- 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.

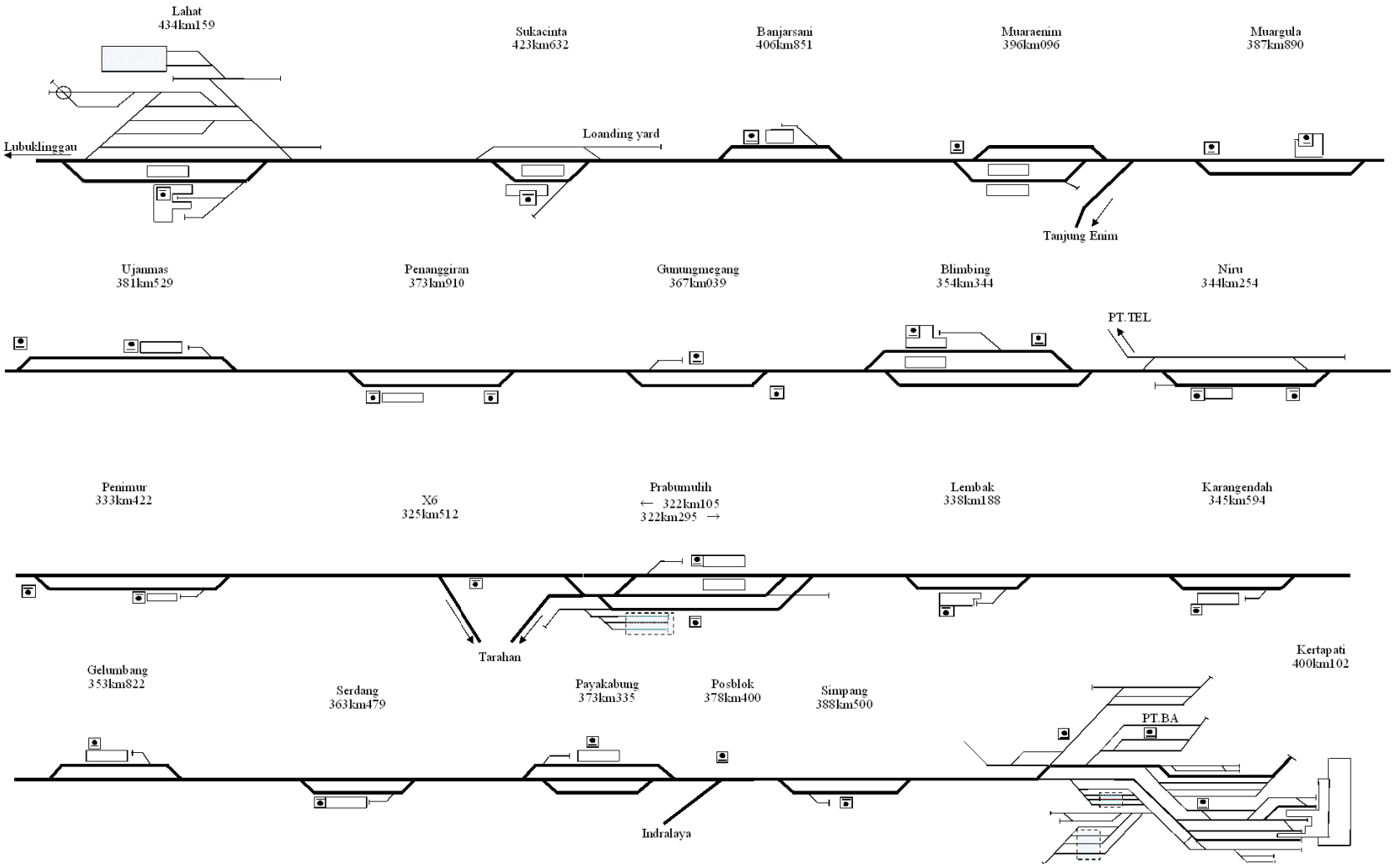
The effective length of track between Prabumulih and Kertapati is between 400m and 600m so that current freight trains can pass each other.

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.

③ Alignment

As for the alignment at intermountain and hillside sections between Lahat and Prabumulih, since tracks are laid to suit land forms in the same way as for vertical alignment, the route has many curves with curve radius of less than 500m. The minimum radius curvature for this section is 234m at the vicinity of 364km between Gunungmegang and Blimbing. For the plain section between Prabumulih and Kertapati, the route has many gentle curves with a radius of more than 1,000m.



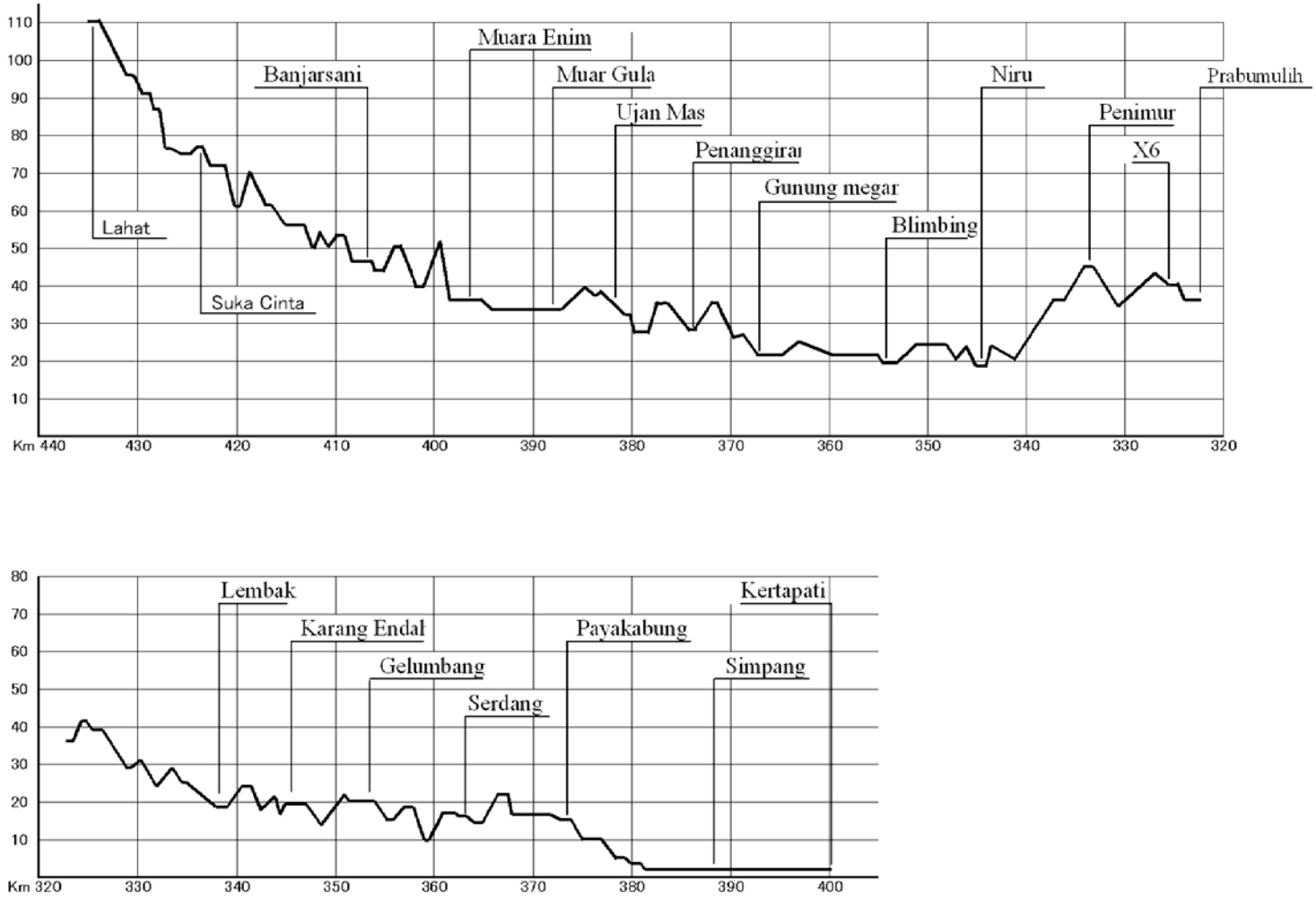
(Source: Study team)

[Fig. 4-5-1] Track Layout for the Section between Lahat and Kertapati

[Table 4-5-1] Distance between Stations and Effective Length of Track between Lahat and Kertapati

Station name	Location	Distance between Stations (m)	Effective Length (m)	
			Main Track	Siding
Lahat	434km159		402	402
Sukacinta	423km632	10,527	173	132
Banjarsani	406km851	16,781	263	225
Muara Enim	396km096	10,755	347	347
Muargula	387km890	8,206	1,197	1,197
Ujanmas	381km529	6,361	1,380	1,380
Penanggiran	373km910	7,619	1,000	1,000
Gunungmegang	367km039	6,871	1,443	1,443
Blimbing	354km344	12,695	1,212	1.285
Niru	344km254	10,090	1,070	1,070
Penimur	333km422	10,832	1,332	1,332
Prabumulih X6	325km512	7,910	—	—
Prabumulih	322km105 322km295	3,407	450	500
Lembak	338km188	15,893	603	603
Karangendah	345km594	7,406	461	461
Gelumbang	353km822	8,228	580	580
Serdang	363km479	9,657	580	580
Payakabung	373km335	9,856	440	440
Simpang	388km500	15,165	434	434
Kertapati	400km102	11,602	485	492

(Source: Study team)



(Source: Study team)

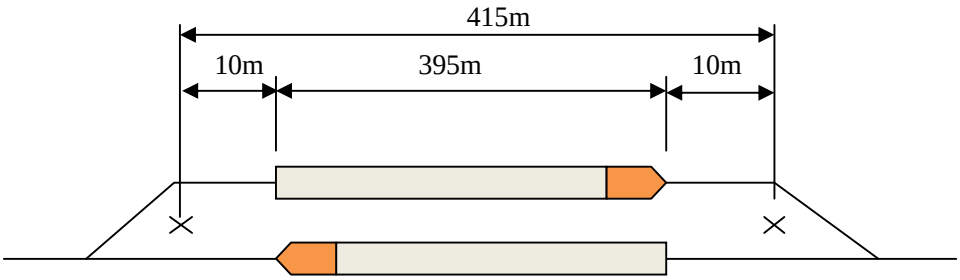
[Fig. 4-5-2] Vertical Alignment of the Section between Lahat and Kertapati

(2) Layout Improvement Plan

① The 1st Stage

The 1st Stage includes a train operation plan with a train set of 1 locomotive and 25 freight wagons for 8 round trips per day. It is necessary to consider the extension of passing tracks at passing stations so that extended freight trains can pass each other as well as new construction of signal stations between stations with a long distance where it is difficult to secure planned train operations of 8 round trips per day.

The train set length for a train with 1 locomotive and 25 freight cars is 395m. The effective length of track with current signaling facilities is more than 415m including 10m at each end of the train for safety margin for over-running, and so forth.



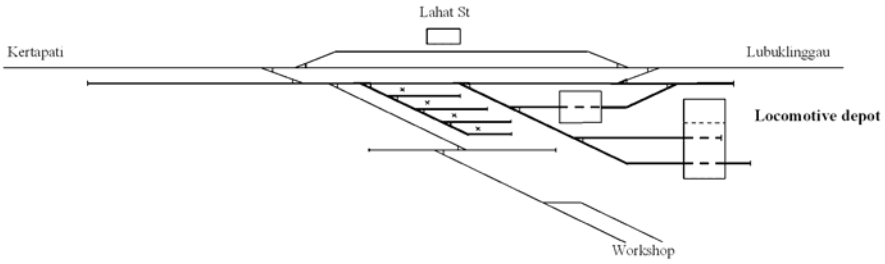
The × indicates vehicle contact gauge.

(Source: Study team)

[Fig. 4-5-3] Train Set Length and Effective Length of Track

The section under consideration is the one between Sukacinta and Kertapati with freight train operations. Of this, in the section between Sukacinta and Muara Enim, the number of operating trains is small and freight trains do not need to pass each other at stations on the way to the destination. As for the section between Muargula and Kertapati, as indicated in [Table 4-5-1] (P. 4-56), the effective length of track of more than 415m is already secured. Additionally, as a result of the consideration of train operational plans at current station locations, it is possible to secure the planed number of trains. For this reason, in the 1st Stage, current effective length of track will not be extended.

In the 1st Stage, 1 locomotive depot will be newly constructed inside Lahat station yard to inspect locomotives in order to cope with the increased number of operating freight trains. The track layout of the locomotive depot is indicated in [Fig. 4-5-4].



(Source: Study team)

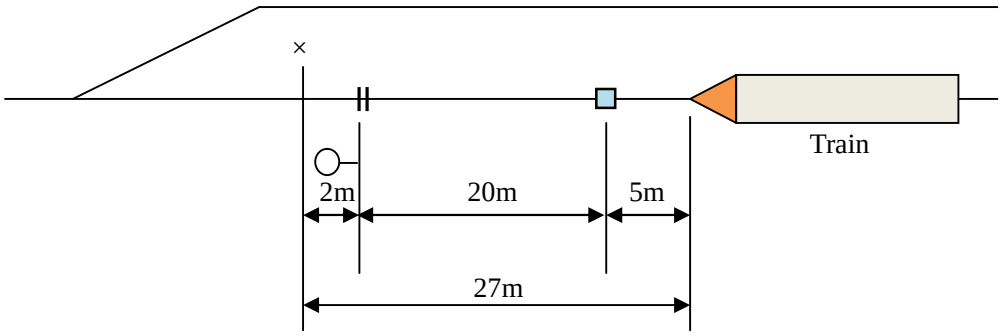
[Fig. 4-5-4] Track Layout for Lahat Locomotive Depot

② The 2nd Stage

The 2nd Stage includes a train operation plan with a train set of 1 locomotive and 40 freight cars for 10 round trips per day. In the same way as in the 1st Stage, it is necessary to consider the extension of passing tracks and new construction of signal stations.

The effective length of track will be approximately more than 670m for the train length of 615m with 1 locomotive and 40 freight cars, including 27m for each end of the train for safety margin for over-running in consideration of future introduction of automatic train stop systems (ATS).

The relationship between a train stop location and its effective length of track at a stopping station is indicated in [Fig. 4-5-5].



The ×: Vehicle contact gauge

‖ : Signal location

□ : ATS wayside coil

(Source: Study team)

[Fig. 4-5-5] Relationship between Train Stopping Location and Effective Length of Track

The section under consideration is the one between Sukacinta and Kertapati. Of this, in the section between Sukacinta and Muara Enim, in the same way as in the 1st Stage, freight trains do not need to pass each other. As for the section between Muargula and Prabumulih X6, as a step in improving coal transport capacity between Tanjung Enim and Tarahan, double tracking work has been implemented and is planned to be completed by the 2nd Stage. As for the section between Prabumulih and Kertapati, since the section does not have enough effective length of track, it will be extended. Additionally, as a result of the consideration of its track capacity in its train operation plan, signal stations will be newly constructed in the section between Prabumulih and Lembak and the section between Payakabung and Simpang with long distance and long traveling time between stations.

Track layout conditions for locations to install new signal stations are as follows: the alignment for locations to install turnouts is a straight line and its vertical pitch is below 2.5‰. Effective length of track extension and locations for newly constructing signal stations between Prabumulih and Kertapati are indicated in [Table 4-5-2] and [Fig. 4-5-6].

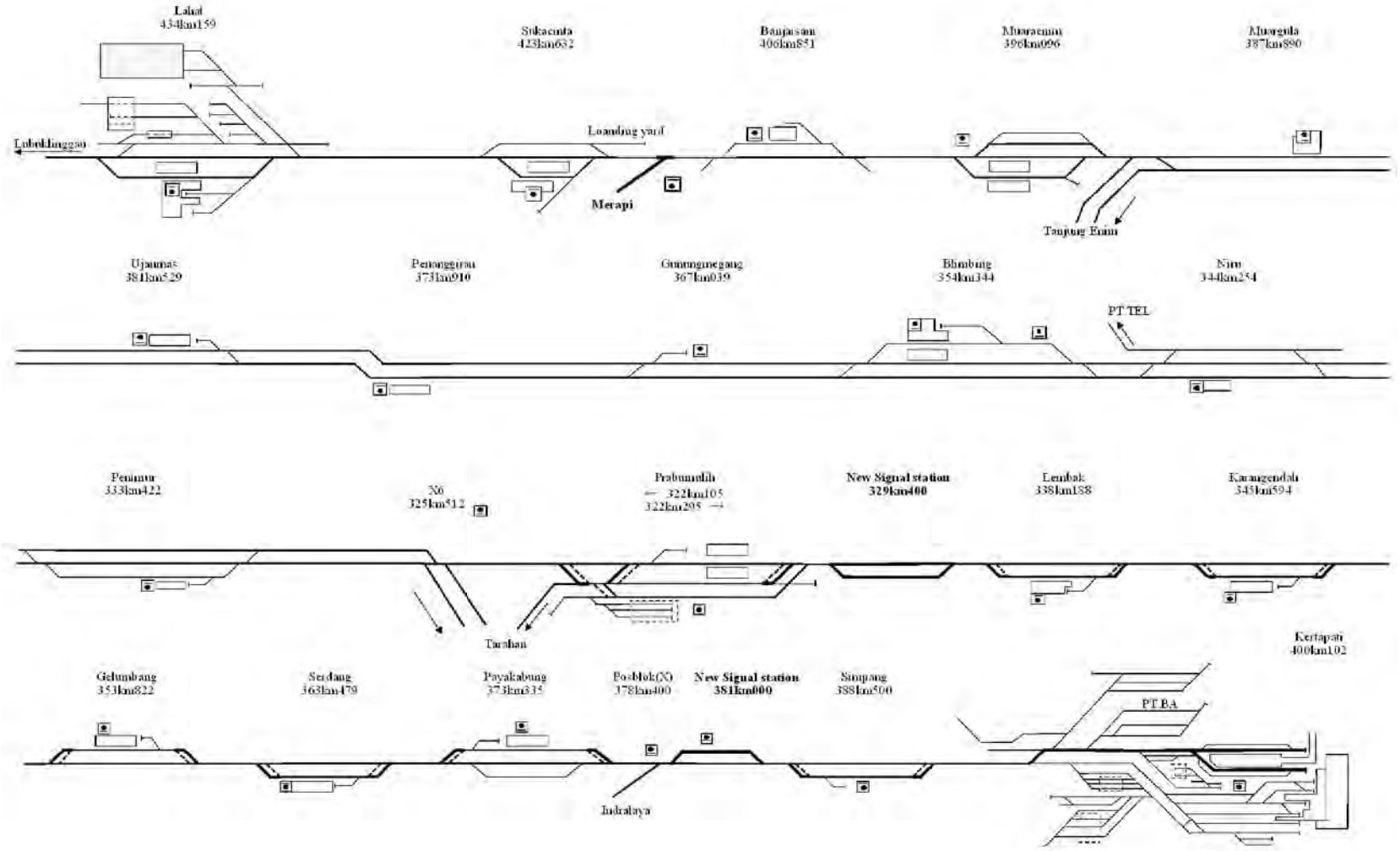
As for the facility for coal loading, in the middle of the section between Sukacinta and Banjarsani, a signal station will be installed to divide the side track from the main track and the facility will be newly installed in Merapi area where the coal mine is located.

The facility for loading and unloading coal will be installed after remodeling the site for current freight line in Kertapati station yard. Simplified floor plan for coal loading and unloading facilities at Kertapati station is indicated in [Fig. 4-5-7].

[Table 4-5-2] Location for New Installation of Signal Stations and Extension of Effective Length of Track between Prabumulih and Kertapati

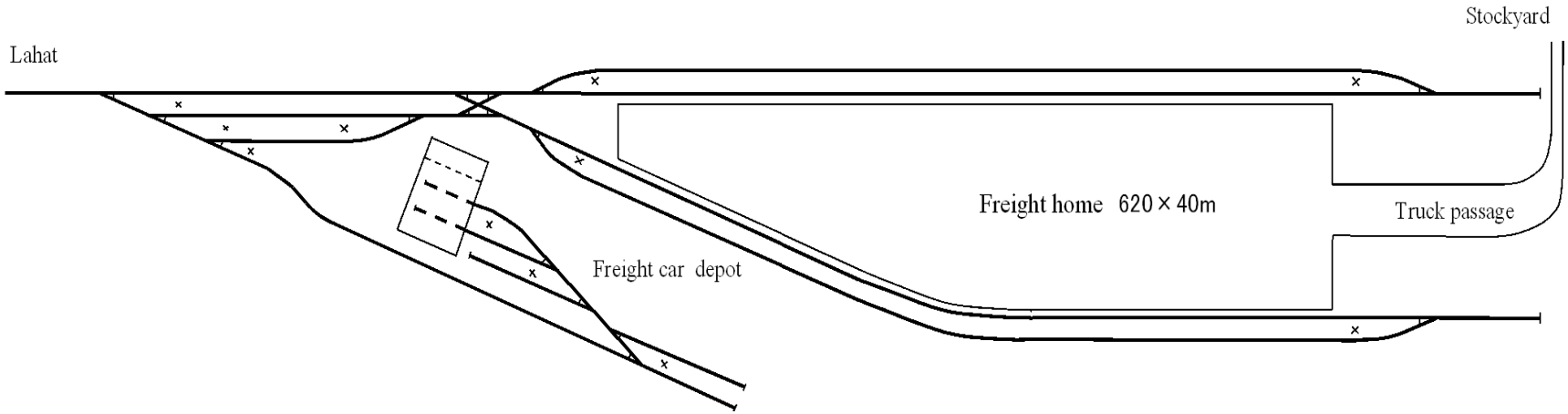
Station name	Location	Distance between Stations (m)		Effective Length (m)		
		Current	Plan	Current	Plan	Extension
Prabumulih	322km295			450	670	220
New signal station	329km400	—	7,105	—	670	—
Lembak	338km188	15,893	8,788	603	670	67
Karangendah	345km594	7,406	7,406	461	670	209
Gelumbang	353km822	8,228	8,228	580	670	90
Serdang	363km479	9,657	9,657	580	670	90
Payakabung	373km335	9,856	9,856	440	670	230
New signal station	381km000	—	7,665	—	670	—
Simpang	388km500	15,165	7,500	434	670	236
Kertapati	400km102	11,602	11,602	485	670	185

(Source: Study team)



(Source: Study team)

[Fig. 4-5-6] Track Layout for the 2nd Stage



(Source: Study team)

[Fig. 4-5-7] Simplified Floor Plan for Coal Loading and Unloading Facilities at Kertapati Station

③ The 3rd Stage

In the 3rd Stage, train operation plan includes train sets of 2 locomotives and 60 freight cars for 21 round trips per day. Effective length of track is more than 984m for the train length of 930m for 2 locomotives and 60 freight cars with a safety margin for over-running of 27m at each end of the train.

The section under consideration is between Sukacinta and Kertapati. Of this, double tracking work will be completed by the 2nd Stage in the section between Muara Enim and Prabumulih X6.

In the train operation plan, as a result of the consideration of track capacity, the following sections will be double tracked: approximately 30km between Sukacinta and Muara Enim; and approximately 80km between Prabumulih X6 and Kertapati.

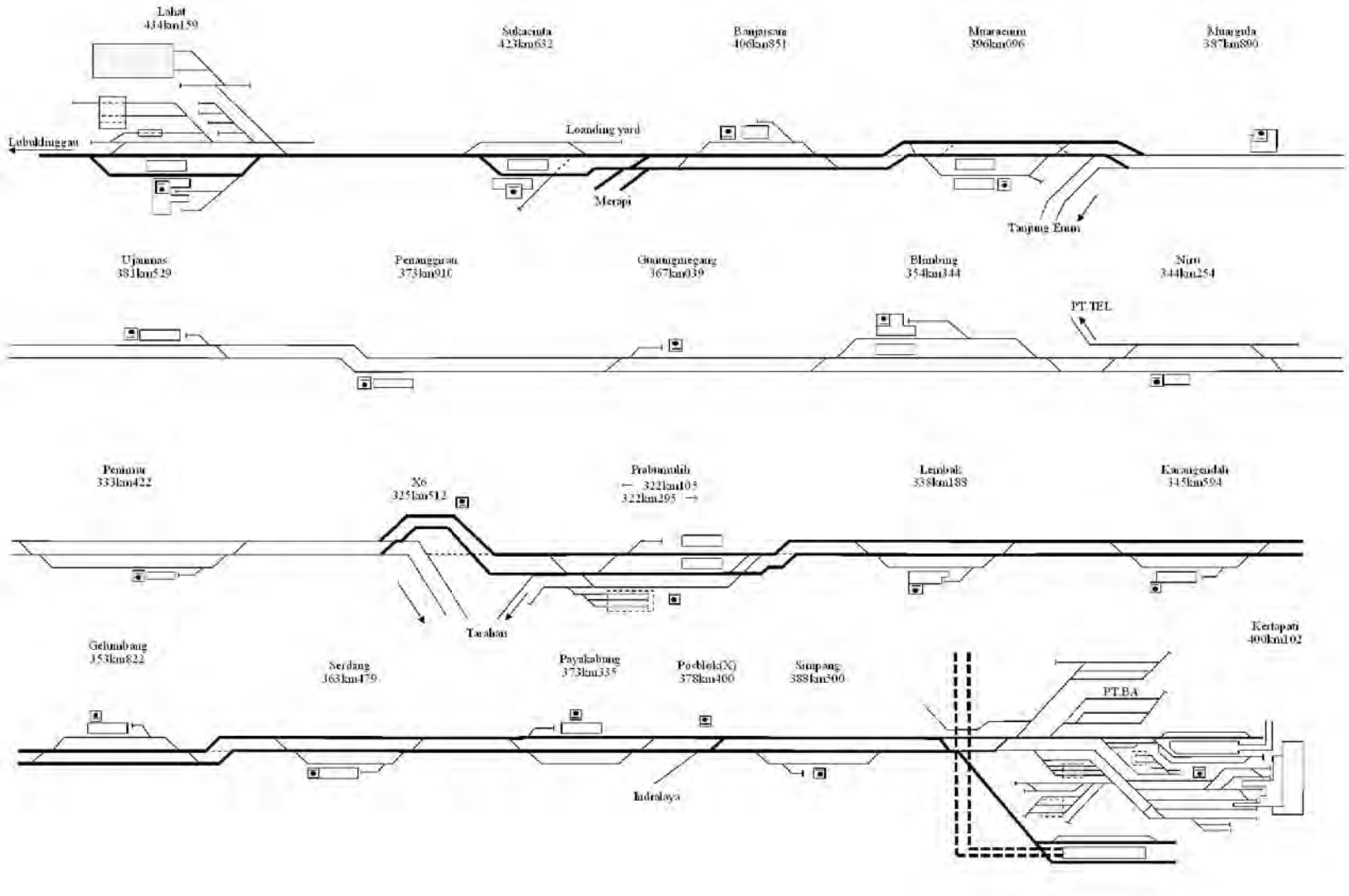
The track layout for double tracks between Lahat and Kertapati is indicated in [Fig. 4-5-8].

The tracks to be newly installed for double tracking will be 5 - 6m distanced from the current track in order to avoid interfering with train operations during the construction since planned lot is wide. Additionally, for bridge sections, when a new bridge is built for the new track, it is necessary to secure enough distance to prevent the construction from affecting the current bridge.

As for plane and vertical alignment, they should be equal or better than the current standard so that they will not interfere with the train operation plan.

As for coal loading facility, the facility installed in Merapi area in the 2nd Stage will be used.

As for coal loading and unloading facility, by installing a side track from the main track at the planned site for the development at the east side of Kertapati station yard, switching arrival, loading and unloading siding and a freight platform will be newly constructed.



(Source: Study team)

[Fig. 4-5-8] Track Layout for Double Tracks between Sukacinta and Kertapati

4.5.2. Track Planning

(1) Track Improvement Plan of the Existing Line Accompanying Traffic-volume Reinforcement

Track improvement plan of the existing line is shown in [Table 4-5-3]. The prerequisites for an improvement plan are as follows:

① Between Prabumulih and Kertapati

- Pre-stressed concrete sleeper is replaced with the type corresponding to R54 rail.
- Although it is necessary to change to R54 rail in the future, during the time that the present R42 rail is continued to be used, it is adjusted by the magnitude of the insulator of Fastenings.
- Ballast shoulder width is set to 50cm according to the installation of heavier rails.
- At the location where there is a lack of ballast, ballast will be added.
- At the line sections (mainly between 375k and Kertapati) where earth and sand are mixed in ballast, ballast will be changed and ballast depth will be increased to 35 - 40cm.

② Between Muara Enim and Prabumulih

- Pre-stressed concrete sleepers developed with crack will be completely replaced.
- Superannuated rail pads will be completely replaced.
- Clips of superannuated fastenings will be changed and at the part where clips are missing, re-tightening should be conducted.
- At the location where amount of ballast is insufficient, ballast will be refilled.
- At the mud-pumping locations near level crossings or locations where earth and sand are mixed in ballast near level crossings, ballast will be changed and ballast depth will be increased to 35 - 40cm.

③ Between Lahat and Muara Enim

- At the location where amount of ballast is insufficient, ballast will be refilled.
- At the mud-pumping locations near level crossings or locations where earth and sand are mixed in ballast near level crossings, ballast will be changed and ballast depth will be increased to 35 - 40cm.

④ Turnout

- Turnouts will be changed to R54 rail as in the case of general section.
- Turnouts will be changed to No. 12 simple turnout (refer [Appendix 4-5-2]) in line with sidetrack passing speed of 45 km/h as a result of raise train speed.

⑤ Continuous Welded Rail

- A buffer line section composed of 3 of 25m unit rails will be laid at the both ends of continuous welded rail.
- Continuous welded rail length is set to 1,000m for the line section of 600m or more of curve radiuses. Standard rail (100m of rail length) is applied for the line section of 600m or less of curve radiuses.

⑥ Sleepers for Steel Bridge (Non-Ballasted Bridge)

- Sleeper for steel bridges (non-ballasted bridge) will be upgraded to plastic sleeper.

[Table 4-5-3] Tracks Improvement Plan of the Existing Line Accompanying Traffic Volume Expansion

Section (extension) (km)	Rail replacement	CWR	Prestressed concrete sleeper replacement	Bridge Sleeper replacement	Rail clip exchange	Rail-pad exchange	Ballast replacement	Ballast supplement	Turnout exchange
375k～KPT (25.1)	◎	◎	◎	◎	◎	◎	◎	◎	◎
PBM～375k (52.7)	◎	◎	◎	◎	◎	◎	5% of all extension (appraisal)	◎	◎
X6～PBM (2.8)	---	---	10% of all extension (appraisal)	---	10% of all extension (appraisal)	◎	5% of all extension (appraisal)	◎	◎
ME～X6 (70.6)	---	---	10% of ★ (appraisal)	★	10% of ★ (appraisal)	★	5% of ★ (appraisal)	★	★
SCT～ME (27.5)	---	---	---	---	---	---	30% of all extension (appraisal)	◎	◎
LT～SCT (10.5)	---	---	---	---	---	---	5% of all extension (appraisal)	◎	◎

* KPT: Kertapati, PBM: Prabumulih, ME: Muaraenim, SCT: Sukacinta, LT: Lahat
* CWR: Continuous welded rail
* ◎: Entire interval, ★: The line section non-started construction work

(Source: Study team)

(2) Track Improvement Method of the Existing Line

Since the improvement of the existing line is considered as construction of an operating line, its method is investigated in consideration of time between trains, field condition, available equipments, etc.

① Ballast Replacement

Since working hour was restricted according to the conditions of time between trains when ballast renewal and the installation of heavier rails are conducted simultaneously, rail replacement and sleeper replacement are implemented separately. In the case that time between trains is approximately 1.5 hours, ballast renewal and sleeper replacement can be conducted at the same time, but rail replacement can't be conducted simultaneously.

② Rail Replacement

Rail welding of continuous welded rails are primarily carried out at a base or a factory to form the rails with a length of approximately 150m. They are then transported to the site and the secondary welding is conducted. If a time between trains of about 3 hours is securable, replacement of the rail with about 150m in length is possible.

③ Rail Welding

As for the rail welding method, since the primary welding performed on a base etc. has a high reliability, flash butt welding that posses excellent workability is recommended. Besides, the secondary welding carried out on-site has a great mobility and the Thermit-welding with simple welding work is considered.

④ Bridge Sleeper Replacement

The sleeper which was re-shaped to the form that can be laid on bridge girder is put on a temporary place (installing scaffold) on a bridge. If a time between trains of about 1.5 hours can be secured, sleeper replacement, tie plate replacement and rail conclusion can be conducted, but rail replacement needs to be implemented separately.

(3) Double-tracking Track Construction

The line sections of double-tracking track construction are the following 3 sections:

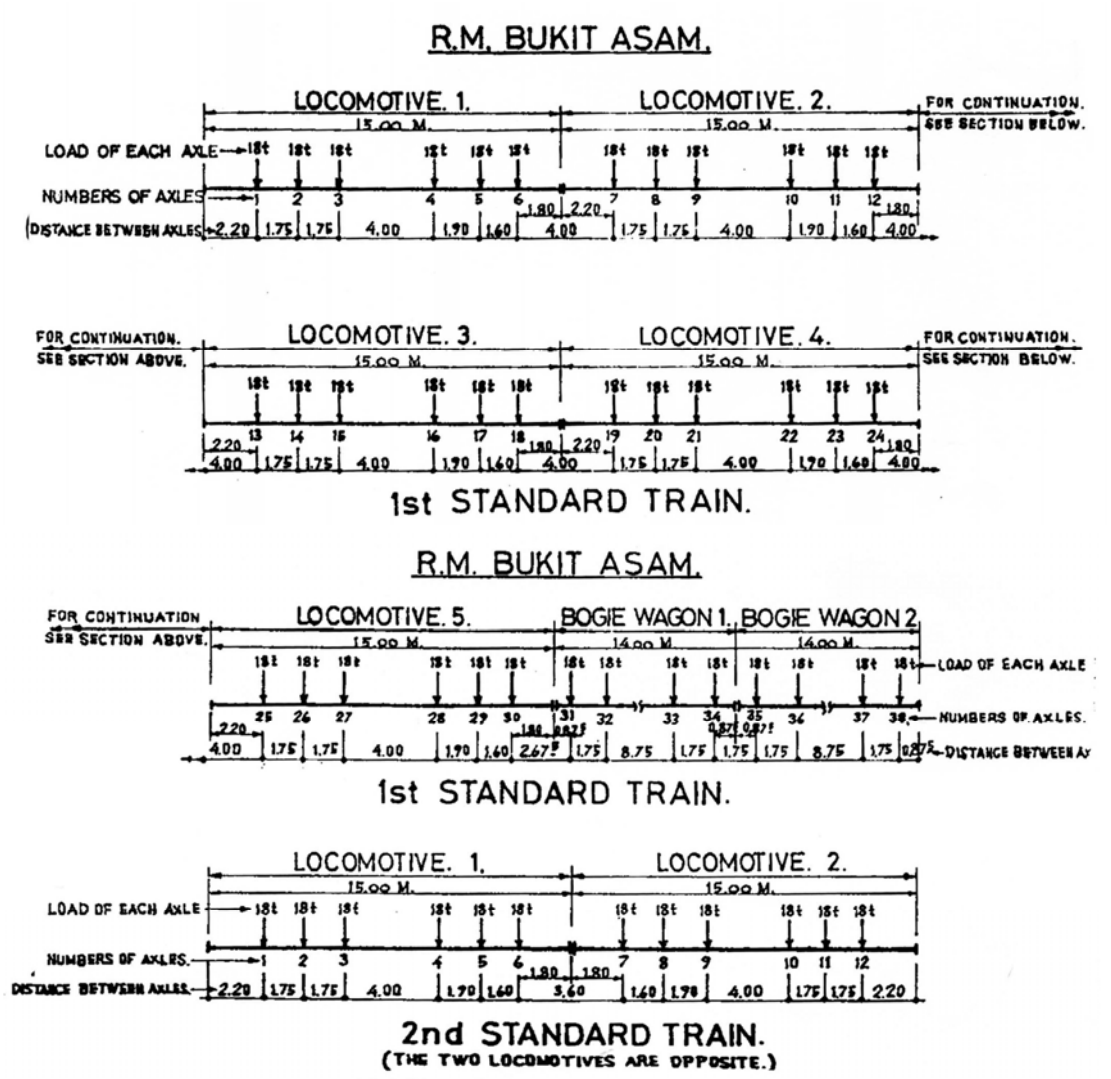
- Between Sukacinta and Muara Enim (approximately 28km)
- The section in the large section between Muara Enim and Prabumulih X6 (approximately 71km) where double-tracking construction has not started
- Between Prabumulih X6 and Kertapati (approximately 81km)

Double-tracking track construction can be conducted without being influenced by the train operation of existing line in principle; after sub-grade is completed, track will be laid.

4.5.3. Infrastructure Plan

(1) Design Load

The plan for the capacity expansion of coal transportation proposes a train formation consisting of 2 locomotives and 60 freight wagons. The design load of civil structures is based on the locomotives and freight cars (axle load of 18t) shown in [Fig. 4-5-9].



(Source: RENCANA MUATAN 1921)

[Fig. 4-5-9] Train Design Load

(2) Infrastructure plan

Because the final goal is to increase the coal transport capacity to 20MTPA, the project has

been divided into the following 3 stages: The 1st Stage (Single track improvement), The 2nd Stage (Partial double tracking), and The 3rd Stage (Whole line double tracking). The effective length at stations will be increased according to the proposed train formation length at each stage and new stations and tracks will also be constructed.

