Republic of Indonesia
Ministry of Transportation
Directorate General of Railways

Preparatory Survey on Capacity Expansion of Railway Line - Lahat and Kertapati in South Sumatra, Indonesia (PPP Infrastructure)

Final Report (Summary Version)

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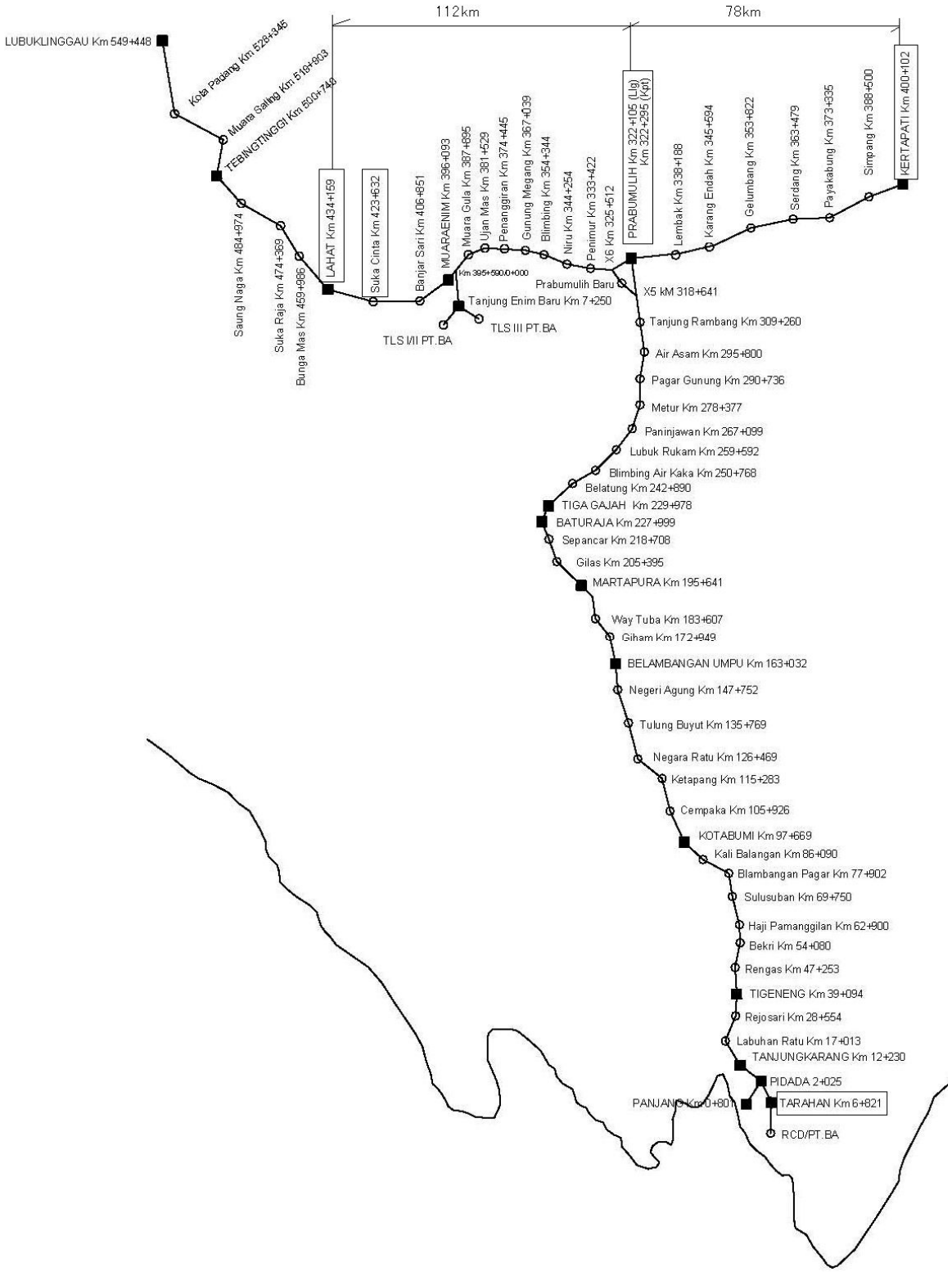
Abbreviations

A	
ADB	Asian Development Bank
ADSCR	Average Debt Service Credit Ratio
AMDAL	Indonesian EIA
APBN	National Budget
AUAID	Australian Agency for International Development
B	
B to B	Business to Business
BOD	Biochemical Oxygen Demand
BAPEDAL	Badan Pengendalian Dampak Lingkungan
BAPPEDA	South Sumatra State Regional Development Agency
BAPPENAS	National Development Planning Agency
BKPM	Capital Investment Coordinating Board
BOO	Build, Operate and Own
BOQ	Bill of Quantity
BOT	Build, Operate and Transfer
BT	Build and Transfer
C	
C.O.D.	Chemical Oxygen Demand
CAPEX	Capital Expenditure
CAPM	Capital Asset Pricing Model
CCTV	Closed-circuit Television
CDM	Clean Development Mechanism
CRP	Country Risk Premium
D	
DEL	Diesel Electric Locomotive
DFID	UK Department For International Development
DGR	Directorate General of Railways
Divre3	South Sumatra Division of PT. KAI
DMO	Domestic Product Use Obligation
DPD	Regional Representative Board
DPR	National Cabinet
DSCR	Debt Service Coverage Ratio
DSR	Debt Service Ratio
E	
EIA	Environmental Impact Assessment
EIRR	Economic Internal Rate of Return
EMD	Electro-Motive Diesel
ENPV	Economic Net Present Value
EPC	Engineering, Procurement and Construction
EPP	Export Parity Price
F	
FIRR	Financial Internal Rate of Return
FNPV	Financial Net Present Value
G	
GCA	Government Contracting Agency
GDP	Gross Domestic Production
GHG	Green House Gas
GMR	Global Market Premium
GOI	Government of Indonesia
H	
HTT	Handheld Tie Tamper
IEDC	Indonesia Economic Development Corridor
I	
IEE	Initial Environmental Examination

IIF	Indonesia Infrastructure Finance
IMF	International Monetary Fund
IMO	Infrastructure Maintenance and Operation
IPP	Independent Power Producer
IRR	Internal Rate of Return
ISO	International Organization for Standardization
J	
JBIC	Japan Bank for International Cooperation
JICA	Japan International Cooperation Agency
JR	Japan Railways
JTC	Japan Transportation Consultants Ltd.
K	
KA-ANDAL	TOR for AMDAL
KALOG	PT. KAI Logistics
KNKT	National Transportation Safety Committee
L	
L/A	Loan Agreement
LARAP	Land Acquisition and Resettlement Action Plan
LLCR	Loan Life Cover Ratio
LNG	Liquid Natural Gas
M	
MOSOE	Ministry of State Owned Enterprises
MP3EI	Master Plan for Economic Acceleration and Integration
MPE	Marginal Propensity of Export
MPR	Indonesian National Council
MTPA	Million Ton Per Annum
MTT	Multiple Tie Tamper
N	
NC	Numerical Control:
NEXI	Nippon Export and Import Insurance
NPV	Net Present Value
O	
O&M	Operation and Maintenance
OCC	Opportunity Cost of Capital
OD	Origin and Destination
ODA	Official Development Assistance
P	
P/Q	Pre-qualification
PAPs	Project Affected People
PC	Pre-stressed Concrete
PER	Public Expenditure Review
PERSERO	State Owned Company
PII	PT. Penjamin Infrastruktur Indonesia
PIU	Project Implementation Unit
PLN	Perseroan Listrik Negara
PMU	Project Management Unit
PPP	Public Private Partnership
PROPENAS	Mid Term National Development Plan
PSC	Project Steering Committee
PSIF	JICA Private Sector Investment Finance
PSO	Public Service Obligation
PT. BA	PT.Tambang Batubara Bukit Asam Tbk
PT. BAU	PT. Bara Alam Utama
PT. INKA	State Owned Rolling-stock Manufacture
PT. KAI	State Owned Railway Operator
PWC	Price Water House Coopers Co.

R	
R	Radius
R42	Rail Type of 42kg/m
R54	Rail Type of 54kg/m
RCD	Rotary Car Dumper
RENSTRA	National Transportation Planning Strategy
RJPP	PT. KAI's Rencana Jangka Panjang Perusahaan
RKL	Environmental Management Plan
ROE	Return On Equity
Rp.	Rupiah
RPJMN	National Mid-term Development Plan
RPJPN	National Long-term Development Plan
RPL	Environmental Monitoring Plan
S	
SIL. 4	Safety Integration Level 4
SDR	Social Depreciation Rate
SEA Games 26	South East Asia Games 26
SISTRANAS	National Transportation System Plan
SOP	Standard Operation Procedure for Toxic Wastes
SPC	Special Purpose Company/Vehicle
STEP	Special Terms for Economic Partnership
T	
TAC	Traffic Access Charge
TATRALOK	Regional Level Transportation Plan
TATRANAS	National Level Transportation Plan
TATRAWIL	State Level Transportation Plan
TOR	Terms of Reference
TSL	Two Step Loan
TSP	Total Suspended Particle
TSS.	Total Suspended Solid
U	
UIC	International Railway Union
UKL	Upaya Pengelolaan Lingkungan
UNFCCC	United Nations Framework Convention on Climate Change
UPL	Upaya Pemantauan Lingkungan
V	
VAT	Value Added Tax
VOC	Vehicle Operation Cost
W	
WACC	Weighed Average Cost of Capital

Project Line Map



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Chapter 1

Background of the Project

1.1. Summary of Indonesia

1.1.1. Outline of the Country

(1) Overview of the Country

① Location

The proper name of Indonesia is the Republic of Indonesia, a name that originates from the Greek words “Indos”, meaning “India”, and “Nesos”, meaning “island”. The country is located between latitude 6° 8’ north and 11° 15’ south, and between longitude 94° 45’ east and 141° 5’ east. The distances of the country from east to west and from north to south are approximately 5,100km and 1,760km respectively. Reputed to be the world’s largest archipelagic country, Indonesia is made up from 17,508 large and small islands, of which approximately 6,000 are inhabited. Its land area extends roughly 1.86million km^2, making Indonesia the world’s 16^{th} largest country, and it has about 5 times more land than Japan. Among the islands, the largest is Kalimantan (539,000km^2, followed by Sumatra (426,000km^2), Irian Jaya (422,000km^2), Sulawesi (174,000km^2), and Java (129,000km^2). [Fig. 1-1-1] shows the map of Indonesia.

DKI Jakarta is the capital of Indonesia, and is located on the northwest coast of Java island, forming the main city of Indonesia. Surabaya is Indonesia’s second largest city, and is located at the eastern end of Java Island. Other cities include Bandung, Medan, Semarang, Yogyakarta, Denpasar, Padang, Palembang, Makassar, Manado, Banjarmasin, Balikpapan, and Jayapura.

(Source: Coordination Agency National Survey and Mapping (Bakosurtanal), Indonesia)

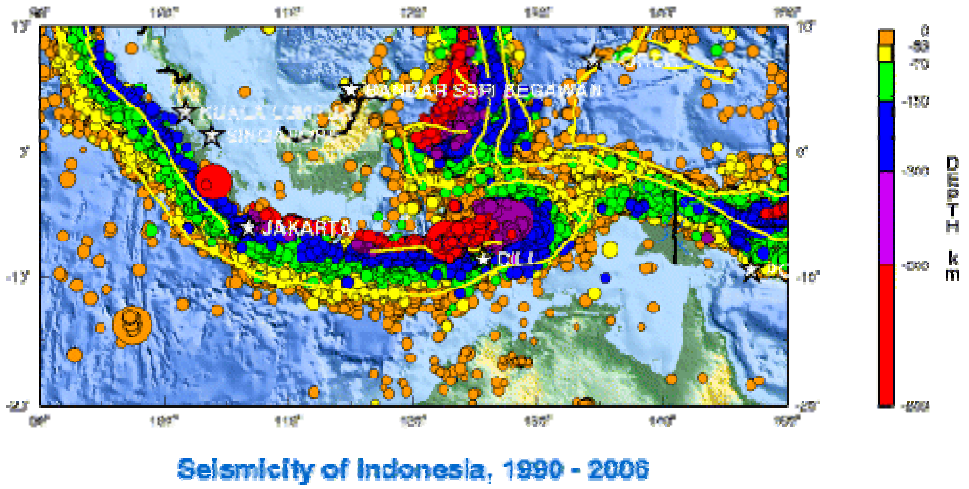
[Fig. 1-1-1] Map of Indonesia

② Geographical Features

It is estimated that the total territorial area of Indonesia is approximately 9.8million km^2, of which 81% is sea and the remaining 19% is land. For the reason that the largest part of its area is sea, Indonesia is said to be the country with the longest coastline, with a length of 54,716km. In addition, because Indonesia is part of the circum-Pacific volcanic belt, the world's largest volcanic zone, the area stretching from Sumatra to Java, Bali, Lombok, Sumbawa, and Flores has many volcanoes, between 400 and 450, of which approximately 130 are active. Indonesia's highest mountain is Mount Jayawijaya in Papua, which is approximately 5,000m above sea level at its highest point and is covered with snow year-round. The country's largest lake is Lake Toba in Sumatra, which has an area of 1,100km^2, and the longest rivers are considered to be the Mahakam River and Barito River on Kalimantan Island, which are used for regional transportation. The majority of the coastline facing the Indian Ocean consists of steep cliffs, with part made up of sand dunes. In contrast, the islands in the sea located on the northern side are comparatively flat, due to the effect of sedimentation built up over many years.

③ Earthquakes

For the reason that the Indo-Australian Plate passes under the Eurasian Plate in the area in the south part of Indonesia bordering the Indian Ocean, many plate boundary type earthquakes occur in Indonesia. In recent years, these included earthquakes in Sumatra on December 26, 2004 (Magnitude 9.3) and on March 29, 2005 (Magnitude 8.7), and in Yogyakarta on May 27, 2006 (Magnitude 6.2). [Fig. 1-1-2] shows the distribution of seismicity (1990 - 2006) published by United States Geological Survey. Earthquakes have happened throughout the whole land of Indonesia.



Seismicity of Indonesia, 1990 - 2006

(Source: USGS (United States Geological Survey))

[Fig. 1-1-2] Distribution of Seismicity (1990 - 2006)

④ Climate

Because Indonesia is located close to the equator, it has a tropical climate. Unlike the changing seasons in Japan, there are only two seasons consisting of a dry season and a rainy season. When the sun is above the northern hemisphere, a dry wind blows across the whole country from the southeast, while when the sun is above the southern hemisphere, a humid wind blows from the northeast. The dry season continues from around June until September, while the rainy season lasts from December to March. April and May, and October and November are the times when the two seasons change. The annual average temperature of the plains in 2008 was between 23℃ and 28℃. The humidity is comparatively high, and was observed between 71.0% and 88.0% in 2008. It rains almost throughout the year, even during the dry-season. The amount of rainfall differs depending on the month and the location. The average amount of rainfall in 2008 was between 949.1mm and 5,652.0mm. The annual average temperature of the plains in 2010 was between 25℃ and 32℃. The humidity is comparatively high, and was observed 74% in 2010. Rain is falling almost throughout the year, even during the dry-season. Average rainfall was observed 1,779 mm in 2010.

⑤ Population

The [Table 1-1-1] shows the population of Indonesia. As shown in the table below, the total population of Indonesia in 2010 was approximately 238million, and Indonesia was ranked 4th of nations with largest population in the world. Looking at the share of population by region, more than half of the population (51.5%) was concentrated in Java Island which equals only 7% of Indonesia's land area. On the other hand, the shares of the other islands were all single digit figures (between 1.8% and 7.2%), except for Sumatra Island (25.2%). Thus, the population density in Java Island is the highest approximately 8 times higher than the national average.

Due to the implementation of population control programs such as family planning, the population growth rate has been reduced gradually from 1.45% between 1990 and 2000 to 1.24% between 2000 and 2005 and 1.08% between 2005 and 2010. However, it seems that the decentralization of population such as the implementation of migration is not much in progress in spite of the efforts of various countermeasures by the government due to the present condition of population above.

[Table 1-1-1] Population of Indonesia

Region	Land Area (Thousand km^2)	Population (Thousand)		Population Density per km^2 (2010)
		2000	2010	
1. Sumatra				
(1) Aceh	58.0	3,929	4,487 (1.7%)	77
(2) North Sumatra	73.0	11,643	12,985 (4.9%)	178
(3) West Sumatra	42.0	4,249	4,846 (1.8%)	115
(4) Riau	87.0	3,908	5,543 (1.6%)	64
(5) Riau Islands	8.2	1,040	1,686 (0.4%)	206
(6) Jambi	50.1	2,407	3,089 (1.0%)	62
(7) South Sumatra	91.6	6,211	7,446 (2.6%)	81
(8) Bangka-Belitung	16.4	900	1,223 (0.4%)	75
(9) Bengkulu	19.9	1,456	1,713 (0.6%)	86
(10) Lampung	34.6	6,731	7,596 (2.8%)	220
(11) Total	480.8 (25.2%)	42,473	50,614 (17.9%)	105
2. Jawa	129.4 (6.8%)	121,294	136,563 (51.1%)	1,055
3. Bali & Nusa Tenggara	73.1 (3.8%)	10,982	13,068 (4.6%)	179
4. Kalimantan	544.2 (28.5%)	11,308	13,773 (4.8%)	25
5. Sulawesi	188.5 (9.9%)	14,882	17,359 (6.3%)	92
6. Maluku & Papua	495.0 (25.9%)	4,195	6,180 (1.8%)	12
Total	1,910.9 (100%)	205,133	237,556 (100%)	124

(Source: Statistical Yearbook of Indonesia 2010)

⑥ Language, Religion, and Ethnic Groups

The Indonesian language (Bahasa Indonesia) is commonly used as the official language. However, there are many regional languages, around 150 to 250, depending on the ethnic groups and regions, which are used in daily conversation among members of the same ethnic groups.

Indonesia guarantees freedom of religious belief through the provisions of Article 29 of the Constitution. Similarly to the situation with languages, many religions are spread out following the differences in regional geography. For example, the Hindu religion is widespread in most areas of Bali Island, while the Roman Catholic religion is found in the north part of Sulawesi Island, the Protestant religion in the eastern Indonesian islands including New Guinea, and the

Islamic religion is present in most areas nationwide. According to the statistical data, believers of the Islamic religion make up 86% of the total, followed by Christians with 9%, Hindus at 3%, Buddhists at 2%, and others. There are more than 170 million believers of Islam in Indonesia, making it the country with the largest Islamic population in the world.

As for the ethnic group, the majority of the population is Malays, but this also consists of many sub-ethnic groups such as the Jawa group of Central and East Java making up 45%, the Sunda group in West Java with 14%, the Madura with 8%, and other groups. In addition, 5% of the population is overseas Chinese Indonesians.

⑦ History

The history of Indonesia can be divided into a number of stages such as the prehistoric times, the introduction of Hinduism and Buddhism, the spread of Islam, the Dutch colonial period, the awakening of nationalism, the occupation by the Japanese imperial army, the declaration of independence, the introduction of democracy under Sukarno, the New Order under Suharto, and the quest for reforms in the post-Suharto period. The following is a summary of each of the stages.

From around the 1st century B.C., there was a spread of a unique culture influenced by the Hindu religion that was introduced by Indian traders. Then, from the 7th century, the Buddhist kingdom of Sriwijaya was established on Sumatera Island and Sailendra was established on Jawa Island. Meanwhile, the Hindu kingdom of Mataram was established on Java Island. In particular, the Majapahit kingdom established in 1292 greatly flourished between 1350 and 1390 under the strong leadership of Gajah Mada.

Meanwhile, in the 13th century, Islam was brought by the Indian and Arab traders who crossed the seas in search of spices and it spread to most of the country by the latter half of the 15th century. Thereafter, European traders had begun visiting Indonesia to trade in spices. Among them, the Netherlands government began directly administering Indonesia as its colony. Although resistance activities occurred in succession against the Dutch colonial administration following the expansion of the plantation business by the Dutch, these were all suppressed. During the 20th century, the Netherlands changed its formerly forceful colonial administration to one that was more lenient, and as a result the democratic movement began to grow larger.

In February 1942, the end of Dutch colonial control was marked by the attack and occupation by the Japanese imperial army. Two days after the unconditional surrender of Japan on August 15, 1945, the nationalist leader, Sukarno, declared Indonesian independence and was appointed president. Following this, the Netherlands tried to re-establish their colony, but this ended in failure due to resistance by armed Indonesians, and the Netherlands finally recognized Indonesian independence in December 1949. President Sukarno established the Sukarno concept

in 1957 based on “guided democracy” and “guided economy”. Since he practiced it with the support of the military and the Communist Party seeking for anti-imperialist, anti-colonial policies, Indonesia became gradually isolated from international society. Meanwhile, the domestic economy rapidly worsened, affected by a steep rise in the cost of living due to inflation. At this time, the attempted Communist Party coup d’état on September 30, 1965 triggered a steep drop in Sukarno’s political influence, and Suharto, who had suppressed the attempted coup, was appointed president in 1968.

At the beginning of the Suharto era, known as the New Order period, Suharto reversed the foreign policies pursued in the Sukarno era by making approaches to Western nations. In addition, President Suharto positively encouraged investment from overseas countries, which resulted in economic development that continued for 30 years. In the Suharto era, this economic growth showed a high average rate of 6.7%, and the president succeeded in realizing economic and political stability. However, the Asian currency crisis in 1997 paralyzed the Indonesian economy. This triggered an explosion of dissatisfaction among the general populace in the Suharto regime, leading to bloody violence and rioting. As a result, Suharto resigned the presidency on May 21, 1998, and was replaced by Bucharuddin Jusuf Habibie, who had been vice president at the time. President Habibie introduced many political reforms including the liberalization of political activities, freedom of speech and gathering, release of political prisoners, and regional decentralization. However, in the elections of June 1999, the newly elected members of the People's Consultative Assembly (MPR) rejected the reappointment of Habibie, and Abdurrahman Wahid was elected president with Megawati Sukarnoputri as vice president. President Wahid tried to further promote democracy and economic growth while twice forming cabinets made up from many political party members, but the political situation became even more confused due to opposition from the People's Representative Council (DPR). President Wahid was unable to take effective measures to end the confusion, and finally on July 23, 2001 he was removed from office through a resolution of the People's Consultative Assembly (MPR), and Vice President Megawati became president as stipulated by the constitution.

Although President Megawati further promoted the reforms towards democratization begun in the Habibie and Wahid eras, these political policies placed greatest importance on unifying and stabilizing the country. However, Megawati was faced with many problems, including the spread of corruption, collusion and nepotism, regional secession and independence movements, the delay of economic reforms, and debt problems. Without taking appropriate measures despite being faced with these problems, Megawati gradually lost the trust of the Indonesian people. Finally in 2004 Megawati lost to Susilo Bambang Yudhoyono in Indonesia’s first direct presidential election.

President Yudhoyono was affected by many calamities after taking office, such as the

earthquakes in Sumatra and Yogyakarta, the volcanic eruption of Mount Merapi, an outbreak of bird influenza, and the mud flow eruption at Sidoarjo. In addition, the president was forced to implement painful policies due to the effect of global high oil prices including raising the prices for fuel. Despite the mentioned problems, Yudhoyono was elected as a President for the second period from 2009 to 2014. Currently, his vice president is Boediono, a former Governor of the Indonesian central bank.

(2) Outline of Indonesian Politics and Administration

① Politics

The system of government in Indonesia is a constitutional republic. The 1945 constitution has been revised four times. In order to represent the characteristics of Indonesia's multiplicity of languages, ethnic groups and religions, in the constitution the motto is "Bhinneka Tunggal Ika", meaning "Unity in Diversity".

After Suharto resigned the presidency in 1998, many political reforms were implemented. One of these is the separation of the executive, legislative, and judiciary powers. The president is the country's head of state and also heads the government. Below the president is the vice president, but there is no post of prime minister. The revisions to the 1945 constitution applied limitations to the exercising of sole authority by the president. These included the prohibition of the right to enact laws, prohibition of the right to appoint members of parliament, and the necessity to obtain the cooperation of the parliament regarding personnel appointments.

As the legislative branch of government, there is the People's Representative Council (DPR), the Regional Representative Council (DPD), and the People's Consultative Assembly (MPR). Out of these, only the People's Representative Council, consisting of 550 members elected for five year periods in a general election, has the authority to enact laws. Other authorities of the People's Representative Council include the determination of the country's budget and a supervisory function over the government. The Regional Representative Council was newly established in 2004 in response to regional administration issues, and is made up of regional representative council members selected by each province. The People's Consultative Assembly is currently positioned as a bicameral parliament, consisting of the People's Representative Council and the Regional Representative Council, and has the functions of revising the constitution, and exercising the authority to dismiss the president or vice president. General election including presidential election is going to be held in 2014.

② Foreign Policies

Immediately after securing independence, Indonesia's basis for foreign relations was non-alignment. This kind of policy was named "Bebas Aktif", meaning "free and active".

Although various changes have been seen in the history of Indonesia's foreign policies, this basis has been constantly maintained. Additionally, since the Suharto New Order period, the forming of economic and political relations with Western nations and Japan has also been a basis of foreign policy. As a result, a large amount of economic aid has been received from donor countries, which has greatly contributed to Indonesia's economic development. Indonesia is a member of many international institutions, including the Association of South-East Asian Nations (ASEAN), the Non-Aligned Movement (NAM), and The Organization of the Islamic Conference (OIC).

In addition, special mention should be made of the fact that 2008 marked the 50th anniversary of the forming of diplomatic relations between Indonesia and Japan, as relations between both countries started in 1958. Many events were held in various fields to commemorate this.

③ National Security and Public Safety

The approximately 300,000 troops of the armed forces are charged with Indonesia's national security, consisting of army, navy, and air force. The highest command authority of the armed forces is vested in the president. In addition, the direct responsibility for the armed forces is exercised by the Minister of Defense, and military command is implemented by the officer commanding the national forces. Various reforms have also been carried out in the armed forces, and its representative seat in parliament was also abolished in 2004. In contrast, the country's public safety is the responsibility of the national police. In the Suharto era, the police were positioned below the armed forces, but in 1999 they were separated from the military and are now under the direct command of the president.

④ Administration

The president is the head of the Indonesian government, while the cabinet is established as the highest consultative institution for exercising administrative authority over the country. In addition to the president and vice president, the cabinet has three coordinating ministers, 20 ministers of various agencies, 10 state ministers, and three non-ministerial high-ranking officials. These ministers are appointed by the president, and assist the president in the various fields. The current cabinet is called the United Indonesia Cabinet and was established in October 2009. Minor reshuffle of this cabinet has been carried out in October 2011.

On the other hand, following the collapse of the Suharto regime, regional decentralization is being promoted in order to establish political democracy also at the regional level. Law No.22 was enacted in 1999 as the base law for regional government, and this law was further revised to become Law No.32 in 2004. According to these laws, the regional government administrative classification was stipulated as provinces (Provinsi), regencies (Kabupaten), and cities (Kota). In this classification, the country consists of several provinces, while provinces are made up of several regencies and cities. Each of the provinces, regencies, and cities can have their own

regional governments and assemblies. In addition, it was stipulated that each of the regional governments can define their own roles in the various regions over a wider range than before in most fields with the exception of foreign policy, national security, religious affairs, judicial affairs and fiscal policy, which come under the jurisdiction of the central government. Further, it was also stipulated that regional governments would be able to implement other important affairs, including the direct election of the regional chief, the separation of administrative functions between central and regional governments, and the establishment of regional development plans. Currently, there are 33 provinces, 398 regencies, and 93 cities. Below the regencies and cities, sub-districts (Kecamatan) are established, and each sub-district is divided into villages (Desa) and neighborhood groups in cities (Kelurahan).

1.1.2. Economic, Industrial, and Fiscal Conditions

(1) Economic and Industrial Conditions

Between 1987 and 1997, as a result of the implementation of policies which were focused on promoting the creation of job opportunities and increasing exports in non-oil sector by the government at the time, Indonesia has maintained a high economic growth rate, nearly 7% per year. However, the 1997 Asian financial crisis caused Indonesia to experience extensive economic damage. For example, the weakness of the rupiah against the dollar, a drop in new investments, and a reduction in imports caused by the unstable currency rates have happened. As a result, the GDP growth rate in Indonesia dropped to minus 13%. Following this, due to the implementation of various reforms by the government and favorable domestic consumption, the GDP growth rate has reached 6% recently except for 2009 when a global financial crisis occurred, as shown in [Table 1-1-2]. Above this condition, it can be said that the Indonesian economy is recovering after the 1997 financial crisis.

However, looking at the economic structure, the private consumption occupied more than 60% of the total GDP. This type of economic structure is easily affected by the economic condition at each time. Therefore, in order to achieve the annual economic growth of 6% to 7% that the government is aiming for, it is said that it will be necessary to change the economic structure from initiative by private consumption to that by investment.

[Table 1-1-2] Statistical Data on Indonesian Economic Condition

Item	Unit	2006	2007	2008	2009	2010
1. Gross Domestic Product (GDP) (*1)	Rp10^9	3,339.2	3,950.9	4,951.4	5,613.4	6,241.8
2. GDP per Capita (*1)	Rp10^6 US$	15.00 1,636	17.50 1,916	21.70 2,237	24.30 2,327	 3,015
3. Growth Rate of GDP (*2)	%	5.5	6.3	6.0	4.5	6.1
4. GDP by Sector (*1)						
(1) Agriculture, livestock, forestry, fishery	%	14.2	13.8	13.7	13.6	13.2
(2) Mining and quarrying	%	9.1	8.7	8.3	8.3	8.1
(3) Manufacturing industry	%	27.8	27.4	26.8	26.2	25.8
(4) Electricity, gas and water supply	%	0.7	0.7	0.7	0.8	0.8
(5) Construction	%	6.1	6.2	6.3	6.4	6.5
(6) Trade, hotel and restaurant	%	16.9	17.3	17.5	16.9	17.3
(7) Transport and communi-cation	%	6.8	7.2	8.0	8.8	9.4
(8) Financial, real estate and business services	%	9.2	9.3	9.5	9.6	9.5
(9) Services	%	9.2	9.3	9.3	9.4	9.4
5. Percentage Distribution of GDP (*1)						
(1) Private consumption	%	59.9	57.6	57.3	57.3	56.9
(2) Government consumption	%	8.0	7.8	8.1	9.0	8.5
(3) Fixed capital formation	%	21.8	22.5	23.7	23.4	24.0
(4) Export	%	47.0	48.0	49.6	42.8	46.4
(5) Import (Less)	%	37.6	38.6	40.0	32.5	36.0
6. Inflation Rate	%	6.6	6.6	11.1	2.8	7.0
7. Umemployment Rate	%	10.3	9.1	8.4	7.8	7.1
8. Percentage of Population be-low Poverty Line	%	17.6	16.6	15.4	14.2	13.3

Note : * 1: At current market price
* 2 : At 2000 constant market price

(Source: The World Bank, Statistical Yearbook of Indonesia 2010 and Website of JETRO)

On the other hand, the manufacturing sector occupied approximately 30% of the total GDP, and the commerce, agriculture, forestry and fisheries sectors followed it. These three sectors occupied over 50% of the total GDP. It is not too much to say that Indonesia has already become an industrial country from the point of view of GDP structure. The mining sector including oil and natural gas occupied almost 8%. Indonesia had been one of the world's major oil and gas producing countries, but became an oil importing country since 2004 due to the ageing of its oil facilities, the lack of new investment in oil and gas sector and the rapid increase of domestic demand for fuels. Besides oil and gas, Indonesia produces a lot of minerals such as bauxite, silver, tin, copper, nickel and gold. Especially, the coal production capacity has been increased by opening coal sector to foreign investment.

Concerning the inflation rate, Indonesia experienced double-digit number of 17.1% in 2005. This was due to the increase in fuel price by an average of 126%. The inflation rate had been

stable for a while after that, but became double-digit number of 11.6% in 2008 due to the re-increase in fuel price by an average 28.7% in May 2008. As shown in [Table 1-1-2] above, the rate of unemployment and the poor is still high. In order to improve the situation, the government recognizes that it is required to achieve high economic growth of 7% to 8%. To this end, the Indonesian government is implementing an economic growth package focused on promoting investment and trade, and on increasing employment opportunities. In addition, the government has also listed up measures as a high priority subject such as infrastructure development and energy management including research and development of alternative fuels in cooperation with private sector.

[Table 1-1-3] shows the latest statistics of Indonesian import and export. The table below shows that the amount of exports in 2009 achieved 116.5billion US dollars, while that of imports was 96.9billion dollars. The total amount of exports and imports had showed increasing tendency, but it decreased in 2009. As shown in the table below, the trade account balance has remained in the black, and its amount was 19.7 billion dollars in 2009. The current account balance deducting service balance, including interest of loans, transportation cost and the profit on foreign investment had become in the red in 2008, but turned in the black in 2009.

[Table 1-1-3] Export and Import Amounts between 2006 and 2010

(Unit : US $ Billion)

		2006	2007	2008	2009	2010 (*1)	Average Annual Increase Ratio (%)
Exports	Non Oil and Gas	79.6	92.0	107.9	97.5	59.4	7.7
	Oil and Gas	21.2	22.1	29.1	19.0	13.2	0.4
	Coal	6.1	6.7	10.5	13.8	-	32.7
	Total	100.8	114.1	137.0	116.5	72.5	6.1
Imports	Non Oil and Gas	42.1	52.5	98.6	77.8	49.8	30.5
	Oil and Gas	19.0	21.9	30.6	19.0	13.1	5.7
	Coal	0	0	0	0	-	0
	Total	61.1	74.5	129.2	96.9	62.9	23.5
Trade Balance	Non Oil and Gas	37.5	39.5	9.3	19.7	9.6	
	Oil and Gas	2.2	0.2	(1.5)	0	0.1	
	Coal	6.1	6.7	10.5	13.8	-	
	Total	39.7	39.7	7.8	19.7	9.7	
Current Account Balance		10.9	10.5	(0.6)	3.5	1.2	

Note: * 1: until June 2010

(Source: Statistical Yearbook of Indonesia 2010 and Website of JETRO)

(2) Fiscal Conditions

[Table 1-1-4] shows the Indonesian 2011 national budget. The annual revenue will be

1,105trillion rupiah, while expenditure will be 1,230trillion rupiah, and it is forecasted that budget deficit will be 125trillion rupiah. The annual revenue is composed of tax revenue, non-tax revenue and grant. It is estimated that 77% of the annual revenue will be gained from income tax, added-value tax and others, and 23% of that will be gained from sales of natural resources and profit of state-owned companies. On the other hand, 70% of the annual expenditure is planned to be allocated to the central government, but 58% of the expenditure is planned to be spent the interest of national debt and government subsidies. The remaining 30% of the annual expenditure is planned to be transferred to the local governments. It is assumed that the budget deficit will be last for several years, and the implementation of budget control is required to be more severe.

[Table 1-1-4] Indonesian 2011 National Budget

Item		Amount (Rp trillion)
1. Revenue	1. Taxation	850.3
	2. Non-taxation	250.9
	3. Grant	3.7
	Total	1,104.9
2. Expenditure	1. Central Government	836.6
	2. Transfer to Local Government	393.0
	Total	1,229.6
3. Balance		(124.7)
4. Funding	1. Balance of Domestic Funding	125.3
	2. Foreign Loan	(0.6)
	Total	124.7

(Source: Ministry of Finance)

1.1.3. Development Subjects and Governmental Development Plan

The local governments of Indonesia are composed of three-layer structure, such as provinces (33, including DKI Jakarta and D.I. Yogyakarta), cities (urban autonomy, 93) and regencies (local autonomy, 398). Each government has the authority to make a social economic development plan based on National Development Plan System Code (Articles 25, 2004) and a spatial plan based on Spatial Plan Code (Articles 26, 2007), and has implemented development based on these plans.

Indonesian development plan (social・economic development plan) at the national level, as shown in Table 1-1-5, is composed of National Long-term Development Plan (RPJPN) which is covering next 20 years and National Mid-term Plan (RPJMN) which is covering next 5 years. Development plan is under control of National Development Planning Agency (BAPPENAS).

Period of existing Long-term Plan (Law No. 17, 2007) is 2005-2025, and period of existing Mid-term Plan (Government Ordinance No.7, 2005) is 2004-2009.

[Table 1-1-5] List of Development Plan

	National Level	Local Level
Long-term Plan	National Long-term Plan RPJP Nasional RTRN	Local Long-term Plan RPJP Daerah RTRW
Mid-Term Plan	National Mid-term Plan RPJM Nasional	Local Mid-term Plan RPJM Daerah
Implementation Plan	Central Government Implementation Plan RKP	Local governments Implementation Plan RKP Daerah

(Source: Study team)

(1) Long-term Plan

National Long-term Plan which is covering next 20 years has an important role as showing mission and policies. Mid-term Plan which is made by the president after every 5-year direct election shows national development strategies, macroeconomic frame and 5-year preferential policy measures based on the President's policies.

As shown in the [Table 1-1-6] below, the Government divided 20 years, which is decided in National Long-term Development Plan, to 4 stages, and proposes objectives in each stage.

[Table 1-1-6] National Long-term Development Plan's Objectives in Each Stage

1st Stage	2005-2009	Aiming to reconstruct and develop Indonesia as a safe, peaceful, equal and democratic country.
2nd Stage	2010-2014	Aiming to further reconstruct focusing on development of science, technology and improvement of economic competetiveness including development of human resources.
3rd Stage	2015-2019	Accelerating overall improvement by achieving economic competitiveness based on advantage of natural and human resources and last-growing of science and technology.
4th Stage	2020-2024	Creating an independent, progressive, equal and prosperous society through accelerated growth by structuring strong economy with competitive human resources based on advantage of competitiveness.

(Source: Study team)

Also, in National Long-term Development Plan, the objectives of inter-regional cooperation and mutual development as priority subjects are as follows;

① Strategic Frame to Accelerate Dispersive Regional Development

- Coordinating development by reinforcing existing infrastructure development, and reinforcing the cooperation between urban and local area.
- Accelerating infrastructure development in the center of existing and new growing area (including agricultural urban area).

② Strategic Frame to Accelerate Independence

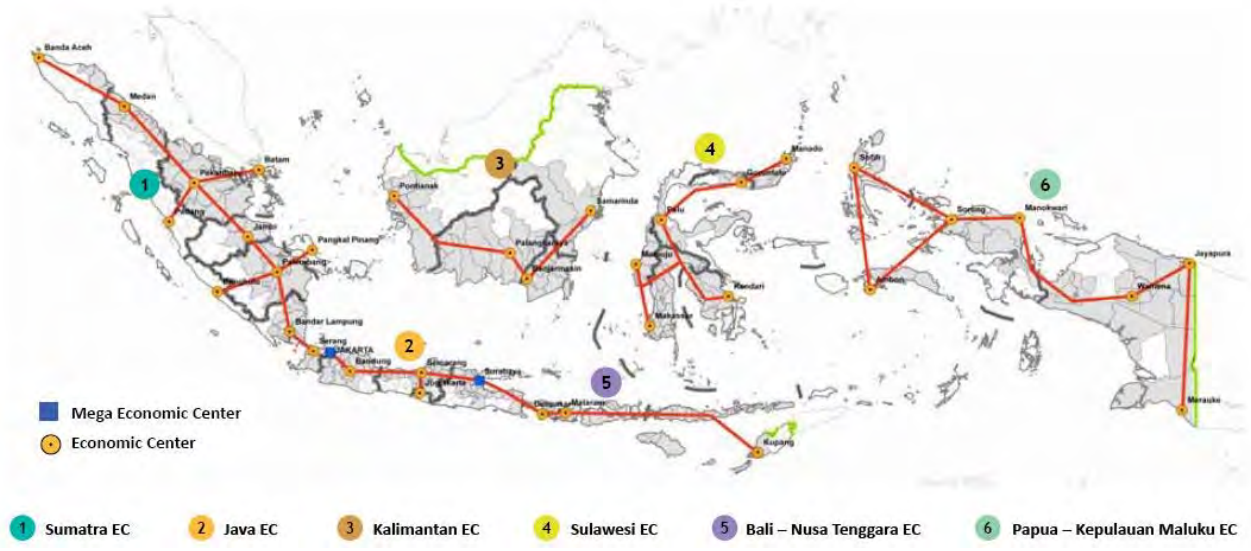
- Developing national border area as national strategic central area, and promoting cooperation between primary cities which are located at the edge of national border.
- Improving export-oriented economic development area based on local resources.
- Utilizing national border area as a dynamic security area in peace and emergency condition.
- Protecting and developing islands which are located around the national border.
- Improving services and infrastructure in specific area.

③ About MP3EI

In January 2010, the cooperation of Indonesia Economic Development Corridor (IEDC: Indonesia Economic Development Corridor)'s projects was confirmed between Hatta Rajasa, Coordinating Minister for the Economy, Republic of Indonesia, and Masayuki Naoshima, Minister for the Economy, Trade and Industry, Japan, and this is the new first step for relationship between Japanese and Indonesian economy. Priority industry and infrastructure is totally developed according to each corridor, infrastructure development (Road, Railway, Harbor, Electric generation plant and so on) with PPP (Public-Private Initiative) scheme are proposed as concepts.

In order to materialize the above IEDC, the Government of Indonesia officially published the Master Plan for the Acceleration and Expansion of Indonesian Economic Development (MP3EI), on May 27th 2011. This master plan is positioned as the center of long-term plan 2011 - 2025, and has been considered at the Government since the last half of the 2010's. Especially, this master plan was focused on making a strategic plan for infrastructure development to achieve the objective of long-term economic development. In This plan, specific projects are also listed.

In MP3EI, 6 economic corridors are set up in the country, and infrastructure development is aimed in order to improve cooperation inside of each corridor and between corridors. These economic corridors consist of ①Sumatera, ②Java, ③Kalimantan, ④Sulawesi, ⑤Bali-South East Nusa, and ⑥ Papua and Maluku Islands as shown in [Fig. 1-1-3]. Especially, development of Sumatra economic corridor and Java economic corridor is the high priority, and the biggest infrastructure development project is the Sunda Strait Bridge connecting the islands.



(Source: MP3EI)

[Fig. 1-1-3] Six Economic Corridors of Indonesia

In MP3EI, railway projects in South Sumatra are shown as following below.

- Railway development of Tanjung Enim - Lampung and Tanjung Enim - Kertapati
- Railway construction between Kertapati, Simpang and Tanjung Api Api.
- Railway coal transportation between South Sumatra and Lampung.
- Railway construction between Muaraenim and Tanjung Carat.

Concerning coal production in South Sumatra region, the mining site is far away from a harbor, although transportation infrastructure such as railway and road as land transportation, the fact that the transportation capacity is insufficient is mentioned as an issue. Although the coal reserve is endowed, this fact is a bottleneck in promoting coal development for the near future. Therefore, it is noted that railway infrastructure development is an important strategy from the point of view of transportation efficiency and global environment.

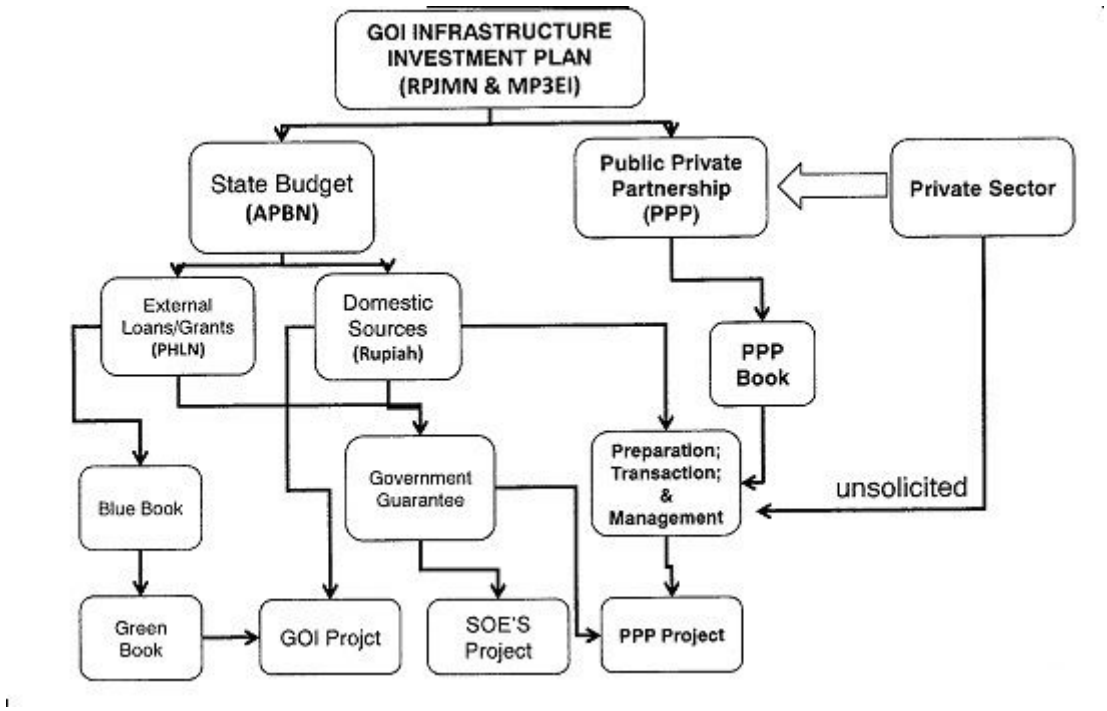
(2) Mid-Term Plan

The new National Mid-term Development Plan whose term is 2010 – 2014 has been implemented as executive order 5 in 2010. In the 2nd Stage of the long-term development plan (2005 – 2024), the previous plan is evaluated as Indonesia has overcome worldwide economic crisis and national disasters such as Sumatra Earthquake, and “independent, progressive, equal and rich Indonesia” is proposed as national vision, and 9 development policies by sector are shown. Especially, in this plan, in addition to the total development plan and the development plan by sector, there are new things that the development policies which are prepared at each local government.

The Government of Indonesia proposed that economic growth rate is 7% (2010, 6.0%), jobless rate is 5 – 6% (2010, 7.4%), poverty rate is 8 – 10 % (2010, 13.3%) as the objectives of 2014.

1.1.4. PPP Policy and Regulations

There are 2 regulatory flows for the development of social infrastructure in Indonesia, namely ① the projects being implemented under the state/government budget and ② the projects being implemented under PPP scheme. [Fig. 1-1-4] summarizes the regulatory flow.

