free area. They will build dikes parallel to the harbor road; thus, close coordination should be needed.

3) Solo Commuter Railway Service

Solo commuter railway brought a lower economic evaluation result compared to Yogya and Semarang commuter services. This is partly attributable to the fact that Solo – Sragen section is less developed and this section is still single track. Therefore, investment will be necessary for double tracking. However, Solo – Klaten section is already double tracked so that Yogya commuter railway may be extended to Solo before the whole section of Solo commuter railway is completed.

(2) Airport Link Development Plan

Both Semarang airport link and Solo airport link are important to provide railway service for airport users. The projected air passenger demands for both airports are however not large enough; thus, the project appears to be less feasible in an economic sense. Thus, it is proposed to combine the service with commuter railway to reduce the cost burden on common items. Combining the services will also reduce the high peak ratio of passenger demand.

(3) Freight Railway Service Development Plan

Solo – Semarang freight corridor development also indicates high priority in economic evaluation but it needs track elevation of railway line in Semarang city which is included in Semarang commuter railway project; thus the project should wait until the track elevation work is completed. The railway freight corridor development includes dry port development in Solo Kalijambe as well as Yogyakarta; thus, coordination between dry port operator and freight railway operator is required.

9. CONCLUSIONS AND RECOMMENDATIONS

(1) Institutional Setup for Central Java Regional Railway System Development

Insufficient management capability on railway business and lack of discipline of employees are regarded as a cause of inefficient railway service provision. At the same time, deteriorated railway infrastructure and aged rolling stock are also a cause of unsatisfactory level of railway service. The central government has limited budget for railway infrastructure development and improvement, while PT. KA is also suffering from shortage of revenue. Therefore, it is essential to expand funding sources for investment. Since the new railway law allows local governments and private sector to be involved in the railway business, participation of new business entities will support to increase available funds for railway development.

1) Organization Structure

It is recommended to establish a CJR with strong private sector participation, to strengthen railway service, make it more competitive, and to provide an additional source of capital investment funds to grow the railway business in Central Java. The Rail Operator would be the strong driving force of CJR and come from the private sector. There are several alternative ways to structure this concept as described below.

i) Establish a Local Government Owned Enterprise (LOE) to develop and administer a performance based contract for the Rail Operator. The Rail Operator would likely include an Indonesian freight

forwarder and an overseas organization experienced in railway operations. PT. KA would maintain and control the railway line and the Rail Operator would market the freight business, operate trains (freight and passenger if commuter service is included), collect revenue and manage the railway business aggressively to increase rail market share and increase operating efficiency.

ii) Establish an LOE responsible for train operations which would be a joint venture with the private rail operator. Composition of the rail operator would be similar to that described in the first alternative.

iii) Establish a joint venture between PT. KA, individual shippers and the private rail operator. Under this third alternative, there would be no change in the structure or manner in which track access fees are administered or paid.

2) Bidding Process for Rail Operator

CJR operator (Rail Operator) will be selected from interested private companies through a process of competitive bidding. Service levels will be determined by the provincial government and all bidders must agree to achieve at least, these standards of service. An important component of the bidding selection criteria would be the requirement that the Rail Operator purchase rolling stock necessary to support the service; bidders could offer to make additional investments in the line. Bidding criteria could include items such as track access charge to pay to PT. KA and the government (central and provincial), passenger fare level and management fee. In this way, the desired service levels would be achieved at the lowest possible cost and with the greatest efficiency.

3) Recommended Institutional Alternative

Three institutional alternatives were presented for the proposed CJR. While it is possible to establish the railway along the lines of any of these three, their impacts on the objectives of establishing this organization will likely be different. These objectives include creating an organization structure favorable for private sector involvement that would lead to increased freight traffic by rail through innovative rail operating and marketing practices as well as efficient operation of rail commuter systems in accordance with the performance contract with the provincial government. This private sector involvement would likely include an Indonesian freight forwarder and a rail operator from overseas. Involvement of the private sector would also provide an additional source of project finance for purchase of locomotives and rolling stock, as well as possibly some additional investments in the railway system. Perception of risk by the private sector company will have a direct impact on their willingness to participate and to make these investments. The likelihood of positive private sector influence and financial contribution would be the greatest under Alternative i) or ii); it is unlikely that Alternative iii) would produce a successful private sector contribution.

(2) Conditions to Materialize Railway System Development

In the financial analysis of the Study, it is assumed that the initial investment cost for railway infrastructure development will be paid as Track Access Charge (TAC), taking depreciation of facilities into account. It is also assumed that this TAC is paid by railway operators according to train car * kilometers of passenger trains, freight trains and the existing trains operated by PT. KA. Financial feasibility appears good for the Semarang – Solo freight transport corridor; however, if the other railway system development cannot be achieved and if they cannot share the TAC, the cost burden to the freight corridor development will become heavier and viability of the freight corridor will be worse. This implies that financial viability of the projects is obtained only if all the proposed projects are implemented and they share the initial investment costs among the projects.

Freight demand of railway transport was projected based on the transport plan of materials and products of shippers; thus, reliability of forecast is high. On the other hand, container transport demand carried by railway depends on the comparative advantage of railway transport service over road transport. In this regard, it is important to develop industrial estate next to the dry port, and redevelop the railway branch line to the container yard in the port to reduce time and cost due to double handling. It is important to attract shippers by reducing disadvantages of railway freight transportation through minimizing loading and unloading time and cost at both ends. These developments require coordination among the relevant agencies. DGR and Transportation Bureau of local government should take lead to materialize these developments. Furthermore, a new regional railway company should undertake aggressive marketing to increase container demand.

In the Study, urban commuter railway services are proposed in the three metropolitan areas (Semarang, Solo and Yogyakarta) where urban transportation problems are expected to be more severe. It should be

noted that the railway passenger demand would be increased not only by railway service improvement but also by integrated railway system development with urban redevelopment in the city center and housing development along the railway corridor. These urban developments would increase not merely railway passenger demand and subsequent revenue from ticket sales but also increase profits from real estate business. This is a commonly practiced mechanism to absorb development benefit as revenue from property business in Japan. Railway business in Indonesia is not able to adequately maintain and upgrade the railway infrastructure and rolling stocks merely with railway transport revenue since this amount is limited. Consequently, it is fundamentally required to expand the revenue base for railway system improvement. To implement housing development and urban development, first of all, the change of land use in the spatial plan at local level is required. To develop the surrounding areas of railway stations local government should develop station plazas, park and ride facilities, access roads to the stations and road network in the surrounding area in collaboration with a real estate company. Without such supports from central and local governments, the railway system development will not be materialized and the expected effects would not be achieved.

In addition, conditions for private sector to enter the railway transportation business should be clearly defined in order to attract them. For instance, the method of calculation of subsidy should be clearly defined; otherwise the private sector will regard it too risky and they will be reluctant to participate in the business.

As mentioned above, to materialize the proposed railway projects, it is indispensable to implement the following measures by relevant agencies in a timely manner.

Actions to be taken to Materialize Proposed Railway Projects

Agency	Timing	Action
DGR, MOT	Prior to establishment of Provincial Government Owned Enterprise	To establish task force to define a role of central and provincial governments in regional railway system development
	Prior to commuter railway service and Prior to the start of the Semarang - Tegal and Semarang – Cepu intercity passenger train service	To speed up double tracking on the Java north main line.
	Prior to start of Semarang commuter railway service	To give priority for double tracking to Kendal - Semarang - Brumbung section
	Prior to the start of Semarang – Solo freight railway transport	To improve railway infrastructure on the Semarang – Solo corridor in collaboration with Provincial government
	Prior to start of Semarang – Solo freight railway transport	To coordinate with relevant agencies(Directorate General of Highways, Ministry of Public Works, Dinas PU, Pelindo III, Power Plant, Kota Semarang Government, regarding Tg. Emas Port access line
Provincial Government	Prior to the start of regional railway service	To establish Provincial government owned enterprise (Central Java Railway Company) To formulate railway service standard and quantity and quality of the required railway service in the region.
	Prior to the start of Semarang – Solo – Yogyakarta freight railway transport	To develop integrated dry port and industrial estate near railway line
Kabupaten/Kota Government	Prior to the start of the commuter railway service	To make modification on land use plan which enables housing development along the railway corridor To develop station plaza and access road to the railway station
Private Railway Company	Prior to the start of railway service	To purchase of rolling stock To develop housing area along the railway corridor To develop urban facilities in the center of the city To purchase loading/unloading equipment for freight transport

(3) Next Action

To materialize the regional railway system development projects recommended in the Study, it is recommended to establish a task force team with DGR, MOT and Central Java and Yogyakarta Provincial Governments for creating a CJR company. The task force team should define the roles and responsibilities of central government and provincial government for regional railway system development.

Summary

1. General

1.1 Background

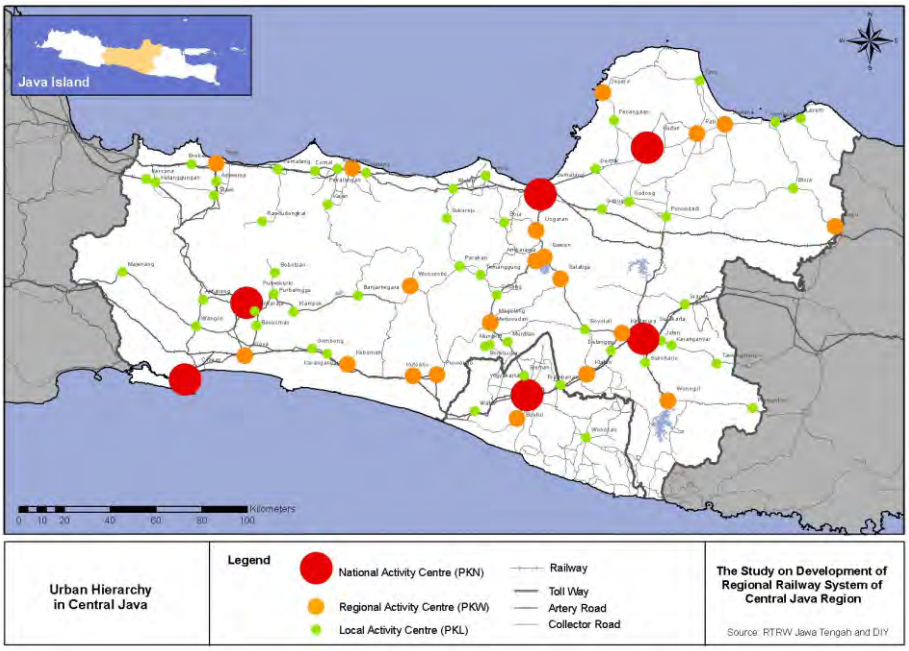
The current railway transportation in the Central Java region has been facing various problems. The railway passenger transport has been decreasing in demand in competition with low cost air carriers and private passenger cars and buses on the expressway. Furthermore many customers of railway freight transport have also shifted to trucks and trailers due to longer travel time and unreliability of operation.

Although the current business circumstance of railway transportation is not bright by any means, it is of great importance to revitalize railway transport to support social and economic activities in the Central Java region that consists of Central Java Province and Yogyakarta Special Province (DIY). The new Railway Law 23, 2007 allows local government and private sector participation in railway transportation business. Taking this opportunity given under the new law in order to revitalize the railway transportation in the region, the Study addresses the question of how regional railway system will be materialized and how efficient railway operation can be achieved. The role of each stakeholder in regional railway services was examined and the viable institutional arrangement was proposed.

2. Present Socio-economic Situation of Central Java Region

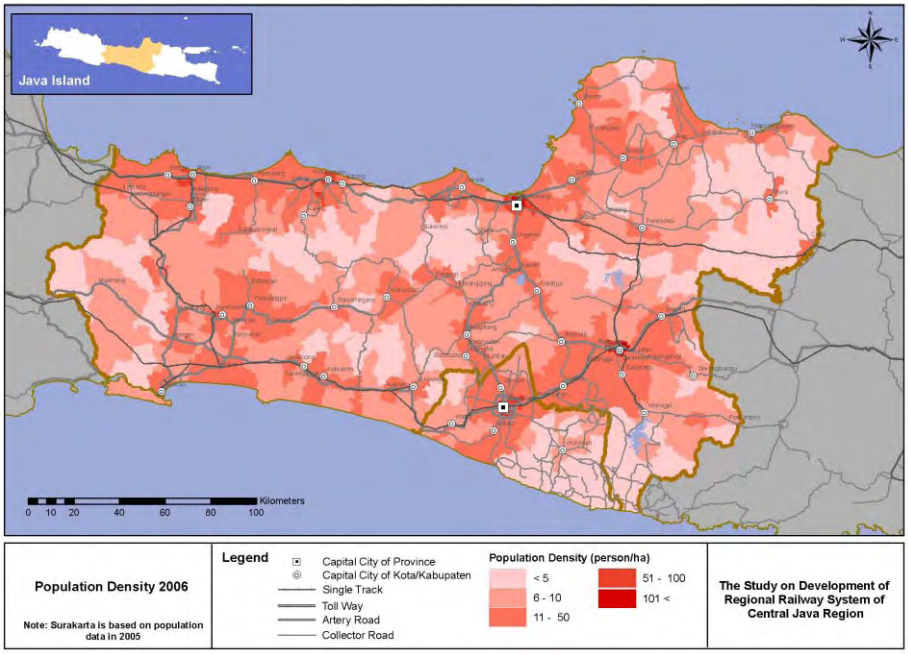
2.1 Current Socio-economic Situation

Semarang is the province capital and centre of economic activities. In particular, trade is dominant because of the Tanjung (Tg.) Emas international port. This port is used for export and import of goods for/to the entire Central Java region, both Central Java Province and Yogyakarta Special Province. Yogyakarta is also a province capital city, and the center of economic activities such as education, services and trade. Other cities, Solo, Kudus, Cilacap and Purwokerto, are core cities of regional industry such as manufacturing, textiles, wood products, cement, and mining. These cities defined as National Activity Centers are expected to drive the economy of the Central Java region.



Source: CJRR Study Team

Figure 1 Urban Hierarchy in the Study Area



Source: Census Population Data from BPS consolidated by CJRR Study Team

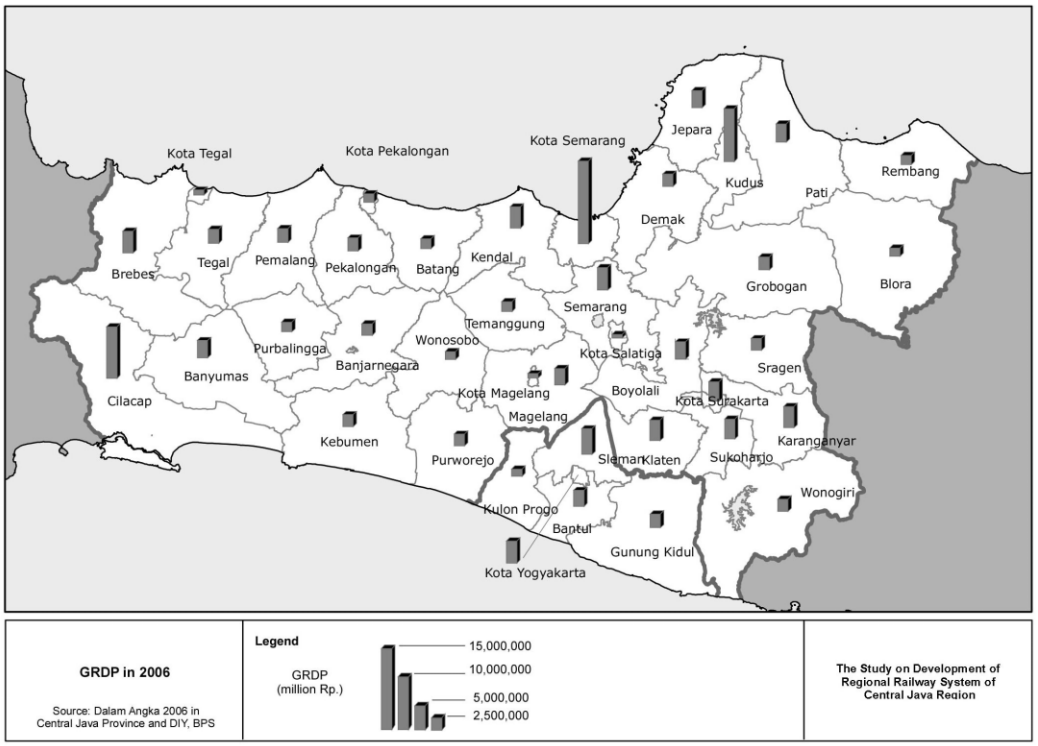
Figure 2 Population Density by Kecamatan in 2006

GRDP of the Central Java region has been increasing steadily. In terms of per capita GRDP, Kota Semarang, Kudus, and Cilacap are largest. Kota Semarang has a variety of economic activities such as trade, services, and commerce. In particular, Tg. Emas Port plays an important role in economic development. In Kudus, industries of paper products, furniture, and stationary are dominant. In Cilacap, industries of cement and fishery products make up the main portion of regional industry. These products are exported to foreign countries and command large export value.

2.2 Current Situation of Major Metropolitan Areas

According to the regional spatial plan (Rencana Tata Ruang Wilayah) in Central Java Province and Yogyakarta Special Province, Semarang, Solo, Yogyakarta, Kudus, Cilacap and Purwokerto are designated as priority cities, namely national activity centers. Of these, Semarang, Yogyakarta and Solo are the main cities in the Central Java region which are leaders in regional politics and economics. Semarang and Yogyakarta are capital cities of the provinces. Solo is also the center of the regional economy and a former capital city. In addition, these three cities play roles of gateway to/from other regions and countries because they have their own international airport. Owing to such circumstance, population is accumulating in these cities.

Urban areas tend to indicate large GRDP compared to other Kabupaten/Kota, but this difference depends upon the type of industry. Secondary and tertiary sectors such as trade, service, and manufacturing contribute to larger GRDP than primary sector which includes agriculture, fishery, and mining. In Semarang, trade is dominant because of the international port, Tanjung Emas. Yogyakarta is also the center of economic activities such as education, services and trade. Solo is one of core cities for the regional industry such as manufacturing, textiles, wood products, cement, and mining.



Source: Dalam Angka 2006 in Central Java Province and DIY

Figure 3 Gross Regional Domestic Products in the Study Area 2006

2.3 Natural Environment

Climate condition in the Central Java region as well as Java Island belongs to Tropical Monsoon Area which can be divided into dry season (May to September) and rainy season (October to April). The

Central Java region has a wide complex topography, ranging from flat to sloping area at more than 40%, and altitude between 0 m and more than 3,000 m including volcanic mountains. The fauna and flora are closely related to those of the Asian continents. In addition, it has a wide variety of climatic conditions with heavy rainfall and monsoon that create its characteristic environment which can generate various disasters such as floods, landslides and earthquakes.

Figure 4 Topography of the Study Area

2.4 Pollution

Air pollution is one of the most critical environmental problems due to recent rapid population growth and urbanization. Both provinces have tackled reduction of air pollution. Under recent policy on decentralization, each local government has established its own air quality management system with legal framework and monitoring system. Basically legal systems are structured based on Indonesian national system under Ministry of Environment (KLH). Major sources of air pollution are stationary pollution load from industrial sector, thermal power station, etc., and mobile pollution load from vehicles. In particular, growth in vehicles causes serious air pollution because of population growth and urban sprawl. Noise disturbance and water pollution has been increasing in the study area for the same reasons as air pollution.

3. Overview of Each Transport Sector in Central Java Region

3.1 Road Sector

3.1.1 Road and Road Traffic

The total road length is 26,307 km in Central Java Province and 4,596 km in Yogyakarta Special Province (DIY), respectively. Ratio of national highways is roughly 4% to 5% and the rest are either provincial or Kabupaten/Kota roads. In the Central Java region, there are toll roads only in Semarang. These toll

roads serve as ring roads bypassing Semarang City, and, in the future, they will form a part of the toll road connecting Semarang and Solo.

Table 1 Length of Roads by Type

[Unit: km]

	Central Java Province		Special District of Yogyakarta	
	Length (km)	% Share	Length (km)	% Share
Jurisdiction				
1. National Road	1,297	4.9%	169	3.7%
2. Provincial Road	2,590	9.8%	690	15.0%
3. Kabupaten/Kota Road	22,420	85.2%	3,737	81.3%
Total	26,307	100.0%	4,596	100.0%
Surface Type				
1. Asphalt	21,350	81.0%	4,596	100.0%
2. Gravel	2,407	9.1%	0	0.0%
3. Earth	885	3.4%	0	0.0%
4. Unspecified/No Cover*1	1,716	6.5%	0	0.0%
Total	26,358	100.0%	4,596	100.0%
Road Condition				
1. Good	12,691	48.1%	2,241	48.8%
2. Sufficient/Moderate	6,685	25.4%	1,440	31.3%
3. Damaged	4,534	17.2%	915	19.9%
4. Heavily Damaged/No Cover*2	2,452	9.3%	0	0.0%
Total	26,362	100.0%	4,596	100.0%

*1: Unspecified (in Central Java Province)/No Cover (in DIY)
*2: Heavily Damaged (in Central Java Province)/No Cover (in DIY)

Source:
DIY: Infrastructure and Settlement Agency of D.I Yogyakarta (DIY in figures, 2006/2007), and
Central Java Province : - Public Work Service of Jawa Tengah Province (Jawa Tengah in figures, 2007)
- BPS-Statistic of Regency/City (Jawa Tengah in figures, 2007)

In Indonesia, there was little development of the railway after Independence. As a result, road traffic has become dominant in land transport in line with motorization, and the number of automobiles has been rapidly increasing except during the economic crisis. On average, the annual rate of increase of vehicles is as high as over 10% in both provinces. This rapid motorization has brought the major cities many urban problems such as traffic congestion and environmental pollution. Traffic congestion on the roads around and between the major cities such as the road connecting Semarang and Solo is becoming worse year by year. Traffic congestion seems to be most serious on Semarang – Yogyakarta, Semarang – Solo, Semarang – Rembang, and Solo – Yogyakarta corridors.

3.1.2 Intercity Bus Transportation

Each city has intercity bus terminals from which relatively frequent bus services connecting the city with

Jakarta or major cities in the region are operated. In the Central Java region, there are around 200 daily bus services connecting Tegal, Semarang, and Solo. While use of motorcycles is very popular for individual, short-distance travel, buses are major mode of travel for a longer distance because the fare is generally reasonable due to the high competition among bus companies. Furthermore, for intercity, inter-provincial bus service, upper and lower limits of the economy class fare have been regulated by the government.