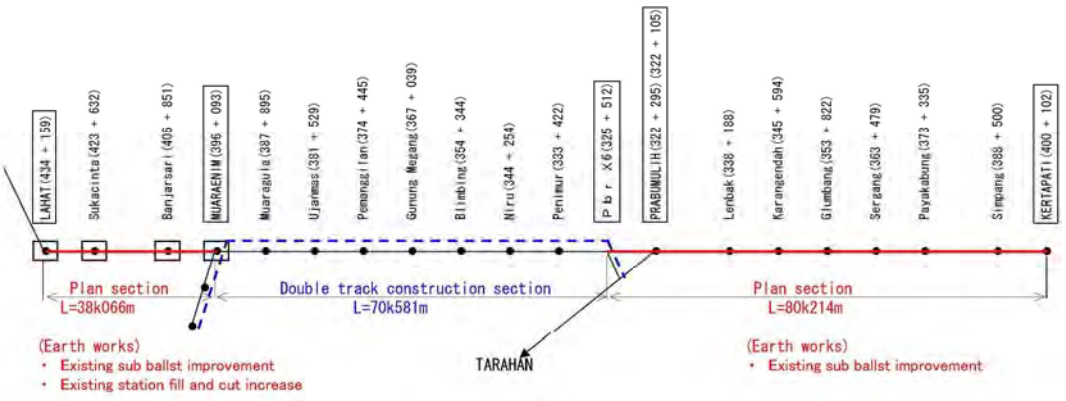
[Table 4-5-4] Plan for Increasing the Effective Length at Stations

No	Station		Existing Siding Length	The 1st Stage	The 2nd Stage	The 3rd Stage
				Train formation L=395m ＜400m	Train formation L=615m ＜700m	Train formation L=930m ＜1000m
1	Kertapati	KPT	1,335m	---	---	---
2	Simpang	SIG	706m	---	---	+294m
	New station	Assumed	---	---	700m	+300m
3	Payakabung	PYK	493m	---	+207m	+300m
4	Serdang	SDN	700m	---	---	+300m
5	Gelumbang	GLB	700m	---	---	+300m
6	Karangendah	KED	461m	---	+239m	+300m
7	Lembak	LEB	661m	---	---	+339m
	New station	Assumed	---	---	700m	+300m
8	Prabumulih	PBM	508m	---	---	---
9	X6	Prabumul	---	---	---	---
10	Penimur	PNM	1,335m	---	---	---
11	Niru	NRU	1,114m	---	---	---
12	Blimbingpendopo	BIB	1,415m	---	---	---
13	Gunungmegang	GNM	1,550m	---	---	---
14	Penanggiran	PGR	1,000m	---	---	---
15	Ujanmas	UJM	1,491m	---	---	---
16	Muaragula	MRL	1,284m	---	---	---
17	Muara Enim	ME	342m	+58	+300m	+300m
18	Baniarsari	BJl	225m	+175	+300m	+300m
19	Sukacinta	SCT	137m	+263	+300m	+300m
20	Lahat	LT	342m	+58	+300m	+300m

(Source: Study team)

① The 1st Stage (Single Track Improvement)

In order to achieve the final goal of increasing the coal transport capacity to 20MTPA, the train formation during the 1st Stage should be expanded to cope with the 2.5MTPA transportation (1 locomotive + 25 freight wagons, formation length=395m). Also, the existing track should be improved to be able to handle an increased number of trains per day (8 round trips /day).

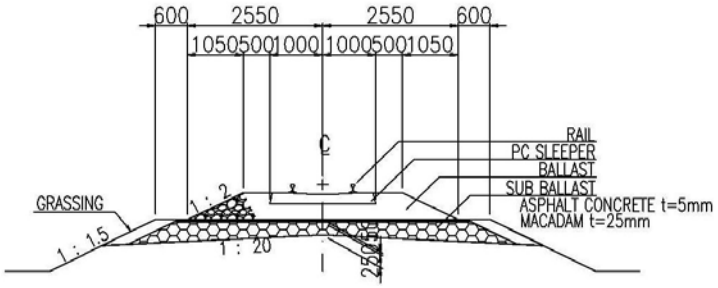


(Source: Study team)

[Fig. 4-5-10] Outline of the 1st Stage (Single Track Improvement)

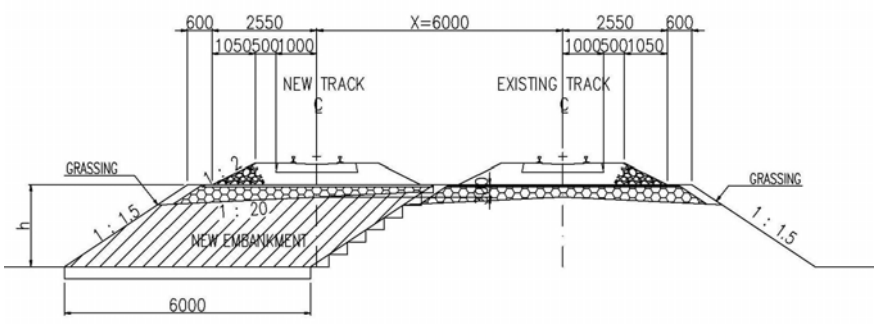
As explained in 4.1.2. (P. 4-8), present condition of civil engineering structures, bridges do not have to be rehabilitated as part of the improvement of the existing line because they have already been reinforced and upgraded to cope with an axle load of 18t. Also, since pipes and culverts that cross the track are buried into the ground and thus cannot be checked, they will be excluded from the improvement works. Instead, detailed surveys shall be conducted when the plans are implemented and required measures will be re-evaluated.

Therefore, at the 1st Stage, damaged sleepers and mud pumping will be dealt with and roadbeds improved as part of the track rehabilitation work. In addition, the effective length at stations will be increased where sidings are less than the train formation length of 395m (refer [Table 4-5-4]).



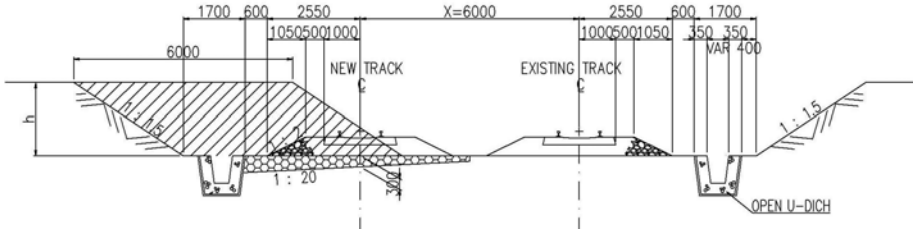
(Source: Study team)

[Fig. 4-5-11] Drawing Showing Improvement of Existing Roadbed



(Source: Study team)

[Fig. 4-5-12] Standard Drawing of Embankment for Increasing Effective Length at Stations



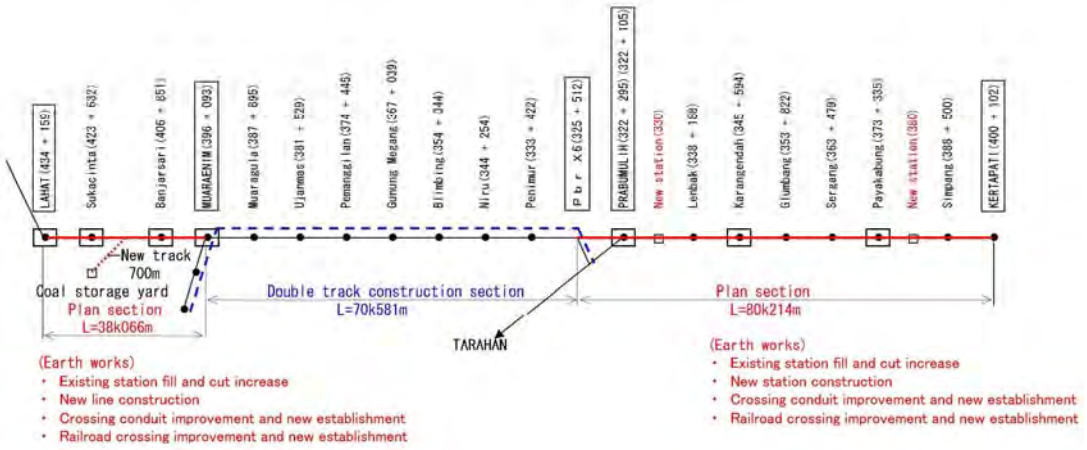
(Source: Study team)

[Fig. 4-5-13] Standard Drawing of Cutting for Increasing Effective Length at Stations

② The 2nd Stage (Partial Double Tracking)

In order to achieve the final goal of expanding the coal transport capacity to 20MTPA, the train formation during the 2nd Stage should be extended to cope with a yearly transport volume of 5.0MTPA (1 locomotives + 40 freight wagons, formation length=615m). Also, the effective length at stations should be improved to be able to handle an increased number of trains per day (10 round trips/day).

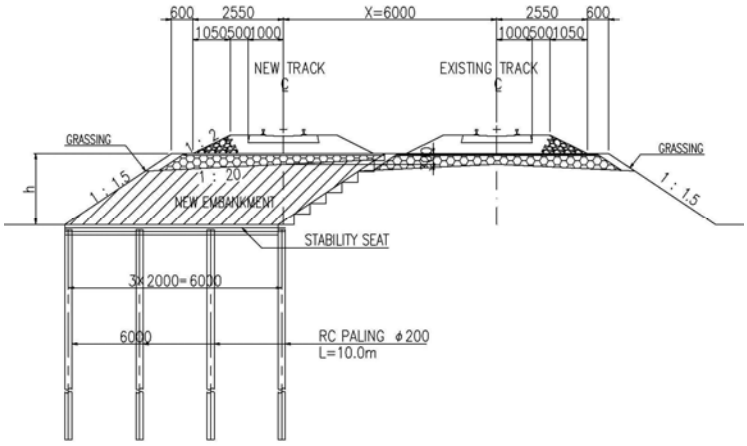
Moreover, 2 more stations (signal stations) will be added and an approximately 700m long sidetrack from Merapi to the coal yard will be constructed.



(Source: Study team)

[Fig. 4-5-14] Outline of the 2nd Stage (Partial Double Tracking)

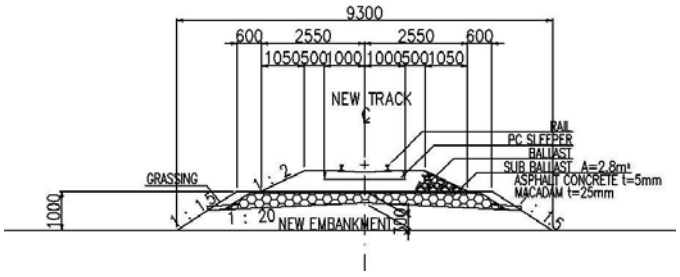
The existing railway structures will be treated in the same way as during the 1st Stage: bridges will not be reinforced and detailed surveys of pipes and culverts crossing the track will be conducted when the plans are implemented and necessary measures will be re-evaluated. Therefore, at the 2nd Stage, damaged sleepers and mud pumping will be dealt with and roadbeds improved as part of the track rehabilitation work. In addition, the effective length at stations will be increased where sidings are less than the train formation length of 615m (refer [Table 4-5-4] (P. 4-70)) and two new stations (signal stations) will also be constructed. New stations and sidings will be constructed in the Prabumulih - Lembak section (about 16km) and the Payakabung - Simpang section (about 15km) section. Embankments and cuttings will be used on the Prabumulih - Lembak section and reinforced piled embankments will be employed in the Payakabung - Simpang section as a countermeasure against soft soil.



(Source: Study team)

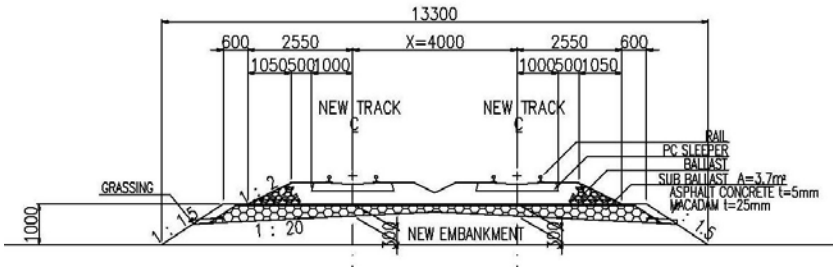
[Fig. 4-5-15] Construction Method for New Piled Embankment on the Pyk - Kpt Section

A single-track embankment (L=700m) will be used for the new track between Merapi and the coal yard while the coal yard station will use a double-track embankment.



(Source: Study team)

[Fig. 4-5-16] Standard Drawing of Embankment at New Line between Merapi and Coal Yard

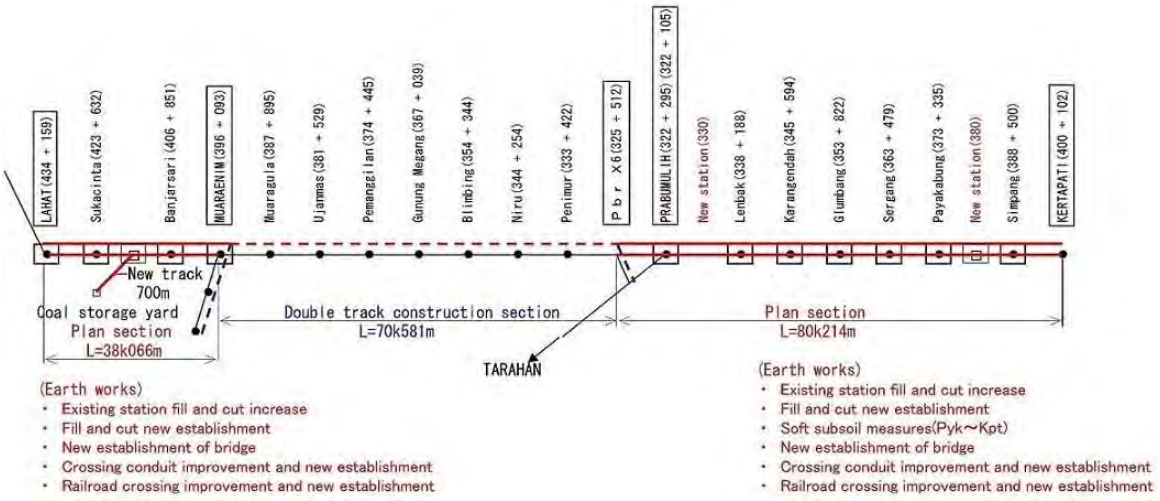


(Source: Study team)

[Fig.. 4-5-17] Standard Drawing of Embankment at New Station between Merapi and Coal Yard

③ The 3rd Stage (Whole Line Double Tracking)

In order to achieve the final goal of increasing the coal transport capacity to 20MTPA, the train formation during the 3rd Stage should be lengthened to cope with the 20.0MTPA transportation (2 locomotives + 60 freight wagons, formation length=930m). Also, the effective length at stations should be improved to be able to handle an increased number of trains per day (21 round trips/day) and the Lahat - Muara Enim and Prabumulih X6 - Kertapati sections will be double-tracked.



(Source: Study team)

[Fig. 4-5-18] Outline of the 3rd Stage (Whole line Double Tracking)

The existing railway structures will be treated in the same way as during the 1st Stage; bridges will not be strengthened and detailed surveys of pipes and culverts crossing the track will be conducted and necessary measures will be re-evaluated. Therefore, at the 3rd Stage, the effective length at stations will be increased where sidings are less than the train formation length of 930m (refer to [Table 4-5-4] (P. 4-70)). The new structures will be constructed in accordance with the following drawings for the 2nd Stage (refer [Fig. 4-5-12] (P. 4-72), [Fig. 4-5-13] (P. 4-72), and [Fig. 4-5-15] (P. 4-74)).

The following paragraphs provide additional information on the plans for the civil engineering structures related to the double-tracking of the Lahat - Muara Enim and Prabumulih X6 - Kertapati sections.

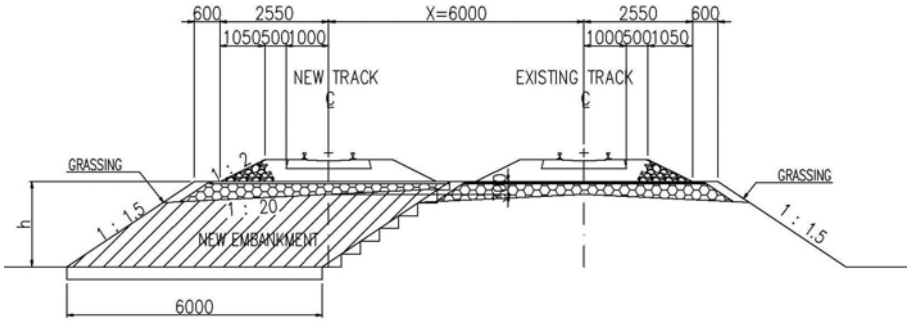
1) Construction of New Embankments

In the Lahat - Payakabung section which consists of sedimentary rock, a new embankment

and track will be constructed 6m beside the existing track (refer [Fig. 4-5-19]). The embankment on the swampy silt portion of the Payakabung - Kertapati section will be reinforced with piles in order to control settlement and ensure the safety of the embankment (refer [Fig. 4-5-20]).

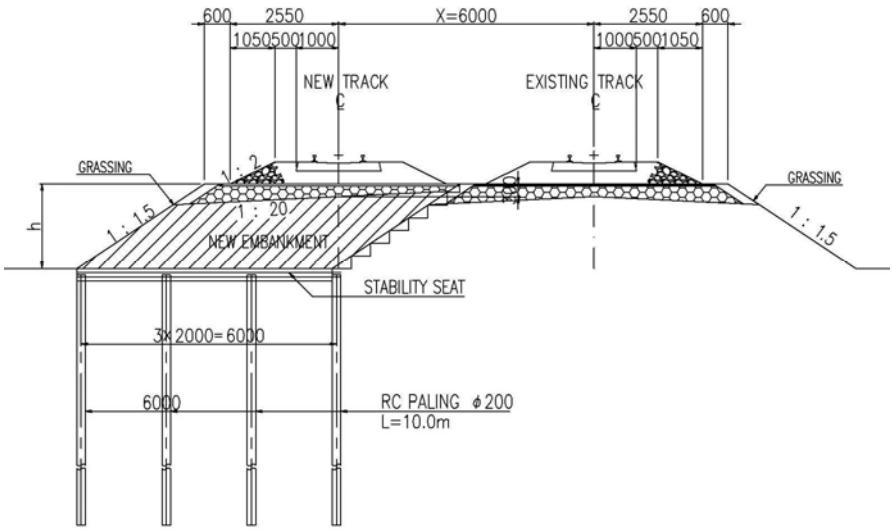
2) Construction of New Cuttings

Cutting structure will be constructed for the new track 6m beside the existing track (refer [Fig. 4-5-21]).



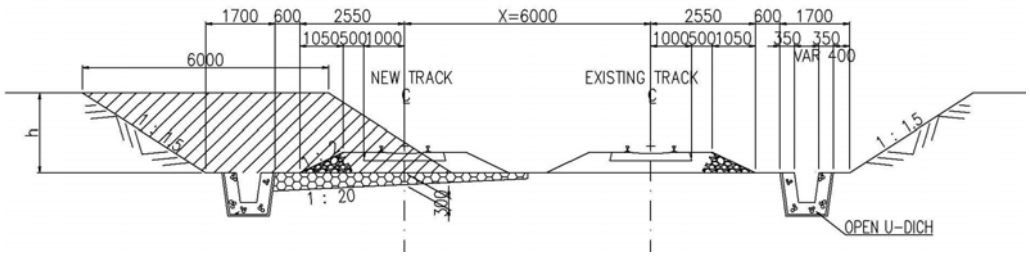
(Source: Study team)

[Fig. 4-5-19] Standard Drawing of Double-track Section with Embankment



(Source: Study team)

[Fig. 4-5-20] Construction Method for Double-track Section with Piled Embankment



(Source: Study team)

[Fig. 4-5-21] Standard Drawing of Double-track Section with Cutting

3) New Construction of Bridges (refer [Fig. 4-5-22])

It is possible to construct superstructure next to the substructure of the existing line. Girders of the same structural type as the existing girders that were upgraded to cope with the 18t axle load will be constructed at the location 10m from the existing line. Using steel girders (SS400) and RC girders (K300) as construction materials is no problem since these materials are of the same type as those currently used in Japan.

As for the substructure, for construction adjacent to the foundation of existing line, check the construction capacity, 10m apart from, because the existing substructure is a reinforced structure, abutments and piers redesigned to tolerate the 18t axle load will be installed.

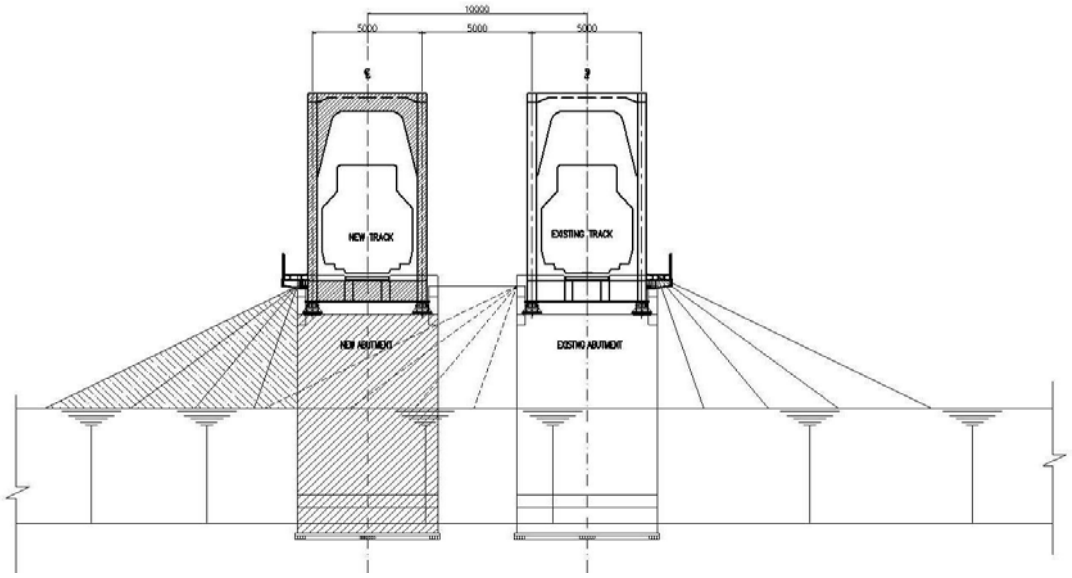
The construction materials for abutments (K250) and piers (K350) do not pose a problem because they have high concrete design strength (240kg/cm^2) and are the same as those currently used in Japan.

4) Additional Transverse Pipes and Culverts

Pipes and culverts suitable for the 6m wide enlarged part of new embankments and cuttings will be constructed.

5) Additional Level Crossings

The 6m wide enlarged part of the new track will be covered with asphalt.

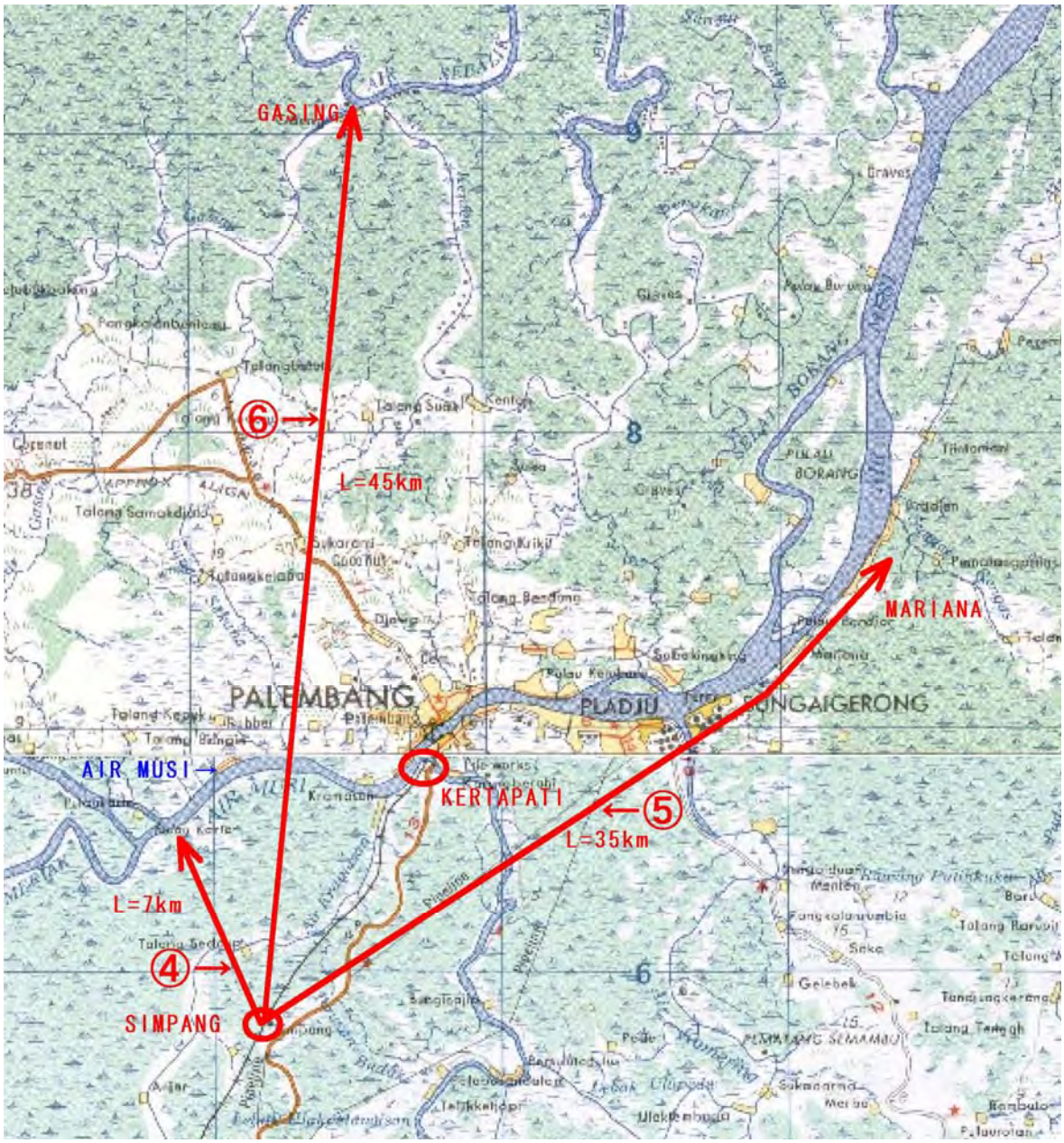


(Source: Study team)

[Fig. 4-5-22] Working Drawing of Double-track Bridge Section

The following 3 routes are also planned from Simpang to the coal loading area just for reference only.

- New station and track for the Musi river located about 7km from Simpang
- New station and track for Mariana located about 35km from Simpang
- New station and track for Gasing located about 45km from Simpang



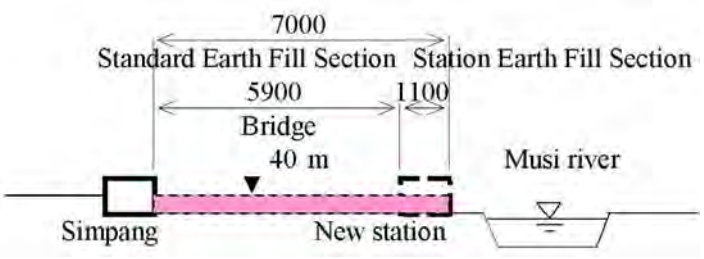
(Source: Study team)

[Fig. 4-5-23] Map Showing Location of Extension Routes

④ New Station and Track for the Musi River Located about 7km from Simpang

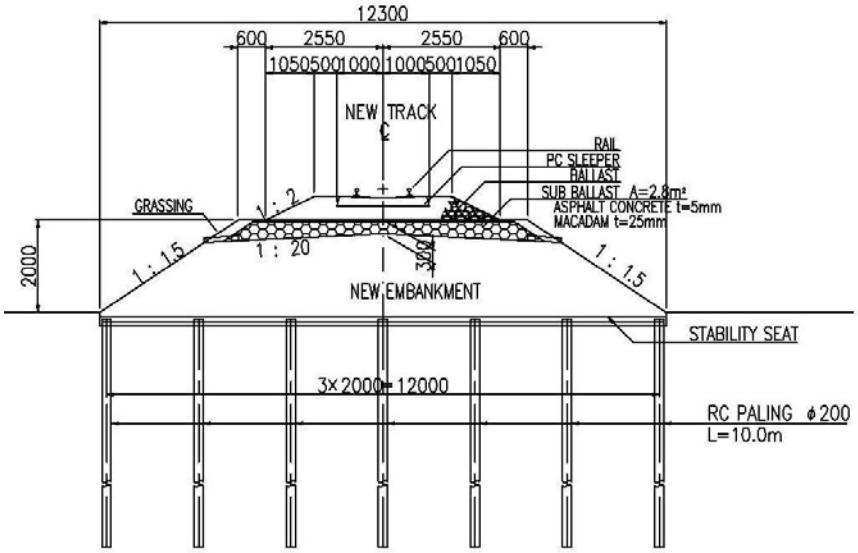
This extension route will have to be constructed on the swampy silt area between Simpang and the Musi river. Because the area consists of soft soil, it would be optimal to construct a girder viaduct that is not affected by settlement although this is more expensive than constructing an embankment. However, since the existing embankment does not show any significant deformation, a piled embankment will be used to prevent settlement and ensure safety.

Therefore, the construction cost will be calculated based on the following assumptions; the general section of the new line will use a single-track embankment (refer [Fig. 4-5-11] (P. 4-72)), the station area will use a double-track embankment (refer [Fig. 4-5-12] (P. 4-72)), and the intermediate section with river and road crossings will be constructed according to [Fig. 4-5-23]. Also, there will be 1 bridge consisting of a 40m truss (superstructure) and semi-gravity abutments (substructure).



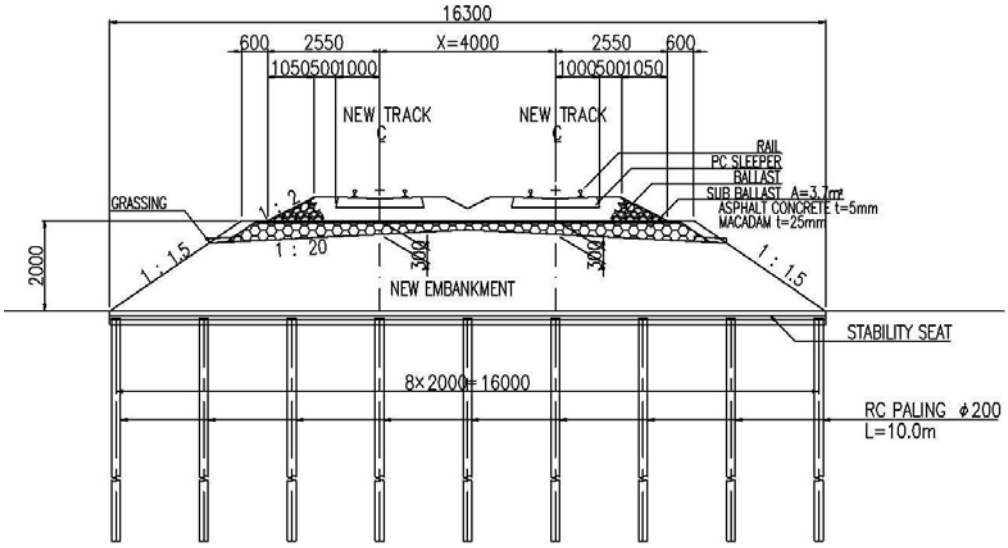
(Source: Study team)

[Fig. 4-5-24] Outline of the Musi River Extension Route



(Source: Study team)

[Fig. 4-5-25] Standard Drawing of New Embankment on General Section



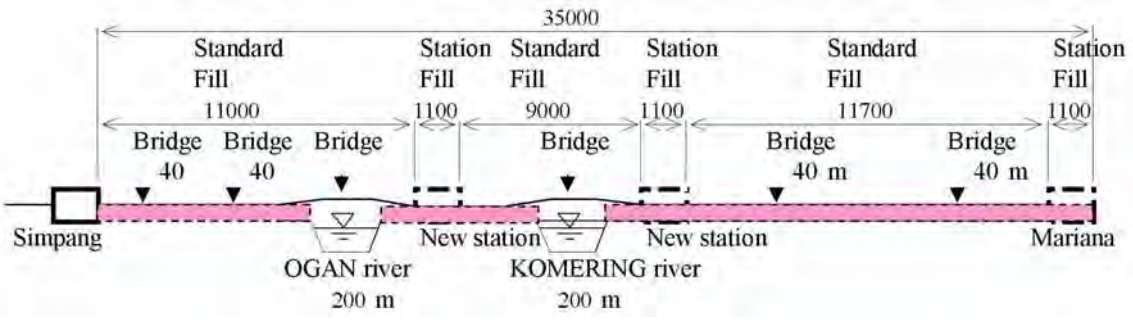
(Source: Study team)

[Fig. 4-5-26] Standard Drawing of New Embankment in Station Area

⑤ New Stations and Track for Mariana Located about 35km from Simpang

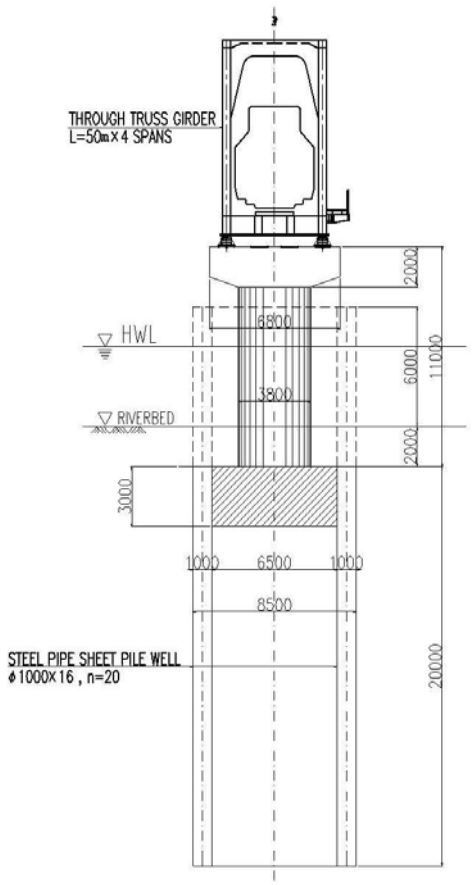
This 35km long extension route begins at Simpang and follows the Musi river downstream to Mariana, crossing the Ogan and Komering rivers on the way. Because this route will have to be constructed on swampy silt in the same way as route ④, it will be constructed on a piled embankment as a countermeasure against soft soil.

Therefore, the construction costs will be calculated based on the following assumptions; the general sections of the new line will use single-track embankments (refer [Fig. 4-5-11] of the route ④ (P. 4-72)), the station areas will use double-track embankments (refer [Fig. 4-5-12] of the route ④ (P. 4-72)), and the intermediate sections with river and road crossings will be constructed according to [Fig. 4-5-23] (P. 4-79). Also, there will be two large bridges with 4 spans consisting of 50m trusses (superstructure), semi-gravity piers and sunk-well steel pipe sheet-piles (substructure) as well as 4 other bridges with 40m trusses (superstructure) and semi-gravity abutments (substructure). There will also be 2 new stations on the intermediate sections.



(Source: Study team)

[Fig. 4-5-27] Outline of the Simpang - Mariana Extension Route



(Source: Study team)

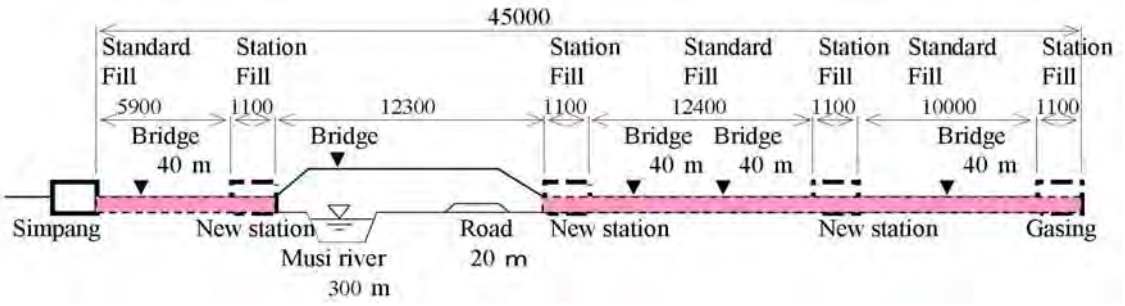
[Fig. 4-5-28] Cross-section of the Ogan and Komering River Bridges

⑥ New Stations and Track for Gasing Located about 45km from Simpang

This approximately 45km long extension route will cross the Musi river north of Simpang and pass through the suburbs of Palembang before arriving at Gasing. On the way, it will cross the

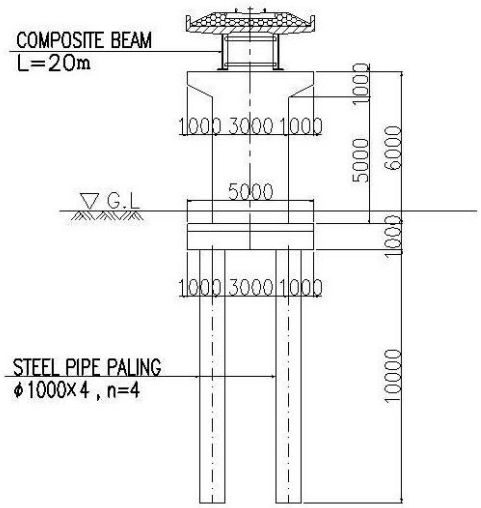
Musi river and a main road as well as pass through the suburbs of Palembang which are dotted with private houses. Because this route will have to be constructed on swampy silt in the same way as the route ④, it will be constructed on a piled embankment as a countermeasure against soft soil. The Musi river requires a large-scale bridge because it is a route frequented by big ships. Therefore, a girder viaduct will be constructed on the approximately 12km long section starting before the Musi river and ending after the main road crossing in the suburbs of Palembang.