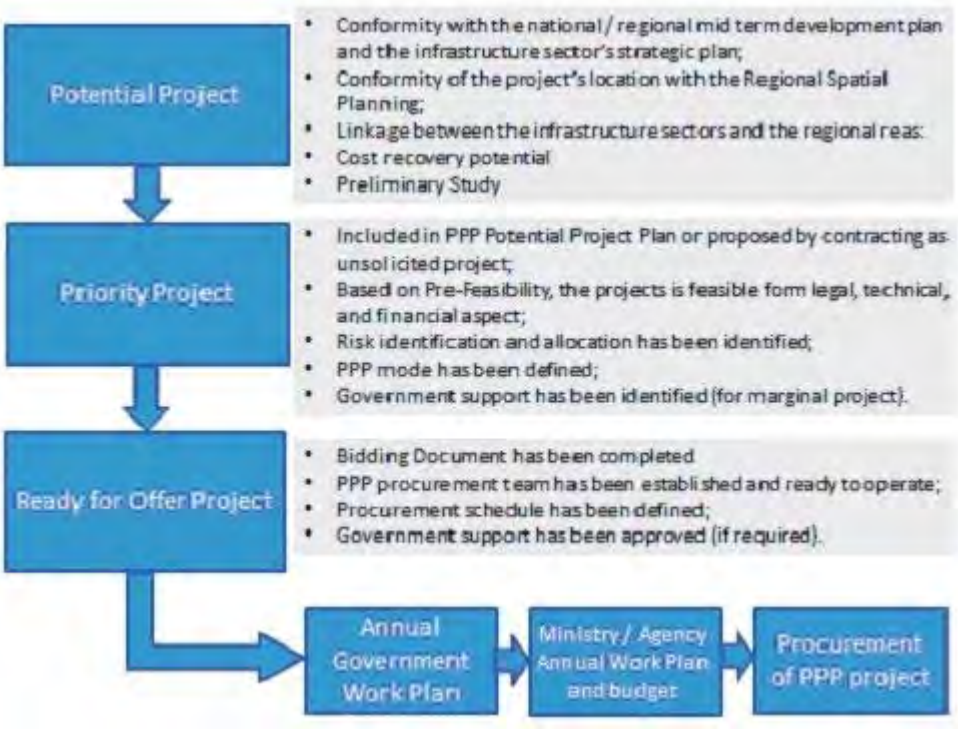


(Source: BAPPENAS presentation material)

[Fig. 1-1-4] Regulatory Flow of Social Infrastructures in Indonesia

As far as the PPP projects are concerned, the projects included/registered in the investment plan and/or master plan by the Central Government or State Governments will be initiated by the Government Contracting Agencies, and the projects will be registered in so called “PPP Book” – “Public Private Partnerships – Infrastructure Projects Plan in Indonesia” being issued by the BAPPENAS.

According to the PPP Book, there are three different categories in the project status, and the following chart summarizes each project status.



(Source: PPP Book)

[Fig. 1-1-5] PPP Project Status

BAPPENAS will evaluate any applications of the potential PPP projects when they receive the applications from a GCA (General Contracting Agency). As the result of their evaluation, they will decide to register new projects and re-register formerly registered but eliminated projects. Details of railway related projects registered in the PPP Book are summarized in Section 1.2.6. (P. 1-46).

The PPP book has been revised once a year in the past 3 years, in which BAPPENAS updated the candidate project list based on request by or hearing from GCA. The record of the past revision is described in 1.2.6. (P. 1-46).

According to the relevant information issued by BAPPENAS and Hadiputranto, Hadinoto & Partners which is the largest law firm in Indonesia, the process to proceed with the PPP business is as follows (refer [Fig. 1-1-6]). Here, the term “Solicited”implies PPP business initiated by GCA.

(1) Project formation

GCA formulate a projects, gives priority for them and request BAPPENAS to enlist them in the PPP book. Thereafter, implementation of pre-F/S and bid preparation will follow.

(2) Bid Preparation

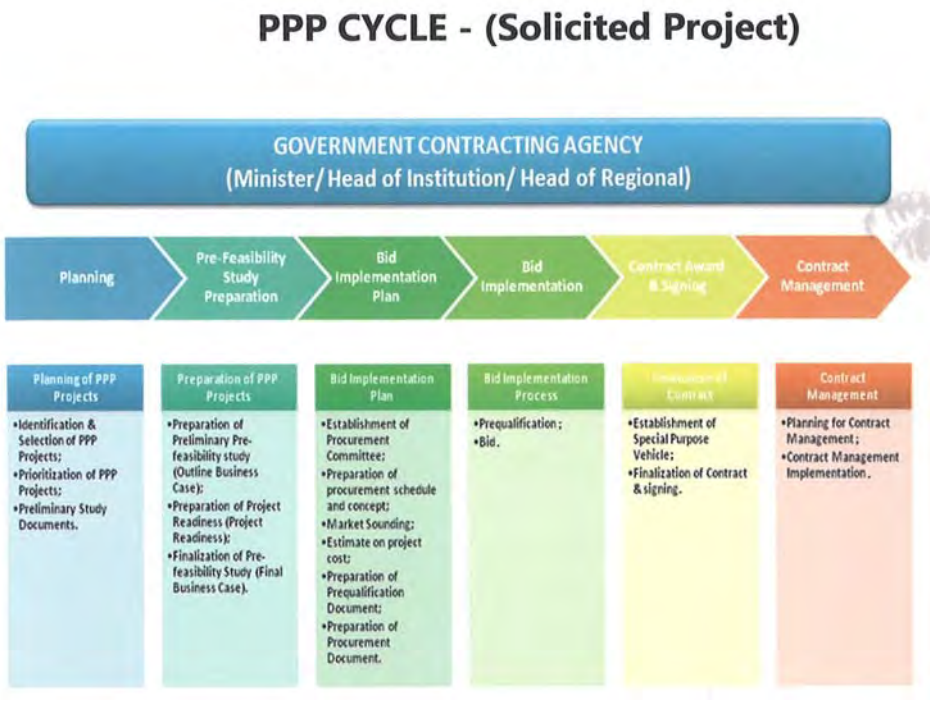
The GCA organizes Procurement Committee and establishs process for procurement and bidding. Hearing to market players concerned is conducted if necessary and project cost is estimated. Preparation of pre-qualification documents and bidding documents will follow.

(3) Bidding

The GCA selects a contractor through pre-qualification, bidding and bid evaluation.

(4) Contracting

The GCA organizes SPC (Special Purpose Company) to work as a implementing agency if necessary, and concludes contract with the successful bidder. The SPC performs the contract and supervises the project.



(Source: BAPPENAS)

[Fig. 1-1-6] PPP Project Cycle for Solicited Project Type Project

On the other hand, it is called “Unsolicited” for projects initiated by private sector. F/S for the project is conducted in the joint effort of a private company and GCA. If the private company participated the bidding of the project, the company will be given a choice of either 1) 10% of bonus point. 2) adjust the bidding price to the lowest bidder to win and 3) buy the project

including copy right of the project.

As mentioned above, even though constructing a framework for setting up the projects under the PPP scheme has been proceeded, only “Central Jawa Coal Fired Power Plant Project” was completed as of this moment. As mentioned in 1.2.6. (P. 1-46), as far as railway sector is concerned, there are some progresses of Soekarno Hatta Airport - Manggarai Project and Palaci - Bangkuang Coal Railway in Central Kalimantan, but they have not been completed yet.

There are many reasons why few projects are completed in Indonesia. For example, risk allocation between public and private is unclear and Indonesian related organizations don’t have enough capability to formulate potential PPP projects, etc. As a result, there are still some problems, such as necessary budget for governmental portion is not allocated and there is not much information for private company to make a decision of investment. On the other hand, some good action in order to encourage private companies to go into the PPP projects in Indonesia can be seen. For example, PT. Penjamin Infrastruktur Indonesia (PII) has decided to guarantee Soekarno Hatta Airport - Manggarai Project and Palaci - Bangkuang Coal Railway in Central Kalimantan. In addition, the project to enhance government’s functions has been proceeded under the support by JICA. It is expected that the project may contribute to streamline the legal framework on PPP, strengthen performance of relevant agencies through PPP project implementation as a model, and promote private companies’ investments to develop infrastructure.

However, since the project scheme has been changed to “B to B scheme” (Business to Business) as the result of discussions with PT. KAI, it has been confirmed with BAPPENAS that the above summarized PPP framework will not be applied.

1.1.5. Environment Related Laws

(1) National Level

National administrative organizations in Indonesia are the Ministry of Environment and Environmental Management Agency (hereinafter BAPEDAL) which was established based on President Decree in 1990 and reinforced its capacity in 1994. The Ministry of Environment has a role of environmental administration and BAPEDAL conducts the implementation of environmental measures and protections including approve of EIA. For actual duties BAPEDAL has many local branches.

Related regulations on Environmental Impacts Assessment are improved and upgraded every year. Since this project is required to make EIA (AMDAL), the following regulations are duly observed;

- Decree of Minister of Environment No.02 Year 2000 regarding Guidance on Review of EIA

Document

- Decree of Minister of Environment No.45 Year 2005 regarding Guidance on the Preparation of Reports for Environmental Management Plan (RLK) and Environmental Management Plan (RPL)
- Regulation of Minister of Environment No.08 Year 2006 regarding Guidance on the Preparation of EIA
- Regulation of Minister of Environment No.11 Year 2006 regarding Type of Effort and/or Activity which obliged to provide with EIA
- Regulation of Minister of Environment No.12 Year 2007 regarding the Documents for the Effort and/or Activity which do not have the Environmental Management and Monitoring Plan
- Decree of Minister of Environment No.05 Year 2008 regarding Work Flows of Commission of Assessment on EIA

(2) Provincial Level

As the project covers some districts, responsible organization for EIA is provincial BAPEDAL. Since this project is required to make EIA, the following regulations at provincial level are duly observed;

- Decision of Head of BAPEDAL No.299/11/1996 regarding Technical Guidance on Social Aspect Study in the Preparation of EIA
- Decision of Head of BAPEDAL No.127/12/1997 regarding Guidance on Municipal Health Study in the Preparation of EIA

(3) Related Regulations on Environment

Since this project is required to make EIA, the following regulations are duly observed in the process;

- Act of the Republic of Indonesia concerning Conservation of Living Resources and their Ecosystems (No. 5, 1990)
- Law of protection on cultural sites (No.05/1992)
- Act of the Republic of Indonesia concerning Environmental Management (No. 23, 1997)
- Government regulation on Forest Protection (No.28/1985)
- Government Regulation of the Republic of Indonesia concerning the Control of Water Pollution (No. 20, 1990)
- Government regulation on Swamp Land Management (No.27/1991)

(4) Related Regulations on Land Acquisition and Resettlement

Land Acquisition and Resettlement should be implemented based on integrated many sector

regulation under consideration of local traditional culture. Since this project accompanies resettlement in the 3rd Stage, the following regulations are duly observed in the process Related regulations are as follows;

- Act No.05/1960 concerning Basic Regulation on Agrarian Principle
- President Decree No.55 Year 1993 regarding Land Acquisition for the Development of the Public Interest.
- President Decree No.36 Year 2005 regarding Land Acquisition for Development for Public Interest.
- President Decree No.65 Year 2006 regarding Correction on President Decree No.36 Year 2005 regarding Land Acquisition for Development for Public Interest.
- Regulation by Head of National Land Body (BPN) No.03 Year 2007 regarding Provision of Implementation of President Decree No.36 Year regarding Land Acquisition for the Development of the Public Interest as Already Corrected by the President Decree No.65 Year 2006 regarding Correction on President Decree No.36 Year 2005 regarding Land Acquisition for Development for Public Interest.

1.1.6. Laws and Regulations for Foreign Investment

(1) Foreign Investment Acts in Indonesia

In 1967, Law No. 1/1967 on Foreign Investment was issued (and revised in 1994), and incorporation by foreign companies is allowed in Indonesia. This foreign investment acts allow foreign investors to operate business, to protect their equity and to exempt certain import duties. Further, this acts define overseas remittance of profit, asset/property transfer, certain guarantee to protest assets in case of nationalization, employment of foreign engineers.

In case of investment by foreign companies, a firm must be established as stock company according to laws and regulations in Indonesia. Revision in 1994 allows 100% ownership by foreign companies, however there is certain limitation to such ownership percentage by foreign investors in certain business field including but not limited to railway, namely, limited up to 49% of foreign investment for railway operation business in Indonesia (remaining 51% equity should be invested by Indonesian firms).

BKPM is a window organization to receive and evaluate the applications for incorporation by foreign investors except for oil & gas and banking & insurance field.

However, as described in 1.1.4. (P. 1-16). in the above, since the project scheme has been changed to “B to B scheme” through the discussions with PT. KAI during the field survey period, railway operation is being conducted by PT. KAI and, therefore, it is confirmed with a local accountant that there will be no foreign investment restriction to the proposed SPC.

(2) Foreign Investment in Railway Sector

Presidential Degree No.36 (Negative List in 2010) establishes a limitation of ownership by foreign investors as well as restricted business field.

This restricts foreign investment ownership up to 49% in case of container cargo transport and general cargo transport. Therefore it is assumed that a SPC on this project may allow maximum 49% of foreign investment.

This restricts foreign investment ownership up to 49% in case of container cargo transport and general cargo transport. However it is confirmed that there will be no foreign investment restriction under the proposed new “B to B scheme”. The details of regulations on establishment and operation of the lease company, restriction of foreign investment, and their approval procedure will be confirmed in discussion with law firm in the project formation process after this study.

Negative list announced in 2010 is available in the website of JETRO as below.

http://www.jetro.go.jp/jfile/country/idn/invest_02/pdfs/indonesia_list.pdf

(3) The Railway Law

The railway law comprising of 19 chapters and 218 articles has been newly issued on April 2007. The main objective of this new railway law is to open door for joining in the railway business not only from central government but also from local government as well as private sector. Conversely saying, local government and private sector will also be able to take part in the railway business in Indonesia.

If it is realized, multiple railway operators will appear and competition among those operators will be possible unlike the present condition of PT. KAI monopoly. And, such business environment is expected to lead to raising a quality of railway transport service via healthy competition among operators, which is also designed to issue the new railway law.

Main contents of this railway law can be roughly summarized as follows.

- Railways are composed of public railway and special railway in its function. Public railway is furthermore divided into intercity railway and intra city railway. Special railway is the one exclusively used by a specified railway enterprise for supporting main activities of the said enterprise.
- Central government as well as local government (province and regency/city) will arrange a railway master plan at each level for development of public railway while maintaining a consistency of supervisor plan as well as development plan at each level.
- Central government has an authority to set out a plan regarding railway development policy,

regulating and supervising the railway system, developing and activating railway business, etc. For this purpose, the central government will arrange the required regulations, and will give a guidance and support for local government.

- Local government is responsible for developing and supervising the railway system at each level, and at the same time it will also give guidance and support for subordinate organization, residents, etc.
- Development of infrastructures for public railway such as track, station facilities, train operation facilities, etc. as well as their maintenance will be implemented by central government or local government. In some cases, it is possible to entrust those activities to state-owned company, public enterprise or private sector.
- Arrangement of rolling stock for public railway will be principally conducted by state-owned company, public enterprise or private sector. In a special case, it is possible to be arranged by the central government.
- Train operation and maintenance of rolling stock for public railway will be implemented by state-owned company, public enterprise or private sector.

After the issuance of No.23/2007, other related laws, such as GR 56/2009, 27/2009 were also issued. In those governmental regulations, the matters regarding development of railway business, railway infrastructure, rolling stock and train operation are regulated.

Regarding the ownership of the railway right of way, Article 23 to 53 of the law regulates acquisition and maintenance of land, but the details are subject to other regulations to be announced by the government. Land use and maintenance of railway right of way is regulated in Chapter 5 and 6, in which Article 13 to 22 of Chapter 5 says that land use, maintenance and acquisition is expected to be implemented by central government and/or local government and/or railway operator separately or jointly.

(4) Tax and Accounting Overview

- Corporate tax in Indonesia is currently 25% according to the 3rd revision of Degree No. 36 dated September 23, 2009. Further, because there is a tax treaty between Indonesia and Japan, withholding tax rate for dividend is currently 10%.
- The construction services are subject to final withholding taxes, 2 - 6% of gross amount of payment (excluding VAT) for construction implementation.
- In general, the payments of interest made to resident are subject to withholding tax of 15% and the payments of interest made to non-resident are subject to withholding tax of 20%. Also, under the prevailing income tax law, the payments made to local banks are exempted from withholding tax. Further, under the tax treaty between Indonesia and Japan, the interest payment made by an Indonesian resident taxpayer to a financial institution wholly owned by Japanese government is exempted from the withholding tax. Since JICA is considered as

financial institution wholly owned by the Japan government, the interest payment made to JICA will be exempted from the withholding tax.

- Transfer of taxable goods or taxable services is subject to VAT of 10%.
- In Indonesia, all fixed assets are categorized in 4 groups according to their economic lives, and their depreciation rate can be calculated in either straight-line method or declining-balance method (except for buildings). Also, as for the diesel locomotives and wagons, their depreciation rate can be calculated in their economic lives of 20 years.
- In general, import of rolling stocks into Indonesia is subject to VAT and withholding tax at the rates of 10% and 2.5%. But, import duty for rolling stocks, locomotives and wagons, may be free.
- For leasing business in Indonesia, the Decision of the Finance Minister Number: 1169/KMK.01/1991 will be generally applied.

As mentioned above, a variety of regulation has been established in railway sector. However, in order to prompt private companies to go into a business in railway sector, effective collaboration among related organizations such as Ministry of National Development Planning, National Development Planning Agency (BAPPENAS), BKPM (Investment Coordinating Board) is expected. On the other hand, as mentioned in 1.2.6. (P. 1-46), action to mitigate private companies' concern like guarantee from PT. Penjamin Infrastruktur Indonesia (PII) should be explored.

1.2. Indonesian Railway Policies

1.2.1. Outline of the Railway Sector

(1) Positioning of the Railway Sector from the View Point of the Transportation Sector

The positioning of the transportation sector in the actual GDP over the last 5 years (at 2000 market prices) is shown in the [Table 1-2-1]. As shown in the table, the share of transportation sector in the GDP increased from 3.5% to 3.8% between 2003 and 2006, and 3.7% in 2010. Compared with other industries, this ratio is not particularly large. In the transportation sector, the largest division is for road transportation, followed by the sea and air. Considering that Indonesia not only has a huge land area, but is also an archipelagic country, this may be a natural consequence.

On the other hand, although the annual growth of GDP in the transportation sector decreased in 2007 and 2008, it is being maintained at more than 6%. However, in order to secure the annual growth rate of nearly 7% of national GDP that the country is targeting, it is expected that the growth of 10% of the transportation sector will be necessary.

[Table 1-2-1] Positioning of the Railway Sector in the Real GNP (2000 Market Prices)

	2006			2007			2008			2009			2010		
	GDP		Annual Growth Rate (%)	GDP		Annual Growth Rate (%)	GDP		Annual Growth Rate (%)	GDP		Annual Growth Rate (%)	GDP		Annual Growth Rate (%)
	Rp.10^6	%		Rp.10^6	%		Rp.10^6	%		Rp.10^6	%		Rp.10^6	%	
1. Transportation															
(1) Railway Transport	0.623	0.03%	-	0.631	0.03%	1.28	0.639	0.03%	3.98	0.634	0.03%	-3.35	0.611	0.03%	-3.60
(2) Road Transport	29.774	1.61%	-	30.860	1.57%	3.65	31.986	1.53%	4.93	34.412	1.57%	5.12	36.313	1.57%	5.50
(3) Ferry & River Transport	2.432	0.13%	-	2.513	0.13%	3.33	2.597	0.12%	3.94	2.860	0.13%	5.93	3.043	0.13%	6.40
(4) Sea Transport	9.497	0.51%	-	9.238	0.47%	-2.73	9.490	0.45%	5.05	12.381	0.57%	8.06	14.307	0.62%	9.05
(5) Air Transport	11.466	0.62%	-	12.419	0.63%	8.31	13.451	0.64%	5.32	16.660	0.76%	14.47	19.260	0.83%	15.61
(6) Services Allied to Transport	17.014	0.92%	-	17.116	0.87%	0.60	17.219	0.82%	0.41	20.405	0.93%	8.40	22.252	0.96%	9.10
(7) Sub Total	70.806	3.83%	-	72.777	3.71%	2.78	75.382	3.61%	2.71	87.352	3.99%	7.60	95.786	4.15%	6.72
2. Others	1,776.494	96.17%	-	1,891.193	96.29%	6.46	2,012.068	96.39%	6.39	2,101.868	96.01%	4.46	2,213.844	95.85%	5.33
3. Total of GDP	1,847.300	100.00%	-	1,963.970	100.00%	6.32	2,087.450	100.00%	6.06	2,189.220	100.00%	5.10	2,309.630	100.00%	5.50

(Source: Created based on Action Program 2010 formulated by MOT)

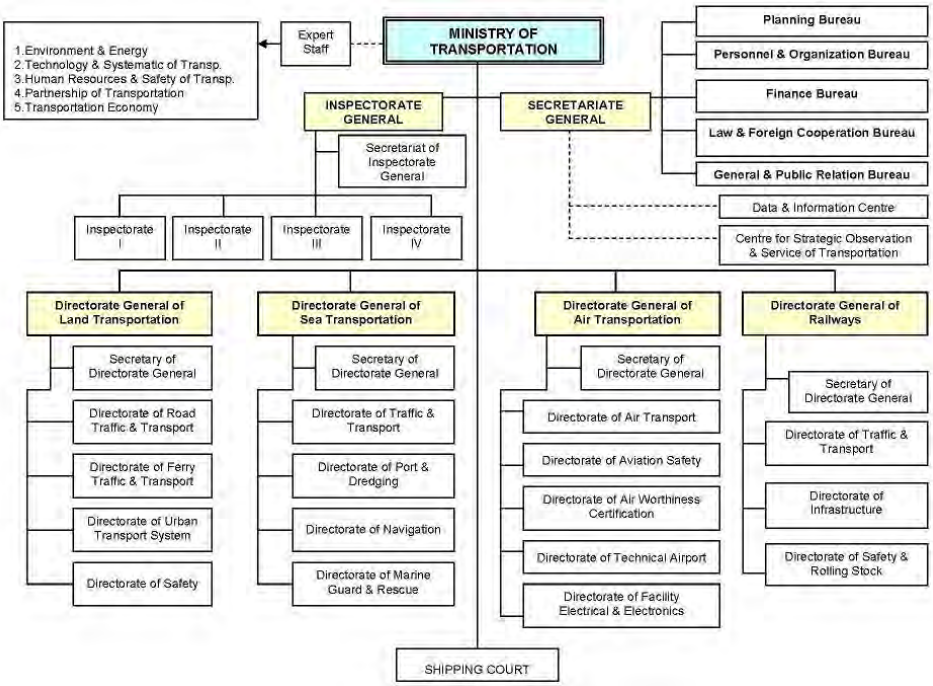
(2) Legal Structure of the Railway Sector

The new code No.23/2007 has been established replacing the old one No.13/1992, to allow local governments and private companies to take part in train operation. Refer 1.1.6 (3) (P. 1-22) for the detail.

(3) Organization of the Ministry of Transportation and PT. KAI

① Organization of Ministry of Transportation

Transportation administration in Indonesia is implemented by the Ministry of Transportation, one of the nation's 20 ministries. The current organizational diagram of the Ministry of Transportation is shown in [Fig. 1-2-1]. As shown in this chart, the organization is structured from the secretary general, four directorates in charge of land, sea, air, and railway transportation, and the inspector general. National Transportation Safety Committee (KNKT) was incorporated in the Ministry of Transportation in 1999 as an independent institution to investigate accidents and to make recommendations to prevent the recurrence of similar accidents. The number of employees in the Ministry of Transportation was 31,200 in 2007, showing an increase of 8% over 2006. Approximately 59% of the employees are assigned to the Directorate General of Sea Transport, followed in numbers by the Directorate General of Air Transport.

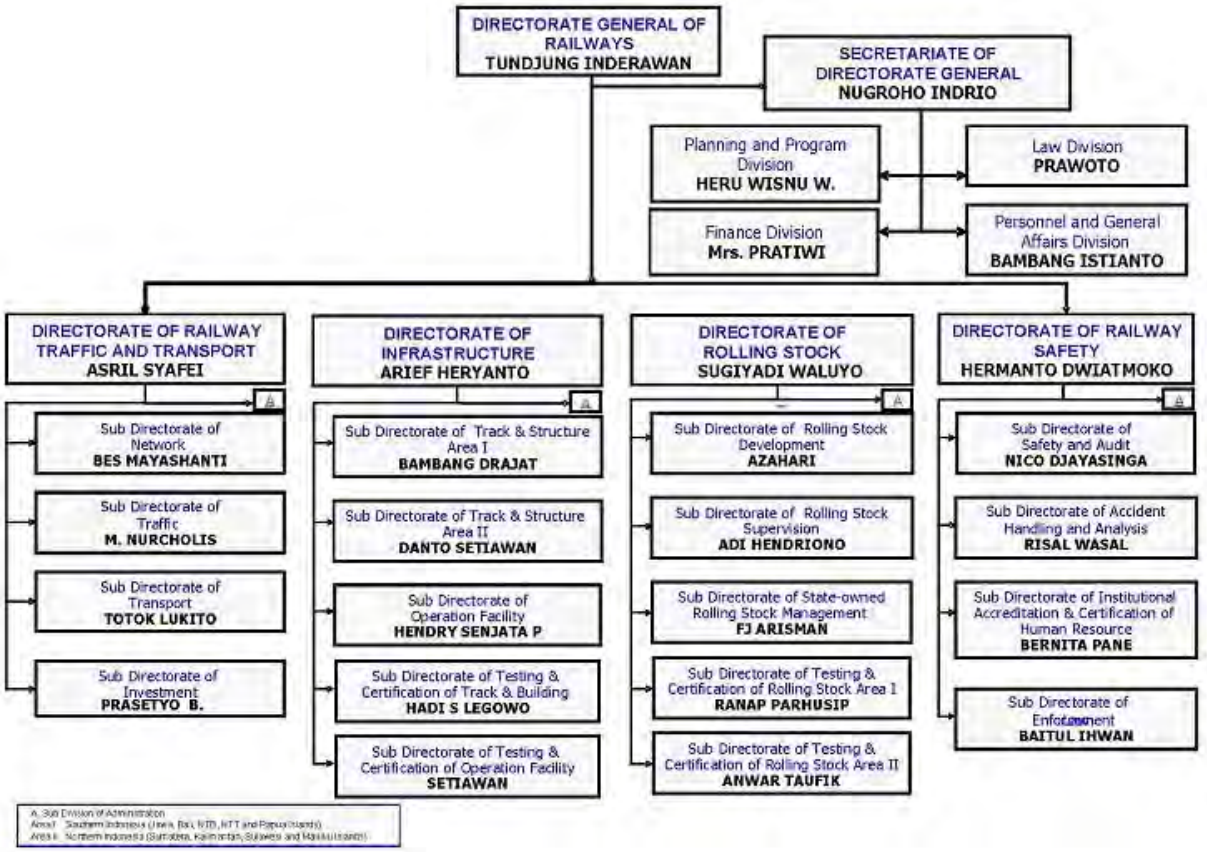


(Source: Ministry of Transportation)

[Fig. 1-2-1] Organization Structure of Ministry of Transportation

② Organization of DGR

Directorate General of Railways (DGR) is composed of 4 directorates such as Directorate Railway Traffic and Transport, Directorate of Infrastructure, Directorate of Rolling Stock, Directorate of Railway Safety, except Secretariat of Directorate General. Each directorate has sub departments. Directorate of Railway Traffic and Transport has four sub directorates as follow; Network, Traffic, Transport, Investment. Directorate of Infrastructure has five sub directorates as follow; Track & Building Area I, Track & Building Area II, Operation Facility, Testing & Certification of Track and Building, Testing & Certification of Operation Facility. Directorate of Rolling Stock has five sub directorates as follow; Rolling Stock Department, Rolling Stock Supervision, State-owned Rolling Stock Management, Testing & Certification of Rolling Stock Area I, Testing & Certification of Rolling Stock Area II. Directorate of Railway Safety has four sub directorates as follow; Safety and Adult, Accident Handling and Analysis, Institutional Accreditation & Certification of Human Resource, Law Enforcement.



(Source: DGR)

[Fig. 1-2-2] Organization Structure of DGR

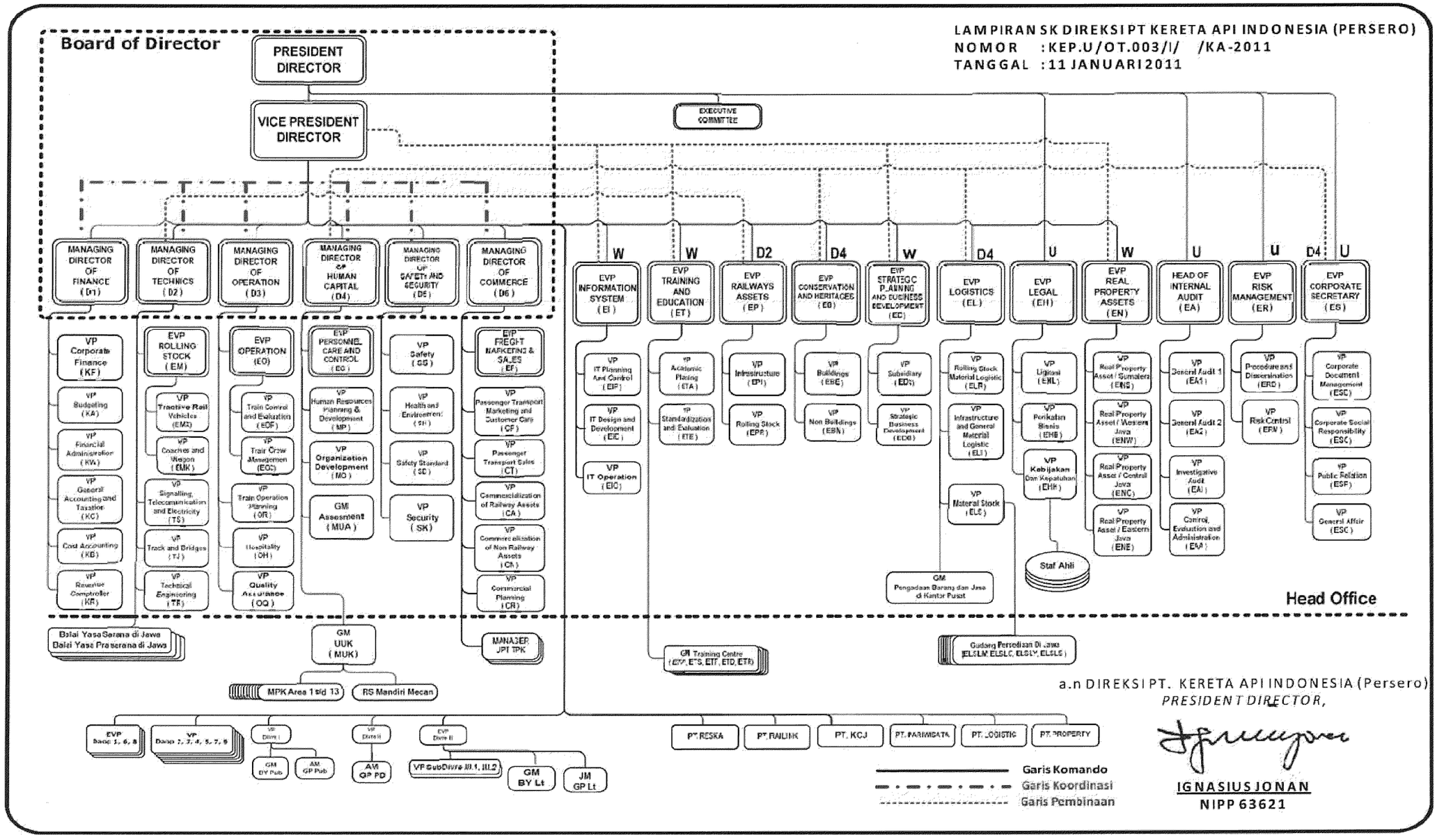
③ Organization of PT. KAI

The organization structure of PT. KAI is shown in [Fig. 1-2-3]. The management structure of the Indonesian railway sector changed since the transfer of the administrative right to the Indonesian government, from national railways to Government Corporation in accordance with the government policy at the times. The current management form is the railway company called PT. KAI that was established in June 1996 in which the government owns 100% of the stake. At the present time, PT. KAI is operating and administering the Indonesian railways as the sole railway administrator in a kind of monopoly. However, following the announcement of the new railway law No.23/2007 in April 2007 in which multiple operators and open access to the same railway tracks is permitted, it is believed that this monopoly condition will be changed before long.

Under such condition, it is expected that PT. KAI will implement full reforms of the railway management and mental change of administrative people. It can be said that the separation of the Jabotabek Railway from PT. KAI is a process of this reform. The plan to spin off Jabotabek Railway from PT. KAI was considered as being necessary to separate the commuter railway business which has a different nature from long distant railway management. The separation itself was finally realized as a subsidiary of PT. KAI in August 2008 after much discussion.

When the railway management structure changed from the government railway company (Perumka) in 1999 to the railway company (PT. KAI), the railway facilities were basically split into 2. One is infrastructure such as railway track, civil structure and operating equipment (under component in the infrastructure and operation separation scheme), and other is not infrastructure such as stations and rolling stock (upper component in the infrastructure and operation separation scheme). The former are owned by the government, while the latter are owned by PT. KAI.

ORGANIZATION STRUCTURE OF PT. KAI



(Source: PT. KAI)

[Fig. 1-2-3] Organization Structure of PT. KAI

(4) Railway Transportation Situation

① Railway Transportation Share

The number of passengers and volume of freight throughout Indonesia by each transportation mode including road, rail, sea, air, and inland waterways (ferries and rivers) in 2010, together with the shares of each, are shown in [Table 1-2-2]. As shown in this table, the road transportation volume shows the largest share of any of the modes both for passengers and for freight, which were 84% and 89% respectively. Although the second largest share for the transportation mode was railway for passengers and sea for freight with the volume as small as around 8% and 10% respectively. Other transportation modes showed minimal volumes of less than 5% or close to 0%. In general, transportation volume depends on the size of network and the capacity of each mode of transportation. In this view, those described above clearly represents the current situation of the transportation sector in Indonesia.

[Table 1-2-2] Transportation Volume and Share for Each Mode in Indonesia (2010)

Mode	Passenger Transport		Freight Transport	
	Volume (10^6 People)	Sharing (%)	Volume (10^6 ton)	Sharing (%)
1. Road	2,144.2	84.32	3,208.7	89.18
2. Railway	201.9	7.94	18.9	0.53
3. Ferry	59.2	2.33	13.5	0.38
4. Sea	16.8	0.66	354.3	9.85
5. Air	117.2	4.61	2.2	0.06
6. River	3.5	0.14	0.2	0.01
Total	2,542.9	100	3,597.9	100

(Source: Website of Ministry of Transport of Republic of Indonesia)

② Traffic Volume

The railway passenger and freight traffic volumes in recent years are shown in [Table 1-2-3]. The passenger traffic volume reached 202million in 2010, showing an average annual increase of 5.78% over the 5 year period. The vast majority of passengers are carried in Java Island, where the largest part of the population is concentrated and large and medium size cities are located in succession from west to east. Approximately 70% of the passenger transportation on Java island is originating in Jakarta metropolitan area (JABOTABEK region), where a railway commuter system has already been established. The railway transportation is getting an indispensable transportation means supporting peoples' daily lives in the JABOTABEK area in these days. Problems triggered by motorization, including traffic jams and air pollution due to exhaust gas,

caused by the concentration of population are becoming severe, and there are plans to incorporate railway commuting systems in other cities including Surabaya, Bandung, Medan, and Yogyakarta with the purpose of alleviating pollution. Although passenger rail services also exist in Sumatra Island, the scale is much smaller, with amounts that were less than 2% of the total in 2007.

The freight traffic volume is approximately 18million tons annually, and maintains an almost constant level. Most of this, approximately 96%, is negotiated freight based on contracts for transporting coal, fuel, palm oil, fertilizer, and cement. Approximately 70% of all the freight traffic occurs on Sumatra island, and 76% of this is the transportation of coal that is concentrated particularly in south Sumatra. In consistent with the government policy of saving fuel consumption, it is also planned to increase coal production, and that railways should be used to transport the additional coal. Particularly in South Sumatra, there are currently several railway facility projects being planned, including the improvement of existing lines and building new lines.

According to the railway timetable revised in February 2008, the number of regularly operating trains in Sumatra and Java totaled 1,044 daily, consisting of 811 passenger trains and 233 freight trains. Comparing this with the figures for 2007, there was a 1.6% increase in passenger trains and a 12% decrease in freight trains. Out of the 811 passenger trains, 95% trains are operated in Java with 330 commercial class trains and 441 economy class trains. The remaining 40 passenger trains are operated in Sumatra consisting of 12 commercial class trains and 28 economy class trains. On the other hand, out of the 233 freight trains, 108 are operated in Java, with the remaining 125 trains are in Sumatra.

[Table 1-2-3] Railway Passenger and Freight Volumes in Recent Years

Passenger Transport	Transported Volume (10^3 person)					Average Annual Growth Rate
	2006	2007	2008	2009	2010	
1 Java & Sumatra excluding Jabotabek						
(1) Commercial	25,190	24,199	30,599	31,202	32,216	+ 6.34%
(2) Economy	31,674	33,162	40,475	45,296	46,959	+10.35%
2 Jabotabek	104,425	111,096	126,700	130,632	122,756	+ 4.13%
Total	161,289	168,457	197,774	207,130	201,931	+ 5.78%

Freight Transport	Transported Volume (10^3 ton)					Average Annual Growth Rate
	2006	2007	2008	2009	2010	
1 Oil Fuel	2,892	2,966	2,624	2,470	1,825	-10.87%
2 Fertilizer	156	69	35	4	0	-100.0%
3 Cement	3,448	3,143	2,974	2,750	2,443	- 8.25%
4 Coal	8,942	8,542	10,926	11,030	11,147	+ 5.66%
5 Plantation Product	532	644	645	1,038	993	+16.89%
6 Containers	476	271	266	111	123	-28.70%
7 Quartz Sand	44	29	29	28	7	-36.84%
8 Rabber	14	15	7	0	0	-100.0%
9 Express Freight	98	101	106	98	87	- 2.93%
10 Freight by Passenger	34	41	57	76	130	+39.84%
11 Others	847	930	1,595	858	2,186	+26.75%
Total	17,483	16,751	19,264	18,463	18,941	+ 2.02%

(Source: DGR)

(5) Issues Relevant to the Project in View of Railway Sector

PT. KAI established in 1999 was permitted to have more than one operator and open access since to the enactment of new railway laws in 2007, and private-sector entry was permitted for the purpose of promoting privatization at the operator side.

In Indonesia, especially in South Sumatra, since coal production raise has been promoted, it is predicted that increase of transportation demand between mining site and shipping site. PT. KAI has attempted to expand coal transportation capacity, because coal transportation is considered to be more profitable business as compared to other commodities. However, the important point here with regard to the transportation is that, since the rail transportation demand is expected to grow in the near future in accordance with the government policy, railway infrastructure is expected to be upgraded by public sector.

1.2.2. Situation and Problems of Existing Infrastructure

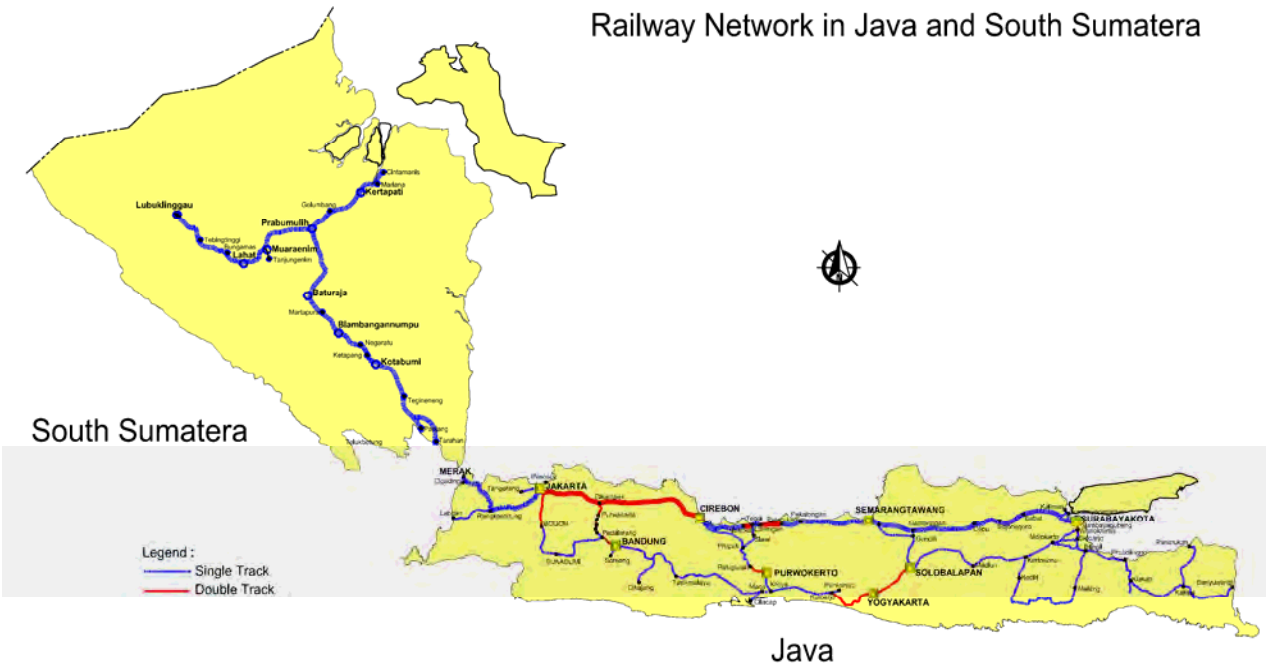
(1) Present Condition of Railway Infrastructure

① Railway

The Indonesian railways network covers Java and Sumatra islands. The total length of railway line is approximately 8,000km at present. Most of the lines are single track (the length of double track is approximately less than 400km).

The trunk lines in Java island are Java North Line, Java South Line and Bandung Line. Java North Line connects Jakarta and Surabaya through Cirebon and Semarang with distance of approximately 730km. Java South Line diverges from Java North Line at Cirebon and leads to Surabaya through Yogyakarta which is the ancient capital and Solo with the distance of approximately 830km. Bandung Line connects Jakarta, the capital city of Indonesia, and Bandung, the academic city located in highland area, with the distance of approximately 180km. The head office of PT. KAI is located in Bandung.

Urban railway has been constructed with the distance of approximately 161km in Jakarta urban area, approximately 25km in Surabaya urban area, out of which 156km has been electrified in Jabotabek.



(Source: Study team)

[Fig. 1-2-4] Railway Route Map

[Table 1-2-4] The Length of Railway

Area	Length of Line (km)	Gauge (mm)	Operated Line (km)	Non-Operated Line (km)	Double Track (km)
Java	4,787	1,067	3,216	1,116	373
Sumatra	1,705	1,067	1,348	336	—
Total	7,984	—	4,564	1,452	373

(Source: Report of Performance and Operation Condition of PT. KA)

② Civil Engineering Structure

The 90% of bridges of Indonesian railways were made of steel. Most of the bridge structure is I-beam and plate girder, also through-truss and deck-truss structures are applied to most of the bridges having long span. Steel girders have been renovated due to the increase of axle load. The bridge members and paint are severely deteriorated due to the insufficient maintenance and waste discharge. The quality of paint maintenance is appeared to be not properly done because the concept of paint maintenance method is not well understood. Therefore, it is necessary to carry out training and education for the maintenance division clews on the paint maintenance method.

Most of the substructures constructed during the Dutch colonial period were composed of stone masonry, and they should be repaired or replaced due to the progression of floating around foundation, scouring and deterioration.

On the Java North Line, the restoration work for the piers in a high-risk condition and subject to repair is in under going. Cisomang Bridge which is the longest bridge on Bandung Line has been repaired with the assistance of Australia in 2004 because it had been constructed more than 100 years ago. The total length of bridges of Indonesian railways is 52,000m for steel bridge and 6,000m for concrete bridge.

The number of tunnel is as few as 18 places. Most of them are located in Java Island. The longest tunnel located in West Sumatra is approximately 1,100m. Most of the tunnels are not wrapped with lining concrete.

Platform height is very low with the variety of 18cm, 20cm and 43 cm, accordingly passenger steps are necessary to get on and off a train. Although the platform height has been raised up to 84cm and 95cm as part of modernization project for Jabotabek line, the low platforms are still remaining.

③ Track

There are 6 types of rail ranging from 54kg/m to 25.75kg/m (54kg, 50.4kg, 42.59kg, 41,52kg, 33.4kg and 25.75kg). Although rail replacement from R42kg/m to UIC54, there still remains 33 kg/m rails even in trunk lines and 25kg/m rails in branch lines. Although most of the sleepers are wooden type, a lot of steel sleepers still exist in local area. There are 3 types of fastener, and recently Pandrol type fastener is coming to dominant in order to reduce maintenance work burden. The other 2 types of fastener are DE clip and KA clip.

Most of the railway lines were constructed more than 10 years ago without material replacement. Thus, rails, sleepers and fastenings are over used. Ballast which supports sleepers dent into roadbed having hollow spots inside due to washout by rainfall, thus causing mud pumping. Also, improvement of track is required by using heavier rails to increase transportation capacity. It is an urgent necessity to replace track materials and establish a proper maintenance method in order to avoid serious accidents which disturb train operation caused by rail overhung under heated weather and rail damage.

④ Level Crossing

According to the general list of level crossing in Java and Sumatra island kept by DAOP of PT. KAI, the total number of level crossing is 5,585. The number of manned level crossing (security officer) is 1,125 (20%), and that of unmanned level crossing is 3,836, and that of illegal level crossing (unacknowledged level crossing) is 624. The number of level crossing equipped with electric safety facility is 845 (15%), and level crossing with mechanical safety facility is 280 (5%). There are so many accidents at level crossing in Java island, and local governments are asking improvement of safety facility. However, facility improvement of level crossing is not implemented due to the lack of budget.

⑤ Signaling and Telecommunication Facilities

Various electronic interlocking devices of signaling facilities have been installed, and they have been installed at over half of the stations. However, electronic interlocking device is divided into 3 types, and the non-standardization makes it difficult to implement maintenance work. Most of the spare parts to be provided when a project has been completed are supposed to be supplied from overseas, and it makes it difficult to repair damaged parts well due to the lack of budget for the procurement of spare parts. Although the efforts to repair light damages by themselves worth praising, the fundamental problems are not resolved due to the lack of budget for outsourcing the repair work. Securing minimum budget for maintenance work is the urgent and significant subject. In addition, thunder attack occurs often during rainy season in Indonesia, and the specification considering the countermeasures against them is required.