3.1.3 Freight Transportation by Road

Road is the main mode of freight transportation in Java island and also in the Central Java region. According to the Road Traffic Survey for the Semarang – Solo – Yogyakarta corridor, east-west commodity flow, which connects west and east Java through Northern Java Main Corridor (or Pantura), is the major traffic corridor within the region, although the flow pattern varies by commodity type. Radial commodity flows from / to Kota Semarang are also massive such as Kabupaten Semarang, Magelang and Solo.

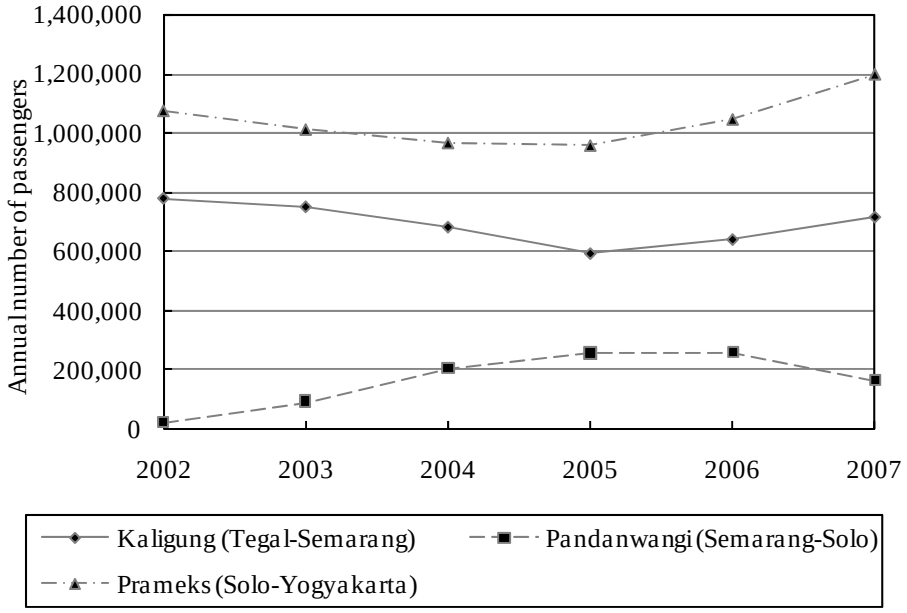
3.2 Railway Sector

As of 2006, total 4,675 km of railway is currently in service in Indonesia. Among others, 3,370 km (or 72%) of the railway in service is in Java Island. Including the railway lines that are not in service, total railway length in Indonesia is 8,067 km, 6,076 km (or 75%) of which are in Java Island.

The Central Java region's railway network is comprised of the Java north trunk line running east to west (Cirebon – Tegal - Semarang - Surabaya) and the Java south trunk line (Bandung – Kroya – Yogyakarta - Solo - Surabaya); the north-south lines linking these two trunk lines between Semarang - Solo and Cirebon - Purwokerto - Kroya; as well as the branch line between Kroya - Cilacap.

3.2.1 Passenger Transport

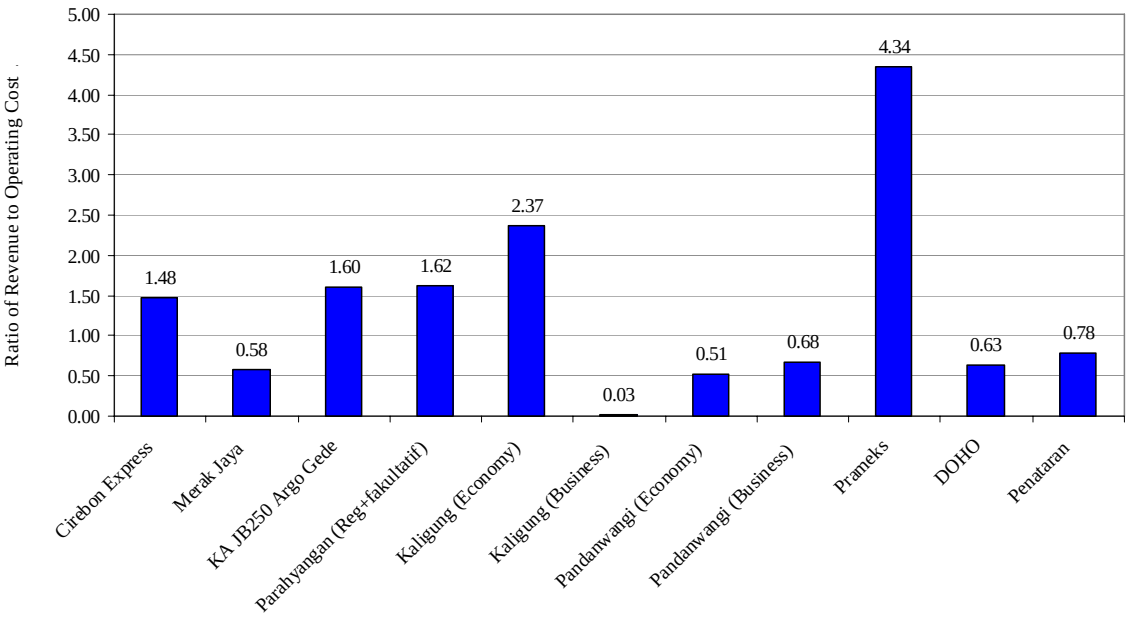
Passenger transport in the Central Java region is mainly through the operation of long-distance trains, and it has been the core business for PT. KA. Meanwhile, in Central Java local (business or economy) trains also operate between Semarang – Solo (Pandanwangi), Semarang – Solo – Sragen (Banyubiru), Solo – Yogyakarta (Prameks), Tegal – Semarang (Kaligung), and Yogyakarta – Kutoarjo (Prameks).



Source: "Progran dan Realisasi" Report DAOP IV and VI

Figure 5 Number of Passengers Using Major Local Trains in Central Java

As for fare box ratios (i.e., ratio of revenue to operating cost) of the short-distance train services, Prameks and Kaligung are showing a gain; in particular, the profitability of Prameks, which has the highest frequency of service (seven times a day with approximately 1.5-hour headway), is the most remarkable of all the short-distance train services. As a result, significant shares of local train passengers are observed in Semarang (DAOP IV) and in Yogyakarta/Solo (DAOP VI).



Source: PT. Kereta Api (Persero)

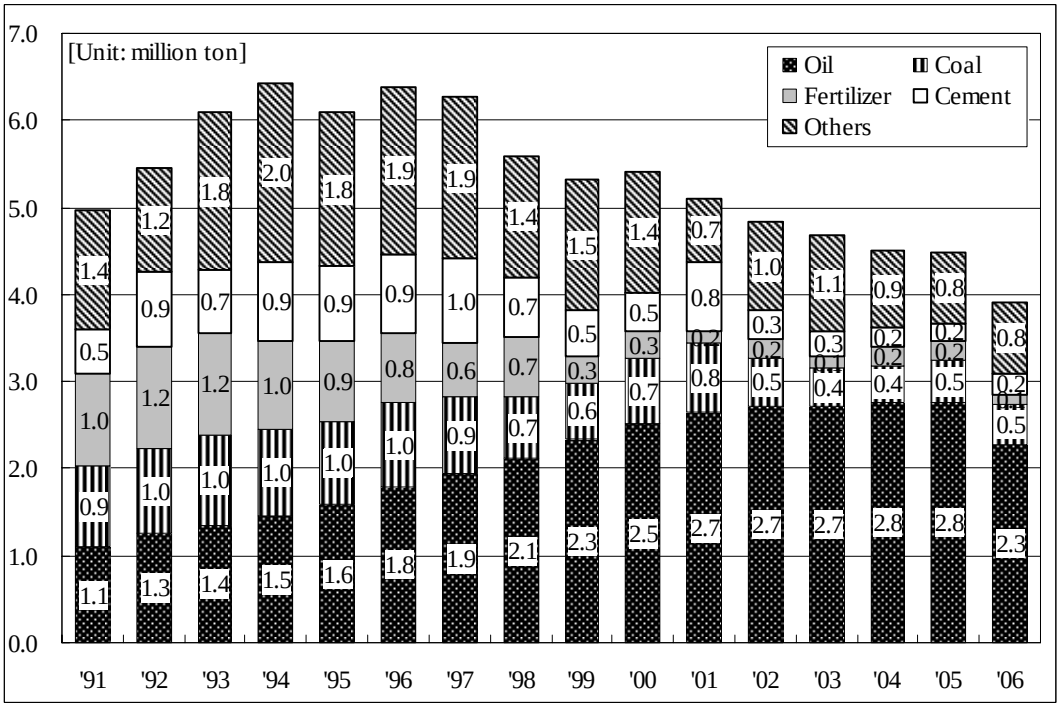
Figure 6 Fare Box Ratios of Major Short-Distance Trains (< 250 km) in Java Island

As for the trend of annual total volume of passengers based on the ticket sales data, while a slight decrease in ridership was observed in some years, the latest trend is generally upwards. In order to make train operation easier in large cities, stations for medium and long-distance trains and those for local trains have been set up separately, but close to each other.

- Semarang: Semarang Tawang Station (medium/long-distance trains), Semarang Poncol Station (local trains)
- Yogyakarta: Yogyakarta Tugu Station (medium/long-distance trains), Lempuyangan Station (local trains)
- Solo: Solo Balapan Station (medium/long-distance trains), Solo Jebres Station (local trains)

3.2.2 Freight Transport

Total volume as well as ton-km of cargos transported by rail has been decreasing in Java Island. Reduced freight carrying capacity due to a policy of prioritizing passengers and poorer service because of aging rolling stock including locomotives have resulted in low utilization ratio of train cars, and the ratio of freight revenue is on the decline. The aged train cars, coupled with insufficient maintenance, have resulted in reduced operation speed, and the freight business is being taken away by trucks which are essentially more suitable for small-lot, door-to-door transportation service. As more toll roads are constructed and travel times between major cities in the Central Java region by road are shortened, the competitive position of the railway may be further weakened.



Source: PT. Kereta Api (Persero)

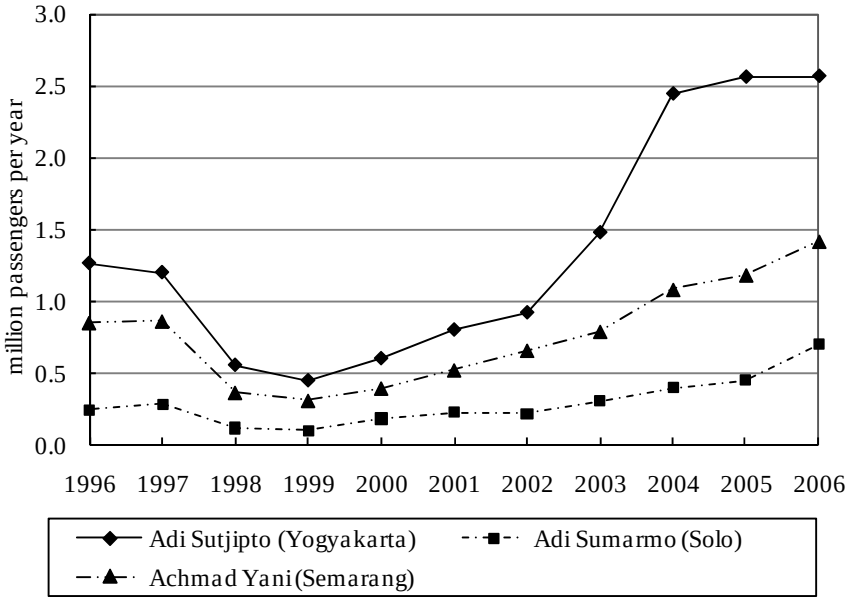
Figure 7 Annual Trend of Railway Cargo Volume by Commodity Type in Java Island

Another reason for the weakening of rail freight business is the low transportation tariff that is often negotiable; consequently, necessary improvements cannot be made due to insufficient revenue and profits. Furthermore, since the railway sector currently has fundamental problems such as train delays and frequent accidents, it is important to provide more reliable services by improving infrastructure, communication and signaling systems, shortage of rolling stock, institutions, human resources, etc.

Major commodities transported by railway in DAOP IV (Semarang) are sand and fertilizer. However, since the middle of 2006, fertilizer is no longer transported by rail to Tg. Emas Port. In DAOP V (Purwokerto), fuel and cement are the major commodities that are transported by railway. Significant amount of fuel is transported by railway from the refinery in Cilacap to Tegal. In DAOP VI (Yogyakarta), fuel is also a major commodity transported by railway as well as quartz sand. From Cilacap to Yogyakarta, aviation fuel is transported by railway. As for containers, although there are some transported by railway especially in DAOP IV, the volume is relatively small. It is also necessary to enhance the inter-modality by revitalizing railway facilities in Tg. Emas Port as well as dry ports at Yogyakarta and Kalijambe.

3.3 Air Transport Sector

Although there is some yearly fluctuation, the annual average growth of the number of passengers on the major air routes in the Central Java region between 2000 and 2006 is as high as 25%. Therefore, railway passenger demand for long distance train routes such as Jakarta – Semarang, Jakarta – Yogyakarta, and Jakarta – Solo is facing strict competition from lower airfares due to the deregulation of the airline sector. Annual volume of cargos handled at the three major airports in the Central Java region has also been remarkably growing since 2000.



Source: Angkasa Pura I

Figure 8 Annual Number of Passengers at Each Airport in Central Java

3.4 Maritime Transport Sector

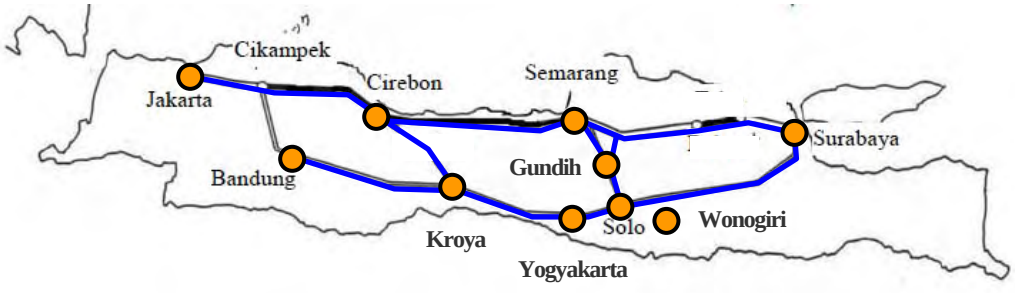
Among the ports located in the Central Java region, international trunk ports are in Semarang (Tg. Emas Port) and in Cilacap (Tg. Intan Port). Both ports have railway tracks beside/near the port. Tg. Emas (Semarang) Port is one of the most strategic ports in Indonesia, and has been designated as an international port.

As of 2006, total annual container throughput at Tg. Emas Port is about 370,000 TEUs, and the volume has been increasing year by year. Meanwhile, the total volume of non-container cargos which mainly consist of domestic inter-island cargos is about 3.7 million tons (as of 2006) excluding fuel, and recently the volume has also been growing. More than 90% of the inter-island cargos are unloaded cargos including oil fuel, timber, fertilizer, cooking oil, cement, and so on. However, Tg. Emas Port was damaged by submergence in 2003. No drastic measures have been taken yet since then, and the railway to the container yard is no longer used. However, it is hoped that the railway transportation will be revived for handling cargos, more specifically, containers.

In Tg. Intan Port, while there are no containers, considerable amount of fuel is handled. Fuel refined in the petroleum refinery in Cilacap is transported by railway mainly to Tegal area. Fuel for aircraft is also transported by railway from the petroleum refinery in the port to Rewulu station near Yogyakarta, in which a Pertamina depot is located, and supplied to Adi Sutjipto (Yogyakarta) Airport. In Tg. Intan Port, total annual cargo throughput excluding fuel is about 2 million tons as of 2006, and the volume has been fluctuating a lot each year. Major commodities unloaded are limestone, fertilizer, and coal, while major commodities loaded are cement, and so on.

4. Analyses on Present Railway Facility and Operation

Operated railway network in Java Island is 894 km (58.9%) and non-operated network is 624 km (41.1%) There are three Railway Management Bureaus, or DAOP (Daerah Operasi), which are under the control of PT. Kerata Api in the Central Java region. The number of trains in Central Java is 424 or 39% of the total number of passenger trains operated in Indonesia. Two-thirds of the total national freight trains or 6,550 coaches are allocated to Java Island.



Source: Based on Each DAOP Report

Figure 9 Railway Network in Java Island

Problems on railway transport can been classified into 1) operational problems, 2) facility problems 3) and regulatory problems.

4.1 Present Condition of Railway System in Central Java Region

(1) Railway Infrastructures

1) Rail

There are seven types of rails depending on its unit weight (54 kg, 50.4 kg, 42.59 kg, 41.5 9 kg, 38kg, 33.4 kg, 25.7 kg). DAOP VI knows clearly the circumstances of rail conditions, mainly due to recent implementation of double-tracking project.

Table 2 Types of Rail by DAOP 2006

Unit: (%)

District	54 kg/m	50 kg/m	41-42 kg/m	33-38 kg/m	25 kg/m
DAOP IV	31	24	40	5	-
DAOP V	41	-	43	13	3
DAOP VI	69	3	13	5	10

Source: DAOP IV, V and VI

2) Sleeper

Types of sleepers utilized on the railway network in the region are concrete, steel and wood. DAOP VI again clearly knows the profiles of sleepers.

Table 3 Types of Sleepers by DAOP 2006

Unit: (%)

District	CONCRETE	STEEL	WOOD
DAOP IV	50	5	45
DAOP V	38	35	27
DAOP VI	86	4	10

Source: DAOP IV, V and VI

(2) Bridges

Long-span bridges are made of steel, whereas short-span bridges are made of concrete. Class 1 is defined as a span length over 10 meters.

Table 4 Types of Bridges by DAOP 2006

District	CLASS 1 (STEEL)		CLASS 2 (CONCRETE)	
	(UNIT)	(kg)	(UNIT)	(m3)
DAOP IV	546	9,128,655	65	398,000
DAOP V	508	9,133,758	168	1,240,616
DAOP VI	257	6,413,759	92	822,373

Source: DAOP IV, V and VI

(3) Rolling Stock

1) Types of Rolling Stock

Long distance and business class coaches are trailed by diesel locomotives, while local trains are operated by diesel cars. Diesel locomotives in operation are either DEL (Diesel Electric Locomotive) or DHL (Diesel Hydraulic Locomotive). Passenger cars are classified into three classes, executive, business and economy. Executive class coaches have AC (Air Conditioning) system and power for AC is supplied by engine and generator set equipped in the power source car, while other classes do not have AC system.

For the freight trains, tank car and container carry wagon are bogie car; however, most freight wagons are 2 axle car. The operation still works on the low axle burden with the high traffic number, which is not efficient for transporting cement and fertilizer.

2) Operating Rate

Operating rate of rolling stock appears to be low from the site reconnaissance of several maintenance facilities. This is mainly due to: 1) many varieties of rolling stock were procured from various international donors, which causes difficulties in learning skills for adequate maintenance and procuring spare parts, and 2) maintenance is not conducted periodically but only on a corrective basis; repair works can rarely be undertaken once a critical disorder occurs.

3) Localization of Rolling Stock Manufacturing

Electric diesel trains (KRDE) are used for Prambanan Ekspres. This was manufactured by Indonesian Company, PT. Inka that developed electric trains with only 30% components made abroad while the remaining 70% are made by themselves.

(4) Train Control System

1) Signaling and Telecommunication

- Installation of automatic signaling system covers limited route sections, i.e. Cirebon - Tegal - Semarang – Brumbung section and Cirebon - Prupuk - Kroya – Yogyakarta section

- Signaling control of the other sections is manual. Blocking sections on each side of stations are made through telephone communications by each station master.

- Signaling facilities from overseas has caused maintenance problems. Spare parts for repair works are often not available when required and skill development is hard to achieve due to too many types of signaling systems.

- Improvement of signaling system in this region will significantly contribute to train control

capabilities, to allow safe and reliable operation as well as reduction of required number of staff for the operation.

2) Centralized Train Control (CTC) Center

- CTC at Semarang, Yogyakarta, and Purwokerto supervise signaling control at each station. However each station master administers the works in practice.

- To meet the basic needs of centralized train control in the region, two issues are of concern with regard to facilities: 1) Introduction of CTC system in Tegal - Jerakah section to achieve the train operation in safe and efficient manner, and 2) Integration of CTC system between Semarang Poncol and Semarang Tawang stations.

- In line with the facility upgrade, it is also mandated to provide sufficient staff training.