Therefore, the construction costs will be calculated based on the following assumptions; the general sections of the new line will use single-track embankments (refer [Fig. 4-5-11] of the route ④ (P. 4-72)), the station areas will use double-track embankments (refer [Fig. 4-5-12] of the route ④ (P. 4-72)), and the intermediate sections with river and road crossings will be constructed according to [Fig. 4-5-23] (P. 4-79). Also, there will be 1 large bridge with 5 spans consisting of 60m trusses (superstructure), semi-gravity piers and sunk-well steel pipe sheet-piles (substructure) as well as 4 other bridges with 40m trusses (superstructure) and semi-gravity abutments (substructure). There will also be 1 girder viaduct with 20m composite I-girders (superstructure), wall-type semi-gravity piers and pile foundations (substructure), as well as 3 new stations on the intermediate sections.



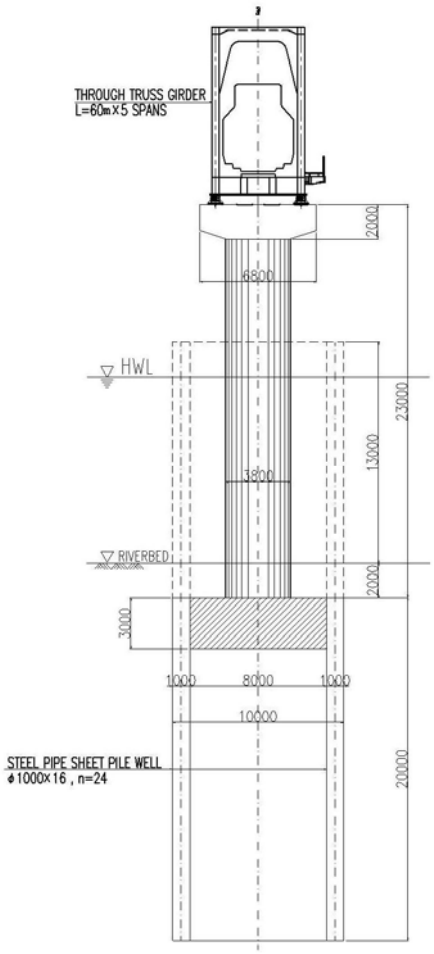
(Source: Study team)

[Fig. 4-5-29] Outline of the Simpang - Gasing Extension Route



(Source: Study team)

[Fig. 4-5-30] Cross-section of Girder Viaduct



(Source: Study team)

[Fig. 4-5-31] Cross-section of the Musi River Bridge

4.5.4. Station and Signal Station Plan

It installs with a signal station based on the train operation plan.

(1) The following will be examined at the 1st Stage.

- Expansion of coal stockyard and coal unloading facility of PT. BAU in Kertapati.

(2) The following will be examined at the 2nd Stage.

- Construction of branch line between main line and Merapi of 700m.
- Expansion of coal stockyard and coal unloading facility by converting container yard in Kertapati station.
- Relocation of existing signal system due to the extension of effective length.
- Increase of signal houses in 2 places.

(3) The following are examined at the 3rd Stage.

- Development of coal stockyard in Kertapati station area of 20ha and installation of belt conveyer system to reach Musi river.

(4) The Followings are examined as a Reference Plan.

- Expansion of Simpang station due to the construction of new line to Gasing and construction of new stations or signal stations at intervals of 10km for trains to wait while passing another train from the opposite direction in the construction of new line of 45km.
- Expansion of Simpang station due to construction of new line to Mariana and construction of new stations or signal stations at intervals of 10km for the train to wait while passing another train from the opposite direction in the new line of 35km.

4.5.5. Electrical Power and Mechanical Plan

Capacity of existing electrical equipment by mechanical control method shall be considered whether it is enough or not at stations where arrival/ departure lines will be improved. Purchase of commercial power from electric power supplier shall be considered for stations, signal cabin and coal stockyard of the new line.

(1) The following matter shall be considered at the 1st Stage.

- Existing electricity equipment shall be used at existing stations basically.

(2) The following matters shall be considered at the 2nd Stage.

- Existing electricity equipment shall be used at existing stations basically.
- Purchase of commercial power from electric power supplier shall be considered at locations where 2 signal cabins are installed.

(3) The following matters shall be considered at the 3rd Stage.

- Purchase of commercial power from electrical power supplier shall be considered for all electrical equipment, including existing stations.
- In the mechanical facility plan, taking advantage of the information communication system via optical line network installed at the 3rd Stage, seat reservation system for passenger train by mobile phone will be installed.

(4) The following matters shall be considered in the Reference Stage.

- In the new line going to Gasing, as a part of modification of electrical and mechanical equipments at Simpang station, building of new station or signaling station and installation of mechanical and electrical equipments at every 10 km will be considered.
- In the new line going to Mariana, as a part of modification of electrical and mechanical equipments at Simpang station, building of new station or signaling station and installation of mechanical and electrical equipments at every 10 km will be considered.

4.5.6. Signaling Plan

Standardized system and functions which can maximize outcome are equipped based on a operation plan.

In addition, installation of ATS system shall be considered in the early stage.

(1) The following matters shall be considered at the 1st and 2nd Stages.

- Due to the extension of train-set, signal equipment and point machines are relocated in accordance with extension of platform.
- In case that mechanical interlocking device cannot control the signaling system due to the extension of platform length, number of signal cabin is increased.
- Installation of 1st class electric relay interlocking device shall be considered for signal facilities at signal cabins where the increased number is more than 2.

(2) The following matters shall be considered at the 3rd Stage.

- The 1st class electric relay interlocking device is installed at each station (ex. signal and telecommunication facilities in Prabumulih station).
- Existing mechanical interlocking system whose control method is economical and the system

is standardized is continued to be used. However, Installation of ATS (backup equipment which operates brake automatically and prevents from accidents derailments in advance) is considered at the new line section and the section between Kertapati and Lahat, in order to counter the situation that signal ignorance and operation mistake may occur.

(3) The following matters shall be considered at the Reference Stage.

- In the new line going to Gasing, as a part of modification of electrical and mechanical equipments at Simpang station, building of new station or signaling station at every 10 km will be considered.
- In the new line going to Mariana, as a part of modification of electrical and mechanical equipments at Simpang station, building of new station or signaling station at every 10 km will be considered.

4.5.7. Telecommunication Plan

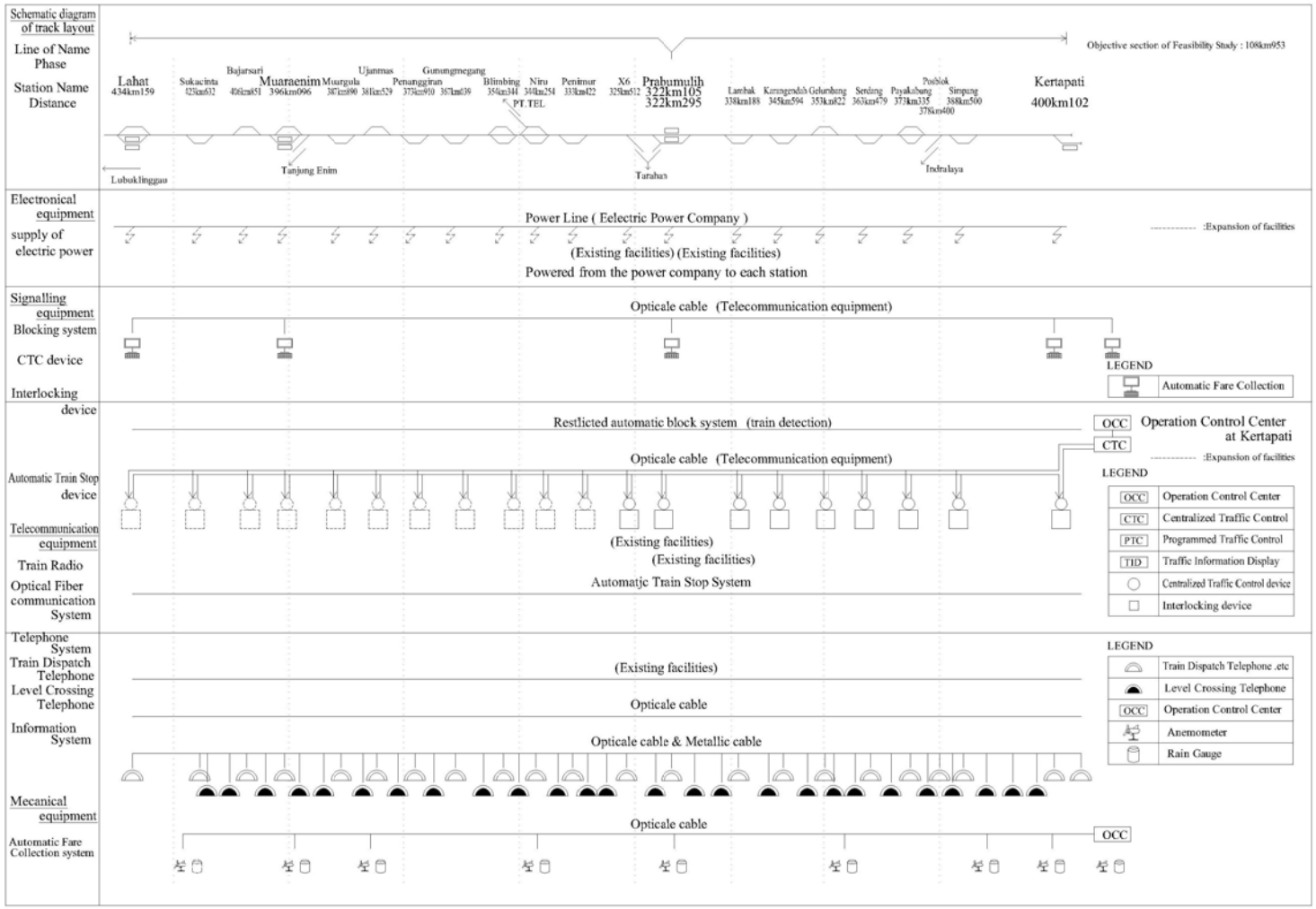
Installation of optical carrier system using optical fiber cable along all the lines shall be considered in order to realize clear voice transmission and large data transfer from operation center to each station and level crossing cabin.

(1) The following matters shall be considered at the 3rd Stage.

Installation of optical carrier system at operation center in Palembang station which covers the section between Kertapati Station and Lahat Station, and Merapi coal stockyard loading facikities shall be considered.

(2) The following matters shall be considered as at the reference stage.

- Installation of optical carrier system at a new line between Simpang Station and coal stockyard at the Musi River shall be considered.
- Installation of optical carrier system at a new line between Simpang Station and Mariana shall be considered.
- In case the optical carrier system has excess capacity, the unused capacity may be open for public use collecting user charge.
- Existing wireless communication system is leaved as backup of line network.



(Source: Study team)

[Fig. 4-5-32] System Outline Chart of Electric Power, Machine, Signal, and Telecommunication

4.5.8. Rolling Stock Plan

(1) Locomotive

PT. KAI operates CC202 (G26MMC-2) type locomotives made by EMD for coal transportation of PT. BA. PT. KAI has a plan to replace GT38 C-AC locomotives made by EMD with CC205 type. The performance comparison with CC205 type locomotive and CC202 type locomotive is shown in [Table 4-5-5].

(Source: Sojitz Co.)

[Pic. 4-5-1] CC202 (G26MMC-2) Type Locomotive Made by EMD

[Table 4-5-5] Performance Comparison of Locomotives

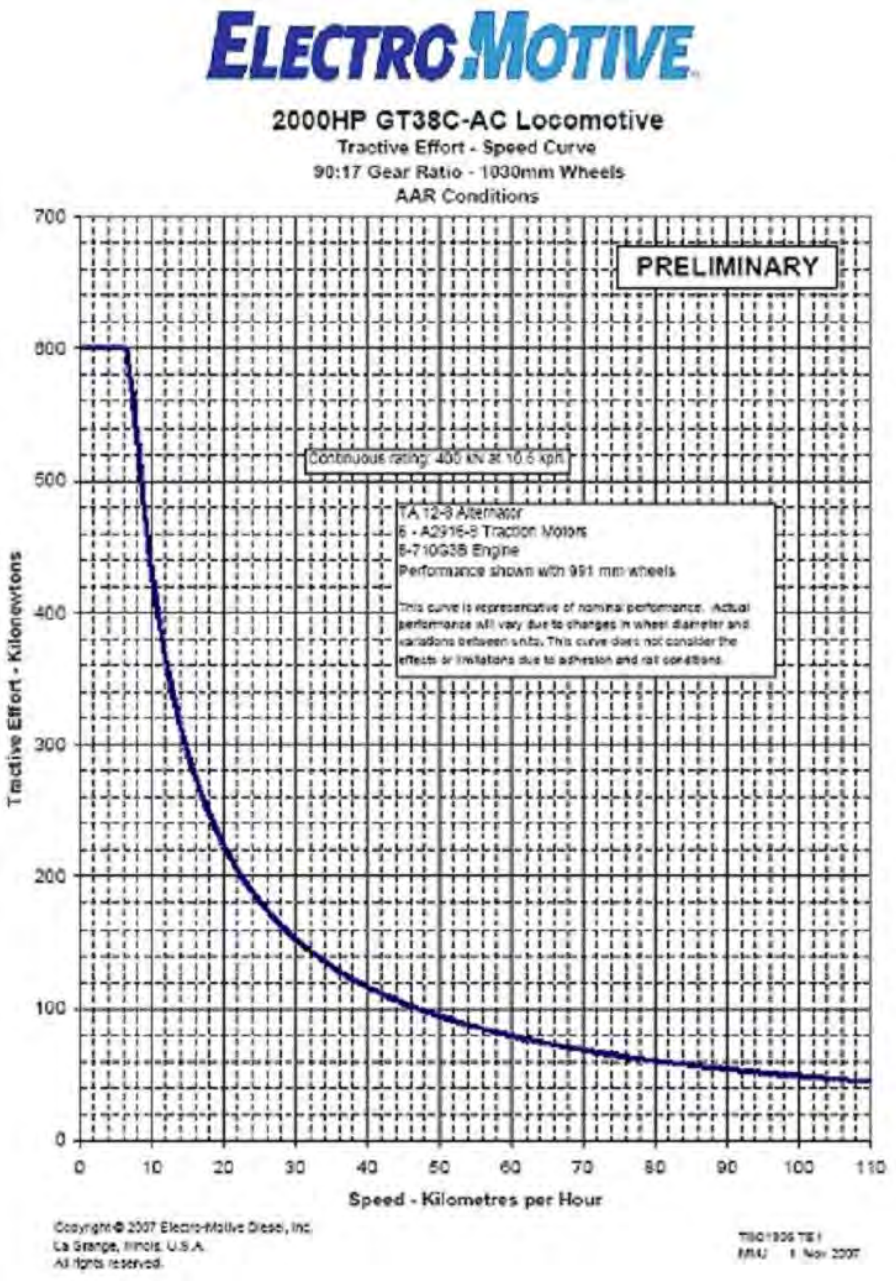
Item	CC202 (G26MC-2)	CC205 (GT38C-AC)	Increase
Power	2,000 HP	2,000 HP	—
Adhesion Coefficient	0.18	0.36	100%
Continuous Rating Tensile Force	228KN	370KN	62%
Track Tensile Force	474KN	556KN	17%
Electric Generation Brake Force	186KN	235KN	25%
Electric Motor Drive	AC	DC	—

(Source: Sojitz Co.)

From the comparison table, it can be recognized that the performance of CC205 type locomotive has been improved considerably compared with CC202 type locomotive. The traction performance in up-gradient slope section of 10‰ has been also improved approximately by 75% compared with CC202 type locomotive. It is recommended to use CC205 type locomotives to be procured by SPC from the view point of fuel consumption, maintenance cost and operating efficiency. However, considering the fact that GE is currently used although the number is small, GE is interested in this project as a supplier as well as investor and GE maintains good relationship with PT. KAI, CC204 type of GE can be considered as a option.

As shown in [Table 4-5-6], it is reasonable to consider the number of locomotives in accordance with transportation volume. The important points in maintaining locomotives are as follows.

- Attaching flange lubricator in order to reduce flange direct friction to be developed in shape curve section.
- Attaching sanding device in order to prevent wheel slip when heavy train accelerate and decelerate.



(Source: EMD)

[Fig. 4-5-33] Characteristic Curve of CC202 Type Locomotive

(2) Wagon

It is reasonable to use freight wagon with container type transportation as it is used presently. It is proposed to use PCW type container wagons made by PT. INKA which is the Indonesian domestic rolling stock manufacturer, in accordance with the stage-wise project implementation schedule.

(Source: Study team)

[Pic. 4-5-2] PPCW Type Container Wagon

Since container transportation of coal is not used in Indonesia except for PT. BAU, DGR expressed concern on the safety aspect, but as it can be evidenced in [Pic. 4-5-3] to [Pic. 4-5-6], it is one of the common mode of transportation for bulk cargo including coal recognized up by ISO standard.

(Source: container.pro.tok2.com.SANPAI.html)

[Pic. 4-5-3] Japan Case

(Source: blog.yahoo.co.jp/nam_winger/847416.html)

[Pic. 4-5-4] Taiwan Case

(Source: http://www.wbrinc.com)

[Pic. 4-5-5] USA Case

(Source: http://www.wbrinc.com)

[Pic. 4-5-6] Coal Container Loading by Reach-stacker in USA

[Table 4-5-6] Rolling-stock Mobilization Plan

Stage		The 1st Stage				The 2nd Stage				The 3rd Stage			
BAU Annual Production Target		2.5MTPA				5.0MTPA				20.0MTPA			
Annual Transport Vol. Target		2.5MTPA				5.0MTPA				20.0MTPA			
Number of Wagon（Length）		25 (395m)				40 (615m)				60 (930m)			
Number of Train		8				10				12			
Annual Max Transport Vol.		2.6MTPA				5.2MTPA				20.4MTPA			
Number of Car	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
	Wagon（Container）	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	-		-	-

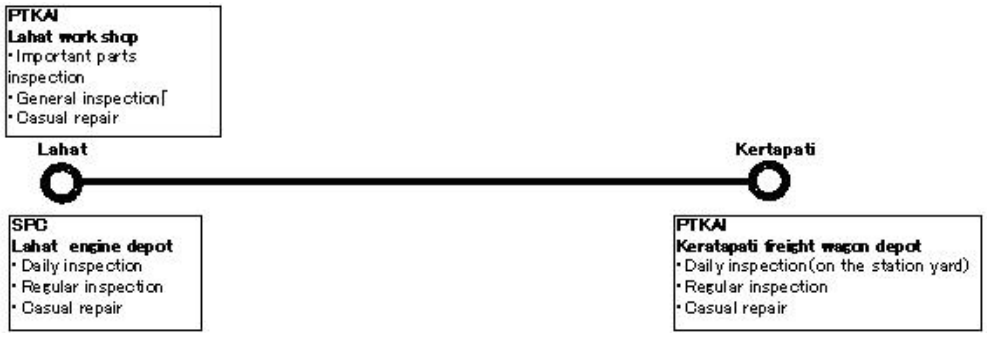
(Source: Study team)

4.5.9. Rolling Stock Depot Planning

The basic principle is to use existing PT. KAI depots. The maintenance for locomotives will be done by expanding facilities of Lahat depot. For the expansion, 1 pit track which can accommodate 2 locomotives and 2 siding tracks which can accommodate 3 locomotives will be required. Building an inspection facility which has equipment for engine overhaul will be required for for regular inspection.

Important part inspection and general inspection should be outsourced at workshop in Lahat.

Wagon and container depots are built in Kertapati station area. Regular inspection is conducted mainly at the depots, and minor rehabilitation and maintenance of travel device such as wheels and axles are also implemented. Daily inspection is implemented while staying at inside of station.



(Source: Study team)

[Fig. 4-5-34] Allocation of Depot and Work Share

4.5.10. Coal Loading/ Unloading Plan

As a coal loading/ unloading plan, loading facilities are constructed near the coal mine. Also, unloading facilities are constructed along the river where barge transportation is conducted.

(1) The following matters shall be considered at the 1st Stage.

- Coal loading capacity to wagon is increased by purchasing wheel loader for coal loading near Sukacinta Station. Currently, 7.2ha land in Sukacinta station is secured where 100,000ton of coal can be stored. Therefore, expansion of the space is not considered in the short-term plan, and only allocation of wheel loader makes it possible to transport 2.5MTPA.
- 1 more reach stacker to relocate containers in the container yard is allocated without touching the space of coal stockyard at Kretapati, and a self-propelled belt conveyer is equipped at the coal stockyard. Installation of the belt conveyer makes it possible to load 100,000ton of coal to a barges per hour.

(2) The following matters shall be considered at the 2nd Stage.

- A new branch-line between Merapi where coal mines are located and main line is constructed with the distance of approximately 700 m, and a belt conveyer is equipped for coal loading to containers at Merapi. 2,500,000tons of coal from Sukacinta and the same amount from Merapi, and the conbined amount of 5,000,000tons is loaded.
- In Kertapati station, a warehouse in the station is demolished, and a new service-line is constructed. 2 more reach stacker are added which are stationed at each service line. 1

train-set with 40wagons is split to 2 train-sets with 20wagons each, and the 2 trains drive into each service line. Then, containers are unloaded from wagons using reach stacker. All of the containers can be unloaded within 40 or 50minutes per 1 train-set.

- Barge loading of 5,000,0000tons/year is achieved by equipping 1 set of self propelled belt conveyers at a coal stockyard along river.

(3) The following matters shall be considered at the 3rd Stage.

- At Sukacinta, expansion and purchase of new equipments are not considered, and instead, loading facilities equipped at the 2nd Stage will be fully used. However, 1 more belt conveyer is equipped at Merapi to realize more efficient coal loading work.
- The east side area of 20ha in Kertapati station is developed for coal stock yard. Then, 3 belt conveyers are equipped connecting the stockyard and the Musi river. Coal is loaded directly from the stockyard to barges with the belt conveyers.

(4) The following matters shall be considered at the Reference Stage.

- Coal loading facilities are equipped in Gasing along with the construction of the new line between Kertapati Station and Gasing. 1 belt conveyer to transfer coal from coal stockyard of 0.4million ton capacity to barge is under construction. The number is increased by 1.
- Stockyard is constructed around Mariana station along with the construction of the new line between Simpang station and Mariana (Prajen) with distance of approximately 35km. In addition, coal loading facilities such as belt conveyers and loader to transfer the coal to barges are equipped.

Chapter 5

Project Implementation Plan

5.1. Construction Plan

5.1.1. Site Condition

[Table 5-1-1] summarizes the site conditions for construction work of the South Sumatra Railways based on the field surveys described in 4.1. (P. 4-1).

[Table 5-1-1] Site Conditions for Construction

	Lahat to Muaraenim section	Muaraenim to Prabumulih X6 section	Prabumulih X6 to Kertapati section
Total Distance	189.26km		
Distance of the Section	38.07 km	70.58 km	80.6 km
Topographic Feature	Mountainous/ hills	Mountainous/ hills	Mountainous/ hills 60.61km Lowland/ wetlands 20.0 km
Road Access	Close and parallel to national road	Close and parallel to national road	Away from national road without access
Ground Condition	Normal ground	Normal ground	Normal ground and soft ground
Houses	Partially urban and village area	Partially urban and village area	Dotted with villages in mountains area and a few houses in wetland area
Line Operation	Single track operation	Single track operation but double tracking work is under way (scheduled to be completed in 2014)	Single track operation
Track Condition	R54 rail is laid but roadbed and sleepers are often damaged by mud pumping	R54 rail is laid but roadbed and sleepers are often damaged by mud pumping	R42 rail remains and roadbed and sleepers are often damaged by mud pumping
Signal and Telecom Facility	Mechanical	Mechanical	Mechanical
Bridges (all comply with K18 live loads instead of K13)	● 1 truss bridge of 160 m in length with 4 spans ● 1 truss bridge of 100 m in length with 3 spans ● 1 simple truss bridge in 30 m in length	● 2 simple truss bridges in length of 40-50 m ● 2 simple pony truss bridges in length of 20 m ● 5e simple plate-girder bridges in length of 15-30 m ● -1 simple RC T-girder bridge in length of 8.0 m	● 1 simple truss bridge in length of 40 m (in wetland area) ● 15 simple plate-girder bridges in length of 8-20 m (all in wetland area except 1 bridge)
Lateral Drainage	Many	Many	Many

(Source: Study team)

5.1.2. Conditions for Construction Planning

[Table 5-1-2] shows project overview of each option planned based on the site construction conditions. Since operation condition analysis of the existing infrastructure shows the difficulty of implementing immediate whole double tracking work, step-by-step transportation expansion approach will be taken in the following stages:

(1) Short-term Plan (The 1st Stage)

This stage is still a single track operation as it is now. The immediate target of coal transportation capacity is to 2.5MTPA as a short-term goal, and the target will be achieved by sharing coal transportation with truck on road. The measures to be taken includes improvement of the existing track, expansion of loading and unloading equipment, modernization of equipment, increase of number of train, and expansion of rolling-stock depot.

(2) Mid-term Plan (The 2nd Stage)

This stage is a partial double tracking option. The target transportation capacity is set to 5.0MTPA as a mid-term target. The target will be achieved by measures such as improvement of existing track, expansion of unloading equipment (in Merapi Area), modernization of equipment (relay interlocking signaling system in particular), increase of number of train, and expansion of rolling-stock depot.

(3) Long-term Plan (The 3rd Stage)

This stage is a whole double tracking option. The target transportation capacity is set to 20.0MTPA or more.

(4) Super Long-term Plan (This is just a reference only and out of the study scope)

Furthermore, construction of new lines, such as between Simpang and Gasing section of 45km distance and between Simpang and Mariana section of 35km distance, will be studied for reference in a super long-term plan.

[Table 5-1-2] Project Overview

	Lahat - Muaraenim	Muaraenim - Prabumulih X6	Prabumulih X6 - Kertapati
[The 1st Stage] Short-Term Plan ● Capacity target: 2.5 MTPA ● Number of train: 8 round trips per day ● Length of train: 395 m ● Train travel speed: 65 km/h	● Track work ● Existing roadbed improvement ● Improvement civil engineering structure ● Modernization of signal and telecom system ● Reinforcement of rolling stock repair facilities ● Rolling stock procurement ● Reinforcement of loading and unloading equipment (on the Sukacinta side)	● Track work ● Existing roadbed improvement	● -Track work ● Existing roadbed improvement ● Improvement of civil engineering structure ● Modernization of signal and telecom system ● Reinforcement of rolling stock repair facilities ● - Rolling stock procurement ● Reinforcement of loading and unloading equipment (on the Kertapati side)
[The 2nd Stage] Mid-Term Plan ● Transportation target: 5.0 MTPA ● Number of trains: 10 round trips per day ● Length of trains: 615 m ● Train travel speed: 65 km/h	● -Improvement of civil engineering structure ● Branch line construction (between Merapi and coal storage yard) ● Modernization of signal and telecom system ● Reinforcement of rolling stock repair facilities ● Rolling stock procurement ● Reinforcement of loading and unloading equipment	● Double tracking for unimproved sections	● Track work ● Improvement of civil engineering structure ● Modernization of signal and telecom system ● Reinforcement of rolling stock repair facilities ● Rolling stock procurement ● Reinforcement of loading and unloading equipment (improvement of a container yard facility in Kertapati station yard, and new installation of coal unloading and barge loading facility)
[The 3rd Stage] Long-Term Plan ● Transportation target: 20.0 MTPA ● Number of trains: 21 round trips per day ● Length of trains: 930 m ● Train travel speed: 65 km/h	● Track work (double tracking) ● Civil engineering work for double tracking (except between Lahat and Sukancinta) ● Modernization of signal and telecom system (signal relay interlocking) ● Reinforcement of rolling stock repair facilities ● Rolling stock procurement		● Track work (double tracking) ● Civil engineering work for double tracking ● Modernization of signal and telecom system (signal relay interlocking) ● Reinforcement of rolling stock repair facilities ● Rolling stock procurement ● Reinforcement of loading and unloading equipment (belt conveyor at Kertapati side)
[Stage for reference] Super Long-Term Plan ● Construction of new lines	● New line, extended by 45 km between Simpang and Gasing, will be built to increase transportation capacity. (Single track) ● New line, extended by 35 km between Simpang and Mariana, will be built to increase transportation capacity. (Single track)		

(Source: Study team)

Working items described in [Table 5-1-2] are articulated in [Table 5-1-3] shown below.

[Table 5-1-3] Details of Works

	Name of Options			
	① Single Track	② Partial Double Tracking	③ Whole Double Tracking	④ New Lines Construction
	The 1st Stage	The 2nd Stage	The 3rd Stage	For Reference
	Short-term Plan	Mid-term Plan	Long-term Plan	Super Long-Term Plan
Track work	○	○	○	○
- Track rehabilitation	○			
- Sleeper & rail replacement	○	○		
- Double tracking		○	○	
Roadbed improvement	○			
Civil structure improve	○	○	○	
- Effective length extension	○	○	○	
- Additional signal station		○		
New line construction		○		○
- Merapi - coal yard		○		
- Simpang - Gasing				○
- Simpang - Mariana				○
Double tracking		○	○	
- Muaraenim - Prabumulih X6※		○		
- Sukacinta - Kertapati (except the above section)			○	
Additional crossing		○	○	
Signal & telecom system	○	○	○	○
- Signal and telecom equipment	○	○	○	○
- Electromechanical equipment		○	○	○
Rolling stock repair facility	○	○	○	○
Rolling stock procurement project	○	○	○	
- Locomotives	○	○	○	
- freight wagons	○	○	○	
Loading and unloading equipment	○	○	○	

※: Double tracking work is under way except for completed section of Nilu and X6. Since the work is expected to be behind the schedule, the remaining work will be handled by this section in the 2nd Stage.

(Source: Study team)

5.1.3. Construction Method

In order to promptly expand coal transportation capacity of the South Sumatra Railway, the project will be implemented by stepwise approach in 3 stages in which transportation target is set at 3 levels of 2.5MTPA, 5.0MTPA, and 20.0MTPA. As for construction planning, a basic policy is set to achieve the transportation capacity target at each stage with certainty, to plan the shortest construction period, and to employ construction method in such a way that works of each stage are certainly finished within a predetermined work period and works of the next stage can be carried out continuously. Therefore, the principle is that procurement procedure for consultant employment, contractor tendering, etc. for the next stage project shall be finished within the period of the current stage project so that the work for the next stage can be started immediately after the completion of the current stage. An overview of construction method of each stage based on the plan is shown below:

(1) The 1st Stage

The measure to achieve the transportation capacity target of 2.5MTPA in the 1st Stage is to increase the number of services by increased train running speed and to increase the number of freight wagon of a train. This measure requires to repair defects of existing track and to extend effective length of station which can accommodate a train length of 395m. In this addition, improvement and new installation of signal and telecom equipment, reinforcement of rolling stock repair facilities, procurement of rolling stock (locomotives and freight wagons), and reinforcement of loading and unloading equipment are required. Improvement works of the 1st Stage will be implemented by the following guidelines and procedures based on the above requirements:

① Improvement Work of Track and Existing Roadbed

- Track rehabilitation is carried out along the whole line to improve defective spots of the existing track.
- Replacement of sleeper and ballast, and replenishment of ballast are carried out in sections of all of the R42 rail between Prabumulih and Kertapati to prepare for replacement of rail to R54.

② Improvement of Civil Engineering Structure

- Extension of effective length is carried out in stations having an insufficient effective length of 395m as part of station facility improvement.

③ Improvement and New Installation of Signal and Telecom Equipment

- Improvement of defective parts of existing signal equipment is carried out. This work is

scheduled in the latter half of the work period.

- Due attention should be paid to the timing of purchase order of the equipments and materials to avoid the 1st Stage schedule disorder.

④ Reinforcement of Rolling-stock Repair Facility and Procurement of Rolling-stock

- Since procurement of rolling stock needs a period of about 2 to 3 years from order to delivery and this process will be a critical path in the working schedule, rolling stock should be ordered immediately after the 1st Stage project is started.
- Due attention should be paid to the timing of order for the equipment and material associated with reinforcement work of rolling stock repair facilities, and the work is planned to be started in the middle of the project period of this stage.

⑤ Reinforcement of Loading and Unloading Facility

- Due attention should be paid to the timing of order of equipment and material associated with reinforcement work of loading and unloading equipment to avoid the 1st Stage schedule disorder.

(2) The 2nd Stage

The measures to achieve the transportation capacity target of 5.0MTPA in the 2nd Stage is, as it is the case for the 1st Stage, is to increase the number of service by increasing train running speed and to extend the number of freight wagon of a train. This measure requires to repair defects of existing track in sections where the 1st Stage did not cover, to extend effective length of stations which cannot accept a train length of 615m, and to install additional signal stations. It is also required to complete the double-tracking work now under construction between Muaraenim and Prabumulih X6. Furthermore, improvement and new installation of signal and telecom equipment, reinforcement of rolling stock repair facilities, procurement of rolling stock (locomotives and freight wagons), and reinforcement of loading and unloading equipment are also required. Improvement works of the 2nd Stage will be implemented by the following guidelines and procedures based on the above requirements:

① Double-tracking between Muaraenim and Prabumulih X6 (referred to hereinafter as "Double tracking work (1)").

- Double tracking work in sections where within "Double tracking work (1)" failed to complete. Work period of about 2 years is assumed due to bridge work and vehicle procurement involved.
- Construction procedure by work item is identical to the double tracking work in the 3rd Stage.

② Track Improvement

- Replacement of rail from R42 to R54 for section where track improvement such as replacement of PC sleeper, replacement of track bed and replenishment of ballast in Prabumulih – Kertapati section at the 1st Stage.

③ Improvement Work of Civil Engineering Structures

- New installation of two signal stations that handle trains traveling in opposing directions to each other. 1 signal station between Prabumulih and Lembak, and 1 signal station between Payakabung and Simpang.
- Extension of effective length in the stations having an insufficient effective length to accommodate a train of 615m in length as part of station facility improvement work.

④ Branch Line Construction between Merapi and Coal Storage Yard

- Construction of incoming line of 700m in length to the coal storage yard.

⑤ Improvement and New Installation of Signaling and Telecommunication Equipment

- Improve defective parts of existing signal equipment. This work is scheduled in the latter half in the 2nd Stage project schedule.
- Due attention should be paid to order timing of equipment and material not hinder the working schedule.

⑥ Reinforcement of Rolling-stock Repair Facility and Procurement of Rolling-stock

- Since procurement of rolling stock needs a period of about 2 to 3 years from order to delivery and the process can be a critical path in the 2nd Stage project schedule, rolling stock should be ordered immediately after the work is started.
- Due attention should be paid to order timing of equipment and materials associated with reinforcement work of rolling stock repair facilities, and the work scheduled to be started in the middle of the 2nd Stage project schedule.

⑦ Reinforcement of Loading and Unloading Facility

- Due attention should be paid to order timing of equipment and material associated with reinforcement work of loading and unloading equipment not hinder the working schedule.

(3) The 3rd Stage

The measures to achieve the transportation capacity target of 20.0MTPA in the 3rd Stage is, as it is the case for the 1st and the 2nd Stages, to increase the number of service by increasing train running speed and increasing the number of freight wagon hauled by a train. Since the 3rd Stage works need long working period mainly due to double tracking work, the first thing to do is to extend the effective length capable of accommodating train length of 930m by which the

transportation capacity will be expanded gradually from 5.0MTPA, then it should be proceeded to double tracking work between Sukacinta and Muaraenim and between Prabumulih X6 and Kertapati. Furthermore, in the same way as the 1st and the 2nd Stages, improvement and new installation of signal and telecom equipment (relay interlocking), reinforcement of rolling stock repair facility, rolling stock procurement (locomotive and freight wagon), and reinforcement of loading and unloading equipment are also implemented. Improvement works of the 3rd Stage will be implemented by the following guidelines and procedures based on the above requirements:

① Improvement of Civil Engineering Structures

- Extension of effective length in the stations incapable of accommodating 930m of train length as a part of station facility improvement work.
- The works mentioned above are also carried out in the 2 signal stations newly installed in the 2nd Stage.

② Double-tracking Work between Sukacinta and Muaraenim (referred to hereinafter as "Double tracking work (2)") and double tracking work between Prabumulih X6 and Kertapati (referred to hereinafter as "Double tracking work (3)")

- Access road to the construction site is constructed between Payakabung and Kertapati, where no available approach road exists. Since national road is nearby and running parallel to the construction sites in other sections, construction sites are used as pilot roads.
- Ground improvement of soft ground sections between Payakabung and Kertapati.
- In the embankment sections, drainage work is carried out before proceeding to embankment work, while in the cut sections, cut work is carried out in advance to proceeding into drainage work.
- For the bridge work, temporally pier and cofferdam are set at the bridge foundation site before proceeding to substructure work and then superstructure work.
- Roadbed work is carried out after earthwork and bridge work are completed.

③ Double-tracking and Installation of Additional Crossing

- Track and additional crossing are laid after roadbed work is completed.

④ Improvement and New Installation of Signaling and Telecommunication Equipment

- Modernization work (signal relay interlocking) of signal and telecom system is carried out along the whole line. This work is scheduled in the latter half of the 3rd Stage project schedule.
- Due attention should be paid to the order timing of equipment and material not to hinder the working schedule.

⑤ Reinforcement of Rolling-stock Repair Facility and Procurement of Rolling-stock

- Since rolling stock procurement needs a period of about 2 to 3 years from order to delivery, the order should be made early so as not to hinder the working schedule for commissioning and so forth.
- The same mentioned above is also true to the reinforcement work of rolling stock repair facility.

⑥ Reinforcement of Loading and Unloading Equipment

- Due attention should be paid to order timing of equipment and material associated with reinforcement work of loading and unloading equipment not to hinder the 3rd Stage project schedule.