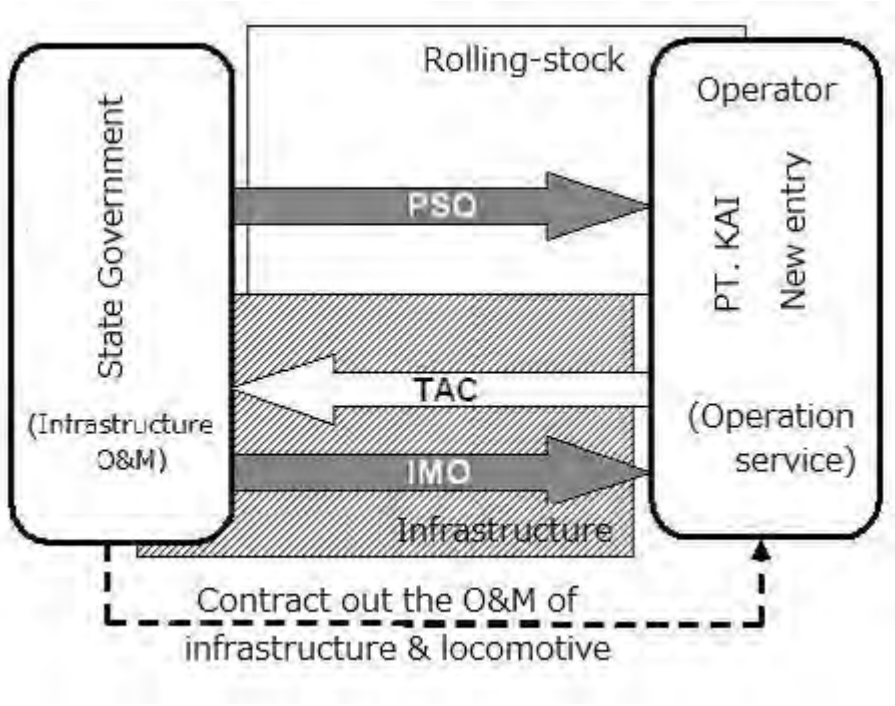
Based on these facts, it is necessary for the Government to consider appropriate budget allocation policy for maintenance to comply with the signaling safety standard which is the main stay of safety railway operation. Also, development of signaling system technical standard for Indonesian climate is required to perform proper maintenance by its own effort.

(2) Issues of Railway Facilities on this Project

Each facility of railway infrastructures such as civil engineering structure, track, level crossing, signaling system and telecommunication system are getting decrepit due to the lack of budget for required improvement. In addition, the safety which is the most important component for railway operation is not assured due to the lack of maintenance in general in terms of management ability, human resources and procurement of parts. As a result, it is impossible to increase the speed of trains since the performance of trains is not exerted sufficiently if running condition is not good no matter how high the performance of the locomotives. Another issue is the punctuality of operation which is not assured due to breakdown, accident, and lack of emergency maintenance. Improvement of railway facilities and thoroughness of maintenance are necessary in order to assure sufficient transportation capacity in accordance with increasing demand for coal transportation in the near future.

1.2.3. Railway Tariff Policy

Concerning railway tariff, the organization of financial assistance for PT. KAI, which is called PSO-IMO-TAC system, has been established to support the financial burden of PT. KAI which is required for economy-class train operation with low tariff. PSO is a grant which is paid from the Government to PT. KAI to cover the additional expenditure for economy-class train operation with low tariff which is required by the Government. IMO is the outsourcing expenses from the Government to PT. KAI because the Government outsources maintenance work of infrastructure which belongs to the Government. Instead of these two things, PT. KAI is required to pay usage charge of infrastructure because PT. KAI operates trains using the infrastructure which belongs to the Government. This is the TAC. And, the amount of difference among these three is the grant from the Government to PT. KAI. The relationship among PSO, IMO and TAC mentioned above is shown in [Fig. 1-2-5].



(Source: Study team)

[Fig. 1-2-5] PSO – IMO – TAC

Basically, freight tariff is determined based on contract of transportation weight-km or volume-km of each item between PT. KAI and a cargo owner, and governmental permission is not necessary. Specific example of freight tariff of PT.KAI is shown in [Table 1-2-5].

In the case of coal transportation, tariff is negotiated considering the competition price against truck transportation, and also by considering of loading and unloading responsibility, whether by PT. KAI or cargo owner. It is also assumed that setting coal transportation tariff on this project will affect profit performance, and it will be an important factor.

[Table 1-2-5] Freight Tariff of PT. KAI (2010 - 2011)

Item	Tariff (Rp.)	Unit	Description
Coal	250～590	ton-km	
Oil	600	kℓ-km	
Cement	230～290	ton-km	
Clinker	390	ton-km	
Pulp	210～310	ton-km	
Baggage car	640～1,170	ton-km	
Container	1,750～2,010	TEU-km	Equivalent Unit
Cash	3,310～4,410	ton-km	
Palm Oil	230～1,020	ton-km	
Silica sand	230	ton-km	

Note: TEU = Twenty Foot Equivalent Unit

(Source: Study team)

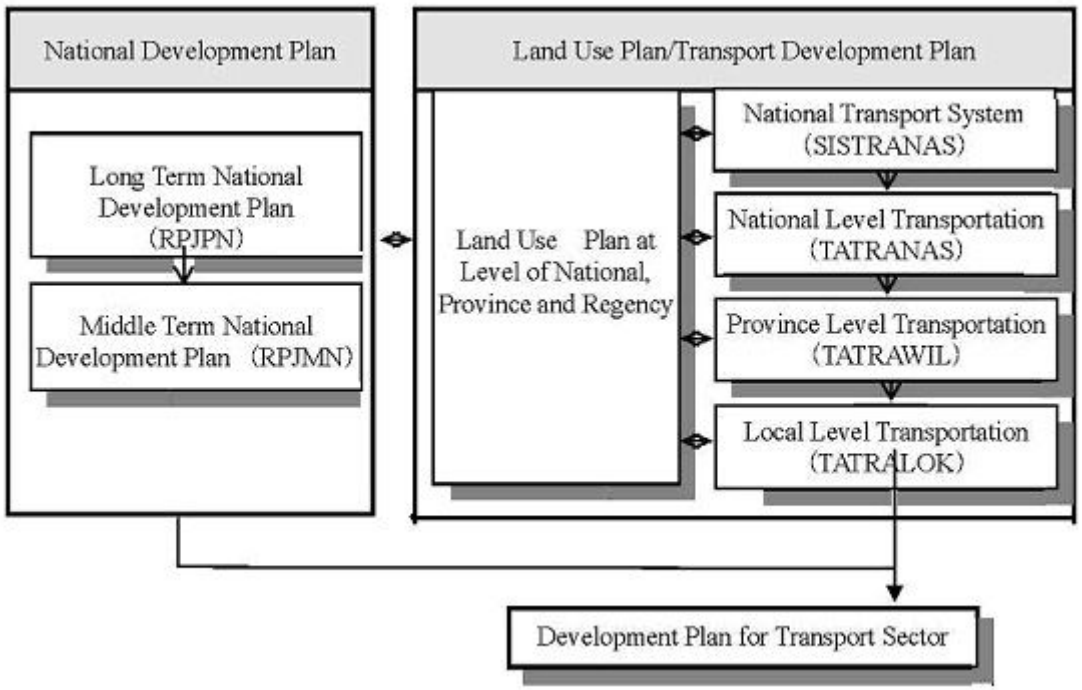
1.2.4. Development Plan of the Government

(1) Transportation Development Plan

In the transportation sector, development plans are made consistent with the National Development Plan, which are structured as the National Transport System (SISTRANAS in the Indonesian acronym), National Level Transportation (TATRANAS), Provincial Level Transportation (TATRAWIL), and Regional Level Transportation (TATRALOK). These are all established by regulations, with SISTRANAS and TATRANAS being determined by presidential decree, while TATRAWIL is established by provincial ordinances and TATRALOK by regional regulations. SISTRANAS describes the basic development concepts for each mode of transportation system in Indonesia, including consideration of the infrastructure, service, demand, safety and maintenance of order, and the public finance, management, and organization. It acts as a guideline for planning, developing, and managing transportation systems in Indonesia. In addition, it also acts as a reference when preparing documentation concerning transportation development plans contained in other plans such as the Long Term National Development Plan (RPJPN) and the strategic plans (RENSTRA).

In order to realize the national policy stipulated in SISTRANAS for the transportation sector at every level from the central government down to the regencies and cities, each entity makes medium-term and long-term development plan as TATRANAS, TATRAWIL, and TATRALOK. All of these plans are made at the responsibility of central government or regional government in harmony with all relevant development plans, and is reviewed at least once every 5 years. As can

be expected, each of the above plans is planned while integrating it with the land use plans at the regional level. The relationships between each of the development plans described above are shown in [Fig. 1-2-6].



(Source: Study team)

[Fig. 1-2-6] Relationships between National Development Plan, Land Use Plan, and the Transportation Development Plans

(2) Railway Development Plan

① National Railways Master Plan 2011-2030

The railway development long-term plan (Rencana Induk Perkeretaapian Nasional) as a national railway master plan (2011-2030) was made by Ministry of Transportation under the assistance of Australian Agency for International Development (AUAID).

The overall target of national railway development up to 2030 is “National railway has market segment for passenger 11-13% and freight 15 - 17 % of total market segment for national transportation in 2030”. In order to achieve the target, the master plan sets strategy and specific target of each strategy as follows.

- Development of Railway Network and Service
  - National railway network reaches 12,100 km (Spreading in Java-Bali, Sumatera,

Kalimantan, Sulawesi and Papua) including urban/city railway network along 3,800 km.

- Facilities of passenger transportation with number of locomotives 2,840 units, inter-city train 28,335 units and urban train 6,020 units.
- Facilities of freight transportation with number of locomotive 1,985 units and wagon 39,645 units.

- Improvement of Railway Safety and Security;
  - Increasing of railway safety and security with an indicator of safety and security interference ratio 50% in the period of 2010 to 2030.
- Technology Transfer and Development of Railway Industry;
  - The reduction the foreign technology up to 25%, at least 85% local content and a minimum of 90% is supplied by domestic industry.
- Development of Railway Human Resource;
  - The availability of professional and competent regulators and operators.
- Development of Institutional Organization of Railway;
  - Railway Infrastructure Operator minimum 8 (eight) business entities with distribution level consist of 1 (one) business entity at every big island (Sumatera, Jawa-Bali, Kalimantan, Sulawesi and Papua), and 3 (three) business entities in urban area;
  - At least 5 (five) business entity of railway operator;
  - Coordinating agency for railway infrastructure and railway operator.
- Investment of Fund of Railway.
  - The fulfillment of strong financing of railway supported by private investment with investment targets estimated to reach USD 67,219.5 million with financing ratio through government investment (30%) and private (70%).

② Strategic Plan on Railways 2010-2014

DGR has made RENSTRA (2010-2014, Rencana Strategis / Strategy Plan), and 6 projects are planned as below.

- Sukacinta - Kertapati (190km/Double)
- Tanjung Enim - Padang (50km/Single)
- Padang - Pulau Baai (160 km/New)
- Muaraenim - Tanjung Api-api (256km/New)
- Banko Tengah - Srengsem (280km/New)
- Tanjung Enim - Baturaja (78km/Short cut)

(3) Plan of PT. KAI

PT. KAI formulated a five-year plan every 2 years, and projects are implemented based on it. Currently, Long-Term Plan of PT. KAI (RJPP: Rencana Jangka Panjang Perusahaan = Company

Long Term Plan) 2009-2013 is the base of projects.

The purpose of this plan is to provide high-quality transportation service and high competitiveness by railway, and to expand domestic and international market in order to support national economy and political program. Also, the purpose is to implement maintenance of railway infrastructure and facilities effectively, and implement smooth passenger and freight transportation.

This plan focuses on the following 5 subjects.

- Railway transportation service in accordance with customer demand, and provision of public service demanded by the Government.
- Maxim use of existing asset.
- Improvement of productivity of business are expansion.
- Optimization of company asset management.
- Achievement of coal transportation projects in Divre 3 (South Sumatra)

In this plan, during the planned period, it was set as a target to increase profit by up to 10% with passenger transportation increase forecast by average of 4% annually in entire PT. KAI. Concerning freight transportation, the target annual profit increase is average of 44%, particularly in Divre 3 (South Sumatra) it is 55%. Also, it is expected that freight transportation in Java is increasing from 250 containers per month to 1,000 containers per day. This target can be achieved if investment scenario by self-support or by government is worked smoothly.

PT. KAI clearly describes that investment for railway facilities, infrastructure, human resource is necessary in order to achieve the target, particularly improvement of decrepit track and installation of automatic train stop system (ATS) are required to improve transportation safety in this plan. Also, the scale and amount of money of investment plan, and income and expenditure plan is released officially as specific data for the plan shown in the [Table 1-2-6], [Table 1-2-7] and [Table 1-2-8] below.

[Table 1-2-6] Planned Scale of Investment in Infrastructure (2009 - 2013)

(Unit: billion Rp.)

NO	ITEM	LOCATION	2008		2009	2010	2011	2012	2013
			Existing	Addition					
1.	**ROLLING STOCK**								
	a. PROCUREMENT :								
	a. Loc CC 205	Divre 3	6	-	-	24	20	-	-
	b. Loc CC 204	Jawa	2	10	10	12	15	13	12
	c. K 1 (Executive Car)	Jawa	10	16	-	-	-	8	8
	d. K 2 (Business Car)	Jawa	-	-	10	10	10	10	27
	e. K 3 (Economy Car)	Jawa	-	-	-	36	36	52	63
	f. KM 1/M 1 (Dining Car)	Jawa	-	2	-	2	2	4	4
	g. KM 2/KMP 2	Jawa	-	-	1	4	4	8	10
	h. KM 3/KMP 3	Jawa	4	-	-	6	6	10	10
	i. BP	Jawa	-	2	-	5	5	10	12
	j. B	Jawa	20	20	-	-	-	-	-
	k. KKW	Ja-Sum	70	-	-	-	-	-	-
	l. KKBW (max.capacity 50 ton)	Divre 3	130	-	-	466	369	661	-
	m. PPCW (max.capacity 50 ton)	Divre 3	-	-	-	60	-	50	50
	n. PPCW (max.capacity 44 ton)	Jawa	38	20	50	-	20	-	30
	o. Others	Ja-Sum	1 package	-	1 package	1 package	1 package	1 package	1 package
	b. Retrofit/Rehab/Modif./MO/Reengine/Repowering,etc.								
	a. Loc DH	Divre 1	-	-	-	5	5	5	5
	b. K 1/Tourism Car	Ja-Sum	15	-	6	-	4	4	-
	c. KM 1	Ja-Sum	2	-	-	-	2	2	2
	d. BP/B	Ja-Sum	-	-	-	-	2	2	-
2.	**PRASARANA**								
	a. Longsiding	Divre 3		-	4	-	3	-	-
	b. Doubletrack	Divre 3		-	-	85	100	99	35
	c. Blok Post	Divre 3		-	1	-	-	-	-
	d. Station (new & rehab/improvement)	Ja-Sum		-	2+8	10	5	8	10
	e. Development of Workshop and Depo	Ja-Sum	1 package	-	1 package	1 package	1 package	1 package	1 package
	f. Bridge rehabilitation	Divre 1	-	-	-	8	8	10	17
	g. Rail Procurement (km)	Ja-Sum	-	-	-	200	200	300	300
	h. Turnout Procurement (unit)	Ja-Sum	-	-	-	50	50	75	100
	i. Signal Procurement	Ja-Sum	-	-	-	1 package	1 package	1 package	1 package
	j. Development of Education and Training Centre	Jawa	-	-	-	1 package	1 package	1 package	1 package
	k. Others	Ja-Sum	1 package	-	-	1 package	1 package	1 package	1 package
3.	**FACILITY**								
	a. Procurement of Machine-2 Workshop & Depo	Ja-Sum	1 package	-	1 package	1 package	1 package	1 package	1 package
	b. Procurement of mesin-2 infrastructure	Ja-Sum	1	-	1	-	2	-	1 package
	d. Procurement of Weighing Equipment	Ja-Sum	2	-	-	2	1	2	-
	e. Facility of Education/audio visual	Jawa	-	-	-	1 package	1 package	1 package	-
	f. Others	Ja-Sum	1 package	-	1 package	1 package	1 package	1 package	1 package
4.	Development of IT	-	-	1 package	-	1 package	1 package	1 package	1 package
5.	**HUMAN RESOURCES**	Ja-Sum	-	-	-	1 package	1 package	1 package	1 package
	(Recruitment and Development of Human Resources)								
6.	**CORPORATE SAFETY PLAN**	Ja-Sum	PROCUREMENT OF ANTO COLLISION DEVICE & AUTOMATIC TRAIN STOP =						

(Source: Company Long Term Plan of PT. KAI 2009-2013)

[Table 1-2-7] Amount of Money of Investment in Infrastructure (2009 - 2013)

(Unit: billion Rp.)

NO	ITEM	LOCATION	2008		2009	2010	2011	2012	2013
			Existing	Addition					
1.	**ROLLING STOCK**								
	1) **PROCUREMENT :**								
	a. Loc CC 205	Divre 3	244,96	-	-	960,00	800,00	-	-
	b. Loc CC 204	Jawa	35,60	192,50	173,94	231,00	288,75	250,25	231,00
	c. K 1 (Executive Car)	Jawa	41,40	79,01	-	-	-	40,00	40,00
	d. K 2 (Business Car)	Jawa	-	-	27,50	27,50	27,50	27,50	74,25
	e. K 3 (Economy Car)	Jawa	-	-	-	90,00	90,00	130,00	157,50
	f. KM 1/M 1 Dining Car)	Jawa	-	9,59	-	10,00	10,00	20,00	20,00
	g. KM 2/KMP 2	Jawa	-	-	3,30	13,20	13,20	26,40	33,00
	h. KM 3/KMP 3	Jawa	10,80	-	-	16,20	16,20	27,00	27,00
	i. BP	Jawa	-	15,31	-	38,27	38,27	76,54	91,85
	j. B	Jawa	40,00	39,91	-	-	-	-	-
	k. KKW	Ja-Sum	52,50	-	-	-	-	-	-
	l. KKBW 50 ton	Divre 3	106,60	-	-	419,40	332,10	594,90	-
	m. PPCW (max.capacity 50 ton)	Divre 3	-	-	-	42,00	-	35,00	35,00
	n. PPCW (max.capacity 45 ton)	Jawa	20,90	13,00	32,50	-	13,00	-	19,50
	o. Others	Ja-Sum	20,03	-	53,41	20,00	20,00	20,00	20,00
	Total a)		**572,79**	**349,32**	**290,65**	**1.867,57**	**1.649,02**	**1.247,59**	**749,10**
	2) **LENGTHEN ECONOMICAL LIFE SPAN**								
	a. MO/Reengine/Repowering Loc DH	Divre 1	-	-	-	40,00	40,00	40,00	40,00
	b. Retrofit/Rehab K 1	Ja-Sum	33,00	-	20,00	-	8,80	8,80	-
	c. Retrofit/Rehab KM 1	Ja-Sum	4,40	-	-	-	4,40	4,40	4,40
	d. Retrofit/Rehab BP/B	Ja-Sum	-	-	-	-	3,00	3,00	-
	TOTAL b)		**37,40**	**-**	**20,00**	**40,00**	**56,20**	**56,20**	**44,40**
	TOTAL ROLLING STOCK		**610,19**	**349,32**	**310,65**	**1.907,57**	**1.705,22**	**1.303,79**	**793,50**
2.	**INFRASTRUCTUR**								
	a. Longsiding	Divre 3	-	-	-	-	24,54	-	-
	b. Doubletrack	Divre 3	-	-	-	858,50	1.010,00	999,90	353,50
	c. Blok Post	Divre 3	-	-	-	-	-	-	-
	d. Station (new & rehab/improvement)	Ja-Sum	-	-	221,22	169,00	10,00	16,00	20,00
	e. Development of Workshop and Depo	Ja-Sum	4,64	-	4,43	50,00	50,00	50,00	50,00
	f. Bridge rehabilitation	Divre 1	-	-	-	80,00	80,00	100,00	170,00
	g. Rail Procurement	Ja-Sum	-	-	-	140,40	140,40	210,60	210,60
	h. Turnout Procurement	Ja-Sum	-	-	-	40,00	40,00	60,00	80,00
	i. Signal Procurement	Ja-Sum	-	-	-	50,00	50,00	50,00	50,00
	j. Development of Education and Training Centre	Jawa	-	-	-	25,00	25,00	25,00	-
	k. Others	Ja-Sum	0,20	-	70,50	10,00	10,00	10,00	10,00
	NUMBER OF INFRASTRUCTURE		**4,84**	**-**	**296,14**	**1.422,90**	**1.439,94**	**1.521,50**	**944,10**
3.	**FACILITY**								
	a. Procurement of Machine-2 Workshop & Depot	Ja-Sum	22,64	-	40,98	50,00	50,00	50,00	50,00
	b. Procurement of mesin-2 infrastructure	Ja-Sum	7,35	-	26,79	-	100,00	-	75,00
	d. Procurement of Weighing Equipment	Ja-Sum	2,61	-	-	3,00	1,50	3,00	-
	e. Facility of Education/audio visual	Jawa	-	-	-	25,00	25,00	25,00	-
	f. Others	Ja-Sum	4,68	-	3,40	15,00	15,00	15,00	15,00
	NUMBER OF FACILITY		**37,27**	**-**	**71,16**	**93,00**	**191,50**	**93,00**	**140,00**
4.	Development of IT	Ja-Sum	**5,25**	**-**	**20,00**	**31,30**	**12,00**	**9,00**	**-**
5.	**HUMAN RESOURCES**	Ja-Sum	**-**	**-**	**-**	**25,00**	**25,00**	**25,00**	**-**
	(Recruitment and Development of Human Resources)								
6.	**CORPORATE SAFETY PLAN**	Ja-Sum			**-**	**-**	**100,00**	**100,00**	**100,00**
	TOTAL		**657,56**	**349,32**	**697,95**	**3.479,77**	**3.473,66**	**3.052,29**	**1.977,60**

(Source: Company Long Term Plan of PT. KAI 2009-2013)

[Table 1-2-8] Income and Expenditure Plan (2009 - 2013)

(In billion Rupiah)

No	Item	2008	2009	2010	2011	2012	2013
1.	**Operating Income**						
	a. Passenger	1.987,75	2.357,93	2.593,72	2.853,10	3.138,41	3.452,25
	b. Freight	1.328,07	1.786,24	2.417,87	3.659,49	4.588,20	6.696,12
	c. Supporting operation	109,98	212,77	234,05	257,45	283,20	311,52
	d. PSO (Public Service Obligation)	544,67	459,17	460,04	487,64	516,90	547,92
	e. IMO (Infrastructure, maintenance,Op)	886,64	922,01	998,15	1.235,28	1.412,43	1.758,71
	f. Sharing of Jabotabek passsenger transp.	-	280,00	338,00	439,40	571,22	742,59
	g. Sharing of Passenger transp. profit	-	12,42	32,93	64,90	114,78	259,30
	Total Operating Income	**4.857,10**	**6.030,54**	**7.074,77**	**8.997,27**	**10.625,14**	**13.768,40**
2.	**Operating Cost**						
	a. Employee	1.374,36	2.000,30	1.945,47	2.188,66	2.407,52	2.648,28
	b. Fuel	862,83	796,81	895,90	958,61	1.025,72	1.097,52
	c. Maintenance :						
	- Rolling stock	842,28	1.064,61	1.173,31	1.407,97	1.689,57	2.027,48
	- Infrastructure	487,04	573,94	612,46	780,32	927,37	1.186,72
	d. Depreciation	155,05	184,11	257,41	506,29	707,91	907,85
	e. Supporting Operation	207,07	239,58	275,94	298,64	323,26	349,98
	f. Insurance	8,25	9,49	10,44	11,48	12,63	13,89
	g. general	227,36	281,19	300,80	323,42	347,78	374,01
	h. Interest	-	32,70	325,63	844,17	1.266,66	1.403,95
	i. TAC (Track Access Charge)	886,64	922,01	998,15	1.235,28	1.412,43	1.758,71
	Total Operating Cost	**5.050,88**	**6.104,74**	**6.795,52**	**8.554,85**	**10.120,84**	**11.768,38**
	Profit/Loss Operation	**-193,78**	**-74,20**	**279,24**	**442,41**	**504,29**	**2.000,02**
3.	**Non-Operating Income**						
	a. Property	118,45	221,53	243,69	420,91	799,73	1.203,49
	b. Interest of Deposit & Current Accounts	82,42	81,08	89,19	125,97	245,34	507,62
	c. others	26,95	16,91	18,51	20,26	22,19	24,32
	Total Non-operating Income	**227,81**	**319,53**	**351,38**	**567,14**	**1.067,26**	**1.735,43**
	Total Income (1+3)	**5.084,91**	**6.350,07**	**7.426,15**	**9.564,41**	**11.692,39**	**15.503,83**
4.	**Non-operating Cost**						
	- Non-operating cost	19,41	30,73	34,24	47,94	73,97	122,34
	Profit/Loss before tax	**14,62**	**214,59**	**596,39**	**961,62**	**1.497,58**	**3.613,11**
5.	**Tax**	**4,39**	60,09	149,10	240,40	374,40	903,28
	Nett Profit/Loss	**10,24**	**154,50**	**447,29**	**721,21**	**1.123,19**	**2.709,83**

(Source: Company Long Term Plan of PT. KAI 2009-2013)

(4) Status of this Project in Development Plan

This project is equivalent to double tracking project between Sukacinta and Kertapati shown in RENSTRA which is a plan of DGR, and is consistent with policy of the Government. Also, according to the five-year plan of PT. KAI, the achievement of coal transportation projects in South Sumatra is clarified in the business policy. It is possible to receive cooperation of the Government of Indonesia and PT. KAI.

1.2.5. Government Policy of Financial Resource for Railway Development

(1) Annual budget of Ministry of Transportation

The total amount of annual budget of the Ministry of Transportation, including the amount expended from foreign loans, is shown in [Table 1-2-9]. As shown in this table, the amount of

budget has been increasing by an annual average of 17%, and from 2007 reached a double-digit trillion amount of Rupiah. Also, the budget in 2010 is approximately 15.8 trillion.

The budget for improvement of infrastructure such as harbors, airports and railways is insufficient. Thus, it is necessary to raise fund using PPP scheme and promoting infrastructure development by government enterprises. Modernization of existing railway infrastructure has been implemented with public investment whose resource is Japanese Yen loan, but private investment is expected in the sectors which profit performance is expected. In Indonesia, utilization of PPP scheme is promoted, but it has been successful in power sector alone so far, and this project will be a pilot project if this project is materialized.

[Table 1-2-9] Annual Budget of the Ministry of Transportation

Purpose	Amount of Annual Budget (Rp billion)					Average Annual Increase Ratio
	2006	2007	2008	2009	2010	
1. Personnel	697	977	1,214	1,273	1,280	16.41
2. Purchasing Goods	1,360	1,686	1,991	2,486	2,898	20.82
3. Development of Infrastructure	6,444	8,547	12,094	13,218	11,655	15.97
Total	8,501	11,210	15,299	16,977	15,833	16.82

(Source: Website of Ministry of Transport of Republic of Indonesia)

1.2.6. Status of Railway Projects being Implemented under PPP Scheme

Recently, due to higher demand and budget constraint in the governments, in the railway sectors in the world, many railway systems are being constructed under PPP scheme. It is a universal process that a pilot project is implemented first, and additional projects will then be proceeded. Generally, the railway projects may have uncertainty of revenue flow especially in case of passenger projects; therefore PPP scheme is more popular for power, port and other infrastructure sectors. In case of railway projects, many projects in the world market are still under BOT scheme or revenue guarantee scheme. In addition, no railway PPP projects have been materialized as of December 2011 in Indonesia.

In Indonesia, Soekarno Hatta Airport- Manggarai Project and Palaci - Bangkuang Coal Railway in Central Kalimantan are 2 major PPP railway projects as of February 2012. The status of such projects are summarized below, however both projects take longer time especially after pre-qualifications have been done. This is because the projects will need to have security or

guarantee scheme, and such pre-qualifications have been proceeded prior to the finalization of the detailed project scheme including but not limited to security and guarantee. As for South Line of Soekarno Hatta Airport - Manggarai Project, however, the project will be implemented by PT. KAI under the recently issued Presidential regulations.

In the meantime, in the PPP Book as explained in Section 1.1.4. (P. 1-16), three editions have been issued so far, and the following tables show the number of the projects listed in each PPP Book.

[Table 1-2-10] Projects Listed in PPP Book 2009 Version

	Railway	Sea Transport	Air Transport	Land Transport	Road	Water	Power	Waste
Project ready for bidding	2 ● Palaci - Bangkuang, Central Kalimantan (※1) ● Soekarno Hatta Airport - Manggarai (※2)	1	0	0	3	1	1	0
Priority projects	0	0	0	0	8	8	0	2
Potential projects	13 ● Kualanamu ● West Sumatera ● Simpang - Tanjung Api-Api ● Tanjung Enim - Batu Raja ● Lahat - Kertapati ● Railway Facility - Blue/Green Line (Jakarta Monorail) ● Gedebage, Bandung, Integrated Terminal (Railway) ● Bangkuang - Lupak Dalam ● Kudangan - Kumai ● Puruk Cahu - Kuala Pembuang ● Tumbang Samba - Nanga Bulik ● Kuala Kurun - Palangka Raya - Kuala Kapuas ● East Kalimantan (Puruk Cahu - Balikpapan)	5	3	1	21	11	7	0

(Source: PPP Book)

[Table 1-2-11] Projects Listed in PPP Book 2010 Version

	Railway	Sea Transport	Air Transport	Land Transport	Road	Water	Power	Waste
Project ready for bidding	0	1	0	0	0	0	0	0
Priority projects	0	0	0	0	18	6	0	3
Potential projects	9 ● Jakarta Monorail (Re-listed) ● Padang Monorail (Re-listed) ● Gedebage, Bandung, Integrated Terminal (Re-listed) ● Bangkuang - Lupak Dalam (Re-listed) ● Kudangan - Kumai (Re-listed) ● Puruk Cahu - Kuala Pembuang (Re-listed) ● Tumbang Samba - Nanga Bulik (Re-listed) ● Kuala Kurun - Palangka Raya - Kuala Kapuas (Re-listed) ● Maratuhup - Kalipapak - Balikpapan (Re-listed)	11	7	2	17	18	5	3

(Source: PPP Book)

[Table 1-2-12] Projects Listed in PPP Book 2011 Version

	Railway	Sea Transport	Air Transport	Land Transport	Road	Water	Power	Waste
Project ready for bidding	0	2	1	0	2	6	0	2
Priority projects	0	0	0	0	17	0	2	2
Potential projects	3 ● Rantau Prapat - Duri - Tl.Kuantan - Muaro (Newly Listed) ● Gedebage, Bandung, Integrated Terminal (Re-listed) (※3) ● Maratuhup - Kalipapak - Balikpapan (Re-listed) (※4)	4	7	2	3	18	4	4

(Source: PPP Book)

Among the above listed railway projects, the 2 “Project Ready for Bidding” (※1, ※2) and 2 projects listed in all 3 issues of PPP Book (※3, ※4) are summarized below.

[Table 1-2-13] Status of 4 Specific PPP Projects

Project	Contracting Agency	Status
Palaci-Bangkuang, Central Kalimantan (※1)	Central Kalimantan Gov.	● Japan Transportation Consultants completed a study in 2008 as requested by JETRO. ● In May 2010, total 15 groups participated in the pre-qualification, and only 4 groups have been shortlisted until today. - Itochu - Toll Consortium - Drydocks World LLC - PT MAP Resources Indonesia Consortium - PT Bakrie - SNC Lavalin - Tyssencrupp Consortium - China Railway Group Limited - PT Mega Guna Ganda Semesta – PT. Royal Energi Consortium ● In November 2011, PT. Penjamin Infrastruktur Indonesia (PII) announced its intention to provide guarantee for the project.
Soekarno Hatta Airport – Manggarai (※2)	Ministry of Transportation	● This project includes two lines, North route (called express line) and South route (called commuter line). ● North circle line is totally 33km elevated in length with a total project cost of Rp. 7,600 billion. The section between Manggarai and the location at Km 22 has already been in service; the remaining 11km is an extension. The employer will implement all the works including land acquisition, construction, operation, etc. PQ stage has already started; there is no progress after evaluation even there are 7 companies joined. ● The guarantee from PT. Penjamin Infrastruktur Indonesia (PII) for north circle line has already been determined. They are 8 guaranties such as the pay of guarantee charge equal to 1.5% of the total project cost, guaranty for land acquisition, etc. However, the details are still unclear. ● On the other hand, according to the presidential decree No. 83/2011 effectuated in November 2011, PT. KAI will be the employer for south circle line. 7km new line connecting the current railway network and the airport will be constructed with a total cost of $250 million (Rp. 2.25 trillion). PT. KAI will confer with domestic banks (PT. BNI, PT. BRI, PT. Bank Mandiri) about loan origination. A period of approximately 10 years for repayment is expected. The remaining 15% is planned to be self-financed by PT. KAI.
Gedebage, Bandung, Integrated Terminal (※3)	Bandung City	Under investigation
Maratuhup – Kalipapak – Balikpapan (※4)	East Kalimantan Gov.	Under investigation

(Source: Study team)

As mentioned above, there are many potential PPP projects and further progresses of these projects are expected. However, since PPP projects are carried out through tender definitely, private company which proposed a project can't always be awarded. Therefore, it's believed that current regulation partially interfere with the progress of PPP projects. Also, like Soekarno Hatta Airport - Manggarai Project, there is a case that PT. KAI will construct new line and operate and do maintenance by themselves in accordance with Presidential order. Therefore, it is hard to say that market in railway sector is wide open to private companies.

Further, the Study team unofficially received PPP Book Issue No.4 (2012 version) which has not been publicly issued as of May 2012. According to this Issue No.4, there are 3 “Ready to Offer Projects”, 26 “Priority Projects” and 29 “Potential Projects”, however only 3 railway related projects are registered as “Potential Projects” (Rantau Prapat-Muaro Railway, Bundung Railway Term,inal, Dl Yogyakarta Rail Stations) which is similar to Issue No.3 (2011 version). According to BAPPENAS, it does not select nor eliminate railway sector projects, however railway sector projects are not recently proposed primarily due to difficulties to realize railway projects which require significant government involvement.

1.3. Energy Policy in Indonesia

1.3.1. Outlook of International Energy Market

(1) Correlation between World GDP Growth and Energy Consumption

The world energy consumption has increased by 2% per year from 1970’s in accordance with world GDP growth. It is said that the main reason for the increase is due to increase of energy consumption in developing countries supported by economic growth.

(Source: 2009 Energy White Book)

[Fig. 1-3-1] Correlation between World GDP Growth and Energy Consumption

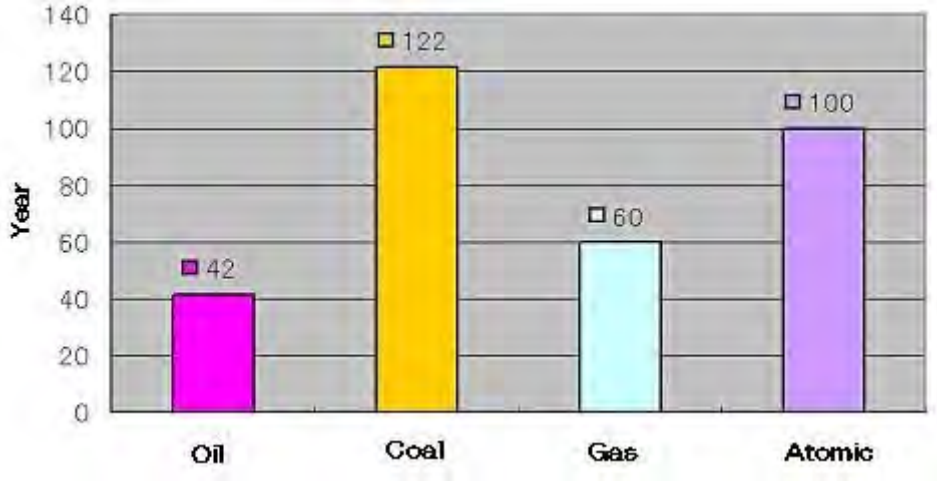
(2) Outlook for World Energy Consumption

The world energy consumption in 2030 will increase to 1.4 times of the one in 2007. The half of the world energy consumption is occupied by the demand in Asia Pacific region (excluding

OECD countries). It is expected that the demand of fossil fuels, such as oil, coal, and natural gas will substantially increase.

(3) Reserve Production Ratio of World Energy

[Fig. 1-3-2] shows the recent Reserve Production Ratio of major fossil fuels in the world. Especially oil is expected to dry up within 42 years. We are required to secure own source of fossil fuels more aggressively, since the supply is easily affected by world affairs. Acceleration of research & development of new energy is also key factor from the long term point of view.



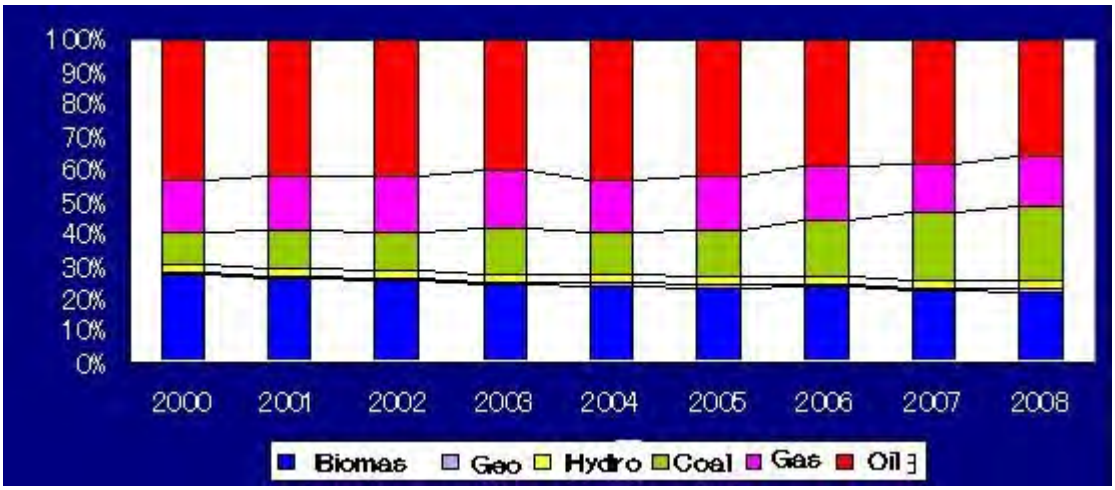
(Source: "Japan Energy 2010" issued by Resources & Energy Agency)

[Fig. 1-3-2] Reserve Production Ratio of World Energy

1.3.2. Situation in Indonesia

(1) Proportion of Energy Supply in Indonesia

The Indonesian energy supply volume in 2000 was 960 million BOE (Barrel Oil Equivalent), which was composed of Oil (43.4%), Natural Gas (16.5%), Coal (9.4%), and Biomass (27%). After that, the supply volume stably increased and reached 1,260 million BOE in 2008. The energy supply in 2008 was composed of Oil (36.2%), Natural Gas (15.3%), Coal (23.0%), and Biomass (22.2%). The main reason for the increase of supply volume during 2000-2008 was due to the increase of Coal supply in Indonesia. The proportion of Coal in the total energy supply has continues increasing.

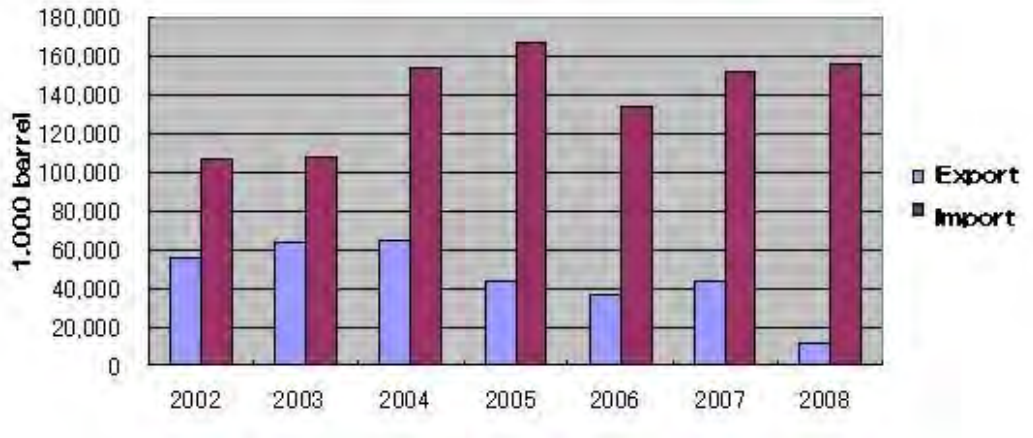


(Source: Based on 2009 Handbook of Energy & Economics Statistics of Indonesia)

[Fig. 1-3-3] Proportion of Indonesian Energy Supply

(2) Oil

Indonesia is 2nd largest crude oil producer following China in Asia. But crude oil production is gradually decreasing. The production in 2000 was 518.1 million barrel but the production in 2008 decreased to 358.1 million barrel. Since the domestic refining capacity is not able to catch up with the increase of demand, Indonesia changed to net import country of oil products since 2004. Indonesian government compensates for the loss of imported oil products and it is a big burden on government finance. Therefore, the decrease of domestic oil consumption is one of the biggest targets in energy policy of government from 2006.

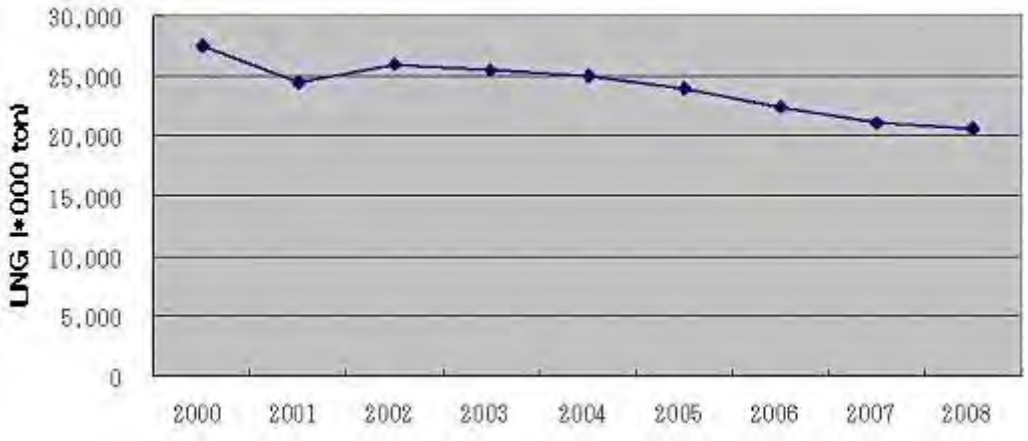


(Source: Based on 2009 Handbook of Energy & Economics Statistics of Indonesia)

[Fig. 1-3-4] Change of Indonesian Oil Product Import & Export

(3) Natural Gas

The major producing area of Natural Gas is South Kalimantan, South Sumatra, Irian Jaya and the production volume has been decreasing after reaching its peak in 2003. Indonesia is exporting country of Liquefied Natural Gas (LNG) and the export volume is expected to increase more due to the construction of new export facility in Tangguh gas field in addition to Arun and Bontang. Indonesian government plans to set up domestic pipeline networks in accordance with the increase of production of Natural Gas.



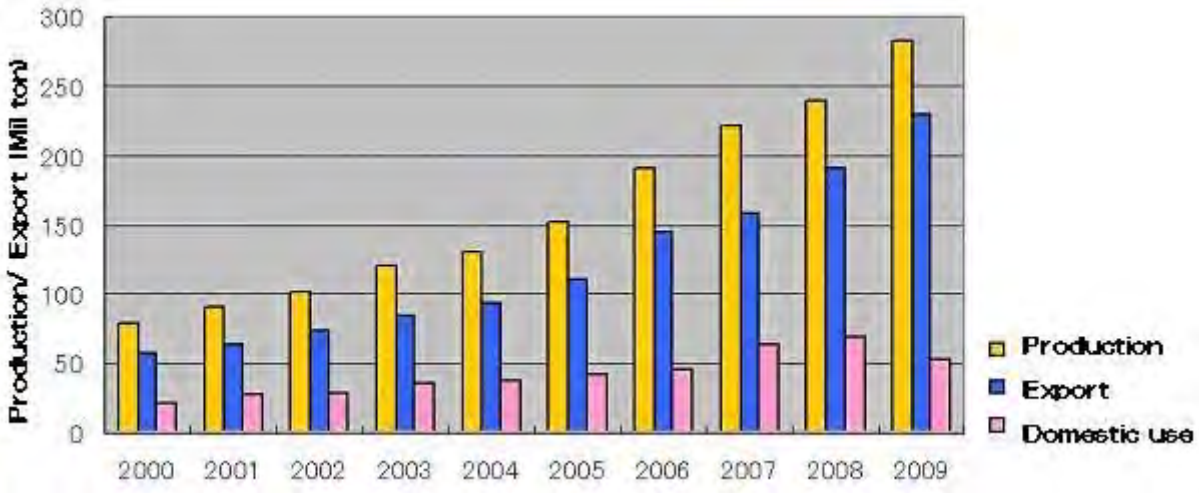
(Source: 2009 Handbook of Energy & Economics Statistics of Indonesia)

[Fig. 1-3-5] Change of Indonesian LNG Export

(4) Coal

Indonesia is the world biggest thermal coal exporter. Its production and export volume have increased by 10% per year from 2000. The main reason of the increase is due to expansion of existing and new coal mine, which are supported by the import demand not only from regular importers in Japan, Korea, Taiwan, but also new demand from other developing countries such as China and India. The production will stably continue increasing.

On the other hand, it is not easy to expect if coal export volume will stably continue increasing, because domestic demand will rapidly grow and government promotes Domestic Market Obligation (DMO) and put priority on the supply to domestic coal-fired power plant.



(Source: Based on 2009 Handbook of Energy & Economics Statistics of Indonesia)

[Fig. 1-3-6] Change of Indonesian Coal Production and Export

(5) Electricity

Perusahaan Listrik Negara (PLN) is solely responsible for electricity supplier in Indonesia. PLN produces electricity and also buy from domestic Independent Power Producer (IPP), and electricity is supplied only through power transmission lines owned by PLN.

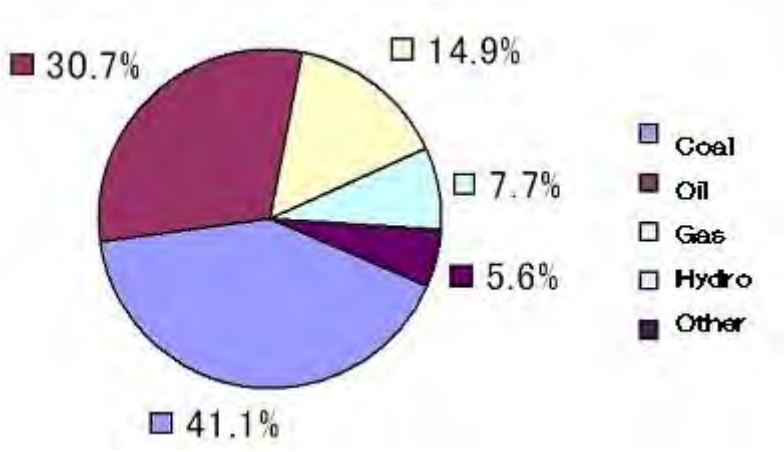
The government compensation for electricity charges is a big burden on government finance. Government plans to raise electricity charges gradually to 960 Rp./kWh by 2015 to decrease the amount of compensation.