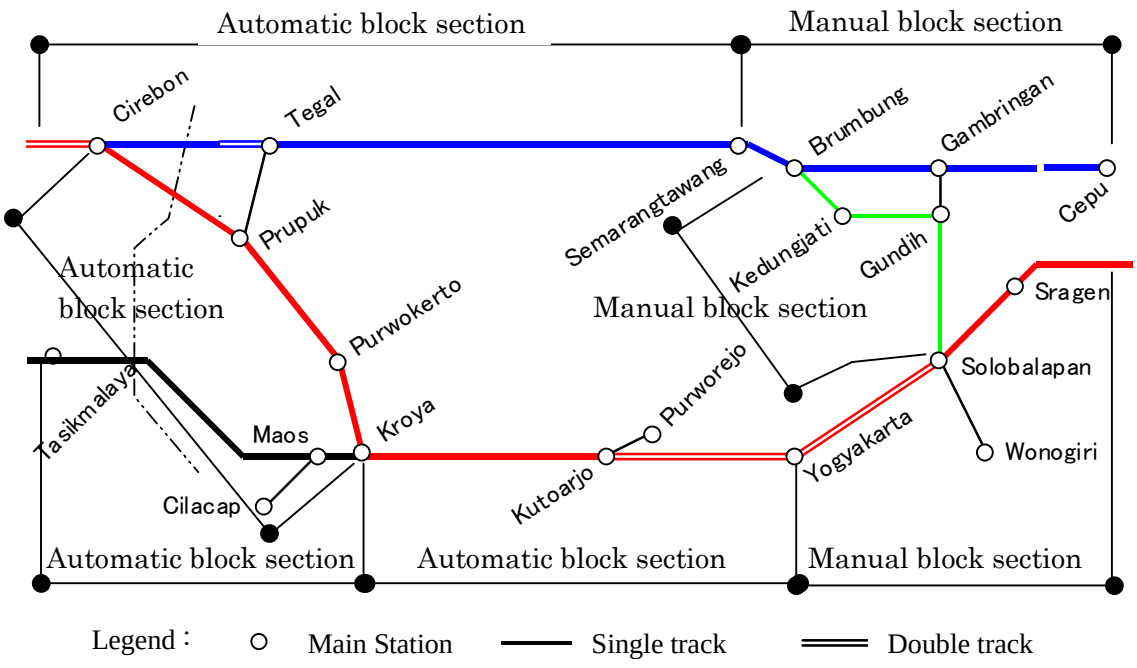


Figure 10 Block Sections in Central Java

(5) Facility Problems

Problems related to railway facilities and rolling stocks are 1) bad track condition, 2) disorder in signal, telecommunication and CTC since different system was installed in each section from many countries, 3) insufficient other infrastructures for providing frequent and high speed service such as level crossing and bridge and station, and 4) insufficient rolling stock to provide appropriate service such as aged cars, low operating rate and insufficiency in number of rolling stocks. More detailed problem descriptions on

facility are listed in the Table below;

Table 5 Facility Problems and Countermeasures

	Problems/bottlenecks	Countermeasures
Track	* Insufficiently and inadequately maintained tracks * Aged or disordered tracks	* Introducing sufficient and adequate maintenance program * Rehabilitating aged or disordered tracks
Signal & Telecom.	* Disorder of signaling facilities due to inadequate and insufficient maintenance * Difficulties in procuring spare parts from overseas * Inefficient operation with manual-based signaling system	* Rehabilitating signaling facilities * Developing maintenance skill * Standardizing signaling system * Introducing automatic signaling system
CTC	* Absence of CTC system in Tegal – Jerakah * Different CTC system between two Semarang Stations	* Introducing CTC system * Standardizing CTC system
Level Crossing	* Unsecuritized illegal crossings * Dangerous crossings without surveillance	* Prohibiting illegal crossings * Providing surveillance at level crossings where accidents frequently occur
Bridge	* Constraints in travel speed when passing aged bridges	* Rehabilitating aged bridges
Station	* Waterlogging at Semarang Stations	* Introducing efficient drainage and pumping system * Elevating critical section of the line
Rolling Stock	* Slow travel speed (especially long distance trains and freight trains) * Frequent disorder (aged cars) and low operating rate * Insufficiency in number of rolling stock to provide frequent operation * Ground pollution and contamination due to leaked fuels and lubrication oils	* Reorganizing operation schedule * Introducing sufficient and adequate maintenance program * Procuring additional rolling stock * Optimizing train operation schedule * Cleaning up and renovating maintenance yards
Maintenance Facilities and Activities	* Aged or disordered maintenance equipment * Aged or disordered tracks in maintenance yards * Insufficiency of maintenance works (corrective maintenance as maintenance policy)	* Providing necessary maintenance equipment * Rehabilitating aged or disordered tracks * Introducing and developing a periodic maintenance environment
Structures	* Illegal structures invading structure gauge	* Prohibiting illegal structures
Integration with ports	* Abandoned spur lines	* Rehabilitating access lines (if required to be integrated)

Source: CJRR Study Team

4.2 Present Train Operation in Central Java Region

(1) Present Passenger Train Operation in Central Java Region

1) Operational Indicators

Operational indicators in each DAOP are shown as follows.

Table 6 Operational Indicators by DAOP 2006

District	Regional Centre	Annual Passengers	Railway Line Length (km)	
			Operated	Not Operated
DAOP IV	Semarang	3,060,435	417,137	537,075
DAOP V	Purwokerto	2,756,108	330,721	96,950
DAOP VI	Yogyakarta	3,693,857	360,358	258,649
Total		9,510,400	1,108,216	892,674

Source: DAOP IV, V and VI

2) Major Regional Train Services

Major regional train services in Central Java region are listed as follows.

Table 7 Major Train Services in Central Java Region 2007

Name of Train	Section	Distance (km)	No. of Trains (2ways /day)	Operating Period	Ave. Travel Time (hour)	Scheduled Speed (km/h)	Train Composition
Kaligung Business	Tegal - Semarang	148.1	4	4:54-19:41	2.40	55.5	5KRD
Kaligung Economy	Tegal - Semarang	148.1	4	6:05 - 19:36	2.47	53.3	4KRD
Pandan –wangi	Semarang - Solo	109.6	4	5:00 - 20:22	3.17	33.4	2KRD
Prambanan Express	Yogyakarta - Solo	59.3	19	5:45 - 19:45	1.00	59.0	3KRDE

Source: DAOP IV, V and VI

3) Maximum Travel Speed

Maximum travel speed in each section is summarized as follows.

Table 8 Maximum Travel Speed in Each Section

Tegal - Semarang (km/h)		Semarang - Solo (km/h)		Yogyakarta - Solo (km/h)	
1. Tegal – Surodadi	95	1. Semarang - Alastuwa	70	1.Yogyakarta - Solobalapan	100
2. Surodadi – Kuripan	95	2. Alastuwa - Brumbung	85	2. Solobalapan - Solojebres	80
3. Kuripan – Krengseng	70	3. Brumbung - Kedungjati	50		
4. Krengseng – Semarangponcol	95	4. Kedungjati-Gundih	40		
5. Semarangponcol – Semarangtawang	50	5. Gundih-Solobalapan	65		

Source: DAOP IV, V and VI

4) Line Capacity

- The operating frequency in Central Java has been kept relatively high, especially by North Line. For some lines, like Tegal, capacity has been exceeded. Double tracking works solve capacity bottlenecks like Yogyakarta-Solobalapan.

Table 9 Line Capacity 2007

	Line	Capacity	No. of Train	Allowance
DAOP 4	Semarngtawan-Tegal	66	64	2
	Semarangtawan-Bojonegoro	70	28	42
	Semarangtawan-Gundih	43	12	31
DAOP 5	Kutoarjo-Kroya	66	58	8
	Kroya-Purpuk	49	42	7
	Kroya-Banjar	40	40	0
DAOP 6	Yogyakarta –Kutoarjo (Double Track)	260	50	210
	Yogyakarta-Solobalapan (Double Track)	260	66	194
	Solobalapan-Walikukun	79	38	41
	Solojebres-Gundih	63	18	45
	Purwosari-Wonogiri	25	2	23

Source: DAOP IV, V, VI and Diagram as of 22 June 2007.

5) Safety and Level of Railway Accident

- Number of accidents in Indonesia range between 100 and 200 per year, types of which vary: collisions, accidents on a level crossing gate, derailment, floods etc. Major factors of these accidents are poor conditions of track, insufficient and inadequately maintained rolling stocks and disorder of signaling systems.

- To reduce the accident risk in 2002, the railway company established a policy to introduce speed limits. Maximum speed on heavily used lines are restricted to as low as 20-30 km/hour.

Table 10 Railway Accidents

	2000	2001	2002	2003	2004	2005	2006	2007
Collision	4	10	4	1	7	9	5	3
Level crossing	28	42	48	57	26	10	20	13
Derailment	79	40	47	83	76	99	75	116
Flood, Landslide	7	10	10	7	4	3	3	6
The others	9	32	71	70	35	29	12	11
Total	127	134	180	218	148	150	115	149
Victim								
Death	89	128	76	72	78	35	45	29
Sever injury	71	156	114	104	87	85	71	102
Tiny injury	93	114	60	122	33	109	51	155
Toatal	253	398	250	298	198	229	167	286

Source: -PT. KA Head Office -Pusat Keselamatan -Divisi Sarana

6) Punctuality

Some indicators of time punctuality of the railways are:

- Average delay of departure time of passenger trains in Java = 6 minutes
- Average delay of arrival time of passenger trains in Java = 47 minutes

To improve the punctuality to an acceptable level, it is required to improve rolling stock, infrastructure

reliability, signal and telecommunication system, manpower and train operational management system.

Table 11 Passenger Train Operation Record in 2007

DAOP/ EKSP.	Punctual Train Operation (%)		Average Delay Time compared to Timetable (min.)		Average Net Delay Time of Travel Time (min.)	
	Departure	Arrival	Departure	Arrival	In	Out
1 JAK	48	5	10	56	25	17
2 BD	87	19	2	39	15	16
3 CN	81	18	4	24	1	5
4 SM	86	21	4	32	9	13
5 PWT	77	10	15	76	30	41
6 YK	85	18	5	69	5	29
7 MN	94	40	2	47	6	13
8 SB	72	33	9	50	5	14
9 JR	92	53	1	35	10	7
Average of JAWA	80	24	6	47	12	17
DIV. l SU	71	28	6	22	-	-
DIV. ll SB	-	-	-	-	-	-
DIV. lll SS	76	20	10	69	-	-
Average of SUMT	74	24	8	45	-	-
Average of PT. KA	77	24	7	46	-	-

Source: PT. Kereta Api (Persero)

7) Comfort

Cleanliness, noise, temperature and lack of air circulation, shaking and unsteadiness (vertical/horizontal) provides riding discomfort in several sections. Especially the Solo - Semarang Section faces chronic problems in this regard.

(2) Present Freight Train Operation in Central Java Region

Freight train operations are scheduled between passenger trains in daytime and nighttime.

Table 12 Number of Freight Trains Operated in Each Section

Yogyakarta – Solo	10 trains /day
Jakarta - Semarang – Surabaya	7 trains /day
Others	4 - 6 trains /day

Source: PT. Kereta Api (Persero), DAOP IV, V and VI

1) Punctuality

Freight trains have bigger delay time than of passenger trains to give priority to recovery of the delay of passenger trains. Some indicators of time punctuality of the railways are:

- Average delay of departure time of freight trains in Java = 82 minutes
- Average delay of arrival time of freight trains in Java = 124 minutes

To improve the punctuality to an acceptable level, it is required to improve rolling stock, infrastructure reliability, signal and telecommunication system, manpower and train operational management system.

Table 13 Freight Train Operation Record in 2007

DAOP/ EKSP.	Punctual Train Operation (%)		Average Delay Time compared to Timetable (min.)		Average Net Delay Time of Travel Time (min.)	
	Departure	Arrival	Departure	Arrival	In	Out
1 JAK	23	0	8	33	17	9
2 BD	6	1	39	176	16	55
3 CN	-	-	-	-	5	-
4 SM	10	12	79	93	13	38
5 PWT	41	45	39	48	41	64
6 YK	23	21	178	193	29	151
7 MN	8	13	168	166	13	105
8 SB	29	20	64	160	14	68
9 JR	-	-	-	-	7	-
Averageof JAWA	20	16	82	124	17	67
DIV. l SU	21	12	38	56	-	-
DIV. ll SB	28	28	32	32	-	-
DIV. lll SS	21	22	148	177	-	-
Average of SUMT	23	21	73	88	-	-
Averageof PT. KA	21	18	77	106	-	-

Source: PT. Kereta Api (Persero)

2) Travel Time

In addition to the delay of departure / arrival of freight train, even scheduled travel time for freight trains is more than that of a passenger train due to PT. KA's policy to put high priority on a passenger train. Some freight trains have to stop almost at all stations for passenger trains in the same direction to overtake and for those of opposite direction to pass in a single track section.

For instance, transporting steel from Ciregon, west end Java Island, to Surabaya, eastern city of Java Island, takes roughly one week for one way trip (ca. 850 km railway track). On the other hand, it usually takes 10 hours from Jakarta, located western area of Java Island, to Surabaya by Argo Bromo Anggrek (ca. 730 km railway track). Another example is cement train from Cilacap to Solo (ca. 220 km railway track). It usually takes 2 – 3 days for round trip.

(3) Operational Problems

Problems related to train operation include 1) insufficient line capacity, 2) frequent railway accidents, 3) delays of trains, 4) long travel time, 5) no integration with other mode of transport, 6) passive attitude on business promotion, 7) lack of comfort, 8) lack of security, 9) low frequency, 10) operator-oriented timetable and 11) inconvenient ticket sales and information service. More detailed problem descriptions on train operation are listed in the table below;

Table 14 Operational Problems and Countermeasures

	Problems	Countermeasures
Line capacity	* Insufficient line capacity	* Providing efficient and reliable train control system * Improving facilities in bottlenecked sections * Double tracking
Safety	* Frequent railway accidents (collisions, derailment, etc.)	* Controlling travelling speed at bottlenecked sections * Introducing efficient and reliable train control system * Improving deteriorated facilities
Time Punctuality	* Frequent delays of departure and arrival	* Improving facilities in bottlenecked sections * Introducing efficient and reliable train control system * Procuring rolling stocks in good condition * Optimizing train operation schedule and management
Travel Time of Freight Train	* Long travel time	* Increase line capacity * Change priority on freight train in rural section
Integration with Port, Dry port	* No railway in Tg. Emas port. * No dry port	* Installing railway line in Tg. Emas port and Solo dry port in cooperation with freight forwarders
Business Promotion	* Passive approach * Few resources for marketing	* In cooperation with private companies * Installing competition among railway operators
Comfort	* Dirty inside the train * Noise * Temperature and lack of air circulation * Shaking and unsteadiness * Lack of Air conditioner * Inadequate lighting apparatus * Large steps between train and platform * Vendors	* Renovating or replacing rolling stock * Improving track facilities * Installation of air conditioner * Frequent maintenance of lighting apparatus * Raising level of platform
Security	* Accidents due to illegal crossing and structures * Broken window	* Prohibiting illegal crossings and improving fencing * Frequent maintenance
Frequency	* Low frequency	* Installation of a train composed with 3 class coaches
Timetable	* Low service level for local trains * Classed service * Ignorance of intermediate stations * Ignorance of transfer passengers	* Improve line capacity * Stops all trains at terminal stations * Installation of a train composed with 3 class coaches * Timetable in consideration of transfer passengers
Ticket Sales	* A few outlets * Inconvenient telephone booking system	* Increase of travel agencies * Installation of internet booking system with variety of options of payment
Information Service	* Station-based information service	* Up to date information service with variety of media
Integration with other modes	* No integration with intercity bus services	* Cooperation with local authorities to allow intercity bus to enter station plazas

Source: CJRR Study Team

4.3 Regulatory Problems

4.3.1 Regulatory Problems and Countermeasures

Some regulatory problems that are being addressed through existing and new legislation, are described in the following section. In addition, it is recommended to implement a pro-rail transport policy by the Ministry of Transport. Suggestions for this policy are described in this section and would enable the Ministry to apply several additional measures that would help develop a stronger and more effective railway network in the country.

(1) Regulatory Problems

While there is the PSO system of compensation to PT. KA for operation of non-profitable passenger services by the central government, due to lack of financial resources the government is unable to fully compensate PT. KA for the losses incurred in operating these services. This shortfall must be compensated by cross-subsidy from other PT. KA services. The study also found that many goods are moved long distances by road because of poor railway freight services, cited by several customers during interviews as long transit times, insufficient freight wagons and locomotives and outdated infrastructure that results in frequent delays. Many industries are paying higher transport prices for road transport, because of the absence of reliable and efficient rail freight service. The rail freight tariff is not controlled by government, though most of PT. KA's customers are parasitical organizations.

Transport regulatory reform is one way to improve this situation and to attract additional capital investments to railways and to permit more innovative railway management structures to more effectively deal with attracting freight traffic to the railways. Passage of Law 23 of 2007 and the subsequent draft enabling legislation is the first step towards developing a stronger railway system in the country and eliminate many of the economic distortions now present.

With regard to passenger services, there will continue to be the need to compensate operators for losses incurred in operating economy passenger trains. It is proposed that there should be a greater involvement of private sector railway operators/managers that would be responsible for operating some passenger services on regional railways. With a properly-structured performance and incentive contract (these contracts would be tied to the payment of a management fee), a private railway operator should be able to operate passenger services efficiently at minimum cost, and attracting the maximum number of passengers.

In fact, the participation of the private sector in operating passenger trains may result in increased financing sources for the passenger rail subsidy. One of the criteria for selecting the private railway manager/operator could be the level of operating subsidy required; the qualified bidder requiring the lowest level of subsidy may be selected. This technique could actually reduce the level of operating subsidy, by inviting private sector operators to manage passenger services, with one of the criteria for selection the subsidy required. The qualified company requiring the lowest subsidy (consistent with service standards) may be selected.

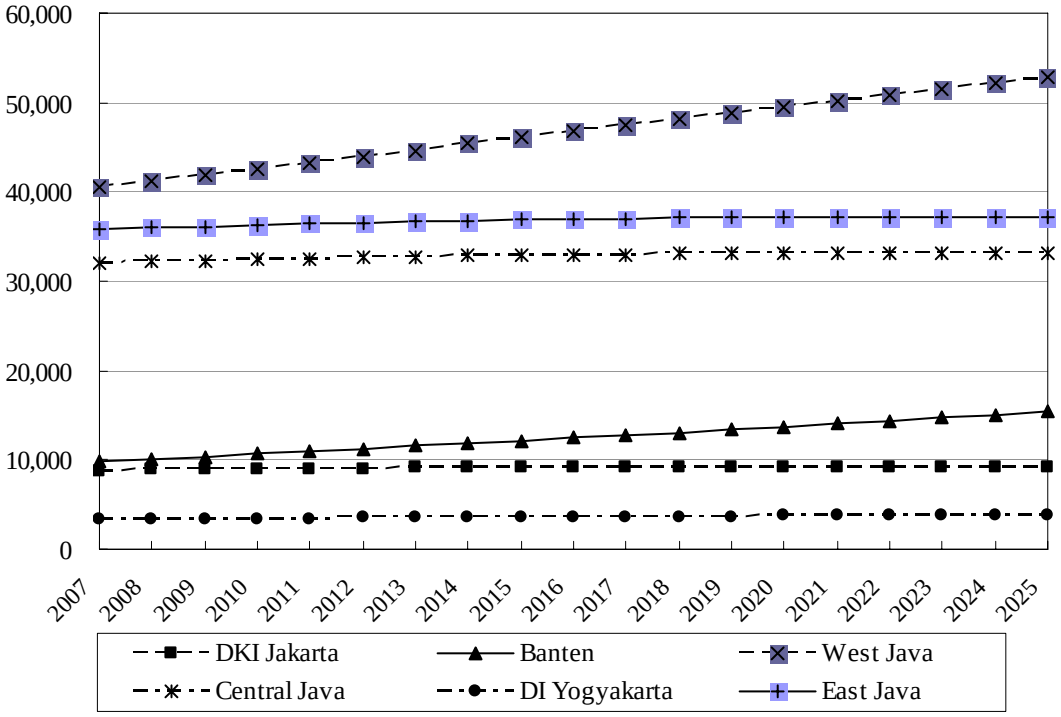
5. Perspective of Central Java Region

5.1 Socio-economic Framework

5.1.1 Population

The Central Statistical Bureau (BPS) estimates that the population in Central Java Province and

Yogyakarta Special Province (DIY) is around 32.1 million and 3.3 million, respectively, totaling 35.4 million for the Central Java region. While the population growth in West Java is remarkable, the growth in the two provinces of the Central Java region is much lower, and nearly 0% growth is expected for 2020 and afterwards.

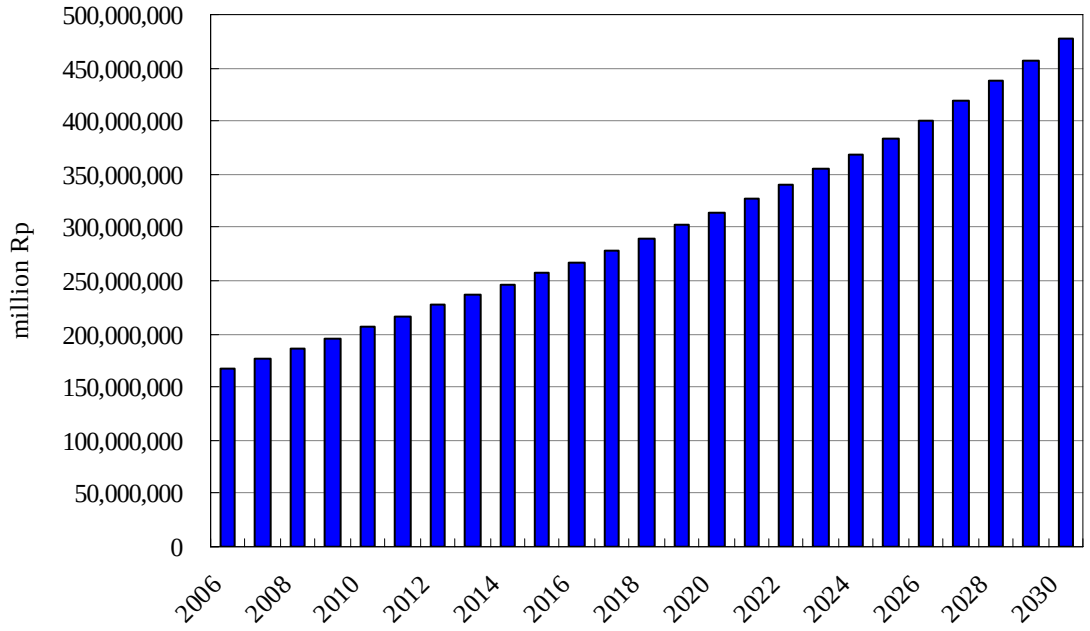


Source: BPS

Figure 11 Future Projection of Population in Central Java Region

5.1.2 Gross Domestic Product

For future projection of GRDP in the Study area, the share of the Study area to the whole country was first calculated for future years in terms of population. The population share is forecast to change from 15.9% in 2006 to 13.2% in 2030. Then, future change of this share was applied to the share of the Study area in terms of GRDP; that is, the GRDP share of the Central Java region will gradually decrease from 9.1% in 2006 to around 7.5% in 2030. The annual GRDP growth ratio of the Study area is estimated as approximately 5.1% for the period of 2009 – 2012 and 4.1% for 2013 onwards.