(4) Reference Stage

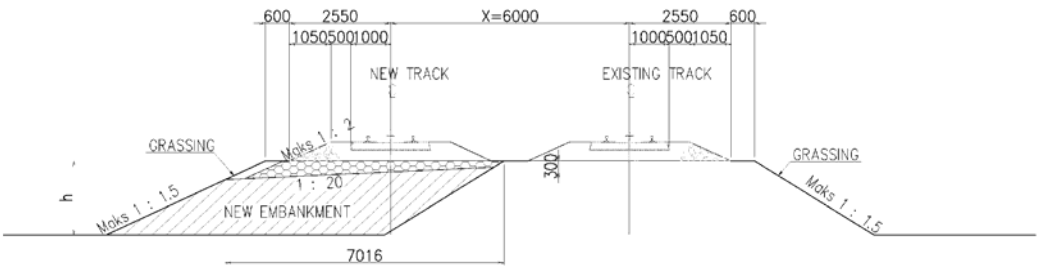
The following two construction plans for the new lines are proposed as a super long-term plan. This plan should be implemented with due attention to construction method and foundation work to cope with-soft ground, because both lines are located in soft ground area. Since the construction method of the new lines are the combination of the same working items in the 1st to 3rd Stage projects, the construction method is taken from them in the following descriptions.

① New line construction between Simpang and Mariana with the distance of 35km
② New line construction between Simpang and Gasing with the distance of 45km

5.1.4. Construction Guidelines

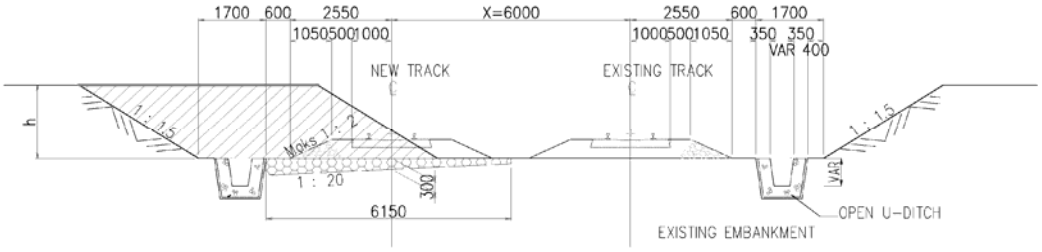
(1) Standard Cross-section Views of Earthwork

Standard cross-section views of embankment and cut work which consist major part of the construction work in the double tracking work are shown in [Fig. 5-1-1] and [Fig. 5-1-2].



(Source: Study team)

[Fig. 5-1-1] Standard Cross-Section View of Embankment Work

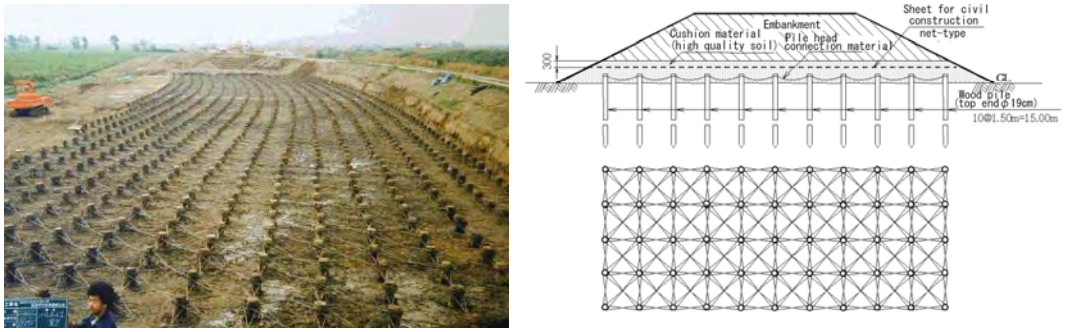


(Source: Study team)

[Fig. 5-1-2] Standard Cross-Section View of Cut Work

(2) Ground Improvement Work (Pile Net Method)

The foundation work between Payakabung and Kertapati where the base ground is soft is implemented using Pile Net Method which can widely distributed the load into deep layers of soil, prevent ground failure, and prevent lateral flow of embankment foundation by a effect of pile group. [Fig. 5-1-3] shows the overview of the method.

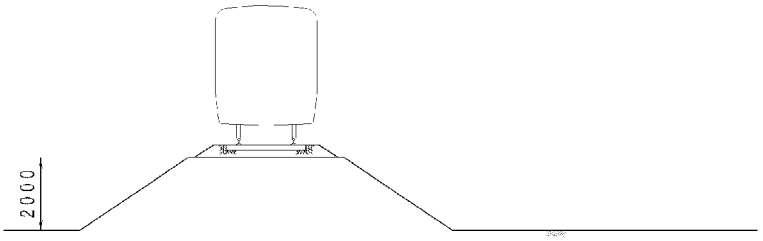
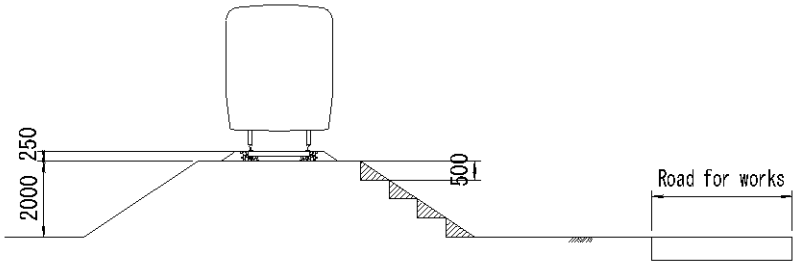
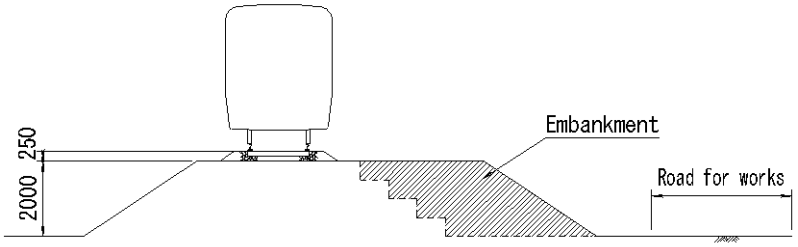
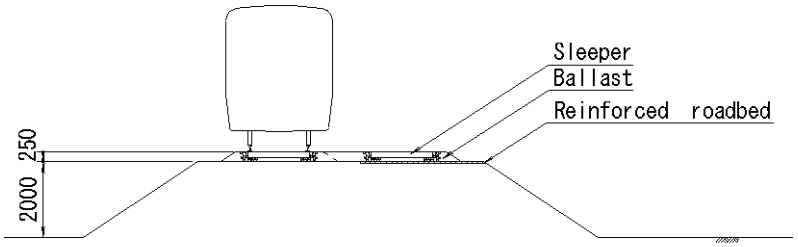
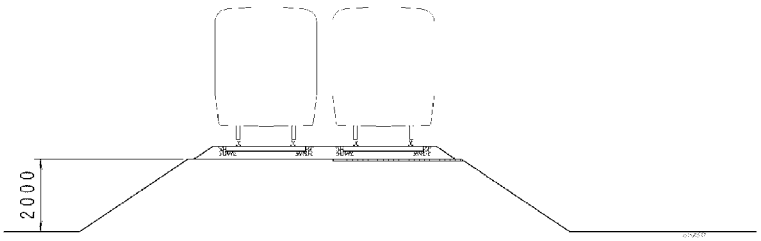


(Source: Study team)

[Fig. 5-1-3] Overview Diagram of Method of Pile-Net

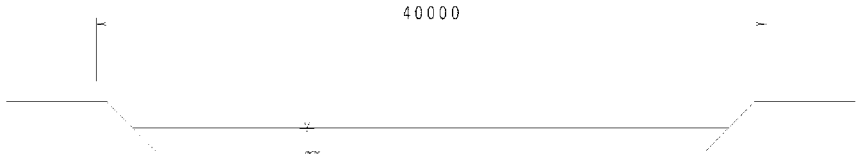
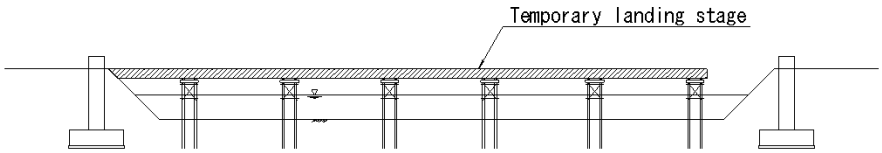
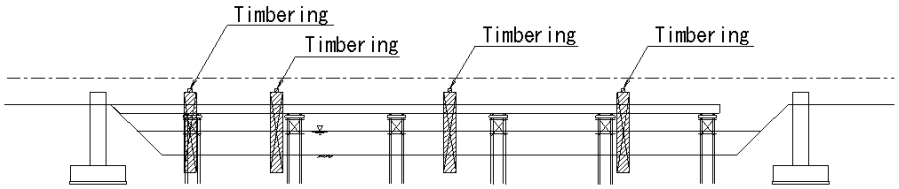
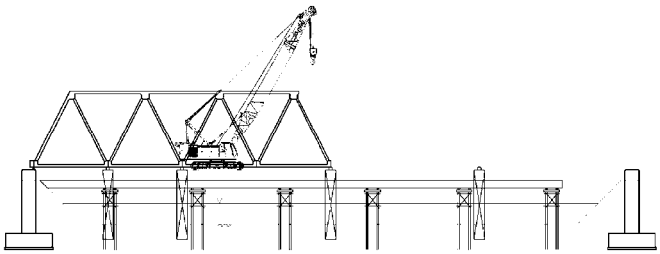
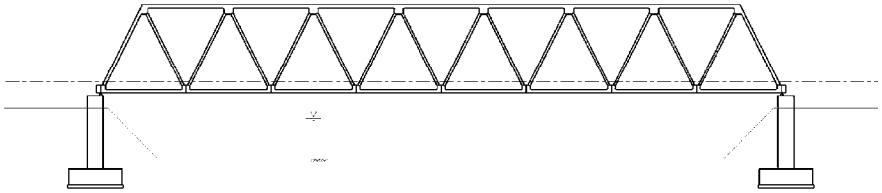
(3) Schematic Diagrams of Construction Process

Schematic diagrams of earthwork and bridge work are shown in [Fig. 5-1-4] to [Fig. 5-1-6], respectively.

At Present	
Bench Cut	
Embankment	
Installation of Roadbed, Ballast and Sleepers	
Completion	

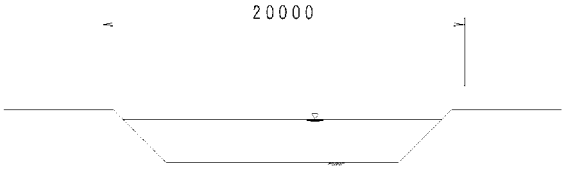
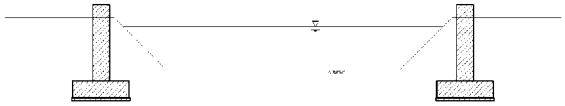
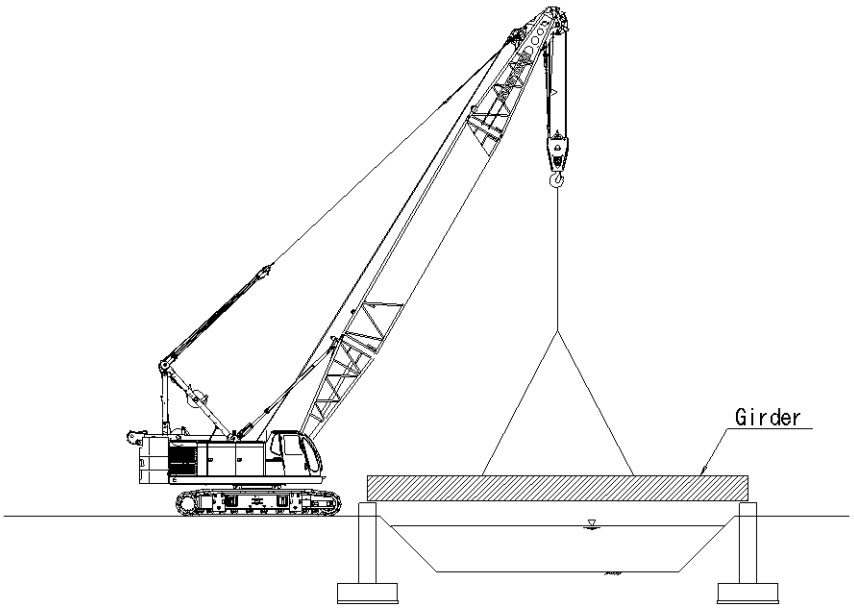
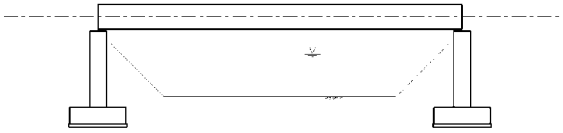
(Source: Study team)

[Fig. 5-1-4] Schematic Diagram of Embankment Work

At Present	
Abutment Installation	
Temporary Landing Stage Installation	
Timbering Installation	
Erection by Crane	
Removal and Completion	

(Source: Study team)

[Fig. 5-1-5] Schematic Diagram of Erection of Through Truss Bridge

At Present	
Abutment Installation	
Erection by Crane	
Removal and Completion	

(Source: Study team)

[Fig. 5-1-6] Schematic Diagram of Erection of Plate Girder

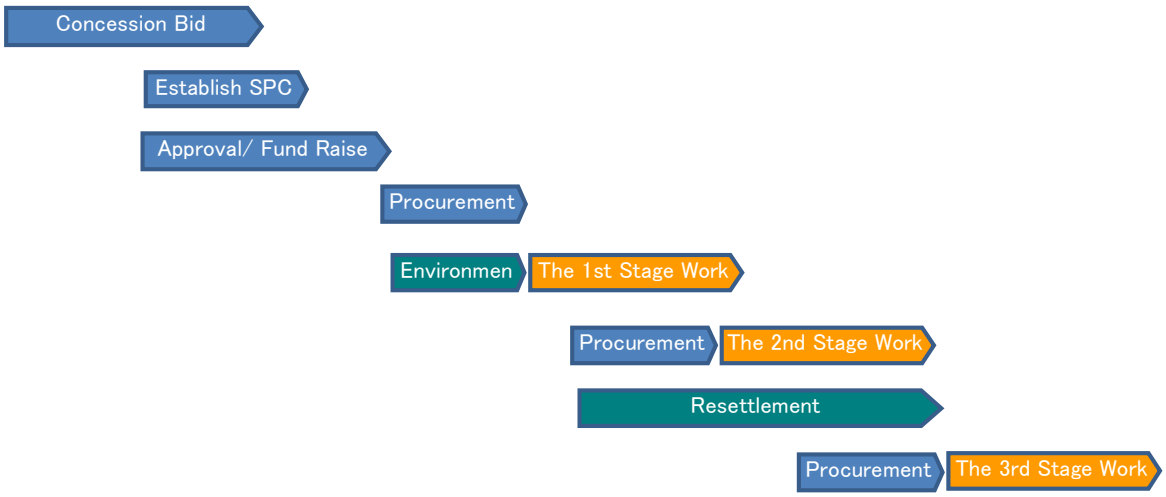
5.2. Implementation Schedule

(1) Basic Schedule

Considering the urgent necessity of transportation capacity expansion, the schedule is set to achieve the transportation capacity of 2.5MTPA as a short-term target in this project. Then, the

target capacity is set to 5.0MTPA as a mid-term target. Finally, it is set to 20.0MTPA and more than 20.0MTPA as a long-term and super long-term targets respectively. Here, the super long-term plan is made just for reference and no detailed site condition is investigated in the field survey conducted by the study team.

The basic schedule for the Project as a whole is shown in the chart below. No exact time spans are mentioned in the chart, but they will be determined in the 5.2.1 and thereafter.



(Source: Study team)

[Fig. 5-2-1] Basic Schedule

(2) Project Implementation in the 1st Stage

Since the implementation of whole double tracking is not considered to be possible in a short run, the 1st Stage capacity expansion target is planned to be achieved by single track operation supported by measures such as improvement of the existing track, improvement of track in station yard, reinforcement of loading and unloading equipment, modernization of equipment, increase of train, and expansion of rail yard. The amount of transportation demand bigger than 2.5MTPA is planned to be supplemented by truck transportation on road.

(3) Project Implementation in the 2nd Stage

The target capacity expansion of 5.0MTPA is planned to be achieved by partial double tracking. The measures taken in this stage are improvement of track in station yard, installation of additional signal station, reinforcement of loading and unloading equipment, modernization of equipment, increase of trains, and expansion of rail yards, etc. Here, if the on-going double

tracking work between Muaraenim and Prabumulih X6 is not implemented on schedule, it is planned to be expedited under this project and complete the whole double tracking of the section and expand the transportation capacity in the end of the 2nd Stage.

(4) Project Implementation in the 3rd Stage

The target capacity expansion of 20.0MTPA is planned to be achieved by whole double tracking. In this addition, the target capacity expansion of more than 20.0MTPA is studied just for a reference without any in-depth study.

Project implementation schedule is prepared based on work volume of the planned project and standard time obtained from past experiences. The implementation schedule of the project is shown in the following tables of [Table 5-2-1] to [Table 5-2-4].

[Table 5-2-1] Procurement Schedule

(Number of months passed after conclusion of L/A)

	The 1st Stage	The 2nd Stage	The 3rd Stage
Project Preparation	(*1)12 month		
Consultant Selection	6 month	9 month	9 month
Site Investigation & D/D	12 month	18 month	18 month
Contractor Selection	6 month	17 month	17 month
Construction Period Warranty Period	To be set at each Stage. 12 month for Civil Work and 24 month for Signal & Telecom.		

(*1) Breakdown

Bid Preparation	3 month
P/Q to Bidding	5 month
SPC Foundation （定款作成・役員選定）	3 month
Approval (Licensing from BKPM)	6 month 4 month
Fund Raising Procedure (Bank account, Tax office registration)	6 month
Negotiation with PT. KAI and DGR	8 month

(Source: Study team)

The implementation schedule for each stage is shown below. The schedules shown here, except the 1st Stage, are corresponding to the additional works after the completion of the previous

stage works.

5.2.1. Implementation Schedule for the 1st Stage

[Table 5-2-2] Implementation Schedule for the 1st Stage

	1st Year	2nd Year	3rd Year	4th Year	5th Year	6th Year	7th Year	8th Year	9th Year	10th Year	11th Year
Project Preparation											
Consultant Selection											
Site Investigation & D/D											
Bidding (Contractor Selection)											
Preparation Work											
Roadbed improvement											
Track rehabilitation											
- Rehab for A and B sections											
- R54 Replacement for C Section											
Civil Structure Improvement											
- Extension of Effective Length											
- Addition of Signaling Station											
Signal & Telecom Improvement											
Electric & Mechanical Improve											
Depot Expansion											
Coal Handling Facilities											
Site Clearance											
Rolling-Stock (Loco & Freight)											

(Source: Study team)

5.2.2. Implementation Schedule for the 2nd Stage

[Table 5-2-3] Implementation Schedule for the 2nd Stage

	1st Year	2nd Year	3rd Year	4th Year	5th Year	6th Year	7th Year	8th Year	9th Year	10th Year	11th Year
Project Preparation											
Consultant Selection											
Site Investigation & D/D											
Bidding (Contractor Selection)											
Roadbed improvement											
Track rehabilitation											
Track rehabilitation											
- Rehab for A and B sections											
- R54 Replacement for C Section											
Civil Structure Improvement											
- Extension of Effective Length											
- Addition of Signaling Station											
Service Line to Merapi											
Double Tracking (1) for Section B											
- Site Access Road											
- Ground Improvement											
- Drainage											
- Earth Work (Cut & Fill)											
- Temporally Work (Pier)											
- Bridge (Substructure)											
- New Road Bed											
- New Track											
Crossing Improvement											
Signal & Telecom Improvement											
Electric & Mechanical Improve											
Depot Expansion											
Coal Handling Facilities											
Site Clearance											
Rolling-Stock (Loco & Freight)											
Commissioning											

(Source: Study team)

5.2.3. Implementation Schedule for the 3rd Stage

[Table 5-2-4] Implementation Schedule for the 3rd Stage

	1st Year	2nd Year	3rd Year	4th Year	5th Year	6th Year	7th Year	8th Year	9th Year	10th Year	11th Year
Project Preparation											
Consultant Selection											
Site Investigation & D/D											
Bidding (Contractor Selection)											
Roadbed improvement											
Track rehabilitation											
Track rehabilitation											
Civil Structure Improvement											
- Extension of Effective Length											
- Addition of Signaling Station											
Service Line to Merapi											
Double Tracking (1) for Section B											
Double Tracking (2)&(3) for Section A & C											
- Site Access Road											
- Ground Improvement											
- Drainage											
- Earth Work (Cut & Fill)											
- Temporally Work (Pier)											
- Bridge (Substructure)											
- New Road Bed											
- New Track											
Crossing Improvement											
Signal & Telecom Improvement											
Electric & Mechanical Improve											
Depot Expansion											
Coal Handling Facilities											
Site Clearance											
Rolling-Stock (Loco & Freight)											
Commissioning											
AMDAL											
Land Acquisition & Resettlement											

(Source: Study team)

5.3. Procurement Package of Materials and Equipment

5.3.1. Division into Procurement Packages

In the project, facility improvement will be implemented by dividing into 3 stages and therefore procurement package will be set by dividing into the 3 stages. Though domestic and international tender classification of civil engineering works is required to be handled flexibly based on adequate survey and examination about results of international tender, in this project amount in which foreign companies may have interests is assumed to be about 220 billion Rp. (2 billion yen) at the present stage. Meanwhile, each component of the equipment-related works such as signal and telecom equipment, electromechanical equipment, rolling stock repair facilities, rolling-stock, loading and unloading equipment, etc., most of which may be procured from abroad, are assumed to be about 110 billion Rp. (1 billion yen). If there is no domestic bidder for a small size contract package opened for domestic tendering, the package may be combined with other package so that the package size will be big enough for international tendering and it will be called for international tendering.

(1) Stage-wise Project Cost

Project cost of each stage is shown in [Table 5-3-1]. Procurement packaging of each stage will be proposed based on the amount of the table.

[Table 5-3-1] Construction Cost by Stage

(Unit: million Rp.)

	The 1st Stage	The 2nd Stage	The 3rd Stage
Track work cost (including rehabilitation)	243,539	402,899	508,398
Improvement work cost of existing roadbed	48,053	0	0
Improvement work cost of civil engineering structures	1,765	35,595	42,894
Construction cost of new line between Merapi and coal storage yard	0	10,608	0
Double tracking work (1) cost	0	249,861	0
Double tracking work (2) and (3) costs	0	0	1,126,593
Installation work cost of additional crossing	0	2,700	12,900
Improvement and new installation work cost of signal and telecom equipment	14,870	99,060	1,447,260
Improvement and new installation work cost of electromechanical equipment	0	15,585	13,970
Reinforcement work cost of rolling stock repair facility	49,610	24,860	37,290
Rolling stock cost (procurement cost of locomotives and wagons)	507,650	272,800	1,184,150
Reinforcement work cost of loading and unloading equipment	14,740	24,420	144,760
Total construction cost	880,227	1,138,388	4,518,215

Note: Monetary units of foreign currency and local currency are tentatively represented by Rp.
(Conversion: 1 yen = 110 Rp.)

(Source: Study team)

(2) Procurement Package of the 1st Stage

Procurement package size should be decided in consideration of procurement factors such as location of construction site, extension of the construction site, equipment and materials, etc. Accordingly, [Table 5-3-2] shows construction cost breakdown classified based on the factors before deciding procurement package.

[Table 5-3-2] Construction Cost by Section (The 1st Stage)

(Unit: million Rp.)

	Civil engineering work cost			Equipment -related work cost
	Section A	Section B	Section C	
	38 km	71 km	81 km	
Track work cost (including rehabilitation)	11,843	16,395	215,301	0
Improvement work cost of existing roadbed	9,673	17,924	20,456	0
Improvement work cost of civil engineering structure	1,765	0	0	0
Improvement and new installation work cost of signal and telecom equipment	0	0	0	14,870
Reinforcement work cost of rolling stock repair facility	0	0	0	49,610
Rolling stock cost (procurement cost of locomotives and wagons)	0	0	0	507,650
Reinforcement work cost of loading and unloading equipment	0	0	0	14,740
Total construction cost	23,281	34,319	235,759	586,870

Note 1: Currency conversion is estimated to be at a rate of 1 yen = 110 Rp.
Note 2: Section A indicates a length of 38.1 km between Lahat and Muaraenim.
Note 3: Section B indicates a length of 70.6 km between Muaraenim and Prabumulih X6.
Note 4: Section C indicates a length of 80.6 km between Prabumulih X6 and Kertapati.

(Source: Study team)

Judging from cost classification and cost scale factor of the above table in comprehensively, procurement package of the 1st Stage is proposed as shown in [Table 5-3-3].

[Table 5-3-3] Procurement Package of the 1st Stage

Package name	Package contents	Planned price (Unit: million Rp.)	Tender classification		Opportunity for Japanese contractor
			Domestic tender	International tender	
Package 1	Track work for Section A, B and C	243,539		○	○
Package 2	Improvement of existing roadbed and civil engineering structure of Section A, B and C	49,818	○		
Package 3	Improvement and new installation of signal & telecom equipment Reinforcement of rolling stock repair facilities Reinforcement of coal handling equipments	79,220	○		○
Package 4	Rolling-Stock (locomotives and wagons)	507,650		○	○
Total		880,227			

Note: Regarding the opportunity of bidding for Japanese firms, working items are selected with the mark of "possible (○)" based on not only work scale but also the applicability of Japanese products.

(Source: Study team)

(3) Procurement Package of the 2nd Stage

As is the case with the 1st Stage, section wise construction cost breakdown is shown in [Table 5-3-4].

[Table 5-3-4] Construction Cost by Section (The 2nd Stage)

(Unit: million Rp.)

	Civil engineering work cost			Equipment -related work cost
	Section A	Section B	Section C	
	38 km	71 km	81 km	
Track work cost (including rehabilitation)	26,515	149,886	226,498	0
Improvement work cost of civil engineering facilities	9,016	0	26,579	0
Construction cost of new line between Merapi and coal storage yard	10,608	0	0	0
Double tracking (1) cost	0	249,861	0	0
Installation work cost of additional crossings	1,350	0	1,350	0
Improvement and new installation work cost of signal and telecom equipment	0	0	0	99,060
Improvement and new installation work cost of electromechanical equipment	0	0	0	15,585
Reinforcement work cost of rolling stock repair facilities	0	0	0	24,860
Rolling stock cost (procurement cost of locomotives and wagons)	0	0	0	272,800
Reinforcement work cost of loading and unloading equipment	0	0	0	24,420
Total construction cost	47,489	399,747	254,427	436,725

(Note) - Currency conversion is estimated to be at a rate of 1 yen = 110 Rp.
- Section A indicates a length of 38.1 km between Lahat and Muaraenim.
- Section B indicates a length of 70.6 km between Muaraenim and Prabumulih X6. (Work for double tracking (1) is intended only for unconstructed sections.)
- Section C indicates a length of 80.6 km between Prabumulih X6 and Kertapati.

(Source: Study team)

Judging from cost classification and cost scale factor of the above table in comprehensively, procurement package of the 2nd Stage is proposed to be as shown in [Table 5-3-5].

[Table 5-3-5] Procurement Package of the 2nd Stage

Package name	Package contents	Planned price (Unit: million Rp.)	Tender classification		Opportunity for Japanese contractor
			Domestic tender	International tender	
Package 1	Track work for Section A, B and C Improvement of civil engineering structure of Section A and C Construction of new line between Merapi and coal storage yard Installation of additional crossings of Section A and C Double tracking (1) work	701,663		○	○
Package 2	Improvement and new installation of signal, telecom and electromechanical equipments	114,645		○	○
Package 3	Building of new rolling stock repair facilities Reinforcement coal handling equipments	49,280	○		○
Package 4	Rolling stock (locomotives and wagons)	272,800		○	○
Total		1,138,388			

Note: Regarding the opportunity of bidding for Japanese firms, working items are selected with the mark of "possible (○)" based on not only work scale but also the applicability of Japanese products.

(Source: Study team)

(4) Procurement Package of the 3rd Stage

As is the case with the 1st and the 2nd Stages, section wise construction cost breakdown is shown in [Table 5-3-6].

[Table 5-3-6] Construction Cost by Section (The 3rd Stage)

(Unit: million Rp.)

	Civil engineering work cost			Equipment -related work cost
	Section A	Section B	Section C	
	38 km	71 km	81 km	
Track work cost	131,622	0	376,776	0
Improvement work cost of civil engineering structure	17,658	0	25,236	0
Double tracking work (2) and (3) cost	420,643	0	705,950	0
Installation work cost of additional crossing	6,450	0	6,450	0
Improvement and new installation work cost of signal and telecom equipment	0	0	0	1,447,260
Improvement and new installation work cost of electromechanical equipment	0	0	0	13,970
Building work cost of new rolling stock repair facility	0	0	0	37,290
Rolling stock cost (procurement cost of locomotives and wagons)	0	0	0	1,184,150
Reinforcement work cost of loading and unloading equipment	0	0	0	144,760
Total construction cost	576,373	0	1,114,412	2,827,430

Note 1: Currency conversion is estimated to be at a rate of 1 yen = 110 Rp.
Note 2: Section A indicates a length of 38.1 km between Lahat and Muaraenim. (Double tracking work (2) is intended for a region between Sukacinta and Muaraenim.)
Note 3: Section B indicates a length of 70.6 km between Muaraenim and Prabumulih X6.
Note 4: Section C indicates a length of 80.6 km between Prabumulih X6 and Kertapati. (Double tracking work (3))
(Source: Study team)

Judging from cost classification and cost scale factor of the above table in comprehensively, procurement package of the 2nd Stage is proposed to be as shown in [Table 5-3-7].

[Table 5-3-7] Procurement Package of the 3rd Stage

Package name	Package contents	Planned prices (Unit: million Rp.)	Tender Classification		Opportunity for Japanese contractor
			Domestic tender	International tender	
Package 1	Track work for Section A and C Improvement of civil engineering structure and installation of additional crossings for Section A and C Double tracking work (2) (Section A) Double tracking work (3-1) (Section C (1)) Double tracking work (3-1) (Section C (2))	1,690,785		○	○
Package 2	Improvement and new installation of signal, telecom and electromechanical equipments	1,461,230		○	○
Package 3	Building of new rolling stock repair facilities Reinforcement coal handling equipments	182,050		○	○
Package 4	Rolling stock (locomotives and wagons)	1,184,150		○	○
Total		4,518,215			

Note 1: Regarding the opportunity of bidding for Japanese firms, working items are selected with the mark of "possible (○)" based on not only work scale but also the applicability of Japanese products.

(Source: Study team)

5.3.2. Opportunity for Japanese Firm

Guiding principle for the opportunity of Japanese firms to participate at each stage of the tendering was discussed already in classifying procurement package into civil engineering works and equipment works, and considering from the aspect of work scale and product. Meanwhile, in the 2nd and the 3rd Stages of the implementation where the JICA yen loan is the option, from the viewpoint of project fund raising aspect, STEP type yen-loan-may be applicable, which increase the opportunity of Japanese firms participation, and by which low-interest loan is available if the procurement rate of Japanese products is equal to or more than 30%. Accordingly, approximate value of items to be procured from overseas out of foreign currency cost as shown in [Table 5-3-8] in each stage is calculated at first, then the availability of Japanese products is chosen, and finally procurement rate of Japanese products are calculated to explore the applicability of STEP type yen loan.

[Table 5-3-8] Foreign Currency Amount of Each Stage

(Unit: million Rp.)

	The 1st Stage	The 2nd Stage	The 3rd Stage
Track work cost	4,556	273,526	198,020
Double tracking work (1) cost	0	25,000	0
Double tracking work (2) and (3) cost	0	0	113,187
Improvement and new installation work cost of signal and telecom equipment	13,706	64,752	815,406
Improvement and new installation work cost of electromechanical equipment	0	1,596	10,314
Reinforcement work cost of rolling stock repair facility	49,610	24,860	37,290
Rolling stock cost (procurement cost of locomotives and wagons)	507,650	272,800	1,184,150
Reinforcement work cost of loading and unloading equipment	14,740	24,420	144,760
Total amount of foreign currency	590,262	686,954	2,503,127

Note: Monetary units of foreign currency and local currency are tentatively represented by Rp.

(Conversion: 1 yen = 110 Rp.)

(Source: Study team)

(1) Head-hardened Rail/Turnout

Transportation capacity expansion target for the super long-term is more than 20.0MTPA which is equivalent to transportation capacity of Japanese 1st class track. This volume of traffic is classified to be the 1st class railway section in Japan, which means rapid progressive damage of track, in particular rails is expected. Therefore, in order to prevent future decline in transportation capacity, it is considered essential to adopt Japanese-made head hardened rail and turnout superior in quality and durability.

(2) Weatherproof Steel Plate

Since the South Sumatra Railway is located in an inland area and rarely affected by sea breeze, steel bridge will be good for choice in general. However, if maintenance and repair works are neglected for years in South Sumatra of high temperature and humidity, materials will be damaged and the bridge life will be shortened. In the case of Japanese railway, steel bridges are repainted with a cycle of about 7 to 13 years, whereas painting cycle in the case of the South Sumatra Railway is observed to be much longer than that. However, repainting work is indispensable in the steel bridges made of general type steel material, which is a factor to increase the maintenance cost. Therefore, building steel bridges made of weatherproof steel plate in an initial investment will enable to reduce the maintenance cost considerably. The quality of Japanese products in this material is outstanding and reputable in the international market.

(3) Signal System

High reliability of Japanese domestic signal technology is endorsed by accident-free bullet train operation during a long period. It reached an extremely high level of SIL 4 (Safety Integration Level 4) measured by the international standard, which means erroneous operation probability of once in 11,500 years. Although the train operation schedule of this project is not considered to be a level of congested railway, it is required to introduce a high quality safety control system which is equipped with auxiliary signals in order to cope with poor visibility condition of signal for a train operator due to long sidings in a station precincts for an opposing train. Accordingly, introduction of high-performance signaling system will enable Japanese firms to win in the tender.

(4) Rolling Stock Repair Machinery

Japanese technology of vehicle repair machinery is far ahead of other countries because of their working accuracy and lower failure rates. The following shows some examples:

- Inner race induction heater: In checking an axle for a flaw, this apparatus heats a bearing's inner race inductively. It fits onto the exterior of the inner race, turns on to heats it to approximately 150ºC, and detaches it from the axle. It is superior in the setting and operation of heating temperatures compared with those manufactured in other countries.
- Bogie frame washing machine: This apparatus is designed to detach a bogie frame from a vehicle body, and to wash the exterior of the bogie frame alone or with wheels attached. Its high washing effect is highly regarded.
- Wheel press fitting machine: This is an NC type press for pressing a wheel onto an axle. These machines are of the same types as those used for the vehicles of the Japanese bullet trains. They are favorably accepted as world-class machines in accuracy.

(5) Procurement Rate of Japanese Products

The materials, systems and repair machineries having advantages in Japanese firms are mentioned above. In addition, products such as sheet piles and H-beam steel for temporary use in civil engineering works supplied by Japanese firms also have high reliability. [Table 5-3-9] to [Table 5-3-11] show items for each implementation stage to be possibly procured from Japanese firms together with procurement rate against total construction cost.

[Table 5-3-9] Items Applicable for Japanese Product (The 1st Stage)

Item	Unit	Quantity	Unit Cost	Total Amount (million yen)
Steel bridge manufacturing	set	0		0
Temporary structural steel (steel sheet pile and timbering material)	set	0		0
Track component (rail, turnout, etc.)	set	1		41
Signal and telecom equipment	set	1		125
Electromechanical equipment	set	1		0
Rolling stock maintenance machinery (repair workshop)	set	1		451
Loading and unloading equipment	set	1		134
Rolling stock (procurement of locomotives and wagons)	set	1		4,615
Total				5,366

Note: Rolling stock procurement cost is listed above because the supplier is not known at this moment.

(Source: Study team)

- Total project cost is 9,877 million yen and out of which procurement cost from Japan: is estimated to be 5,366 million yen (it is 751if the cost of rolling stock is excluded)
- The ratio of material and equipment to be possibly supplied by Japan against total project cost in the 1st Stage is 54% (8% without rolling-stock).

[Table 5-3-10] Items Applicable for Japanese Product (The 2nd Stage)

Item	Unit	Quantity	Unit Cost	Total Amount (million yen)
Steel bridge manufacturing	set	1		182
Temporary structural steel (steel sheet pile and timbering material)	set	1		45
Track products (rail, turnout, etc.)	set	1		2,528
Signal and telecom equipment	set	1		713
Electromechanical equipment	set	1		15
Rolling stock maintenance machinery (repair workshop)	set	1		677
Loading and unloading equipment	set	1		356
Rolling stock (procurement of locomotive and wagon)	set	1		7,095
Total				11,611

Note: Rolling stock procurement cost is listed above because the supplier is not known at this moment.

(Source: Study team)

- Total project cost is 22,688 million yen and out of which procurement cost from Japan: is estimated to be 11,611 million yen (it is 4,516 if the cost of rolling stock is excluded).
- The ratio of material and equipment to be possibly supplied by Japan against total project cost in the 1st Stage is 51% (20% without rolling-stock).

[Table 5-3-11] Items Applicable for Japanese Product (The 3rd Stage)

Item	Unit	Quantity	Unit Cost	Total Amount (million yen)
Steel bridge manufacturing	set	1		908
Temporary structural steel (steel sheet pile and timbering material)	set	1		348
Track products				4,328
Signal and telecom equipment	set	1		8,126
Electromechanical equipment	set	1		108
Rolling stock maintenance machinery (repair workshop)	set	1		1,016
Loading and unloading equipment	set	1		1,672
Rolling stock (procurement of locomotives and wagons)	set	1		17,860
Total				34,366

Note: Rolling stock procurement cost is listed above because the supplier is not known at this moment.