In terms of fuels, the proportion oil has decreased every year and it only occupies 31% of the fuels. Instead, the proportion of coal is increasing these days and it occupies more than 40% after 2003. Natural gas occupies about 15% in 2008 and expected to hold a firm position as major fuel. The research and development of renewable energy such as Hydroelectric, Geothermal, and Solar power is proceeding.

[Table 1-3-1] Electricity Power Production and Proportion in Indonesia

		2002	2003	2004	2005	2006	2007	2008
Electricity Production (Gwh)		108,217	114,467	120,163	127,371	133,109	142,440	149,441
Proportion (%)	Coal	39.7	40.6	40.1	40.7	44.0	44.8	41.1
	Oil	34.8	32.8	33.6	31.0	29.7	28.5	30.7
	Gas	10.6	13.2	12.7	14.7	14.0	13.8	14.9
	Hydro	9.2	7.9	8.1	8.4	7.2	7.9	7.7
	Others	5.8	5.5	5.6	5.2	5.0	5.0	5.6

(Source: Based on 2009 Handbook of Energy & Economics Statistics of Indonesia)



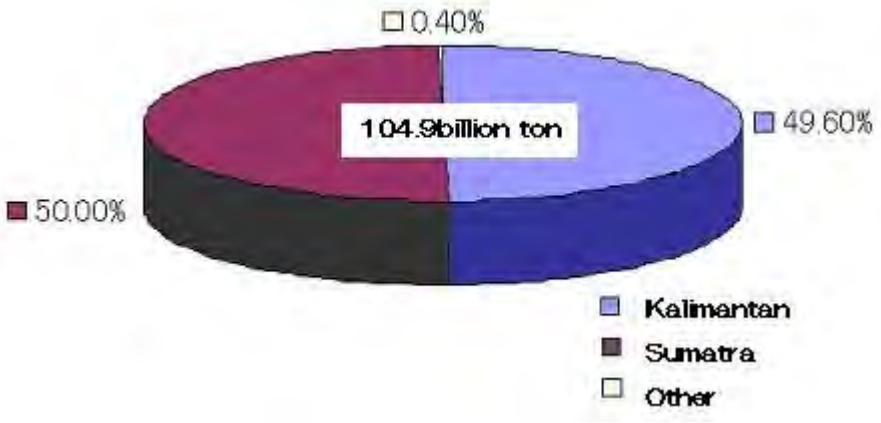
(Source: 2009 Handbook of Energy & Economics Statistics of Indonesia)

[Fig. 1-3-7] Proportion of Electricity Production in 2008

1.3.3. Development Subject and Government Development Plan

(1) Coal Resources and Reserves

Coal Resources in Indonesia are 104.94 billion tons. Most of them are located in Kalimantan (52.1 billion tons, 49.6%) and Sumatra (52.45 billion tons, 50.0%). Technically minable Coal Reserves are expected as 12.47 billion ton. Coal Resources and Reserves will increase further, since there are lots of unexplored areas.



(Source: Indonesia Coal Book 2010/2011)

[Fig. 1-3-8] Indonesian Coal Resources by Region

(2) Coal Production Plan

[Table 1-3-2] shows Coal Production Plan made by Indonesian government. The key point is if the expansion of new and existing coal mine develops as per government plan.

[Table 1-3-2] Coal Production Plan

(Unit: Million Ton)

Year	2010	2011	2012	2013	2014	2015	2020	2025	2030
Production	270	280	290	297	321	321	361	405	430

(Source: Directorate General of Mineral, Coal and Geothermal, 2009)

(3) Coal Mine Development Project

The new coal mine development projects with over 20 million tons per year production are Maruwai project developed by joint venture of BHP Billiton and PT. Adaro Energy in East-Central Kalimantan, and East Kutai Project developed by MEC (Minerals Energy Commodities) Holdings.

Expansion of existing coal mine is also ongoing. In case the expansion plan by Adaro, Arutmin, and Kideco goes as scheduled, totally the production increases by 100 million ton.

(4) Development Subject

Any problem isn't heard to occur in mine management and operation under new mining law issued in 2009. But it is concerned that strict government regulation to the approval of development in forest areas (IPPKH) will affect new development project, since the expansion of existing coal mine and new development project must start at inland areas.

On the other hand, logistics infrastructure is not fully prepared in lots of areas. The main logistics still rely on barge transportation through rivers. But the transportable volume reduces in dry season due to low water level of rivers. Therefore, the soonest set up of coal dedicated railway networks are desired so that Indonesian coal meets increasing demand in domestic and Asian region.

(5) Promotion of Coal Resource Development

As shown in MP3EI and IEDC above, especially coal resource development in South Sumatra region is positioned as a contributed project to development of Indonesian economy due to the bountiful reserve and increase of world demand. Development of transportation infrastructure, mainly railway, is required urgently. In order to promote development of

infrastructure smoothly for the near future, it is assumed that PPP project is also effective from the viewpoint of financial burden reduction of the government of Indonesia and utilization of private finance.

1.4. South Sumatra Province

1.4.1. Summary of the Region

(1) Geography

Sumatra Island is the second largest island in Indonesia, located in west edge of the Country. South Sumatra Province is the area located south part of Sumatra Island, indicating green color in [Fig. 1-4-1]. Total area is 60,303km^2; it is third largest province among 10 provinces in Sumatra Island. South Sumatra Province have a border of Jambi Province in North, Bengkulu Province in west, Lampung Province in South, and east side is faced on Bangka sea channel.

(Source: Wikipedia)

[Fig. 1-4-1] Location Map of South Sumatra Province

(2) Population, Race, Language, Religion

Capital of South Sumatra Province is Palembang City located estuary of Musi River, having more than 1million population. Population of Province is over 7.4million and it is consist of 60% young generation under 24 years old. Main race is Malay (31%) and Java (27%). Most of persons

speak Indonesian. In addition, main religion is Islam (96%) and then following by Christian (2%) and Buddhism (2%).

(3) Industry, Trade, Transportation

There are many natural resources and long history of its development. Main industry is mining of coal and oil, cement, wood. Main export items are agricultural products such as coffee, spices, fish, and industrial products such as fertilizer, rubber.

Traffic system is road and railway. Almost all export products are exported using railway to South (Tarahan and Panjang port). More than 90% of export products are coal. There is an international airport in 20km north from center of Palembang city.

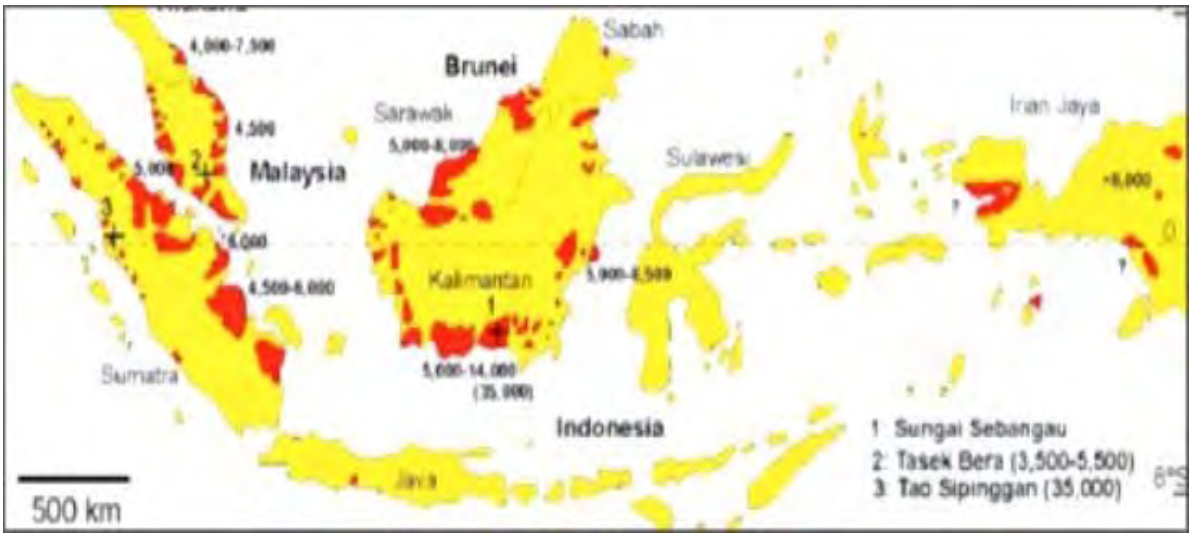
1.4.2. Environment of the Project Area

(1) Topography

There is the Barisan mountain chain in western area of South Sumatra Province. Main mountains are Mt.Dempo (3,159m), Mt.Nanti (1,619m), and Mt.Pesagi (2,231m). There is steep mountainous land in western part of the Lahat coal mine area. Meanwhile eastern part of the Province is mainly low swamp lands and there are big peat bog lands near the coast line with mangrove.

(2) Soil

There is big peat bog in eastern area, especially near coast and river in south Sumatra province. Red color marks of [Fig. 1-4-2] below show “peat bog” in Indonesia.



(Source: Wetlands International)

[Fig. 1-4-2] Distribution of Peat Bog in Indonesia

(3) Climate

It is monsoon climate with annual rainfall of 2,200mm~3,000mm. Rainy season is from October to April. There is little rain in dry season and it affect to water level of rivers. Temperature is 26^0C - 32^0C and humidity is 78% - 88%.

(4) Water Resources

There are two wide and deep rivers, Musi River and Lematang River, in South Sumatra Province. Water resources of rivers are mostly come from Barisan Mountains and flow to Bangka sea channel. Meanwhile all of Ogan river, Komering river, Lematang river, Kelingi river, Lakitan river, Rawasu river, flows to Musi river.

1.4.3. Position under National Development Plan

DGR, Ministry of Transport mentioned about the target projects up to year 2030 under National Railway Master Plan as follows;

- Cargo transportation services in Sumatra Island have cross relation with development of natural resources same as Kalimantan Island. Indonesian Government makes aggressive support for expansion of railway transportation to meet with rapid production of mineral resources.
- Under New Railway Law No.23 issued in 2007, Provincial Government is authorized to promote railway project inside the province. Since this project shall be completed inside a province, it will be organized and approved by South Sumatra Provincial Government.
- Under National Development Plan, railway investment is targeting to reach US$672 million by increasing private investment. The target ratio of Government and Private ratio are 30% and 70% respectively.

1.4.4. Future Development Plan

Regional Development Planning Board (BAPPEDA) of South Sumatra Province mentioned about railway development in their medium term 5 years (2008~2013) development plan.

- Since railway development in South Sumatra did not reach the target, it affects to the coal mining industry.
- Transportation of coal should be reach 22 million ton/year urgently by changing sleeper, double tracking, increasing of new station.
- May, 2009 Central Government promised to support for double tracking project in South Sumatra. However, project is delaying now and it is expected to reach target of transportation volume of 22 million ton/year.

BAPPEDA long term 20years (2005~2025) development plan also mentioned 3 main targets of transportation sector as follows;

- Road construction in East-Midland area.
- Development of cargo terminal.
- Railway construction from Palembang to Tanjung Api Api Port.

Final destination of the above listed railway construction plan is Tanjung Api Api Port, the same destination of this project. Currently, this project plans to increases transportation capacity by taking most cost effective means of “Railway transportation - River transportation by barge - Tanjung Api Api Port”, which coincides with BAPPEDA long term plan.

Chapter 2

Project Rationale

2.1. Coal Industry in South Sumatra Province

2.1.1. Overview

Coalfields in Indonesia are found all over the country, but the most significant resources lie on the island of Kalimantan and Sumatra.

Sumatra in particular holds almost half of the coal resources in the country. Some of the major coalfield includes the Central - South Sumatra Coalfield that stretches throughout the South Sumatra, Jambi and Riau Provinces, the Ombilin Coalfield in West Sumatra Province, and the Bengkulu Coalfield in Bengkulu Province.

Central - South Sumatra Coalfield hosts coal from the Neogene period. With thick seams and large resource base, they provide an ideal condition for mining. However, majority of the resource are sub-bituminous coal, and mining activities to date has been limited, conducted by companies such as PT. BA.

However, with the growing demand for lower grade coal, the Central - South Sumatra Coalfield is seen as the next major supply base in Indonesia.

With the constraint on the capacity of the inland coal transportation, however, the increase in coal production is being hampered, and there is a necessity to address this issue as soon as possible.

(Source: NEDO)

[Fig. 2-1-1] Coalfields in Sumatra

(1) Coal Resources

According to the “Indonesian Coal Book 2010/2011” compiled by the Indonesian Coal Mining Association, the total coal resource in Indonesia is around 104.9billion tons.

Among those resources, Sumatra holds around 52.5billion tons, which represents almost 50% of the total, and Kalimantan hosting around 52.1billion tons. Almost all of the coal resources in Indonesia lie within these 2 islands.

[Table 2-1-1] Coal Resources in Indonesia by Region

Region	Resources (million tons)	Percentage (%)
Sumatra	52.449.87	50.0
Kalimantan	52,100.79	49.6
Others	389.55	0.4
Total	104,940.21	100.0

(Source: compiled from data obtained from Indonesian Coal Book 2010/2011)

Within Sumatra, most of the coal resources are concentrated in South Sumatra Province, with the province holding almost 90% of the total.

[Table 2-1-2] Coal Resources in Sumatra by Province

Province	Resources (million tons)	Percentage (%)
South Sumatra	47,085.07	89.77
Banten	13.31	0.03
Lampung	106.95	0.20
Bengkulu	198.65	0.38
Jambi	2,069.07	3.94
West Sumatra	732.16	1.40
Riau	1,767.54	3.37
North Sumatra	26.97	0.05
Nanggroe Ache	450.15	0.86
Total	52,449.87	100.00

(Source: compiled from data obtained from Indonesian Coal Book 2010/2011)

(2) Coal Production

Although Sumatra holds the largest coal resources in Indonesia, majority of the production comes from Kalimantan.

[Table 2-1-3] Coal Production in Indonesia by Region

(Unit: thousand tons)

Region	2005	2006	2007	2008	2009
Sumatra	11,035	12,360	12,098	17,415	19,180
Kalimantan	154,558	184,179	204,832	222,818	211,377
Total	165,593	196,539	216,930	240,233	230,557

(Source: compiled from data obtained from Indonesian Coal Book 2010/2011 and 2011 Coal Manual)

PT. BA accounts for a large portion of coal produced in Sumatra.

[Table 2-1-4] Coal Production in Sumatra by Company

(Unit: thousand tons)

Company	2005	2006	2007	2008	2009
PT. BA	8,607	9,292	8,555	10,099	10,831
Others	2,428	3,068	3,543	7,316	8,349
Total	11,035	12,360	12,098	17,415	19,180

(Source: compiled from data obtained from Indonesian Coal Book 2010/2011 and 2011 Coal Manual)

In terms of production from South Sumatra Province only, the share of production by PT. BA increases significantly.

[Table 2-1-5] Coal Production in South Sumatra Province by Company

(Unit: thousand tons)

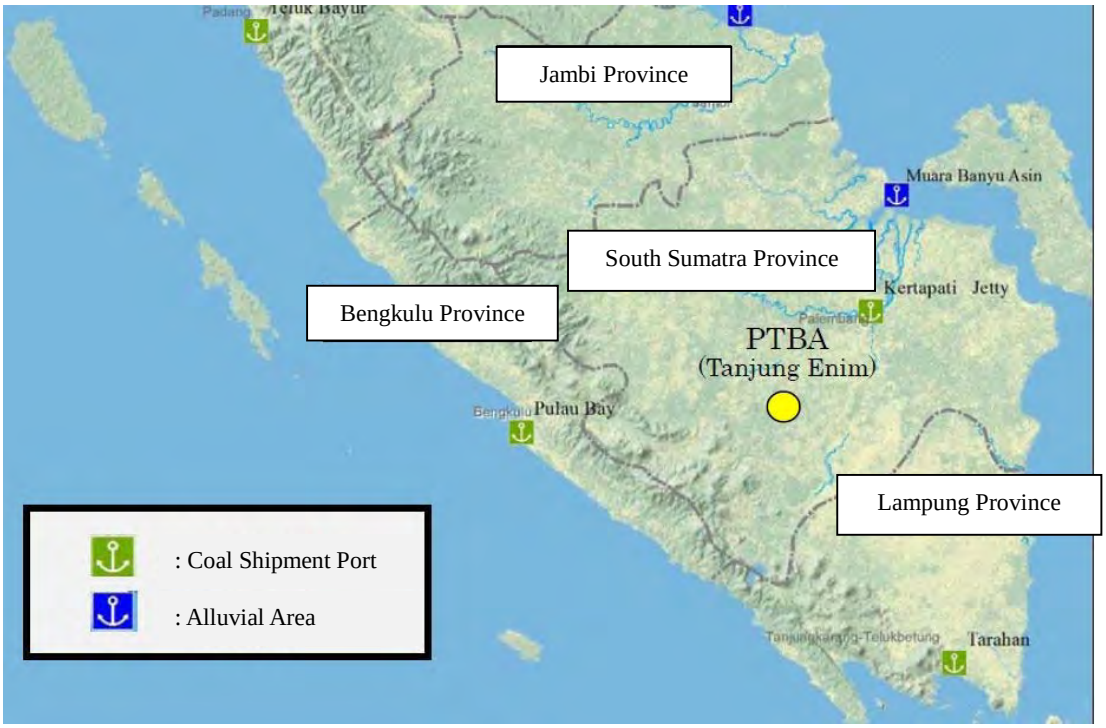
Company	2005	2006	2007	2008	2009
PT. BA	8,607	9,292	8,555	10,099	10,831
Others	-	-	-	656	1,054
Total	8,607	9,292	8,555	10,755	11,885

(Source: compiled from data obtained from Indonesian Coal Book 2010/2011 and 2011 Coal Manual)

(3) Inland Transportation and Shipping Infrastructure for Coal

PT. BA is the largest coal producer in South Sumatra Province. Their mine is located in Tanjung Enim. Coal mined by PT. BA is railed to either Kertapati barge loading facility at

Palembang or to Tarahan Port, that is located in the adjacent province of Lampung, to be shipped out.



(Source: NEDO)

[Fig. 2-1-2] Infrastructure Used by PT. BA in South Sumatra Province

Meanwhile, there are many private companies that hold mining rights in Muara Enim and Lahat Regencies that is in close proximity to PT. BA's mine. Some of those private companies conduct coal mining, and they are being transported by trucks mainly on public roads to Kertapati or other barge loading facility to be shipped.

Therefore, modal distribution of coal transportation is equal to replace the "PT. BA" to rail and "Others" to road in the [Table 2-1-5] (P. 2-4). Since it was PT. BA alone that used railway until 2007, the railway share was 100% by then, but since private coal mines started production in 2008, the share of road has been picking up. As a result, the railway share is about 91% and the rest is road in 2009.

2.1.2. Development Plan and Agenda

(1) Development Plan

With the increasing demand for lower grade coal, Sumatra, with its vast coal resources is attracting significant attention. In South Sumatra Province also, there are numbers of plan for the

development of coal mines and expansion of production capacity.

The development and expansion plans within the Muara Enim and Lahat Regencies in particular are set out in [Table 2-1-6] below.

[Table 2-1-6] Production Capacity of Coal Mines in Muaraenim and Lahat Regencies

(Unit: thousand tons)

Company/Mine	2010	2011	2012	2013	2014
PT. BA	12,500	12,500	12,500	12,500	12,500
Bara Alam Utama	-	800	2,500	4,000	4,000
Reliance	-	-	-	2,700	5,500
Pendopo	-	-	-	-	200
Batualam Selaras	200	500	500	500	500
Batubara Lahat	1,000	1,000	1,000	1,000	1,000
Total	13,700	14,800	16,500	20,700	23,700

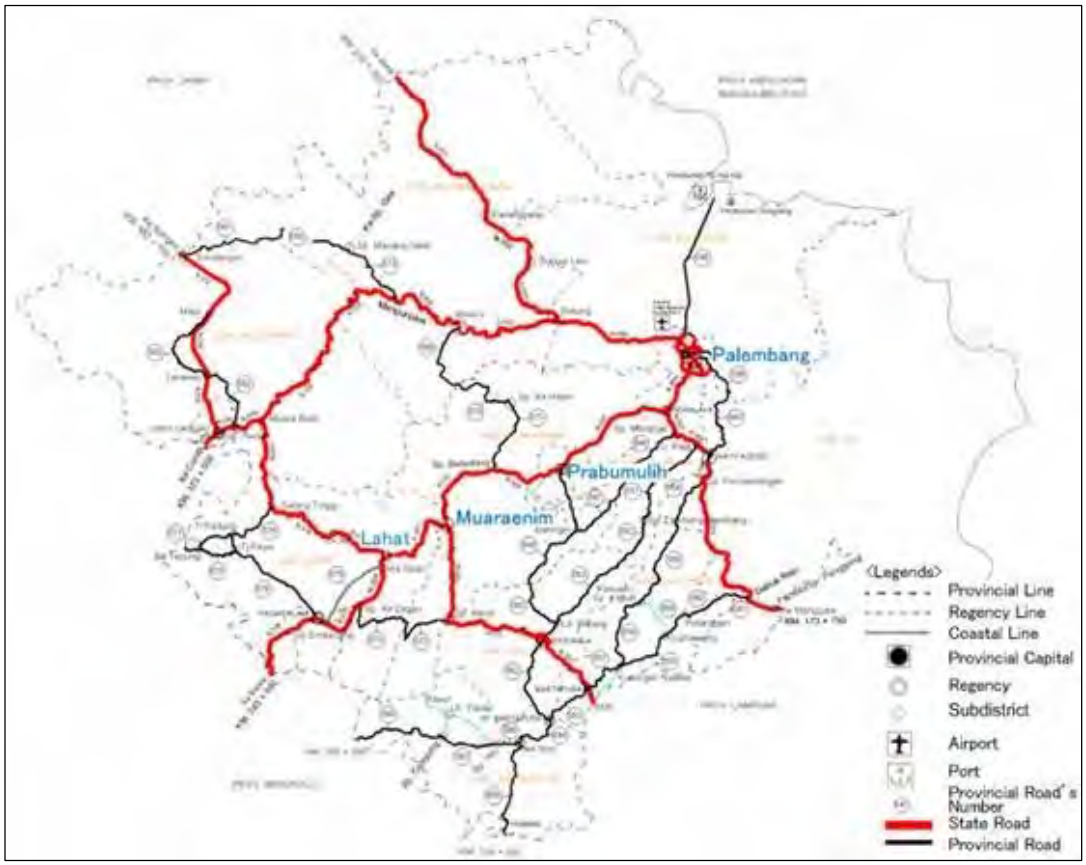
(Source: compiled from data obtained from Indonesian Coal Book 2010/2011and company announcements)

(2) Agenda

As discussed earlier, there are plans to almost double the coal production by 2014 from mines in Muara Enim and Lahat Regencies in South Sumatra Province. However, constraints on the inland transportation capacity may prove to be a roadblock for such expansion.

PT. KAI's rail operation is running at almost full capacity transporting coal produced by PT. BA, with little room for additional tonnage. Besides, transportation by track on public road is also limited because coal tracks are allowed to pass after 17:00 of a day until 8:00 of the next day and the volume of coal load of each track is limited to 10 ton. These measures are taken because as it can be seen in [Fig. 3-1-6], the road network in South Sumatra has no alternatives but to use national road connecting Lahat to Kertapati only which leads to deterioration of road due to insufficient maintenance, and also leads to environmental problem such as air pollution, noise and vibration along the road. As a result, about 37% of the national road is damaged as it is shown in [Table 3-1-8]. The number of registered vehicle is rapidly increasing in recent years as shown in [Fig. 3-1-7] and it is expected that the trend will continue, thus the coal transportation by road will be affected due to short of maintenance and environmental concerns.

And as such, the expansion of coal production capacity in Muaraenim and Lahat Regencies must be accompanied by an increase in inland transportation capacity, which will be the major challenge going forward.



(Source: Public Work Service of South Sumatra Province)

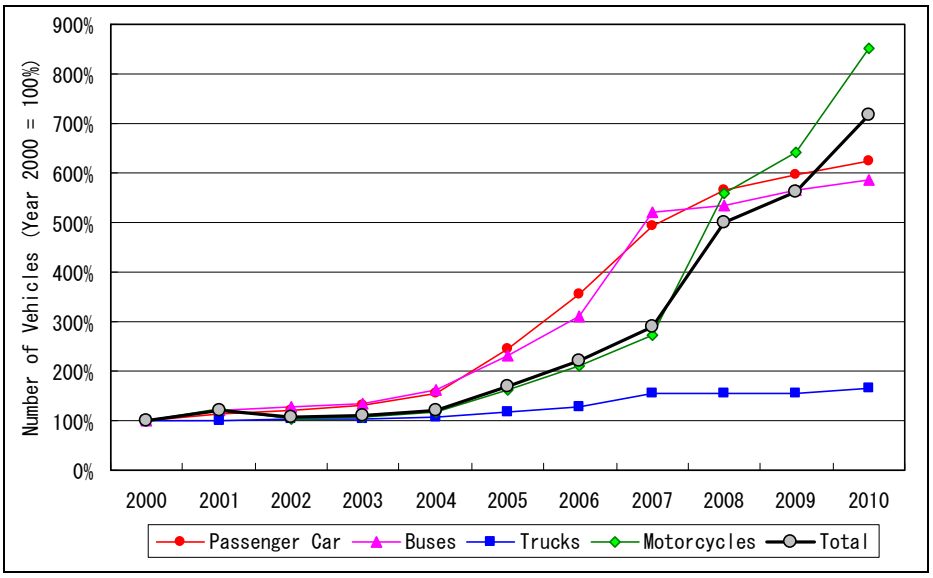
[Fig. 3-1-6] (Re-taken) Roads Network of South Sumatra Province in 2010

[Table 3-1-8] (Re-taken) Length of Roads by Type of Surface in South Sumatra Province in 2009

(Unit: km)

Type of Condition	State		Provincial		Regency		Total	
	Length(km)	Rate(%)	Length(km)	Rate(%)	Length(km)	Rate(%)	Length(km)	Rate(%)
Good	827.1	63.7	495.4	28.3	9,514.4	62.6	10,836.9	59.4
Medium	424.8	32.7	608.3	34.8	-	-	1,033.1	5.7
Slightly Damaged	46.3	3.6	498.0	28.5	3,900.1	25.6	4,444.4	24.3
Heavy Damaged	-	-	146.8	8.4	1,788.0	11.8	1,934.8	10.6
合 計	1,298.2	100.0	1,748.5	100.0	15,202.5	100.0	18,249.2	100.0

(Source: Mid-term Development Plan for South Sumatra Province 2008-2013, BAPPEDA)

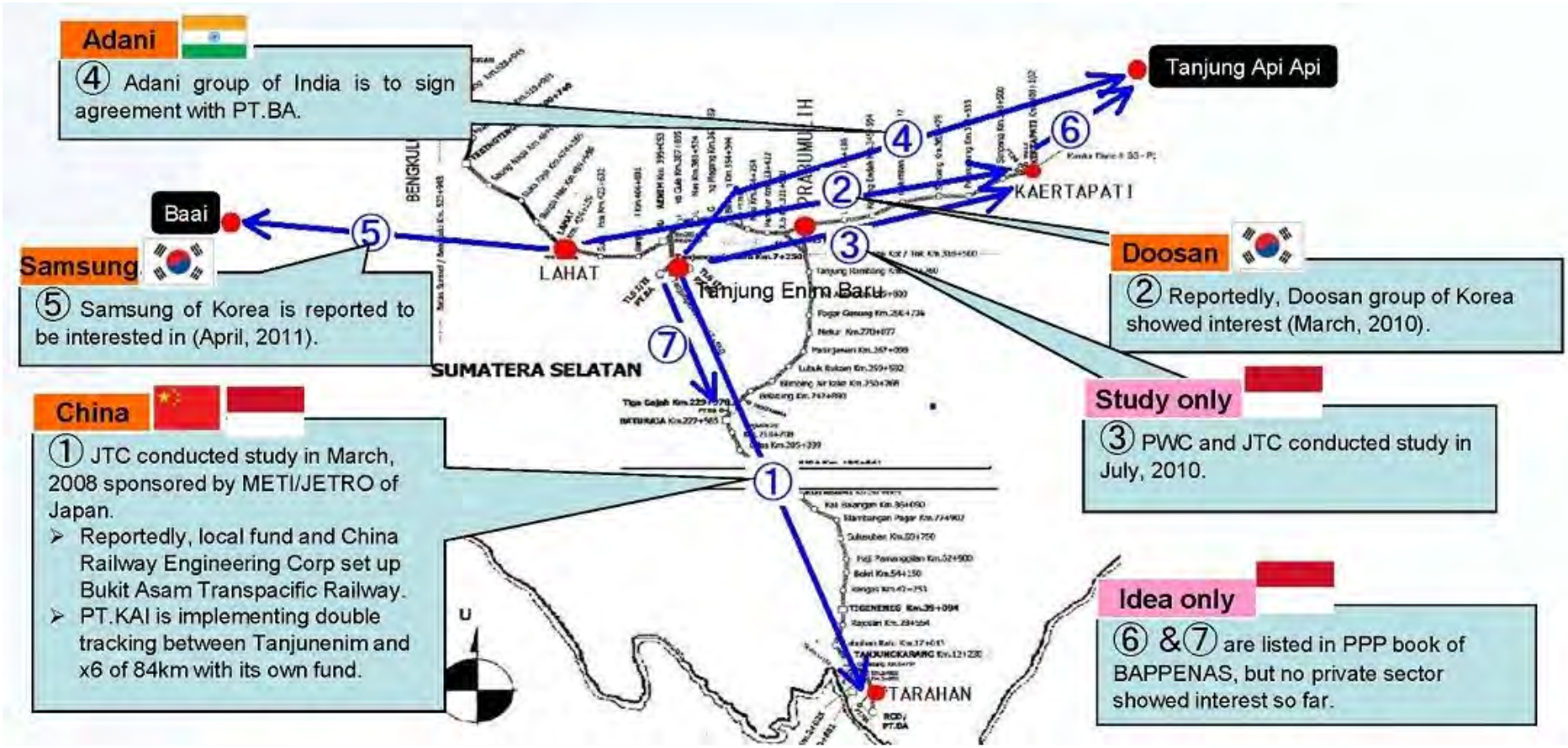


(Source: Statistical Yearbook of Indonesia 2000-2011, BPS)

[Fig. 3-1-7] (Re-taken) The Number of Registered Motor Vehicles by Type in South Sumatra Province (Year 2000 = 100%)

2.1.3. Private Sectors Initiatives

Given such major challenge, many studies have been or are being conducted to look into the expansion of coal railing capacity from Muaraenim and Lahat Regencies. However, those initiatives are merely a study at this moment, and there are no concrete plans to implement the upgrade. This is mainly because those plans are based on obtaining offtake rights of coal, or is being based on a BOT scheme. For example, all of the project being mulled by Adani Group (India), Samsung C&T (Korea) and CREC (China) are aiming to conclude a BOT contract based on PT. BA's coal. For more details on each group's plan, refer to Chapter 2.3.2. (P. 2-13).



(Source: Study team)

[Fig. 2-1-3] Studies to Expand Railing Capacities from Muaraenim and Lahat Regencies

2.2. Railway in South Sumatra Province

2.2.1. Present Situation and Problem

70% of railway freight of Indonesia is handled in Sumatra island. Major commodities are coal, pulp, fertilizer, cement which constitutes more than 90% of all freight.

Presently, coal transportation by rail in South Sumatra is almost for PT. BA from Tanjung Enim to Tarahan, Kertapati. The transportation volume is 10MTPA for Tarahan and 2MTPA for Kertapati respectively.

Since railway transportation capacity is saturated at this moment, coal transportation by rail to be allocated for private coal companies is limited to PT. BAU only with the volume of 0.5MTPA going to Kertapati. Other private coal companies have no choice but to depend on road transportation by 10ton truck. The road transportation is not expected to be expanded with several limitations such as traffic volume, traffic jam, bad road condition, and environmental problem. At present, local government restricts coal transportation by truck during night time between 6:00PM to 8:00AM. As such, it is an urgent agenda in South Sumatra transportation sector to shift the coal transportation mode from road to railways by strengthening railway transportation capacity.

Meanwhile, South Sumatra provincial government has a long term plan of constructing new railway going to Tanjung Api Api and seaport terminal there. However, it is projected to take time and big construction cost to materialize the plan because the new line is located in swampy area with land subsidence.

2.2.2. Railway Development Funds and Provincial Government

The State takes major part of budgetary responsibility for the development and maintenance of the railways sector in Indonesia. In 2010, the railroad sector budget of the South Sumatra Provincial government was Rp.86.4billion (JY 0.78billion) against the aggregate State budget allotment of Rp. 3,916.9billion (JY 35.61billion), while only accounting for 2.2%[1]. A large part of the budget emanates from infrastructure development both in the State and South Sumatra government, while accounting for 98.4% and 100% in 2010, respectively[2].

Over the past 5 years from 2006 to 2011, the railroad sector budget of the Provincial and the State governments increased by 4.1% and -19.8% respectively in real terms (2006 price level)[3].

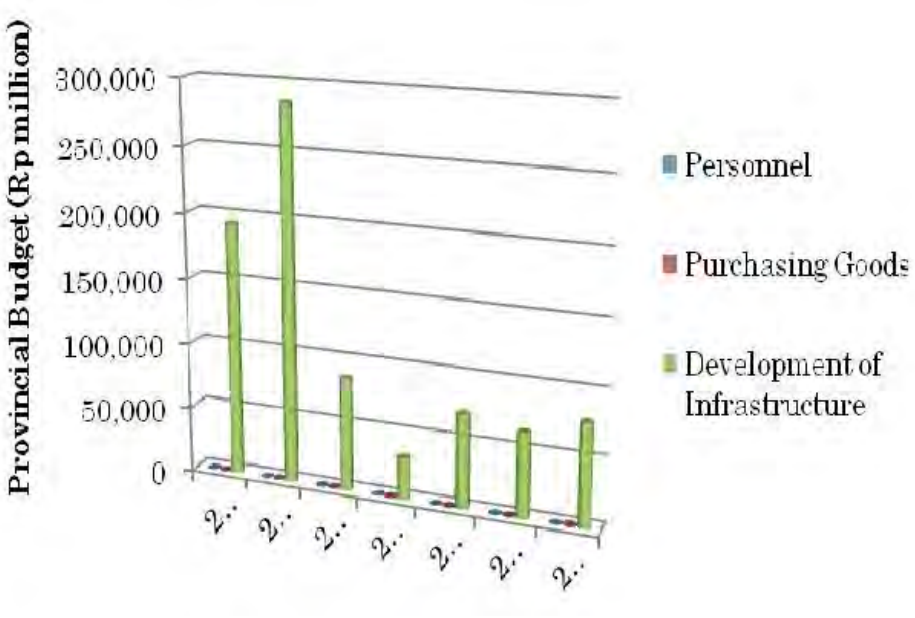
---

[1] Source: DGR, Project Management of South Sumatra Railways Infrastructure Projects, February 2012

[2] Besides infrastructure development, budget in 2010 was allotted to personnel and procurement of goods, accounting for 0.6 % and 1.0 %, in that order.

[3] Inflation rates from 2007 through 2011 are placed at 6.4%, 10.3%, 4.9%, 5.1%, 5.4% 6.4%, 10.3%, 4.9%, 5.1%, 5.4% in descending order. (Source: Bank of Indonesia)

Nonetheless, funds of the Provincial government to the sector in 2012 is anticipated to bounce back to Rp. 78.7billion (JY 0.71billion), increasing by 21.5% in nominal term.



(Source: Project Management of South Sumatra)

[Fig. 2-2-1] South Sumatra Provincial Government Budget (real term)

2.2.3. Railway Tariff and Provincial Government

While the Law No. 23 of 2007 on railway deregulation pointed out an important role and participation of local governments and the private sector in the sector finance and operation, provincial government plays diminutive part in administratively setting railway tariff scheme. Passenger tariffs (commercial and Non-commercial) are revised every year by DGR in compliance with "The Regulation of the Minister of Transportation No. 34/Year 2011" (February 28, 2011) on calculation procedure and determination of passenger and freight transport tariff by train. Basic tariff (BT, Rp. per passenger-km) imposed on operator including PT. KAI is figured out by the following formula. Meanwhile, freight tariff is set by agreement between PT. KAI and customers.

Basic Tariff (BT) (Rp. per passenger-km)

= [(100% + Profit) × Base Cost[4]] ÷ [Load Factor[5]× Passenger Capacity × Travel Distance]

[4] Aggregate of capital, operating costs, and expenses maintenance/repair

[5] load factor which is the proportion of passengers with a payload capacity

2.3. Justification of the Project

The objective of the Project is to help increase the coal production volume of private coal mines located around Lahat area by expanding transportation capacity which is the major factor for restricting production volume. Therefore, this type of project is usually formulated with private sector initiative. In fact, many private sector initiative projects are proposed as it can be seen in [Fig. 2-1-3] (P. 2-9), but none of them are considered to be firm. Here exists the reason why this project is proposed to be formulated in PPP scheme using ODA facility.

Firstly, due to large amount of initial investment with long term recovery period which is eminent in railway projects is mentioned, most of railway projects are initiated by public sector. Secondly, although it is peculiar in South Sumatra, the huge impact of coal industry to regional economy is mentioned. Furthermore, considering the fact that the coal industry in South Sumatra is in one of the 2 biggest production sites in Indonesia, the impact to Indonesian national economy by coal production hike is huge as well. Thirdly, since the development of regional economy in South Sumatra is tied to Palembang city, provision of cheap and stable transportation means to secure access to Palembang city will greatly contribute in reducing regional poverty, which complies to ODA principle.

The followings are the details of the justification.

2.3.1. Priority and Requirement of the Project

The result of hearing survey is as follows:

(1) South Sumatra Government

It is the first priority for South Sumatra government to develop coal mining and also rerated railway transportation is very important. All the parties concerned that the study team made hearing including BAPPEDA, PT. KAI, PT. BA, and private coal mine companies, PT. BAU expressed strong desire to expand railway transportation capacity for coal.

(2) BAPPEDA Medium Team Plan (5 Years)

Medium term 5 years (2008~2013) development plan of BAPPEDA says that the target railway coal transportation is 22MTPA for the year 2010. Although the implementation is being delayed by PT. KAI which is undertaking operating & maintenance of railway in South Sumatra due to budget allocation priority of PT. KAI and expectation to private investment, this project still secures high priority and support by South Sumatra Government.

(3) PT. KAI's Latest Transport Plan

According to the latest coal transportation plan of PT. KAI, transportation target of PT. BA's coal in the year 2014 is 20MTAP ton for Tarahan and 2.7MTPA ton for Kertapati respectively. In order to achieve this target, double track construction between Muaraenim and X6 is going on by PT. KAI's own financing. Moreover, PT. KAI is planning to use the land located east side of Kertapati station for stock yard for private coal mining companies and also planning to construct new railway line to Mariana (35km) as part of its long term development plan.

Further, the following information has been obtained through various hearings from PT. KAI's senior managements.

- By 2020, the total of 70MTPA capacity will be achieved in South Sumatra, namely 5MTPA (Lahat to Kertaati), 15MTPA (Lahat to Mariana), 20MTPA (Lahat to Tarahan) and 30MTPA (Lahat to Slengsen).
- Further, the total of 100MTPA capacity will be achieved in the future.

It has been determined that, instead of railway operation by SPC, SPC's participation in PT. KAI's master plan by purchasing rolling stock and conducting infrastructure development to PT. KAI under "B to B scheme" will be the most ideal and practical solution.

2.3.2. Concerns by Private Investors on the Project

This project is targeting to increase coal transportation capacity making use of existing railway line for carrying coal produced by private companies in collaboration with PT. KAI. On the other hand, there are several new railway construction projects called "Special Railway" under BOT scheme proposed by India group, China Group and Korea Group. However, those "Special Railway" projects have several problems, such as land acquisition, huge amount of project cost, buying right of PT. BA coal, and its target operation is scheduled to 5 years later (after year 2017). Since all of these plans are targeting to carry PT. BA's coal only, transportation demand of private coal mining companies is out of the scope of these "Special Railway" plan. Meanwhile, the project proposed by this study aims at expediting the double tracking project which is implemented by PT. KAI under its "Capacity Expansion Plan" and this is the earliest possible way for capacity expansion. Present proposed projects are listed in [Table 2-3-1] below and the feasibility study, project proposal and financial arrangement of these projects are undertaken by each group independently.

[Table 2-3-1] Railway Coal Transportation Plan in South Sumatra

No.	Project Company	Route	Traffic Volume	Project Cost	Scheme	Remarks
1	PT. KAI	1) Lahat - Kertapati (190km) (East Route) Double track 2) Lahat - Tarahan (390km) (South Route) Double track	1) 2.7 MTPA 2) 20 MTPA	unknown	Own Fund	Muaraenim - X6 section, Double Track (under construction)
2	Transpacific : 80% PT. BA : 10% China Railway : 10%	Lahat - Tarahan (390km) (South Route) New Line	25 MTPA	U$4,800mil	BOT 20yr	Finance: CDB/ ICBC/China EXIM Target Operation : 2017
3	Adani Group (India) : 98% South Sumatra Gov. : 2%	Lahat - Tanjung ApiApi (270km) (N-E Route)New Line + Port construction	35 MTPA	U$1,600mil	BOT 30yr	(Coal Handling) Adani/PT. BA : 60%/40%
4	Samsung C&T (Korea)	Tanjung Enim - Baai Port(120km) (West Route) New Line	25 MTPA	U$1,500mil	BOT	Mountain railway to Bengkulu

(Source: Study team)

2.3.3. Involvement in Project by Other Institutions of Relevance

(1) The Asian Development Bank (ADB)

ADB has thus far had no experience in financing to PPP scheme projects in Indonesia. As regards the involvement to the coal-related projects, the Bank has recently been in a position not to extend any loans or technical assistances (TAs) due largely to ① The World Bank is now very reluctant to any lending/TAs to coal, ② environment issues that coal would aggravate worldwide environment, and ③ policy drive to encourage shifting of energy sources from fossil to renewable energy.

(2) The World Bank (The International Bank for Reconstruction and Development)

The World Bank has since early 2000s supported PPP projects in Indonesia to the road sector (highway toll road projects). Bank support to the railroad sector was the advisory technical assistance to DGR for institutional reform in 2000, and no bank has come ever since. As regards coal-related projects, Board of the Bank has rejected all of the Bank involvement due to ① environment issues that the use of coal would inversely effect worldwide environment by CO_2 emission, and ② policy drive to encourage shifting energy sources from fossil to renewable energy. In the light of global warming and climate change issue, the Bank expressed skepticism on the Indonesian Presidential commitment of decreasing 26% of CO_2 by the year 2025.

In association with the Law 23/2007 on railway deregulation regarding decentralization of

PT. KAI to institutionally split Divisi Regional (Divre III) South Sumatra, the Bank advised that no policy discussion has recently taken place in the Government, as such the concerned issue would have been dropped off from the Government's policy agenda. Unlike other transport sectors including roads and ports, railway sector has remained slumbering in growth and profitability except in South Sumatra, thereby leading to unlikeliness of PT. KAI to split concerned profit-making region from its management.

Reflecting the Bank view of lingering inefficiency in managing sector policy and operation by MOT and PT. KAI, World Bank is soon to issue Public Expenditure Review (PER) on the Indonesian railway sector to identify policy issues of and impediments lying to sector reform. With policy commitment of the Government to fulfill conditionalities set out in PER, the railroad sector reform loan would come in place to discussion and processing by the Bank.

Following the port sector, the Bank is soon to publicize PPP tool kit (technical and financial-economic analyses model) of the railway sector on the Bank website for free of charge.

(3) International Finance Corporation, WB Group (IFC)

IFC is a member institution of the World Bank Group focusing on the private sector enhancement in developing economies by providing financing and advisory services to help creating job opportunities by local business entities, as well as mobilizing capital market in the country. IFC likewise does not get involved in coal-related projects worldwide due to environment issue.

(4) Indonesian Infrastructure Finance (PT. IIF)

Established in 2010 by the equity participation of the Government of Indonesia, the Asian Development Bank (ADB), International Finance Corporation (IFC), and DEG (Deutsche Investitions und Entwicklungsgesellschaft mbH), PT. IIF is a non-bank financial institution focusing on providing long term Indonesia Rupiah funding for infrastructure projects by the private sector. PT. IIF provides fund up to 20% of the total project cost to commercially viable private infrastructure projects through debt instruments, equity participation or infrastructure financing guarantee for credit enhancement. Shareholding scheme of PT. IIF is depicted in [Fig. 2-3-1] below[6]. No financing record has been made thus far. While coal related projects would not be rejected by PT. IIF, finance decision depends on discussions with and concurrence from shareholders including ADB/IFC.

Meanwhile, as part of institutional framework for PPP infrastructure development in the country, PT. Indonesia Infrastructure Guarantee Fund (IIGF) provides guarantee over certain investment risks to enforce PPP project financial viability to facilitate the participation of the

[6] Source: http://www.ptsmi.co.id/ptiif.php

private sector to infrastructure development.

(Source: Study team)

[Fig. 2-3-1] Shareholding Structure of PT. IIF

2.3.4. Consistency with Government Railway Plan and Law

(1) Consistency with Government Railway Plan and Law

In compliance with the long Term National Development Plan which mapped out the development vision for the 20 years, the Government of Indonesia officially published the Master Plan for the Acceleration and Expansion of Indonesian Economic Development (MP3EI) on May 27th 2011. This master plan is constitutes the center of long-term plan 2011 – 2025, in which it is mentioned with regard to coal production in South Sumatra region that the bottleneck in promoting coal development is the insufficient land transportation capacity because mining sites are located far away from harbor. Therefore, it is noted that railway infrastructure development is an important strategy from the point of view of transportation efficiency and global environment. In This plan, specific projects are also listed as follows.

① Railway development of Tanjung Enim - Lampung and Tanjung Enim – Kertapati
② Railway construction between Kertapati, Simpang and Tanjung Api Api.
③ Railway coal transportation between South Sumatra and Lampung.
④ Railway construction between Muaraenim and Tanjung Carat.

This project corresponds the ① above.

(2) New Railway Law

New Railway law No.23 was issued in 2007. Main purpose of the law is to allow Local Government and/or private companies to participate in railway service so that improvement of railway services is expected because PT. KAI will not be able to make monopoly of railway

service under this new law.