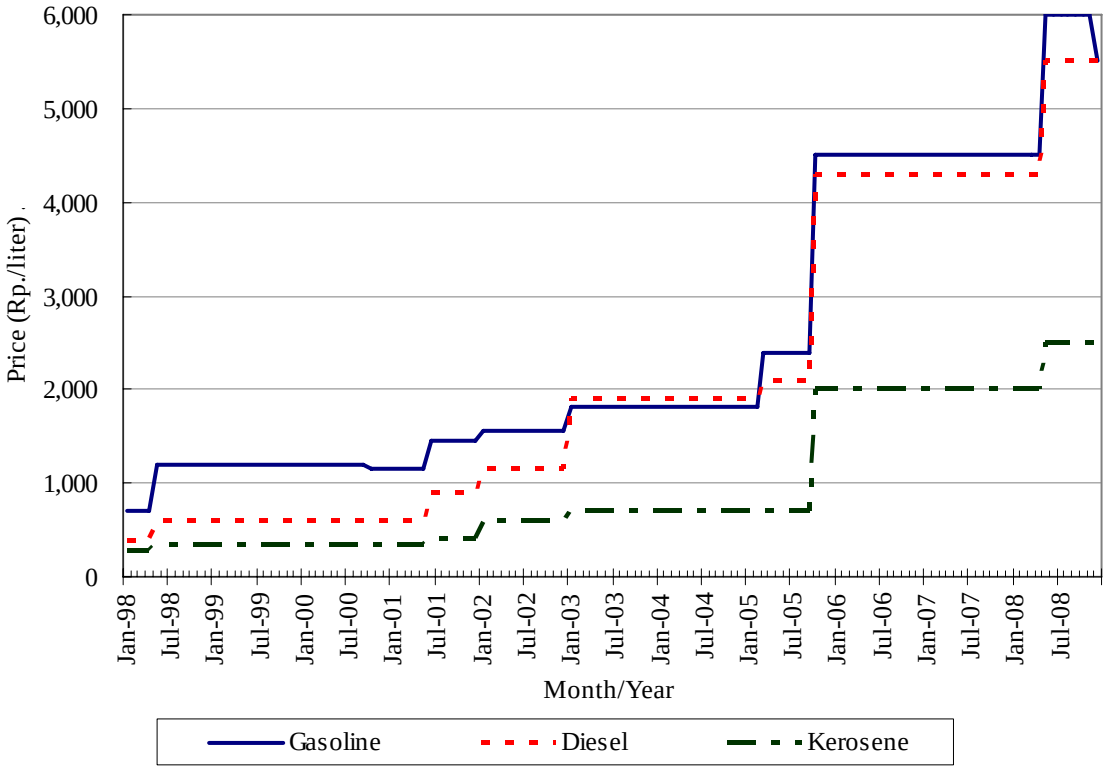
Note: All figures in 2000 constant price.
Source: CJRRStudy Team

Figure 12 Future Projection of GRDP in Central Java Region

5.1.3 Increase in Fuel Prices

Increase in the fuel prices has caused higher prices in many commodities and services, seriously affecting people's lives. However, since the soaring fuel prices discourage use of private vehicles and airplanes, railway travel which is supposed to be energy-efficient has a relative advantage over other travel modes. Similarly for freight transport, as the unit cost of transporting commodities by truck increases due to the higher fuel prices as well as the stricter regulation of overloading, railway is regarded as a more competitive mode of transport.

Furthermore, as oil prices increase, coal is becoming more and more important as alternative energy resources for Indonesia. Since railway is essentially suitable for transporting bulky, heavy commodities such as coal for long distances, it is also a great opportunity for the railway to become the main mode for transporting coal.



Note: All subsidized prices.
Source: BPH Minyak dan Gas Bumi (November 2008)

Figure 13 Historical Trend of Gasoline, Diesel, and Kerosene Prices in Indonesia

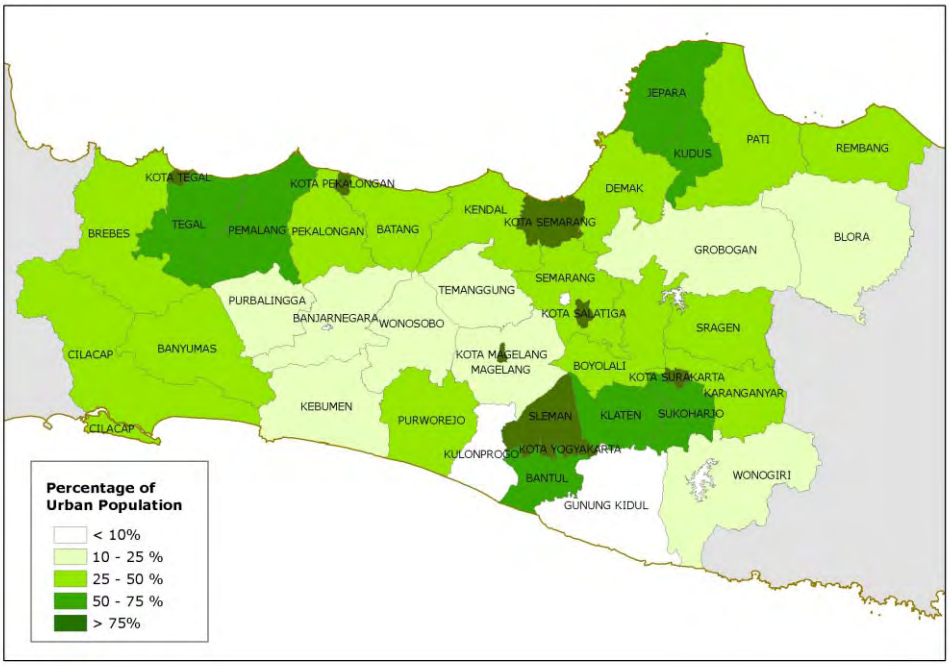
5.2 Growth of Metropolitan Area

Urbanization is one of phenomena associated with the globalization. The study area reflects this. Population of three kota, Semarang, Solo and Yogyakarta, has been growing and gradually becoming denser. At the same time, other areas (kota and kabupaten) have been changing the demographics. Urban population has been increasing in the study area, notably, in kabupaten surrounding the cities (kota). Comparing the data of 1995 and 2005, urban population increased remarkably in a decade. The growth of urban population in some kabupaten was over 5%, and the highest is more than 13%.

GRDP is expected to follow the trend of urban population growth. Urbanization could offer many people the opportunity to shift from primary to secondary and tertiary sector industries. On the other hand, improvement of agricultural, fishery and forestry skills such as introducing mechanized system might help to change the industrial structure, by decreasing population of the primary industrial sector. In terms of GRDP per capita by the sector, the tertiary achieved high price compared to the primary and secondary. Increase in the tertiary population might help for further economic growth in the urban area.

Urban land use needs to efficiently support urban functions and convenience in line with urban population growth. In addition, it should provide good business environment that could attract business activities and encourage economic growth. In order to take account of future dynamics from increasing urban

population and economic growth, the Study team suggests reviewing the existing land use plan periodically. In addition, an integrated land use plan of metropolitan area which covers not only kota but also surrounding kabupaten will be needed in accordance with future urbanization.



Source: CJRR Study Team based on BPS Central Java Province and DIY, SUPAS

Figure 14 Urban Population Ratio by Kota / Kabupaten in 2005

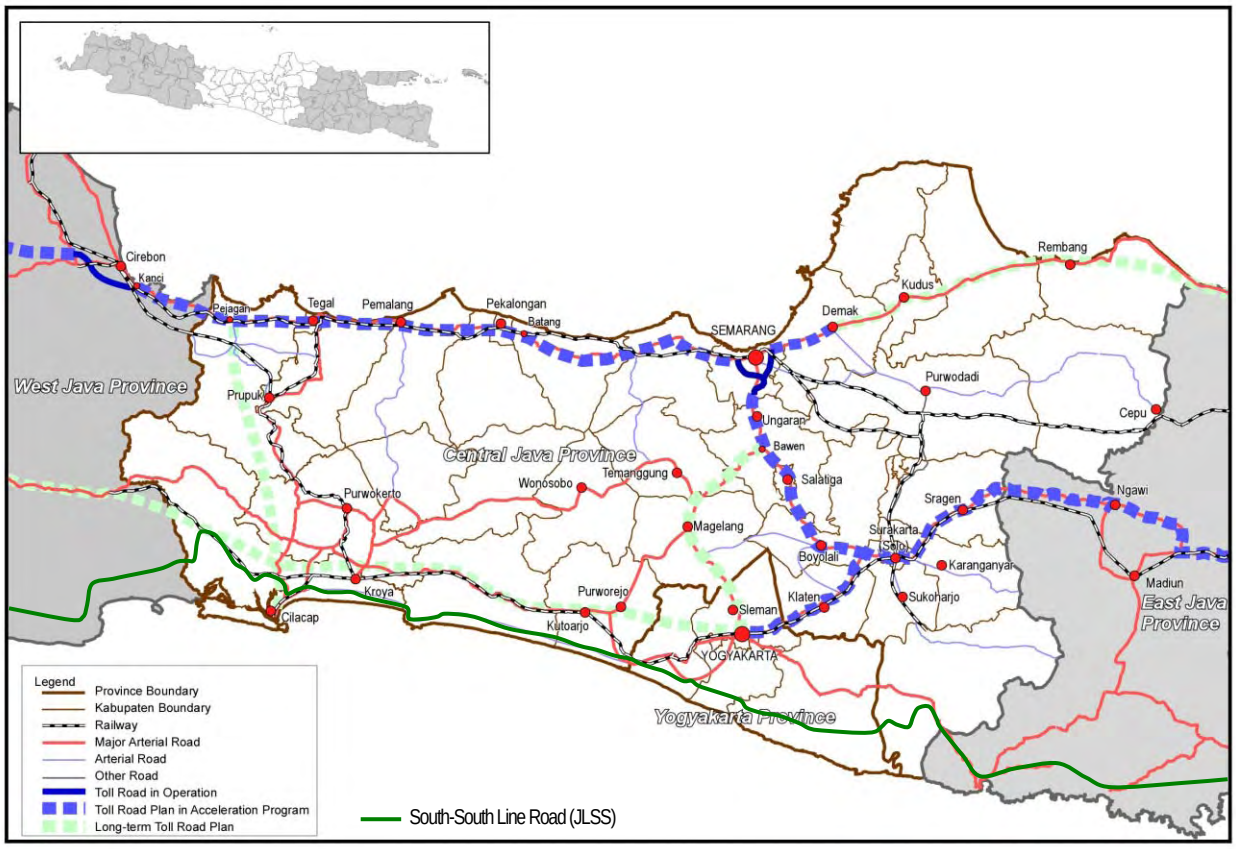
5.3 Existing Transportation Development Plan and Program

5.3.1 Road

In the north Java corridor (Brebes – Tegal – Pemalang – Pekalongan – Semarang – Demak – Kudus – Pati – Rembang), some road sections already have four lanes. By the end of 2008, the section between Semarang and Losari (western border of Central Java Province) is planned to be all four-lane roads and the work is currently underway. The remaining sections on the north corridor (i.e., Semarang – Kudus – eastern border of Central Java Province) are also planned to be widened in the near future, and will be four lanes or at least two lanes with 2 m hard shoulders.

In addition to the current toll roads in Semarang, there are plans for toll roads in the Central Java region with the following sections given high priority.

- Cirebon (West Java) – Tegal – Pekalongan - Semarang
- Semarang – Solo – Madiun (East Java)
- Yogyakarta－Solo



Source: CJRR Study Team

Figure 15 Planned Roads in the Central Java Region

In addition, North Semarang Toll Ring Road (NSTRR), which is planned to traverse the northern area of Kota Semarang, aims at improving accessibility to the two main international and intercity terminals: namely, Ahmad Yani Airport and Tg. Emas Port. These two terminals assume a very important role for the regional economy including Semarang. It is hoped that construction of NSTRR will reinvigorate the movement of people and goods.

At present, in order to reduce the road damage caused by overloaded trucks, regulation against overloading is being enforced in accordance with the phased schedule. At each weighbridge, overloaded trucks within the designated maximum percentage are still allowed to go by paying retribution; however, overloaded trucks over the maximum percentage are forced either to reduce the load on the spot or to return to the origin place. The control of overloading is gradually being tightened, and no overloading (i.e., 0% overloading) will be allowed in 2009. As the regulation against overloading becomes stricter, the unit transport cost of goods is expected to increase. Along with the soaring fuel prices, it will be a disadvantage for trucks in terms of modal competition for freight transport. On the other hand, it will be a great opportunity for railways to draw attention of shippers and forwarders as a more cost-efficient mode of transport.

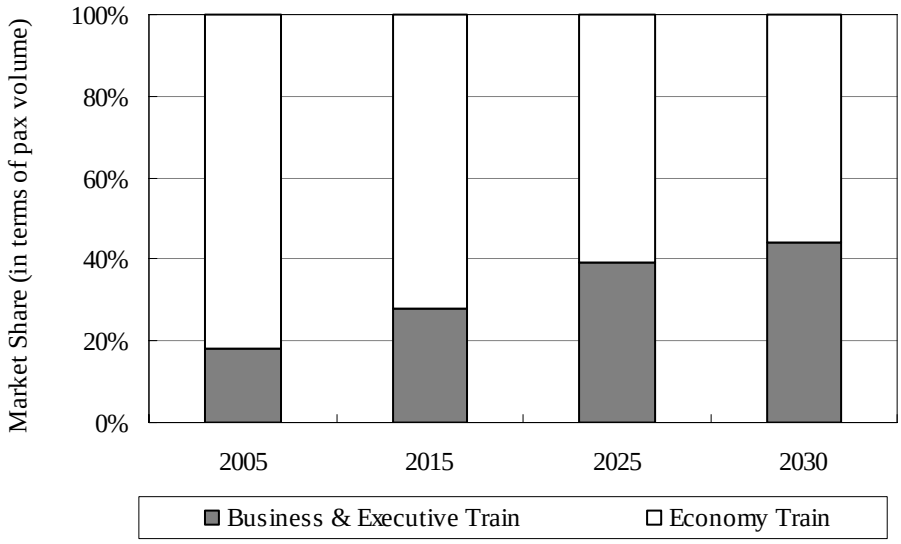
5.3.2 Bus

In addition to the major developments for the intercity bus transportation including new bus terminals and intercity bus routes, a new bus rapid transit (BRT) system is being developed in the metropolitan regions of the Study area. The one in Yogyakarta, called Transjogja, began its operation in February, 2008, and a similar BRT system is planned for the cities of Semarang and Solo as well. In each city, development of BRT is designed to enhance the accessibility to the main transportation terminals including railway stations.

5.3.3 Railway

In the Central Java region, there is a plan to eventually double-track the entire sections of Java north trunk line (Cirebon – Tegal – Semarang – Surabaya), Java south trunk line (Kroya – Yogyakarta – Solo), and the linking north-south line (Cirebon – Purwokerto – Kroya). The section of Kutoarjo – Yogyakarta – Solo has already been double tracked, and double-tracking the section of Kroya – Kutoarjo is now underway with a yen loan. As for the Java north trunk line, most of the sections have been or will be double-tracked under the GOI's own budget. The sections of Brebes – Tegal and Pemalang – Petarukan have already been double-tracked, and double-tracking the sections of Losari – Brebes and Tegal – Pekalongan will be finished by 2011. Double-tracking the section of Cirebon – Losari is also planned in the near future.

According to the draft master plan of the Indonesian railways for 2006 – 2030 which was prepared by PT. KA as well as the Ministry of Transport, the passenger mode share of railways is forecasted to increase from the current 6% (as of 2005) to 10% (in a moderate case) or 20% (in an optimistic case) in 2030. Regarding the future market share (in terms of passenger volume), while at present the majority of passengers are from economy class trains, improvement of railway services especially for business and executive train classes is planned in order to increase the share. As for railway freight transport, the mode share of railways is forecast to increase from the current very small share of 0.6% (as of 2005) to 5% (in a moderate case) or 10% (in an optimistic case) in 2030.



Source: PT. Kereta Api (Persero) and Ministry of Transport

Figure 16 Expected Future Composition of Train Classes in Indonesia

5.3.4 Airport

According to the master plan of Adi Sutjipto (Yogyakarta) Airport, along with expansion and development of the runway, taxiways, and apron parking area, the passenger terminal is planned to be moved north toward the existing Yogyakarta – Solo railway line. A new railway station, taking over old Maguwo station, has been constructed and the station will be integrated with the new passenger terminal building. This plan is included in Phase 2 (2007 – 2008), and new Maguwo station started operation in June, 2008. In addition to the existing local business class train (Prameks), new railway services linking the airport and Yogyakarta/Solo are expected to be provided after completion of the new passenger terminal and railway station.

For Ahmad Yani (Semarang) Airport, there is also a master plan with two-phase development including extension the runway and construction of new terminal facilities. Although there is a railway track which passes by the airport, an extension railway line needs to be constructed in order to access the existing railway because the new passenger terminal building is planned on the north of the runway, that is, apart from the existing railway.

As for Adi Sumarmo (Solo) Airport, a master plan study has been done by PT. (Persero) Angkasa Pura I. New terminal building is planned to be constructed. At present there is no railway nearby the airport, and so far, there is no plan to link the airport by railway.

5.3.5 Port

A master plan of Tg. Emas Port has recently been prepared for the next 25 years along with phased

improvement plans considering national port affair regulations, regional/city spatial plans, and environmental aspects. Bulk cargo area including coal is planned to be moved to the west of the port (toward the existing marina) in order to expand the existing container terminal and general cargo area. In the short-term development plan (2008 – 2012), the development area includes additional berths (2 x 150 m) and a container yard (6 ha). In accordance with the port expansion and improvement, growth in the handling volume is expected for most commodity types. Among others, rapid and stable growth of container volume is expected for both import and export.

6. Identification of Planning Issues and Development Objectives

6.1 Planning Issues on Regional Railway System Development

1) Anticipated Urban Transportation Problem

Urban transportation problems are anticipated due to urban population growth, expansion of urban areas, and increase of car ownership due to real household income increase. To prevent the consequent traffic congestion in metropolitan areas, service level of the public transportation system should be enhanced by making the railway transportation system a trunk system.

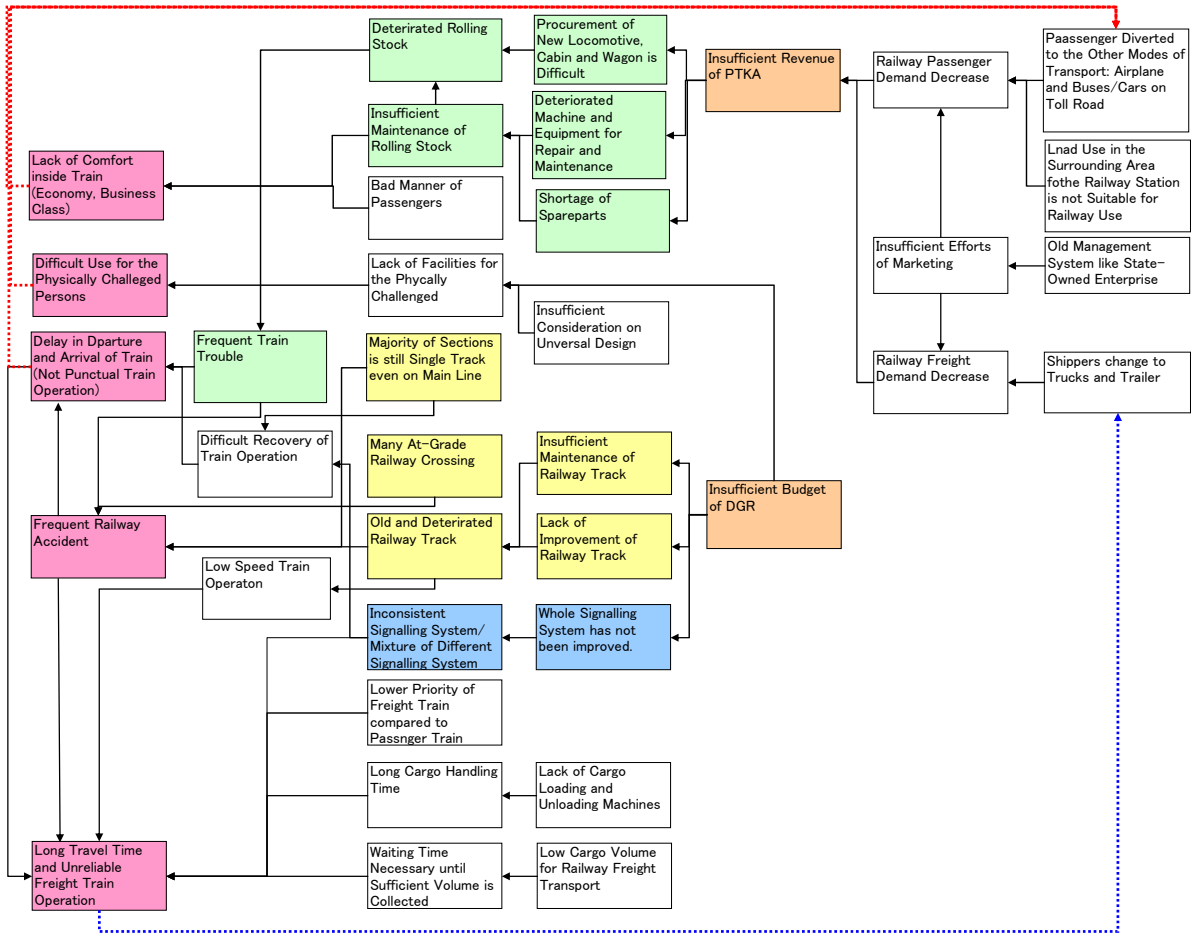
2) Necessity of Improvement of Railway Transportation System

The service level of the existing railway system is assessed as being unsatisfactory. The train often is delayed and railway accidents often occur by various causes. For intercity passenger transport, the ridership of railway transport has been decreasing due to the emergence of low cost carriers for long distance travel and buses: namely, "Travel" and private passenger cars on the toll road as a competitor for middle distance travel. Reliability of railway operations has been lost and shippers are changing mode of transport from railway to roads.

3) Financial Source Increase required for Railway System Development

The problem structure of railway transportation is drawn in Figure 17. This diagram indicates relationship between components of problems and shows the vicious downward spiral of the railway transportation problem. One of the crucial causes for the insufficient level of railway service is lack of financial sources of both the Central government and PT. KA for rehabilitation and improvement of the railway system.

An improved railway transportation system could bring about improvement of accessibility and shorter travel time and as a consequence, land value along the railway corridor would increase. However this increase in land value would not be captured by the railway operator and instead only land owners would enjoy the increase of their property value.



Source: CJRR Study Team

Figure 17 Problem Structure of Railway Transportation in Central Java Region

4) Enhancing Railway Freight Transport to reduce Road Damage

Road damages caused by overloaded trucks and trailers are significant and Department of Land Transport is making traffic enforcement gradually stricter this year. Until last year, the allowance for overload was 100% but it is planned to reduce allowance to 0% by the end of 2008. If this goal is achieved, it will lead to significant increase in costs to road transport. In other words the cost for transporting cargoes by trucks and trailers will increase and the cost of railway freight transport will become comparatively cheaper. On the other hand, if this scenario does not happen, then the damages to the road will continue and the central and local government will have to continue to spend considerable amounts for road repair and maintenance. By shifting heavy road traffic to railway transport the damage of the roads would be reduced and this would justify subsidy to the railway transportation by the government sector.

5) Food Security as Constraint for Urban Development

Since Indonesia has been facing shortage of food production, the government is seriously concerned about conversion of agricultural land into industrial and residential land. Urbanization is however expected to

proceed in the Central Java region and the requirement of urban land will increase due to housing demand and the need for industrial land. Although conversion of agricultural land is inevitable to some extent, but it should be minimized.