(Source: Study team)

- Total project cost is 74,437 million yen and out of which procurement cost from Japan: is estimated to be 34,366 million yen (it is 16,506 if the cost of rolling stock is excluded).
- The ratio of material and equipment to be possibly supplied by Japan against total project cost in the 1st Stage is 46% (22% without rolling-stock).

5.4. Project Cost Estimation

Total project cost of each implementation stage is shown in [Table 5-4-1], [Table 5-4-4] and [Table 5-4-7].

5.4.1. Project Cost of the 1st Stage

[Table 5-4-1] Total Project Cost of the 1st Stage

(Unit: million Rp.)

	Foreign Cost	Local Cost	Total
Track rehabilitation work cost	4,556	238,983	243,539
Improvement work cost of existing roadbed	0	48,053	48,053
Improvement work cost of civil engineering structure	0	1,765	1,765
- Improvement work cost of station facilities (effective length extension)	(0)	(1,765)	(1,765)
- Installation work cost of additional signal stations	(0)	(0)	(0)
Improvement and new installation cost of signal and telecom equipment	13,706	1,164	14,870
Improvement and new installation cost of electromechanical equipment	0	0	0
Reinforcement work cost of rolling stock repair facilities	49,610	0	49,610
Rolling stock cost (procurement cost of locomotives and coal wagons)	507,650	0	507,650
Reinforcement work cost of loading and unloading equipment	14,740	0	14,740
Total construction cost: (A)	590,262	289,965	880,227
Consultant service: (A) ×3%	17,708	8,699	26,407
Tax: (A) × 10%	0	28,997	28,997
General administrative expense: (A) × 3%	0	8,699	8,699
Land acquisition cost	0	0	0
Compensation cost	0	0	0
Price escalation: (A) × 3%	17,708	8,699	26,407
Project cost: (B)	625,678	345,058	970,736
Contingency budget: (B) × 10%	62,568	34,506	97,074
Interest during Construction	12,044	6,642	18,687
Total project cost	700,290	386,207	1,086,496

Note: Monetary units of foreign currency and local currency are tentatively represented by Rp.
(Conversion: 1 yen = 110 Rp.) (Source: Study team)

5.4.2. Project Cost of the 2nd Stage

Project cost of the 2nd Stage includes project cost of the 1st Stage because the 2nd Stage is implemented immediately after the completion of the 1st Stage.

[Table 5-4-2] Total Project Cost of the 2nd Stage

(Unit: million Rp.)

	Foreign Cost	Local Cost	Total
Track work cost (including rehabilitation)	278,082	368,356	646,438
Improvement work cost of existing roadbed	0	48,053	48,053
Improvement work cost of civil engineering structures	0	37,360	37,360
- Improvement work cost of existing stations (effective length extension)	(0)	(19,797)	(19,797)
- Installation work cost of additional signal stations	(0)	(17,563)	(17,563)
Construction cost of new line between Merapi and coal storage yard	0	10,608	10,608
Work cost for double tracking (1)	25,000	224,861	249,861
Installation work cost of additional crossings	0	2,700	2,700
Improvement and new installation work cost of signal and telecom equipment	78,458	35,472	113,930
Improvement and new installation work cost of electromechanical equipment	1,596	13,989	15,585
Reinforcement work cost of rolling stock repair facilities	74,470	0	74,470
Rolling stock cost (procurement cost of locomotives and wagons)	780,450	0	780,450
Reinforcement work cost of loading and unloading equipment	39,160	0	39,160
Total construction cost: (A)	1,277,216	741,399	2,018,615
Consultant service: (A) × 3%	38,316	22,242	60,558
Tax: (A) × 10%	0	74,140	74,140
General administrative expense: (A) × 3%	0	22,242	22,242
Land acquisition cost	0	0	0
Compensation cost	0	0	0
Price escalation: (A) × 3%	38,316	22,242	60,558
Project cost: (B)	1,353,849	882,265	2,236,114
Contingency budget: (B) × 10%	135,385	88,226	223,611
Interest during Construction	23,718	12,238	35,955
Total project cost	1,512,952	982,729	2,495,681
The 2nd Stage project cost alone	812,662	596,522	1,409,185

Note: Monetary units of foreign currency and local currency are tentatively represented by Rp.
(Conversion: 1 yen = 110 Rp.) (Source: Study team)

5.4.3. Project Cost of the 3rd Stage

Project cost of the 3rd Stage includes project cost of the 1st Stage and the 2nd Stage because the 3rd stage is implemented immediately after the completion of the 2nd Stage.

[Table 5-4-3] Total Project Cost of the 3rd Stage

(Unit: million Rp.)

	Foreign Cost	Local Cost	Total
Track work cost (including rehabilitation)	476,102	678,734	1,154,836
Improvement work cost of existing roadbed	0	48,053	48,053
Improvement work cost of civil engineering structures	0	80,254	80,254
- Improvement work cost of existing stations (effective length extension)	(0)	(55,113)	(55,113)
- Installation work cost of additional signal stations	(0)	(25,141)	(25,141)
Construction cost of new line between Merapi and coal storage yard	0	10,608	10,608
Work cost for double tracking (1)	25,000	224,861	249,861
Work cost for double tracking (2), (3)	113,187	1,013,406	1,126,593
- Temporary work cost (road for works, cofferdam, and pier)	(33,379)	(42,015)	(75,394)
- Ground improvement work cost (method of pile-net)	(0)	(192,734)	(192,734)
- Earthwork cost (ground leveling, embankment, cut, and planting)	(0)	(289,411)	(289,411)
- Roadbed work cost	(0)	(145,535)	(145,535)
- Drainage work cost	(0)	(292,170)	(292,170)
- Bridge work cost (superstructure work and substructure work)	(79,808)	(51,541)	(131,349)
Installation work cost of additional crossings	0	15,600	15,600
Improvement and new installation work cost of signal and telecom equipment	893,864	667,326	1,561,190
Improvement and new installation work cost of electromechanical equipment	11,910	17,645	29,555
Reinforcement work cost of rolling stock repair facilities	111,760	0	111,760
Rolling stock cost (procurement cost of locomotives and wagons)	1,964,600	0	1,964,600
Reinforcement work cost of loading and unloading equipment	183,920	0	183,920
Total construction cost: (A)	3,780,343	2,756,487	6,536,830
Consultant service: (A) × 3%	113,410	82,695	196,105
Tax: (A) × 10%	0	275,649	275,649
General administrative expense: (A) × 3%	0	82,695	82,695
Land acquisition cost	0	0	0
Compensation cost	0	52,000	52,000
Price escalation: (A) × 3%	113,410	82,695	196,105
Project cost: (B)	4,077,164	3,332,220	7,339,383
Contingency budget: (B) × 10%	400,716	333,222	733,938
Interest during Construction	69,230	45,571	114,801
Total project cost	4,477,110	3,711,013	8,188,123
The 3rd Stage project cost alone	2,964,158	2,728,284	5,692,442

Note: Monetary units of foreign currency and local currency are tentatively represented by Rp.
(Conversion: 1 yen = 110 Rp.) (Source: Study team)

5.4.4. Project Cost to Address Super Long-Term Issues

The super long-term issues will be addressed only after the 3rd Stage project is completed, therefore the cost calculated hereunder is not going to the detail.

[Table 5-4-4] Total Project Cost of the Super Long-Term Stage (Simpang - Mariana of 35km)

(Unit: million Rp.)

	Foreign Cost	Local Cost	Total
Track equipment work cost	88,976	118,958	207,934
Civil engineering structure work cost (earthwork, bridges, drainage work, etc.)	157,300	910,719	1,068,019
Signal facility work cost	198,660	94,048	292,708
Building facility work cost (including five stations as 400 million yen per station)	66,000	154,000	220,000
Total construction cost: (A)	510,936	1,277,725	1,788,661
Consultant service: (A) × 3%	15,328	38,332	53,660
Tax: (A) × 10%	0	127,773	127,773
General administrative expense: (A) × 3%, land cost: 3,000 yen per m^2	0	38,332	38,332
Land acquisition cost (20 m × 35,000 m = 700,000 m^2)	0	231,000	231,000
Price escalation: (A) × 3%	15,328	38,332	53,660
Project cost: (B)	541,592	1,751,494	2,293,086
Contingency budget: (B) × 10%	54,159	175,149	229,308
Total project cost	595,751	1,926,643	2,522,394

Note 1: Monetary units of foreign currency and local currency are tentatively represented by Rp. to prevent a mistake. (Conversion: 1 yen = 110 Rp.)

Note 2.: Costs such as rolling stock procurement cost, loading and unloading facility cost, etc. are not included.

(Source: Study team)

- Unit length cost is 72.1 million Rp./m (equivalent to about 660 thousand yen per meter).
  (Note: Unit length cost is the total project cost divided by the line length of 35,000 m)

[Table 5-4-5] Total Project Cost of the Super Long-Term Stage (Simpang - Gasing of 45km)

(Unit: million Rp.)

	Foreign Cost	Local Cost	Total
Track equipment work cost	112,945	152,803	265,748
Civil engineering structure work cost (earthwork, bridges, drainage work, etc.)	1,148,500	1,192,432	2,340,932
Signal facility work cost	949,080	101,894	1,050,974
Building facility work cost (including six stations as 400 million yen per station)	79,200	184,800	264,000
Total construction cost: (A)	2,289,725	1,631,929	3,921,654
Consultant service: (A) × 3%	68,692	48,958	117,650
Tax: (A) × 10%	0	163,193	163,193
General administrative expense: (A) × 3%, land cost: 3,000 yen per m2	0	48,958	48,958
Land acquisition cost (20 m × 45,000 m = 900,000 m2)	0	297,000	297,000
Price escalation: (A) × 3%	68,692	48,958	117,650
Project cost: (B)	2,427,109	2,238,996	4,666,105
Contingency budget: (B) × 10%	242,711	223,900	466,611
Total project cost	2,669,820	2,462,896	5,132,716

Note 1: Monetary units of foreign currency and local currency are tentatively represented by Rp. to prevent a mistake. (Conversion: 1 yen = 110 Rp.)

Note 2.: Costs such as rolling stock procurement cost, loading and unloading facility cost, etc. are not included.

(Source: Study team)

- Unit length cost is 114.1 million Rp./m (equivalent to about 1 million yen per meter).

  (Note: Unit length cost is the total project cost divided by the line length of 45,000 m)

5.5. Consultant Employment Plan

5.5.1. Scope of the Work

In order for a project to be implemented efficiently, implementing agency of the project is required to have sufficient technical knowledge and experience in the railway facility building and its maintenance. In this project, particularly in the 1st Stage of the implementation, the implementing agency is planned to be SPC which is not necessarily the railway operator in nature. In such a case, consultant employment will be crucial. However, the necessity of the consultant is up to the discretion of SPC.

The purpose of having consulting engineering service is to implement the project safely and economically by taking expertise on advanced railway engineering as assistant to the

implementing agency in the implementation process of the project in such aspects as technical decision making, basic design, detailed design and tender document preparation.

The terms of reference (TOR) of consultants to assist the implementing agency in the project is summarized as follows.

- Basic design: Technical review-of-technical documents, schematic diagram, quantity calculation
- Detailed design: Design report, design calculation basis, work drawing, quantity calculation
- Tender-documents for procurement and construction: Pre-qualification documents, tender document, contract document
- Tendering procedure assistance
- Construction supervision
- Commissioning of rolling-stock , various equipments and system performance
- Performance test inspection: Supervise the commissioning service provided by suppliers for rolling-stock and other equipments and systems
- SPC selection assistance
- Assistance in compiling documents concerning SPC selection and its evaluation work

Reports to be prepared by the engineering services are expected to be as follows.

- Basic design documents: Technical report, basic design drawing, and technical specification
- Detailed design documents: Detailed design drawing, calculation basis document, quantity calculation document, cost estimation document
- Pre-qualification documents, construction plan, construction specifications, material specification
- Specification for materials, tender document, contract document
- Business condition for SPC, tender document for the selection of SPC, tender evaluation criteria, SPC contract document

5.5.2. Implementation Schedule of Consulting Services in the 1st Stage

[Table 5-5-1] shows the outline of implementation schedule of consulting services in the 1st Stage.

[Table 5-5-1] Implementation Schedule of Consulting Services in the 1st Stage

	1st Year	2nd Year	3rd Year	4th Year	5th Year	6th Year	7th Year	8th Year	9th Year	10th Year	11th Year	12th Year
Project Preparation												
General supervision												
Consultant selection												
Tender (construction firm selection)												
Environment plan												
Social program												
Transportation plan												
Maintenance management plan of operation												
Maintenance management plan of rolling stock												
Maintenance management plan of building civil engineering tracks												
Maintenance management plan of power maintenance management plan												
Maintenance management plan of signal and telecommunication												
Maintenance management plan of mechanical equipment												
Detailed design (rolling stock and workshop)												
Detailed design (civil engineering)												
Detailed design (building and equipment)												
Detailed design (tracks)												
Detailed design (Power)												
Detailed design (signal and telecommunication)												
Detailed design (machinery)												
Construction supervision (civil engineering, tracks, and facilities)												
Construction supervision (machinery and workshop)												
Construction supervision (Power, signal and telecommunication)												

(Source: Study team)

5.5.3. Implementation Schedule of Consulting Services in the 2nd Stage

[Table 5-5-2] shows the outline of implementation schedule of consulting services in the 2nd Stage.

[Table 5-5-2] Implementation Schedule of Consulting Services in the 2nd Stage

	1st Year	2nd Year	3rd Year	4th Year	5th Year	6th Year	7th Year	8th Year	9th Year	10th Year	11th Year	12th Year
Project Preparation												
General supervision												
Consultant selection												
Tender (construction firm selection)												
Environment plan												
Social program												
Transportation plan												
Maintenance management plan of operation												
Maintenance management plan of rolling stock												
Maintenance management plan of building civil engineering tracks												
Maintenance management plan of power maintenance management plan												
Maintenance management plan of signal and telecommunication												
Maintenance management plan of mechanical equipment												
Detailed design (rolling stock and workshop)												
Detailed design (civil engineering)												
Detailed design (building and equipment)												
Detailed design (tracks)												
Detailed design (Power)												
Detailed design (signal and telecommunication)												
Detailed design (machinery)												
Construction supervision (civil engineering, tracks, and facilities)												
Construction supervision (machinery and workshop)												
Construction supervision (Power, signal and telecommunication)												

(Source: Study team)

5.5.4. Implementation Schedule of Consulting Services in the 3rd Stage

[Table 5-5-3] shows the outline of implementation schedule of consulting services in the 3rd Stage.

[Table 5-5-3] Implementation Schedule of Consulting Services in the 3rd Stage

	1st Year	2nd Year	3rd Year	4th Year	5th Year	6th Year	7th Year	8th Year	9th Year	10th Year	11th Year	12th Year
Project Preparation	■	■										
General supervision		■	■	■	■	■						
Consultant selection					■	■						
Tender (construction firm selection)							■	■				
Environment plan						■	■	····	····	····	····	···→
Social program						■	■	····	····	····	····	···→
Transportation plan						■	■	····	····	····	····	···→
Maintenance management plan of operation						■	■	····	····	····	····	···→
Maintenance management plan of rolling stock						■	■	····	····	····	····	···→
Maintenance management plan of building civil engineering tracks						■	■	····	····	····	····	···→
Maintenance management plan of power maintenance management plan						■	■	····	····	····	····	···→
Maintenance management plan of signal and telecommunication						■	■	····	····	····	····	···→
Maintenance management plan of mechanical equipment						■	■	····	····	····	····	···→
Detailed design (rolling stock and workshop)						■	■					
Detailed design (civil engineering)						■	■					
Detailed design (building and equipment)						■	■					
Detailed design (tracks)						■	■					
Detailed design (Power)						■	■					
Detailed design (signal and telecommunication)						■	■					
Detailed design (machinery)						■	■					
Construction supervision (civil engineering, tracks, and facilities)									■	■	■	■
Construction supervision (machinery and workshop)									■	■	■	■
Construction supervision (Power, signal and telecommunication)											■	■

(Source: Study team)

5.5.5. Scale of Consulting Services

[Table 5-5-4] shows staff configuration for engineering services, wherein Pro A, Pro B, and S represent, according to the JICA appraisal manual, foreign expert, Indonesian expert with technical level of equivalent to international engineer, and staff other than engineer, respectively.

[Table 5-5-4] Staff Configuration for Engineering Services

No.	Assignment	Pro A	Pro B	S
A01	Project Manager	○		
B01	Deputy Project Manager		○	
A02	Chief Contract Specialist	○		
B02	Contract Administration Engineer		○	
A03	Cost Estimate Expert	○		
B03	Quantity Survey Engineer		○	
A04	Safety Control Expert	○		
B04	Safety Control Engineer		○	
A05	Quality Control Expert	○		
B05	Quality Control Engineer		○	
A06	Alignment Specialist	○		
B06	Alignment Engineer		○	
A07	Environment Expert	○		
B07	Environment Engineer		○	
A08	Resettlement Expert	○		
B08	Resettlement Engineer		○	
B09	Geotechnical Engineer		○	
B10	Surveyor		○	
B11	Traffic Management Engineer		○	
A09	Operation Planning Specialist	○		
B12	Train Operation Engineer		○	
A10	Locomotive Expert	○		
B13	Rolling Stock Engineer		○	
B14	Depot Engineer		○	
B15	Workshop Engineer		○	
A11	Chief Civil Engineer	○		
A12	Steel Structure Expert	○		
B16	Civil Engineer 1		○	
A13	RC Structural Expert	○		
B17	Civil Engineer 2		○	
B18	Soil Engineer		○	
A14	Track Facility Expert	○		
B19	Track Engineer		○	
A15	Chief Architect	○		
B20	Facility Engineer		○	
A16	Power System Expert	○		
B21	Power System Engineer		○	
A17	Signal System Expert	○		
B22	Signal Engineer		○	
A18	Telecom System Expert	○		
B23	Telecom Engineer		○	
A19	Utility System Expert	○		
B24	Utility Facility Engineer		○	
S01	Computer Administrator			○
S02	CAD Operator			○
S03	Office Manager			○
S04	Executive Secretary			○
S05	Secretary			○
S06	Typist			○
S07	Office Boy			○
	Total	19	24	7

(Source: Study team)

Chapter 6

Project Implementation and Operation Body

6.1. Project Implementation

6.1.1. Legal Status of Implementing Agency

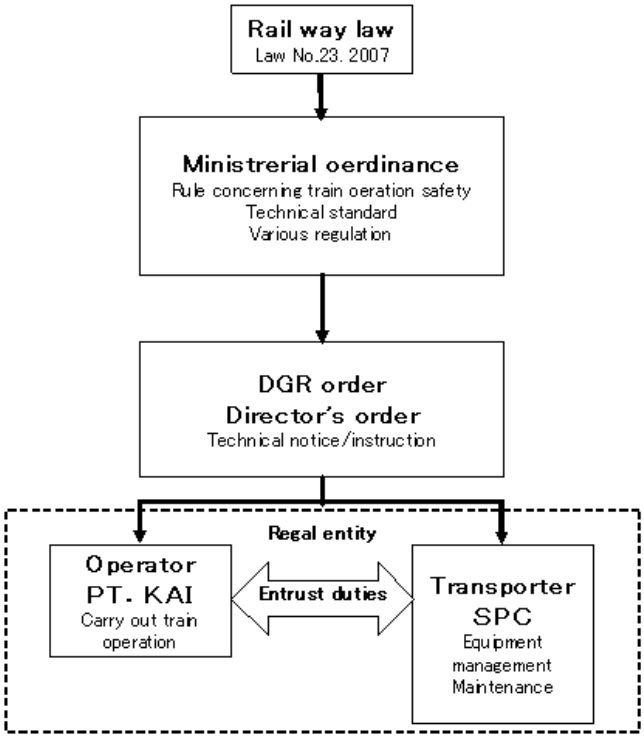
The implementing agency in this project will be changed through each stage from the 1st Stage to the 3rd Stage. That is, in the 1st Stage, SPC assumes to implement all the works including railway infrastructure improvement by its private investment.

On the other hand, in the 2nd Stage and the 3rd Stage, the conventional public investment scheme by Japanese ODA loan is assumed for improvement and new construction of railway infrastructure. Therefore, an implementation organization will be DGR. Moreover, an implementing agency can be PT. KAI when Two-Step Loan (TSL) through the Ministry of Finance is arranged. Legal status about the relation between SPC, DGR, and PT. KAI is described below.

According to the railway law of Indonesia No23/2007, legal status of SPC can be defined as a part of railway operator which owns railway facilities including rolling-stock and gives maintenance to the facilities. Since train operation and maintenance management of rolling stock and other facilities are planned to be entrusted to PT. KAI, there is no responsibility for train operation itself in PSC. However, as long as SPC has a responsibility in maintenance management of the rolling-stock, it will be under the control of DGR.

However, the section between the bank of Musi river and Simpang station can be defined as a exclusive line attached to coal shipment facilities even thought it is a new line constructed by SPC. According to the low No. 23, since through operation between general purpose line and exclusive line is possible, PSC shall follow governmental control.

The governments control aside from the law No.23 includes railway operational regulation given by DGR, technical standards on infrastructure, facility, rolling-stock and so forth. These are all important for the safety of railway operation and any railway company has to follow in good faith.



(Source: Study team)

[Fig. 6-1-1] Regal Relationship

6.1.2. Division of Duties

SPC entrusts train operation and equipment including rolling-stock for the purpose of railway service to PT. KAI. Even though SPC is not a train operator, SPC shall carry out maintenance management necessary to safety train operation.

Maintenance managements is basically periodic inspection and/or repair of rolling stocks, but it should includes establishment of the management system such as building work shop, recruiting maintenance staff and so forth. In this addition, SPC must establish internal rules on technical standards necessary for maintenance management..

When SPC entrust these duties to PT. KAI, establishment of the regulation for technical standards and information service shall discuss with PT. KAI to define the division of duties.

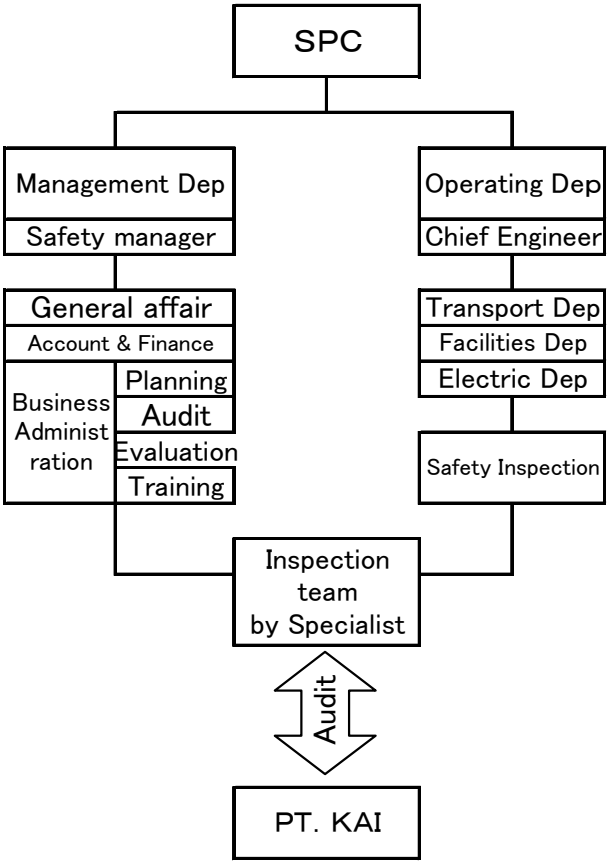
SPC does not take responsibility on maintenance management of the railway facility owned and maintained by PT. KAI. However, it is SPC's responsibility to carry out maintenance to the facilities for loading and unloading of coal.

6.1.3. Organizational Structure

In all stages, the primary party to conduct railway operation will be PT. KAI. Therefore, the

size of SPC organization can be as small as possible because it will not be a party to operate railway. However, it will be important for SPC that it is so structured as to be able to ensure and monitor the proper operation carried out by PT. KAI.

In this context, [Fig. 6-1-2] proposes a model SPC organization structure. In order to establish this structure, a preparatory office should be established at very early timing of the 1st Stage, and to start comprehensive study on the SPC's operation.



(Source: Study team)

[Fig. 6-1-2] Structure Model of SPC

6.1.4. Personnel and Structure

SPC needs to secure necessary personnel and arrange the personnel properly to undertake transport business. The structure should be divided into administration section and operation section, in which the size and balance of the personnel depends on the scale of facility and scope of operation contract with PT. KAI.

The number of necessary personnel in the outset of the 1st Stage based on the organization

model shown in [Fig. 6-1-2] will be approximately 12, excluding management, in which 1 to 4 personnel is assigned in Management Departments under 1 Safety Manager and 1 Chief Engineer person at each Operating Department.

The number of personnel needs to be expanded in the 2nd Stage and the 3rd Stage as the scale of the operation expands. In the mean time, however, since the 1st Stage is implemented under “B to B scheme”, it is important to have an efficient cost structure acceptable to PT. KAI.

Inspection team is an ad hoc section to be organized depending on the classification of audit, such as business and/or safety management audit, and security inspection consisting of external third-party organization and specialists. Management Department of SPC gives advice to parties concerned based on the audit and evaluation made by the inspection team in a timely manner, and implements education and training program if it finds necessary.

PT. KAI, as implementing agency of railway operation, needs to secure locomotive crew and maintenance staff for train operation. Since PT. KAI already purchased CC205 type locomotive, it can be assumed that training of maintenance staff can be done in house education and training by OJT etc. However, since training of the locomotive crew may require long time, it is necessary to start schedule the staff training program for the 2nd and the 3rd Stage during the implementation of the 1st Stage in advance to the arrival of the locomotives. Crew assignment route model by depot based on [Fig. 4-3-3] (P. 4-33) is shown in [Fig. 6-1-3].

Crew's track chart (1st stage. 2nd stage)

DEPOT	Track	Working hour						
	LT SCT PBM	Main	Shunt	Dep	turn	prep	ather	total
Lahat	2:30 ((SCT4)) 2:45	0:15	0:15	0:15		1:00		1:45
	3:00 SCT4 4:40	1:40						1:40
	14:51 SCT11 12:47	2:04	0:15		8:07			10:26
	15:21 ((SCT11)) 15:06	0:15		0:15		0:30		1:00
	((SCT4)) 0:15 min							0:00
	SCT11 0:15 min Total	4:14	0:30	0:30	8:07	1:30	0:00	14:51

DEPOT	Track	Working hour						
	PBM KPT	Main	Shunt	Dep	turn	prep	ather	total
Kertapati		0:00	0:00	0:00		0:00		0:00
	4:25 SCT3 3:00	1:25	0:00	0:00		0:30		1:55
	8:58 SCT8 10:15	1:17	0:00	0:00	7:15			8:32
		0:00	0:00	0:00		0:30		0:30
								0:00
	Total	2:42	0:00	0:00	7:15	1:00	0:00	10:57

Crew's track chart (3rd stage)

DEPOT	Track	Working hour						
	LT SCT KPT	Main	Shunt	Dep	turn	prep	ather	total
Lahat	2:30 ((SCT4)) 2:45	0:15	0:15	0:15		0:30		1:15
	3:00 SCT4 6:06	3:06						3:06
	17:30 SCT13 13:07	4:23	0:15		7:01			11:39
	18:00 ((SCT13)) 17:45	0:15		0:15		0:30		1:00
								0:00
	Total	7:59	0:30	0:30	7:01	1:00	0:00	17:00
Kertapati	8:26 SCT5 5:00	3:26	0:00	0:00		0:00		3:26
	8:56 ((SCT5)) 8:41	0:15	0:15	0:15		0:30		1:15
	14:30 ((SCT16)) 14:45	0:15	0:15	0:15	5:34			6:19
	15:00 SCT16 18:10	3:10	0:00	0:00		0:30		3:40
								0:00
	Total	7:06	0:30	0:30	5:34	1:00	0:00	14:40

(Source: Study team)

[Fig. 6-1-3] Model of Crew's Track Chart

A case study of necessary number of crew in the 1st Stage and the 2nd Stage is shown in [Table 6-1-1] in which a crews belongs to Kertappati (KPT) and Lahat (LT) transfer locomotives at Prabumulih. This calculation is based on locomotive operation schedule shown in [Fig. 4-3-3]

(P. 4-33). As a result the number of crew is as large as 88, 156 and 236 for the 1st Stage, the 2nd Stage and the 3rd Stage respectively which signifies a big increase of crew number.

Now, it is proposed to assign one crew team to operate train between KPT and LT as it is shown at the lower line of [Fig. 6-1-3] setting standard that one crew team can operate about 180km of travel distance. If this proposal is acceptable for PT. KAI, the cost for crew training can be minimized because the number of crew will be reduced by half of the afore mentioned numbers.

[Table 6-1-1] Necessary Number of Locomotive Crews

			1st stage			2nd stage			3rd stage		
			LT	KPT	Total	LT	KPT	Total	LT	KPT	Total
Driver	main line	scheduled	17	17	34	22	22	44	31	31	62
		spare	5	5	10	8	8	16	8	8	16
		total	22	22	44	30	30	60	39	39	78
	shunting	scheduled	0	0	0	6	6	12	15	15	30
		spare	0	0	0	3	3	6	5	5	10
		total	0	0	0	9	9	18	20	20	40
	Driver total		22	22	44	39	39	78	59	59	118
Asistanr driver	main line	scheduled	17	17	34	22	22	44	31	31	62
		spare	5	5	10	8	8	16	8	8	16
		total	22	22	44	30	30	60	39	39	78
	shunting	scheduled	0	0	0	6	6	12	0	0	0
		spare	0	0	0	3	3	6	0	0	0
		total	0	0	0	9	9	18	0	0	0
	Asist driver total		22	22	44	39	39	78	39	39	78
All total			44	44	88	78	78	156	98	98	196

LT: Lahat Depot, KPT: Kertapati Depot

(Source: Study team)

6.1.5. Technical Capabilities

In the 1st Stage, SPC will be a party for the supply and construction, however, since SPC will be a private sector selected through competitive bid process, it cannot be assessed the technical capabilities of SPC at present. Therefore, in this study, it assumes that such activities will be performed by consultants.

In the 2nd Stage and the 3rd Stage, DGR or PT. KAI will be a party for the procurement and

construction. It is the fact that DGR has a lot of experience to be a party to implement Japanese ODA Loan, however PT. KAI has not directly involved in the ODA projects but rather on operation & maintenance activities.

However, since private sectors can be a party for the development of railway infrastructure by revision of railway law in 2007, PT. KAI is acting as an implementation agency of double-track construction of the line between the Tanjung Enim - Prabumurih X6 in the south Sumatra district. The construction concerned was due to be completed in the original plan in 2009. However, construction is still continuing and the section of Niru - Prabumurih X6 is completed in January, 2012.

According to PT. KAI, the cause was related to technical issues, however according to a study team's on-site survey, any work involves difficult construction work is not observed, but budget restriction or less experiences in bridge construction is assumed. Therefore, the support by the consultants will be necessary for this purpose.

6.1.6. Technical Assistance to an Implementation Agency

SPC will be a new entity, and it will need to acquire technical capabilities. Especially, CC205 type locomotive proposed by this study uses induction motor and inverter control system, therefore many advanced technologies including computerized control system, are used. Since the same type of locomotive is planned to be introduced to PT. KAI in coming years, therefore PT. KAI also needs to upgrade its technical capabilities on the advanced technologies. Although detailed technology transfer must be performed by the locomotive supplier, SPC must carry out maintenance management once operation is started. SPC needs to cooperate with EMD, PT. KAI, PT. INKA, and so forth in upgrading technical capabilities.

Japan is one of the most advanced countries in the field of rolling-stock with inverter control system technology; in particular the DF200 type locomotive currently used in Hokkaido division of JR Freight co. has ample track record on maintenance technology of inverter control locomotive. Therefore, use of maintenance management engineering of the abundant inverter locomotives of Japan is proposed to be the most effective measure in asking technical cooperation for SPC by transferring technology on necessary maintenance equipments and creating training materials.

6.2. Operation and Maintenance Structure

6.2.1. Maintenance Planning

(1) Railway Infrastructure

Train operation and facility maintenance has been the responsibility of PT. KAI. Existing facility upgrading work to be planned in the 1st Stage is undertaken by SPC, but the operation and maintenance of the facilities is to be undertaken by PT. KAI in contract basis. It was observed in the study team site inspection that these works are not properly done as it was described in 4.1. (P. 4-1). If there will be no change in the maintenance system for the facilities upgraded in the project, it is expected that the condition of those facilities will soon be the same. Therefore, the current maintenance method must be improved for the project line via quality improvement activities in cooperation with the technical section of SPC.

Organizational chart of present PT. KAI Sumatera Selatan (Divisi Regional III) is shown in [Fig. 6-2-1]. Organizational chart of PT. KAI Kertapati (Sub Divisi Regional III.1) is shown in [Fig. 6-2-2].

In Divisi Regional III, Rolling Stock section (Sarana), Track and Bridge section (Jalan Rel dan Jembatan), and Signaling section (Sintellis) are responsible for maintenance management planning. There are also sections in Sub Divisi Regional III.1 corresponding to the sections and each section has site office (Kantor Sub Divre) actually implementing maintenance work.

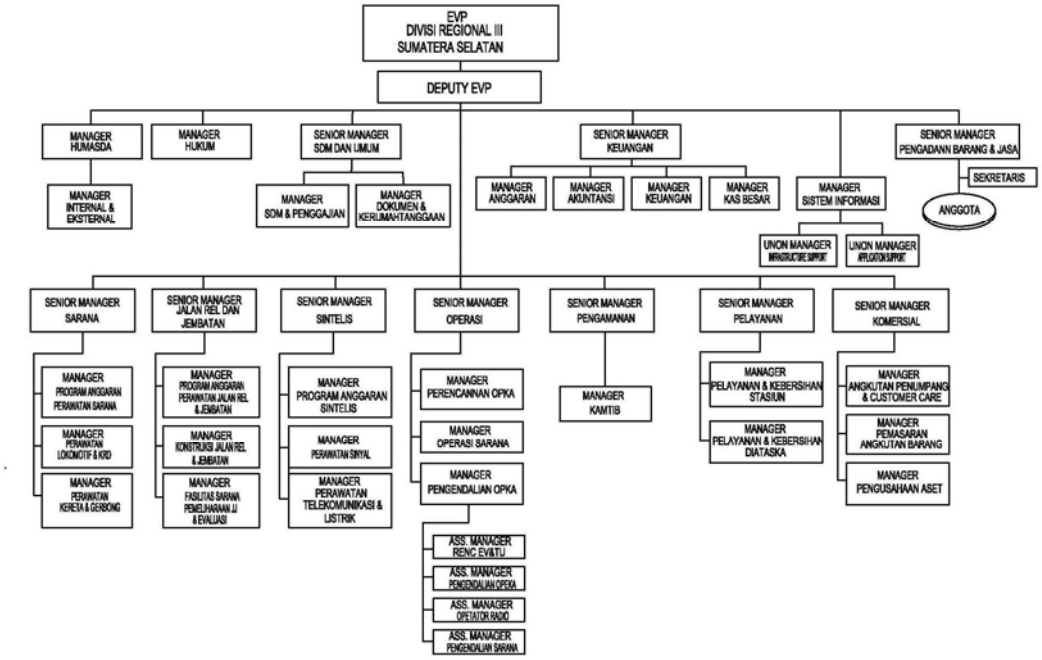
As for track maintenance work, it is undertaken in site offices responsible for maintenance work and planning. The maintenance work includes HTT (hand held tie tamper) system for on the spot repair works and MTT (multiple tie tamper) system for planned repairs.

It was observed, according to the site hearing, that HTT system work is undertaken by a team consisting of 10 clews of out-sourced personnel and quality of the maintenance work is not high. The MTT system work is scheduled to be undertaken every half a year or 2 years, but actual performance is observed to be much behind the schedule.

[Table 6-2-1] shows the list of maintenance facility in PT. KAI Sumatera Selatan. There are 5 MTTs in total, out of which 2 units in Sub div III.1 (Kertapati), 2 units in Sub div III.2 (Tanjung Karang), and 1 unit in Prabumulih depot. It looks that the number of MTT is in short considering the length of railway section for maintenance work, but since the machine is mobilized in a flexible manner there is no problem according to the site hearing. Whatever the present condition, the number of MTT to be needed in the 3rd Stage of the project will be definitely in short.

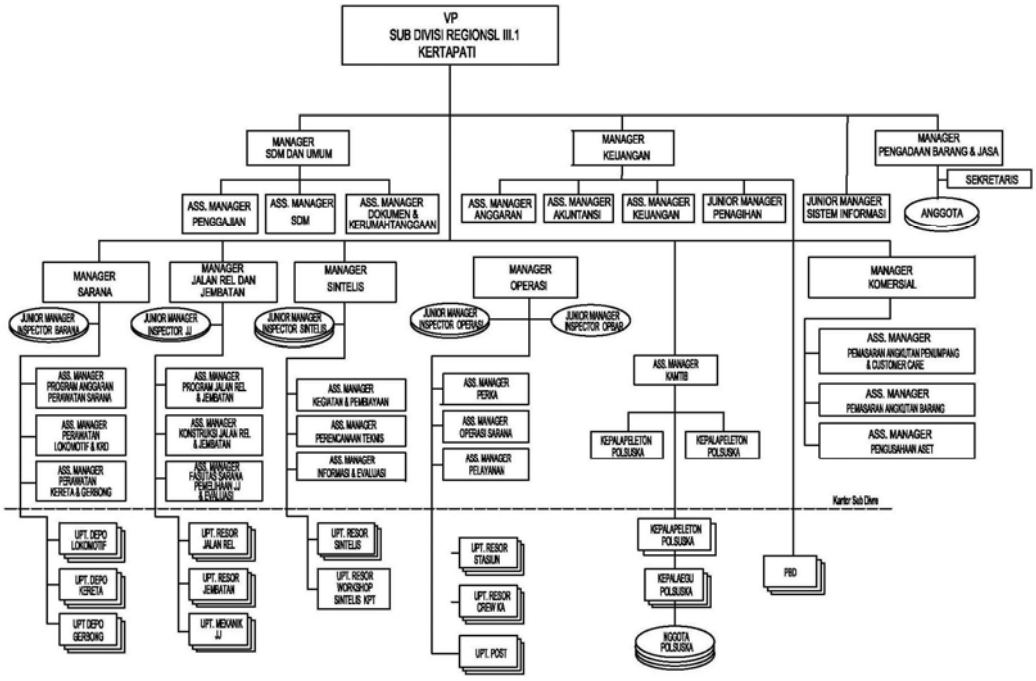
The signaling and telecommunication system was an old model of mechanical type except for Prabumulih signaling station. Maintenance work looks to be done properly by ocular site

inspection and there will be no serious problem so far as the traffic volume is not high as it is now. At some stations, although photovoltaic power generation is used for electric power supply, commercial power supply is needed when the traffic volume was increased. When the transportation capacity expansion project is implemented in the future, a new system different from present system will be employed which is much more complicated and the current maintenance method employed is not applicable any more. Therefore, a measure should be taken to prepare for the transition to the new system from the beginning of the project.