- Under new railway law 23/2007, main role of DGR is administration of railway and approval for any railway development infrastructure which local government will conduct.
- Meanwhile, local government also has responsibility for local railway administration and requested to work with private company to minimize development cost.
- The target of this project is to expand the railway capacity of existing railway in collaboration between private company and PT. KAI in line with 5 years medium plan of South Sumatra Government (BAPPEDA). The scheme proposed by this study is completely different from "Special railway" projects which are proposed by other private groups. Involving private company for finance and technical aspect will make strong support for the implementation of the project smoothly and expeditiously.
- As mentioned in the section 2.3.2. (P. 2-13), at present several railway development projects are planned in South Sumatra with redundant manner under new Railway Law. However it is expected to be streamlined in taking lead by South Sumatra Provincial Government as the major beneficiary of coal which is the biggest local industry, in coordination with DGR, PT. KAI, PT. BA and private investors together to find out the best solution for the development of local economy.
- As mentioned in the section 2.3.1. (P. 2-12), it has been determined, through various meetings with PT. KAI's senior managements, to change the project scheme to "B to B scheme", and this has been basically acknowledged by both PT. KAI's managements as well as DGR's managements.

2.4. Necessity of PPP Scheme

Having heard from various sources, it has been confirmed that there are high demands to transport coal by railway especially from Lahat to Kertapati, and it is an urgent necessity to promptly increase the transport capacity because there are various private coal mines in this area.

In South Sumatra, there are some plans to enhance transportation capacity such as ① capacity expansion plan by PT. KAI, ② capacity expansion plan by Chinese, Indian and Korean companies. As for the plan ①, PT. KAI prioritize their another capacity expansion plan to Tarahan where there is a coal terminal owned by PT. BA. As for the plan ②, in order for them to conduct their project, firstly they have to acquire land and it is very difficult only for private company to proceed because project costs are too high. Therefore, they have much problem in starting their project.

On the other hand, this project should be considered as a project under the cooperation between public and private. Because so far almost of coals owned by private mining companies

are transported by truck to Kertapati and proposed SPC will mainly transport coals owned by them. Considering the soundness and speed to cope with the situation, this study proposes to implement the Project in 3 stages to upgrade the non-electrified railway section between Lahat and Kertapati. In the 1st Stage, priority is given to quick remedy to the situation. Since Indonesian government is not in a position to improve the railway section by acquiring ODA financing for the time being, this study proposes private sector to finance for the infrastructure improvement component of the Project. However, railway projects are usually on the responsibility of public sector due to its huge initial investment cost and long investment recovery period. Therefore, it is necessary for this project to have public sector involved in order to attract private sector investment. Although, the main objective of the Project is to expand the coal transportation capacity, the Project will contribute to regional development and the involvement of public sector in the Project can be justified, thus the application of PPP scheme to the Project will be justified as well. In the 2nd and the 3rd Stages, since the cost for the infrastructure component will be even bigger than the 1st Stage, this study proposes to have public sector the greater involvement.

(1) The 1st Stage:

This scheme is to expand transportation capacity as big as possible with the existing single track. A Special Purpose Company (SPC), being established principally by private sectors, undertakes ① track rehabilitation work for Larat - Kertapati line and ② procurement of necessary rolling stock (locomotives and wagons) and loading/unloading facilities under the long term leasing contract between PT. KAI and SPC. Considering urgency and feasibility of this project, SPC will deal with urgent matter including its funding.

(2) The 2nd Stage and the 3rd Stage:

The 2nd Stage scheme is to expand transportation capacity as big as possible with the partial double track and the 3rd Stage is to achieve the coal transportation demand of 20MTPA. The SPC undertakes ① procurement of necessary rolling stock (locomotives and wagons) and ② outsourcing their operation & maintenance of rolling stocks and track to PT. KAI, while PT. KAI or DGR undertakes double-tracking works for Lahat - Kertapati line by borrowing loans from JICA in order to meet future demands.

No matter whichever the country including Indonesia, it is very difficult for only private company to construct new railway due to some problems such as land acquisition, relocation of residents, environmental matter, obtaining business licenses, etc. On the other hand, exporting coal can contribute to economic growth in Indonesia and implementing this project under the support of Indonesian and Japanese government can make the relationship between Indonesia and Japan stronger.

Chapter 3

Project Scale Formation

3.1. Demand Forecast for Target Railway Line and Section

3.1.1. Existing Condition of Land Transportation in South Sumatra Province

(1) Railway Transportation

① Freight Transportation

Result of the investigation for railway freight transportation in PT. KAI Divre Ⅲ from 2000 to 2011 are summarized here. The volume of railway freight transportation is shown in [Table 3-1-1] and [Fig. 3-1-1]. [Fig. 3-1-1] shows the volume of railway freight transportation setting 2000 number to 100%. [Fig. 3-1-2] shows the share of the volume of railway freight transportation by commodity in 2011.

The share of coal transportation of PT. BA is particularly big. The coal transportation volume from Tanjung Enim to Tarahan was 9.4MTPA and from Tanjung Enim to Kertapati was 2.1MTPA in 2011. The coal transportation volume had been stable with little fluctuation up to 2007, but it increased from 2008. Coal transportation of PT. BAU started in April 2011 and the coal transportation volume from Sukacinta to Kertapati was 0.146MTPA.

And the transportation volume of fuel oil, pulp and clinker in 2011 was 0.492MTPA, 0.394MTPA and 0.344MTPA respectively. The fuel oil transportation volume was stable with little fluctuation and increased about 8% compared with 2000. Although the transportation volume of pulp and clinker had a big fluctuation, it increased about 20% compared with 2000. Cement and fertilizer were transported by regular trains in the past, but fertilizer transportation ended in 2008 and cement transportation ended in 2010.

The share of railway freight transportation by commodity is shown in [Fig. 3-1-2]. The share of the volume of coal transportation is 90% in the volume of all railway freight transportations, and particularly the coal transportation is high with the share of 72% for the section between Tanjung Enim - Tarahan. The share of fuel oil, pulp and clinker transportation is 3 - 4%.

The railway service section and frequency of freight trains are shown in [Table 3-1-2].

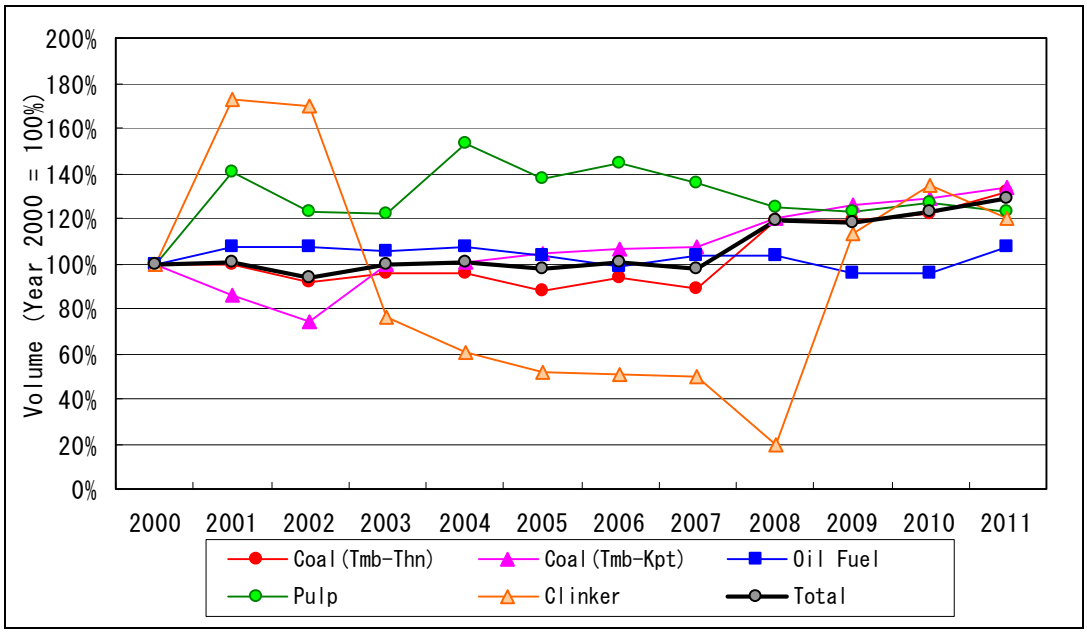
[Table 3-1-1] Railway Freight Transportation Volume

(Unit: ton/year)

Year	Commodity										
	Coal (PT. BA)			Coal	Fuel Oil	Pulp	Clinker	Cement	Fertilizer	Others	Total
	Tmb-Thn	Tmb-Kpt	Tmb-Tjh	(PT. BAU)							
2000	7,116,100	1,580,189	26,610	-	457,130	321,298	286,240	28,820	0	213,789	10,030,176
2001	7,068,750	1,359,238	71,640	-	489,544	450,779	493,740	24,780	0	130,889	10,089,360
2002	6,539,600	1,168,650	105,660	-	491,994	396,341	486,593	18,310	0	171,840	9,378,988
2003	6,788,850	1,579,500	112,020	-	483,649	391,669	217,051	296,790	2,244	130,724	10,002,497
2004	6,806,350	1,593,062	123,411	-	491,729	491,504	173,833	287,197	9,408	125,431	10,101,925
2005	6,263,050	1,653,901	138,085	-	472,350	442,618	148,139	311,316	9,574	328,443	9,767,476
2006	6,690,650	1,684,140	139,080	-	451,147	462,791	146,190	322,750	13,753	181,277	10,091,778
2007	6,322,400	1,695,690	136,330	-	473,813	437,099	142,710	311,910	15,140	235,184	9,770,276
2008	8,480,300	1,897,490	125,850	-	472,089	402,185	56,580	255,240	4,650	274,819	11,969,203
2009	8,477,600	1,995,085	119,470	-	438,903	394,550	323,490	9,420	0	71,797	11,830,315
2010	8,712,100	2,041,190	112,735	-	437,800	406,311	386,120	8,970	0	259,741	12,364,967
2011	9,368,000	2,108,710	87,810	145,934	492,447	393,889	343,860	0	0	8,055	12,948,705

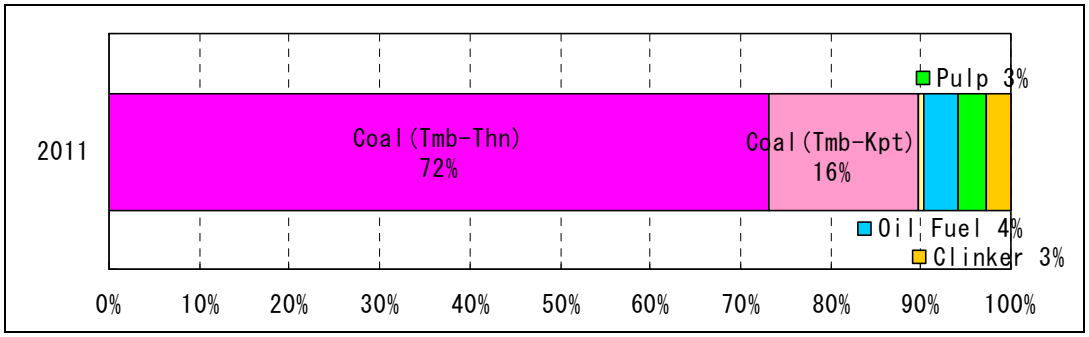
Note: Tmb - Tanjung Enim, Thn - Tarahan, Kpt - Kertapati, Tjh - Tigagajah

(Source: PT. KAI Divre Ⅲ)



(Source: PT. KAI Divre Ⅲ)

[Fig. 3-1-1] Railway Freight Transportation Volume (Year 2000 = 100%)



(Source: PT. KAI Divre Ⅲ)

[Fig. 3-1-2] Railway Freight Transportation Distribution by Commodity (Year 2010)

Regular trains have been operated for cement, fertilizer and mixed commodities in addition to present commodities, but the trains went out of service in 2008. Presently, freight train service provided by PT. KAI have limited transportation commodities based on the annual contract and a new coal transportation of PT. BAU started in April 2011.

Coal transportation train frequency is particularly high. In 2011, the number of PT. BA's coal transportation trains was 36trains/day for one way to Tarahan, 16 to Kertapati and 2 to Tigagajah. The number of PT. BAU's coal transportation trains was 12trains/day for one way to Kertapati. The total number was 66. The number of coal transportation trains in 2011 increased by 6trains

/day for one way to Tarahan and by 12 to Kertapati compared with 2010. The all coal transportation trains aren’t operated every day.

All coal transportation trains run through between Muaraenim and Prabumulih X6 and many coal transportation trains run through between Prabumulih X6 and Kertapati. So the total number of trains between Muaraenim and Kertapati is over line capacity in 2011.

[Table 3-1-2] Operation Section and Frequency of Freight Trains

Commodity	Section				Distance (km)	Conditions of Contract	Train Frequency[1] (one-way/day) 2002	2004	2006	2008	2010	2011	Remark
Coal - PT. BA	Tanjung Enim	(Tmb)	Tarahan	(Thn)	403.2	Negotiation	22	22	24	28	30	36	
	Tanjung Enim	(Tmb)	Kertapati	(Kpt)	159.0		14	12	14	16	16	16	
	Tanjung Enim	(Tmb)	Tigagajah	(Tjh)	169.4		2	2	2	2	2	2	
Coal - PT. BAU	Sukacinta	(Sct)	Kertapati	(Kpt)	179.3	Negotiation	-	-	-	-	-	12	Operation strart in Apr. 2011
Oil Fuel - PT.Pertamina	Kertapati	(Kpt)	Lubuklinggau	(Llg)	305.2	Negotiation	2	2	2	4	4	4	
	Kertapati	(Kpt)	Lahat	(Lt)	189.9		2	2	2	0	0	0	
	Kertapati	(Kpt)	Tigagajah	(Tjh)	170.1		2	2	2	2	2	2	
Pulp - PT. TEL	Niru	(Nru)	Tarahan	(Thn)	344.1	Negotiation	2	2	2	2	2	2	
Clinker - PT. SB	Tigagajah	(Tjh)	Kertapati	(Kpt)	170.1	Negotiation	4	6	4	2	4	4	
	Tigagajah	(Tjh)	Pidada	(Pid)	228.0		2	2	2	2	0	0	Operation end in Nov. 2008
Cement - PT.SB	Tigagajah	(Tjh)	Pidada	(Pid)	228.0	Negotiation[2]	2	2	2	2	0	0	Operation end in Nov. 2008
Fertilizer	Kertapati	(Kpt)	Pidada	(Pid)	398.1	Negotiation	2	2	2	2	0	0	Operation end in Nov. 2008
	Kertapati	(Kpt)	Lubuklinggau	(Llg)	305.2		2	2	2	2	0	0	
Mixed Freight Train	Kertapati	(Kpt)	Pidada	(Pid)	398.1	Non negotiation	2	2	2	2	0	0	Operation end in Nov. 2008
	Kertapati	(Kpt)	Lubuklinggau	(Llg)	305.2		2	2	2	2	0	0	
Sugar	Bekri	(Bki)	Kertapati	(Kpt)	346.0								
	Bekri	(Bki)	Lubuklinggau	(Llg)	491.4								
Casaba Powder	Bekri	(Bki)	Kertapati	(Kpt)	346.0								
Silica Sand	Panjang	(Pjn)	Tigagajah	(Tjh)	229.2								
Rubber	Lubuklinggau	(Llg)	Kertapati	(Kpt)	305.2								
	Tebingtinggi	(Ti)	Kertapati	(Kpt)	256.4								
Hulled Rice	Kertapati	(Kpt)	Pidada	(Pid)	397.7								
	Kertapati	(Kpt)	Lubuklinggau	(Llg)	302.6								
Freight by Passenger Train	Kertapati	(Kpt)	Tanjung Karang	(Tnk)	387.9	Non negotiation	2	2	2	2	0	0	Operation end in Dec. 2009
	Kertapati	(Kpt)	Lubuklinggau	(Llg)	305.2		2	2	2	2	0	0	

Note: 1) Refer to GAPEKA for train frequency. GAPEKA is the train operation timetable of PT. KAI.

2) Cement is a non negotiation commodity from Dec. 2008.

(Source: PT.KAI Divre Ⅲ)

② Passenger Transportation

Result of the investigation for railway passenger transportation in PT. KAI Divre Ⅲ from 2000 to 2011 are summarized here. The volume of railway passenger transportation is shown in [Table 3-1-3] and [Fig. 3-1-3]. [Fig. 3-1-3] shows the volume of railway passenger transportation setting 2000 number to be 100%. The percentage distribution of the volume of railway passenger transportation by class in 2011 is shown in [Fig. 3-1-4].

The total volume of railway passenger transportation was decreasing till 2004, but the total volume was increasing from 2005. The volume of railway passenger transportation was 2.0MPPA (million passenger per annum) in 2011.

Regarding the volume of railway passenger transportation by class, the volume of executive class had been showing a little change till 2008, but it increased again after the volume decreased in 2009. The volume of executive class in 2011 decreased about 10% compared with 2000 and the volume was 0.13MPPA. After the volume of business class decreased about 50% from 2001 to 2003, the volume is slightly decreasing. The volume of business class in 2011 decreased about 53% compared with 2000 and the volume was 0.391MPPA. The volume of economy class had been changing a little till 2005, but the volume was increasing from 2006. The volume of economy class in 2011 increased about 88% compared with 2000 and it was 1.03MPPA. The volume of local economy class operated from 2008 is continuing increasing. The volume of local economy class in 2011 increased more than twice compared with 2008 and it was 0.458MPPA.

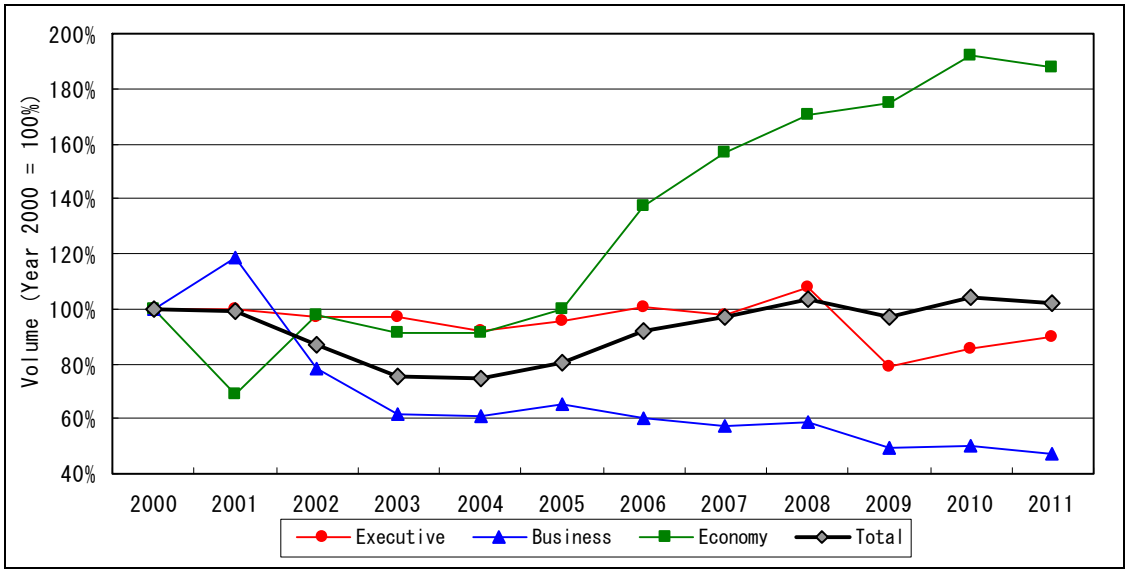
The percentage distribution of the volume of railway passenger transportation by class in 2011 is shown in [Fig. 3-1-4]. In 2011, the volume of executive, business, economy and local economy class occupied 6%, 19%, 51% and 23% respectively. The volume of economy class occupies more than half of the volume of railway passenger transportation in 2011.

[Table 3-1-3] Railway Passenger Transportation Volume

(Unit: passenger/year)

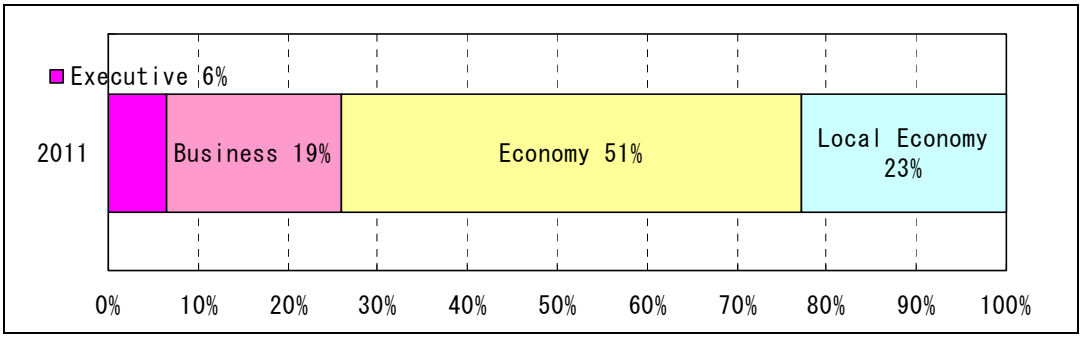
Year	Class				
	Executive	Business	Economy	Local Economy	Total
2000	144,411	831,006	549,271	—	1,524,688
2001	143,647	987,106	379,367	—	1,510,120
2002	140,371	650,638	535,755	—	1,326,764
2003	139,672	509,164	500,742	—	1,149,578
2004	132,712	507,277	500,542	—	1,140,531
2005	137,695	542,231	549,203	—	1,229,129
2006	144,811	501,826	752,199	—	1,398,836
2007	141,054	474,795	859,154	—	1,475,003
2008	156,081	489,840	934,428	221,784	1,802,133
2009	113,614	407,447	960,743	262,434	1,744,238
2010	123,131	414,825	1,055,258	346,764	1,939,978
2001	129,581	390,849	1,032,907	457,639	2,010,976

(Source: PT. KAI Divre Ⅲ)



(Source: PT. KAI Divre Ⅲ)

[Fig. 3-1-3] Railway Passenger Transportation Volume (Year 2000 = 100%)



(Source: PT. KAI Divre Ⅲ)

[Fig. 3-1-4] Railway Passenger Transportation Distribution by Class in 2011

The operation section and frequency of passenger trains are shown in [Table 3-1-4]. And the average occupancy of passenger trains by class from 2008 to 2011 is shown in [Table 3-1-5].

The operation sections of passenger trains are mainly Kertapati - Tanjungkarang and Kertapati - Lubuklinggau. There is an overnight train of executive and business classes and a daytime train of economy class operates and the each of the trains operates 1 both-way/day and a total of 2 both-way/day. In addition, the number of local economy class trains which started service in 2008 operates 2 both-way/day in the suburbs for each of Tanjung Karang and Kertapati.

The number of executive, business and economy class trains has not changed in the past 10 years. But the number of local economy class trains decreased 1 both-way/day and increased 2 both-way/day in the suburbs for each of Tanjung Karang and Kertapati. The reasons for the changelessness of the number of passenger trains except local economy class trains are that increasing the number of trains is very difficult, because there are many trains for coal transportation and there isn’t margin in line capacity between Muaraenim and Kertapati.

The average occupancy rate of passenger trains is high, and it is particularly high in the economy class trains. The average occupancy rate of passenger trains by class in 2011 is 75 - 85% in executive class, 70 - 80% in business class and over 100% in economy class. In particular, the average occupancy rate of economy class trains between Kertapati and Tanjung Karang is very high (157% in 2011).

[Table 3-1-4] Operation Section and Frequency of Passenger Trains

Train Name	Class	Train Formation 2010	Section		Distance (km)	Train Frequency* (oneway/day)						Remark
						2002	2004	2006	2008	2010	2011	
Sriwijaya	Executive & Business	2K1-4K2-1KM2	Kertapati (Kpt)	Tanjung Karang (Tnk)	387.9	2	2	2	2	2	2	Overnight Train
Sindang Marga	Executive & Business	2K1-4K2-1BP	Kertapati (Kpt)	Lubuklinggau (Llg)	305.2	2	2	2	2	2	2	Overnight Train
Raja Basa	Economy	6K3-1KP3	Kertapati (Kpt)	Tanjung Karang (Tnk)	387.9	2	2	2	2	2	2	
Bukit Sarelo	Economy	5K3-1KM3	Kertapati (Kpt)	Lubuklinggau (Llg)	305.2	2	2	2	2	2	2	
Elok	Local Economy	-	Batraja (Bta)	Kotabumi (Kb)	130.3	2	2	2	2	0	0	Operation end in Nov. 2008
Ruwahuuran	Local Economy	2KD3	Kotabumi (Kb)	Tanjung Karang (Tnk)	85.4	-	-	-	4	4	4	
Seruni	Local Economy	2KD3	Kertapati (Kpt)	Indralaya (Idr)	25.6	-	-	-	4	4	4	

Note: * Refer to GAPEKA for train frequency. GAPEKA is the timetable of PT. KAI.

(Source: PT. KAI Divre Ⅲ)

[Table 3-1-5] Average Occupancy of Passenger Trains by Classes (2008 – 2011)

Train Name	Section		Distance (km)	Class	Occupancy Rate				Remark
					2008	2009	2010	2011	
Sriwijaya	Kertapati (Kpt)	Tanjung Karang (Tnk)	387.9	Executive	103%	66%	85%	85%	Overnight
				Business	95%	86%	90%	78%	Train
Sindang Marga	Kertapati (Kpt)	Lubuklinggau (Llg)	305.2	Executive	101%	36%	69%	76%	Overnight
				Business	101%	90%	89%	69%	Train
Raja Basa	Kertapati (Kpt)	Tanjung Karang (Tnk)	387.9	Economy	144%	112%	138%	157%	
Bukit Sarelo	Kertapati (Kpt)	Lubuklinggau (Llg)	305.2	Economy	111%	109%	108%	112%	
Ruwahuuran	Kotabumi (Kb)	Tanjung Karang (Tnk)	85.4	Local Economy	139%	65%	77%	101%	
Seruni	Kertapati (Kpt)	Indralaya (Idr)	25.6	Local Economy	42%	18%	14%	20%	

(Source: PT. KAI Divre Ⅲ)

The average occupancy of the economy class trains is in high level. The congestion situation of economy class train at Kertapati station was surveyed by study team. The result of survey is shown in [Pic. 3-1-1].

	
In the outside of the ticket counters (There were some passengers unable to buy a ticket.)	On the platfom with an economy class train (Kiosks were located on the platform.)
	
On the platfom with an economy class train (Many passengers seeking shade can be seen.)	In the coach of economy class train to Lubuklinggau

Note: Above pictures were taken at Kertapati Station in November 2011.

(Source: Study team)

[Pic. 3-1-1] Congestion of Economy Class Train to Lubuklinggau

The train surveyed was the economy class train from Kertapati (9:20) to Lubuklinggau. In the outside of the ticket counters, some passengers unable to buy tickets were observed because the economy ticket was sold out. Many passengers beating the heat were waiting for departure of the economy class train on the platform and most of the seats are occpied in the coach of the economy class train. The congestion of passenger train was confirmed by looking at only 1 economy class train chosen as a sample.

One of the factors which causes the economy class trains to be overcrowded is that the economy class fare is politically capped at low price, thus railway is considered to be one of the most important transportation means to secure access to the cities for the low income population.

As mentioned above, it was confirmed that the economy class trains are functioning as the most popular transportation in the daily life. Therefore, if the line capacity between Lahat - Kertapati is increased by the implementation of the Project which will contribute to increase the number of passenger train, it is assumed that passenger train demand will be increased as well.

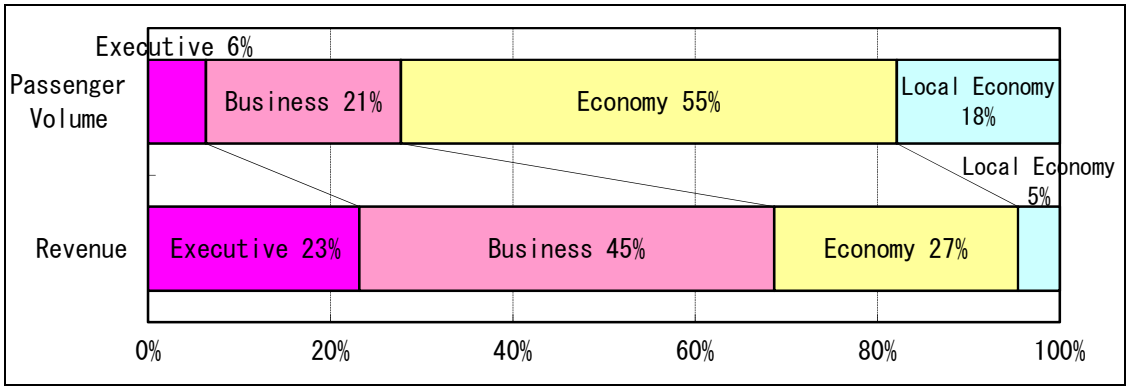
According to the data of passenger volume and revenue distribution by class in 2010, passenger volume of economy and local economy class contributes 73% of the total passenger volume. However, revenue from these two classes only contributes 33% of total revenue as shown in [Table 3-1-6] and [Fig. 3-1-5]. The reason of this condition is government control the fare of economy class to be affordable. Consequently, increasing of economy class passenger volume will not significantly contribute the revenue.

As mentioned above, it was confirmed that the economy class trains are functioning as the most popular transportation in the daily life. Therefore, if the line capacity between Lahat - Kertapati is increased by the implementation of the Project, which will contribute to increase the number of passenger train, it is assumed that passenger train demand will be increased as well. As aforementioned, increasing of economy class passenger will not significantly contribute the revenue, however, will contribute the society as a whole.

[Table 3-1-6] Comparison of Passenger Volume and Revenue Distribution by Class in 2011

Class	Passenger Volume Distribution (A)	Revenue Distribution (B)	Difference (= B - A)
Executive	6%	23%	+17%
Business	21%	45%	+24%
Economy	55%	27%	-28%
Local Economy	18%	5%	-13%

(Source: Study team)



(Source: Study team)

[Fig. 3-1-5] Comparison of Passenger Volume and Revenue Distribution by Class in 2011

(2) Road Transportation

① Road Network

The length of roads by class in South Sumatra province is shown in [Table 3-1-7] and the road network of South Sumatra province in 2010 is shown in [Fig. 3-1-6].

In 2010, the road length by administration is 1,444km for national, 1,748km for province and 13,443km for regency. Regarding the percentage distribution of the roads length by level of government authority in 2010, the national road is 9%, the provincial road is 11% and the regency road is 80%.

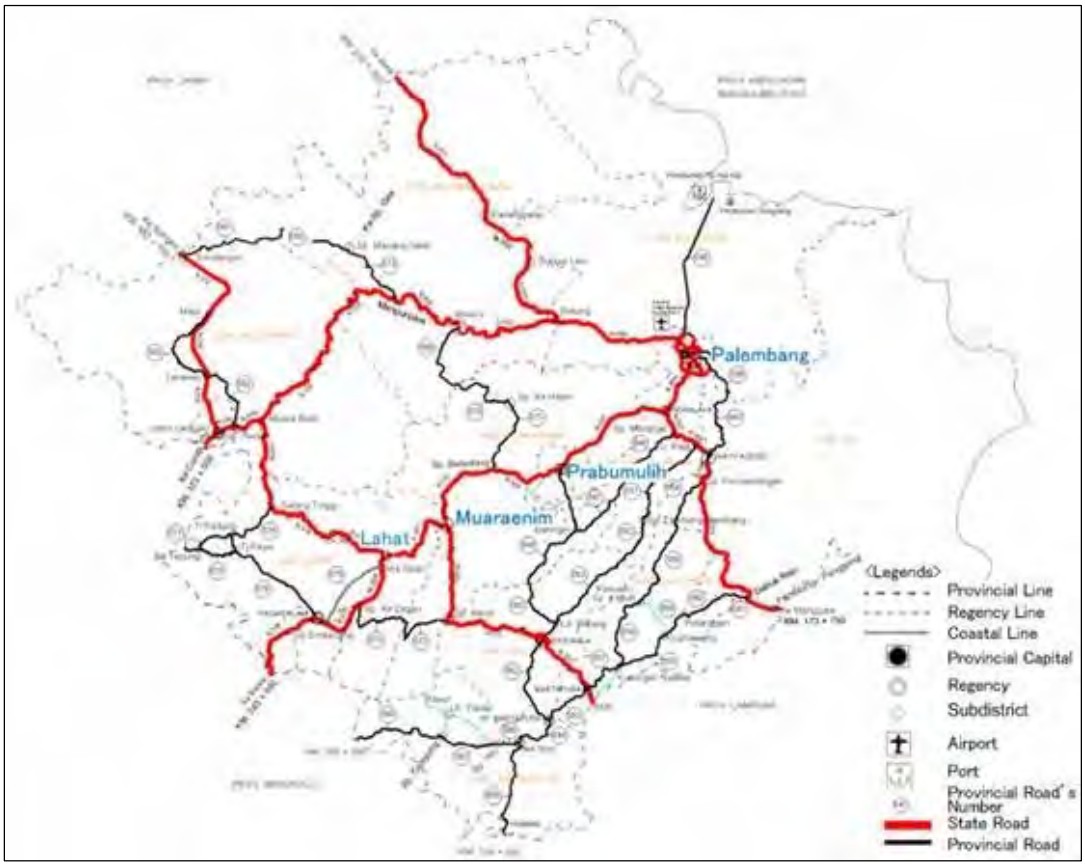
In South Sumatra, national road consists of 2 routes which connect Lampung province and Jambi province to north and south and 2 routes which connect the 2 national roads in the direction of east and west. And the national roads make the main frame of road network of South Sumatra province. The provincial roads spread in the southern part and the western part of South Sumatra province in the form where provincial roads complement national roads. Lahat and Muaraenim where many private coal mining companies are located and Palembang where river ports for coal transshipment by barge are located, are connected by national road.

[Table 3-1-7] Road Network of South Sumatra Province by Class

(Unit: km)

Year	State	Provincial	Regency	Total
2004	1,290	1,621	9,981	12,892
2005	1,290	1,621	11,269	14,180
2006	1,290	1,621	10,485	13,396
2007	1,290	1,621	11,153	14,064
2008	1,290	1,621	12,141	15,052
2009	1,444	1,748	13,215	16,407
2010	1,444	1,748	13,443	16,635

(Source: Statistical Yearbook of Indonesia 2005-2011, BPS)



(Source: Public Work Service of South Sumatra Province)

[Fig. 3-1-6] Roads Network of South Sumatra Province in 2010

The length of roads by surface condition in South Sumatra province in 2009 is shown in [Table 3-1-8]. Regarding the percentage of the length of roads in good condition by class in 2009, the national road is 64%, the provincial road is 28% and the regency road is 63%. In particular the

condition of the provincial roads is as bad as 72% of the provincial is damaged. Also 36 - 37% of the national roads and the regency roads are damaged. While the increase of the road traffic volume is expected, it can be pointed out that the maintenance and management of the roads is a subject.

[Table 3-1-8] Length of Roads by Type of Surface in South Sumatra Province in 2009

(Unit: km)

Type of Condition	State		Provincial		Regency		Total	
	Length(km)	Rate(%)	Length(km)	Rate(%)	Length(km)	Rate(%)	Length(km)	Rate(%)
Good	827.1	63.7	495.4	28.3	9,514.4	62.6	10,836.9	59.4
Medium	424.8	32.7	608.3	34.8	-	-	1,033.1	5.7
Slightly Damaged	46.3	3.6	498.0	28.5	3,900.1	25.6	4,444.4	24.3
Heavy Damaged	-	-	146.8	8.4	1,788.0	11.8	1,934.8	10.6
Total	1,298.2	100.0	1,748.5	100.0	15,202.5	100.0	18,249.2	100.0

(Source: Mid-term Development Plan for South Sumatra Province 2008-2013, BAPPEDA)

For the private coal mining companies to transport the coal from Lahat to Palembang via Muaraenim by truck, there are only 2 routes; one is the national road which connects Muaraenim and Palembang and another is the provincial roads which divert from Belimbing or Prabumulih. So since the many coal transportation trucks concentrate to the section between Lahat and Belimbing, coal truck traffic at this section is huge, thus the following problems are pointed out in the coal truck transportation (refer to [Pic. 3-1-2]). Therefore, the coal transportation trucks are restricted to use the road between 17:00 and 8:00 of the next day with the weight of less than 10ton/truck.

- The damage of the road is getting worse due to the insufficient road maintenance.
- Since the running speed of the coal trucks is slow, other vehicle transports are blocked by the trucks.
- Environmental problems are getting eminent such as dispersal of coal particles, noise, vibration, etc.

(Source: Study team)

[Pic. 3-1-2] Coal Transportation Trucks (November 2011)

② Road Traffic Volume

Since the road traffic statistics in South Sumatra is not available, the coal truck traffic volume for coal mining companies is estimated in the following way. The number will be evaluated by comparing with truck traffic capacity estimated based on 3.1.3. (1) ② (P. 3-22).

Coal transportation volume by traffic mode in 2010 is shown in [Table 3-1-9]. Since the company using rail for coal transportation is PT. BA alone by the year 2010, other companies are assumed to have been using truck.

[Table 3-1-9] Coal Transportation Volume by Traffic Mode (2010)

Traffic Mode	Volume	Estimation Basis
South Sumatra Total (A)	15.300MTPA	Production volume (South Sumatra State Statistics 2011)
By Rail for PT. BA (B)	10.866MTPA	PT. KAI South Sumatra Divre
By Truck for Private Coal Mining Companies (C)	4.434MTPA	The difference between the above. (A-B)

(Source: Study team)

The coal transportation volume by truck is estimated to be 4.434MTPA which is equivalent to 1,417trucks/day as calculated in the formula shown below.

Estimate of the number of truck (2010)
Truck number = 4.434MTPA÷10ton/truck÷313days/year = 1,417truck/day Here, ● 10ton/truck : Maximum loading capacity for one truck by regulation ● 313days/year : Working days a year taken from PT. KAI's record

The number of truck for coal transportation in 2010 is estimated to be 4.434MTPA. It signifies that the coal transportation truck traffic volume is far exceeding the truck traffic capacity of the road as big as more than double of the capacity.

- The accessible road from Lahat and Muala Enim area where private coal mines are located, to Palembang for coal transportation is only one national road with single lane for each direction.
- The working time for a coal transportation truck is assumed to be 7hours a day considering that passable time frame for the trucks is between 17:00 of a day and 8:00 of the next day and travel time of about 8hours for a truck between coal mines and coal storage yard for barge forwarding (refer 3.1.3. (2) ② (P. 3-22)). Therefore, the number of truck in an hour is assumed to be about 202 (=1,417trucks÷7hours).
- Traffic volume of truck in national road (single lane) near coal mines is assumed to be 100trucks/hour/lane (refer 3.1.3. (2) ② (P. 3-22)).
- Therefore, the number of coal transportation truck in 2010 of 202truck/hour is bigger than capacity of 100truck/hour/lane.

③ Number of Registered Motor Vehicles

The number of registered motor vehicles by type in South Sumatra province from 2000 to 2011 is shown in [Table 3-1-10] and [Fig. 3-1-7]. [Fig. 3-1-7] shows the number of registered motor vehicles by type setting 2000 number to be 100%.

Regarding the number of registered motor vehicles by type of motor vehicles in South Sumatra province in 2011, the passenger car is 383thousand units, the bus is 72thousand units, the truck is 107thousand units and the motorcycle is 2.68million units. The number of passenger car, bus, truck and motorcycle occupies 12%, 2%, 3% and 83% respectively.

The growth rate of the number of passenger cars and buses became high from around 2004 and the number of passenger cars and buses increased by about 6 times compared with 2000. The number of motorcycles increased rapidly from around 2007 and increased by about 8.5 times compared with 2000. The growth rate of the number of trucks is lower than the growth rate of other vehicle types and the number of trucks increased by about 1.6 times compared with 2000. Considering the increase of the number of registered motor vehicles by type of motor vehicles, it is

expected that the growth rate of the volume of passenger transportation by roads is much higher than the growth rate of the volume of freight transportation by roads.

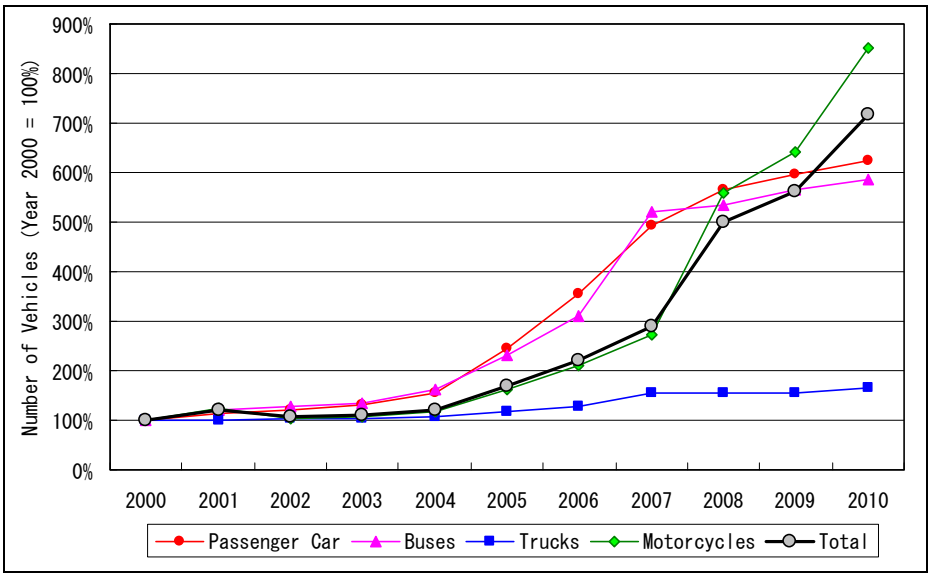
[Table 3-1-10] Number of Registered Motor Vehicles by Type in South Sumatra Province

(Unit: unit)

Year	Passenger Car	Bus	Truck	Motorcycle	Total
2000	61,409	12,283	64,830	313,996	452,518
2001	69,515	14,616	65,519	392,755	542,405
2002	73,913	15,589	66,644	325,757	481,903
2003	79,721	16,627	67,788	334,395	498,531
2004	94,866	19,747	69,120	364,998	548,731
2005	150,733	28,477	76,599	508,150	763,959
2006	218,782	38,223	83,312	663,154	1,003,471
2007	301,955	63,891	99,861	850,639	1,316,346
2008	346,968	65,611	100,033	1,757,324	2,269,936
2009	365,540	69,407	100,722	2,013,404	2,549,073
2010*	383,175	72,077	107,245	2,676,318	3,238,815

Note) *: Preliminary figures

(Source: Statistical Yearbook of Indonesia 2000-2011, BPS)



(Source: Statistical Yearbook of Indonesia 2000-2011, BPS)

[Fig. 3-1-7] The Number of Registered Motor Vehicles by Type in South Sumatra Province (Year 2000 = 100%)

3.1.2. Target and Methodology of Demand Forecast

The targets of demand forecast of this study are (1) Coal of private companies, (2) Coal of PT. BA, (3) Other freights than coal, and (4) Passengers. The methodologies of demand forecast are as explained below.

(1) Coal of Private Mining Companies

Since origins and destinations (hereinafter referred to as “OD”) of bulk cargo like coal are limited, in many cases, cargos volume by transportation mode is calculated from production plan of cargo owners. Future demand of coal transportation of private mining companies in South Sumatra province is assumed by the same method, however, capacity of existing railway and road shall be considered.

Coal transportation volume allocation to other private companies by railway is not enough because coal transportation of PT. BA is prioritized. As a result, PT. KAI only handles coal transportation of PT. BAU and no space to transport coal from others private mining companies.

In road transportation, passable time of the coal trucks is restricted to from 17:00 to 8:00 and loading capacity is restricted to 10tons/truck, due to the environmental problems as described in 3.1.1. (2) (P. 3-12). Therefore, transportation capacity of coal by truck will be limited in the near future.

Considering the contents of the various development plans by central and provincial government and also environmental problems of coal transportation by truck, expectation to increase transportation capacity of railway is very high, and also demand of coal transportation by railway will increase. Then, the future demand of coal transportation by railway and road is assumed as follows.

Railway: Demand of coal transportation is predicted based on observation of transportation demand in Lahat and Muaraenim area. Considering that coal transportation by railway will be prioritized, increasing of transportation capacity by this Project also will increases transportation demands. In case of transportation demand exceeds the transportation capacity of railway, the extra demand will be transferred to the road transport.

Road: Transportation capacity by truck is calculated based on road capacity. Road capacity per hour such as in Japan will be adopted to calculate road capacity. In calculation of road capacity, restriction of passable time in a part of South Sumatra Province is considered, and then loading capacity per truck will be multiplied with annual operation days.

(2) Coal of PT. BA

Since total production of coal by PT. BA is transported by railway based on yearly contract with PT. KAI, production plan of PT. BA is directly become transportation volume. Thus, volume of demand transportation in the future is observed by hearing survey with PT. KAI.

Specifically for transportation volume to Tarahan, specifics and working schedule of double tracking project between Tanjung Enim and Prabumulih X6 undertaken by PT.KAI and PT.BA will be taken into consideration. Projected transportation volume after the double tracking work is assumed to be the future transportation volume. In addition, for the transportation volume to Kertapati, existing transportation volume and planned improvement projects will be taken into consideration to calculate future transportation volume.

(3) Freights Other than Coal

As describe in 3.1.1. (P. 3-1), allocation for freight other than coal is limited because coal transportation in South Sumatra occupies 90% of railway freight. In addition, transportation volumes of other freights are narrowed down to yearly contract because strong influence from coal owners.

Existing transportation volume and future production plan or transportation plan of freights other than coal are estimated by hearing survey to PT. KAI. In addition, if the line capacity is increased by the implementation of transportation project and the line capacity has a margin to accommodate the projected coal transportation volume, the additional freight transportation volume is estimated based on the survey on the transportation demand of potential clients for other commodities.

(4) Passenger Transportation

Demand of passenger transportation forecast is normally conducted by establishing demand forecast model based on population growth, ownership ratio of car and motorcycle etc. However, in this study, although the OD survey data on passenger transportation volume is available, it is difficult to establish the demand forecast model with the following reasons.

The first reason is the difficulty of explaining modal choice of road and railway by service level (required time, cost, etc.), thus it is difficult to establish a reliable transportation choice model. Although the fare of railway is politically set in low price, number and volume of passenger trains is limited because coal transportation is prioritized, which means that passengers are not able to choose the rail no matter how cheap the fare. In addition, since the train frequency is limited and travel time by rail is not flexible, it is hard to assume that passengers are choosing the rail by travel time advantage.

The second reason is skepticism on the reliability of OD survey data. OD survey is conducted for all transportation modes in Indonesia every 5 years, and OD survey data in 2001 and 2006 were obtained in this study. Comparison of the 2 data on total transportation volume in South Sumatra province shows that the transportation volume in 2006 is smaller than that of 2001 by about 60%, while the number of registered motor vehicles, population and GRDP increased during the same period. This is a very unusual phenomenon therefore reliability of the OD survey data is dubious.

The third reason is the unavailability of passenger number of bus transportation which is one of the sources of modal shift to railway. Consequently, establishment of demand forecast model missing the bus transportation component has low accuracy.

According to the above reasons, transportation demand forecast is made by the hearing to PT. KAI, confirming the possibility of passenger train number increase when the line capacity was increased, and conducting regression analysis based on population growth and socio-economic variables.