6) Flooding Problem in Semarang and Countermeasures

Flooding is a chronic problem in the region, in particular, in the urban area of Semarang. Railway facilities including railway track and stations often suffer from floods. The flooding problem has been caused by land subsidence and a fundamental solution should be provided by flood control measures. Currently an urban drainage project is being undertaken and will be completed in six years; then the area will be enclosed by Banjir Kanal in the east and west and the planned dike to be constructed parallel to the harbor road in the northern part of the city canal.

6.2 Goals for Railway System Development

The railway is a more economically efficient mode of transport than road, in terms of fuel efficiency and utilization of economic resource costs; there are potentially large economic benefits if the movement of goods and passengers can be diverted from road to rail transport.

In the Ministry of Transport's Revitalization Program on Indonesian Railways the following were included as stated goals:

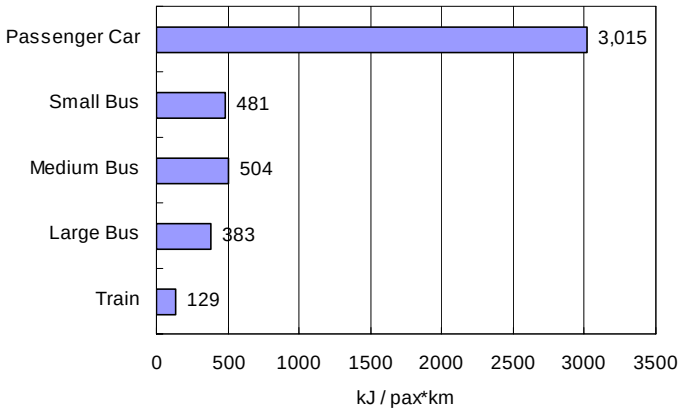
- Increase role of railway in freight transport
- Increase the role of railway in passenger transport
- Reduce burden on road transport

The analysis of the present transportation problems and the planning issues in the Central Java region have resulted in the identification of four major principles, which the railway transportation system development needs to pursue. These principles include: (i) efficiency improvement; (ii) equity to all members of society; (iii) environment betterment and (iv) safety enhancement.

(1) Efficiency in Transportation System

1) Intercity Transportation

For improvements of the energy efficiency of total transportation system in the Central Java region, it is effective to promote railway transportation and facilitate modal shift from passenger cars and various types of buses to trains. Even though mass transit system consumes more energy for operation of each unit, it can save the energy consumption per person-km, because of its higher transport capacities and greater energy efficiency than private vehicles.



Source : Study on Integrated Transportation Master Plan for Jabodetabek, 2004

Figure 18 Energy Consumption by Mode of Transportation

2) Intra-Urban Transportation

In Semarang, Solo and Yogyakarta metropolitan areas, development of efficient transport system is of great importance to support economic activities. Railway transit system has an advantage over private modes of transport in terms of travel costs and lesser consumption of space in the context in urban area.

Traffic congestion in the metropolitan areas has not been severe but the situation will get worse as urbanization proceeds. It is proposed to establish an efficient and convenient public transportation network to prevent shifting to private modes of transportation. Railway transportation should play the primary role in the public transportation network. The following two integrations should be taken into consideration for developing railway system development:

- Integration with Other Modes of Public Transportation
- Integration with Urban Development

(2) Equity in Transport to All Members in the Society

1) Low Income Household

A minimum level of transportation service should be provided to all members of the society. In the Central Java region, the mobility of the low-income group is limited due to their insufficient income. Railway transport has been playing a role for providing transportation service for the poor. The tariff for economy class passenger trains is determined by the central government and the current railway operator PT. KA receives a subsidy as PSO (Public Service Obligation) to compensate for the operation loss of an economy class train.

The service level of economy class train however is very low with deteriorated and badly maintained train cars. This decreases the attractiveness of railway service and results in reducing railway passenger

demand. The service standard should be clearly defined and the gap between fare revenues and cost to fulfill the service in accordance with the standard should be paid to the railway operator from the government. If this cannot be committed to by the government, it will be difficult to attract private sectors to railway business.

2) Physically Challenged

At present availability of the railway facilities for the physically challenged is still vey limited in the region. It is sometimes difficult to ride on the trains due to the gap between floor of train and ground even for able-bodied people. Since it is essential to provide a satisfactory mode of transportation for all members in the society, it is recommended to develop transportation facilities for the physically challenged.

(3) Environmental Betterment: Global Warming

Global warming is an urgent issue in the world and many countries have been making efforts to reduce greenhouse gases. In the transportation sector, passenger cars, buses and trucks are producing the greatest amount of greenhouse gases. To deal with this problem, a common countermeasure is promoting diversion from passenger cars, buses and trucks to more environment-friendly to mode of transport such as railway.

(4) Transportation Safety

Causes of railway accidents occurring from January 2004 up to May 2006 were examined. Although more than half of the railway accidents were made by internal and external human errors, 22% of the accidents were caused by failure of infrastructure and 19% by disordered rolling stock.

Since railway accidents are caused by various kinds of factors, various countermeasures should be taken to reduce them. The majority of the existing rolling stock of PT. KA is not in good condition since they are old and maintenance is insufficient. Due to the limited revenue, PT. KA, cannot afford to buy new rolling stock or tools/equipment. To tackle the railway safety issue, not merely rolling stock, but also infrastructure should be upgraded and improved. Despite efforts in improving railway infrastructure by the central government, the railway facilities still need further upgrading and rehabilitation. Many railway accidents have occurred at level crossings due to lack of careful driving practices of public road transport and so on. In this regard, railway crossings in urbanized areas, where commuter railway services are proposed, should be elevated as much as possible to reduce conflict with road traffic.

7. Forecast of Future Railway Demand

7.1 Forecast of Railway Passenger Demand

7.1.1 Growth of Passenger Demand

The Study Team expects that, apart from individual railway projects focusing on certain railway corridors, the future railway passenger demand as a whole will grow in accordance with ongoing double-tracking projects and proposed overall improvements in railway operations and management. As long as those are successfully implemented and the demand grows smoothly, an increase in the number of railway passengers caused by population and economic growth in the Study area can be foreseen and it is projected forward assuming the same growth rate as GDP per capita in the Central Java region. Thus, future growth rates are targeted at around 3.8% - 4.4% per annum. In 2030, the annual number of railway passengers in the Central Java region is expected to increase from the current 9.5 million (as of 2007) to 24.4 million passengers.

Table 15 Projected Annual Number of Railway Passengers in Central Java Region

Year	Annual Total Passengers (million/year)	Annual Growth Rate
2007 (actual)	9.5	2.0%*
2015	13.3	3.8%
2020	16.1	4.0%
2025	19.7	4.1%
2030	24.4	4.4%

* Average annual growth rate from 2003 to 2007.
Source: PT. Kereta Api (Persero) (for 2007) and CJRR Study Team (for future years)

7.1.2 Passenger Demand for Individual Railway Project Corridors

While an overall great modal shift to the railway may be unrealistic, growth of the passenger demand caused by the modal shift can be well expected from individual railway projects focusing on certain railway corridors in addition to the increase in the number of railway passengers due to the population and economic growth in the Study area. The modal shift that will be caused by individual railway projects is expected to add to the above-mentioned number of railway passengers. For modal shift, the Study Team assumes that, for intercity trips with both origin and destination along the new railway project corridor, some 70%, 10%, and 10% of the existing bus, car, and motorcycles users respectively will shift to the new railway service after its operation. Actual modal shift from each mode may vary depending on the type of service (e.g., with or without air-conditioning) provided by the new railway. Furthermore, a considerable number of additional intercity trips may be induced by the new railway service. As for commuter railways, detailed modal shift is analyzed based on the SP Survey, and is discussed in the Case

Study.

7.2 Forecast of Railway Freight Demand

7.2.1 Forecast of Freight Demand at Port

Usually demand for freight movement is caused by economic activities, and the volume of freight to be transported is correlated with magnitude of economic activities. An economic index such as GDP or GRDP is often selected as an independent variable, and it shows high correlation with port demand in most cases. For forecasting the port demand of containers, Tg. Emas (Semarang) Port is focused on since it is the only port that handles containers in the Central Java region. To arrive at the projection, the container handling volumes from 1999 to 2006 have been utilized for regression analysis. Assuming the share of import and export containers will follow the recent trend, some 1.2 million TEUs of containers (0.54 million TEUs for import and 0.65 million TEUs for export) are projected in 2030. Estimated growth of container volumes is moderate compared to the projection in the Tg. Emas Port Master Plan. However, the Study Team's estimates may be more realistic figures based on the GRDP growth of the Study area.

Table 16 Projected Future Container Volume at Tg. Emas Port

Year	Estimated Future Container Traffic (1,000 TEUs)			*Port Master Plan* (1,000 TEUs)*
	Import	Export	Total	*Total*
2010	217	262	479	*495*
2015	277	334	611	*692*
2020	345	415	761	-
2025	428	515	942	*1,358*
2030	537	647	1,184	-

* PT. (Persero) Pelabuhan Indonesia III, "Master Plan Pelabuhan Tanjung Emas Semarang 2001-2025"
Source: CJRR Study Team

7.2.2 Projection of Container Volume by Railway

In order to forecast the volume of containers transported by railway, it is necessary to understand from/to which part of the Study area containers are transported to/from Tg. Emas Port. The Study Team roughly estimated the origin/destination regions of containers exported/imported through Tg. Emas Port by utilizing the results of the roadside interview survey conducted on the major Kabupaten/Kota boundaries. Current composition of origin and destination regions of container trailers that go to/come from Tg. Emas Port was calculated. This was used as a proxy for future regional composition of origin and destination of containers handled through Tg. Emas Port.

There is a potential of utilizing the railway for freight transport, if the necessary construction and rehabilitation of the railway facilities are conducted including the access to Tg. Emas Port. Among other reasons, if a new dry port in Solo and the existing inland port in Yogyakarta are planned to be connected to the railway, it can be assumed that a significant share of containers from/to Solo and Yogyakarta will be transported by railway. In this Study, achievable railway market shares for containers have been set as 50% for Solo dry port and 70% for Yogyakarta inland port.

Table 17 Future Volume of Tg. Emas Port Containers Transported by Railway

Origin/ Destination	Container Volume in 2015 (TEUs / day)			Container Volume in 2030 (TEUs / day)		
	To Port	From Port	Total	To Port	From Port	Total
Solo (Solo dry port)	92	72	164	179	140	318
Yogyakarta (Yogyakarta inland port)	58	58	116	113	111	224
Demak, Kudus, Pati, Rembang	106	208	314	205	402	607
Kendal SEZ	80	-	80	156	-	156

Source: CJRR Study Team

7.2.3 Projection of Other Freight Volume by Railway

(1) Cement

Among the three major cement companies, at present, only Holcim has a plant in the Central Java region. Transport route goes via the south Java corridor from Cilacap, where the cement plant is located, east to Yogyakarta, Solo, and towards Surabaya. Not only truck but also railway is utilized to transport the cement. Some wagons that are used to transport cement to Solo and Semarang areas are utilized to transport quartz sand on the way back to the plant in Cilacap. In this Study, future demand growth of cement in the Central Java region has been set as 3% including the volume of cement transported by railway.

(2) Quartz Sand (Silica)

Quartz sand (silica), which is another important raw material for cement, is mined in the region. Railway is also used to transport quartz sand. It is usually transported from the place of mining to the place where it is consumed. PT. KA regards the route of Bojonegoro – Gundih – Solo – Yogyakarta – Cilacap as the main corridor to transport sand. For projection of the future growth in the demand of sand transported by railway, trend of GRDP in the mining and quarrying sector in the Study area was considered. As such, an annual growth rate of 6% (and 5% from 2013) has been assumed for projection of future demand of sand transported by railway.

(3) Fertilizer

As for the future demand, while transport of fertilizer from Semarang may not be expected, the Study Team assumed that the current fertilizer transport from Cilacap by railway would be maintained in the future as well. For projection of the future growth in the demand of fertilizer transported by railway, trend of GRDP in the agriculture sector in the Study area was considered. An annual growth rate of 3% (and 2.5% from 2013) has been assumed for projection of future demand of fertilizer transported by railway.

(4) Fuel

Most fuel consumed in the region is refined in Cilacap by PT. Pertamina (Persero), a state-owned oil and gas company, and transported between the depots by pipeline, railway, truck, or ship. As for future fuel transport, since PT. Pertamina plans to connect all the depots by pipeline, the remaining possibility of fuel transport by railway tank wagon (RTW) is aviation fuel. Assuming that aviation fuel transport from Cilacap to Rewulu (and to Adi Sutjipto and Adi Sumarmo Airports by special truck called Bridger) will continue in the future as well, the Study Team estimates the future transport volume in accordance with the growth in air travel demand that is planned by each airport.

(5) Coal

In the Central Java region, coal is not actually transported by railway at present. However, the potential for transporting coal by railway is possible in three conceivable cases. One is transporting coal from Tg. Emas Port (Semarang) to Solo by railway in order to supply coal to be used for small power plants of the textile factories in Solo and its vicinities. A second case is transporting coal from Kendal Port (near Semarang) to Kabupaten Kulonprogo (near Wates) via Solo and Yogyakarta for a planned steel/iron factory targeting start of the production in 2015. Third, there is potential to transport coal from Tg. Intan (Cilacap) Port to Karangkandri, where a coal steam power plant with a capacity of 600 MW is in operation.

8. Regional Railway Master Plan

8.1 Long Term Regional Railway System Development Plan

A long-term regional railway system development plan has been prepared based on the identified present problems and planning issues. The railway system development plan includes the following projects:

(1) Commuter Trains

To support efficient urban functions of the major cities of the Central Java region, commuter trains should be introduced on the existing or new railway lines. When commuter rail service starts, it would be better to avoid level crossings in the urbanized area, since traffic volume on the crossing streets is large and

frequent train operation may lead to traffic congestion on the road network in the city. Track elevation inside the city of Semarang would be the first priority to get the line functioning as commuter rail. In the Semarang metropolitan areas the following lines have been proposed: a) Semarang - Kendal Commuter Line, b) Semarang - Demak Commuter Line, and c) Semarang - Brumbung Commuter Line. Also in Solo the following lines have been proposed: a) Solo – Klaten Commuter Line and b) Solo - Sragen Commuter Line, while in Yogyakarta a) Yogya – Klaten Commuter and b) Yogya - Wates Commuter.

(2) Urban Railways

In city areas three rail systems have been proposed: Semarang Monorail, Solo Tramway and Bantul Tramway.

(3) Airport Links

Two airport rail links are proposed to enhance convenient access to the airports in the region. These are Semarang airport link which will provide 4 km branch line to the planned relocated location of a new air terminal. Solo airport link connects the existing railroad and the airport terminal and allow "direct-through" operation to Solo and Yogyakarta. .

(4) Intercity Trains

Redevelopment of this intercity train on the Semarang – Magelang - Yogyakarta corridor basically traces the old alignment between Semarang and Yogyakarta. The corridor consists of: a) Yogyakarta – Magelang Line, b) Magelang - Ambarawa Line, c) Ambarawa – Kedungjati Line, d) Semarang – Tegal Line, e) Semarang – Cepu Line and f) Demak – Rembang Line. Improvement of the Semarang –Solo existing line has also been proposed and this line would be utilized for freight transport as well.

(5) Freight Trains

The project aims to improve the reliability of freight service by track rehabilitation and improvement of overall traffic control system over the whole alignment (109 km), including: a) Semarang – Solo Freight Corridor and b) Solo – Wonogiri Freight Corridor. In addition, four accesses to important freight facilities are proposed. These access lines include: a) Semarang Port Access, b) Kendal SEZ Access, c) Kalijambe Dry Port Access and d) Yogyakarta Dry Port Access.

(6) Tourist Train

The railway lines for tourism in the region are proposed. Improvement of railway system and railway museum in Ambarawa would attract more railway amateurs and also the development of a branch line to Borobudur from the proposed intercity railway corridor between Yogyakarta and Magelang provides better access to the world heritage site.

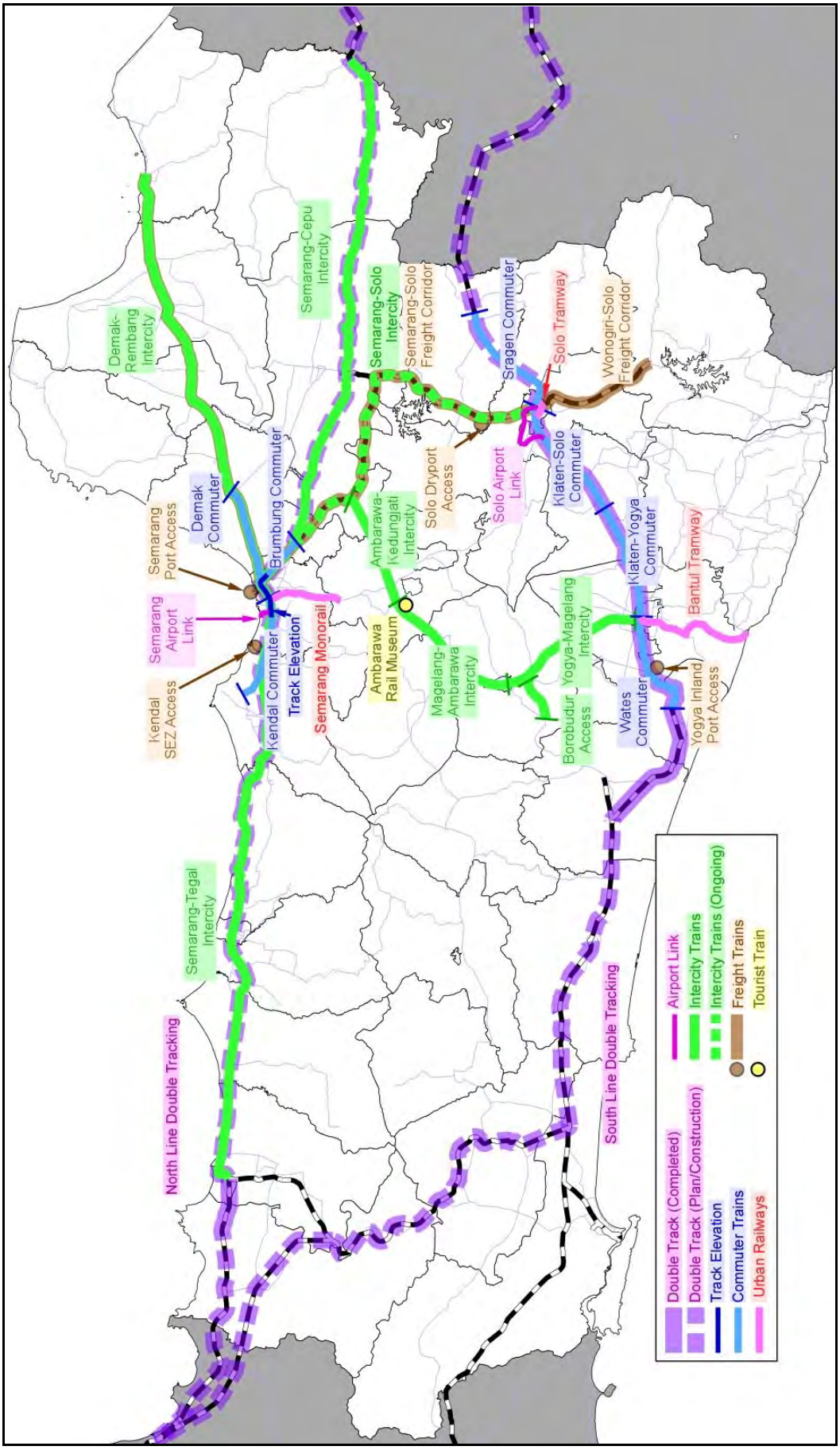


Figure 19 Potential Railway Development Projects

8.2 Railway-Related Development Projects

Integrated development of railway system and urban/housing development along the commuter railway line is recommended to strengthen the financial viability of the railway system development by: a) internalizing development benefits of improving railway service from increase in land value in housing development and b) increasing fare box revenue which is brought about by increase of railway passenger demand by developing housing along the railway line.

8.3 Preliminary Evaluation of the Projects

(1) Consolidation of Project Packages

Sequence of the proposed railway projects have been examined from technical point of view. Some projects have to be started after the completion of other projects and some projects partially share railway tracks or stations. This sequence of the projects has been taken into consideration when giving priority to the projects. Considering these relationships and also features of these projects, they are consolidated into 20 packages.

(2) Future Demand

The following table summarizes future demand forecast of railway use. The results of demand forecast by project are the basis for benefit estimation. In addition, passenger demand is included city-developed demand.

Table 18 Summary of Demand Forecast

Project Name	2010	2015	2020	2025	2030
Commuter Train (PAX*km/day)					
1-1 Semarang Commuter	225,838	277,025	335,366	408,886	507,268
1-2 Solo Commuter	270,836	332,222	402,188	490,357	608,342
1-3 Yogya Commuter	361,389	443,300	536,658	654,307	811,739
Urban Train (PAX*km/day)					
2-1 Semarang Monorail	61,678	75,658	91,591	111,670	138,539
2-2 Solo Tramway	69,206	77,001	84,769	93,321	102,736
2-3 Bantul Tramway	63,041	77,330	93,615	114,138	141,601
Airport Link (PAX*km/day)					
3-1 Semarang Airport Link	74,095	107,342	136,790	165,288	170,988
3-2 Solo Airport Link	29,354	39,775	50,425	61,419	68,016
Freight Train (TEU*km/day)					
4-1 Semarang Solo Yogya Freight Corridor	42,219	67,833	83,569	102,804	128,211
4-2 Solo – Wonogiri Freight Corridor	2,724	3,475	4,323	5,357	6,731
4-4 Kendal SEZ	3,607	7,880	9,684	11,885	14,809
Inter-city Train (PAX*km/day)					
5-1 Yogya - Magelang Intercity	633,951	777,638	941,407	1,147,788	1,423,956
5-2 Borobudur Access	30,294	37,160	44,986	54,848	68,045
5-3 Magelang - Ambarawa Intercity	262,420	321,899	389,690	475,120	589,438
5-4 Ambawara - Kedungjati Intercity	268,853	329,790	399,243	486,768	603,888
5-5 Semarang-Tegal Intercity	653,998	802,230	971,178	1,184,085	1,468,986
5-6 Semarang-Cepu Intercity	254,793	312,543	378,363	461,310	572,306
5-7 Demak-Rembang Intercity	642,711	788,384	954,416	1,163,649	1,443,633

Source: CJRR Study Team

*: Including Semarang Port, Solo Dry port and Yogyakarta Dry port

Ton as a unit of bulk cargo was converted to be TEU (1TEU is set to e equivalent to 15 ton) as a unit of container

(3) Preliminary Economic Evaluation

The benefits of railway system development projects estimated in this preliminary evaluation include Vehicle Operating Cost (VOC) saving, Travel Time Cost Saving, Reduction of Traffic Accidents, Reduction of CO_2 and reduction of road damage. VOC and travel time cost savings from both railway passengers and drivers of parallel road are included. The results of preliminary economic evaluation are presented in the following table and implementation of several projects seems difficult to justify from economic point of view under the current condition of the projects.