(Source: PT. KAI)

[Fig. 6-2-1] Organizational Chart of PT. KAI Sumatera Selatan (Divsi Regional III)



(Source: PT. KAI)

[Fig. 6-2-2] Organizational Chart of PT. KAI Sumatera Selatan (Sub Divisi Regional III.1)

[Table 6-2-1] List of Maintenance Equipments

	Name of Equipment	Type	Location
1	Multiple Tie Tamper	08-16 GS	Subdivre Ⅲ.2 Tnk, Subdivre Ⅲ.1 Kpt
2	Multiple Tie Tamper	08-16 GS	Subdivre Ⅲ.2 Tnk, Subdivre Ⅲ.1 Kpt
3	Multiple Tie Tamper	08-75 GS	Dipo Mekanik Pbm
4	Ballast Regulator	400	Subdivre Ⅲ.1 Kpt
5	Ballast Regulator	400	Subdivre Ⅲ.2 Tnk, Subdivre Ⅲ.1 Kpt
6	Ballast Regulator	303	Subdivre Ⅲ.2 Tnk
7	Way Motor Vehicle	80-4	Dipo Mekanik Pbm
8	Consolidating (VDM)	800 GS	Rusak di Dipo Mekanik Pbm
9	Consolidating (VDM)	800 GS	Rusak di Dipo Mekanik Pbm
10	Flash But Welding	K 355 APT	Dipo Mekanik Pbm
11	Ballast Cleaner (BC)	RM 62	Rusak di PKLG LT

(Source: PT. KAI)

[Table 6-2-2] shows the inventory of various documents such as standard, manual and ledger for track, bridge and electricity and signal facilities relevant to inspection and maintenance. Thought the details were not confirmed, they look to be not widely used according to the site visit.

It is urgently necessary to prepare a set of on-site manuals for maintenance work simultaneously when compiling maintenance standard.

[Table 6-2-2] Inventory of Maintenance Documents

Subject	Specification / Standard	Manual	Ledger
Track	Yes	Yes	Yes
Bridge	None	None	Yes
Electricity and Signal	None	None	None

(Source: PT. KAI)

The basic principle for the improvement of current maintenance method of the railway facilities are summarized in the 3 subjects as follows.

① Data Keeping

Inspection record, repair record, and failure record (quantity and frequency, contents, primary reason, method of repair measure) for every facility must be kept to measure the soundness of facilities and upgrade the quality of maintenance. It can be realized by introducing I.T. technology for maintenance record data management as well as establishing accident restoration technology, facility oriented accident prevention method, and maintenance material inventory control. The site inspection of the study was not able to confirm them.

② Understanding of Appropriate Equipment and Cost

The maintenance cost record should be classified in expenses for personnel, materials, and administration and it should be used to plan the appropriate size of maintenance expenses at work site operation. The site inspection of the study was not able to identify such data management except for maintenance facilities including MTT.

Appropriate size of maintenance crew including out-sourced personnel at each work site should be evaluated by establishing technology standard and inspection and maintenance standard for the MTT and HTT works.

③ Enhancement of Maintenance Crew Training

Maintenance crew training program such as measures to cope with train diagram disorder and unusual situation should be implemented so that technical standard of railway facilities and maintenance manuals will be observed properly and the effective maintenance will be realized. Inspection and maintenance manuals for various facilities and infrastructure should be compiled

in Indonesian language so that they are understood at the working site level and properly applied. The training program should be implemented using the practical text books.

(2) Maintenance management of the rolling-stock

The body which carries out maintenance management is carrying out the periodic inspection based on the inspection standard by type of a rolling stock of PT. KAI in each depot, such as Kertapati and Tarahan. General inspection, inspection of a wheel axle, and extra repair are carried out at the Lahat rolling stock workshop.

The system which carries out control of maintenance is inspecting by deciding upon an inspection plan on each depot under control of a Sumatra Third Division Kertapati office. Planned repair is carried out by teams, such as the body, bogies, an engine, and an electric system, with the inspection period defined as each depot took rolling stock operation into consideration. Although the required equipment for maintenance suits the present rolling stock maintenance work, they are superannuated and the thing corresponding to the new technology of CC205 type locomotive is not fixed.

According to the interview at a Lahat rolling stock workshop, the inspection of CC205 type locomotive is planned to be carried out in Tarahan locomotive depot after preparing all necessary equipments. And the hearing suggested the possibility of outsourcing of the work. However, when this point was confirmed to the vice president responsible for locomotive at PT. KAI head office in Bandung, it was found that general inspection is carried out at a Lahat workshop and outsourcing is not in the view, which means that there is inconsistency of policy between the management side and the field side.

The discussion either own maintenance or out souring is up to the discretion of PT. KAI, but PT. KAI is required to start preparing for the maintenance management planning for the new technology associated with the introduction of CC205 type of locomotive as soon as possible

.Basic policy for SPC regarding the locomotive operation and maintenance is to entrust them to PT. KAI, SPC also needs to have engineering section responsible for technical aspects of the locomotives so that safety and stable coal transportation will be secured.

6.2.2. Legal Framework Corresponding to Operation and Maintenance Entities

Basic law regarding railway is the law No. 13 in 1992 (Railway Law) which specifies the responsibility among the government, state-owned firm, and private enterprises as follows.

- Railway development policy planning, policy implementation supervision, and provision of major railway infrastructure and its maintenance management are the responsibility of the government (Directrate General of Land Transportation of MOT (presently DGR)).

- Railway business is the responsibility of a railway corporation (or corporations) which is/are fully owned by the government.
- Maintenance and management of railway infrastructure is entrusted to PT. KAI by the government. Private enterprises are able to participate in the railway business by having cooperation with PT. KAI.

The present PT. KAI is the government owned enterprise inaugurated its operation in June 1999 as a result of privatization and operation and infrastructure separation policy of the government.

Railway infrastructures owned by the government are track, bridge, tunnel, signal and telecommunication facility, electric facilities, and land, while PT. KAI owns infrastructures such as station building, platform, garage, repair plant, and other land. Construction of railway facilities and improvement plan are implemented by the government, the government entrust railway facility maintenance work to PT. KAI and pay the cost. But the new law constitutes a mixed form of “Railway business” and “Railway operation” which are usually separated in other countries such as Japan. Therefore, it fails to identify the responsibility sharing between the government and railway operators.

The article 11 of the law defines that the government has a responsibility for railway policy formation and give guidance to railway operators, while article 14 of the law defines that the government is entitled to be a railway operator, which means that there is no clear line between railway policy guidance giver and the follower.

As it is defined in the article 14 of the law, private enterprises are allowed to participate in the railway business in Indonesia on condition that concession agreement between the operator and the government shall be reached. However, there are no articulations on the contents of the agreement and any comprehension is possible. The similar ambiguity lies on the possibility of infrastructure design and specification setting by the railway operator because the infrastructure development planning is in the hand of the government.

However, in reality, some potential operators such as Adani of India and Trans Pacific Railway of China acquired concession to build and operate a new line to transport coal in South Sumatra and the infrastructure design is under way right now. PT. KAI also is working on the double tracking project between Tanjung Enim and the Prabumulih X6 section even though DGR insists that it has not approved.

In the following, outline of Republic of Indonesia law No.23 (April 25, 2007) is shown.

- Railway line is comprised of general railway and special railway and general railway is classified into national railway, state railway, and prefecture/ city railway (Article No. 4).

- Government has an authority in railway policy making and the government gives guidance to planning, control, construction, utilization and maintenance management (Article No. 11).
- Construction and installation of railway facilities are implemented by central government and local government (Article No. 14).
- Central government and local government can cooperate with state owned company, local government owned company, or private company in concession formation. The concession agreement can cover railway facility management, facility maintenance management, and railway operation (Article No. 14).
- The cooperation must comply with the concession agreement, the railway network master plan and the technical requirement of railway facilities (Article No. 15).
- Management of railway facilities is usually undertaken by central government, local government, government owned company, local government owned company, or private company (Article No. 16).
- Railway management and operation permissions are required to undertake railway facility management (Article No. 20).
- Operation of special railway must obtain construction and operation permissions (Article No. 21).

6.2.3. Scope of the Work

As described above, while government implements construction and improvement plan of railway facilities, a railway company is responsible for railway service under the guidance of government. Infrastructure and facility maintenance work is undertaken by PT. KAI entrusted by government, and the cost is paid by the government. Legal scope of the work of SPC is presumed to be in par with PT. KAI.

Actual scope of the work of SPC may diverse including railway operation in the extreme case, but the basic idea is to entrust train operation and maintenance of railway facilities to PT. KAI under the permission of DGR, because PT. KAI has enough experience of the works. This set up is possible under the new railway law and the rest of the work is to conclude an operation contract between SPC and PT. KAI.

The advantage of the proposed scheme for PT. KAI is that it can expand transportation capacity in south Sumatra where coal transport demand is huge without expending its fund resource for rolling-stock while PT. KAI is in need of allocating resources for various field of transportation capacity and upgrading service quality. In addition, PT. KAI will increase revenue by train operation and facility maintenance services under a contract with SPC. Furthermore, PT. KAI will have a stake in competing with other proposed projects in expanding coal transportation capacity such as private companies of India, Chinese and Korea.

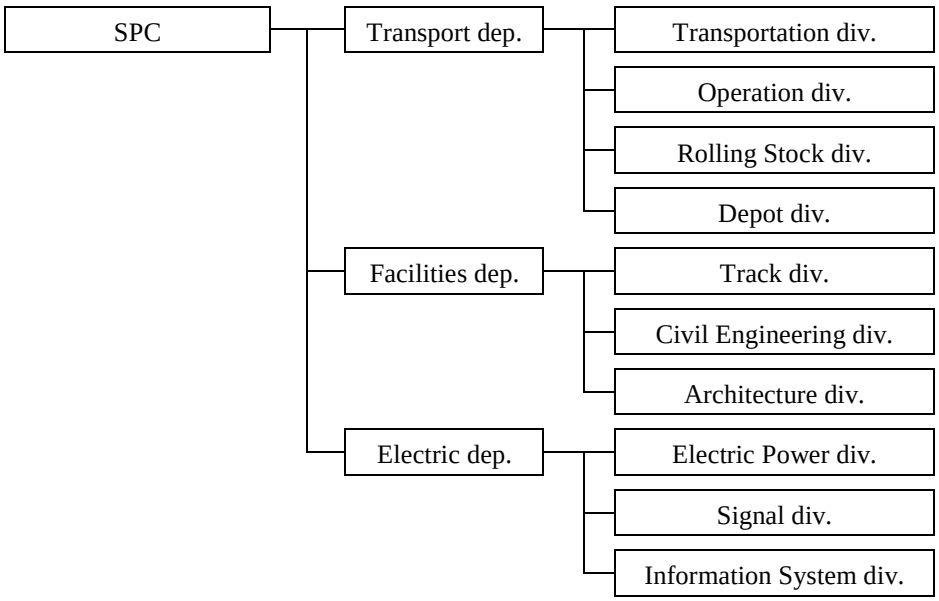
6.2.4. Organizational Structure

As it was proposed above, in case where train operation and facility maintenance are contracted out from SPC to PT. KAI, the organizational structure of SPC can be minimal size for administrative works only. [Fig. 6-2-3] shows an example of the organizational structure which constitutes “Operating Department” of [Fig 6-1-2] (P. 6-3). Here, the offices necessary for the work are supporting work for the management regarding transportation, asset and electricity supply, and administration on the train operation and maintenance contract.

The transport department consists of transportation in charge of coal transportation planning, operation in charge of train operation planning, freight car in charge of freight car operation plan, depots in charge of locomotive and freight car maintenance.

The facilities department consists of track maintenance which in charge of track maintenance, civil engineering in charge of civil structure maintenance and architecture in charge of management and maintenance of building.

Electric department consists of electric power in charge of electric power supply plan to equipment, signal in charge of railway maintenance of signal machine, and system in charge of information control.



(Source: Study Team)

[Fig. 6-2-3] Operation and Maintenance Organization Outline

6.2.5. Staffing

As it was described above, since SPC contracts out all the field works to PT. KAI, the number of personnel belongs to each division can be as small as 2 to 3 including division chief.

As for the staffing of PT. KAI, according to the hearing conducted by the study team, there is no problem in terms of equipment, man power and budget. This response is not compliance with the field survey by the study team on track maintenance work in particular which is behind the schedule. For the moment, since PT. KAI has a track record of implementing the work so far, there is no denying for its performance. However, considering the fact that the number of train will greatly increase in the future if the project was implemented, the number of maintenance clew is needed to be increased and improvement of train operation control to secure a time space for maintenance work is needed.

6.2.6. Technical Capabilities

(1) Railway Infrastructure Maintenance

In order to maintain railway facilities for years to come in good condition, allocation of budget for operation and maintenance, inspection to know the condition of facilities accurately, and allocation of sufficient number of stuff for repair and improvement work with sufficient technical ability are required. Although, it was explained by PT. KAI officials in the field survey conducted by the study team, that human resources and budget are sufficiently allocated, but it is not sure whether the newly constructed infrastructure will be properly maintained or not if the present maintenance practice is applied. In particular, since all the on-the-spot maintenance work is implemented by out sourced personnel, it is questionable if the workers actually doing the job are keeping enough level of technical ability. It is proposed that SPC shall collaborate with PT. KAI to conduct training program for the maintenance stuff to keep up with the technical ability.

(2) Rolling-stock Maintenance

In this project, the newly established SPC will possess equipment for transportation, such as a locomotive, and staff required for maintenance management in principle. In order to carry out maintenance management of the locomotive and container freight wagon which SPC supplies, maintenance staff's security, education and training are required.

Since, as for the rolling stock, PT. KAI also possesses the same type of rolling-stock, it is proposed to entrust staff education and training to PT. KAI. It is also proposed to have technical cooperation with EMD which is a locomotive manufacturer and PT. INKA which is a domestic railway rolling-stock manufacturer in Indonesia, and ask for the training of engineers in order to step up the technical capabilities required.

As for such facility as civil engineering structure, track, and electricity, the project use the existing ones owned by DGR or PT. KAI. And PT. KAI carries out the maintenance management as it is now. The training institution for infrastructure maintenance is in Bandung, and it is explained that staff training is carried out there.

In order to maintain the railway facilities over the future in a good condition, the budget required for maintenance must be secured, and enough number of staff and technical capability to carry out the inspection to assess the right condition of facilities and give repair and improvement work are required.

Education and training on the locomotive of PT. KAI is carried out in the locomotive workshop in Yogyakarta. There, each unit in the workshop provides working manuals and collects technical information and information sharing system is established. However, as it is described in 6.2.3, since the CC205 type locomotive to be introduced by PT. KAI in South Sumatra from now on requires variety of equipments for new technology, it is necessary to review the present education and training facility and manuals. On this subject, it is PT. KAI's opinion that it is ready. However, the study team failed to have any evidence. As for such general technical aspect as body, bogie, and coupler, no technical problem in particular was recognized by the study team at the rolling-stock workshop in Lahat. However, it is necessary to study further the inspection and repair technology corresponding to the new type locomotive. PT. KAI has already procured 6 CC205 type locomotives, and is planning to procure 44 more locomotives. Although 6 cars arrived on site now, it is still in a verification running process. If substantial number of locomotive come to operate fully in the trunk line, it is inevitable to upgrade the technical capability for the new type of locomotives.

Regarding maintenance management skill of a freight wagon, since the freight wagon which SPC uses is the same as the freight wagon which PT. KAI uses, no technical difficulties in the maintenance capability is foreseeable. As for personnel training, it is implemented in ad hoc basis according to PT. KAI.

6.2.7. Accounting Analysis of PT. KAI

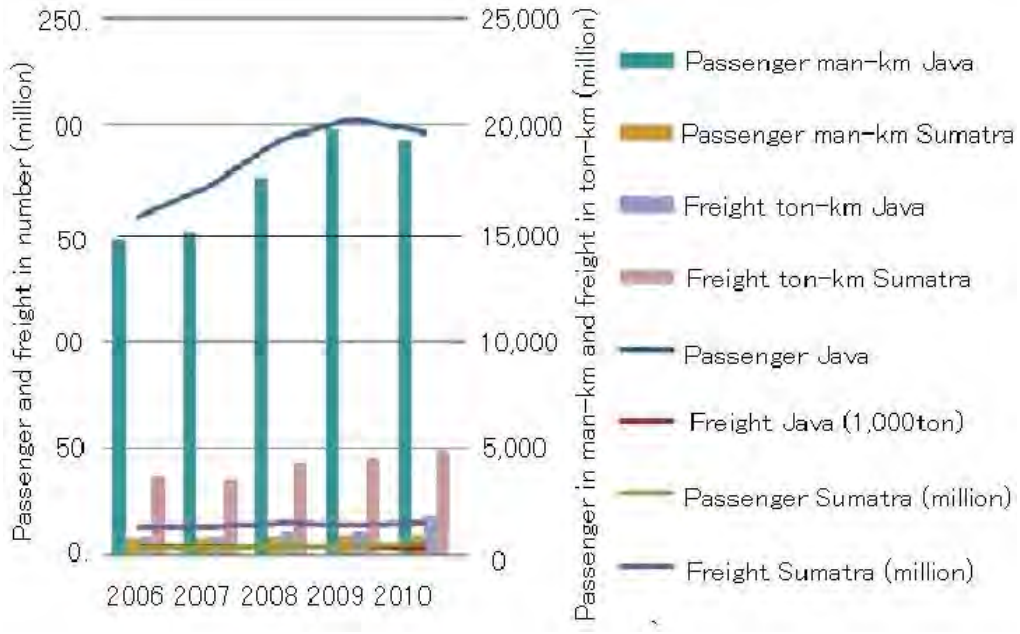
Accounting analysis of PT. KAI is given below by Profit Loss Statement, Balance Sheet, Cash flow Statement (Statement of Change in Financial Position) and accounting ratios.

(1) Railways Service Operation

Over the long stretch of Indonesia railways of 5,040km in operation, around a quarter (26.6%, 1,340km) of the all runs in Sumatra with rolling stocks of locomotive (50) and wagons (1,380) in Divre III (South Sumatra Region). Of the aggregate 19.0 million ton of freight and 202.2 million passenger transport, Didre III accounted for, respective of, 81.1% (15.4million ton) and

2.6% (5.2 million passengers) in 2010. Average annual growth rates of freight and passengers in Region III over 5 years of 2006-10 stood at 3.2% and 12.1%, as against those in Java of -2.4% and 5.7%, in that order[1].

Alternatively by the units of ton-km and man-km, Java and South Sumatra dominate in passenger and freight transport services, while each of these accounting for 95.5% (19,367 million man-km) in Java and 72.7% (4,869 million ton-km) in South Sumatra. This numerical trend explicitly demonstrates growth trend of railway transportation in South Sumatra, and depicted in [Fig. 6-2-4] below[2].Note 65% of operating revenue emanated from passenger services in 2009.



(Source: PT. KAI Audited Annual Reports 2006 - 2010)

[Fig. 6-2-4] Passenger and Freight Transport in Java and South Sumatra (2006 - 2010)

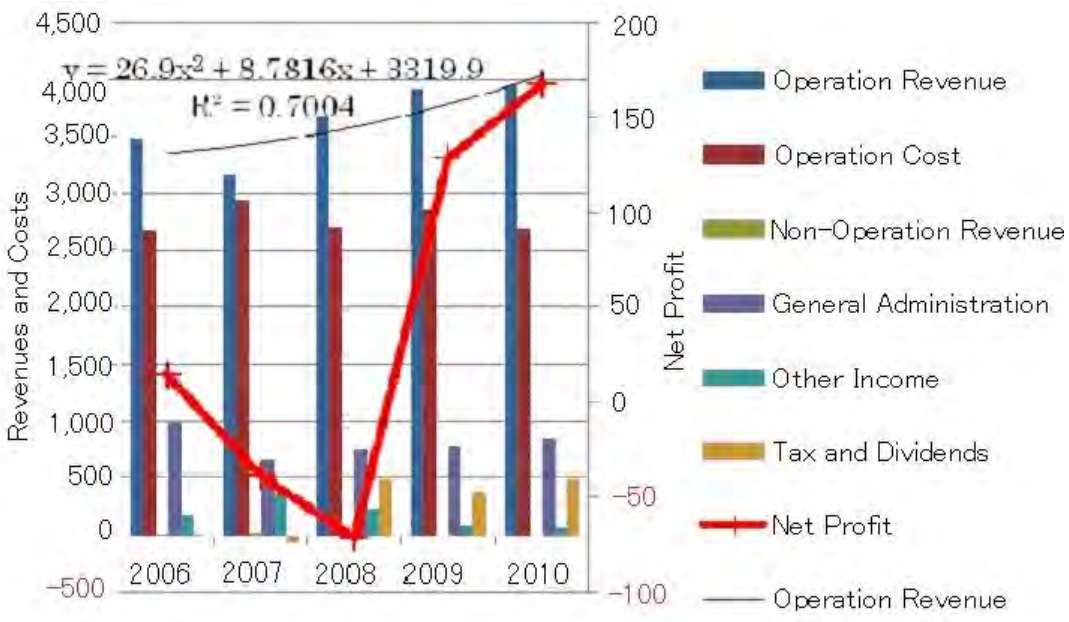
(2) Profit Loss Statement

On the financial front, of PT. KAI posted net profit of Rp. 216.3 billion (JY1.7billion)3 in 20104., arising from Rp. 14.2billion (JY 0.11 billion) in 2006. Average annual growth rates in nominal and real term over the period of 2006 through 2010 stood at 97.5% and 85.5%

[1] Number of rolling stocks comprising locomotives and wagons in 9 DAOP (Java) is counted at respective of 100 and 1,810, respectively.
[2] Source: The Ministry of Transport, T*ransportation Statistics*, 2011
[3] Foreign exchange quotation is set at JY 0.0078125 per Rupee, as per November 2011 price.
[4] Source: PT. KAI, *Laporan Manajemen Perusahaan (Annual Audit Report)*, 2010, 2009, 2008, and 2007

respectively5. Uprising financial performance of the entity in the light of net profit in the past two years (2009 - 10) is noteworthy, while considering two consecutive years of deficits in 2007 and 2008. Nonetheless, gross asset turnover rate remains still very low of 2.2%6 in 2010; managerial and technical effort for efficiency would further be in need.

Breakdown of Profit-Loss Statement during the said 5 years (2006 - 2010) is summarized in the following. ([Fig. 6-2-5], [Table 6-2-3] and [Table 6-2-4]). Note that public service obligation (government subsidy to economy class passengers, PSO) is categorized in operation revenue, whereas track access charge (TAC), infrastructure maintenance and operation (IMO) in indirect operation cost. Further to note in this regard, IMO which is revenue to PT. KAI is totally cancelled out by TAC. Summary Profit Loss statement 2006 - 2010 is shown in [Table 6-2-4].



(Source: PT. KAI Audited Annual Reports 2006-2010)

[Fig. 6-2-5] Revenues, Costs, and Net Profit (Nominal 2006 - 2010)

[5] Inflation rates in 2007 through 2010 are assumed at 5.4, 11.4, 2.8, and 7.0%s, in descending order.(Source: IMF, *World Economic Outlook*, 2011)

[6] Current profit was Rp. 126.0 billion whereas gross asset amounting to Rp. 5,583 billion in 2010.

[Table 6-2-3] Summary Profit Loss Statement (2006 - 2010)

(Unit: Rp. billion, JY billion)

	2006 Nominal	2007 Nominal	2008 Nominal	2009 Nominal	2010 Nominal	Nominal Growth Rate annual	Real Growth Rate annual
Operation Revenue (+)	3,476.5 (27.2)	3,341.2 (26.1)	4,319.7 (33.7)	4,724.4 (36.9)	5,082.9 (39.7)	10.0	3,2
of which PSO	535.0 (4.1)	425.0 (3.3)	544.7 (4.3)	504.1 (3.9)	534.8 (4.2)	0.0	-6.1
Operation Cost (-)	2,669.1 (20.8)	3,098.9 (24.2)	3,164.8 (24.7)	3,434.5 (26.8)	3,461.0 (27.0)	6.7	0.2
of which TAC	746.5 (5.8)	824.4 (6.4)	859.1 (6.7)	922.4 (7.2)	1,175.2 (9.2)	12.0	5.2
of which IMO	-746.5 (-5.8)	-824.4 (-6.4)	-859.19 (-6.7)	-922.4 (-7.2)	-1,175.2 (-9.2)	12.0	5.2
Net Operation Revenue	807.6 (6.4)	242.3 (1.9)	1,154.9 (9.0)	1,289.9 (10.1)	1,621.9 (22.7)	19.0	11.8
Net Non-Operation Revenue (+)	17.1 (0.1)	24.7 (0.2)	14.3 (0.1)			-8.6	-15.6
Administration and Sales Cost (-)	990.3 (7.7)	705.5 (5.5)	878.5 (6.9)	935.0 (7.3)	1,088.6 (8.5)	2.4	-13.3
Current Profit	-165.4 (-1.3)	-438.5 (-3.4)	252.4 (2.0)	57.7 (0.5)	126.0 (1.0)	115.2	68.7
Net Other Income (+)	171.8 (1.3)	365.3 (2.9)	277.4 (2.2)	100.5 (0.8)	85.7 (0.7)	-16.0	-21.1
Current Tax (-)	3.4 (0.03)	34.6 (0.4)	120.2 (0.9)	60.6 (0.07)	66.7 (0.04)	195.7	184.6
Retained Tax (+)	11.0 (0.09)	82.5 (0.6)	235.1 (1.8)	51.5 (0.4)	20.5 (0.1)	16.9	9.7
Dividends (-)	0.3 (0.002)	1.9 (0.01)	0.8 (0.006)	0.9 (0.007)	0.2 (0.002)	-4.5	-10.4
Net Profit	14.2 (20.8)	-40.5 (20.8)	-83.5 (20.8)	154.8 (20.8)	215.3 (20.8)	97.5	85.5

(Source: PT. KAI Audited Annual Reports 2006 - 2010)

[Table 6-2-4] Summary Profit Loss Statement in Real and Nominal Terms (2006 - 2010)

(Unit: billion Rp.)

	Audited	Base yerar	Audited	Real term	Audited	Real term	Audited	Real term	Audited	Real term
				6.4%		10.3%		4.9%		5.1%
	2006	2006	2007	2007	2008	2008	2009	2009	2010	2010
Revenue from Passenger Transport Services										
Executive Class	718,350	718,350	773,274	726,733	1,036,144	882,781	1,080,242	877,403	1,015,540	784,638
Business Class	450,807	450,807	408,302	383,727	513,440	437,444	626,934	509,213	868,904	671,342
Economy Class	548,641	548,641	571,154	536,778	713,363	607,776	790,867	642,365	846,307	653,884
Supporting of Operational Passenger Transport	86,348	86,348	71,949	67,618	89,762	76,476	87,459	71,037	83,564	64,564
Total	**1,804,146**	**1,804,146**	**1,824,679**	**1,714,857**	**2,352,709**	**2,004,478**	**2,585,501**	**2,100,018**	**2,814,315**	**2,174,428**
Revenue from freight transport services										
Negotiation goods	903,072	903,072	855,592	804,096	1,164,596	992,221	1,533,455	1,245,516	1,686,109	1,302,741
Non Negotiation goods	234,283	234,283	236,047	221,840	257,756	219,605	99,767	81,034	29,202	22,562
Supporting of Operational Passenger Transport	-	-	-	-		-	1,492	1,212	18,458	14,261
Total	**1,137,355**	**1,137,355**	**1,091,639**	**1,025,937**	**1,422,352**	**1,211,826**	**1,634,714**	**1,327,761**	**1,733,769**	**1,339,564**
Government subsidies	**535,000**	**535,000**	**425,000**	399,420	**544,665**	464,048	**504,168**	409,499	**534,798**	413,202
Total Revenue from Transport Services	**3,476,501**	**3,476,501**	**3,341,318**	**3,140,214**	**4,319,726**	**3,680,351**	**4,724,383**	**3,837,278**	**5,082,882**	**3,927,194**
Cost fo Sales										
Direct Operating Cost										
Fuel & Electricity	646,688	646,688	616,897	579,768	798,897	680,650	718,585	583,655	753,574	582,235
Maintenance of Motion Facility	551,877	551,877	534,245	502,090	666,461	567,817	906,141	735,993	1,087,653	840,354
KSO				-	38,370	32,691		-		-
Operational employee	411,704	411,704	517,845	486,677	494,814	421,575	581,858	472,602	547,710	423,178
Depreciation of motion facility	121,240	121,240	344,367	323,640	232,602	198,174	197,656	160,542	170,317	131,593
Extra Charge	73,154	73,154	57,871	54,388	72,663	61,908	46,013	37,373	5,536	4,277
Advanced transportation	9,477	9,477	13,968	13,127	18,867	16,074	29,492	23,954	31,300	24,183
Operational of container terminal	1,992	1,992	1,786	1,678	240	204	936	760	1,534	1,185
Total	**1,816,132**	**1,816,132**	**2,086,977**	**1,961,368**	**2,322,913**	**1,979,092**	**2,480,680**	**2,014,879**	**2,597,624**	**2,007,005**
Indirect Operating Cost										
maintenance of basic infrastructure	340,508	340,508	385,554	362,348	220,467	187,835	463,272	376,283	424,429	327,927
employee of basic infrastructure	280,398	280,398	368,169	346,010	192,551	164,051	212,987	172,994	191,945	148,302
employee of operating in basic infrastructure		-		-	144,825	123,389	211,634	171,895	200,494	154,908
employee of planning and supervision	69,293	69,293	52,141	49,003	65,022	55,398	77,582	63,015	75,652	58,451
maintenance of supporting infrastructure	21,998	21,998	21,478	20,186	48,891	41,655	78,969	64,141	43,278	33,438
depreciation of supporting infrastructure	10,191	10,191	9,987	9,386	8,577	7,308	9,206	7,477	9,087	7,021
general station yard	126,389	126,389	158,276	148,750	72,330	61,624	80,672	65,524	68,645	53,038
employees of station operation and yard		-		-	111,421	94,929	149,546	121,465	188,067	145,307
K3	1,771	1,771	15,956	14,995	1,677	1,428	30,223	24,548	48,619	37,564
employee of container terminal	1,996	1,996	1,004	943	2,672	2,277	930	755	1,726	1,333
lease of infrastructure (TAC)	746,531	746,531	824,381	774,764	859,076	731,922	922,388	749,190	1,175,188	907,987
		-	(461)	(433)		-		-		-
Total	**1,599,074**	**1,599,074**	**1,836,486**	**1,725,953**	**1,727,509**	**1,471,816**	**2,237,408**	**1,817,286**	**2,427,128**	**1,875,275**
Government of subsidies	(746,531)	(746,531)	(824,381)	(774,764)	(859,076)	(731,922)	(922,388)	(749,190)	(1,175,188)	(907,987)
Overhead of company subsidiary		-	-	-	11,791	10,046	37,669	30,596	142,912	110,418
Total Cost of Sales	**2,668,675**	**2,668,675**	**3,099,082**	**2,912,557**	**3,203,136**	**2,729,031**	**3,833,369**	**3,113,571**	**3,992,477**	**3,084,712**
Gross Profit (Loss)	**807,826**	**807,826**	**242,236**	**227,657**	**1,116,589**	**951,320**	**891,014**	**723,707**	**1,090,406**	**842,482**
Other Operating Income										
Property lease	-	-	-	-	60,729	51,741	88,124	71,577		-
Warehouse / station space lease	6,790	6,790	4,668	4,387	7,765	6,616	11,877	9,647		-
Land lease advertising	4,990	4,990	4,714	4,430	1,291	1,100	9,195	7,468		-
Buffet & stall lease	1,594	1,594	1,032	970	1,138	970	1,427	1,159		-
Others	3,779	3,779	14,309	13,448	4,127	3,516	3,197	2,596		-
Total Other Operating Income	**17,154**	**17,154**	**24,723**	**23,235**	**75,050**	**63,942**	**113,820**	**92,448**	**108,671**	**83,963**
Operating Expense										
Sales Expense	8,422	8,422	9,187	8,634	14,860	12,661	48,559	39,441	14,303	11,051
General and Administration Expense	981,940	981,940	696,344	654,433	1,554,176	1,324,138	898,597	729,866	1,058,739	818,014
Total Operating Expense	**990,362**	**990,362**	**705,531**	**663,067**	**1,569,036**	**1,336,799**	**947,156**	**769,307**	**1,073,042**	**829,066**
Operating Profit (loss)	**(165,383)**	**(165,383)**	**(438,572)**	**(412,175)**	**(377,396)**	**(321,537)**	**57,677**	**46,847**	**126,035**	**97,379**
Total Other Income (Expense)	171,856	171,856	365,296	343,310	174,595	148,753	158,727	128,923	156,762	121,120
Extraordinary loss	392	392								
Earning (loss) before taxes	**6,865**	**6,865**	**(73,276)**	**(68,866)**	**(202,802)**	**(172,784)**	**216,405**	**175,770**	**282,798**	**218,498**
Taxes	7,626	7,626	34,656	32,570	120,169	102,382	(60,680)	(49,286)	(66,698)	(51,533)
Earning (loss) before minority interest	**14,492**	**14,492**	**(38,620)**	**(36,296)**	**(82,633)**	**(70,402)**	**155,724**	**126,484**	**216,099**	**166,965**
Minority Interest	(285)	(285)	(1,886)	(1,772)	(854)	(727)	(924)	(750)	237	183
Net Income (loss)	**14,207**	**14,207**	**(40,506)**	**(38,068)**	**(83,487)**	**(71,130)**	**154,800**	**125,733**	**216,336**	**167,148**

(Source: PT. KAI Audited Annual Reports2006 - 2010)

(3) Balance Sheet

Aggregate assets of PT. KAI was Rp. 5,583.6 billion (JY 50.76 billion) in 2010 very slightly arising from Rp. 5,546.5 billion (JY 50.42 billion) in 2006, with the average annual growth rate of 0.18% in nominal term, and oppositely downsizing of -8.1% in real term as per 2006 price level. This contracting scale of operation emanates largely from the compression of fixed liabilities, with the average growth rates in nominal and real terms are respective of -12.8% (from Rp. 1,435.6 billion-JY 13.05 billion in 2006 to Rp. 830.1 billion – JY 8.09 billion in 2010) and -18.2% (Rp. 641.3 billion-JY 5.83 billion). Current liability of Rp. 839.5 billion (JY 7.63 billion) in 2006 downsized by -2.6% to Rp. 755.7 billion (JY 6.87 billion) in nominal and -8.7% per annum to Rp. 583.9 billion (JY 5.30 billion) in real term in 2010. Meanwhile, owner's equity was Rp. 3,232.3 billion (JY 29.38 billion) in 2006 to slightly grow 5.2% to Rp. 3,953.2 billion (JY 35.94 billion) in nominal term and actually decrease by 1.4% to Rp. 3,054.4 billion in real terms.

Owner's equity comprise ① shares (3.5 million) of Rp. 2,470.0 billion (JY 22.45 billion) with the face value of Rp. 1.0 million per share, and ② Government subsidy of Rp. 1,072.9 billion (Jy 9.75 billion) being allotted to electric locomotive (53.8%), passenger trains (31.0%), spare parts (4.9%), Diesel locomotives (4.2%), and others (6.1%) in 2010. The Ministry of State owned Enterprises (MOSOE) holds 100% of PT. KAI shares, and hence administratively controls PT. KAI through Board of Directors. As previously noted, annual operation plan and other decisions including tariff issues need to get approval of or concurrence from MOSOE.

Meanwhile, PT. KAI has since 2009 posted profits in tandem with commencing own investments to infrastructure and facilities in South Sumatra. The entity has at this moment in time little sign of typical state-budget dependency on finance and operation, with the symptoms including chronicle deficit and state fund inflows, accumulated debts inclusive of contingent liabilities and heavy burden of debt services, and inefficient operation and management due to staff redundancy. With this, PT. KAI would not be categorized as typical public-owned enterprises heavily depending on the State.