3.1.3. Demand Forecast of Coal Transportation

(1) Coal of Private Mining Companies

① Market Demand

There are 17 companies in Lahat area which already started exploration, and those companies are shown in [Table 3-1-11]. According to the survey, the number of companies expecting to transport the coal by rail in 2014 is 2, namely PT. Bara Alam Utama (4MTPA) and PT. Batubara Lahat (1MTPA).

[Table 3-1-11] Private Coal Company in Lahat Area

No.	Company Name	Gov. Approval Date	Mining Area (ha)
1	PT. Baniasari Pribumi	10/MAR/2010	519.84
2	PT. Bara Alam Utama	29/APR/2010	799.60
3	PT. Batubara Lahat	23/MAR/2010	500.00
4	PT. Budi Gema Gempita	29/APR/2010	1,524.00
5	PT. Bumi Merapi Energi	27/APR/2010	1,881.00
6	PT. Dizamatra Powerindo	29/APR/2010	971.00
7	PT. Duta Alam Sumatera	27/APR/2010	357.00
8	PT. Golden Great Boreno	10/MAR/2010	1,913.00
9	PT. Muara Alam Seiahtera	27/APR/2010	1,745.00
10	PT. Mustika Indah Permai	29/APR/2010	2,000.00
11	PT. Priamanaya Energi	29/APR/2010	1,000.00
12	PT. Aman Toebillah Batubara	01/NOV/2010	687.00
13	PT. Andalas Bara Seiahtera	14/MAY/2010	150.00
14	PT. Bukit Telunuuk	21/MAY/2010	500.00
15	PT. Dianrana Petrojasa	02/JUN/2010	1,011.00
16	PT. Dianrana Petrojasa	02/JUN/2010	994.60
17	PT. Baniasari Pribumi	03/JUN/2010	730.00

(Source: MEMR)

Meanwhile, among coal mining companies in Muara Enim area, the following companies are expecting railway coal transportation:

- Reliance Group (3 coal mining companies in Muaraenim)
  - PT. Brayan Bintang Tiga Energi (12,960ha)
  - PT. Sriwuaya Bintang Tiga Energi (10,600ha)
  - PT. Sugico Pendragon Energi (13,060ha)
- PT. Pendopo Energi Batubara
- PT. Prima Mulia Sarana Seiathera (513ha)

The total future demand from private coal mines in 2014 if the ones which are presently using track is assumed to be 12.2MTPA as shown in [Table 3-1-12]. After 2014, since the coal production depends on the land transportation capacity including road, no one has clear picture on production expansion. In other words, the demand will be increased in line with transportation capacity increase.

[Table 3-1-12] Traffic Demand of Private Coal Mining Company in 2014

No.	Coal Mining Company	Mining Area	Demand of Coal Transportation (1,000 ton)
1	PT. Bara Alam Utama (PT. BAU)	Lahat	4,000
2	PT. Batubara Lahat (PT. BL)	Lahat	1,000
3	PT. Batubara Selaras (PT. BS)	Lahat	500
4	PT. Pendopo Energi Batubara (PT. PEB)	Muaraenim	200
5	Reliance Group (3 companies)	Muaraenim	5,500
6	PT. Prima Mulia Serana Seiathera (PT. PMSS)	Muaraenim	1,000
		TOTAL	12,200

(Source: Indonesian Coal Book and Survey team)

② Assumption of Future Demand

According to the market survey on coal transportation demand, it is assumed that the future demand will increase to 20MTPA, which is sufficient for the Project. The reasons are as follows. Firstly, transportation capacity by truck is limited due to the problems as mentioned in 3.1.1. (2) (P. 3-12). Secondly, there is virtually no railway construction plan connecting Lahat and Muaraenim area to coal shipping port likely to be realized as mentioned in 2.1.3. (P. 2-8) other than this project. Therefore, all of the coal transportation demand in Lahat and Muaraenim area of which the amount is 20MTPA as shown in ① above, can be counted as the future demand for this project. So, it is assumed that the maximum future transportation demand by railway will be 20MTPA up to which the transportation capacity will grow along with the implementation of this project as shown later.

In the meantime, PT. KAI has its own plan to increase the transport capacity from Lahat to Kertapati/Marina up to 20MTPA by year 2020, therefore the above assumed maximum capacity in this report can be in line with PT. KAI's own plan. As for the southern route, namely Lahat to Kertapati/Slengsen, PT. KAI plans to increase the capacity up to 50MTPA by the year 2020.

The maximum transportation volume of coal by road between Lahat and Prabumulih is estimated as follows considering the fact that the National Road (2- way and 2-lane road) is the only route available. In this estimation, transportation capacity of truck (C_T) is assumed based on average of survey result of Japanese Commercial Vehicle Ratio (P_T). Thus, in case of C_T in Lahat and Muaraenim is available, transportation capacity by truck shall be recalculated.

- Assumption of Transportation Capacity of Trucks, C_T (trucks/hour/2-lane)

(Source: Japan Road Association, Traffic Capacity of Road, Sep. 1984)

$C_T = (C_B \times \gamma_I) \times S \times P_T \div E$

$= 2{,}500 \times 0.85 \times 0.75 \times 0.25 \div 2 = 199.22 \fallingdotseq$ 200 trucks/hour/2-lane

Where;

- Basic Capacity: C_B = 2,500 pcu/hour/2-lane (at 2-way and 2-lane road)
  pcu: Passenger Car Unit
- Possible capacity: $C = C_B \times \gamma_I$
  γ_I: Correction Factor of Road Condition (= 0.85: Level ground under 2 lanes)
- Design capacity: $C_D = C \times S$
  S: Correction factor of service level (= 0.75: Service level No.1[1)] in rural areas)
- P_T: Commercial vehicle ratio ($\fallingdotseq$25%: Average of national roads in Japan[2)])
- E: Passenger car equivalence of commercial vehicle (= 2.0)

Note: 1) Service level No.1: The service level is the annual maximum peak hour traffic doesn't exceed possible capacity. The service level is applied to the road where high service is required.

2) The commercial vehicle ratio is quoted from Road Traffic Census 2005 in Japan.

● Critical Coal Transportation by Truck

- Transportation time by truck: 8hours = 240km÷30km/h (from Merapi to Gasin)
- Time zone in which truck can leave a coal mine: From 17:00 to 24:00 = 7hours
  (It is assumed that the last truck leaves mining area at 0:00 and arrives at Gasin by 8:00.)
- Maximum number of truck available: 700 trucks/day = $C_T \div 2 \times 7$ hours
- Limit of transportation by trucks: 2.2MTPA $\fallingdotseq$ 700 trucks/day×10 ton/truck×313 days/year
  (Annual operation ratio is assumed based on actual performance of PT. KAI of about 85%)

The coal transportation volume for private coal mines in the "without the project case" is set as 0.15MTPA which is the current volume for PT. BAU, the sole private coal mine using railway. According to GAPEKA 2011, train for private coal mines is allocated to 1.5MTPA with 6 roundtrip of train/day, but it has never been achieved due to railway infrastructure problems which will be rehabilitated under the Project.

Capacity expansion plan of PT. KAI was made irrelevant to the implementation of this Project. However, it should be noted that if the capacity expansion plan made by PT. KAI is not progressing on schedule, the line capacity will be tight and the future transportation demand projected in this Project of 20MTPA will be difficult to achieve.

(2) Coal of PT. BA

From the result of hearing survey to PT. KAI, the outline of capacity expansion projects of coal transportation to Tarahan is shown in [Table 3-1-13] and the projects is scheduled to be completed by 2014. Under the projects, PT. KAI is scheduled to increase the train formation of coal transportation to Tarahan into 2 new locomotives and 60 freight wagons and the number of trains

will be 20 roundtrip/day. The volume of coal transportation to Tarahan will increase from 9.4MTPA at present to 20MTPA.

In addition, while the transportation volume of coal to Kertapati is limited by the number of train and the handling capacity of barge in Kertapati, it is targeted to be increased to 2.73MTPA by 2014. This target is the same as that of 2012, thus, particular improvement of facilities and equipments are not necessary to achieve it. By the implementation of the expansion projects as shown in [Table 3-1-13], some spaces of line capacity will be available between Tanjung Enim and Prabumulih X6, thus the target transportation volume of 2.73MTPA will be achieved. Regarding the volume of coal transportation from Tanjung Enim to Tigagajah, it is also assumed that it will be possible to achieve the transportation volume in 2012 (0.245MTPA) by 2014.

[Table 3-1-13] Outline of Expansion Projects of Transportation Capacity to Tarahan

Plan for 20MTPA to Tarahan		
Investor	Item	Area
PT. BA	Development of loading facility (from 3 places to 4 places)	Tanjung Enim
	Development of unloading facility (from 2 places to 4 places)	Tarahan
PT. KAI	Double tracking	Tanjung Enim - Purabumulih X6
	Partial double tracking	Purabumulih X6 - Tarahan
	Extension of siding track	Purabumulih X6 - Tarahan

Note: Above projects will be completed by 2014.

(Source: Study team)

Based on the above, the future demand of coal transportation of PT. BA is assumed as shown in [Table 3-1-14]. As for the coal transportation to Tarahan, as the double tracking project between Tanjung Enim and Prabumulih progresses, the train delay is expected to be decreased, the present target transportation volume will be achieved, and the next target volume of 13.21MTPA will be achieved by 2013. It is assumed that the further capacity expansion projects by PT.KAI will be completed in 2014 and the target transportation volume of 20MTPA will be achieved in 2015. Here, the transportation volume in 2014 when the capacity expansion project is scheduled to be completed is set as the mean value of planned volume of 2013 and 2015, assuming that full operation of facility and equipment in 2014 is difficult.

[Table 3-1-14] Future Demand of PT. BA's Coal Transportation

Year	Coal - PT. BA (Unit : ton/year)			
	Tmb-Thn	Tmb-Kpt	Tmb-Tjh	Total
2010	8,712,100	2,041,190	112,735	10,866,025
2011	9,368,000	2,108,710	87,810	11,564,520
2012	11,288,125	2,315,140	140,140	13,743,405
2013	13,208,250	2,521,570	192,470	15,922,290
2014	16,604,125	2,728,000	244,800	19,576,925
2015	20,000,000	2,728,000	244,800	22,972,800
2016	20,000,000	2,728,000	244,800	22,972,800
2017	20,000,000	2,728,000	244,800	22,972,800
2018	20,000,000	2,728,000	244,800	22,972,800
2019	20,000,000	2,728,000	244,800	22,972,800
2020	20,000,000	2,728,000	244,800	22,972,800
2021 -	20,000,000	2,728,000	244,800	22,972,800

Note: Tmb - Tanjung Enim, Thn - Tarahan, Kpt - Kertapati, Tjh - Tigagajah

(Source: Study team)

As shown in [Table 3-1-13] expansion projects of transportation capacity to Tarahan will give significant effect to transportation demand (or transportation capacity) to Kertapati which is scope of this study as well as railway freight transportation in PT. KAI Divre III. Therefore, by understanding the progress of expansion projects of transportation capacity to Tarahan, in some cases, appropriate review of demand forecast of this Project is necessary. Thus, according to hearing and questioner to PT KAI, some monitoring criteria is recommended as shown in [Table 3-1-15].

[Table 3-1-15] Monitoring Criteria of Railway Freight Transportation Capacity (Draft)

Classification	Item	Monitoring Criteria
Progress of Expansion Projects of Transportation Capacity to Tarahan	Improvement of Loading and Unloading Facilities	・Number of Loading Facilities to be constructed in the Expansion Projects ・Number of Unloading Facilities to be constructed in the Expansion Projects
	Improvement of Railway Tranportation Capacity	・Length (or Ratio) of Double Tracking to be constructed in the Expansion Projects ・Number (or Ratio) of Stations, including Siding Track, to be improved in the Expansion Projects
Improvement of Railway Freight Transportation Capacity	Improvement of Capacity	・Railway Freight Transportation Volume by Commodity and OD (ton or ton-km)
	Improvement of Productivity	・Number of Freight Trains by Commodity and OD (Plan) ・Number of Freight Trains by Commodity and OD (Actual Result) ・Operation Rate (=Actual Result / Plan)
	Improvement of Stability	・Number of Freight Trains by Commodity and OD (On-time Operation) ・On-time Operation Rate (= On-time / Plan)

(Source: Study team)

For comparison, although the PT. KAI Master Plan was not available for the study team, according to the hearing to PT. KAI[1], PT. KAI is projecting the aggregated coal transportation volume in 2020 is as big as 70MTPA in South Sumatra area. The break down is as follows. Based on the figures, the transportation volume between Lahat and Sinpang (one station before Kertapati) comes to 20MTPA (=5+15) and the amount is exceeding the demand forecast of this study.

① Lahat-Kertapati.....5MTPA
② Lahat-Mariana (New line).....15MTPA
③ Lahat-Tarahan.....20MTPA
④ Lahat-Slengsen (New line).....30MTPA

(3) Coal Demand for Financial/ Economic Analysis

Railway transportation of coal to Kertapati is 2.1MTPA for PT. BA and the volume is

[1] The meeting with the president of PT. KAI held on March 15, 2012.

scheduled to be expanded to 2.73MTPA after the completion of PT. KAI double tracking project which is currently under work. As for the private coal mines, PT. BAU alone is using railway since 2011 with the amount of merely 0.15MTPA at present.

This project aims at expanding coal transportation capacity for private coal mines. Coal transportation demand for aggregate private coal mines in 2014 is 12.2MTPA. It means that coal production of private coal mines are virtually restrained by the land transportation capacity including truck. In other words, the railway infrastructure is far short of coal transportation demand. Therefore, the coal transportation demand to be used for economic and financial analysis in this study hinges on what is the priority of transportation, while transportation demand commands the scale of the infrastructure in conventional project analysis (except for the 3rd Stage where conventional approach will be applied). In this study the transportation demands for the 1st, 2nd and 3rd Stage are set as 2.5MTPA, 5.0MTPA and 20.0MTPA respectively from the current volume of 0.15MTPA. The calculation basis will be described in 4.2.2. (P. 4-22).

3.1.4. Demand Forecast of Freight and Passenger Transportation other than Coal

(1) Demand Forecast of Freight Transportation other than Coal

From the result of hearing survey to PT. KAI, it was assumed that considering the production capacity of cargo owner's factory, the future transportation volume is not significantly increased, there is a plan to transport wood (from Tarahan to Niru) based on yearly contract from 2012, and new commodities other than wood are currently unavailable.

The reasons for no entry of new commodities other than wood are that the cargo owners are required to secure the transportation volume by train by annual base contract and that additional freight wagons procurement is the responsibility of cargo owners. There are cases that it includes the procurement of locomotives.

As for the transportation of wood, contract between PT. KAI and PT. TEL has been agreed to prepare 1 roundtrip/day, but freight wagons are not yet procured and fare are not yet decided. In addition, the wood transportation will be carried out only when the wood in South Sumatra will run short, which is extremely low comparing with coal demand. Based on these, it is assumed that there will be no new commodity which should be taken into consideration in this study.

Based on the above, it is assumed that the future demand of freight transportation other than coal is shown in [Table 3-1-16]. It is assumed that the future demand by commodities will increase to the planned volume made in 2012 by 2014 when the capacity expansion project of PT. KAI will be completed and it will remain constant after 2014.

In addition, it is assumed that the future demand will not change as shown in [Table 3-1-16] even if this project is not be implemented. However, if the progress of capacity expansion projects

planned by PT. KAI is not on schedule, the planned volume shown in [Table 3-1-16] will not be achieved because the line capacity between Tanjung Enim and Prabumulih X6 will become tight.

[Table 3-1-16] Future Demand of Freight Transportation other than Coal

Year	Commodity (Unit: ton/year)				
	Oil Fuel	Pulp	Clinker	Others	Total
2010	437,800	406,311	386,120	259,741	1,489,972
2011	492,447	393,889	343,860	8,055	1,238,251
2012	532,898	433,593	365,240	10,000	1,341,731
2013	573,349	473,296	386,620	10,000	1,443,265
2014	613,800	513,000	408,000	10,000	1,544,800
2015	613,800	513,000	408,000	10,000	1,544,800
2016	613,800	513,000	408,000	10,000	1,544,800
2017	613,800	513,000	408,000	10,000	1,544,800
2018	613,800	513,000	408,000	10,000	1,544,800
2019	613,800	513,000	408,000	10,000	1,544,800
2020	613,800	513,000	408,000	10,000	1,544,800
2021 -	613,800	513,000	408,000	10,000	1,544,800

(Source: Study team)

(2) Demand Forecast of Passenger Transportation

The demand forecast of passenger is made by regression analysis based on socio-economic variables. The criterion variable is the number of railway passengers except for economy class passengers from 2004 to 2010 and explanatory variables are population number of South Sumatra Province and GRDP at 2000 constant market price.

Economy class was excluded from the total number of passengers as criterion variable because of the following reasons. Considering the scope and transportation characteristic of this project, passengers for medium and long distance consist of 3 classes (executive, business and economy) are targeted. However, operation frequency of passenger train is small, thus, separation of passenger volume by class will not enough. Consequently, considering total passengers as criterion variable is easier to be estimated.

The result of regression analysis between passenger volume and selected variables is shown in [Table 3-1-17]. The following equation is formulated since GRDP at 2000 constant market price shows the best statistical result as log approximation.

Demand of Passenger Transportation (passenger/year)

= 1,484,037×Ln(GRDP at 2000 Constant Market Price (billion Rp.)) – 14,783,510

The followings will explain the assumption of GRDP at 2000 Constant Market Price of South Sumatra Province, which is selected as explanatory variable. Average of economic growth rate of Indonesia from 2000 to 2010 is assumed equal with GDRP's growth rate of South Sumatra Province. According to this assumption, GDRP of South Sumatra is shown in [Table 3-1-18]. In addition, the economic growth rate of Indonesia is quoted from "World Economic Outlook Database (IMF, Sep. 2011)" (from 2011 to 2016), from "The Current of World Economy (Cabinet Office of Japanese Government, May 2010)" (from 2017 to 2029) and from "Asia 2050 - Realizing the Asian Century (ADB, Aug. 2011)" (from 2030 to 2040).

[Table 3-1-17] The Result of Regression Analysis on Railway Passenger Transportation

Explanatory Variable	Evaluation Criteria*	Approximation Formula			
		Linearization	Quadratic Polynomial	Cubic Polynomial	Logarithm
Population	Coefficient of Determination (R^2)	0.775	0.865	0.821	0.787
	Significant F-ratio	0.00556	0.00806	0.04421	0.00482
	t-value	All more than |2|	All more than |2|	All less than |2|	All more than |2|
	P-ratio	All less than 5%	All more than 5%	All more than 5%	All less than 1%
GRDP at 2000 Constant Market Price	Coefficient of Determination (R^2)	0.805	0.907	0.888	0.834
	Significant F-ratio	0.00382	0.00385	0.02223	0.00256
	t-value	Some less than |2|	All more than |2|	All less than |2|	All more than |2|
	P-ratio	Some more than 5%	Some more than 5%	All more than 5%	All less than 1%

Note: * The contents of evaluation criteria are shown as follows;

- Coefficient of determination: It is a measure of fitness for regression formula and shows the coefficient of determination adjusted for degree of freedom. It is so accurate to be close to one, and generally it is supposed to be accurate at 0.5 or more.
- Significant F-ratio: It is a probability which shows the significance of the whole regression formula. It is supposed that the significant F-ratio is less than 5% statistically.
- t-value: It is a value of which shows the significance of the explanatory variables. It is supposed that the significant t-value is absolute value of 2 or more statistically.
- P-ratio: It is a probability which judgment that the explanatory variables are significant has mistaken. It is supposed that the significant P-ratio is less than 5% statistically.

(Source: Study team)

[Table 3-1-18] Assumption of GRDP at 2000 Constant Market Price of South Sumatra Province

Category	Year	Growth Rate[1)] of GDP of Indonesia	Growth Rate of GRDP of South Sumatra	GRDP[2)] of South Sumatra (billion Rp.)
Calculation Method	—	(A_n)	$(B_n)=(A_n)*b/a$	$(C_n)=(C_{n-1})*(Bn)$
Actual Figures	2000～2010	Average 5.22%(=a)	Average 4.73%(=b)	—
	2010	6.10%	5.43%	63,736
Predicted Figures	2011	6.40%	5.80%	67,435
	2012	6.30%	5.71%	71,288
	2013	6.70%	6.08%	75,620
	2014	7.00%	6.35%	80,420
	2015	7.00%	6.35%	85,525
	2016	7.00%	6.35%	90,954
	2017	5.70%	5.17%	95,656
	2018	5.70%	5.17%	100,601
	2019	5.70%	5.17%	105,801
	2020	5.20%	4.72%	110,790
	2021	5.20%	4.72%	116,015
	2022	5.20%	4.72%	121,486
	2023	5.20%	4.72%	127,215
	2024	5.20%	4.72%	133,214
	2025	5.20%	4.72%	139,496
	2026	5.20%	4.72%	146,074
	2027	5.20%	4.72%	152,962
	2028	5.20%	4.72%	160,176
	2029	5.20%	4.72%	167,729
	2030	4.80%	4.35%	175,030
	2031	4.80%	4.35%	182,649
	2032	4.80%	4.35%	190,600
	2033	4.80%	4.35%	198,897
	2034	4.80%	4.35%	207,555
	2035	4.80%	4.35%	216,590
	2036	4.80%	4.35%	226,018
	2037	4.80%	4.35%	235,856
	2038	4.80%	4.35%	246,123
	2039	4.80%	4.35%	256,837
	2040	4.80%	4.35%	268,017

Note: 1) Growth rate of GDP is quoted from "World Economic Outlook Database (IMF, Sep. 2011)" (from 2011 to 2016), from "The Current of World Economy (Cabinet Office of Japanese Government, May 2010)" (from 2017 to 2029) and from "Asia 2050 - Realizing the Asian Century (ADB, Aug. 2011)" (from 2030 to 2040).

2) GRDP shows GRDP of South Sumatra at 2000 constant market price with oil and gas industry.

(Source: Study team)

Based on the above, it is assumed that the demand forecast of passenger transportation is as

shown in [Table 3-1-19]. According to the hearing survey to PT. KAI, it was informed that if the future demand of passenger transportation exceeds the current transportation capacity, rolling stock or train frequency will be increased. This idea is considered to be unrealistic without implementation of this Project because the present train schedule between Prabumulih and Kertapati is set as to exceed the line capacity and therefore it is not possible to increase the number of passenger train. Although it is possible to increase the number of wagon in a train from 7 to 10 in the initial stage of transportation demand increase, it will be necessary to increase the number of train for further increase of passenger transportation demand. According to the demand forecast of this study, the timing of train number increase is after 2017.

[Table 3-1-19] Future Demand of Passenger Transportation

Year	Class			
	Exective	Business	Economy	Total
2010	123,131	414,825	1,055,258	1,593,214
2011	132,727	447,154	1,137,499	1,717,380
2012	139,100	468,623	1,192,112	1,799,834
2013	145,865	491,415	1,250,092	1,887,372
2014	152,924	515,197	1,310,590	1,978,711
2015	159,983	538,979	1,371,088	2,070,050
2016	167,042	562,761	1,431,586	2,161,389
2017	172,823	582,235	1,481,126	2,236,184
2018	178,603	601,710	1,530,667	2,310,980
2019	184,384	621,184	1,580,207	2,385,775
2020	189,669	638,989	1,625,501	2,454,159
2021	194,954	656,794	1,670,794	2,522,542
2022	200,239	674,599	1,716,088	2,590,926
2023	205,524	692,404	1,761,381	2,659,309
2024	210,809	710,209	1,806,675	2,727,692
2025	216,094	728,014	1,851,968	2,796,076
2026	221,379	745,819	1,897,261	2,864,459
2027	226,664	763,624	1,942,555	2,932,842
2028	231,949	781,429	1,987,848	3,001,226
2029	237,234	799,234	2,033,142	3,069,609
2030	242,121	815,698	2,075,024	3,132,843
2031	247,008	832,162	2,116,906	3,196,076
2032	251,895	848,626	2,158,789	3,259,310
2033	256,782	865,090	2,200,671	3,322,543
2034	261,669	881,554	2,242,554	3,385,777
2035	266,556	898,019	2,284,436	3,449,010
2036	271,443	914,483	2,326,319	3,512,244
2037	276,330	930,947	2,368,201	3,575,477
2038	281,217	947,411	2,410,083	3,638,711
2039	286,104	963,875	2,451,966	3,701,944
2040	290,990	980,339	2,493,848	3,765,178

(Source: Study team)

3.2. Tasks to be investigated to Determine Facility Size

3.2.1. Necessity of Existing Facilities Improvement for Transport Capacity Expansion

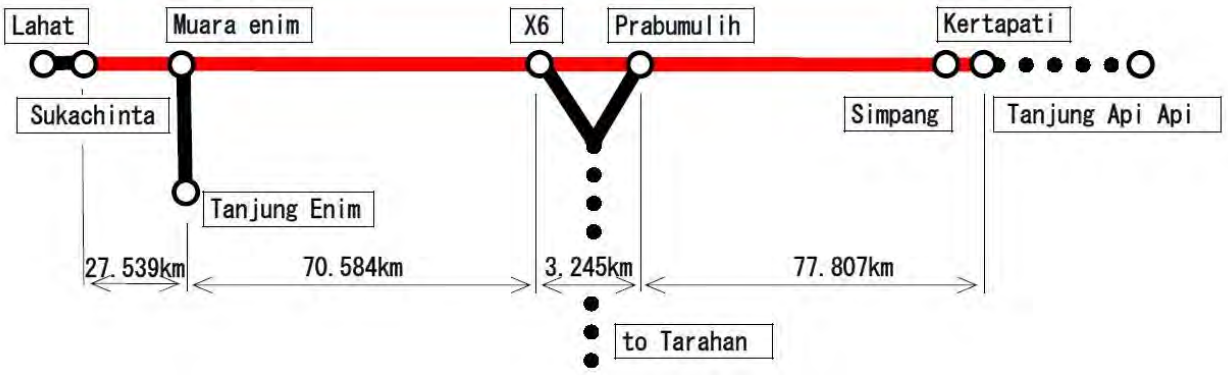
(1) Project Section

The project section of the study, as shown in [Fig. 3-2-1], is 189.864 km from Lahat to Kertapati, but since coal transportation is performed between Sukachinta and Kertapati, the transportation-capacity-expansion project study is carried out between Sukachinta and Kertapati. This section is roughly divided into 3 sections as follows, and since PT. KAI has already started the double-tracking project between Muaraenim and Prabumulih X6 section, this section is not included in the study. The technical specifications including train speed, axle load and radius of curve employed for the section complies with Indonesia Railway Standard which is applied in this project.

Coal transportation capacity expansion plan in South Sumatra which includes the double-tracking project was presented by PT. KAI. It was explained in the hearing with PT. KAI officials that the plan is going on schedule with no construction budget constrain and land clearance difficulties. However, as of March, 2012, only 28km between TLP - Prabumulih X6 was completed. This is scheduled to be completed by 2010 which is 2 years behind the schedule according to the plan. Therefore, if the work may go further behind the schedule, it will be necessary for this project to support expediting the progress.

Since the coal loading yard is located near Sukachinta station and Kertapati has a coal unloading yard, the actual study section for the project is 108.753 km.

- Between Sukachinta - Muaraenim (27.539 km)
- Between Muaraenim - Prabumulih X6 (70.584 km)
- Between Prabumulih X6 - Kertapati (81.214km = 3.407km + 77.807km)



(Source: Study Team)

[Fig. 3-2-1] Schematic Project Map

(2) Target Coal Transportation Capacity for Facility Improvement

The purpose of this project is to perform coal transportation using the existing railway from Lahat area to Kertapati. The target transportation capacity for coal from private coal mines at the final stage of the project is calculated by coal transportation demand of private coal mines of 12.2MTPA deducted by maximum track coal transportation volume of 2.2MTPA, which is 10.0MTPA. However, the current railway transportation volume to Kertapati is merely 1.9MTPA for PT. BA coal and that of private coal mine of PT. BAU is almost negligible. It means that in order to increase the private coal mine transportation volume up to 10.0MTPA from the current amount of almost zero, there is no other solution but to wholly double truck the section which is very costly as it is mentioned in Chapter 4. In addition, the transportation capacity will not be expanded by the completion of the work. Therefore, this study proposes to expand the capacity in step-by-step basis as it was mentioned in 2.4. (P. 2-17). The target capacity at each stage will be determined as follows.

① The 1st Stage

This is a measure to increase transportation capacity in maintaining the existing single truck configuration. In concrete, it is to improve railway infrastructure to cope with higher train speed and longer train set as it is described in 4.4. (P. 4-35). Therefore, the target capacity for private coal mines of the 1st Stage is determined not by transportation demand but by facility. The details will be discussed in 4.3. (P. 4-26) but the result is the addition of 2.5MTPA for private coal mines.

② The 2nd Stage

This is a measure to increase transportation capacity by partially double-truck the existing single truck. In concrete, it is to improve railway infrastructure including signaling system to cope with higher train speed and longer train set as it is described in 4.4. (P. 4-35). Therefore, the target capacity for private coal mines of the 2nd Stage is determined not by transportation demand but by facility. The details will be discussed in 4.3. (P. 4-26) but the result is the addition of 5.0MTPA for private coal mines.

③ The 3rd Stage

This is a measure to increase transportation capacity by wholly double-truck the existing single truck. The transportation capacity by wholly double-track the railway is far bigger than the transportation demand of 20.0MTPA, although the figure is not calculated in this study because it is irrelevant in the discussion.

As such, the 1st Stage was formulated giving priority on urgent remedy for the coal

transportation capacity and project cost. However, it is strongly recommended to go forward to the 2nd and the 3rd Stage in order to achieve sustainable train operation.

Regarding passenger transportation, since the train schedule will be congested by the increased number of coal freight train in the 2nd and 3rd Stages, the increase of passenger demand during the corresponding stages is proposed to be coped with increasing the number of passenger coach in a passenger train, maintaining the number of passenger train in a day. In the 3rd Stage, the number of passenger train will be increased to accommodate the expected passenger demand of about 2 times of the current level, because the line capacity in the 3rd Stage will have enough volume by the double-tracking work.

(3) Facility Improvement Measures

Storage of 100 thousand ton is possible for the capability of the coal loading yard located adjacent to the Sukachinta station judging from a field survey and collected data, and it is performing 1,280 t (about 0.46MTPA) by rail with 2 sets of train per day. However, the present condition is that even the target amount of 2.5MTPA in the 1st Stage of the project will not be achieved. Therefore, capability reinforcement of the coal stockyard is needed.

Coal loading volume is restrained by the number of a train and the size of the barge in the coal stockyard of the Kertapati. It becomes possible to increase barge loading capacity by introducing high performance conveyor belt and loader.

The basic concept of coal loading and unloading equipment reinforcement is as follows. As for the short term solution to instantaneously increase the capacity are the expansion of the existing storage facilities and equipment. As for the mid and long-term solution, they are to newly build loading equipment in a place near the coal mine, to build a coal loading and unloading facility and to build a dedicated line along the river for barge transportation.

On the other hand, in view of operation diagram, the present freight train operation number is 8 between Lahat and Muaraenim section, 55 - 58 per day between Muaraenim and Prabumulih X6 section, and 34 - 38 per day between Prabumulih X6 and Kertapati section. It turns out that at least operation of the freight train exceeds the appropriate track capacity as compared with the theoretical track capacity (0.6) between Niru and Prabumulih X6. Although there is some margin in the other sections, since the increase of the train number to be planned in this project cannot be accommodated, some actions are needed.

Although track number increase is the principal solution to increases traffic capacity in general, it requires a long construction period and it can not be a timely solution. Therefore, in order to implement this project with safety and efficient manner, it is proposed to plan a incremental implementation of traffic capacity expansion. This is a solution to quickly increase the

transportation capacity in the early stage of the project and, in the mean time, achieve the target capacity in the long run. Since the commercial transportation can be started in the early stage of the implementation, it is effective in terms of financial point of view.

The initial measures of the gradual transportation capacity expansion are speed up of train operation and extension of train length. However, judging from the observation of a field survey, the present track doesn't comply with these measures. Priority must be given to repair and reinforcement of the track of about 108km section excluding between Muaraenim and Prabumulih X6 section where the double tracking work is under way by PT. KAI as shown in the [Fig. 3-2-1].

The next measures are the extension of clear-length and increase of signaling-station for track capacity expansion.

Final measures are the expansion and reinforcement of coal loading and unloading facility and modernization of signaling and telecommunication system with adding of new track.

3.2.2. Assets of SPC

(1) Coal Loading / Unloading Facilities

With respect to the assets to be owned by SPC, it is proposed to be wheel loader, reach stacker to freight wagon and self-propelled belt conveyer. Fixed facilities to the ground such as conventional belt conveyer is proposed to be owned by either GOI or PT. KAI in the same concept as railway facilities such as track and signaling system instead of SPC, because they are considered to be fixed asset.

Other facilities and assets than the ones mentioned above are proposed to be owned by DGR in basic. The following tables show the ownership distribution of facilities and asses between SPC and GOI at each stage of the project implementation.

① The 1st Stage (2.5MPTA Target Volume) (Improvement of Existing Single Track)

[Table 3-2-1] Necessary Assets for the 1st Stage

Ownership	Target volume	2.5MTPA
Assets of SPC	Diesel Locomotive (Type CC205)	11 units (8 for main line + 2 for shunting and 1 for backup)
	Freight Wagon (2 unit of 20 ton size container for 1 unit of wagon)	210 units (equivalent to 420 pieces of container)
	Wheel loader	1 unit
	Self-propelled belt conveyer	1 set in Kertapati
	Reach stacker	1set in Kertapati
Assets of DGR financed by SPC	● Track from reinforcement between Prabumuli X6 Sta. and Kertapati Sta. (Replacement of 42kg rail to 54kg rail) ● Improvement and rehabilitation of signaling system ● Extension of station yard-line to accommodate 25 unit wagon train in Kertapati Station ● Construction of Locomotive Depot in Lahat Area for periodic inspection and crucial parts inspection equipped with repairing facilities	

(Source: Study Team)

② The 2nd Stage (5.0MPTA Target Volume)

[Table 3-2-2] Necessary Assets for the 2nd Stage

Ownership	Target volume	5.0MTPA
Assets of SPC	Diesel Locomotive (Type CC205)	15 units (13 for main line + 1 for shunting and 1 for backup)
	Freight Wagon (2 unit of 20 ton size container for 1 unit of wagon)	420 units (equivalent to 840 pieces of container)
	Wheel loader	1 unit
	Self-propelled belt conveyer	2 sets in Kertapati
	Reach stacker	3 sets in Kertapati
Assets of DGR financed by SPC	● Branch line construction from Merapi to main line of approx. 700m distance and belt conveyer ● Branch line in to PT. BAU stock yard in Kertapati Sta. ● Extension of station yard-line to accommodate 40 unit wagon train in Kertapati Station	

(Source: Study Team)

③ The 3rd Stage (20.0MPTA Target Volume)

[Table 3-2-3] Necessary Assets for the 3rd Stage

Ownership	Target volume	20.0MTPA
Assets of SPC	Diesel Locomotive (Type CC205)	36 units (27 for main line + 6 for shunting and 3 for backup)
	Freight Wagon (50 ton capacity)	840 units
	Wheel loader	2 unit
	Self-propelled belt conveyer	4 sets in Kertapati
	Reach stacker	6 sets in Kertapati
Assets of SPC financed by SPC	● Branch line construction from Merapi to main line of approx.700m distance and belt conveyer ● Branch line in to PT. BAU stock yard in Kertapati Sta. ● 3 units of belt conveyer connecting east side of Kertapati station and stock yard along Musi river ● Double tracking between Lahat and Kertapati	

(Source: Study Team)

(2) Facilities for Train Operation

Station building, platform and bridge maintenance facility are the major infrastructure for train operation but they are just among conventional railway infrastructures which should not be owned by SPC.

(3) Facilities for Track Maintenance

① Maintenance Depot

Although PT. KAI owns 2 sets of MTT for the project line section, the number will become insufficient after the completion of double-tracking. Since it is desirable to minimize the variety of railway facilities to be owned by SPC, it is proposed that MTT should buy additional unit. But, if it is not possible, alternative idea is to lease the MTT bought by SPC.

② Rail Welding Base and Transportation Car of Continuous Welded Rail

Currently rail welding is done by field welding (Thermit welding method) in PT. KAI, lot of welding faulty points are observed in the site inspection. Therefore, it is proposed to install

continuous pre-welded R54 rails by flush vat welding method of the length of about 150m at a welding base after transporting the set to the site instead of on site welding, because it can expect better welding quality and cost effectiveness. The welding base and long rail transportation car will be necessary to realize this method, and these facilities are recommended to be owned by PT. KAI, but it is also possible that SPC owns them and lease them out to PT. KAI.

(4) Facilities for Signaling and Telecommunication

The facility ownership responsibility principle is proposed to be that SPC owns minimal size of facilities to be used for the coal transportation in the long run, PT. KAI owns facilities relevant to general railway operation and maintenance, and DGR owns other railway infrastructure.

In case where SPC operates its train by itself, it is proposed that SPC owns minimal size of facilities to be used for the coal transportation in the long run too, which means that SPC owns Kertapati Operation Control Center (OCC) so that SPC can monitor the accurate departure and arrival time of trains at Kertapati station. In this addition SPC can coordinate train operation with PT. KAI.

Also in case where SPC owns facilities relevant to signaling and telecommunication system maintenance, it is recommended that a new company dedicated to the system maintenance should be established and the company should implement the maintenance work not only SPC facilities but also PT. KAI facilities in a contract basis so that better working efficiency and quality control will be achieved.

3.2.3. Necessity for Loading/ Unloading Facility Construction

In order to expand coal transportation capacity, not only the expansion of railway facilities but also improvement of coal loading/ unloading facilities is necessary, because the coal handling efficiency at the both ends of the railway line will also control in measuring the total transportation capacity of the coal.

It is observed that the present loading facility to coal freight wagon in Sukacinta, unloading facility from coal freight wagon in Kertapati, and coal transporting facility from stock yard to barge in Kertapati are not able to achieve the targeted volume of 2.5MTPA or 20.0MTPA in the project. The present condition of the capacity and the proposal of measures to achieve the project target amount in accordance with the step-by-step implementation of the project are summarized as below.

- Sukacinta/ Merapi: Presently, coal loading method to container cargo wagon employs a kind of primitive method such as to load the coal by wheel loader. The method is good for coal loading volume of 2 trains a day, but 1 additional wheel loader will be necessary to achieve the 2.5MTPA transportation target. In order to achieve the next stage target of 5.0MTPA, it

will be necessary to construct a branch line linking to trunk line from Merapi, expand coal stock yard, and establish more efficient loading system using belt conveyer and silo. Furthermore, in order to achieve the 20.0MTPA target, another 2 set of conveyer will be necessary.

- Kertapati Station: Presently, only 1 reach stacker is being operated to transfer coal filled containers from wagons to trucks and transfer vacant containers from the trucks to the wagons which takes about 3 hours. The loading/ unloading capacity of this method with 2 times of freight trains a day comes to 1,280 ton a day. In order to achieve the project target of 2.5M TPA, additional 1 reach stacker will be necessary. In order to achieve the next stage target of 5.0MTPA, additional 1 branch line for coal train and additional 2 reach stacker will be necessary. Furthermore, in order to achieve the 3rd Stage target of 20.0MTPA, the reach stacker forwarding method will not be enough and alternative method such as expanding the stock yard up to 20 ha of space and installing 6 sets of belt conveyer to directly reach barges will be necessary.

- Loading site to Barge in Kertapati: At present, since an old fashioned belt conveyer system of which the head can not be tilted is employed, not only the coal forwarding capacity to the barges is limited but also flattening work of coal piled up at the same spot is necessary, which resulted in the forwarding capacity of 400 to 500 ton an hour. Furthermore, the space of the stockyard is limited and barges have to be moved back and forth in order to adjust the position of the belt conveyer head so that the height of piled up coal mountain can be even. In order to achieve the project target volume of 2.5MTPA, additional 1 set of self propelled type belt conveyer equipped with swing head will be necessary so that it can select best position for the efficient coal forwarding work. In order to achieve the target of 5.0MTPA, additional 1 set of the same type of conveyer will be necessary.

Chapter 4

Project Planning

4.1. Review of Planned Construction Site and Existing Facilities

The following describes the present condition of facilities based on the field survey and data collection between Sukacinta and Kertapati.

Earthwork consists of cutting and embankment and civil engineering and railway structures consist of station platforms, bridges, small-scale pipes and culverts, and level crossing. Schematic drawing of double tracking project between Muara Enim and Prabumulih conducted by PT. KAI is shown in [Fig. 4-1-1].

(Source: Study team)

[Fig. 4-1-1] Route Sketch

The distance between stations and effective length are shown in [Table 4-1-1]. Almost all stations have track effective length of less than 700 m. Therefore, when the number of hauling freight wagons of a train is increased to expand transportation capacity, the necessary track effective lengths to accommodate freight train will not be enough. From long-term viewpoint, it is necessary to provide about 1 km of track effective length for each station. Although almost all stations were constructed in level gradient, track gradient between stations from Lahat to Kertapati is down-slope of about 5‰ to 10‰. Therefore, consideration of slope change and detailed investigation is necessary to extend track effective length. In addition, interference with level crossing around each station also shall be closely investigated.

The maximum design speed is 70 km/h for all sections as shown in [Table 4-1-2]. However, according to visual inspection, the actual operation of train speed is about 45 km/h. Detailed investigation on the causes of low-speed operation shall be conducted, whether the track, rolling

stock or outdated signal facilities. Improvement and removal of the aforementioned causes will possibly increase train operation speed of about 65 km/h.

As shown in [Table 4-1-3], there are many level crossings without crossing gate equipment which shall be improved. Moreover, as shown in [Table 4-1-4], there are also many curves with radius of less than 500 m which subject to speed limitation. In order to increase train operation frequency, improvement of curve and particular location which become bottleneck is indispensable.

As shown in [Table 4-1-5], many of bridges are steel type bridge. Since many steel bridges were already reconstructed, bearing force problem will not be a problem. According to the field survey observation, although sleeper and girder must be fixed together for open-floor type bridges, it was found that there are many missing fastening bolts and unfastened parts. Although reason of these problems is unclear, it can be assumed that track maintenance on the bridges is not carried out properly.

Moreover, many mud-pumping has been found near level crossings, which also become obstacle of high speed operation of train. Track material is not replaced for long time period, and all rails and sleepers are outdated, thus replacement is necessary.

Signal equipment is old mechanical type. Although embrocating by oil lubrication is performed, disorder of diagram still occurred, mostly by failure of locomotive and signal equipment. Taking into consideration of the present situation, increase of transport capacity will become possible by introducing of electrical signaling system to shorten block section and introducing of security equipment by ATS, ATC, etc.

[Table 4-1-1] Distance Between Stations and Track Effective Length

No	Station		Kilometer Point	Distance (m)	Track Effective Length(m)	
					Main Track	Side Track
1	Lahat	LT	434+159	10,527	402	342
2	Sukacinta	SCT	423+632	16,781	175	137
3	Banjarsari	BJI	406+581	10,758	263	225
4	Muara Enim	ME	396+093	8,198	402	342
5	Muaragula	MRL	387+895	6,366	1,283	1,284
6	Ujanmas	UJM	381+529	7,929	1,490	1,491
7	Penanggiran	PGR	373+600	6,561	1,000	1,000
8	Gunungmegang	GNM	367+039	12,695	1,550	1,550
9	Blimbingpendopo	BIB	354+344	10,090	1,415	1,415
10	Niru	NRU	344+254	10,832	1,114	1,114
11	Penimur	PNM	333+422	7,913	1,335	1,335
12	Prabumulih X6	X6	325+512	3,407		
13	Prabumulih	PBM	322+105 (To LT) 322+295 (To KPT)	15,893	452	508
14	Lembak	LEB	338+188	7,406	661	661
15	Karangendah	KED	345+594	8,228	461	461
16	Glumbang	GLB	353+822	9,657	700	700
17	Serdang	SDN	363+479	9,856	700	700
18	Payakabung	PYK	373+335	15,165	493	493
10	Simpang	SIG	388+500	11,602	706	706
20	Kertapati	KPT	400+102		1,335	1,335

(Source: Study team)

[Table 4-1-2] Maximum Design Speed by Section

Section	Maximum Design Speed(km/h)
LT - ME	70
ME - PBM	70
PBM - KPT	70

(Source: Study team)

[Table 4-1-3] Number of Level Crossing by Section

Section	With Gate Equipment	Without Gate Equipment
LT - ME	7	9
ME - PBM	11	20
PBM - KPT	9	16

(Source: Study team)

[Table 4-1-4] Number of Curves by Section

Section	R ≤ 200m		200m < R < 500m		R ≥ 500m		Total	
	No	Length (m)	No	Length (m)	No	Length (m)	No	Length (m)
LT - ME	1	211	23	6.758	16	5.206	40	12.175
ME - PBM	0	-	23	4.923	65	19.629	88	24.552
PBM - KPT	0	-	0	-	32	10.428	32	10.428

(Source: Study team)

[Table 4-1-5] Number of Bridges by Section

Section	Steel Bridges	Concrete Bridges	Sub Structure		Number of Bridges	Box Calvert etc.
			Abutment	Pier		
LT - ME	9	2	12	5	6	125
ME - PBM	10	8	34	1	17	177
PBM - KPT	16	0	32	0	16	76

(Source: Study team)

4.1.1. Current Condition of Track Structure and Track Material

Condition of railway facilities investigated during field survey is shown in [Table 4-1-6]. Photographs of site conditions are shown in the [Pic. 4-1-1].

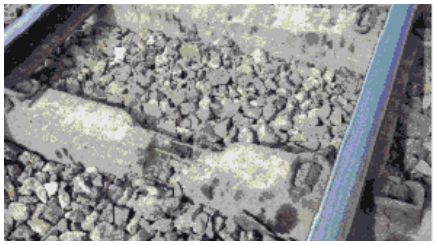
[Table 4-1-6] Present Condition of Railway Facilities Inspected during Field Survey

Section	Survey point	Kilometerage	Rail	Condition of Track
Prabumulih - Kertapati	Kertapati	400+102	R42	● Sleeper is hidden by the ballast. ● Ballast is contaminated by soil.
	Simpang	388+500	R42	● Aging PC sleeper, about 30% of sleepers is cracked, and exposed steel bar was found. ● Although grain refined coal is settled on ballast surface from sleeper edge to ballast shoulder, it seems not mixing inside the ballast.
	Near a level crossing (Kerangenda)	350+000	R42	● About 5% of the PC sleeper is cracked and exposed steel bar was found. ● Ballast condition is not maintained well (insufficient ballast)
	Near a level crossing (Prabumulih)	320+000	R42	● No cracking in PC sleeper ● Ballast condition is not maintained well (insufficient ballast)
	Prabumulih	322+706	R42	● Fastening device is aging, some part of fastening devices are loss. ● The sleeper is hidden by the ballast. ● Ballast is contaminated by soil. ● Ballast condition is not maintained well (insufficient ballast)
Lahat - Prabumulih	Near a level crossing (Prabumulih-X6)	330+000	R54	● Mud-pumping has occurred in rail weld location. ● No cracking in PC sleeper. ● Under double-tracking construction (roadbed is under construction)
	Near a level crossing (Niru)	360+000	R54	● Mud-pumping has occurred near level crossing.
	Gunungmegang	367+039	R54	● Ballast is washed-out by rain water. ● Fastening devices is aging; original elasticity of rail-pad is missing; and some part of fastening devices are missing. ● Some parts of PC sleepers are cracked.
	Near a level crossing (Gunungmegang)	367+500	R54	● About 10% of PC sleeper is cracker and exposed steel bar was found. ● The mud pumping has occurred near level crossing and in rail weld location.
	Steel Bridge (Gunungmegang)	367+500	R54	● Sleeper on bridge (wooden sleeper) is aging and broken. ● All fixing bolt to fasten sleeper with L type girder are missing.
	Near a level crossing (Sukacinta)	423+000	R54	● The mud pumping has occurred near level crossing ● Thickness of ballast is insufficient.
	Sukacinta	423+632	R54	● Cracking is not found because new PC sleeper is installed,. ● New replacement of ballast. ● Turnout for main track line is still use R42.