Table 19 Preliminary Economic Evaluation

Project Name	NPV (Mill. Rp.)	EIRR	B/C	Priority
Commuter Train				
1-1 Semarang Commuter	-	8.6%	0.765	A-
1-2 Solo Commuter	-	8.2%	0.870	A-
1-3 Yogya Commuter	728,457	15.0%	1.355	A+
Urban Train				
2-1 Semarang Monorail	-	-	0.365	B
2-2 Solo Tramway	-	2.3%	0.437	B
2-3 Bantul Tramway	-	1.0%	0.339	B
Airport Link		-		
3-1 Semarang Airport Link	-	-	0.229	C
3-2 Solo Airport Link	-	-	0.047	C
Freight Train				
4-1 Semarang Solo Yog Freight Corridor	131,932	13.1%	1.078	A
4-2 Solo Wonogiri Freight Corridor	-	-	0.253	B
4-4 Kendal SEZ	-	-	0.305	B
Inter-city Train				
5-1 Yogya - Magelang Intercity	-	0.3%	0.265	B
5-2 Borobudur Access	-	-	0.125	C
5-3 Magelang – Ambarawa Intercity	-	-	0.141	C
5-4 Ambawara - Kedungjati Intercity	-	-	0.212	C
5-5 Semarang-Tegal Intercity	-	-	0.476	B
5-6 Semarang-Cepu Intercity	-	-	0.160	C
5-7 Demak-Rembang Intercity	-	3%	0.433	B

Source: CJRR Study Team

*: 'Demak-Rembang Intercity' includes benefit of freight transport between Demak-rembang transportation

(4) Preliminary Environmental Impact Evaluation

Preliminary environmental impact evaluation shows negative impacts to social environment are expected from development of commuter trains and intercity train operation based on the survey on air quality, noise, vibration, water quality and right of way and public hearing. In addition, serious or some pollution would be brought about by commuter train, intercity train, urban railway and airport link development projects.

(5) Priority of Railway System Development Projects

Based on the project sequence in terms of technical aspects, preliminary economic evaluation and initial environmental examination, priorities were given to the proposed projects and the projects were divided into short-term, medium-term and long-term implementation programs as listed in the table below.

Table 20 Project Phasing of Central Java Region

million USD in 2008 Price

Project Packages	Route (km)	Project (km)	Capital Cost	Cost per km
Short Term Projects				
1-1 Semarang Commuter	43	34	106.2	3.1
1-3 Yogya Commuter	58	58	129.5	2.2
Sub Total	101	92	235.7	2.6
Middle Term Projects				
1-2 Solo Commuter	58	58	143.9	2.5
3-1 Semarang Airport Link	9	4	32.7	8.2
4-1 Semarang – Solo – Yogya Freight Corridor	115	101	121.6	1.2
4-3 Kendal SEZ Access	5	5	20.9	4.2
5-5 Semarang - Tegal Intercity	150	150	45.0	0.3
5-6 Semarang - Cepu Intercity	140	140	36.0	0.3
Sub Total	477	458	400.1	0.9
Long Term Projects				
2-1 Semarang Monorail	12	12	181.0	15.1
2-2 Solo Tramway	6	6	51.9	8.6
2-3 Bantul Tramway	15	15	111.1	7.4
3-2 Solo Airport Link	7	8	69.3	8.7
4-2 Wonogiri – Solo Freight Corridor	36	36	25.8	0.7
5-1 Yogya – Magelang Intercity	47	47	177.7	3.8
5-2 Borobudur Access	7	7	11.7	1.7
5-3 Magelang – Ambarawa Intercity	37	37	125.4	3.4
5-4 Ambarawa – Kedungjati Intercity	37	37	76.3	2.1
5-7 Semarang – Demak – Rembang Intericty	110	107	360.3	3.4
Sub Total	314	312	1190.4	3.8
Grand Total	892	862	1826.1	2.1

Source: CJRR Study Team

8.4 Institutional Setup for Regional Railway Company

(1) Types of Travel Flow and Responsibility of Central / Local Governments

Roles and responsibilities of central, provincial and Kabupaten/Kota governments are as follows: The central government is responsible for inter-provincial traffic, provincial governments are responsible for inter-kabupaten/kota traffic, and kota and kabupaten governments are for traffic within their territory.

(2) Privatization of Railway Transportation Industry

Six different techniques/models for improving the efficiency of railway operations; these range from minimal private sector involvement (improving the operating efficiency of freight trains by PT. KA) to

total control over railway operations and maintenance (railway concessions) are listed by increasing intensity of private sector involvement:

- Operation of more efficient freight trains
- Separation ("outsourcing") of non-core activities from the national railway
- Private companies (typically freight forwarders) contracting trains operated by the national railway
- Private trains operating on infrastructure of the national railway ("Open Access")
- Private sector operation of light density railway lines
- Railway operating concession

(3) Establishment of Regional Railway Company

A Central Java Railway (CJR) is proposed to be established responsible for railway operations over regional lines on the corridor Semarang – Solo – Yogyakarta. The primary functions to be undertaken by CJR would be train operation (train and engine crews CJR employees) while infrastructure maintenance and train control would remain with PT. KA.

Central Java Railway Management

Government	Central Java Province Pelindo III PT. KA (optional)
Private Sector	Railway Manager Property Developer

Management of the CJR will be a joint public – private partnership. The railway manager would likely be a partnership between an Indonesian freight forwarder and an overseas railway operator for freight railways. In the case of commuter railways, a private sector partner will include a property developer. The presence of government representatives will be reflected primarily in the definition of the passenger train service CJR must provide; the railway will be essentially managed and operated by the private sector railway manager. PT. KA is shown as an optional participant in the organization.

Financing of needed capital improvements in the track and signaling systems would be from a combination of central and provincial government sources. Funding for rolling stock and some minor infrastructure improvements would be from the railway operator (CJR). CJR would reimburse PT. KA for track maintenance and train dispatching through payment of a track access charge (maintenance and train control fee) and for the capital improvements to the infrastructure paid by the provincial government, a track access charge would be paid. PSO from central government and a possible additional amount from the provincial government will cover any remaining shortfall.

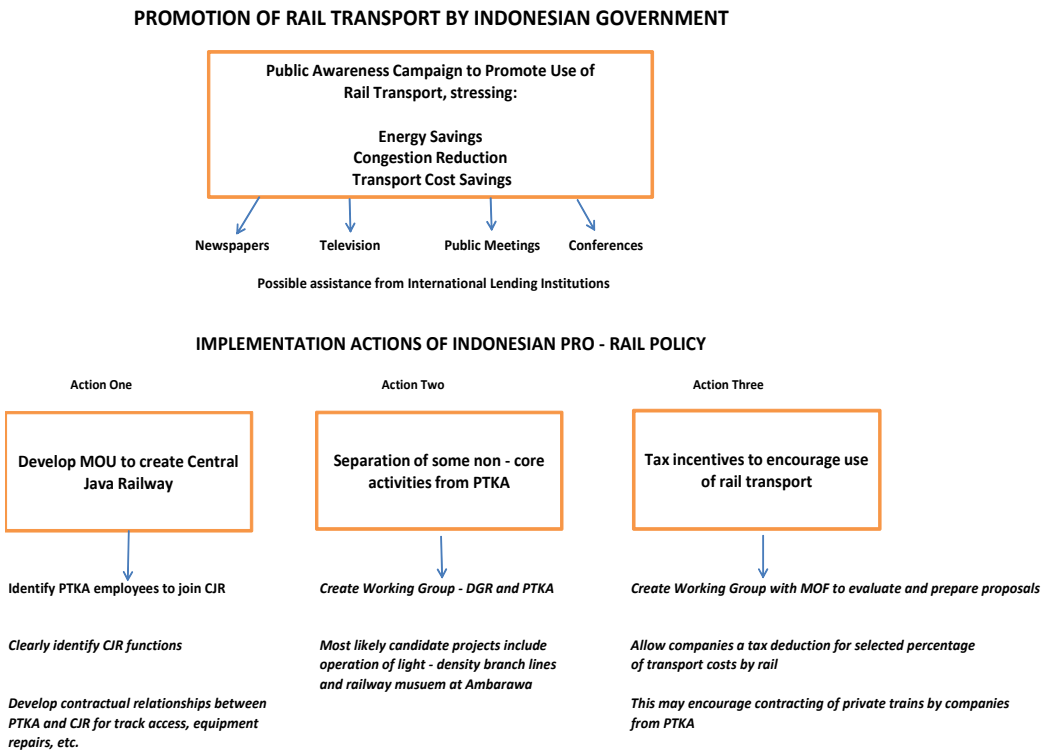
(4) Recommended Approach to Improve Railway Efficiency

We recommend a dual approach: (i) begin the process to create the CJR by drafting the MOU between the

Minister of Transport and the provinces of Central Java and Yogyakarta to create a regional railway organization; and (ii) establish the pro-rail policy in the Directorate General of Railways.

This pro-rail transport policy by the Ministry of Transport will be designed to increase public awareness of the efficiencies of rail transport as well as to provide some financial incentives for companies to use rail transport to a greater extent.

With regard to the operation of more efficient freight trains, a joint task force should be established between DGR and PT. KA to investigate the steps that need to be taken to improve the efficiency of freight train operation.



Source: CJRR Study Team

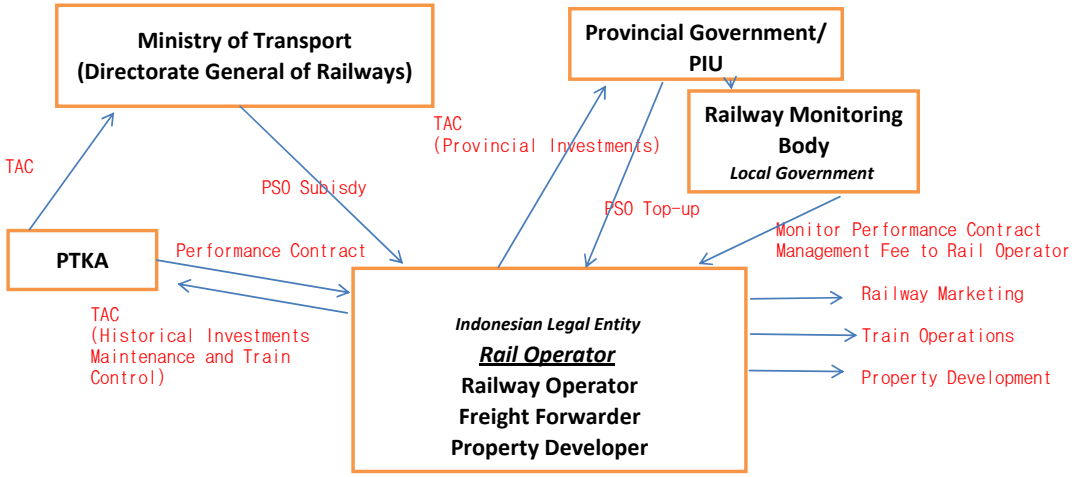
Figure 20 Promotion of Rail Transport by Indonesia Government

(5) Alternatives of Organization Structure

There are several alternative ways to structure this concept; these alternatives are described in the following.

(i) Establish a Local Government Owned Enterprise (LOE) to develop and administer a performance based contract for the rail operator. The performance based contract would include the payment of a management fee to the operator, provided certain operational service standards are achieved. The railway operator would be granted a concession to operate the line for a period of twenty years, for example. Performance of the operator would be reviewed every five years, and if found to be suitable, the concession would be continued for another five years. During the start – up

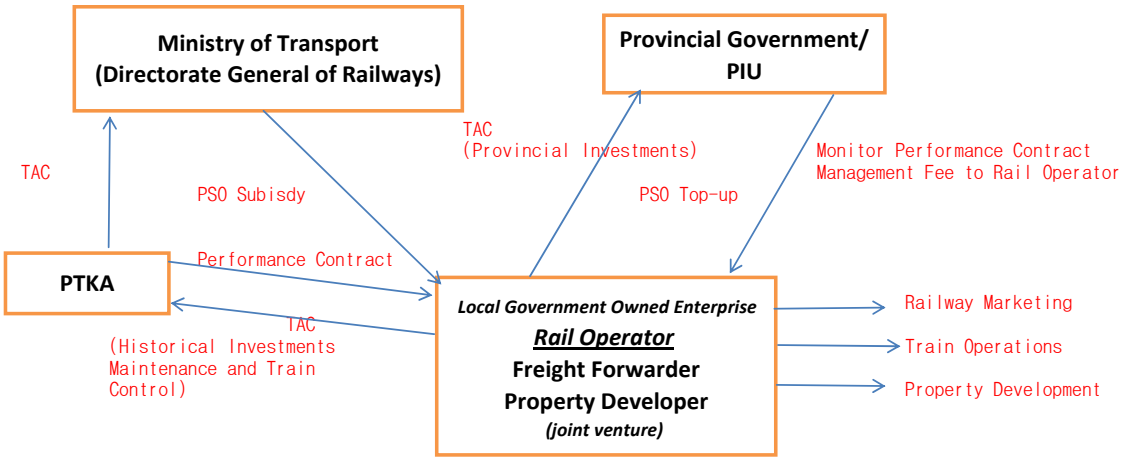
phase of the project a Project Implementation Unit (PIU) within the provincial government would be established to develop and monitor the bidding and selection process of potential candidate companies to become the rail operator. After the rail operator is selected and begins operation, the PIU will fall away and be replace by a LOE to administer the performance based contract. This LOE would be staffed by individuals familiar with railway operations, finance and management; possibly some of the same individuals as in the PIU. The rail operator would be an Indonesian legal entity, most likely a partnership of an Indonesian freight forwarder, a real estate developer and an overseas railway operator and would be selected through a competitive bidding process. The real estate developer would be essential if the CJR were to operate commuter services as the concept would be to develop high – density housing along the railway line in order to make the commuter services more attractive to potential users.



Source: CJRR Study Team

Figure 21 Regional Railway Organization Option #1

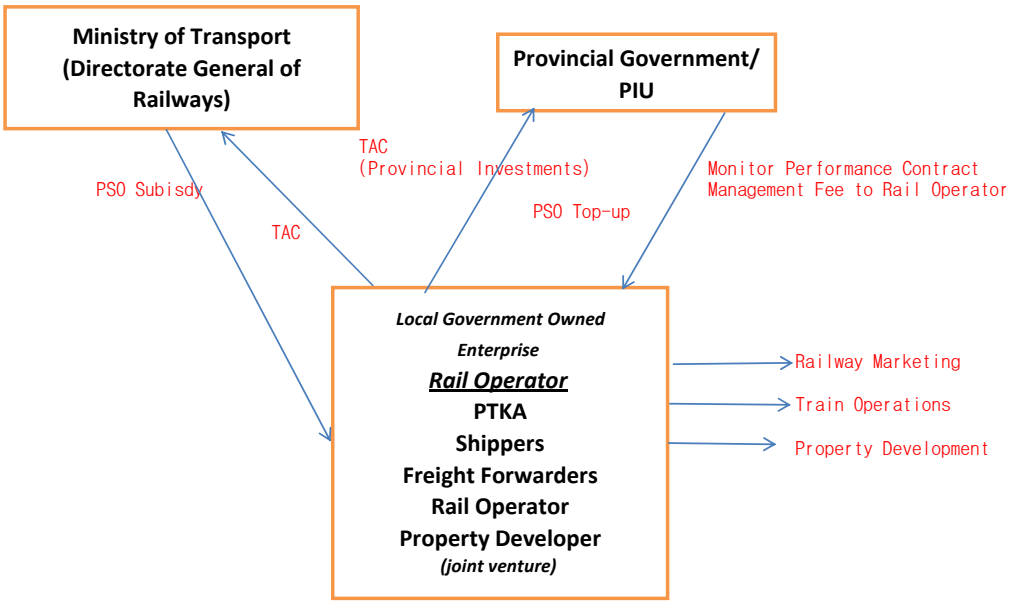
(ii) The second alternative would be to establish a LOE responsible for train operations and would be a joint venture with the private sector rail operator. Composition of the rail operator would be similar as described in the first alternative. The performance based contract would be established between the LOE and the provincial government, monitored by the PIU. The PIU would monitor the standards of service provided by the operator with respect to this contract and would form the basis of payment of a management fee provided the standards of service are achieved.



Source: CJRR Study Team

Figure 22 Regional Railway Organization Option #2

(iii) A third alternative would be to establish a joint venture between PT. KA, individual shippers and the private sector rail operator. Possible shippers would include Holcim cement and freight forwarders handling container movements, as well as possibly other interested parties. In this case, PT. KA would operate all trains and the role of the private sector rail operator would be limited to marketing new services, procurement of new rolling stock where necessary and organizing block trains to be operated by PT. KA for individual shippers (primarily for cement, containers and coal traffic). Under this third alternative, there would be no change in the structure or manner in which track access fees are administered or paid.



Source: CJRR Study Team

Figure 23 Regional Railway Organization Option #3

9. Case Study: Semarang – Solo – Yogyakarta Corridor

The Case Study focuses on the Semarang – Solo – Yogyakarta corridor, which is seen to potentially have a high need for transportation services. The projects/programs that are of high priority for the establishment of a "Central Java Regional Railway System" are studied in detail including institutional setup and financial arrangement.

9.1 Commuter Railway Service Development Plan

9.1.1 Passenger Demand

For forecast of demand in future years, the commuter railway ridership is subject to the growth of GRDP per capita in each metropolitan area. The total daily boarding passengers for each commuter railway line in 2020 and 2030 are presented in Table 21. Furthermore, line loading, or railway passenger volume between stations, in a peak hour is one of the important planning parameters for train operation planning of the new commuter railways. The table also shows the maximum hourly passenger loading that is estimated based on the morning peak ratio of commuting trips to the city derived from the SP survey results. While it is different depending on each commuter rail line which has different OD patterns, it is around 10% – 15% of the total daily passenger volume.

Table 21 Commuter Railway Demand Forecast in Years 2020 and 2030

Railway Line	Year 2020		Year 2030	
	Daily Volume (pax/day)	Peak Line Loading (pax/hour/direction)	Daily Volume (pax/day)	Peak Line Loading (pax/hour/direction)
Semarang-Kendal Commuter (Alt. 1)	42,000	5,700	64,000	8,600
Semarang-Kendal Commuter (Alt. 2)	40,000	5,700	61,000	8,600
Semarang-Demak Commuter	24,000	3,800	37,000	5,700
Semarang-Brumbung Commuter	37,000	5,800	56,000	8,800
Solo-Klaten Commuter	58,000	4,700	88,000	7,100
Solo-Sragen Commuter	32,000	2,700	48,000	4,100
Yogya-Klaten Commuter	70,000	6,800	106,000	10,300
Yogya-Wates Commuter	37,000	5,000	56,000	7,600
Semarang Monorail	28,000	2,500	42,000	3,700
Solo Tramway	25,000	3,500	38,000	5,200
Yogya-Bantul Tramway	17,000	1,500	25,000	2,300

Note: Under the assumed fare of Rp. 5,000.
Source: CJRR Study Team

9.1.2 Profile of service and System Improvement

(1) Requirements and Objectives of Commuter Railway Planning

The commuter train projects aim to provide the following service levels as basic requirements.

- Serving commuting sphere and satellite cities within 30 km distance from each regional core.
- Frequent operation with double track for all commuter lines
- From 10 to 20 minutes headway at peak hours, and 30 to 60 minutes headway at off peak hours depending on the traffic forecast
- Express and local train services at average speed of 50 and 35 km/h respectively
- Safe and reliable operations with automated signaling, train control and telecommunication systems
- Environmental friendly and energy efficient service employing electricity-based traction system
- Increased number of stations with approximately 3km of distance between each stops
- User-friendly station facilities, such as high platform, commercial establishments, and barrier free considerations (elevators, toilets, signage, tactile tiles, slopes etc)
- Comfortable railcar interiors (Second hand electric railcars procured from international market, i.e. Japan)
- Improved accessibilities to stations (Station plaza, feeder services etc)

(2) Route Alignment

Based on such objectives and requirements of the commuter train services, route alignments for the same were identified as discussed below. (Note however, that Semarang – Demak Commuter is treated later as optional due to its significant capital investment cost.)

1) Semarang Commuters

Semarang Commuters consist of 3 commuter lines, namely:

- **Semarang – Kendal Commuter** (Beginning at Semarang Tawang and running through Semarang Poncol – Kaliwung, diverging from existing railroad to north west along National Road, and ending up at Kendal with total length of around 29 km.)
- **Semarang – Demak Commuter** (Beginning at Semarang Tawang and running along National Road and ending up at Demak, with total length of around 24 km.)
- **Semarang – Brumbung Commuter** (Beginning at Semarang Tawang and running through Alastuwa – Brumbung and ending up at Brumbung, with total length of around 14 km.)

2) Solo Commuters

Solo Commuters consist of 2 commuter lines, namely:

- **Solo – Klaten Commuter** (Beginning at Solo Balapan and running through Purwosari – Gawok and ending up at Klaten, with total length of around 29 km.)

- **Solo – Sragen Commuter** (Beginning at Solo Balapan and running through Kemiri – Masaran and ending up at Sragen, with total length of around 29 km.)

3) Yogyakarta Commuters

Yogyakarta Commuters consist of 2 commuter lines, namely:

- **Yogya – Klaten Commuter** (Beginning at Yogyakarta Tugu and running through Lempunyangan – Maguwo – Brambangan and ending up at Klaten, with total length of around 30 km.)
- **Yogya – Wates Commuter** (Beginning at Yogyakarta Tugu and running through Patukan - Sentolo and ending up at Wates, with total length of around 28 km)

9.1.3 Integration with Housing Development along the Corridor

(1) Development Concept

Integrated housing development is proposed along the commuter railway lines. The development concepts for housing area, railway station, station plaza and related facilities are as follows.

Railway Station and Station Plaza

Railway station should be designed for achieving international standards. Barrier free concept is appropriate to be included the plan.

Station plaza should have a terminal for public transportation facilities including feeder services, pedestrian walkway and commercial area such as shopping mall and banks.