[Table 6-2-5] Summary Balance Sheet (2006 - 2010)

	2006	2007	2008	2009	2010
Assets					
Current Assets					
Cash and Equivalent		1,348,157	1,602,459	1,215,230	735,138
Shorterm Investment		50,000	64,928	3,200	
Trade Receivable		117,926	129,333	174,679	161,485
Other Receivable		18,182	16,480	48,016	13,152
Inventory		302,887	393,335	463,673	519,975
Accured Income		148,353	140,882	135,743	139,109
Advance		15,173	67,765	35,844	42,940
Prepaid tax		10,752	-	92,033	102,683
Other Current Assets		399,757	232,947	83,454	265,790
Total Current Assets	**-**	**2,411,188**	**2,648,130**	**2,251,870**	**1,980,273**
Non Current Assets					
Deffered Tax		40,152	275,298	223,772	203,238
Fixed Assets		2,377,775	2,632,990	2,846,600	2,842,432
Construction in Progress		88,405	98,545	40,656	433,809
Slow Moving equipment & spareparts		40,112	39,945	43,779	50,430
Non Productive fixed assets		19,347	21,498	18,965	18,878
Deffered charges		1,355,032	4,204	2,639	2,394
Employment benefit		127,161	53,252	116,222	52,144
Total Non Current Assets	**-**	**4,047,983**	**3,125,731**	**3,292,633**	**3,603,326**
Total Assets	**-**	**6,459,171**	**5,773,861**	**5,544,503**	**5,583,599**
Liability & Equity					
Liability					
Current Liability					
Shorterm Loan		-	-	-	161,824
Trade Payable		161,122	262,782	207,018	219,621
Deffered Charges		334,416	374,231	396,491	141,065
Tax payable		205,735	278,401	83,889	114,318
Advance		102,738	118,376	87,262	100,037
Other Liability		16,246	104,679	11,549	18,842
Pension loan - mature in 1 year		79,500			
Total Current Liability	**-**	**899,757**	**1,138,469**	**786,208**	**755,707**
Non Current Liability					
Employment benefit	-	468,333	955,346	45,199	43,175
Pension loan - all	1,156,182	1,272,000	-	814,263	734,763
Deffered tax	42,308				
Pension loan - Swakelola	20,162	127,161	53,252	116,222	52,144
Subsidiary loan	216,933				
Total Non Current Liability	**1,435,585**	**1,867,494**	**1,008,598**	**975,684**	**830,082**
Minority Interest	40,504	42,602	43,916	44,932	44,569
Equity					
Shares	2,370,000	2,470,000	2,470,000	2,470,000	2,470,000
Government subsidies	696,820	1,055,893	1,072,941	1,072,941	1,072,941
Differences in liquidation	968	968	968	968	968
Retained earning	164,562	122,457	38,970	193,770	409,332
Total Equity	**3,232,349**	**3,649,318**	**3,582,879**	**3,737,679**	**3,953,241**
Total Liability & Equity	**4,708,439**	**6,459,171**	**5,773,861**	**5,544,503**	**5,583,599**

(Source: PT. KAI Audited Annual Reports2006 - 2010)

(4) Ratio Analysis

In line with what has currently been in practice for accounting analysis in JICA, following 5 accounting ratios[7] and debt sustainability ratio in the past 5 years have been picked up from the entity's financial documents. Subsequently, financial performance as borne out by these ratios is evaluated, while comparing those to the benchmarked ratios[8] of private sector business entities in Japan's transportation sector (refer [Table 6-2-6]). Summary cash-flow statement is seen in [Table 6-2-7].

Financial performance of PT. KAI in aggregate seems profoundly sound in terms of profitability, stability, and debt solvency. As seen from the figures of return on sales, equity ratio, current ratio, and debt service coverage ratio (DSCR), the entity has a high profile of profitability (efficiency), stable capital structure, least external borrowings and burden, and solvency. Incredible performance is the ratio of non-cash revenue, namely, account/note receivables and promissory notes, out of sales or current assets. In the light of this, together with DSCR, the entity is free from debt and cash burdens that most of the public entities in developing economies suffer from.

Meanwhile, good but lesser efficiency results as given by current ratio as well as quick ratio (193.2% in 2010), return on assets, and fixed assets to own and long-term capital (owner's equity and borrowings) imply ① over liquidity, and ② lesser investment to fixed assets. With this in view, PT. KAI would preferably be enhancing the basis of gross sales by more investing to infrastructure and newer rolling stocks.

As regards the cash-flow statement (the statement of change in cash position), cash inflows from operation, investment, and finance activities in 2010 stood at Rp. 48.7 billion (JY 0.4 billion), Rp. -689.5 billion (JY -6.2 billion), and Rp. -160.7 billion (JY -1.5 billion), revealing somewhat unsound cash position. With this, it would be noted that the financial structure posting cash from finance activities well exceeds that from operation is one of the symptoms of "bubble" economy, generally speaking, though. It would not be appropriate herewith to place the PT. KAI cash position as "bubble economy" due to ① newly started investment activities in return of interest-borne borrowings from commercial banks, and ② insufficient descriptive and numerical information on PT. KAI financial activities from annual reports and financial statements. Nonetheless, careful eyes on the 2nd Stage of cash position of the entity in the days that come would be in need. Meanwhile, the amount of contingent liabilities as borne out by the entity was not figured out due to a lack of note to financial statements.

[7] JICA Institute for International Cooperation training course on Financial Analysis
[8] Indicative figures based on the Bank of Japan, *Managerial Analysis on Major Business Entities*, 2000, cited in Y. Yamaguchi *Textbook on Managerial and Financial Analysis*, Nippon Jitsugyou Shuppan, 2003, pp.212-217

[Table 6-2-6] Accounting Ratios (2006 - 2010)

Ratio	Formula	2006	2007	2008	2009	2010	Benchmark	Evaluation
Return on Assets (ROA)	Net Income/ Total Assets	0.3%	-0.6%	-1.4%	2.8%	3.9%	1.8% 1/	A
Return on Sales	Net Income/ Sales	0.4%	-1.2%	-1.9%	3.3%	4.3%	3.3% 2/	A+
Total Asset Turnover	Revenue/ Average Total Assets	n.a	55.7%	70.6%	83.5%	91.4%	0.57	A
Owners' Equity Ratio	Total Equity/ Total Assets	58.3%	56.5%	62.1%	67.4%	70.8%	0.215	A+
Current Ratio	Current Assets/ Current Liabilities	266.4%	268.0%	232.6%	286.4%	262.0%	1.008	A+
Fixed Assets to Equity + Long-term Liability	Fixed Asset/ (Equity + Long Term Liability)	48.0%	43.1%	57.3%	60.4%	59.4%	1.0023	A
Sales to Account Receivable	Account (note) Receivable/ Sales	3.8%	4.1%	3.4%	4.7%	3.4%	0.25	A+
Debt Service Coverage Ratio (DSCR)	Debt (Interest Bearing)/ Net Benefit	91.5%	0.0%	0.0%	0.0%	0.0%	25.0%	A+

1/ Return (Current profit)/ Total Assets as Proxy
2/ Return (Current Profit)/ Sales as Proxy

(Source: PT. KAI Audited Annual Reports 2006 - 2010)

[Table 6-2-7] Summary Cash-flow Statement (2006 - 2010)

(Unit: million Rp.)

	2006	2007	2008	2009	2010
Cash Fow from operating activity					
Net Income (loss)	14,207	(40,506)	(83,487)	154,800	216,336
Added (less) - non cash charges component	-	-	-	-	-
Fixed assets depreciation	16,200	370,941	247,962	221,337	198,159
Deffered tax assets	60	(40,152)	(235,146)	51,526	20,533
Defered tax	(11,100)	(42,308)			
Pension loan - all	1,156,181	195,318	-	814,263	(79,500)
Employment benefit	-	468,333	487,012	(910,147)	(2,024)
Pension loan - swakelola	20,162	106,998	(73,909)	62,970	(64,078)
Receivable rightoff reserve	110,700	863	890	58,298	6,680
Cash & Equivalent before changes in working capital	1,306,410	1,019,488	343,323	453,047	296,107
Changes in working capital					
Decrease (increase) of current assets					
Receivable - related party	(11,700)	(19,858)			
receivable - third [arty	(13,500)	15,819	(12,298)	(45,346)	13,194
other receivable	(115,100)	214	1,702	(89,834)	34,864
inventory	5,600	(64,964)	(90,448)	(70,338)	(56,303)
Accured Income	(149,800)	10,077	7,471	5,139	(3,366)
advance	(2,900)	12,717	(52,592)	31,921	(7,097)
prepaid tax	(2,000)	(8,778)	10,752	(92,033)	(10,651)
others current assets	(64,400)	(14,052)	1,016	149,494	(25,718)
Decrease (increase) of current assets					
Trade payable	2,100	40,119	101,659	(55,764)	12,603
Bank Loan payment due	(13,000)				
Deffered charges	70,700	(104,361)	39,814	82,788	(255,425)
Tax payable	68,600	(13,086)	72,667	(255,040)	30,429
Advance	39,000	58,932	15,638	(31,114)	12,775
Others payable	(3,200)	(816)	88,433	(93,130)	7,293
Net Cash flow from (for) operating activity	**1,116,810**	**931,450**	**527,138**	**(10,209)**	**48,707**
Cash flow from investing activity					
Assets release (additional)					
Shorterm investment	-	(50,000)	(14,928)	61,728	3,200
Fixed assets	(89,800)	(508,440)	(503,176)	(434,947)	(193,991)
Deposit	85,400	(197,284)	165,794	-	(163,299)
Construction in progress	42,700	(4,625)	(10,140)	57,889	(393,153)
Slow moving equipment and spareparts	700	10,856	166	(3,834)	(6,651)
Non productive fixed assets	(2,700)	(972)	(2,150)	2,533	87
Deffered charges	6,000	(458,346)	(672)	1,565	246
Pension fund -swakelola	-	(106,998)	73,909	(62,970)	64,078
Net Cash flow from (for) investing activity	**42,300**	**(1,315,809)**	**(291,198)**	**(378,037)**	**(689,485)**
Cash flow from financing activity					
Loan to Government	(31,200)	(216,933)			
Shares - Government	100,000	100,000			
Shorterm loan	-	-	-	-	161,824
Minority Interest	40,200	2,098	1,314	1,016	(363)
Government Subsidies	22,300	359,073	17,048	-	-
Devidend payment	-	(631)	-	-	(774)
Net Cash flow from (for) financing activity	**131,300**	**243,607**	**18,362**	**1,016**	**160,686**
Increase (decrease) net cash flow	**503,190**	**(140,752)**	**254,302**	**(387,230)**	**(480,092)**
Beginning cash balance	**985,719**	**1,488,909**	**1,348,157**	**1,602,459**	**1,215,230**
Ending cash balance	**1,488,909**	**1,348,157**	**1,602,459**	**1,215,230**	**735,138**

(Source: PT. KAI Audited Annual Reports2006 - 2010)

6.2.8. Technical Assistance to Operation and Maintenance Entities

(1) Railway Infrastructure

Since SPC contract out train operation and facility maintenance work to PT. KAI, it has no field technical staff, but it has management offices in charge of transportation, facility and electricity. PT. KAI is actually doing railway operation business with organization responsible for operation and maintenance of various railway facilities and infrastructure having basic equipments, working regulations and asset management ledgers. On the other hand, judging from the field survey conducted by the study team, equipment management record, management method application and management ledger record were not confirmed to be maintained appropriately. Also, it was informed that preventive maintenance is practiced based on the manual inspection on the civil structures such as bridge on foot for the entire route and it is used for the disaster prevention measure, but the study team was not able to confirm the record in the field survey. As for the MTT maintenance, it is not implemented as planned according to the hearing because it is difficult to control the train operation to secure a time space for the maintenance work.

Subjects to be addressed with regard to the operation and maintenance of facilities and equipment at PT. KAI to be contracted out for operation and maintenance are summarized as follows in [Table 6-2-8].

[Table 6-2-8] Subjects for Operation and Maintenance of Facilities and Equipments

Track, Structure, Facilities	Electricity, Communication, Signal	Rolling Stock
● MTT cannot be mobilized although track maintenance is behind the schedule. ● Lots of breakage of sleeper. ● Although mud pumping point of track bed is conspicuous, there are no record by which causative analysis was conducted. ● Basic management ledgers do exist with blank form but the information is empty. ● Although railway maintenance plan is prepared every year, there is no record of actual implementation.	● Basic management ledgers do exist with blank form but the information is empty. ● There is no maintenance record for old equipments.	● Failure rate is high. ● Preventive maintenance is not practice but ad hoc inspection and maintenance at the time of failure. ● Suitable maintenance technology is insufficient.

(Source: Study Team)

What is particularly impressive in the hearing during the field survey by the study team was that due to the high rate of rolling-stock disorder, train operation time schedule disorder is frequent and it becomes quite difficult to secure a time space for the infrastructure and facility maintenance work. Thus, the mobilization schedule of MTT can not be planned and track without maintenance work is used in practice. In the end, it is presumed that a negative spiral is occurring starting from bad track condition to transportation capacity decrease. Implementation of this project can increase the transportation capacity and cut the negative spiral, but if the present maintenance practice is applied for the infrastructure and facility renewed in the project, the negative spiral may resume.

In order for SPC to contract out the train operation and maintenance to PT. KAI in a long run, it is proposed to request PT. KAI to improve and restore the existing operation management system which does exist but not practiced properly. Particular importance should be placed on the preventive maintenance for which experienced Japanese experts (JR personnel for example) are dispatched to establish the system and help apply to the field.

(2) Maintenance management of the rolling-stock

CC205 type locomotive is a U.S. made locomotive being manufactured by EMD in US. It will be important for SPC to receive support from EMD in order to acquire necessary maintenance management skills of locomotives. The technical assistance about establishment of maintenance management system is based on inspection and repair manual by the locomotive supplier. However, the dispatch of experts for checking the compatibility of the manual offered by the supplier and the technical standard of DGR, and the personnel training for preparing an inspection period, an inspection method, a technical standard, etc. suitable for CC205 type locomotive, the training in railway enterprise companies such as JR, Railway Bureau of the Ministry of Land Infrastructure and Transport, and various research institutions, etc. is considered that the technical assistance to SPC which led is effective.

(3) Establishment of Maintenance Management Support Organization

It becomes impossible to secure the planned traffic volume if maintenance for infrastructure and facilities specified by SPC was not given. Therefore, SPC should support to establish a system for PT. KAI to implement appropriate maintenance management as it was mentioned in the preceding clause. The followings are a proposal to materialize the concept.

An organization responsible for maintenance management plan and personnel training should be established in SPC. This organization belongs to “Operation Division” shown in [Fig. 6-2-3] (P. 6-15) and executes the tasks shown below.

- Prepare a standard for maintenance management.
- Prepare manuals for maintenance management.
- Train maintenance work leaders (Track facilities maintenance management, signal and electric power facilities maintenance management, and maintenance machinery and vehicle management)

The SPC engineers, specialist invited from Japan and engineers of PT. KAI should collaborate to make the maintenance management standard and the maintenance management manual. The maintenance management standard will be ready within 9 months after SPC was established and it will be incorporated in detailed design. The maintenance management manual that SPC specifies will be ready within 6 months.

Currently, actual maintenance work is outsourced to private companies by PT. KAI. In order for the maintenance work to be implemented exactly in accordance with the manual, it is necessary to educate Indonesian maintenance work leaders and let the leaders to train the maintenance workers of PT. KAI and outsourced companies.

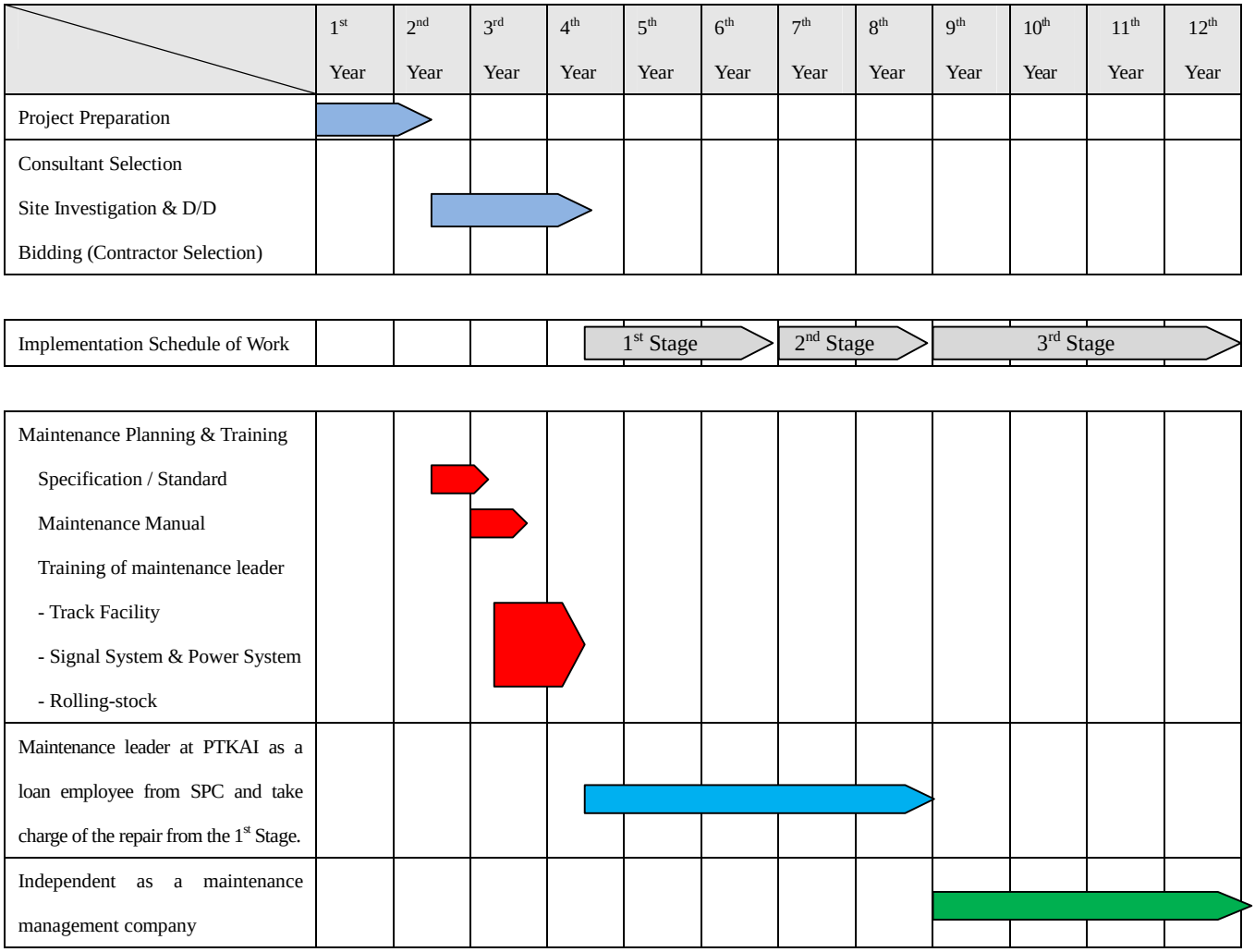
The maintenance leader is proposed to be Indonesian who has enough experiences in railway facility maintenance work. The number of the leader is about 20 composed of PT. KAI retiree, newly recruit, and the kind. They will be re-educated in OJT basis under the supervision of specialists invited from Japan and engineers of PT. KAI.

After 1 year of education, the maintenance leader will be assigned to PT. KAI field work for the project section seconded by SPC and implement the maintenance work jointly with PT. KAI engineers. In this way, maintenance quality that SPC expects will be satisfied.

When the 2nd Stage is ended, the maintenance leader will have the experience of the maintenance management of about 4 years at the project actual site. As a result, it will be possible to establish an independent company which specialize railway infrastructure and facility maintenance for Indonesian railway as a whole. Maintenance quality of the project railway facility will be secured by establishing the maintenance dedicated company that enables the sustainable operation of the project and thus contribute to the development of Indonesia.

The building schedule of the maintenance management support organization is shown in [Table 6-2-9].

[Table 6-2-9] Building Schedule of Maintenance Management Organization



(Source: Study Team)

Chapter 7

Economic/ Financial/ Risk Analysis

7.1. Cost

7.1.1. Cost Estimate

The project will be implemented in 3 stages depending on the coal transportation demand. Calculation basis for the project cost in each stage can be found in Section 5.4. (P. 5-29). Cost estimate at each stage is shown in [Table 7-1-1], [Table 7-1-2] and [Table 7-1-3].

The project cost in each stage is categorized into infrastructure construction costs, rolling-stock costs, loading/unloading facility costs, consultancy service costs, land acquisition costs, and tax and others (administrative expenses, tax, prices escalation expense, and reserve fund are included) in foreign and local cost components as shown below.

[Table 7-1-1] Project Cost at the 1st Stage

(Unit: million Rp.)

	Foreign Cost	Local Cost	Total
Construction	18,262	289,965	308,227
Rolling stock	557,260	0	557,260
Loading/Unloading	14,740	0	23,100
Consultant	17,708	8,699	26,407
Land	0	0	0
Tax and others	92,320	87,543	179,863
Total	700,290	386,207	1,086,497

(Source: Study team)

[Table 7-1-2] Cumulative Project Cost up to the 2nd Stage

(Unit: million Rp.)

	Foreign Cost	Local Cost	Total
Construction	383,136	741,399	1,124,535
Rolling stock	854,920	0	854,920
Loading/Unloading	39,160	0	39,160
Consultant	38,316	22,242	60,558
Land	0	0	0
Tax and others	197,419	219,088	416,507
Total	1,512,951	982,729	2,495,680

(Source: Study team)

[Table 7-1-3] Cumulative Project Cost up to the 3rd Stage

(Unit: million Rp.)

	Foreign Cost	Local Cost	Total
Construction	1,520,063	2,756,487	4,276,550
Rolling stock	2,076,360	0	2,076,360
Loading/Unloading	183,920	0	183,920
Consultant	113,410	82,695	196,105
Land	0	52,000	52,000
Tax and others	583,357	819,831	1,403,188
Total	4,477,110	3,711,013	8,188,123

(Source: Study team)

7.1.2. Annual Fund Requirement

The project will be implemented in 3 stages depending on the coal transportation demand. Calculation basis for the project cost in each stage can be found in Section 5.4. (P. 5-29). Annual fund requirement at each stage is shown in [Table 7-1-4], [Table 7-1-5] and [Table 7-1-6].

[Table 7-1-4] Annual Fund Requirement at the 1st Stage

(Unit: million Rp.)

	1st Year	2nd Year	3rd Year	4th Year	5th Year	6th Year
Amount	0	0	54,325	162,974	434,599	434,599
(%)	0	0	5	14	40	40
	7th Year	8th Year	9th Year	10th Year	11th Year	12th Year
Amount	-	-	-	-	-	-
(%)	-	-	-	-	-	-

(Source: Study team)

[Table 7-1-5] Cumulative Annual Fund Requirement up to the 2nd Stage

(Unit: million Rp.)

	1st Year	2nd Year	3rd Year	4th Year	5th Year	6th Year
Amount	0	0	54,325	162,974	434,599	505,058
(%)	0	0	2	7	17	20
	7th Year	8th Year	9th Year	10th Year	11th Year	12th Year
Amount	634,133	704,592	-	-	-	-
(%)	25	28	-	-	-	-

Notes: The amount is the total sum up to the 2nd Stage.

(Source: Study team)

[Table 7-1-6] Cumulative Annual Fund Requirement up to the 3rd Stage

(Unit: million Rp.)

	1st Year	2nd Year	3rd Year	4th Year	5th Year	6th Year
Amount	0	0	54,325	162,974	434,599	505,058
(%)	0	0	1	2	5	6
	7th Year	8th Year	9th Year	10th Year	11th Year	12th Year
Amount	785,429	634,133	989,214	1,081,564	1,366,186	2,163,128
(%)	8	12	13	17	10	26

Notes: The amount is the total sum up to the 3rd Stage.

(Source: Study team)

7.1.3. Financial and Economic Costs of the Project

Financial costs of the Project by alternative stage (step-wise implementation by 1st, 2nd, and 3rd Stage) are summarized hereunder as the basis on which economic and financial analyses are to further be proceeded with. Note that financial cost estimates are somewhat different from the cost as elucidated in the previous section of 7.1.1. (P. 7-1) due largely to the compliance of this section with the guidelines of project analysis prepared by JICA[1], the Asian Development Bank[2], and others.

Total financial costs of the 1st Stage, the 2nd Stage, and the 3rd Stage (comprising base cost, physical and price contingencies) stand at Rp. 1,174.2 billion (JP¥ 10.65 billion), Rp. 2,887.0 billion (JP¥ 26.18 billion), and Rp. 11,157.0.billion (JP¥ 101.19 billion), in that order. Excluding

[1] *Manual of IRR estimation for Japan's Yen Loan Projects*, JBIC, September 2002

[2] *Handbook on Economic Analysis of Investment Operations*, ADB 1998

price contingencies from each of these aggregate costs, the costs to estimate internal rate of return (IRR) are elucidated at Rp. 1,038.8 billion (JP¥ 9.42 billion), Rp. 2,393.1 billion (JP¥ 21.71 billion), and Rp. 7,857.6 billion (JP¥ 71.27 billion), in the same order. Annual operation costs that account for 8% of FIRR cost (base cost + physical contingency) are figured out at Rp. 83.1 billion (JP¥ 0.75 billion), Rp. 191.4 billion (JP¥ 1.74 billion), and Rp. 628.6 billion (JP¥ 5.70 billion) for respective of the 1st Stage, the 2nd Stage, and the 3rd Stage. Detailed cost estimates are given below as [Table 7-1-7], [Table 7-1-8] and [Table 7-1-9].

[Table 7-1-7] Financial Cost for the 1st Stage

(Unit: Rp. billion)

	FC	LC	Total
Construction	590.3	290.0	880.2
Land Acquisition			0.0
Administration cost		8.7	8.7
Engineering Fee	17.7	8.7	26.4
Tax and Duties		29.0	29.0
Base Cost	608.0	336.4	944.3
Physical Contingency	60.8	33.6	94.4
BC + PhyC	668.8	370.0	1,038.8
Price Contingency	34.4	101.1	135.5
Total	703.1	471.1	1,174.2

(Unit: JP¥ billion)

	FC	LC	Total
Construction	5.35	2.63	7.98
Land Acquisition			
Administration cost		0.08	0.08
Engineering Fee	0.16	0.08	0.24
Tax and Duties		0.26	0.26
Base Cost	5.51	3.05	8.57
Physical Contingency	0.55	0.31	0.86
BC + PhyC	6.07	3.36	9.42
Price Contingency	0.31	0.92	1.23
Total	6.38	4.27	10.65

(Source: Study team)

[Table 7-1-8] Financial Cost for the 2nd Stage

(Unit: Rp. billion)

	FC	LC	Total
Construction	1,277.2	741.4	2,018.6
Land Acquisition			
Administration cost		22.2	22.2
Engineering Fee	38.3	22.2	60.6
Tax and Duties		74.1	74.1
Base Cost	1,315.5	860.0	2,175.6
Physical Contingency	131.6	86.0	217.6
Base Cost + PhyC	1,447.1	946.0	2,393.1
Price Contingency	106.2	387.6	493.9
Total	1,553.3	1,333.6	2,887.0

(Unit: JP¥ billion)

	FC	LC	Total
Construction	11.58	6.72	18.31
Land Acquisition			
Administration cost		0.20	0.20
Engineering Fee	0.35	0.20	0.55
Tax and Duties		0.67	0.67
Base Cost	11.93	7.80	19.73
Physical Contingency	1.19	0.78	1.97
Base Cost + PhyC	13.13	8.58	21.71
Price Contingency	0.96	3.52	4.48
Total	14.09	12.10	26.18

(Source: Study team)

[Table 7-1-9] Financial Cost for the 3rd Stage

(Unit: Rp. billion)

	FC	LC	Total
Construction	3,780.3	2,756.5	6,536.8
Land Compensation		52.0	52.0
Administration cost		82.7	82.7
Engineering Fee	113.4	82.7	196.1
Tax and Duties		275.6	275.6
Base Cost	3,893.8	3,249.5	7,143.3
Physical Contingency	389.4	325.0	714.3
Base Cost + PhyC	4,283.1	3,574.5	7,857.6
Price Contingency	532.6	2,766.7	3,299.4
.79al	4,815.8	6,341.2	11,157.0

(Unit: JP¥ billion)

	FC	LC	Total
Construction	34.29	25.00	59.29
Land Compensation		0.47	0.47
Administration cost		0.75	0.75
Engineering Fee	1.03	0.75	1.80
Tax and Duties		2.50	2.50
Base Cost	35.32	29.47	64.79
Physical Contingency	3.53	2.95	6.48
Base Cost + PhyC	38.85	32.42	71.27
Price Contingency	4.83	25.09	29.93
Total	43.68	57.51	101.19

(Source: Study team)

Likewise, the economic costs of the 1st Stage, the 2nd Stage, and the 3rd Stage are estimated at Rp. 973.1 billion (JP¥ 8.83 billion), Rp. 2,225.1 billion (JP¥ 20.18 billion), and Rp. 7,175.8 billion (JP¥ 65.08 billion), in that order. In the estimation of Economic costs, transfer payments (taxes and duties, land acquisition compensation) and price contingency are excluded from financial cost. Further, domestic cost portion of the Project is converted to international competitive prices (border prices) by applying the Standard Conversion Factor (SCF) of 0.9 in the current analysis. Annual operation cost in economic term stands at Rp. 77.8billion (JP¥ 0.71 billion), Rp. 178.0 billion (JP¥ 1.61 billion), and Rp. 574.1 billion (JP¥ 5.21billion) for each of the 1st Stage, the 2nd Stage and the 3rd Stage. Detailed economic costs are given below in [Table 7-1-10], [Table 7-1-11] and [Table 7-1-12].

[Table 7-1-10] Economic Cost for the 1st Stage

(Unit: Rp. billion)

	FC	LC	Total
Construction	590.3	261.0	831.2
Land Acquisition			
Administration cost		7.8	7.8
Engineering Fee	17.7	7.8	25.5
Tax and Duties			
Base Cost	608.8	276.6	884.6
Physical Contingency	61.7	27.7	88.5
Base Cost + PhyC	668.8	304.3	973.1
Price Contingency			
Total	668.8	304.3	973.1

(Unit: JP¥ billion)

	FC	LC	Total
Construction	5.35	2.37	7.72
Land Acquisition			
Administration cost		0.07	0.07
Engineering Fee	0.16	0.07	0.23
Tax and Duties			
Base Cost	5.51	2.51	8.02
Physical Contingency	0.56	0.25	0.80
Base Cost + PhyC	6.15	2.76	**8.83**
Price Contingency			
Total	6.15	2.76	8.83

(Source: Study team)

[Table 7-1-11] Economic Cost for the 2nd Stage

(Unit: Rp. billion)

	FC	LC	Total
Construction	1,277.2	667.3	2,327.3
Land Acquisition			
Administration cost		20.0	20.0
Engineering Fee	38.3	20.0	58.3
Tax and Duties			
Base Cost	1,315.5	707.3	2,417.1
Physical Contingency	131.6	70.7	202.3
Base Cost + PhyC	1,447.1	778.0	2,225.1
Price Contingency			
Total	1,447.1	778.0	2,225.1

(Unit: JP¥ billion)

	FC	LC	Total
Construction	11.58	6.05	17.64
Land Acquisition			
Administration cost		0.18	0.18
Engineering Fee	0.35	0.18	0.53
Tax and Duties			
Base Cost	11.93	6.42	18.35
Physical Contingency	1.19	0.64	1.83
Base Cost + PhyC	13.13	7.06	20.18
Price Contingency			
Total	13.13	7.06	20.18

(Source: Study team)

[Table 7-1-12] Economic Cost for the 3rd Stage

(Unit: Rp. billion)

	FC	LC	Total
Construction	3,780.3	2,480.8	6,261.2
Land Acquisition			
Administration cost		74.4	74.4
Engineering Fee	113.4	74.4	187.8
Tax and Duties			0.0
Base Cost	3,893.8	2,629.7	6,523.4
Physical Contingency	389.4	263.0	652.3
Base Cost + PhyC	4,283.1	2,892.7	7,175.8
Price Contingency			
Total	4,283.1	2,892.7	7,175.8

(Unit: JP¥ billion)

	FC	LC	Total
Construction	34.29	22.50	56.79
Land Acquisition			
Administration cost		0.68	0.68
Engineering Fee	1.03	0.68	1.70
Tax and Duties			
Base Cost	35.32	23.85	59.17
Physical Contingency	3.53	2.39	5.92
Base Cost + PhyC	38.85	26.24	65.08
Price Contingency			
Total	38.85	26.24	65.08

(Source: Study team)

7.2. Benefit

7.2.1. Financial Benefit

In anticipation of the establishment of the private sector business entity to operate and maintain passenger and freight transportation services in the projected area, financial benefit of the Project is assumed to be tariff revenue emanating from the said services. Because of the newly set-up business undertaking, the incremental benefit between the "With-"and "Without-", the Project are respectively assumed to be the target amount of 2.5MTPA (the 1st Stage), 5.0MTPA (the 2nd Stage) and 20.0MTPA (the 3rd Stage) from the current transportation services of 0.15 MTPA of coal. Passenger tariff revenue is set at Rp. 26,154 per capita[3], while freight tariff levied on the incremental supply (transportation) of coal is assumingly set at Rp. 650.1 per ton-kilometer, while taking into account the forthcoming PT. KAI freight tariff in 2012 for private coal mining companies between Sukachinta - Kertapati (179km) section coal transportation service[4].

7.2.2. Economic Benefit

In line with international trade data now in place where 70% of the coal is exported, 50% of incremental transportation of coal brought about by the Project will be exported overseas, thus leading to the estimation of economic benefit based on foreign exchange earned by coal export. Unlike financial analysis, the quantities of incremental coal transported by the Project are measured on an incremental basis, that is, differences between coal transportation currently in

[3] Source: PT. KAI, *Tarif Angkutan Barang Posisi Tahun 2010 &2011*

[4] PT. KAI Managing Director of Finance, 2 May 2012

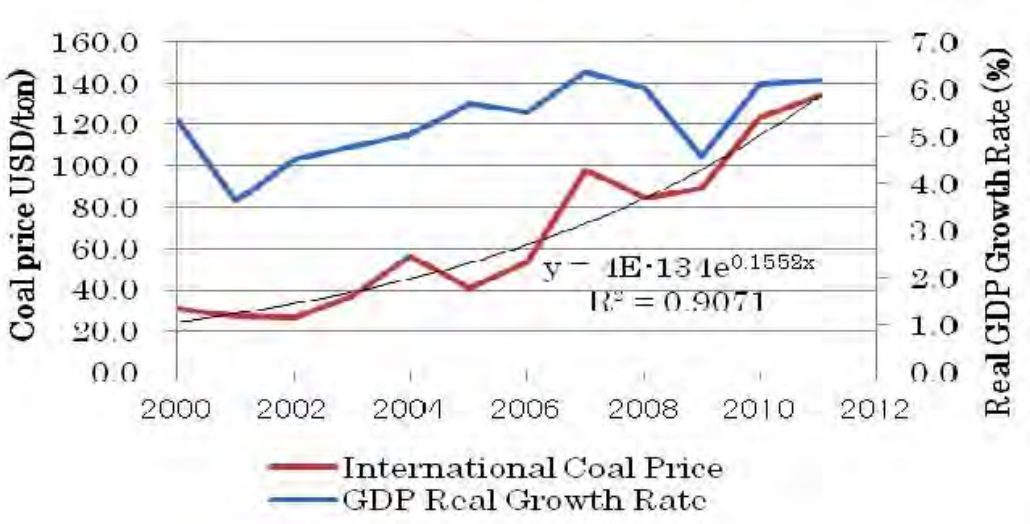
place (1.5MTPA) and those (2.5, 5.0, and 20.0MTPA) targeted additional amounts in each of the Stages.

In carrying out the analysis, export parity price of coal is estimated in lieu of international coal price, while considering a large share of economic cost of transportation from Kertapati to Tanjuang Api Api (about 80km in addition to 180km). Currently, coal transportation by barges for this 80km is in place, as such the economic cost of barge operation and maintenance cost was tried to be estimated and deducted from aggregate economic benefits. Nonetheless, due to a paucity of numerical data on the cost of barge operation and maintenance in South Sumatra[5], in tandem with a lack of the concerned economic price as applied by the World Bank and others of relevance, the economic cost of trucks to transport coal for that 80km to Tanjung Api Api was estimated as *proxy* for the concerned in the current analysis. In so doing, economic cost of transportation by truck is specifically measured in aggregate of fuel deletion and vehicle operation cost (VOC), with each of these valued at US$ 0.68 per litter[6] and US$ 0.58 per vehicle-km[7], in that order. US$ 0.03 per ton-km was applied as economic cost of fuel consumption by truck in due course[8]. As such, export parity price of coal has been estimated at US$ 119.1 per ton in the current analysis.

International price of coal is assumed to be US$ 123.2 per ton as per 2011 price, while taking a conservative view against the uprising trend of international price of coal in the past decade (average annual growth rate of 13.4% in nominal term).

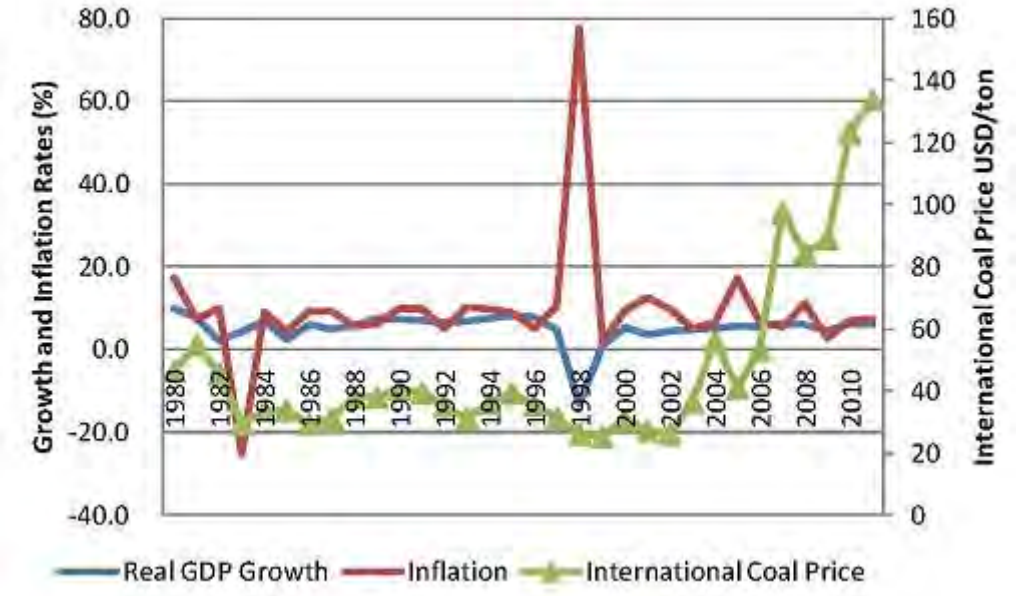
International prices of coal and macroeconomic transition since 1980 to date are respectively depicted as [Fig. 7-2-1] and [Fig. 7-2-2]. Further, inflationary pressure experienced in the developed economies affecting international demand for coal is depicted as [Fig. 7-2-3].