(Source: Study team)

PC Sleeper is hidden by the ballast.

(Simpang Station toward Kertapati)



PC sleeper is cracked

(Near the level crossing on the starting point of Karangendah Station, 350+)

Ballast volume is insufficient

(Near the level crossing on the starting point of Karangendah Station, 350+)

Ballast volume is insufficient

(Near the level crossing on the ending point of Prabumulih Station, 320+)

Ballast is contaminated by soil

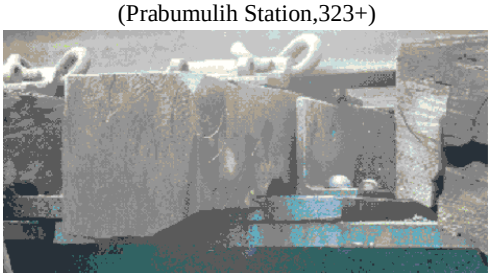
(Prabumulih Station,323+)

Fastenings is aging

(Prabumulih Station,323+)

Mud-pumping near a rail weld position

(Near the level crossing on the ending point of Prabumulih(X6), 330+)

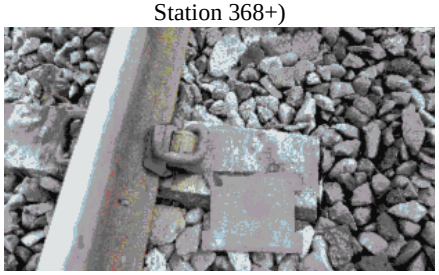


Bridge sleeper is aging

(Steel Bridge on the ending point of Gunungmegang Station 368+)

Ballast is washed-out by rain water and fastening device is missing

(Gunungmegang Station, 368+)



Rail pad is aging

(Gunungmegang Station, 368+)

(Source: Study team)

[Pic. 4-1-1] Condition of Facilities Inspected during Field Survey

The track structure and track material between Lahat and Kertapati are shown in [Table 4-1-7].

[Table 4-1-7] Present Condition of Track Structure and Track Material

Length of section (km)	Ton-nage (million ton/year)	Track Class	Minimum curve radius (m)	Maximum axle road (kN)	Rail classi-fication	Con-struction year	Continuaus Welded Rail (CWR)	Depth of ballast (cm)	Ballast shoulder width (cm)	Sleeper classi-fication	Fastening device	Turnout type
PBM・KPT (77.4)	16.1	2	600	180	R42	1963	CWR	30	40	PC	EG	R42
ME・PBM (73.8)	43.8	1	234	180	R54	1970	CWR a part is Standard rail	30	50	PC	EG	R42
LT・ME (38.1)	2.9	4	264	180	R54	2007	CWR or Standard rail	30	50	PC	EG	R42

*KPT: Kertapati, PBM: Prabumulih, ME: Muara Enim, LT: Lahat

*EG: Double elastic fastening *PC: Pre-stressed concrete

*The track category was classified on the basis of the tonnage.

(Source: Study team)

- Width of ballast shoulder in Lahat - Muara Enim section (38.1km) and Muara Enim - Prabumulih section (73.8km) is 50cm. Thus, track structure of these sections can be classified into Class 1 and 2 respectively. In addition, track structure of Prabumulih - Kertapati section is classified into Class 3 because width of ballast shoulder is 40cm.
- According to the tonnage, as shown in [Table 4-1-2], track class is determined Lahat - Muara Enim section (2.9MTPA) is classified into Class 4, Muara Enim - Prabumulih section (43.8MTPA) is classified into Class 1, and Prabumulih - Kertapati section (16.1MTPA) is classified into Class 2.
- The track of Lahat - Muara Enim section was constructed in 2007, Muara Enim - Prabumulih section in 1970, and Prabumulih - Kertapati section in 1963. Thus, Muara Enim - Kertapati section was constructed 40-50 years ago.
- The rail classification of Lahat - Muara Enim section and Muara Enim - Prabumulih section is R54 rail (UIC 54 rail). Additionally, Prabumulih - Kertapati section is still use R42.
- Continuous Welded Rail (CWR) is laid for track with radius of 600m or more, and the standard rail is laid for track with radius of 600m or less. CWR is laid along section of Prabumulih - Kertapati section. More than half of Lahat - Kertapati section is used standard

rail because of many sharp curves in this section. In addition, some parts in Muara Enim - Prabumulih section is used standard rail. Rail length of CWR and standard rail are shown in [Table 4-1-8].

[Table 4-1-8] Rail Length by Curve Radius

Curve radius	Rail length (m)	Note
R≧600m	300	Without intermediate rail
R＜600m	100	-

(Source: Study team)

- Double elastic fastening (e clip) is used for rail fastening.
- Post-tensioned PC sleeper is used for general section of main track, but wooden sleeper is also used for rail-joint section. Additionally, besides PC sleeper, iron and wooden sleeper are also used for siding track.
- The pitch between sleepers is 60cm and sleeper arrangement for rail-joint section is based on suspended joint.
- Direct fastened track of bridge sleeper (wooden sleeper) is adopted for steel bridges (non-ballasted bridge).
- R42 rail turnout is used for turnout of main track line.

4.1.2. Present Condition of Civil Structures

(1) Earthwork (Cutting and Embankment)

Mud pumping most likely caused by foundation ground characteristics as well as poor roadbed and drainage conditions could be observed at many locations along the track. Thus, rehabilitation of roadbeds and drainage systems is necessary when the track is rehabilitated.

(2) Station Platforms

Platform of Kertapati, Prabumulih and Sukacinta stations are concrete slab structure with height between 500mm and 700mm. Based on the field observation, improvement of platform condition is not required. The platforms could be lengthened and widened as part of the alignment plan to accommodate longer train formations.

(3) Bridges

There are 27 bridges in the railway section covered by this study. Bridge types consist of RC girder (K300) and I-shaped steel girder (SS400) for bridges with length shorter than 10m, plate girder (SS400) for bridges with length between 10m and 20m, as well as truss (SS400) for bridges with length longer than 20m. Because the bridges with old girders that were designed for an axle load of 13t (in accordance with the 1911 design standard) were redesigned and renewed between 1991 and 2003 (in accordance with the 1921 design standard, see [Fig. 4-5-9] (P. 4-69)), they can withstand the 18t axle load of new locomotives without problems.

The substructure piers (K350) and abutments (K250) were also reinforced at the same time as the superstructures to be able to withstand an axle load of 18t. There should be no problem because the frameworks have already been reinforced and the foundations were widened with concrete jackets. It was impossible to check the condition and construction figures of all bridges as part of this study, so everything will still have to be reviewed carefully before making detailed design plans.

(4) Small-Scale Pipes and Culverts

As shown in [Table 4-1-10], there are 208 locations with different types of culverts, pipes and water conduits that cross the railway line on the section covered by this study. In the same way as the bridges, the box culverts were redesigned and rebuilt to withstand an axle load of 18t (in accordance with the 1921 design standard) between 1996 and 2003, so they should not have a problem. Because the other pipes were designed in accordance with the 1911 design standard (axle load 13t) and have not been changed since 1913, careful review shall be conducted before making detailed design plans.

(5) Level Crossings

The level crossings examined in this study have a simple structure consisting of asphalt pavement and H-steel arranged to fit the level crossings. The rails are covered by soil and sand and leave only top parts of rail visible. Rail and road level is differenct and has not been properly maintained. Thus, improvement of level crossing is necessary when the track is rehabilitated. Moreover, many of level crossings are also without crossing gates.

(Source: Study team)

[Pic. 4-1-2] Mud Pumping on Tracks

Kertapati Station

Simpang Station

Prabumulih Station

Sukacinta Station

(Source: Study team)

[Pic. 4-1-3] Present Condition of Existing Stations

(Source: Study team)

[Pic. 4-1-4] 367k461m BH No. 837 Truss Bridge (L=50m)

[Table 4-1-9] Summary of Existing Bridges

DLJ.No.52			LINTAS : PRABUMULIH - LAHAT							
No Urut	B H No	Letak Km	Bentang (m) hulu	hilir	Emp	MACAM B A	No. Seri	Berat Jemb baja kg	Vol.Jemb Bet.m3	Volume Pa/Pi m3
		MUARAENIM KM. 396 + 091								
	915	396+427	25			Dd.rk.llb	B.no.872/B.77	49,824	-	
			50			Dd.rk.ttp	B.no.880/B.101	127,417	-	2,470
			25			Dd.rk.llb	B.no.872/B.77	49,824	-	
	935	401+161	30			Dd.rk.ttp	B.no.874/B.78b	57,996	-	540
	953	406+316	10			Bet.Com	B.Com.	-	31	340
		Banjarsari Km. 406 + 831								
	958	407+628	6			Bet.bert	Byb.no.812	-	13	106
	987	416+902	20			Ras.rk	B.no.871/B.82	28,258	-	131
	998	419+893	60			Dd.rk.ttp	B.no.882/B.79a	193,527	-	
			40			Dd.rk.ttp	B.no.878/B.92	88,258	-	
			30			Dd.rk.ttp	B.no.874/B.78b	57,996	-	
			30			Dd.rk.ttp	B.no.874/B.78b	57,996	-	
		Sukacinta Km. 423 + 632								
		L A H A T KM. 434 + 159								

DLJ.No.51			LINTAS : PRABUMULIH - KERTAPATI							
No Urut	B H No	Letak Km	Bentang (m) hulu	bj	Emp	MACAM B A	No. Seri	Berat Jemb baja kg	Vol.Jemb bet m3	Volume Pa/Pi m3
		Gelumbang Km. 353 + 833								
	686	358+875	15	15		Ras.dl	B.no.410 Aus	18,722	-	288
		S e r d a n g Km. 363 + 479								
		Payakabung Km. 373 + 335								
	714	382+325	8	8		Ras.dl	B.no.386/Ab.8-8	7,039	-	260
	715	383+121	13	13		Ras.dl	B.no.443c/Aus	16,282	-	275
	716	383+835	15	15		Dind.pel	B.no.438 Aus	33,927	-	269
	717	385+753	12	12		Dind.pel	B.no.415 Aus	24,488	-	228
	718	387+038	40	40		Dd.rk.ttp	B.no.428 Aus	135,650	-	408
		S i m p a n g Km. 388 + 500								
	720	389+872	8	8		Ras.dl	B.no.386/B.8-8	9,900	-	163
	721	390+786	12	12		Dind.pel	B.no.415 Aus	24,488	-	212
	722	392+765	20	20		Dind.pel	B.no.483 Aus	47,440	-	504
	723	393+609	12	12		Ras.dl	B.no.443 Aus	13,318	-	280
	724	394+259	8	8		Ras.dl	B.no.386/Ab.8-8	7,039	-	292
	725	394+757	15	15		Ras.dl	B.no.410 Aus	18,722	-	330
	726	395+574	15	15		Dind.pel	B.568/B.719 Ais	25,166	-	332
	727	396+192	8	8		Ras.dl	B.no.386/B.8-8	9,900	-	259
	728	397+047	8	8		Ras.dl	B.no.386/Ab.8-8	7,039	-	322
	729	397+609	8	8		Ras.pel	B.no.563	5,975	-	308
		KERTAPATI KM. 399 + 915								

(Source: PT. KAI)

[Table 4-1-10] Summary of Lateral Drainages and Small-Scale Culverts

Lahat - Muaraenim, Pbm X6 - Prabumulih Total		
Crossing conduit and others	Boxculvert	1
	Duiker	17
	Saluran turbuka,Opendoorlat	0
	Pipa besi	2
	Bis beton,Beton buis	0
	Koker	41
	Armuco	6
	Pelat beton	17
	Gorong-gorong	14
	Pasangan batu	33
	Lt - Pbm Total	**131**

Prabumulih - Kertapati Total		
Crossing conduit and others	Boxculvert	6
	Duiker	32
	Saluran turbuka, Opendoorlat	7
	Pipa besi	1
	Bis beton, Beton buis	15
	Koker	15
	Armuco	1
	Pelat beton	0
	Gorong-gorong	0
	Pasangan batu	0
	Pbm - Kpt Total	**77**

(Source: PT. KAI)

(Source: Study team)

[Pic. 4-1-5] Present Condition of Lateral Drainages and Small Scale Culverts

(Source: Study team)

[Pic. 4-1-6] Present Condition of Level Crossings

4.1.3. Geological Condition

The geological condition of the section covered by this study is estimated from the geological map as shown in [Fig. 4-1-2] (Geological Map of the Lahat Quadrangle, South Sumatra 1986). According to this, the geological condition of the Lahat - Kertapati section can be classified into the 3 types as below. Since geological survey data is unavailable, it is necessary to re-examine the geological data and conduct additional surveys before making detailed design plans.

(1) Lahat - Muara Enim Section, Gunungmegang - Prabumulih Section

Sedimentary rock of Air Banakat (Tma) and Muara Enim layers (Tmpm) is distributed. Most of the Air Banakat layer (Tma) consists of alternate strata with lime, carbon-rich slate and shale. The Muara Enim layer (Tmpm) consists of tuffaceous slate interspersed with coal deposits, siltstone and sandstone.

(2) Muara Enim - Gunungmegang Section, Prabumulih - Payakabung Section

Sedimentary rock of Kasai layer (Qtk) is distributed. The Kasai layer (Qtk) consists of strata with pumiceous tuff, sandy tuff and tuffaceous sandstone.

(3) Payakabung - Kertapati Section

The alluvium (Qs) is located in the delta between the Musi and Ogan rivers and consists of swampy sedimentary soil distributed in table-like strata. The alluvium (Qs) is a soft layer consisting of mud, silt and sand sediments.

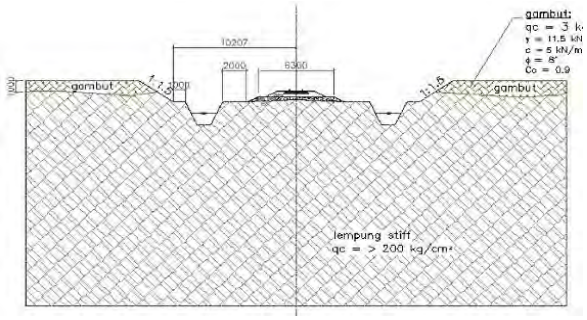
(Source: Study team)

[Fig. 4-1-2] Geological map of Lahat, South Sumatra

The soil bearing capacity shown in [Fig. 4-1-3] taken from the "Railroad Coal Transport System of PT. Bara Alam Utama/ Sojitz Corporation South Sumatra 2009" can be a reference.

Bearing capacity of foundation

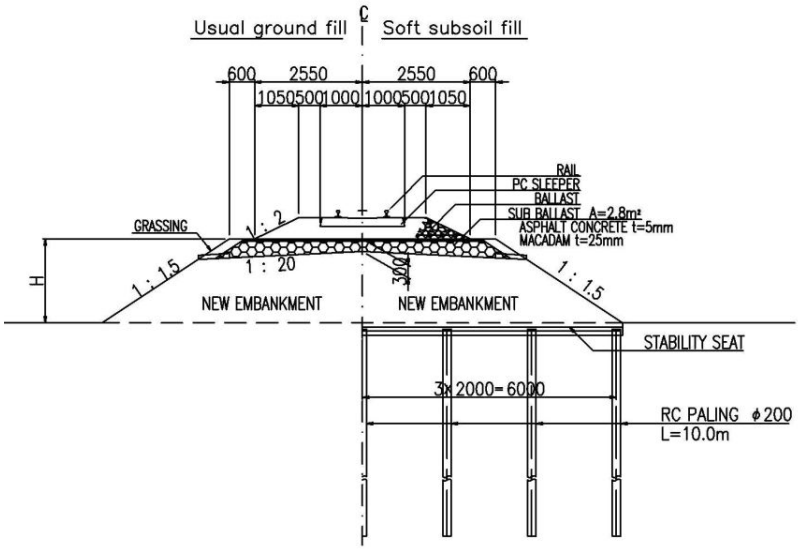
- Alluvium (Qs) : 0,80-6,40t/m^2
- Muara Enim layer (Tmpm) : 10,40t/m^2
- Air Banakat layer (Tma) : 0,40-13,60t/m^2



(Source: Study team)

[Fig. 4-1-3] Soil Conditions at Simpang and Keramasan Stations

The embankment and cutting land are the majorities in the civil structures of study section, and the shape of embankment heavily depends on the ground condition. Soil of Payakabung - Kertapati section is assumed as soft subsoil because several meters of alluvial formation (Qs) is accumulated in surface layer. In order to prevent subsidence and ensure stability, appropriate construction method for embankment is necessary. Construction method which considered subsidence prevention and stabilization measurement will give little influence to the vicinity structures. As shown in [Table 4-1-11], pile net construction method is considered as the most appropriate method.



(Source: Study team)

[Fig. 4-1-4] Typical Cross Section of Embankment

[Table 4-1-11] Selection of Construction Method for Soft Ground

Design condition \ Construction method for Soft Ground			Soft Ground Improvement Method												
			Substitution Method		Loading Method			Compression Piling Method		Consolidation Method			Industrial Method		
			Digging substitution	Compulsion substitution	Preloading	Atmospheric pressure industrial method	Underground water level lowering method	Crabel compaction	Sand compaction	Stir mixture piling	Lime pile	Chemical injection	Pile slab	Pile net	Sheet piling
Purpose	Subsidence		○	○	○	○	○	○	○	◎	○	○	◎	○	○
	Stability measures		○	○	○	○	○	○	○	◎	○	○	◎	○	○
	Road bed strengthening		◎	○	×	×	○	×	×	×	×	×	×	×	×
	liquefaction		×	×	×	×	×	◎	○	○	×	○	×	×	○
Effect	Subsidence	Promotion	×	×	◎	◎	◎	△	△	×	×	×	×	×	×
		Control	◎	◎	×	×	×	○	○	◎	○	○	◎	○	△
	Stability	Strength an increase	○	○	×	×	×	○	○	◎	○	○	○	○	○
		Strength promotion	×	×	○	○	○	△	△	×	△	×	×	×	×
		Load reduction	×	×	×	×	×	×	×	×	×	×	×	×	×
	Road bed improvement		○	○	×	×	×	×	×	×	△	△	×	×	×
	liquefaction		×	×	×	×	×	◎	○	△	×	○	×	×	○
Construction condition	Nature of soil	Cohesive soil	○	○	○	○	○	○	○	○	○	×	○	○	○
		Corrosion soil	○	○	○	○	○	×	×	○	○	×	○	○	○
		Sandy soil	×	×	×	×	×	◎	○	○	×	○	×	×	○
	Thickness of weak layer	＜3m	○	○	○	○	○	○	○	○	○	○	△	△	○
		3～10m	×	×	○	○	○	○	○	○	○	×	○	○	○
		10m≦	×	×	○	○	○	△	△	○	×	×	○	△	△
	Influence on adjacent structure		○	×	×	×	×	×	×	◎	△	△	◎	◎	○
	Influence of noise vibration		◎	×	◎	○	○	×	×	○	△	○	△	△	△
	Fill amount	Low fill	◎	○	○	○	○	○	○	○	○	○	○	○	○
		High fill	○	○	○	○	○	○	○	○	○	○	○	○	○
	Work efficiency (term of works)		△	△	×	×	×	○	○	△	○	△	△	○	×

(note) ◎ :It especially suits the condition. ○: It suits the condition in principle.

△ :To suit the condition, the examination is required. ×: As a rule, it doesn't suit.

(Source: Study team)

4.1.4. Electric Power, Signal, and Telecommunication

(1) Existing Electric Power System

There is photovoltaic power generation equipment in Simpang Station. If it is the mechanical signal system which does not consume an especially large amount of electricity, it is satisfied with the current electric power system. However, due to its aged deterioration, the capacity expansion

is necessary to modernize the equipment.

Signal and telecommunications house at Prabumulih Station and level crossing near Prabumulih Station were using the commercial power system.

(Source: Study team)

[Pic. 4-1-7] Power Generation at Simpang Station and Commercial Power System on Signal and Telecommunication House at Prabumulih Station

(2) Existing Signaling System

Mechanical interlocking system has been installed for South Sumatra Railway (Railway line between Lahat and Kertapati) excluding Prabumulih station. There is no special trouble with the small number of the train. However, the equipment needs to be updated due to the low equipment maintenance update frequency and the aged deterioration of essential equipment.

It was the situation that a class-1 electric relay interlocking device and telecommunication system would begin to be used soon at Prabumulih main signal and telecommunication house.

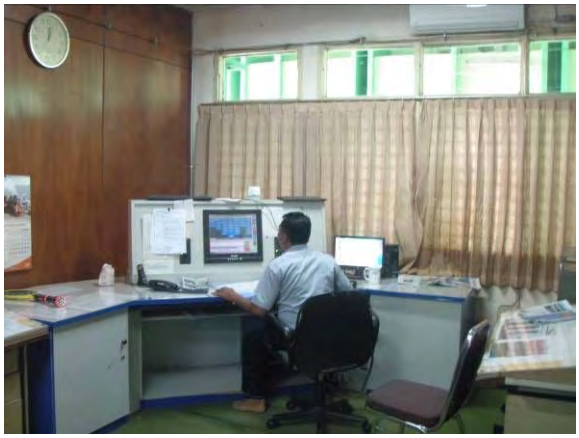

(Source: Study team)

[Pic. 4-1-8] Signal and Telecommunication Equipment House at Prabumulih and Mechanical Interlocking Equipment of Gunungmegang Station

(3) Existing Telecommunication System

As for a communication line for traffic control, train radio was used from Palembang Operation Control Center (OCC) in each station. A level crossing house also had been using a metallic communication cables from the stations.

As in other equipments, the equipment needs to be updated due to the low equipment maintenance update frequency and the aged deterioration of essential equipment.




(Source: Study team)

[Pic. 4-1-9] Telecommunication System of Palembang Operation Control Center and Telecommunication System at Kertapati Signal House

4.1.5. Coal Loading/ Unloading Facilities

(1) Sukacinta Side

The coal loading/ unloading facilities in Sukacinta Station, Kertapati Station and stockyard nearby riverside of Musi are explained as follows:

In Sukacinta station, PT. BAU prepared 7.2ha of stockyard, which can store maximum 100,000tons of coal. In addition, service line was constructed from coal stock yard to main track of Sukacinta station where coal can be loaded directly to freight container. The coal is carried by trucks from coal mining place in Merapi area to coal stock yards with the distance of about 10km. While the coal stored in the stockyard is loaded by wheel loader to container freight wagon, the coal carried by container from Merapi is loaded on top of the freight wagon without being stored in the yard. At the current stage, 1,280tons (640 tons × 2 train sets) per day are loaded to containers for carriage to Kertapati.

Stockyard nearby Sukacinta station.

Truck running from Merapi to Sukacinta

(Source: Study team)

[Pic. 4-1-10] Present Condition of Sukacinta Side

(2) Kertapati Side

As for the unloading of coal in Kertapati station, PT. BA uses the dedicated wagons (hopper type wagon) for coal loading of which both sides are opened for unloading from there. The coal from the wagons is dumped directly to belt conveyer and transferred to a barge when the barges are in riverside, or stored in a stockyard. At this stage, only 1 belt conveyer (oscillation type) is working. Its loading capacity to barges is 1,000 ton per hour.

Loader by belt conveyer to barge

Unloading facilities

(Source: Study team)

[Pic. 4-1-11] Present Condition of Kertapati Side

As for the coal of PT. BAU which amounts to 1,280 tons per day, PT. KAI Logistics (KALOG) handles all loading/ unloading process from freight unloading, coal carriage until river side by truck as well as loading by belt conveyor to barges. The detailed process is as follows:

① When a train-set having containers with coal enters into container yard nearby Kertapati station, reach stacker grasps container and put each container to truck.

Unloading container from wagon

Loading container to truck

② Truck carries coal from the container yard to a coal stockyard by using public road of approximately 100m distance, and then unloads coal. The width of this coal stockyard is around 1ha.

Truck carrying container with coal

Coal stockyard in the riverside

③ The coal stored in the stockyard is loaded to barge by wheel loader and belt conveyer.

Wheel Loader in the Stockyard

Stockyard and Wheel Loader

Belt Conveyer installed in the Stockyard

Coals being load to barge

(Source: Study team)

[Pic. 4-1-12] Present Condition of PT. BAU Facility

4.2. Technical Measures to Demand Forecast

4.2.1. Technical Challenges to Determine the Project Size

Capacity expansion of railway can be achieved by increasing the number of train and increase the number of coaches in a train set, but it requires improvement of track structure as well. Conventionally, the improvement work is double-tracking and the double tracked rail can expect drastic capacity expansion which is much bigger than the two times of the number of rail because it contributes to make train operation planning easier, unless otherwise the operation is parallel single track type. However the double-tracking work requires big amount of construction cost as well as takes longer time before the construction work is completed.

With regard to this project, as it is discussed in 3.1.3. (P. 3-20), the capacity expansion of the railway for coal transportation is the urgent necessity and quick action is required even before the double-tracking work is completed. As such, this study considers it practical to gradually expand the railway capacity starting from maximum use of the existing single track toward the double-tracking by improving railway infrastructure and facilities.

The existing single track railway has various shortcomings as it was detailed in 1.2.1. (P. 1-24) which resulted in making the actual transportation capacity less than theoretical railway capacity. This state of condition is exemplified by running speed of train. Theoretically, railway capacity can be increased by increasing train running speed because travel time of higher speed train is shorter than that of slow train, thus number of train in a day will be bigger. In order to increase train speed, it is necessary to improve horizontal and vertical railway line alignment such as having bigger curve radius. The alignment improvement will not be necessary for the project section because, according to the design standard, design speed is set to 70km/h. In this addition, it will be necessary to have strong track bed and replacement of rail to heavier type in order for a train to run safe and stable.

Another measure to expand transportation capacity is to increase the number of wagon in a train. In a single track railway operation, one of two trains running opposite direction must stop and wait in a place to allow another train to pass. The waiting place must have enough length of rail for a train to park. The parking rail length must be extended to accommodate longer trains with bigger number of wagons (extension of effective length). Transportation capacity can be increased by allowing trains to pass each other at their convenient spots. Therefore, it is an effective measure to increase the number of the waiting place (signaling station) for transportation capacity expansion. It is also effective to establish a rational and practical train operation planning based on run-curve in which locomotive performance, horizontal and vertical alignment, location of signaling stations and so forth are incorporated.

No matter how much the transportation capacity is increased at the railway side, if loading

capacity at train departure side and unloading capacity at train terminal side are short, waiting train cue will be developed at both sides of the railway thus transportation capacity as a whole will not be expanded.

As it was overviewed above, measures to expand railway transportation capacity is summarized as below. It should be noted that the listing is not a logical one but just a reference for the better understanding in the subsequent description, because the measures listed below are interrelated each other. As for the detailed capacity expansion measure, it is elaborated in (4) of 4.3.1. (P. 4-28).

- Increase the traction power of locomotives, thus increase the number of wagon in a train.
- Increase the number of rolling-stock (locomotive and wagon), thus increase the number of train in a railway line.
- Expand the capacity of rolling-stock depot, thus increase the capacity utilization of rolling-stock.
- Deploy high performance locomotive in acceleration, deceleration and running speed.
- Improve horizontal and vertical alignment of the railway line to facilitate high speed running of the train.
- Establish rational and practical train operation plan, thus increase train density of a railway line.
- Increase the number of signaling station in a single track section, thus allow a trains to pass each other in a timely manner.
- Strengthen the track bed, thus allow a trains to run with higher speed and bigger number of wagons.
- Replace the existing rail with a heavier type, thus allow a train to run with higher speed and bigger number of wagons.
- Modernize signaling system, thus reduce opportunity of train schedule disorder and facilitate quick restoration from the disorder.
- Modernize signaling system, thus facilitate punctual train operation.
- Modernize safety facilities, thus reduce opportunity of train accident.
- Enhance maintenance quality performance, thus reduce opportunity of train accident and speed saving operation.
- Expand coal loading facility, thus facility coal train to depart loading site on schedule.
- Expand coal unloading facility, thus facilitate coal train not to wait before arriving at the coal unloading site.
- Expand coal dumping site at both ends of a railway line, thus facilitate loading and unloading work quickly.

4.2.2. Technical Options for Transport Capacity Expansion

It was proposed in 4.2.1 that the project shall be implemented in a step-by-step manner under the current circumstances of urgent necessity of transportation capacity expansion, and described technical measures to expand the capacity. The measures to be taken into the project are summarized in the following 3 options by symbolizing with each track improvement work.

① Single Track Option: This option is to make maximum use of the existing single track railway, thus increase the number of operating train a day.
② Partial Double-Tracking Option: This option is to add signaling stations for trains to pass each other, thus further increase the number of operating train a day.
③ Whole Double-Tracking Option: This option is to build additional railway track in the entire stretch of the existing single track railway line and introduce modern signaling system to facilitate effective train operation control, thus ultimately increase the number of train a day.

This study proposes to implement the above mentioned 3 options in sequence in line with the increase of coal transportation demand. In the mean time, the facilities other than railway infrastructure will be deployed with a scale in balance with the target transportation volume of each option. Here, "in sequence" means that the construction work itself excluding procurement process of the 2nd Stage shall be carried out immediately after the completion of the 1st Stage construction work, and in the same way, the 3rd Stage construction work shall be carried out immediately after the 2nd Stage construction work overlapping procurement process of the 3rd Stage work with the 2nd Stage construction work process, so that there shall be no idle time of construction work between each stage.

The prospected client of the Project is all the coal mine companies, but the total sum of the demand is already 10.0MTPA excluding track transportation in 2014 which is not achievable in a short run. Therefore, this study picks up PT. BAU transportation demand in determining target transportation volume. The transportation volume target at each stage is basically set as to cope with the PT. BAU demand growth. However, each target must be checked whether or not the measure taken at each option corresponding to each step can comply with the target volume. Therefore, the final target volume is set through confirmation process described below.

In the ①Single Track Option, the target volume of the 1st Stage was checked out if a transportation volume calculated by increasing train speed, by increasing number of wagon of a train and by increasing number of train a day based on maximum density of train operation plan which is practically acceptable, will exceed the target volume. As for the ② Partial Double-Tracking Option, the target volume of the 2nd Stage was checked out if a transportation volume calculated by increasing least number of signaling station, by increasing number of wagon

of a train and by increasing number of train a day based on maximum density of train operation plan which is practically acceptable, will exceed the target volume. In the case of ③Whole Double-Tracking Option, since the whole double-tracking measure can accommodate substantial volume increase of transportation, the target volume of the 3rd Stage was set in compliance with the growth of transportation demand and the capacity of loading and unloading facility at the 3rd Stage. As a result, the figures in the table below were adopted as the target volume of each stage.

[Table 4-2-1] Target Transportation Volume and Calculation Basis (The 1st Stage & The 2nd Stage)

Step	Target	Calculation Basis
The 1st Stage	2.5MTPA	● The coal transportation demand of PT. BAU in the year 2014 will reach 4.0MTPA (total sum for private mines is 12.2MTPA), but a part of the amount will be by truck. It is estimated that the maximum amount by truck will be 1.5MTPA considering the congestion of road traffic and damage of the road. Therefore the balance the two figures of 2.5MTPA is set as a target volume for the rail. If the road condition was further aggravated and additional road traffic restriction was imposed, the amount expected for the rail will exceed 2.5MTPA and the coal production will be restrained. ● Regarding passenger transportation, since the train schedule will be congested by the increased number of coal freight train, the increase of passenger demand is proposed to be coped with increasing the number of passenger coach in a passenger train, maintaining the number of passenger train in a day.
The 2nd Stage	5.0MTPA	● The coal transportation demand of PT. BAU in the year 2014 will reach 4.0MTPA, but stable transportation by road will not be expected because road rehabilitation plan is not expected while damage may be aggravated further more, and imposition of road traffic restriction will be strengthened. Therefore, it is projected that PT. BAU will shift the coal transportation mean for its whole production from road to rail of which stable transportation is assured. In this addition, since other private mines are willing to transport their coal by train, 1.0MTPA is added and the total sum is calculated to 5.0MTPA. Minimal amount of coal produced by other small coal mines will still be transported by road. ● Regarding passenger transportation, since the train schedule will be congested by the increased number of coal freight train, the increase of passenger demand is proposed to be coped with increasing the number of passenger coach in a passenger train, maintaining the number of passenger train in a day.

(Source: Study team)

[Table 4-2-2] Target Transportation Volume and Calculation Basis (The 3rd Stage)

Step	Target	Calculation Basis
The 3rd Stage	20.0MTPA	● The present coal transportation demand in Sukacinta area is already 12.2MTPA as it is shown in [Table 3-1-11] of 3.1.3. The demand increase in the years to come hinges on railway transportation capacity expansion, but according to a demand forecast for the east route in 2020 made by PT. KAI is 20.0MTPA. Here, the target demand for this project is set to 20.0MTPA. It should be noted that the transportation capacity for the whole double track line is far bigger than this amount. ● Regarding passenger transportation, the number of passenger train will be increased to accommodate the expected passenger demand of about 2 times of the current level, because the line capacity in the 3rd Stage will have enough volume by the double-tracking work.

(Source: Study team)

In this study, a stage to which the project should be implemented will be proposed in terms of economic and financial point of view, because the project is targeting private investment in the PPP framework. The yardstick to make the decision will be elaborated in the Chapter 7 of Economic and Financial Analysis.

4.3. Operation Plan

4.3.1. Precondition

(1) The Present Operating Conditions

From the train diagram dated October 1, 2011, the current operating conditions of the train between Kertapati and Lahat are summarized in [Table 4-3-1].

[Table 4-3-1] Train Operation Condition (Oct 1, 2011)

Type of train	Number of trains					
	LT-ME	ME-NUR	NUR-X6	X6-PBM	PBM-PYK	PYK-KRT
Passenger	4	4	4	4	8	12
Freight	16	70	71	32	38	38
Total	20	74	75	36	46	50

LT : Lahat　　NRU : Niru　　PYK : Payakabung
ME : Muara Enim　　PBM : Prabumulih　　KPT : Kertapati

(Source: PT. KAI)

According to [Table 4-3-1], the trains are concentrated mainly between Muara Enim and Prabumulih X6, and this is because the coal trains for PT. BA which is operated in the section between Muara Enim and Tanjung Karang.

(2) Line Capacity

The line capacity in the single track section is calculated by the following formula.

$$N = \frac{1{,}440}{(t+s)} \times d \quad \cdots\cdots\cdots\cdots (4\text{-}1)$$

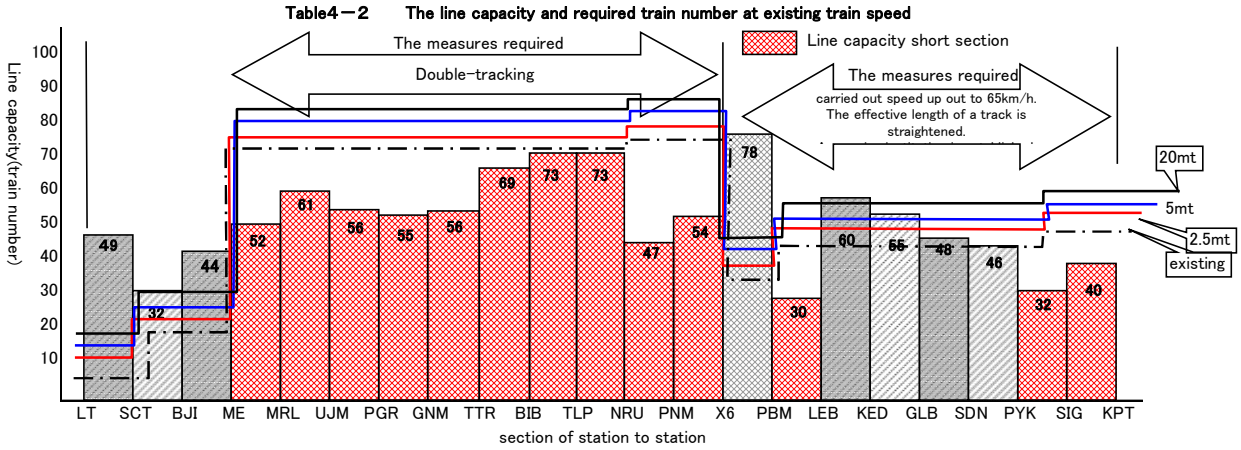
t: Average train running time station to station (minute)
s: Operation service time in a station (minute)
d: Line utilization ratio

Here, operation service time "s" is the time until it can leave a train which turnout is switched, a route is constituted, and a proceed signal is displayed on the starting signal to the direction, and actually goes to the opposite direction, after the train from a certain direction arrives at a station. It is assumed that 2.5minutes is the standard operation service time in the non automatic block section.

Line utilization ratio "d" is the rate of time zone for which a line is actually used in 24hours per day. This rate is approximately 55% - 75% depending on restrictions of time zone allocated for track maintenance work and train schedule. However, the line utilization ratio of the line on which trains with different service speeds are operated is generally set as 60%.

[Fig. 4-3-1] shows the result of investigation comparing line capacity by section based on the formula (4-1) with train number based on present train diagram, present transportation volume and planned ones. According to this figure, it can be read that the line capacity is already short in seven sections. Since train diagram will be easily jeopardized if line capacity is in short, the following problems are expected to arise.

- Since the opportunity of crossing station and passing station increase, the scheduled train speed may fall. Moreover, it may become easy to cause train delay.
- Train delay cannot be restored once operation diagram is jeopardized. In this case, such delay may affect the following train and incoming train, and it becomes a cause of chronic delay.
- Since there is no margin in the diagram, implementation of line maintenance work etc. becomes difficult.



(Source: Study team)

[Fig. 4-3-1] The Line Capacity and Required Train Number at Current Train Speed

(3) Transport Capacity Increase

In order to satisfy the coal production increase by PT. BAU, SPC plans the transport capacity increase between Kertapati and Lahat. In order to increase transportation capacity, although there are 2 ways, namely "adding wagons" which generally increases the number of wagons of train set, and "increase the number of train" which increases train number without adding wagons, however, there are also the following shortcomings.

- The track improvement work by extending track effective length of stations is needed. In addition, in order to increase the traction of a locomotive, it becomes necessary to improve slope gradient.
- Even though the number of train is increased, there is no effect in increasing the transportation capacity because the train is already dispatched up to the limit of line capacity.

(4) Method to Increase the Line Capacity with Single Track Operation

The fundamental solution to increase transport capacity is to increase the line capacity. The following methods can be considered in order to increase the line capacity in the single track section.

① Shorten the Distance between Stations.

- Construct sidetracks in the intermediate stations in which the sidetrack is not prepared.
- Construct crossing and passing stations in the sections where the distance between stations is long.

- Implement partial double-tracking in the sections in which line capacity is short.

② Raise Train Running Speed in order to Shorten the Average Operation Time between Stations,.

③ Shorten Operation Service Time.

- Introduce automatic signal control system.
- Introduce relay interlocking system in station yards.

④ Implement Double-tracking in the Whole Line as a Drastic Measure.

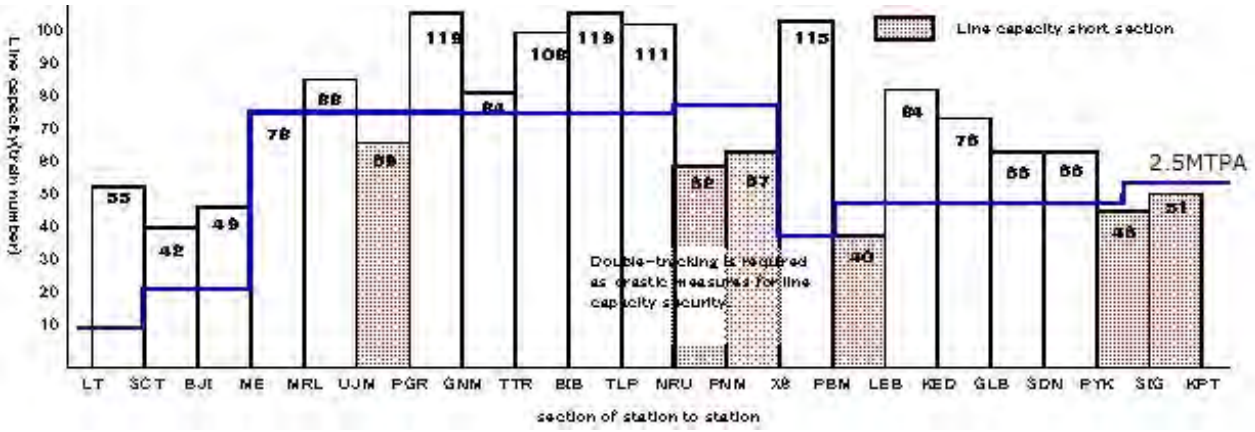
(5) Transportation Planning

The transportation planning of SPC to comply with the coal production plan of PT. BAU, and the necessary measures to fulfill the demand are shown in [Table 4-3-2].

[Table 4-3-2] Transportation Planning of SPC

Year		The 1st Stage				The 2nd Stage				The 3rd Stage			
The annual production target of BAU		2.5 million ton				5 million ton				20 million			
Annual transportation target		2.5 million ton				5 million ton				20 million ton			
The number of freight wagons per train (train length)		25(395m)				40(615m)				60(930m)			
Required train number		8				10				21			
Annual transport maximum		2.6 million ton				5.2 million ton				20.4 million ton			
Required train number	Locomotive	Line	shunting	spare	total	Line	shunting	spare	total	Line	shunting	spare	total
		8	0	3	11	9	3	3	15	26	5	5	36
	Freight wagon	Use		Spare	Total	Use		pare	Total	Use		Spare	Total
		200		10	210	400		20	420	840		20	860
	Container	Use		Spare	Total	Use		pare	Total	Use		Spare	Total
		400		20	420	800		40	840	*****		***	***
Measure required for transport capacity increase		Train length is less than the effective length of each station except ME.								Extension is required in the effective length of each station between KRT-X6.			
		Diagram setup is possible for between KRT-X6 without speed up.				The speed up is required for 65km/h in the all section.							
		Between X6 and GNM, double-tracking is requiredA crossing facility is required for the middle between PGR and UJM.											

(Source: Study team)



(Source: Study team)

[Fig. 4-3-2] Line Capacity with Train Speed Increase up to 65km/h (8 Extra Trains of SPC train)

[Fig. 4-3-2] shows the comparison of line capacity and train number with upgraded traveling speed between KRT-ME and to comply with the 2.5MTPA transportation. According to this figure, the shortage of line capacity between KPT and PBM will improve, when train running speed is improved to 65km/h. However, since shortage is not improved as for the capacity between X6 and GNM, double-tracking of the section will be necessary.

4.3.2. Run Curve

In preparing operation plan, a train hauling 1,400t with one CC205 type locomotive between LT and KPT, and another empty freight train hauling 1,100t with one CC201 type locomotive on the way back both of which the maximum speed is set to 65km/h is set. Run curve, minimum train running time table and train operation diagram are reviewed based on the upgraded speed. As a result, it has been confirmed that the extra train of 10 round trips would be possible per day by raising running speed of trains in the section. Therefore, it proves that the transportation planning of [Table 4-3-3] is reasonable, and it is highly likely that this can be realized.

[Table 4-3-3] Minimum Running Time

Odd Number Train						Section		Even Number Train					
Ruling Grade (‰)	Freight Train					Station	Distance (Km)	Coal Train					Ruling Grade (‰)
	CC201					Type of Locomotive		CC205					
	1100 ton					Hauling Capacity		1400 ton					
L		13·15 =	— 12·00			Kertapati (KPT)	11.6		— 12:00		13:45 =		L
-0.9		17·00 =	— 15.30	16·00 —	14·30	Simpang (SIG)	15.2	14:00	— 15:00	15:15 —	16:15 =		0.9
L		12·15 =	— 11·00	10·45 —	9·30	Payakabung (PYK)	9.9	9:00	— 10·15	10·30 —	12·00 =		L
-0.5		14·45 =	— 12·30	11·45 —	10·30	Serdang (SDN)	9.7	9·15	— 10·30	10·45 —	12·00 =		0.5
L		10·45 =	— 9.30	9·00 —	7·45	Gelumbang (GLB)	8.2	8:00	— 9·15	9·15 —	10·30 =		L
0.2		9·15 =	— 8·15	7·45 —	7·00	Karangendah (KED)	7.4	7·15	— 8·30	8·30 —	10·00 =		-0.2
-1.6		18·15 =	— 16·45	16·00 —	14·30	Lembak (LEB)	15.9	15·00	— 16·15	16·30 —	17·30 =		1.6
2			— 4·15		3·00	Prabumulih (PBM)	3.4	3·30	— 4·30				-2
8.6				14·45 —	12·15	X6 (Pbrx6)	7.9	7·15		8·00 —			-8.6
2.5		12·30 =	— 11·00	12·15 —	10·45	Penimur (PNM)	10.8	10·30	— 12·00	11·45 —	13.15 =		-2.5
-0.1		12·15 =	— 11·00	11·00 —	9·45	Niru (NRU)	10	9·30	— 12·00	10·15 —	13·00 =		0.1
4		17·15 =	— 16·30	15·45 —	15·00	Blimbingpendopo(BIB)	12.7	12·30	— 14.30	13·30 —	15·15 =		-4
7.6		12·15 =	— 11·15	11·00 —	9·45	Gunungmegang(GNM)	6.5	6·30	— 8·00	7·45 —	8·45 =		-7.6
7.6		15·45 =	— 13·45	15·15 —	13·30	Penanggiran(PGR)	7.9	8·00	— 9·45	9·00 —	10·45 =		-7.6
-4.7		8·45 =	— 6·45	8·15 —	6·15	Ujanmas (UJM)	6.4	6·45	— 8·30	8·45 —	10·00 =		4.7
4.8		12·00 =	— 11·00	10·30 —	9·15	Muaragula (MRL)	8.2	7·45	— 9·15	9·00 —	10·45 =		-4.8
9.3		22·00 =	— 21·00	19·15 —	18·15	Muaraenim (ME)	10.8	10·30	— 11·45	11·30 —	13·00 =		-9.3
1.8		19·15 =	— 18·30	18·30 —	17·45	Banjarsari (BJI)	16.8	16·00		17·00 —	18·15 =		-1.8
-1.8		13·00 =		11·30 —		Sukacinta (SCT)	10.5			11·30 —	12·15 =		1.8
						Lahat (LT)							
						Total	189.8						
						Mean Speed	===						

(Source: Study team)

The transport capacity increase measures depending on the transportation planning is shown in [Table 4-3-4].