Access Road

Access roads are to be improved to link between railway station and residential area as well as between railway station and arterial road.

Housing Development (small scale)

- Area: 30~50 ha
- Target Population: 1,000~1,500
- Housing Unit: 300~500 detached units
- Facilities: Basic infrastructure, shopping mall, commercial facilities, bank, open space, medical facilities, religious facilities, police office, kindergarten/ primary school

Housing Development (large scale)

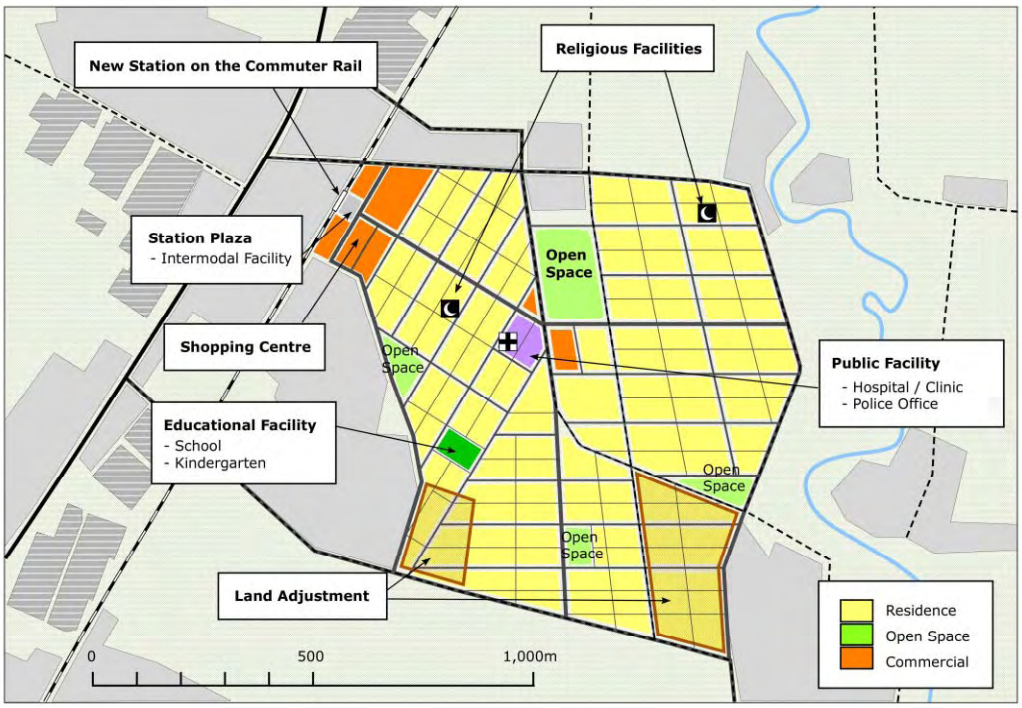
- Area: above 70~100 ha
- Target Population: 2,000~3,000

- Housing Unit: 700~1,000 detached units
- Facilities: Basic infrastructure, large suburban shopping mall, commercial facilities, bank, recreational facilities, open space, medical facilities/ clinics, religious facilities, police office, school, bus terminal for public transportation

Housing development will be comprehensive improvement which includes development of not only basic infrastructure such as electricity, water supply, sewage, and telecommunication, but also inducement of social facilities for education, medical care, religious and police office. For larger housing development, a suburban shopping mall which is connected directly with a new railway station is proposed. This development will offer people the use of the railway for commuting on weekdays as well as for shopping on weekends.

Plan of housing development area is depended upon the existing conditions in surrounding areas. In case there are existing settlements in the planned area, land adjustment could contribute to create integrated housing development. The general idea is shown in a series of following figures.

Proposed size of housing development area is based upon middle density with low-rise buildings such as detached houses. For taking account of food security and minimizing land conversion from agricultural land to settlement, the housing development area supposed to be smaller by means of high-dense development. Thus, to apply middle- and high-rise buildings into this plan is able to minimize development area. This kind plan could coordinate with other local policy including food security.

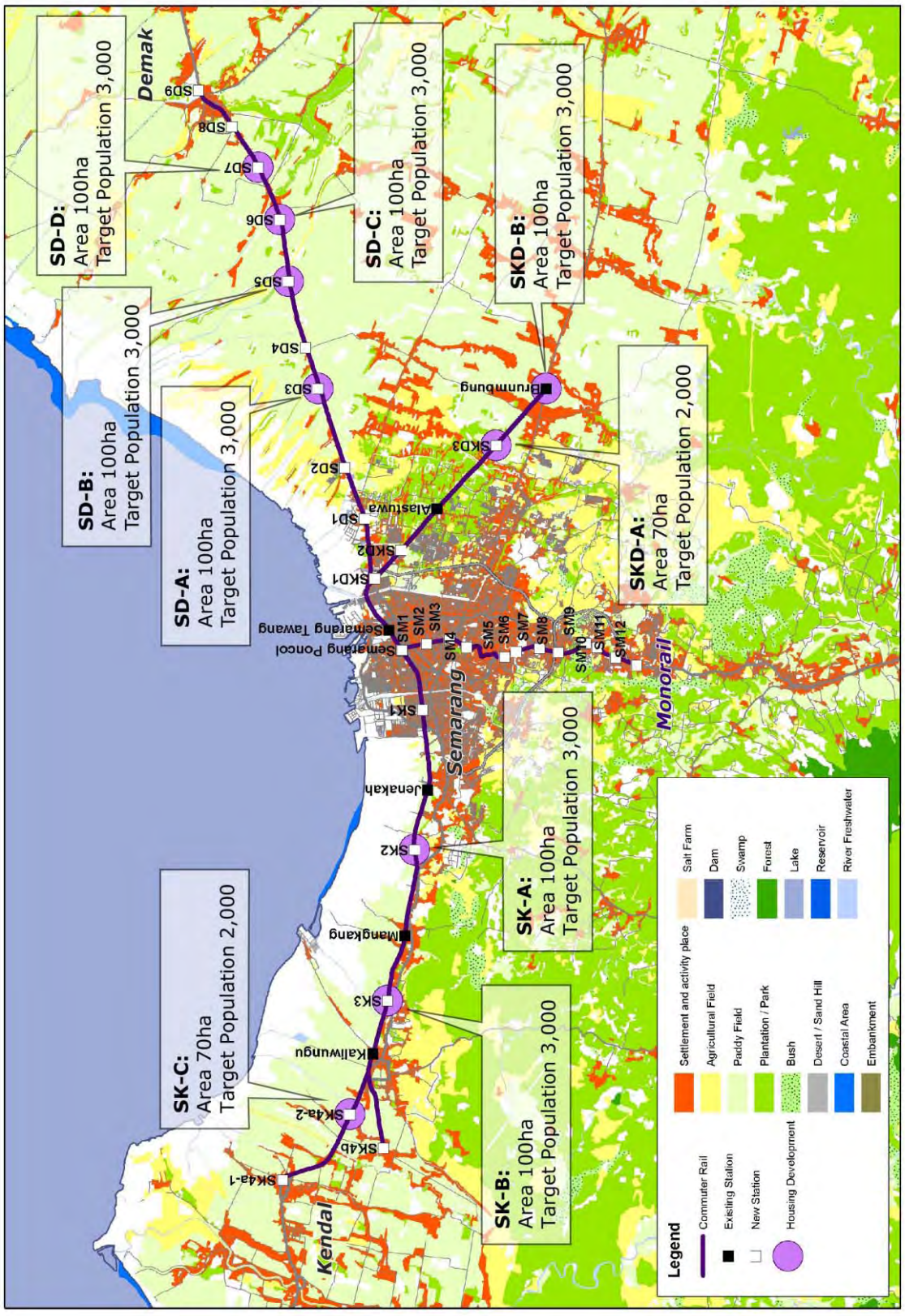


Source: CJRR Study Team

Figure 24 Plan for Housing Development

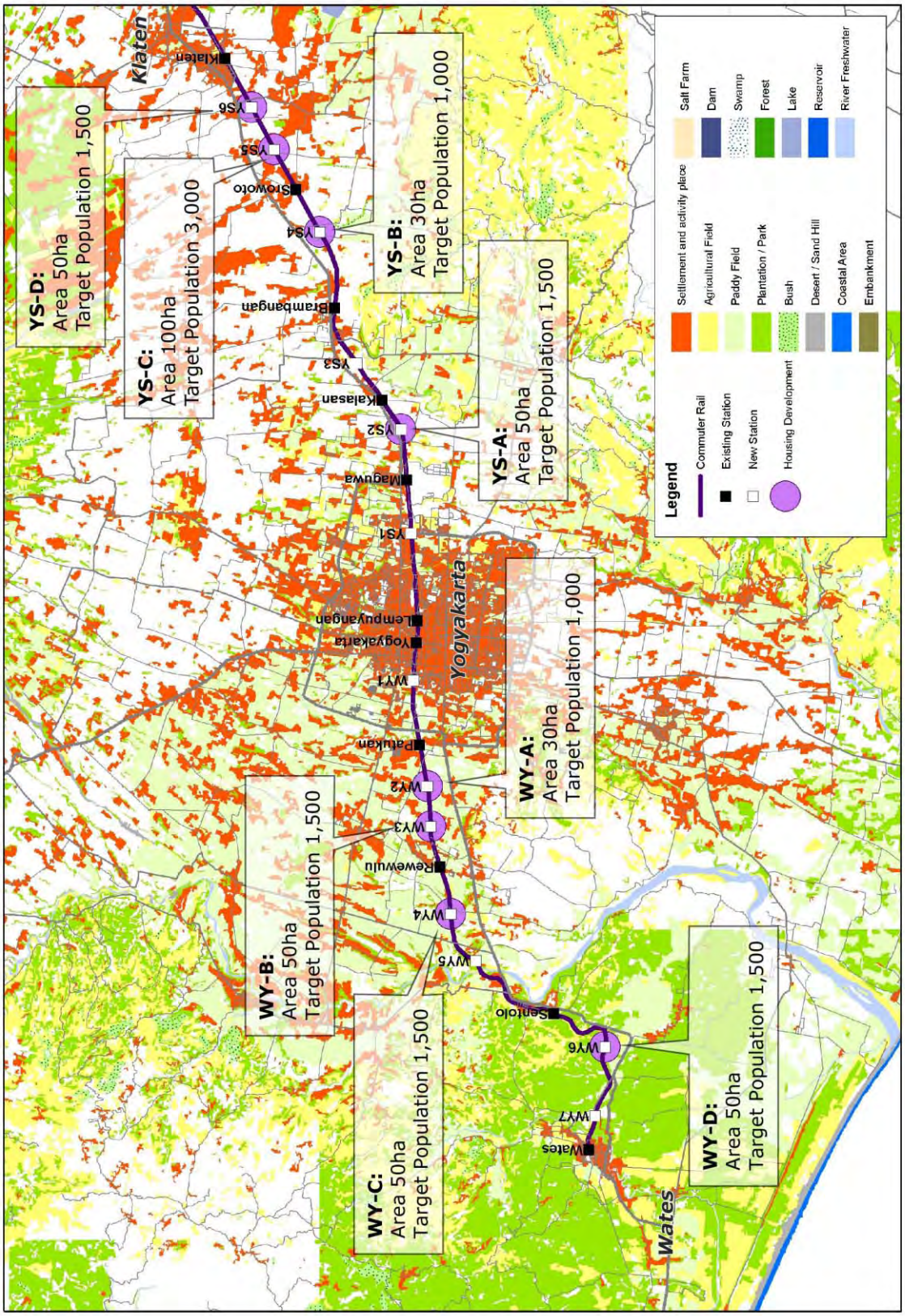
(2) Candidate Area for Housing Development

The location of candidate sites are shown as follows.



Source: CJRR Study Team

Figure 25 Candidate Areas for Housing Development: Kendal – Semarang – Brumbung and Semarang - Demak



Source: CJRR Study Team

Figure 26 Candidate Areas for Housing Development: Wates – Yogyakarta - Klaten

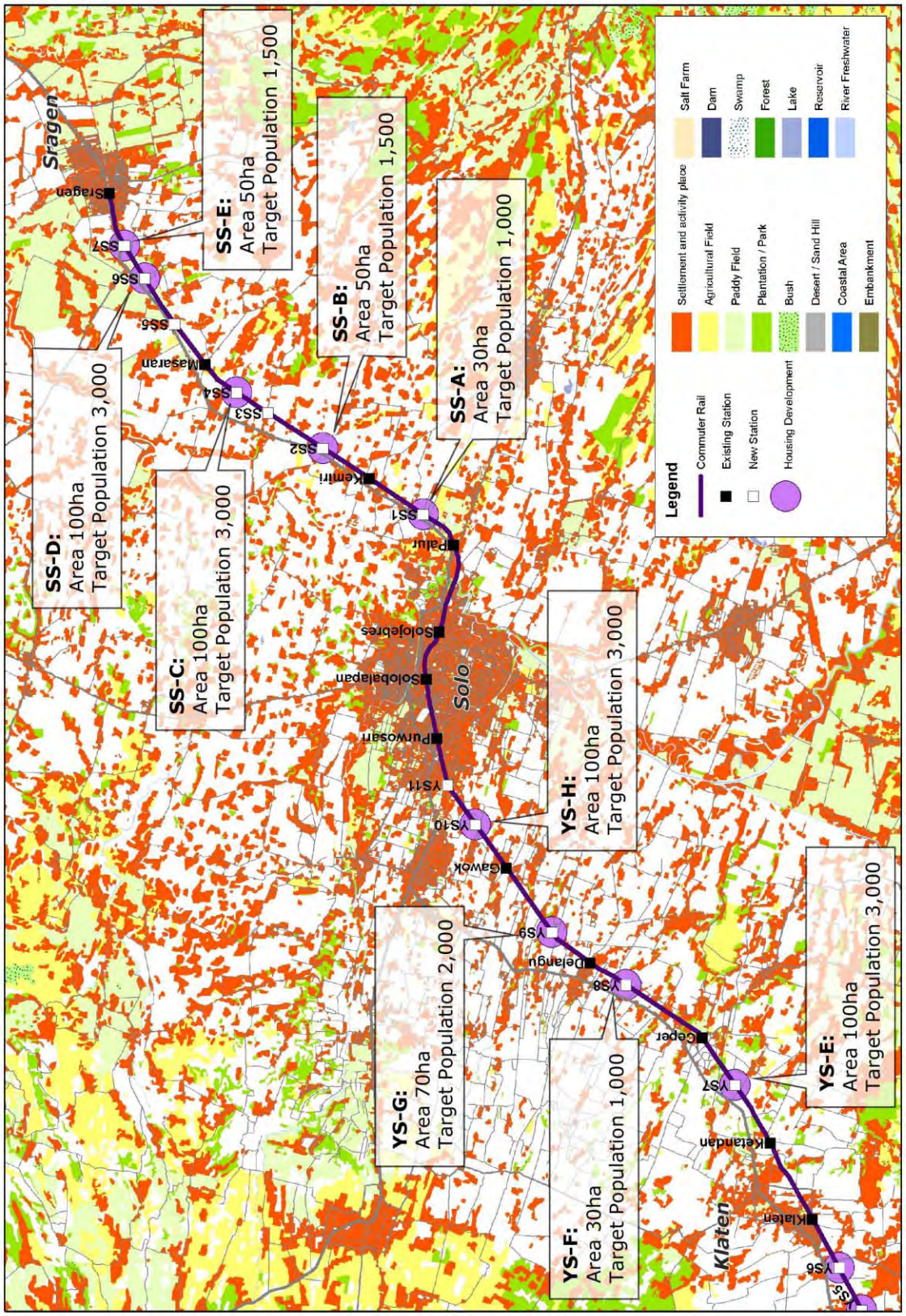


Figure 27 Candidate Areas for Housing Development: Klaten – Solo - Sragen

Source: CJRR Study Team

(3) Food Security

These candidate areas are currently used for agriculture; thus it does not need resettlement. However, to take account of the food security policy in Indonesia is not negligible matter because the candidate areas are basically selected in existing paddy fields along the commuter railways. Agricultural is a major industry in the study area. Rice is the main product, and the amount of production makes up 16% of the total in Indonesia.

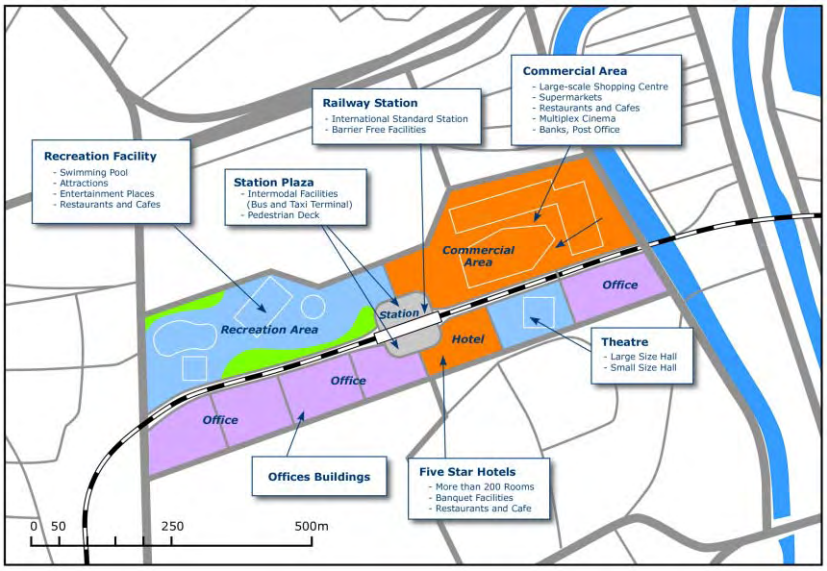
9.1.4 Urban Development at City Centre in Semarang and Yogyakarta

(1) Semarang

Semarang is the centre of regional economy for central java province. As the third largest port city in Java Island, trade and industry dominate the economic activities in Semarang. One of the important strategies is to further expand the economy, strengthen urban competitiveness, and improve the business environment.

This urban redevelopment could help to create business agglomeration by means of developing office buildings and required infrastructure. The well-developed business environment could attract businesses. In addition, to build a new railway station, to exploit the existing rail truck, could provide access to railway service including the commuter rail and airport link. To taking account of tourists and business passenger, is also an efficient idea to utilize this area to build hotels.

On the other hand, urban redevelopment needs to benefit the citizens. The plan is expected to include development of a theatre, large sized shopping centre including multiplex cinema and recreation facilities such as theme park and swimming pool. These facilities could induce passengers to use the commuter rail on weekends. The basic idea is shown in Figure 28.

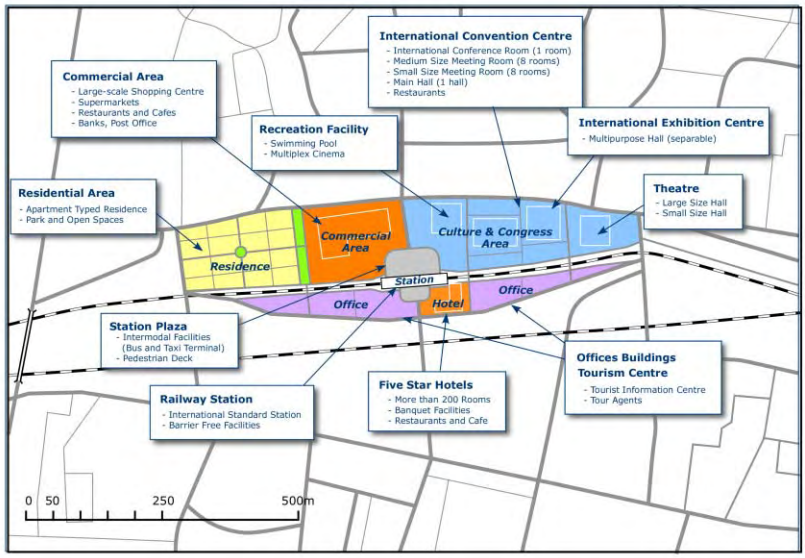


Source: CJRR Study Team

Figure 28 Basic Idea for Urban Redevelopment in Semarang

(2) Yogyakarta

Yogyakarta is one of the popular tourist destinations as an ancient town with Javanese culture. Simultaneously, it is also well-known as a gateway to Borobudur and Prambanan, declared as World Heritage sites. To take advantage of this, Yogyakarta has the opportunity after development to become a place which holds international congresses like Bali. Accordingly, the redevelopment plan includes international convention hall and exhibition centre. For business passengers and tourists, high-end hotels of international standard are also planned in the area. In addition, building a new railway station, which exploits the existing rail truck, could provide railway service including the commuter rail and airport link. A basic idea shown in Figure 29.



Source: CJRR Study Team

Figure 29 Basic Idea for Urban Redevelopment in Yogyakarta

9.1.5 Institutional Setup of Railway Operation-Commuter Railway

We have identified three rail commuter systems in the Study area: (i) Semarang Commuter; (ii) Solo Commuter; and (iii) Yogyakarta Commuter. The following are the proposed organizations for each of these systems. PT. KA is shown as an optional participant in the organization. PT. KA will, of course, be involved as required to coordinate technical issues in interchanging of trains between the commuter railways and PT. KA.

Figure 30 Proposed Organizations for Commuter Systems

We propose that PT. KA continue to provide track maintenance and train dispatching functions for these services; the services will be operated by the Railway Manager, who will hire his own locomotive and train crew members, purchase rolling stock and handle all ticket selling functions and other station services.

Though we have treated them as separate projects in our evaluation, the commuter systems proposed for Yogyakarta and Solo could be operated most efficiently as a single system. Trains, for example, could depart from Wates and operate all the way to Sragen, serving both markets. The train crew and rolling stock could then make a return trip to Wates. This would eliminate the need to turn train sets of each commuter at Klaten, in opposite directions, if they were operated as two separate systems.

9.1.6 Financial Arrangement of Commuter Railway Operation

The following table indicates the results of cash flow analysis, B/C and BEP (Break-Even Point) for 'Commuter Train' projects by class. Subsidy (including PSO) is not considered in "Basic Case" as revenue.

All commuter projects show negative condition according to results of cash flow analysis. However, the deficit amount decreases gradually decade after decade. By class, "Economy Class" is the most loss-making business, meanwhile the deficit amount in 'Business Class' and 'Executive Class' are smaller than 'Economy Class'.

Financial analyses on alternatives cases are conducted. Alternatives are 1) Elevated Structure in Central area of Semarang City; 2) Electric Cars; 3) Public Service Obligation (PSO); 4) Urban Development and 5) Comparison among Three Commuter Rail Services.

Table 22 Summary of Cash Flow (Unit: Million Rp.)

(Total)			Acc. TAC			Acc. Revenue			Acc. CF		
	B/C	B.E.P	-10	10-20	20-30	-10	10-20	20-30	-10	10-20	20-30
Semarang Commuter	0.522	n/a	1,403,613	1,578,176	1,616,217	621,740	1,004,932	1,084,453	-781,873	-573,243	-531,765
Solo Commuter	0.384	n/a	1,781,828	2,018,834	2,204,635	547,732	940,550	1,251,936	-1,234,096	-1,078,285	-952,699
Yogya Commuter	0.480	n/a	1,771,755	2,008,495	2,192,071	680,692	1,168,894	1,555,895	-1,091,063	-839,601	-636,177
(Economy Class)			Acc. TAC			Acc. Revenue			Acc. CF		
	B/C	B.E.P	-10	10-20	20-30	-10	10-20	20-30	-10	10-20	20-30
Semarang Commuter	0.134	n/a	540,024	434,748	404,054	66,285	67,512	67,359	-473,738	-367,236	-336,696
Solo Commuter	0.103	n/a	785,543	640,306	551,159	73,335	77,843	77,743	-712,207	-562,463	-473,416
Yogya Commuter	0.129	n/a	782,060	637,049	548,018	91,097	96,696	96,572	-690,963	-540,352	-451,446
(Business Class)			Acc. TAC			Acc. Revenue			Acc. CF		
	B/C	B.E.P	-10	10-20	20-30	-10	10-20	20-30	-10	10-20	20-30
Semarang Commuter	0.717	n/a	589,773	771,951	808,109	377,727	626,313	678,063	-212,046	-145,638	-130,046
Solo Commuter	0.556	n/a	687,007	928,059	1,102,318	326,818	580,354	782,796	-360,188	-347,704	-319,522
Yogya Commuter	0.696	n/a	682,504	923,292	1,096,036	406,180	721,282	972,882	-276,324	-202,010	-123,154
(Executive Class)			Acc. TAC			Acc. Revenue			Acc. CF		
	B/C	B.E.P	-10	10-20	20-30	-10	10-20	20-30	-10	10-20	20-30
Semarang Commuter	0.721	n/a	276,762	383,120	404,054	177,728	311,107	339,031	-99,035	-72,013	-65,023
Solo Commuter	0.562	n/a	309,279	450,470	551,159	147,579	282,352	391,398	-161,700	-168,117	-159,761
Yogya Commuter	0.703	n/a	307,191	448,154	548,018	183,415	350,916	486,441	-123,776	-97,238	-61,577

Source: CJRR Study Team

9.2 Freight Railway Service Development Plan

Solo – Semarang freight corridor development also indicates high priority in economic evaluation but it needs track elevation of railway line in Semarang city which is included in Semarang commuter railway project; thus the project should wait until the track elevation work is completed. The railway freight corridor development includes dry port development in Solo Kalijambe as well as Yogyakarta; thus, coordination between dry port operator and freight railway operator is required.

9.2.1 Freight Demand on the Corridor

Projected future volume of containers and bulk commodities transported through the Semarang – Solo – Yogyakarta railway corridor is summarized in Table 23.

Table 23 Future Cargo Volume on Semarang-Solo-Yogyakarta Railway Corridor

Commodity	Section	Unit	Forecasted Volume		Remarks
			2015	2030	
Container	Solo Dry Port – Tg. Emas Port	TEU / day (both directions)	164	318	Based on the railway share of 50%
Container	Yogyakarta Dry Port – Tg. Emas Port	TEU / day (both directions)	116	224	Based on the railway share of 70%
Container	Kendal SEZ – Tg. Emas Port	TEU / day (both directions)	80	156	Based on the railway share of 70%
Cement	Cilacap – Yogyakarta, Solo, Semarang	ton / day	2,388	3,721	Based on the current trend and future plan
Sand	Gundih, Kalasan, Wates, Bojonegoro - Cilacap	ton / day	438	911	Based on the current trend
Coal	Kendal SEZ – Semarang – Solo, Wates	ton / day	3,377	6,268	Based on the future plan

Source: CJRR Study Team

9.2.2 Profile of Service and System Improvement

(1) Requirements and Objectives of Freight Railway Planning

The freight railway projects aim to provide the following service levels as basic requirements.

- Fast and reliable service
- Competitive with trucks running on toll road
- Headways able to deal with projected freight demand
- No/little time loss when crossover at single track section
- High operating rate of locomotives with periodical maintenance

(2) Route Alignment

1) Semarang – Solo – Yogyakarta (S-S-Y) Freight Corridor

Beginning at Semarang Port and running through Semarang Gudang – Gundih – Solo Balapan – Klaten – Yogyakarta Tugu and having three freight handling yards at Semarang Port, Solo Kalijembe Dryport and Yogyakarta Dry Port with total length of around 193 km.

2) Semarang – Solo – Wonogiri (S-S-W) Freight Corridor

Beginning at Semarang Port and running through Semarang Gudang – Gundih – Solo Balapan, passing through 3 km of new shortcut line to Solokota, running on existing single track and ending up at Wonogiri. Having two freight handling yards at Semarang Port and Solo Kalijembe Dryport with total length of around 147 km.

3) Kendal – Semarang Freight Corridor

Beginning at Semarang Port and running through Kaliwungu and ending up at Special Economic Zone (SEZ) near Kendal. Having two freight handling yards at Semarang Port and Kendal SEZ with total length

of around 29 km.

9.2.3 Institutional Setup of Railway Operation-Freight Railway

The organization of the regional railway will include a private sector railway manager/operator, representative of the provincial government and coordination with PT. KA as necessary. The freight railway will not receive any subsidies, operations must be profitable, with all rolling stock and locomotives required purchased by the regional railway.

We have identified three freight railway opportunities: (i) Semarang-Solo-Yogyakarta; (ii) Wonogiri branch line; and (iii) Kendal SEZ. The following are the suggested institutional descriptions of each of these potential projects. Similar to the proposed commuter organizations, PT. KA is shown as an optional participant in the organization PT. KA will, of course, be involved as required to coordinate technical issues in interchanging of trains between the freight railway and PT. KA. This approach to the participation of PT. KA is the same for the freight railway projects for Kendal SEZ and Wonogiri branch line.

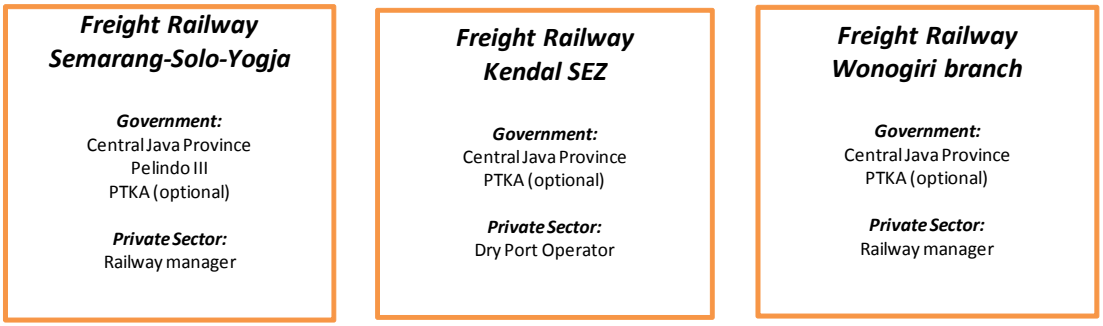


Figure 31 Proposed Organizations for Freight Railway

9.2.4 Financial Arrangement of Freight Railway Operation

The following table indicates the result of cash flow analysis, B/C and BEP (Break-Even Point) for 'Freight Train' projects. The Study Team considered another alternative which is with/without 'container handling facilities (CHF)'.

In case of without CHF, only S-S-Y Freight Corridor project is positive according to results of cash flow analysis. However, S.W. freight corridor project and Kendal SEZ project have deficit amount at the end of project evaluation term (30 years) and according to B/C results are less than 1. In the case of with CHF, all freight train projects are positive in terms of annual cash flow and also cumulative cash flow at the end of the project evaluation term.

Figure 32 Summary of Cash Flow (Unit: Million Rp.)

(With C.H.F.)			Acc. TAC			Acc. Revenue			Acc. CF		
	B/C	B.E.P	-10	10-20	20-30	-10	10-20	20-30	-10	10-20	20-30
S-S-Y Freight Corridor	2.648	1	1,732,973	2,071,308	2,139,464	3,706,466	7,007,407	7,739,006	1,973,493	4,936,098	5,599,542
W-S Freight Corridor	1.884	7	320,522	334,213	320,622	380,321	1,006,636	1,006,636	59,799	672,423	686,014
Kendal SEZ	0.958	11	743,848	827,391	813,800	636,071	926,468	933,490	-107,777	99,077	119,690
(Without C.H.F.)			Acc. TAC			Acc. Revenue			Acc. CF		
	B/C	B.E.P	-10	10-20	20-30	-10	10-20	20-30	-10	10-20	20-30
S-S-Y Freight Corridor	1.979	1	1,678,610	2,016,946	2,085,101	2,502,112	5,270,637	5,895,852	823,502	3,253,692	3,810,751
W-S Freight Corridor	0.785	n/a	293,341	320,622	320,622	199,988	309,525	309,525	-93,353	-11,097	-11,097
Kendal SEZ	0.728	n/a	716,667	813,800	813,800	443,396	705,280	802,379	-273,271	-108,520	-11,421

Source: CJRR Study Team
Footnote: C.H.F. means Container Handling Facilities

9.3 Airport Link Development Plan

Both Semarang airport link and Solo airport link are important to provide railway service for airport users. The projected air passenger demands for both airports are however not large enough thus the project appears to be less feasible in economic sense. Thus it is proposed to combine service with commuter railway to reduce cost burden on common items. By combining the service with commuter railway it will reduce high peak ratio of passenger demand.

9.3.1 Passenger Demand

Demand for railway passengers on these airport links under the assumed fare of Rp. 5,000 is forecasted in Table 24.

Table 24 Demand Forecast for Railway Passengers on Airport Links

[Unit: passengers / day]

Year	Semarang Airport Link	Solo Airport Link
2020	15,200	7,200
2025	18,400	8,800
2030	19,000	9,700

Note: Under the assumed fare of Rp. 5,000.
Source: CJRR Study Team

9.3.2 Profile of service and System Improvement

(1) Requirements and Objectives of Airport Link Planning

The commuter train projects aim the following service level as basic requirements.

- Airport station at/adjacent to airport terminal building
- Dedicated to airport passengers
- Non-stop or limited stops
- Fast and reliable service
- Easy travelling with carrying heavy luggage

- Frequent operation with 30 minutes headways at peak hours
- Direct link to city center
- Airport to airport direct transfer (Solo – Yogyakarta)
- Able to check-in at City Air Terminal (optional)
- User-friendly station facilities, such as high platform, commercial establishments, and barrier free considerations (elevators, toilets, signage, tactile tiles, slopes etc)
- Comfortable railcar interiors
- Improved accessibilities to stations (Station plaza, feeder services etc)

(2) Route Alignment

Based on such objectives and requirements of the airport link services, route alignments for the same were identified as follows:

1) Semarang Airport Link

Beginning at Semarang Tawang and running through Semarang Poncol, diverging from existing railroad to the north, and ending up near terminal building of Semarang Airport (proposed new location) with total length of around 9 km.

2) Solo – Yogyakarta Airport Link

Beginning at Solo Airport and running on viaduct, connecting to existing railroad near Gawok, running through Klaten – Brambangan – Maguwo and ending up at Yogyakarta Tugu with total length of around 59 km.

(3) Alignment, Plane and Spatial Locations

Alignment, plane and spatial locations of proposed airport links are presented in the following table.

9.3.3 Institutional Setup of Railway Operation-Airport Link

The organization and problems facing the management of airport link railways is very similar to that of the commuter railway; airport link trains will operate within the rail commuter zone, we have identified airport link projects for Solo and Semarang; suggested organization plans are shown below.

Figure 33 Propose Organization for Airport Link

9.3.4 Financial Arrangement of Airport Link Railway Operation

The following table indicates the result of cash flow analysis, B/C and BEP (Break-Even Point) for 'Airport Link' projects by class. Subsidy (including PSO) is not considered in "Basic Case" as revenue.

All Airport-link train projects have negative condition according to results of cash flow analysis. However, the deficit amount decreases gradually decade after decade. By class, "Economy Class" is the most loss-making business, meanwhile the deficit amount in 'Business Class' and 'Executive Class' are smaller than 'Economy Class'.

Table 25 Summary of Cash Flow (Unit: Million Rp.)

(Total)			Acc. TAC			Acc. Revenue			Acc. CF		
	B/C	B.E.P	-10	10-20	20-30	-10	10-20	20-30	-10	10-20	20-30
Semarang Airport Link	0.725	n/a	246,657	277,510	279,082	163,726	226,837	233,415	-82,931	-50,673	-45,667
Solo Airport Link	0.254	n/a	358,278	376,538	376,538	86,362	105,611	105,611	-271,916	-270,927	-270,927
(Economy Class)			Acc. TAC			Acc. Revenue			Acc. CF		
	B/C	B.E.P	-10	10-20	20-30	-10	10-20	20-30	-10	10-20	20-30
Semarang Airport Link	0.189	n/a	92,922	74,538	69,771	16,924	15,352	14,449	-75,999	-59,186	-55,321
Solo Airport Link	0.065	n/a	112,959	94,135	94,135	7,187	6,545	6,545	-105,773	-87,589	-87,589
(Business Class)			Acc. TAC			Acc. Revenue			Acc. CF		
	B/C	B.E.P	-10	10-20	20-30	-10	10-20	20-30	-10	10-20	20-30
Semarang Airport Link	0.991	9	104,607	135,659	139,541	99,855	141,343	145,978	-4,752	5,684	6,436
Solo Airport Link	0.333	n/a	164,465	188,269	188,269	53,277	66,044	66,044	-111,188	-122,225	-122,225
(Executive Class)			Acc. TAC			Acc. Revenue			Acc. CF		
	B/C	B.E.P	-10	10-20	20-30	-10	10-20	20-30	-10	10-20	20-30
Semarang Airport Link	0.993	9	49,128	67,313	69,771	46,948	70,142	72,989	-2,180	2,829	3,218
Solo Airport Link	0.346	n/a	74,401	94,135	94,135	25,898	33,022	33,022	-48,502	-61,113	-61,113

Source: CJRR Study Team

9.4 Yogyakarta – Magelang –Ambarawa – Kedungjati Intercity Railway Service Development Plan

Yogyakarta – Magelang –Ambarawa – Kedungjati intercity railway train shows relatively low economic feasibility. Although a part of the abandoned railway line and ROW still exist along the corridor, railway tracks and bridges are already deteriorated thus it requires new railway construction over the whole section. Furthermore the section between Magelang – Ambarawa – Kedungjati is mountainous section thus the construction cost of the railway line is more expensive than flat terrain. On the other hand this section does not have sufficient passenger demand since most of them are through traffic. Yogyakarta - Magelang section has larger demand compared to the other two sections consequently it shows better economic evaluation result but it requires grade separated structure within the Ring Road of Yogyakarta.

10. Conclusions and Recommendations

10.1 Institutional Setup for Central Java Regional Railway System Development

Insufficient management capability on railway business and lack of discipline of employees are regarded as a cause of inefficient railway service provision. At the same time deteriorated railway infrastructure and aged rolling stock are also a cause of unsatisfactory level of railway service. The central government

has limited budget for railway infrastructure development and improvement, while PT. KA is also suffering from shortage of revenue. Therefore it is essential to expand funding sources for investment.

Since the new railway law allows local governments and private sector to be involved in the railway business, participation of new business entities will support to increase available funds for railway development.

(1) Organization Structure

It is recommended to establish a Central Java Regional Railway (CJR) with strong private sector participation, to strengthen railway service, make it more competitive, and to provide an additional source of capital investment funds to grow the railway business in Central Java. The Rail Operator would be the strong driving force of the CJR and come from the private sector. There are several alternative ways to structure this concept as described below.

(i) Establish a Local Government Owned Enterprise (LOE) to develop and administer a performance based contract for the Rail Operator. The Rail Operator would likely include an Indonesian freight forwarder and an overseas organization experienced in railway operations. PT. KA would maintain and control the railway line and the Rail Operator would market the freight business, operate trains (freight and passenger, if commuter service is included) collect revenue and manage the railway business aggressively to increase rail market share and increase operating efficiency.

(ii) A second alternative would be to establish an LOE responsible for train operations which would be a joint venture with the private sector operator. Composition of the rail operator would be similar to that described in the first alternative.

(iii) A third alternative would be to establish a joint venture between PT. KA, individual shippers and the private rail operator. Under this third alternative, there would be no change in the structure or manner in which track access fees are administered or paid.

(2) Bidding Process for Rail Operator

CJR operator (Rail Operator) will be selected from interested private companies through a process of competitive bidding. Service levels will be determined by the provincial government and all bidders must agree to achieve at least, these standards of service. An important component of the bidding selection criteria would be the requirement that the Rail Operator purchase rolling stock necessary to support the service; bidders could offer to make additional investments in the line. Bidding criteria could include items such as track access charge to pay to PT. KA and the government (central and provincial), passenger fare level and management fee. In this way, the desired service levels would be achieved at the lowest possible cost and with the greatest efficiency.

(3) Recommended Institutional Alternative

Three institutional alternatives were presented for the proposed CJR. While it is possible to establish the railway along the lines of any of these three, their impacts on the objectives of establishing this organization will likely be different. These objectives include creating an organization structure favorable for private sector involvement that would lead to increased freight traffic by rail through innovative rail operating and marketing practices as well as efficient operation of rail commuter systems in accordance with the performance contract with the provincial government. This private sector involvement would likely include an Indonesian freight forwarder and a rail operator from overseas. Involvement of the private sector would also provide an additional source of project finance for purchase of locomotives and rolling stock, as well as possibly some additional investments in the railway system. Perception of risk by the private sector company will have a direct impact on their willingness to participate and to make these investments.

The likelihood of positive private sector influence and financial contribution would be the greatest under Alternative #1 or #2; it is unlikely that Alternative #3 would produce a successful private sector contribution.

10.2 Conditions to Materialize Railway System Development

In the financial analysis of the Study, it is assumed that the initial investment cost for railway infrastructure development will be paid as Track Access Charge (TAC), taking depreciation of facilities into account. It is also assumed that this TAC is paid by railway operators according to train car * kilometers of passenger trains, freight trains and the existing trains operated by PT. KA. Financial feasibility appears good for the Semarang – Solo freight transport corridor; however, if the other railway system development cannot be achieved and if they cannot share the TAC, the cost burden to the freight corridor development will become heavier, and viability of the freight corridor will be worse. This implies that financial viability of the projects is obtained only if all the proposed projects are implemented and they share the initial investment costs among the projects.

Freight demand of railway transport was projected based on the transport plan of materials and products of shippers; thus, reliability of forecast is high. On the other hand, container transport demand carried by railway depends on the comparative advantage of railway transport service over road transport. In this regard, it is important to develop industrial estate next to the dry port, and redevelop the railway branch line to the container yard in the port to reduce time and cost due to double handling. It is important to attract shippers by reducing disadvantages of railway freight transportation through minimizing loading and unloading time and cost at both ends. These developments require coordination among the relevant agencies. Directorate General of Railways and Transportation Bureau of local government should take lead to materialize these developments. Furthermore, a new regional railway company should undertake aggressive marketing to increase container demand.

In the Study, urban commuter railway services are proposed in the three metropolitan areas (Semarang,

Solo and Yogyakarta) where urban transportation problems are expected to be more severe. It should be noted that the railway passenger demand would be increased not only by railway service improvement but also by integrated railway system development with urban redevelopment in the city center and housing development along the railway corridor. These urban developments would increase not merely railway passenger demand and subsequent revenue from ticket sales but also increase profits from real estate business. This is a commonly practiced mechanism to absorb development benefit as revenue from property business in Japan. Railway business in Indonesia is not able to adequately maintain and upgrade the railway infrastructure and rolling stocks merely with railway transport revenue since this amount is limited. Consequently, it is fundamentally required to expand the revenue base for railway system improvement. To implement housing development and urban development, first of all, the change of land use in the spatial plan at local level is required. To develop the surrounding areas of railway stations local government should develop station plazas, park and ride facilities, access roads to the stations and road network in the surrounding area in collaboration with a real estate company. Without such supports from central and local governments, the railway system development will not be materialized and the expected effects would not be achieved.

In addition, conditions for private sector to enter the railway transportation business should be clearly defined in order to attract them. For instance, the method of calculation of subsidy should be clearly defined; otherwise the private sector will regard it too risky and they will be reluctant to participate in the business.

As mentioned above, to materialize the proposed railway projects, it is indispensable to implement the following measures by relevant agencies in a timely manner.

Table 26 Actions to be taken to Materialize Proposed Railway Projects

Agency	Timing	Action
Directorate General of Railways, MOT	Prior to establishment of Provincial Government Owned Enterprise	To establish task force to define a role of central and provincial governments in regional railway system development
	Prior to commuter railway service and Prior to the start of the Semarang - Tegal and Semarang – Cepu intercity passenger train service	To speed up double tracking on the Java north main line.
	Prior to start of Semarang commuter railway service	To give priority for double tracking to Kendal - Semarang - Brumbung section
	Prior to the start of Semarang – Solo freight railway transport	To improve railway infrastructure on the Semarang – Solo corridor in collaboration with provincial government
	Prior to start of Semarang – Solo freight railway transport	To coordinate with relevant agencies(Directorate General of Highways, Ministry of Public Works, Dinas PU, Pelindo III, Power Plant, Kota Semarang Government, regarding Tg. Emas port access line

Agency	Timing	Action
Provincial Government	Prior to the start of regional railway service	To establish provincial government owned enterprise (Central Java Railway Company) To formulate railway service standard and quantity and quality of the required railway service in the region.
	Prior to the start of Semarang – Solo – Yogyakarta freight railway transport	To develop integrated dryport and industrial estate near railway line
Kabupaten/Kota Governmnet	Prior to the start of the commuter railway service	To make modification on land use plan which enables housing development along the railway corridor To develop station plaza and access road to the railway station
Private Railway Company	Prior to the start of railway service	To purchase of rolling stock To develop housing area along the railway corridor To develop urban facilities in the center of the city To purchase loading/unloading equipment for freight transport

10.3 Next Action

To materialize the regional railway system development projects recommended in the Study, it is recommended to establish a task force team with Directorate General of Railways, Ministry of Transport and Central Java and Yogyakarta Provincial Governments for creating a CJR company. The task force team should define the roles and responsibilities of central government and provincial government for regional railway system development.