[Table 4-3-4] The Transportation Planning of SPC and Necessary Measure

<table>
<tr><th>Year</th><th>The 1st Stage</th><th>The 2nd Stage</th><th>The 3rd Stage</th></tr>
<tr><td>The annual production target of BAU</td><td>2.5MTPA</td><td>5.0MTPA</td><td>20.0MTPA</td></tr>
<tr><td>Annual transportation target</td><td>2.5MTPA</td><td>5.0MTPA</td><td>20.0MTPA</td></tr>
<tr><td>The number of freight wagons per train (train length)</td><td>25（395m）</td><td>40（615m）</td><td>60（930m）</td></tr>
<tr><td>Required train number</td><td>8</td><td>10</td><td>21</td></tr>
<tr><td>Annual transport maximum</td><td>2.6MTPA</td><td>5.2MTPA</td><td>20.4MTAP</td></tr>
<tr><td rowspan="3">Measure required for transport capacity increase</td><td colspan="2">Train length is less than the effective length of each station except ME.</td><td>Extension is required in the effective length of each station between KRT-X6.</td></tr>
<tr><td>Diagram setup is possible for between KRT-X6 without speed up.</td><td colspan="2">The speed up is required for 65km/h in the all section.</td></tr>
<tr><td colspan="3">Between X6 and GNM, double-tracking is requiredA crossing facility is required for the middle between PGR and UJM.</td></tr>
</table>

(Source: Study team)

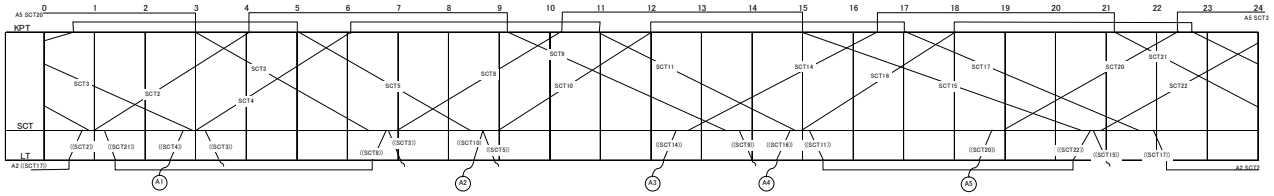
The 5.0MTPA transport volume will be achieved by partial double tracking, adding wagons to train, and having extra trains. However, double tracking of the whole line would be needed in order to secure line capacity when the demand exceeds 5.0MTPA.

4.3.3. Rolling Stock Operation Scheduling Plan

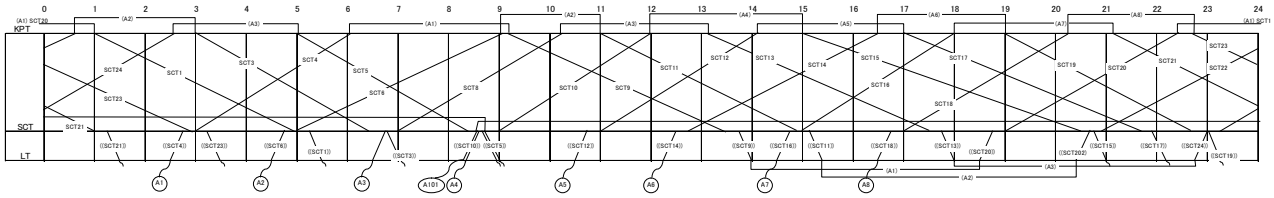
(1) Locomotive Operation

The trains of up to 40 freight wagons formation can be hauled with one CC205 type locomotive. However, when the necessity of adding freight wagons occurs, it is necessary to increase the number of locomotive to 2. Although the locomotive will be procured by SPC, it would be reasonable to have technical unification with PT. KAI in the service of rolling stock and maintenance and repair as well as in consideration of rolling stock operation scheduling and the necessary crew, etc. From the above viewpoint, the locomotives being procured by SPC would be CC205 and this may bring efficiency, less environmental impact, commercial benefit and technical standard. Both for main line and for shunting use, CC205 type locomotive can be used, and this may bring unification of maintenance management. Locomotive operation scheduling model at each stage is shown in [Fig. 4-3-3].

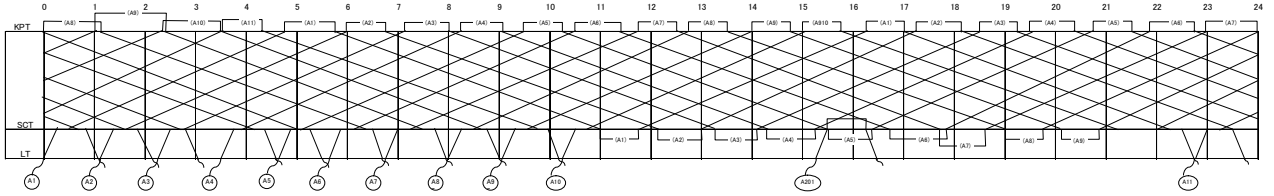
1st Stage



2nd Stage



3rd Stage



（Source：Study team）

[Fig. 4-3-3] Locomotive Operation Scheduling Diagram

According to [Fig. 4-3-3], the locomotive operation pattern in the 1st Stage and the 2nd Stage between Sukacinta and Keratapati will be loaded train, while between Lahat and Sukacinta is empty train. In the 3rd Stage, since the number of train will be increased to 21 trains, for higher operation efficiency, locomotives are based on turning at Sukacinta station. Locomotives will be returned to Lahat depot only for the purpose of water refilling, refueling, and inspection.

(2) Freight Wagon Operation Scheduling

In the 1st Stage and the 2nd Stage, the same container freight wagons as the existing transportation style would be used. In the 3rd Stage, the freight wagons specialized for coal transport of 50ton loading could be used.

4.3.4. Rolling Stock Planning

The necessary number of the rolling stock is shown in [Table 4-3-5].

(1) Locomotive

Locomotives will be principally located in the locomotive depot of Lahat judging from operating efficiency and operation and maintenance contract with PT. KAI. Since there is a rolling stock workshop in Lahat, it would be possible to entrust important parts inspection and general inspection. Although the locomotives to be procure by SPC will be 36 cars at the 3rd Stage, expansion of the facility and increase of the number of crew and maintenance staff would be needed. It was informed by PT. KAI official in Lahat that the outsourcing of the maintenance of CC205 type locomotives is under consideration by PT. KAI. In such a case, the maintenance of locomotives owned by SPC may also be outsourced.

Loading-and-unloading facility of coal would be newly built in the shore of the Musi river, which is about 7km away from Simpang to the north, and there would be an option to construct a coal private siding from Simpang to a unloads facility. In this case, the locomotive and freight wagon depot dedicated to SPC would be constructed in a private siding, and there would be also an option to carry out important parts inspection and general inspection there. Important parts inspection and general inspection of CC205 type locomotive of PT. KAI would be also undertaken as an option.

Up to the volume of 1.0MTPA, the main line locomotives can act as shunting locomotives, however if it goes over 2.5MTPA, dedicated shunting locomotives would be necessary at Lahat station and Kertapati station.

(2) Freight Wagon

Transportation of coal follows the existing loading-and-unloading and transportation style, therefore container style transportation is applied. Since the number of wagon is large and operating conditions is expected to be severe, container freight wagons shall be stationed at Lahat and Kertapati stations in order to keep the condition good. It would be necessary to also place containers at both stations and proper maintenance should be given.

[Table 4-3-5] Rolling Stock Input Plan

Year		The 1st Stage				The 2nd Stage				The 3rd Stage			
The annual production target of BAU		2.5MTPA				5.0MTPA				20.0MTPA			
Annual transportation target		2.5MTPA				5.0MTPA				20.0MTPA			
The number of freight wagons per train (train length)		25 (395m)				40 (615m)				60 (930m)			
Required train number		8				10				21			
Annual transport maximum		2.6MTPA				5.2MTPA				20.4MTPA			
Required train number	Locomotive	Line	shunting	spare	total	Line	shunting	spare	total	Line	shunting	spare	total
		8	0	3	11	9	3	3	15	26	5	5	36
	Freight wagon	Use		Spare	Total	Use		pare	Total	Use		Spare	Total
		200		10	210	400		20	420	840		20	860
	Container	Use		Spare	Total	Use		pare	Total	Use		Spare	Total
		400		20	420	800		40	840	-		-	-

(Source: Study team)

4.4. Proposal of Facility Scale

4.4.1. Site Condition and Technical Problem

Railroad between Lahat and Kertapati is going down from altitude of 78m of Sukachinta towards altitude of 2m of Kertapati via altitude of 43m of Prabumulih. Topographically, it is classified mountainous area between Lahat and Muara Enim, hilly area between Muara Enim and Payakabung, and plains area between Payakabung and Simpang.

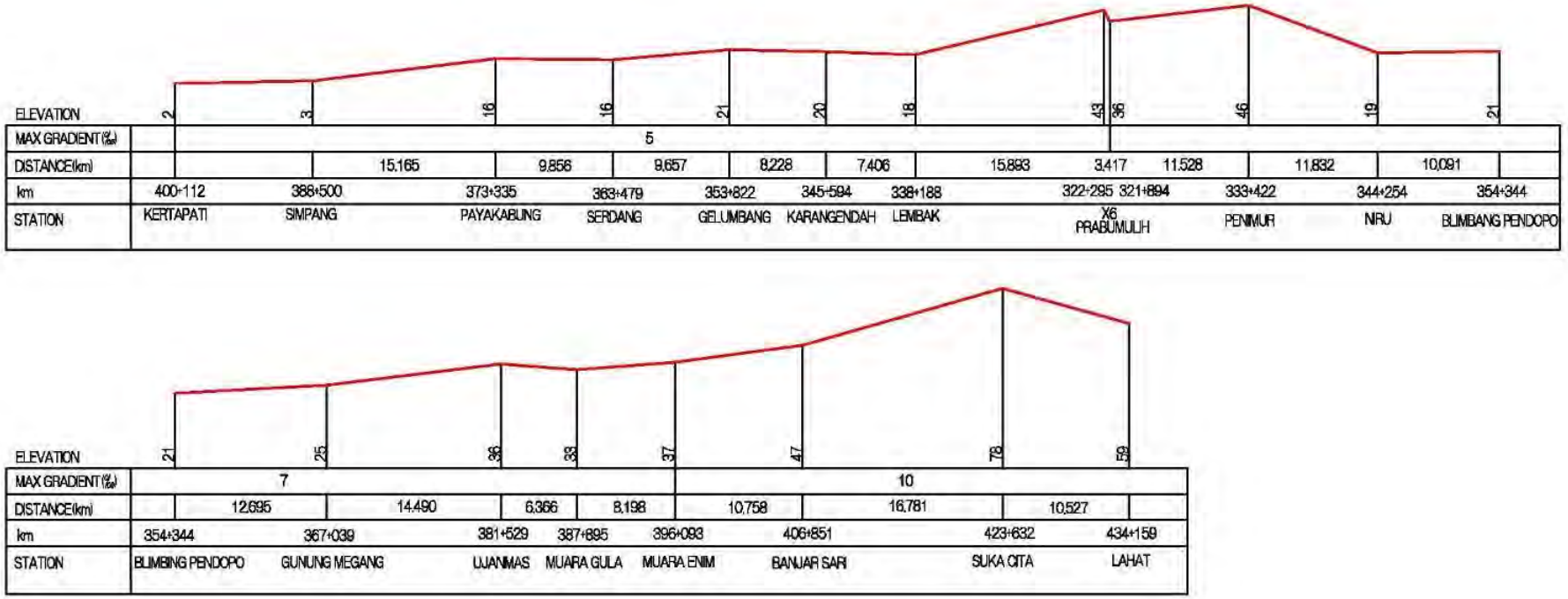
There are many slope sections of 10‰ which is the maximum steep grade between Lahat and Muara Enim, and there are many curves of 500m or less in radius. As for geology, Sedimentary rock of Air Banakat layer (Tma) and Muaraenim layer (Tmpm) is distributed by ordinary ground. Although cities and villages are formed around major stations, there are few houses observed in between.

Up and down vertical alignment with average grade of 5‰ with loose curve more than 1,000m in radius in line with topographic land shape is going on between Muaraenim and Payakabung. In terms of geology, ordinary ground and sedimentary rock of Kasai layer (Qtk) is distributed. Although cities and villages are formed around major stations, there are few houses observed in between.

As for Payakabung - Kertapati section, it is located in alluvial fan inserted into Musi river and Ogan river and it is running on a flat ground with an altitude of 2m or 3m with many loose curves more than 1,000m in radius. In terms of geology, the swampy sedimentary soft soil of

Anuvium (Qs) is surfacing over the bed ground. Although there are few houses in the swampy sedimentary soil section, Kertapati is urbanized and is crowded with private houses.

All the sections between Lahat and Kertapati are the earthwork sections (cut and embankment), and civil structure and railroad structures to be observed are station home, bridge, small-scale lateral viaduct, and crossing.



(Source: Study team)

[Fig. 4-4-1] Slope between Stations

Judging from these field conditions, in order to make in-depth plan for the alignment and facility, it is necessary to create station yard plan view, plane alignment view, and vertical alignment view based on topographic survey. When extending clear length, due to the limitation of slope in the station yard to be less than 2.5‰, it is necessary to conduct a study to secure the slope gradient of 2.5‰ for the extension line, while intense field survey will be necessary to determine the location of new line.

According to the result of field survey, wear of rail head and side, breakage or damage to concrete sleeper presumably caused by either train derailment or shortage of track-bed ballast were detected. It was explained by PT. KAI official in the field survey that damage of up to 3 pieces of sleepers has no problem for the train operation, but it is baseless and very questionable.

Rehabilitation of track is a pressing issue, because many problems are observed such as shortage of maintenance, poor arrangement of sleepers, and lack of fastening will affect safety and stable transportation.

Crossing must be improved in the mean time because as it is exemplified that crossing is not equipped with crossing gate and maintenance of road surface is not suitable.

Signaling and telecommunication system is superannuated. It seems difficult to speed up train. Updating to modernistic electric equipment is required.

In the section where track rehabilitation is needed, the work includes all rail, sleeper, track bed (ballast supplement), turnout, and weak track-bed improvement. But, if the work is implemented in one single project, it will require not only huge project cost and time necessary for completion, but also require extra cost because major track materials have to be supplied from abroad. It is proposed to make an practical plan in terms of fund raising and implementation phasing.

Although improvement of track bed is performed simultaneously, embankment material selection should be conducted in advance of construction in order to use appropriate materials with good drainage performance.

Although there are many problems as described above in the facilities, it is proposed to implement the project starting from the higher priority component in the upgrading of track structure and signal facilities rather than implement it in one project for the total stretch of the project line, because it requires huge project cost and time which hinder the rapid expansion of transportation capacity.

If maintenance is not performed by optimum method in a timely manner, the facilities

rehabilitated in the project will be rapidly deteriorated and high speed train operation will not be possible. Therefore, education of maintenance people based on the scheduled maintenance concept must be introduced.

The subjects which should be taken into consideration in the rehabilitation of facilities are summarized as below.

(1) Replacement of a Track Material

① Rail Replacement

- The rail weight between Prabumulih and Kertapati is R42 rail laid more than 50 years ago. The standard replacement period of 40kg class rail due to detritions or fatigue using is about every 300 million ton in accumulated tonnage. Since the tonnage has reached in 16MTPA now, the track is considered to reach rail replacement timing.
- Since the line is classified as 2nd class in terms of tonnage, the new rail to be laid should be heavier with rail classification of R54.
- Destruction of track (track irregularity) is expected to be eased by use of heavier rail in which rail life will be extended (extension of a rail-replacement cycle length) and train load impact with high speed running will be distributed more widely.
- The rail classification between Muara Enim and Prabumulih is R54 rail laid about 40 years ago. The standard replacement period of 50kg class rail due to detrition or fatigue is about 300 - 400 million ton in an accumulated tonnage. It seems that the rail is in a marginal condition since the present tonnage is 43MTPA.

② Replacement of Sleeper and Fastening

- As for the pre-stressed concrete sleeper between Prabumulih and Kertapati section, since 50 years have passed since it was laid, aging is progressing considerably as exemplified in the exposure of steel bar with the defect rate of 30%. Moreover, the elasticity of the rail pad of fastenings is lost mostly in all parts. Omission of a rail clip also appears here and there. Sleepers and Fastenings have a function of distributing train load equally, transmitting it from rail to ballast, and resisting against track buckling. However, if they are not replaced as it is, the function will be lost and accidents, such as a rail overhang and a rail failure in the end and it will lead to a serious trouble for train operation. Therefore, replacement is needed.
- If the existing rail of R42 is used even after the replacement of sleepers, the fastenings for pre-stressed concrete sleepers should be so selected as to compatible for different types of rail of R42 rail and R54 rail just by replacing rail insulator pad between fastening and rail clip to prepare for the future rail replacement.
- Since over 40 years has passed since the track between Muara Enim and Prabumulih was laid, the sleepers and the fastenings of the section are over used and the replacement of broken PC

sleepers and rail fastenings are necessary. Besides, rail pads of which elasticity was lost should be replaced as well.

- Cracked pre-stressed concrete sleepers and rail fastening without rail clip are neglected for maintenance at present, but once after they are replaced, track materials inventory should be controlled properly, replaced in a preventive maintenance concept, maintain the track in sound condition, and make effort to efficient track maintenance in order to counter against railway accident.

③ Ballast Renewal

- Altitude is low (2 - 3m) between the 375+000 in the vicinity and Kertapati, and its ground is soft. The state of a sub-grade is considered that it is bad, and ballast caves in into a sub-grade or earth and sand are mixing into ballast.
- Moreover, as for the weak-ground part including the vicinity of level crossing between Lahat and Simpang, the ballast has caved in into the sub-grade. In the part which caved in, due to the rigidity of the rail, it became a loose sleeper, and the mud pumping failure has occurred.
- The function of ballasts (such as the resistance to the rail overhang at the time of a rise in temperature, distribution of the train load to sub-grade, sleeper position keeping, securing track drainage) is lost by mud pumping failure and the soil mixes in ballast. As a result, since a rail overhang accident is induced or it has a big possible adverse effect on the maintenance frequency, a ballast renewal is required.
- In the ballast renewal of the existing line, in order to reduce bearing pressure of roadbed, it is effective to make ballast depth increase to about 35 - 40cm from the present 30cm.
- To set ballast depth before and behind a level crossing to 35 - 40cm (A rail level is heighten 5 cm to 10cm), it is necessary to also unite the level of a level crossings with it.

④ Addition of Ballast

- There are presumed spots which are not maintained ballast depth in place. For the reason that ballast sinks into the roadbed due to weak roadbed strength. In that case, it is necessary to focus on performing a sampling survey of ballast depth and ballast state (Grain refining of ballast or soil mixes in ballast) is carried out. After the result of the survey, in the case ballast depth is insufficient, it is the necessity of performing an addition of ballast.
- The addition of ballast is carried out from the width of ballast shoulder of present 40cm to 50cm designed for the installation of heavier rails between Prabumulih and Kertapati.
- The ballast is insufficient in the center of ballast shoulder section between Lahat and Prabumulih. It is the necessity of performing an addition of ballast to maintain the width of ballast shoulder of 500mm occurring lateral resistance of ballast and prevention of the track buckling of a continuous welding rail.
- It is necessary to survey that the drainage function is satisfied with the capacity demand in

the location where the ballast is spilt out of the track by rain water. In the case the drainage function is not satisfied, improvement or installation of facilities for drainage is required.

⑤ Replacement of a Bridge-Sleeper

- The wooden sleeper for non-ballast bridges (truss bridge) is aging and cracked. Moreover, all the bolts for being fixed to a bridge girder are omitted and the track panel (a rail and sleeper) is in the state where it floated completely from the bridge. For this reason, it is necessity of the construction for exchanging sleepers and fixing a sleeper to a bridge girder using bolt.

⑥ Maintenance of a Fishplate

- There are fishplates slacked and having no bolt. Maintenance is necessary to secure the bolts fixed in view of controling proper rail joint gap and preventing fishplate fall out in a continuous welding rail.

⑦ Rail Welding

- In a rail weld position, rail head corner failure above mud pumping spots are observed due to poor welding. For this reason, it is necessary to raise the quality of an on-site rail welding (Thermite welding). Moreover, it is necessary to ensure the quality control of the rail welding using a nondestructive inspection.

⑧ Others

- Different-unit weight rails must be connected using compromise rail. It was observed in the field inspection that different-size of rails were connected by direct welding on site.
- The length of a short size rail must be 5m or more (The rails of 5m or less is used on site).
- Three spans of buffer rails of 25m length must be equipped at the both sides of a continuous welding rail following the “Indonesian Railway Technical Standard on Track Design, Installation and Maintenance (IMO)”.

(2) Construction Materials

Construction materials used is following the material type provided in "Consulting Engineering Service for Improvement of Maintenance and Operation (April, 2006)”.

Materials other than the steel bridge of civil engineering works materials are procured domestically, and the one produced outside the country is assembling constructed about the steel bridge.

① Reinforcing Bar and Steel

● Steel Bar

[Table 4-4-1] Type of Reinforcing Bar

Category	Type	Yield Strength (N/mm^2)	Tensile Strength (N/mm^2)
Deformed bars	SD345	345	490
	SD390	390	560

(Source: Study team)

● Steel Strand

[Table 4-4-2] Type of Steel Strand

Type	SS400 SM400 SMA400	SM490
Basic strength (N/mm^2)	235	315

(Source: Study team)

② Concrete and Aggregate

[Table 4-4-3] Type of Concrete

Type	Structure	Design Strength (N/mm^2)	Cement Type	Maximum Dimensions of Coarse Aggregate (mm)	Upper Limit of Water-cement Ratio (%)
Reinforced Concrete	Abutment	21	Normal	25	60
	Pier	24	Normal	25	60
	Cast-in-place Pile	30	Normal	25	50
	Box Culvert	24	Normal	25	55

(Source: Study team)

③ Roadbed Material

[Table 4-4-4] Type of Roadbed Material

Reinforced Roadbed	Material	Thickness (mm)	Grain Size (mm)	Composition
Upper Layer	Asphalt Concrete	150	Maximum Grain Diameter 20	Asphalt Content 4.5-6.0%
Lower Layer	Crushed Stone (to adjust grain size) M-40	300	40-0	---

(Source: Study team)

④ Embankment Material

[Table 4-4-5] Type of Embankment Material

Group	Soil and Rock Quality
Group A (K_{30} value ≧ 110MN/m^3)	Gravel, gravel mixed with silt, gravel mixed with clay, gravel mixed with volcanic soil, silt gravel, sand mixed with silt, sand mixed with clay, hard rock waste (without noticeable peel)
Group B (K_{30} value ≧ 110MN/m^3)	Gravel mixed with organic soil, clay gravel, sand mixed with volcanic soil, sand mixed with organic soil, sand, silt sand, clay sand, hard rock waste, soft rock waste (with noticeable peel), brittle rock waste

(Source: Study team)

(3) Electric Power, Signal, Telecommunication, and Mechanical System

① Electric Power Supply System

In the 1st Stage and the 2nd Stage, except for newly built signaling stations, power system is good with the existing system.

In the 3rd Stage, since electric power of big capacity is needed along with the modernization of a signal and telecommunication system, the purchased power from the electric power company will be need.

② Signaling System

In the 1st Stage, there is no problem in existing signaling system because of sufficient maintenance condition of the existing system.

In the 2nd Stage, due to the expansion of a train, extension of track effective length in stations become necessary further, some of signals and point machines must be relocated. When the extension of effective length of a station exceeds the length of the controllable length for a mechanical interlocking system, it is necessary to build additional signal houses.

An existing level crossing with gatemen controlling car and motorcycle passing, because the traffic is heavy and it pass the level crossing just in front of a train. But considering the working load of the gateman at a level crossing, it is fine with the present system as long as the train frequency is as it is now, but when the train frequency gets heavier in the future, the signaling system must be upgraded to an automatic signaling system. The transition of the system should be started in a step-by-step manner starting depending on the traffic increase. However, gatemen must be positioned temporarily for the time being for the level crossing where the system was automated in order for the passengers to get used to the new system and for the personnel training.

③ Telecommunication System

The optical fiber network which can reduce communication trouble between train conductor and dispatcher is necessary as early as possible. The optical fiber cable will not only raise the quality of communication but also it can be used for other purposes such as train seat reservation by mobile phone and transmission of big size image data for remote monitoring (CCTV).

This image monitoring system will enable not only monitoring of train schedule, but also the congestion condition of stations and protection of assets from robbery and vandalism by installing video monitoring camera.

④ Mechanical System

Seat reservation of a train will be possible via internet by mobile phone, when the optical fiber cable was laid along the line for the railway communication network.

(4) Coal Loading / Unloading Facilities

① Loading Facilities

Presently, in the stockyard adjacent to Sukacinta station, only 1 wheel loader is stationed for loading coal to containers on wagons, which is sort of a primitive measure. It will not be a problem so far as to load only 1,280tons of coal per day, however, when the coal loading amount is increased in the future, more effective and capable facilities will be necessary.

So, the points to be considered for the selection of a new coal loading system are as follows;

- The amount of coal stored in the stockyard is limited to 7.2hr in Sukacinta station. In this case, it is better to install belt conveyer and silo at the inside of the stockyard for more effective alternative to load the coal to wagons.
- Dedicated road for truck passage should be constructed and between Merapi and the stockyard in Sukacinta station. Currently, trucks are running at will no matter where inside of the stockyard, however, the road for the trucks should be restricted for the transportation efficiency and accident prevention purposes, when the amount of loading coal is increased.
- As for belt conveyer to be installed in the stockyard, oscillation (swing type) belt conveyer has to be installed, because the area of the stockyard is limited and the coal put in wagon has to be flatted evenly.

② Unloading Facilities

There are some kinds of unloading facilities in stockyards constructed in the riverside of Musi, so each company takes its own loading method from wagon to coal. Followings are the points to be considered in upgrading coal loading facilities in the stockyard of PT. BAU;

- As for the unloading capacity of container from wagon, it will be possible to load 2.5MTPA by just increasing the number of reach stacker without increasing the number of service line in the yard. However, if it goes up to 5.0MTPA, one more bay-line has to be constructed at the inside of Kertapati station where unused warehouse exist at present. In this case, since 1 train set consists of 40 wagons, it must be divided into 2 parts consisting of 20 wagons each then each wagon uses the 2 different lines where 1 reach stackers is allocated independently. Also, the warehouse has to be demolished to give space for the new line on condition that permission for the demolition from the Government of South Sumatra to be given.
- Presently, the trucks loaded with coal are running on a public road with the distance of 100m from Sukacinta station to the stockyard at the riverside. But for the purpose of more efficient transportation, there are plans to construct much larger stockyard than current one from Sukacinta station to the stockyard on the riverside by converting this public road to stockyard, and to equip belt conveyer from Sukacinta station to the stockyard on riverside. In this case, it is necessary to obtain permission from the Government, because the road is for public use and some there are some houses identified in this area. Also, the dust of coal could be a problem when installing belt conveyer from Sukacinta station to the stockyard on riverside.
- Barges can harbor along the riverside stockyard waiting for the coal to be loaded. However, since the length of the barge is more than 50m, it is difficult for all side of the barge to be come along with the stockyard. The stockyard of PT. BAU is sandwiched in between a mosque and the stockyard of another coal company called PMSS which is not under our control. So, it is necessary to discuss and collaborate with other mining companies, local inhabitants and the Government of South Sumatra for expansion of the stockyard.

(5) Operation Management

It is possible for the system in Palembang OCC to perform more reliable communication by laying optical fiber cable network system Furthermore, visual confirmation of train operational condition at some stations and level crossings becomes possible by using CCTV at the Palembang OCC.

4.4.2. Project Size Determining Policy

The basic project size discussed above is based on DGR opinion that Yen loan will not be used for this project before the year 2014, which means that the cost for the 1st Stage shall be born by SPC. Therefore, the partial rail replacement work which is advisable to be implemented in the 1st Stage is planned to be implemented in the 2nd Stage, thus the 1st Stage project cost is reduced. Even though this operation will not reduce the target transportation volume in the 1st Stage of 2.5MTPA increase, it creates a impending issue of securing a stable long term transportation during 20 years of project period.

The 2nd Stage works are planned to be implemented immediately after the completion of the 1st Stage works. Since the track bed improvement work is completed in the 1st Stage period, it is possible to minimize the period for trains to run on the track where the rail replacement work is not completed by allocating the rail replacement work schedule in the front part of the 2nd Stage working schedule. According to 5.5.2. (P. 5-36), the rail replacement work will be completed within 2 years without waiting for 2 years of the 2nd Stage working schedule. Therefore careful operation of trains during the 2 years period is required.

As discussed above, it is strongly recommended that the project should be implemented up to the 2nd Stage in order for the railway to secure stable transportation. The measures to be taken at each stage of 3 are summarized in the table below.

[Table 4-4-6] Capacity Expansion Measures at Each Stage (The 1st Stage and The 2nd Stage)

Stage	Capacity expansion measures
The 1st Stage	● Target transportation volume = 2.5 MTPA ● Increase the number of train in a day. → Number of train to be increased = 8 trains/day(one direction) → Needs capacity expansion of rolling-stock depot ● Increase the number of freight wagon in a train. → The length of a train = 395m = Locomotive (1) + Freight wagon (25) → Extend the effective length of existing line to accommodate 395m of a train. ● Increase the running speed of a train. → Velocity of a train = 65km/h ● Increase the capacity of coal loading facility. → Capacity expansion at Sukacinta station area. ● Increase the capacity of coal unloading facility. → Capacity expansion at PT. BAU site in Kertapati. ● Increase the space for coal stock piling. → No change as it is.
The 2nd Stage	● Target transportation volume = 5.0 MTPA ● Increase the number of train in a day. → Number of train to be increased = 10 trains/day(one direction) → Needs capacity expansion of rolling-stock depot → Complete double tracking between Muaraenim and Prabumulih X6 section → Number of signaling station to be increased = 2 stations ● Increase the number of freight wagon in a train. → The length of a train = 615m = Locomotive (1) + Freight wagon (40) → Extend the effective length of existing line to accommodate 615m of a train. ● Increase the running speed of a train. → No change from the 1st Step. → **<u>Track bed improvement and partial replacement of rail.</u>** ● Increase the capacity of coal loading facility. → Branch line construction between Merapi near Sukacinta station and the main line of about 700m long. ● Increase the capacity of coal unloading facility. → Coal handling area development and unloading facility construction at the north end of Kertapati station area. ● Increase the space for coal stock piling. → Coal handling area development at the north end of Kertapati station area.

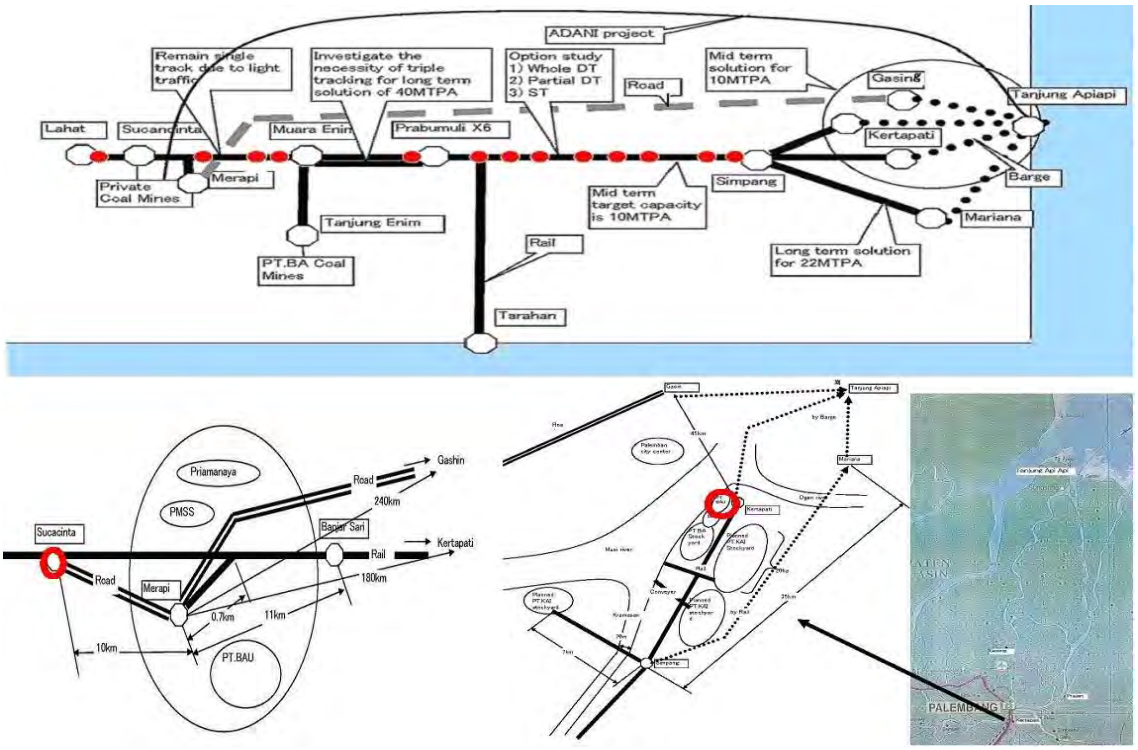
(Source: Study team)

[Table 4-4-7] Capacity Expansion Measures at Each Stage (The 3rd Stage)

Stage	Capacity expansion measures
The 3rd Stage	● Target transportation volume = 20.0 MTPA ● Increase the number of train in a day → Number of train to be increased = 21 trains/day(one direction) → Needs capacity expansion of rolling-stock depot → Complete double tracking between Sukacinta and Kertapati section → Introduction of electrified signaling system ● Increase the number of freight wagon in a train. → The length of a train = 930m = Locomotive (2) + Freight wagon (60) ● Increase the running speed of a train. → No change from the 2nd Step. ● Increase the capacity of coal loading facility. → No change from the 2nd Step. ● Increase the capacity of coal unloading facility. → Development of coal handling area of 20ha space in the west side of the Kertapati station area and construction of belt conveyer facility to Musi river. ● Increase the space for coal stock piling. → Development of coal handling area of 20ha space in the west side of the Kertapati station area.

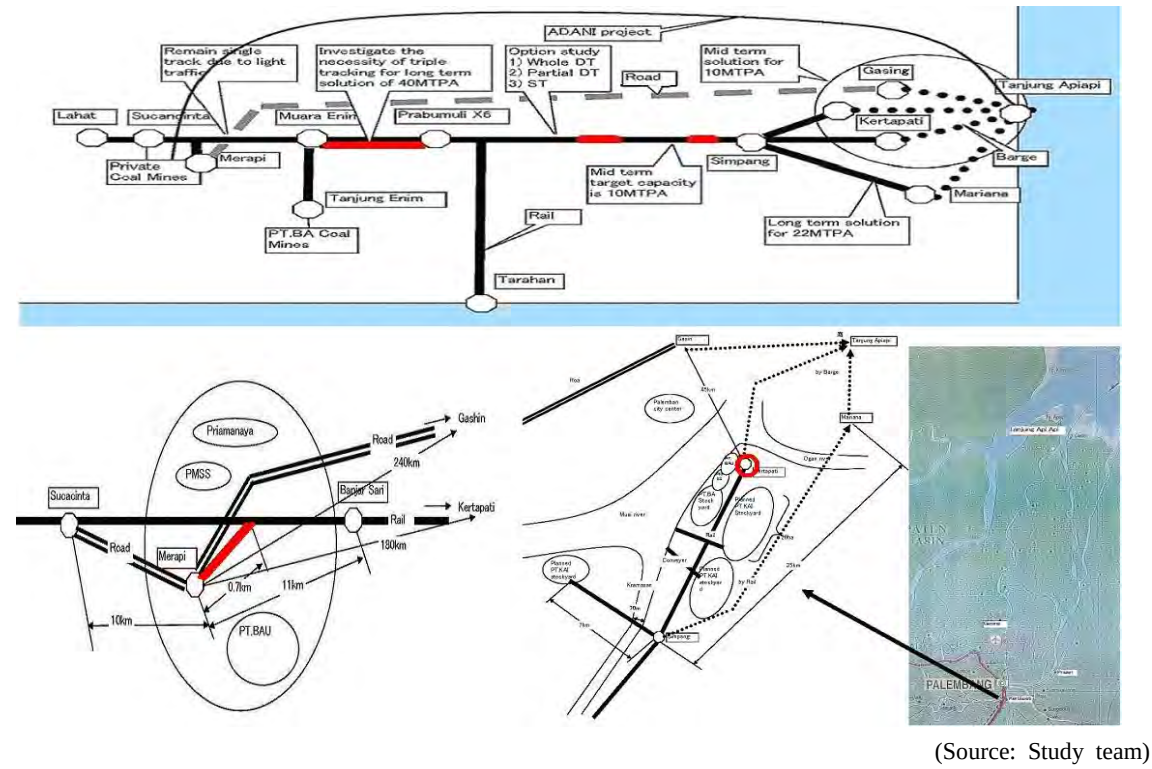
(Source: Study team)

The schematic diagram of infrastructure improvement at each stage of the implementation is shown in the figures below.



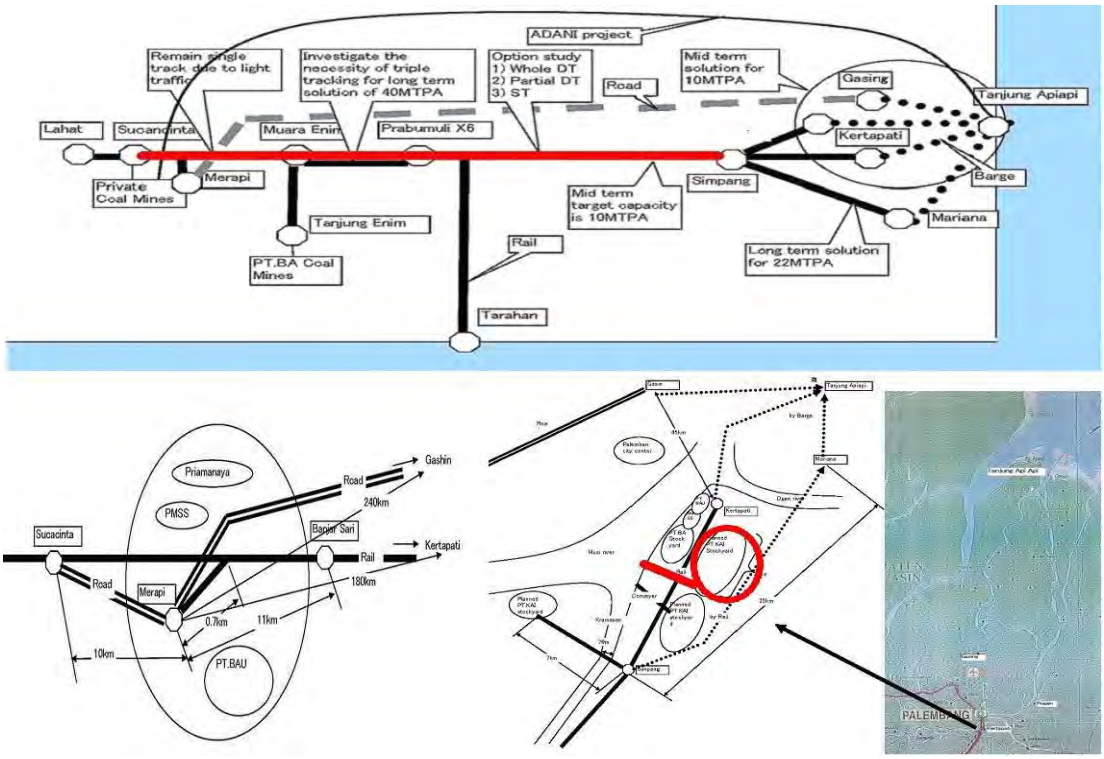
(Source: Study team)

[Fig. 4-4-2] Schematic Image of the 1st Stage Measures



(Source: Study team)

[Fig. 4-4-3] Schematic Image of the 2nd Stage Measures



(Source: Study team)

[Fig. 4-4-4] Schematic Image of the 3rd Stage Measures

4.4.3. Points to be considered for the Facility Specification

Principle for facilities to improve and build is as follows.

- Cost effectiveness of initial investment: Propose specification appropriate in expense.
- Cost effectiveness of maintenance management planning: Although track maintenance-free is recommended, consider balance with expense and choose specification.
- Acquisition of spare part: Carry out continuous supply in Indonesia about consumable part, and consider it as specification which can be maintained.
- Communalization of maintenance-management-planning method with adjacent railroad sections: Don't apply specification extremely different from adjacent railroad sections.
- Possibility of applying Japanese specification: When considering it as Japanese specification, explain superiority.

Hereafter, individual review of study result is explained.

(1) Track

- The sleeper for turnouts uses the pre-stressed concrete sleeper which can be produced domestically and is durable from a wooden sleeper.
- The sleeper for ballast-less bridges uses a plastic sleeper. Although an initial cost increases

from a wooden sleeper, a plastic sleeper is durable just like pre-stressed concrete sleeper, and also when carrying out a maintenance, it is advantageous (it can economize).

- A special fastening dedicated for ballast-less bridges which has low rail prevention force shall be used in order to reduce the continuous welding rail longitudinal load to a girder.
- While side wear is evident at the outside rail in a sharp curved section compared with a general section, reduction of the amount of maintenance as well as pertaining are expected by using the head hardened rail of which the hardness is increased by heat-treatment. Generally a head hardened rail is used by the right and left rail or outside rail of a sharp curve of 300 - 500m or less of curve radiuses.
- In order to operate train stably, the present R42 rail should be replaced with R54 rail (UIC54 rail). The replacement of the rail is recommended to be carried out in the 1st Stage, but if not, it should be carried out as soon as possible after the 2nd Stage construction inauguration at the latest.

(2) Civil Engineering Structure

- Because the major materials such as cement, aggregates, and reinforcing bar for concrete structure can be procured easily at low price in Indonesia, Indonesian specification should be applied.
- The use of reinforcing bar of SD390 type for RC structure with high strength will enable to reduce the size of the structure and reduce the weight of the reinforcing bar.
- The SM490 of high strength steel should be used for the steel material of upper structure of steel bridge which enables to reduce the bridge height and reduce the weight of the steel material, and weather proof steel plate should be used to prevent corrosion.
- As for the production and the material supply of steel plate with the plate thickness of 12mm for a large-scale bridge of the span of about 12m or more, it is proposed to procure from abroad due to production technology concerns. The design and production should be made in the same country to integrate the design method and the production method.
- The pile type used for the pile net construction method of the fill reinforcement measure for soft subsoil, it is proposed to use a RC pile that becomes cheap compared with PC pile and H-steel.

(3) Electric Power, Signaling, Telecommunication, and Machine System

① Electric Power System

The existing electric power system can be used up to the 2nd Stage in order to reduce the initial investment and to perform easy maintenance.

At the 3rd Stage, since the signal and telecommunications system will be modernized, it will require large power supply and electric power should be supplied by its own power facilities

instead of commercial power supply from the power company, because it can reduce cost and it can unify the maintenance system.

However, presently since there are some facilities that are not subject to commercial power, it is necessary to examine if a power transmission line from a power company to a station is necessary or not.

Also, it is necessary to check out whether it is possible to use domestically produced electric appliances can be used for the new system.

② Signaling System

It is a precondition that a same system must be adopted for the entire section of the project line. As a result, maintenance can be easily shared. Spare parts can be easily obtained up to the 2nd Stage by using refurbished signal system taken from Java Island where the mechanical interlocking system is not in use.

The class 1 electric relay interlocking device in the 3rd Stage is proposed to be identical to the signaling system that begins to be used in Prabumulih. In this way, easy maintenance will be possible and it can reduce the amount of spare parts.

As for the class 1 electric relay interlocking device, Japanese specification which conforms to the international performance standard and the system guarantee standard including Electromagnetic Compatibility (EMC) is proposed, because it is equipped with measures on safety, humidity, and moisture, etc.

③ Telecommunication System

Optical communication network will be used based on the optical fiber cable in the 3rd Stage. The optical fiber cable must comply with the performance requirement of the optical communication system. For this purpose, it is proposed to use Japanese product because it has high standard for quality assurance.

In addition, the system enables the use of Closed-circuit Television (CCTV) to monitor train operation, passenger move, and level crossing condition, etc.

④ Mechanical System

Mass data can be transmitted by using the optical fiber cable based network system in the 3rd Stage and under the system, seat reservation by mobile phone will be available.

(4) Coal Loading/ Unloading Facilities

- The reach stacker in Kertapati station has to be able to load containers on 4 piles from ground level and its spreader is able to grasp each type of 20ft and 40ft containers. Also, since the space of Kertapati station is very small so that the reach stacker cannot be installed easily, reach stacker has to be assembled at the inside of Kertapati station.

- The belt conveyer for the stockyard in the riverside of Musi has to be oscillation type because coal needs to be evenly loaded in a barge. Also, this belt conveyer should be self-propelled type in order to move properly and easily inside of the stockyard by itself.
- The belt conveyers in Kertapati station at the 3rd Stage has to be covered in order to prevent from scattering coal dust.

4.5. Overview of the Design Plan

4.5.1. Layout Plan

(1) Conditions of Current lines

① Track Layout

The track layout between Lahat and Kertapati is indicated in [Fig. 4-5-1]. Each station is equipped with passing lines so that trains can pass each other. The distance between stations and effective length of track for each station between Lahat and Kertapati are indicated in [Table 4-5-1].

The effective length of track between Lahat and Muara Enim is set to be between 130m and 400m because the number of operating trains is small with 8 trains per day and passenger trains pass each other only once a day at Banjarsani.

The effective length of track between Muargula and Prabumulih X6 is longer with more than 1,000m because of the large number of operating freight trains transporting coal from Tanjung Enim to Tarahan. Also, it is necessary to secure space for long and large freight trains to pass each other.

The effective length of track between Prabumulih and Kertapati is between 400m and 600m so that current freight trains can pass each other.

② Vertical Alignment

The vertical alignment between Lahat and Kertapati is indicated in [Fig. 4-5-2]. The vertical alignment for the whole line is descending from an altitude of 110m at Lahat to an altitude of 2m at Kertapati. For the intermountain section between Lahat and Muara Enim and the hillside section between Muara Enim and Payakabung, the route has a repetition of ups and downs since the tracks are laid down following the shape of the land. Especially, the section between Lahat and Muara Enim has slopes with the route's steepest gradient of 10‰ in many places. Additionally, from the vicinity of 380km in the section between Payakabung and Simpang to Kertapati is plain field with a constant gradient of an altitude of 2m to 3m.