[5] This includes, among others, fuel, labor cost, operation and maintenance costs, depreciation, and others.
[6] Source: US Energy Information Administration, NY Harbor Ultra-low sulphur No. 2 diesel spot price, 31 January 2012
[7] Source: The World Bank, *Road Economic Decision (RED) model*, 2008
[8] Source: DFID, *A Comparison of Freight Transport Operations in Tanzania and Indonesia,* 1997



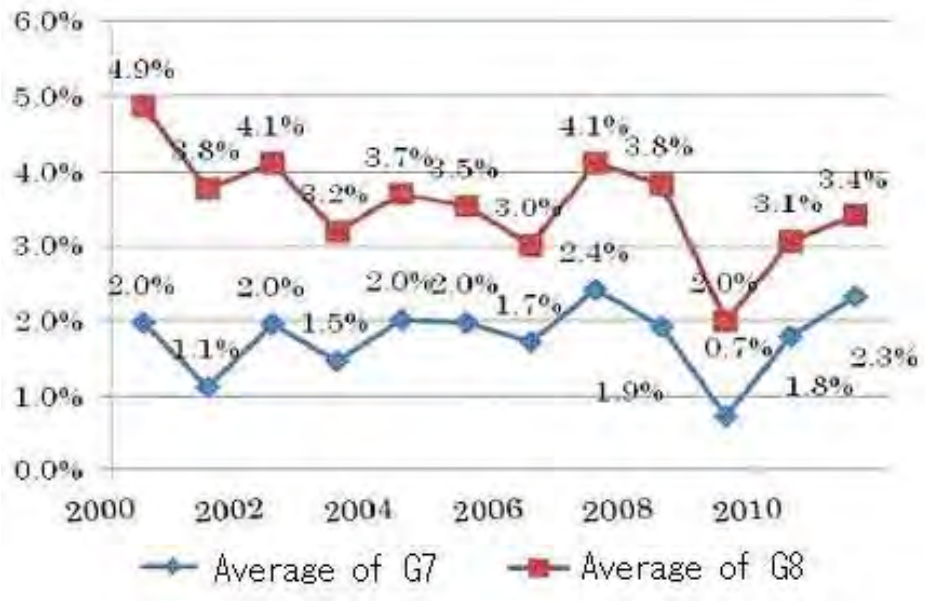
(Source: IMF World Economic Outlook, April 2011)

[Fig. 7-2-1] International Coal Price and Real GDP Growth (2000 - 2010)



(Source: IMF *World Economic Outlook*, April 2011)

[Fig. 7-2-2] Indonesia Macroeconomic Indicators and Coal Price (1980 - 2010)



(Source : IMF World Economic Outlook, April 2011)

[Fig. 7-2-3] Inflation Rates in Developed Economies (2000-2010)

7.3. Overall Economic and Financial Analyses of the Project

7.3.1. Analytical Framework and Model Configuration

Time-discount cash-flow analysis takes place herewith in section 7.3 to quantitatively quantify economic and financial impacts emanating from each of the 1st Stage, the 2nd Stage and the 3rd Stage, with internal rate of return (IRR[9]) as measurement index. In addition to Project FIRR analysis, the World Bank-advocated analytical methodology of *PPP-financial modeling and analysis*, is carried out in the following section of 7.4 (not disclosed in Summary Version), while taking in view equity profitability and debt sustainability indices quantitatively measuring viability for investors. Net Present Value (NPV) index will also be given besides IRR to measure incremental wealth in terms of pecuniary and allocative efficiency.

At the outset of the analysis, model configuration articulating the variables and assumptive parameters used in the overall analysis of the Project is specified and summarized in [Table 7-3-1] below. Exchange quotation of the Indonesia Rupee against the Japanese Yen is set at Rp. 110.3/JP¥ as per January 2012 price.

[9] IRR, by definition, is a discount rate that equalizes discounted net benefits (benefit-cost) over the project life, and mathematically expression as follows.

$$\text{IRR} \equiv r \text{ : that makes } \sum_{t=1}^{n} \{(B-C)_t \times (1+r)^{-t}\} = 0$$

where $(B - C)_t$ represents net benefit in the year t (t = 1, 2,…, n). The equation above is numerically solved by repeated calculation.

[Table 7-3-1] Model Configuration

No.	Variables	The 1st Stage	The 2nd Stage	The 3rd Stage
1	Project life (construction period)	24 (4)	26 (6)	30 (10)
2	Exchange rate (Rp./JP¥)	110.3	110.3	110.3
3	GDP real growth rate (%, estimate 2011)	6.2	6.2	6.2
4	Inflation rate (%, estimate 2011)	7.3	7.3	7.3
5	Economic feasibility criterion (EIRR, SDR)	12.0 %	12.0 %	12.0 %
6	Financial viability cut-off rate (FIRR-OCC)[10]	6.0 %	6.0 %	6.0 %
	Financial and economic costs			
7	Aggregate financial cost (Rp. billion)	1,174.2	2,887.0	11,157.0
8	Physical contingencies (against IRR cost)	10.0 %	10.0 %	10.0 %
9	Price contingency (FC/LC)[11]	1.6% / 7.9%	1.6% / 7.9%	1.6% / 7.9%
10	Operation and maintenance (% of IRR Cost)	8.0 %	8.0 %	8.0 %
11	IRR financial cost (Rp. billion)	1,038.2	2,393.1	7,857.6
12	Standard conversion factor (EIRR)	0.9	0.9	0.9
13	Project economic cost (Rp. billion)	973.1	2,225.1	7,175.8
14	Annual investment schedule	[Table 7-1-4] (P. 7-2)	[Table 7-1-5] (P. 7-3)	[Table 7-1-6] (P. 7-3)
	Economic and financial benefits			
15	Incremental supply of coal (MTPA) for BAU	1.5	1.5	1.5
16	Incremental supply of coal (MTPA) for FIRR	2.5	5.0	20.0
17	Freight tariff (Rp. per ton-km)	650.1	650.1	650.1
18	Revenue ratio outside of railway operation[12]	0 %	0 %	0 %
19	Coal transport revenue (Rp. billion)	279.6	559.2	1,118.5
20	Export of coal (MTPA) for EIRR analysis	1.18	2.43	9.93
21	Export Ratio of coal (%)	50	50	50
22	Incremental supply of coal (MTPA) for EIRR analysis	0.7	2.45	5.95
23	International price of coal (USD/ton)[13]	112.0	112.0	112.0
24	Unit fuel consumption (L/ton-km)	0.03	0.03	0.03
25	International price of fuel (Rp./L)	5,789	5,789	5,789
26	# of trucks employed (loading 10-ton of coal, million)	0.07	0.245	0.595
27	Economic cost of fuel deletion (Rp. billion)	19.5	19.5	19.5
28	Vehicle Operating Cost (VOC, Rp./vehicle-km)	444.3	444.3	444.3
29	Aggregate VOC (Rp. billion/year)	5.0	5.0	5.0
30	Export parity price of coal (USD/ton)	107.9	107.9	107.9

(Source: Study team)

[10] Bank of Indonesia Reference Rate, January 2012

[11] Reference: 2011 Indonesia inflation rate estimate, IMF *World Economic Outlook*, Apr. 2011,

[12] Reference: Study Proposal (Detailed version), July

[13] Reference: IMF - *Primary Commodity Prices*, 2011 (G8 countries minus Russia) in 2010 has been taken.

7.3.2. Results and Sensitivity Analysis

(1) Economic Analysis

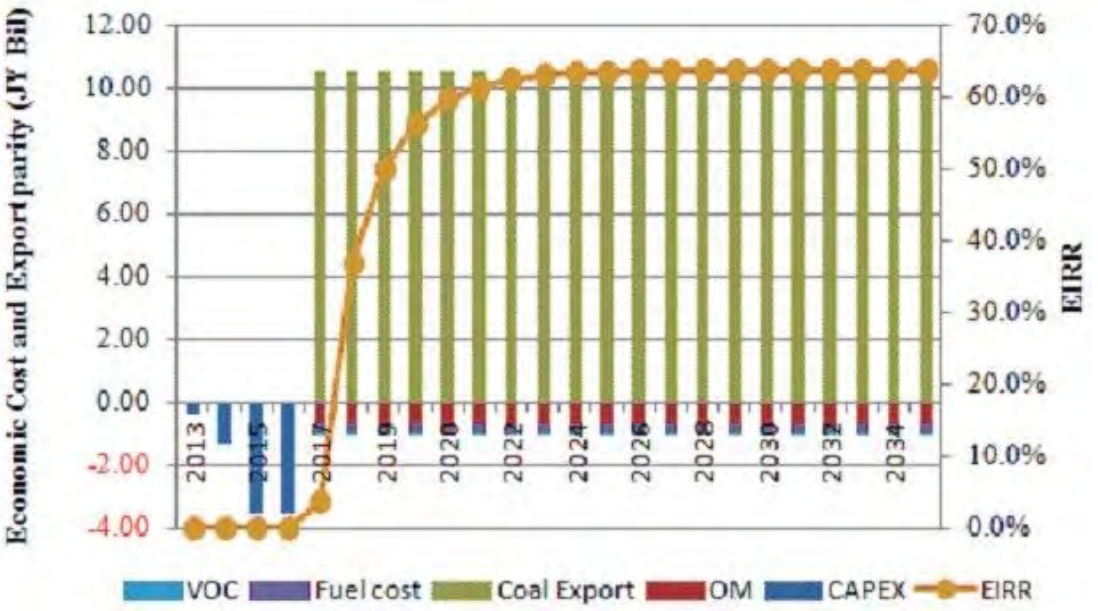
Against the assumptive variables and parameters as specified immediately above, the estimated Economic Internal Rates of Return (EIRRs) for the 1st, the 2nd and the 3rd Stages are estimated at 63.8%, 46.2%, and 38.9%, in that ascending order. Likewise ENPV by 12.0% social discount rate stand at JP¥ 38.60 billion, 60.78 billion, and 164.18 billion, in the same order (See [Table 7-3-2]).

All of the stages resulted in very high remarks on "Allocative efficiency" in the national economy with EIRRs highly exceeding the social discount rate of 12.0%, while the 1st Stage and the 2nd Stage revealing an explicit superiority over the 3rd Stage. Cost and benefit streams with depicted IRRs by stage are also given as [Fig. 7-3-1], [Fig. 7-3-2] and [Fig. 7-3-3] below.

[Table 7-3-2] EIRR and ENPV by Stage

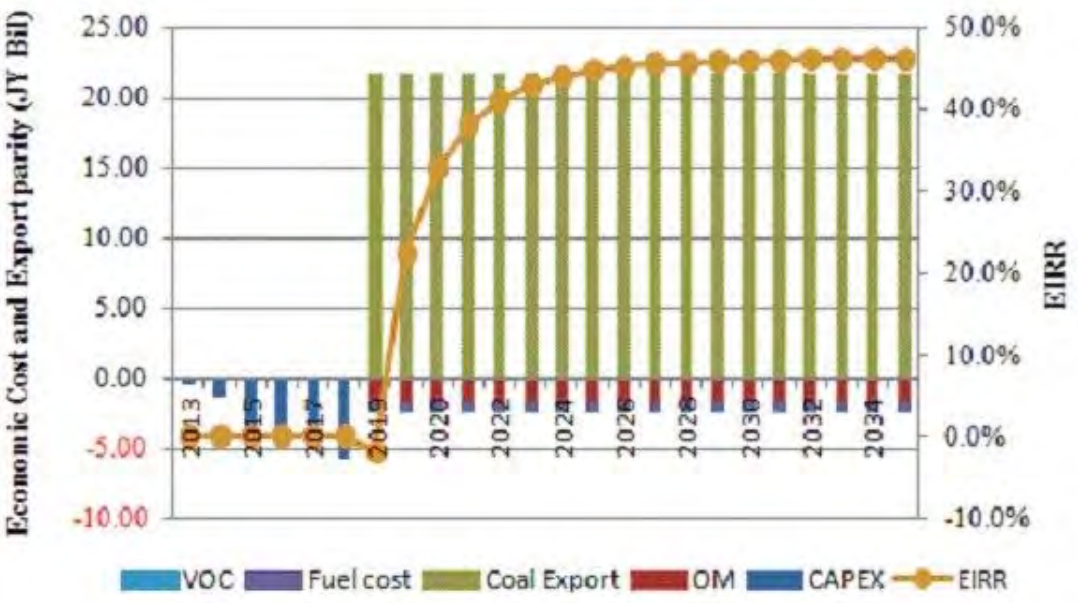
	The 1st Stage	The 2nd Stage	The 3rd Stage
EIRR (%)	63.8	46.2	38.9
ENPV (JP¥ billion)	38.60	60.78	164.18

(Source: Study team)



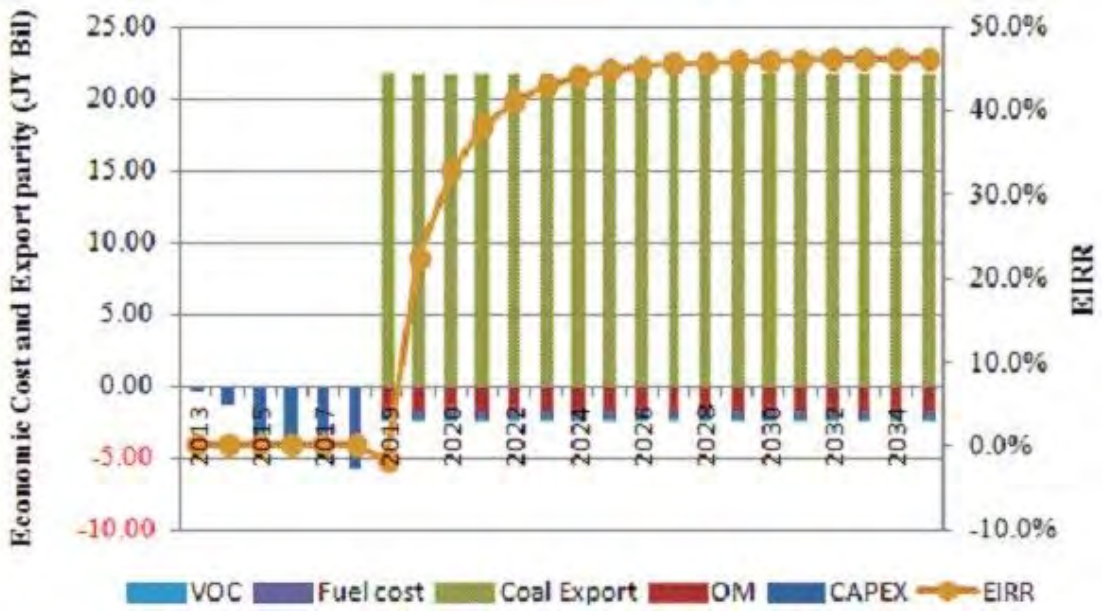
(Source: Study team)

[Fig. 7-3-1] Economic Cost and Export Parity Benefit, and EIRR for the 1st Stage



(Source: Study team)

[Fig. 7-3-2] Economic Cost and Export Parity Benefit, and EIRR for the 2nd Stage



(Source: Study team)

[Fig. 7-3-3] Economic Cost and Export Parity Benefit, and EIRR for the 3rd Stage

(2) Financial Analysis

Likewise, the estimated financial internal rate of returns (FIRRs) of the Project for the 1st, the 2nd and the 3rd Stages are estimated at 18.7%, 13.7%, and 14.6%, in that ascending order.

Likewise FNPVs by 6.0% opportunity cost of capital stand at Rp. 1,316.8 billion (JP¥ 11.94 billion), Rp. 1.627.9 billion (JP¥ 14.76 billion), and Rp. 4,891.3 billion (JP¥ 44.36 billion), in the same order (See [Table 7-3-3]).

[Table 7-3-3] FIRR and FNPV by Stage

	The 1st Stage	The 2nd Stage	The 3rd Stage
FIRR (%)	18.7	13.7	14.6
FNPV (JP¥ billion)	11.94	14.76	44.36

(Source: Study team)

Following the estimation of financial impacts, sensitivity analysis has been undertaken to numerically indicate resiliency of the concerned alternatives against risks, on a *ceteris paribus* basis. Analytical results of sensitivity, notably, ①lower benefit by 10%, ②capital cost overrun by 10%, and ③1 year delay in construction are given as [Table 7-3-4], [Table 7-3-5], and [Table 7-3-6].

As reflected in tables below, all of the stages, other than the 3rd Stage, revealed vulnerability to cost increase and benefit downsizing in compare with delay in construction, as such it would be acceptable to note that there would need rigid project administration and guidance on cost control during construction and project operation thereafter.

[Table 7-3-4] Sensitivity Analysis for the 1st Stage

	Base Case	Cost 10% Up	Benefit 10% Down	1 Years Delay
FIRR (%)	18.7	16.5	16.3	16.4

(Source: Study team)

[Table 7-3-5] Sensitivity Analysis for the 2nd Stage

	Base Case	Cost 10% Up	Benefit 10% Down	1 Years Delay
FIRR (%)	13.7	11.9	11.7	12.4

(Source: Study team)

[Table 7-3-6] Sensitivity Analysis for the 3rd Stage

	Base Case	Cost 10% Up	Benefit 10% Down	1 Years Delay
FIRR (%)	14.6	13.1	12.9	13.3

(Source: Study team)

Summary cash-flow tables of FIRR and EIRR by stage are given below in [Table 7-3-7], [Table 7-3-8] and [Table 7-3-9].

[Table 7-3-7] Summary FIRR and EIRR Cash-flow Tables for the 1st Stage

(Unit: JP¥ billion)

		Cost			Benefit			Net Benefit
		CAP EX	O&M	Total	Freigt	Passenger	Total	
1	2013	0.47		0.47				-0.47
2	2014	1.41		1.41				-1.41
3	2015	3.77		3.77				-3.77
4	2016	3.77		3.77				-3.77
5	2017		0.75	0.75	2.79	0.02	2.81	2.05
6	2018		0.75	0.75	2.79	0.04	2.83	2.07
7	2019		0.75	0.75	2.79	0.05	2.84	2.09
8	2020		0.75	0.75	2.79	0.07	2.86	2.11
9	2021		0.75	0.75	2.79	0.09	2.88	2.12
10	2022		0.75	0.75	2.79	0.10	2.89	2.14
11	2023		0.75	0.75	2.79	0.12	2.91	2.15
12	2024		0.75	0.75	2.79	0.13	2.92	2.17
13	2025		0.75	0.75	2.79	0.15	2.94	2.19
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22	2033		0.75	0.75	2.79	0.29	3.08	2.33
23	2034		0.75	0.75	2.79	0.31	3.10	2.34
24	2035		0.75	0.75	2.79	0.32	3.11	2.36
	Total	9.42	15.07	24.50	55.79	3.46	59.25	34.76

		Cost			Export Parity Price					Net Benefit
		CAP EX	O&M	Total	Coal Export	Fuel Cost	VOC	Cost of Export	Export Parity Price	
1	2013	0.44		0.44						-0.44
2	2014	1.32		1.32						-1.32
3	2015	3.53		3.53						-3.53
4	2016	3.53		3.53						-3.53
5	2017		0.71	0.71	10.53	0.31	0.08	0.38	10.14	9.44
6	2018		0.71	0.71	10.53	0.31	0.08	0.38	10.14	9.44
7	2019		0.71	0.71	10.53	0.31	0.08	0.38	10.14	9.44
8	2020		0.71	0.71	10.53	0.31	0.08	0.38	10.14	9.44
9	2021		0.71	0.71	10.53	0.31	0.08	0.38	10.14	9.44
10	2022		0.71	0.71	10.53	0.31	0.08	0.38	10.14	9.44
11	2023		0.71	0.71	10.53	0.31	0.08	0.38	10.14	9.44
12	2024		0.71	0.71	10.53	0.31	0.08	0.38	10.14	9.44
13	2025		0.71	0.71	10.53	0.31	0.08	0.38	10.14	9.44
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.	.		.	.	.	.	.	.	.	.
22	2033		0.71	0.71	10.53	0.31	0.08	0.38	10.14	9.44
23	2034		0.71	0.71	10.53	0.31	0.08	0.38	10.14	9.44
24	2035		0.71	0.71	10.53	0.31	0.08	0.38	10.14	9.44
	Total	8.83	14.12	22.95	210.56	6.11	1.56	7.68	202.88	179.94

(Source: Study team)

[Table 7-3-8] Summary FIRR and EIRR Cash-flow Tables for the 2nd Stage

(Unit: JP¥ billion)

		Cost			Benefit			Net Benefit
		CAP EX	O&M	Total	Freigt	Passenger	Total	
1	2013	0.47		0.47				-0.47
2	2014	1.42		1.42				-1.42
3	2015	3.78		3.78				-3.78
4	2016	4.39		4.39				-4.39
5	2017	5.52		5.52				-5.52
6	2018	6.13		6.13				-6.13
7	2019		1.74	1.74	5.58	0.05	5.63	3.90
8	2020		1.74	1.74	5.58	0.07	5.65	3.91
9	2021		1.74	1.74	5.58	0.09	5.67	3.93
10	2022		1.74	1.74	5.58	0.10	5.68	3.94
11	2023		1.74	1.74	5.58	0.12	5.70	3.96
12	2024		1.74	1.74	5.58	0.13	5.71	3.98
13	2025		1.74	1.74	5.58	0.15	5.73	3.99
.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.
24	2035		1.74	1.74	5.58	0.29	5.87	4.13
25	2036		1.74	1.74	5.58	0.31	5.88	4.15
26	2037		1.74	1.74	5.58	0.32	5.90	4.16
	Total	21.71	31.26	31.26	100.43	3.46	103.84	50.87

		Cost			Export Parity Price					Net Benefit
		CAP EX	O&M	Total	Coal Export	Fuel Cost	VOC	Cost of Export	Export Parity Price	
1	2013	0.44		0.44						-0.44
2	2014	1.32		1.32						-1.32
3	2015	3.51		3.53						-3.51
4	2016	4.08		3.53						-4.08
5	2017	5.13		0.71						-5.13
6	2018	5.70		0.71						-5.70
7	2019		1.61	0.71	21.73	0.63	0.16	0.79	20.94	19.32
8	2020		1.61	0.71	21.73	0.63	0.16	0.79	20.94	19.32
9	2021		1.61	0.71	21.73	0.63	0.16	0.79	20.94	19.32
10	2022		1.61	0.71	21.73	0.63	0.16	0.79	20.94	19.32
11	2023		1.61	0.71	21.73	0.63	0.16	0.79	20.94	19.32
12	2024		1.61	0.71	21.73	0.63	0.16	0.79	20.94	19.32
13	2025		1.61	0.71	21.73	0.63	0.16	0.79	20.94	19.32
.	.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.	.
22	2033		1.61	0.71	21.73	0.63	0.16	0.79	20.94	19.32
23	2034		1.61	0.71	21.73	0.63	0.16	0.79	20.94	19.32
24	2035		1.61	0.71	21.73	0.63	0.16	0.79	20.94	19.32
	Total	20.18	29.06	49.24	391.10	11.36	2.91	14.26	376.84	377.60

(Source: Study team)

[Table 7-3-9] Summary FIRR and EIRR Cash-flow Tables for the 3rd Stage

(Unit: JP¥ billion)

		Cost			Benefit			Net Benefit
		CAP EX	O&M	Total	Freigt	Passenger	Total	
1	2013	0.47		0.47				-0.47
2	2014	1.42		1.42				-4.42
3	2015	3.78		3.78				-3.78
4	2016	4.40		4.40				-4.40
5	2017	5.52		5.52				-5.52
6	2018	8.61		8.61				-8.61
7	2019	9.41		9.41				-9.41
8	2020	11.89		11.89				-11.89
9	2021	6.94		6.94				-6.94
10	2022	18.83		18.83				-18.83
11	2023		5.70	5.70	22.32	0.12	22.44	16.73
12	2024		5.70	5.70	22.32	0.13	22.45	16.75
13	2025		5.70	5.70	22.32	0.15	22.47	16.77
.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.
24	2035		5.70	5.70	22.32	0.29	22.61	16.91
25	2036		5.70	5.70	22.32	0.31	22.62	16.92
26	2037		5.70	5.70	22.32	0.32	22.64	16.94
	Total	71.27	114.03	185.30	446.36	5.11	451.47	266.17

		Cost			Export Parity Price					Net Benefit
		CAP EX	O&M	Total	Coal Export	Fuel Cost	VOC	Cost of Export	Export Parity Price	
1	2013	0.43		0.43						-0.43
2	2014	1.30		0.30						-1.30
3	2015	3.45		3.45						-3.45
4	2016	4.01		4.01						-4.01
5	2017	5.04		5.04						-5.04
6	2018	7.86		7.86						-7.86
7	2019	8.60		8.60						-8.60
8	2020	10.86		10.86						-10.86
9	2021	6.33		6.33						-6.33
10	2022	17.19		17.19						-17.19
11	2023		5.21	5.21	88.93	2.58	0.66	3.24	85.69	80.48
12	2024		5.21	5.21	88.93	2.58	0.66	3.24	85.69	80.48
13	2025		5.21	5.21	88.93	2.58	0.66	3.24	85.69	80.48
.	.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.	.
22	2033		5.21	5.21	88.93	2.58	0.66	3.24	85.69	80.48
23	2034		5.21	5.21	88.93	2.58	0.66	3.24	85.69	80.48
24	2035		5.21	5.21	88.93	2.58	0.66	3.24	85.69	80.48
	Total	65.08	104.14	169.22	1,778.6	51.64	13.21	64.85	1,713.7	1,544.5

(Source: Study team)

Chapter 8

Project Impact Assessment

8.1. Operational and Performance Indicators

The project could achieve a modal shift from road to rail due to the expansion of the rail transportation capacity. It is expected that air quality along the road will be improved by a reduction of truck traffic. Therefore, the quantitative index of operational and performance indicators are set as follows.

Regarding each index, project participants can quantitatively evaluate a difference between a benchmark and a target with implementing the monitoring.

[Table 8-1-1] Operation and Performance Indicators

Indicators		Unit	Benchmarks (Post Construction)	Targets (Post 2nd year Operation)	Targets (Post 7th year Operation)
Operation ratio[1]		%	92	92	92
Coal transportation		MTPA	25.5	28.0	43.0
Coal production in Lahat Area		MTPA	4.7	7.2	22.2
Passenger Transportation		Thousand person-km	674,008	719,096	801,542
Freight Transportation		Million ton-km	9,381	9,829	12,519
Number of Train	Freight	train/day	79	83	105
	Passenger	train/day	16	16	20
Travel Time between Lahat and Kertapati		hour	6.17	4.5	4.5
Coal Transportation by Road		MTPA	2.2	2.2	2.2

(Source: Study team)

Regarding each index, project responsible body should confirm a status of the achievement of benchmark and target values with the following monitoring methods.

[1] According to the haering to PT. KAI Palemban, maintenace operatin ratio was 97.3% based on the record of 355 working days in a year, but 5% points were reduced considering the malfunctionning risk.

[Table 8-1-2] Monitoring Methodology of Operation and Performance Indicators

Indicators	Unit	Project responsible body	Explanations	Monitoring frequency
Operation ratio	%	Railway operator	Annual operational report of railway operator	Annual
Coal Transportation	MTPA	Railway operator	Annual transport report of railway operator	Annual
Coal Production in Lahat Area	MTPA	Railway operator	Interview coal producers	Annual
Passenger Transportation	person-km	Railway operator	Annual transport report of railway operator	Annual
Freight Transportation	ton-km	Railway operator	Annual transport report of railway operator	Annual
Number of Train	train/day	Railway operator	Annual transport report of railway operator	Annual
Travel Time between Lahat and Kertapati	hour	Railway operator	Annual transport report of railway operator	Annual
Coal Transportation by Road	MTPA	Railway operator	Interview truck companies	Once before start of the project and once the target year

(Source: Study team)

In order to monitor the operational performance of the project continuously, the project responsible body should monitor the indicators following each monitoring method such as statistic or interview survey. When it becomes evident that monitoring values deviate from indicators significantly, the project responsible body should confirm the causes and reform the project to the extent possible.

Utilization of the coal resources by the Project will activate the local economies. At the same time, better accessibility to local public facilities owing to the improved railway service, and environmental improvement are also expected. Therefore, the qualitative index of operational and performance indicators will be set as follows. Regarding each index, project participants can qualitatively evaluate a difference between a benchmark and a target with implementing the beneficiary survey. Each indicator is set up based on the following framework.

[Table 8-1-3] Monitoring Framework for the Qualitative Index of Operational and Performance Indicators

Items	Explanations	Benchmarks (Post Construction)	Targets (Post 2nd year Operation)	Targets (Post 7th year Operation)
Improvement of living convenience	Travel time of passenger trains btw Lahat and Kertapati	4.75	4.75	4.75
	Number of passenger trains	6	6	7
Development of towns along the railway	Increasing income level of inhabitants along the rail with improvement of living convenience, creation of employment opportunities	18,230,598	19,510,590 (Annual real growth rate of 3.5%)	22,346,494 (Annual real growth rate of 3.5%)
Improvement of living environment	The air quality improvement by a decrease in trucks	Achievement of the environmental standard NO_2: 400μg/m^{3}N(hourly), 150μg/m^{3}N(24 hours) Noise: 70dB(commercial and service)		
Creation of employment opportunities	Employment during the construction period	340,000 persons (at the 1st Stage)	320,000 persons (at the 2nd Stage)	470,000 persons (at the 3rd Stage)

(Source: Study team)

[Table 8-1-4] Monitoring Methods for the Qualitative Index of Operational and Performance Indicators

Items	Monitoring method	Responsible body	Monitoring frequency	Monitoring target
Improvement of living convenience	Interview survey to railway passengers concerning traffic reliability	Railway operator	Target year	Cargo owners, passengers
Development of towns along the rail	Interview survey to inhabitants along the rail concerning their income level	Railway operator	Target year	Inhabitants along the rail
Improvement of living environment	Monitoring NO_x and noise for confirming the air quality improvement	Railway operator	Annual	Monitoring site
Creation of employment opportunities	Total number of employment during construction period	Railway operator	Target year	Constructors

(Source: Study team)

8.2. Evaluation and Proposal from Technical Aspect

8.2.1. Technical Aspect

Implementation of this project is proposed to be implemented with stepwise improvement approach in 3 stages starting from immediate measure depending on the increase of coal transportation demand considering economical effect.

In the 1st Stage, it is targeting to attain target transportation volume by implementing improvement and reinforcement of existing facilities supplemented by truck transportation. Major works involved in this stage are repair of track structure and reinforcement, thus no technical complexity can be foreseen. Construction period is planned to be about 4 years including design etc., and no particular problem can be foreseen as well. If any problem dared to be forecasted, since the big amount of track material for about 200km such as turnout, rail, and composite sleeper may supplied from overseas dividing in several years, procurement procedure must be properly controlled avoiding confusion and enough number of skilled maintenance clew must be secured.

The 2nd Stage must be started immediately after the completion of the 1st Stage. The major works involved are reservation of siding clear length for train evacuation and 2 signaling station construction corresponding to train extension. Construction period is planed to be 6 years including the 1st Stage work. Technical challenges are shifting of slope sections relevant to slope before and behind station where clear length is extended and relocation of crossing which crosses station before and behind in the level sections. A proper selection of method to extend the clear length with scrutinized topographic profile based on vertical section survey may and it may cause to relocate the structures other than railways such as existing road. No other technical difficulties can be foreseen.

In order to increase transportation capacity, coal loading and unloading facility at the Kertapati side must be reinforced which entails capital improvement in Kertapati station yard, coal loading and unloading facility, and barge shipping equipment. Although there is no technical difficulties in the machine components, adjustment of interest among entities concerned will be needed in respect of land reservation for the construction of new bay line etc., or capital improvement of station yard. Furthermore, although it is a precondition that full double-tracking of between Muara Enim and Prabumulih X6 section is completed, the work must be completed under this project if the progress of the double tracking work is not as planned.

In the 3rd Stage, new line will be constructed in parallel with existing track, and clear length extension corresponding to train length extension is needed at almost all stations. Although the

accumulated starting from the 1st Stage is planned to be about 10 years, there is no technical difficulties can be foreseen in the civil work and track work of general kind. The challenge at this stage is to secure land in Kertapati to reinforce coal loading and unloading facility and barge loading equipment.

Signaling and telecommunication system will be modernized in the entire stretch of additional track section as well as the existing track, which will require to develop technical solution in order to safely implement the changing work from the existing signaling and telecommunication system to the new ones while allowing normal train operation. Furthermore, the modernized signaling and telecommunication system demands bigger electric supply. In this project, since the electric power is planned to be supplied by electric power company, where the distance from transmission network of electric power company is far, additional power supply line will be needed. Moreover, since the signaling and telecommunication system will work as an integrated system, it should be avoided to procure the equipments from different suppliers with different technical culture in order to ensure safety and efficient operation and maintenance.

As it was proposed in 4.4.2. (P. 4-46), the rail replacement work which should be completed in the 1st Stage, was shifted to the 2nd Stage in order for the Project to be viable with the private sector initiative in terms of financial concern. However, it is necessary to replace the existing rail to a heavier one as early as possible for the train operation to be stable with higher speed in the long run. Therefore, the schedule for the 2nd Stage is so designed as to complete the rail replacement work at the beginning of the 2nd Stage implementation schedule. In this context, the implementation of the 2nd Stage is indispensable for the 1st Stage project to be technically viable even thought the 2nd Stage is financially inferior to the 1st Stage.

8.2.2. Environmental and Social Aspects

(1) Environmental Consideration

Concerning the environmental aspect of this Project, JICA study team prepared a draft screening report, a draft scoping report, and identifications of environmental impact elements based on JICA environmental guideline. Outline of environmental impact at each implementing stage are as follows;

At the 1st Stage, the constructions involve mainly an improvement of track, reinforcement of coal loading and unloading facility. During the construction period, environmental consideration is needed, even though no big environmental impact will be expected.

At the 2nd Stage, the constructions which involve the partial double tracking work and reinforcement of unloading facility at Kertapati station will require environmental considerations, even though no big environmental impact will be expected. However, the branch line construction

which is laid from Merapi to the main line (approximately 700 meters) will require an appropriate alignment and construction plan paying due attention to environmental considerations.

At the 3rd Stage, the construction plan involves the double tracking work between Sukacinta and Simpang, coal loading and unloading facility at Kertapati station yard, the barge loading system. A construction site for coal loading and unloading facility is adjoining to the housing area. Therefore this work will especially require a construction plan paying due attention to environmental considerations.

In this project, in case of the double tracking work and increasing the number of trains for passengers and freights, it is expected that negative environmental impact will not be occurred. However the construction plans at the 3rd Stage, which set up the coal loading and unloading facility at Kertapati station yard (20ha), the barge loading system and the conveyor belt for a barge transport along the Musi river, will require an environmental assessment in the construction site.

(2) Social Consideration

Concerning the social aspect, it was observed in the field survey that there are many occupants on both sides of the railway right of way (25m for in-city areas and 75m for other areas) between Lahat to Kertapati (at present, there are about 436 houses on the northern side of the line). These houses are mostly concentrating in 3 station areas of Lahat, Prabumulih and Kertapati. As about 70 houses were identified nearby Lahat station, but the Lahat-Sukacinta section is not subjected to double tracking works, the number of houses subjected to resettlement will be about 366 units.

On the other hand, in order to construct the new coal stockyard as well as the coal unloading railway line etc. in Kertapati station in the 3rd Stage of the Project, the 20ha area annexed to this station with many inhabitants living for decades (presently about 800 households, a market and many old graves) will be subjected to resettlement.

Therefore, in terms of area for resettlement, there are substantially 2 main areas. But, in comparison to the relatively simple resettlement works along the railway line (about 366 households), the resettlement works for the 20ha area annexed to Kertapati station (presently about 800 households, a market and many old graves) will basically require high compensation costs and long time, about 3 - 5 years, for resettlement enforcement due to its complexity. The preparation for resettlement works for this part should be done before the implementation of 3rd Stage.

On social impacts, even with the completion of double tracking project and high increase of daily traffic of coal and passengers trains, apart from the resettlement problem, no major negative

social impacts are foreseeable by the installation of effective warning control system at railway crossings (for safety improvement) and adopting prevention measures to noise and air pollution. On the other hand, in comparison to bus transportation, the increase of daily trains for passengers transportation will contribute a safe, cheap and convenient transportation means for low-income people in the areas.

According to PT. KAI officials concerned, occupants presently living and having farms inside the railway right of way along the railway are mostly not illegal occupants but having some kind of previous permission from PT. KAI. Therefore, for the implementation of the Project, PT. KAI considers that it could take back these land areas by making compensation negotiations for their resettlement without having any serious social problems.

Presently, in order to implement the double tracking works in the section between Muara Enim to Prabumulih X6, the clearance of occupants (about 200 houses) in this section was completed already within one year. Therefore, regarding the resettlement of occupants for this Project implementation, the PT. KAI proceedings for compensation negotiations, in principle, could be applied accordingly.

However, in the social surveys of this Study, local people expressed their requests on Project implementation, especially the formation of vocational trainings, as for an income recovery program for relocates. Based on the present conditions of local social capitals, the vocational trainings on agro-gardening and manufacturing of farming and workshop tools could be periodically organized in the main station premises of Muara Enim, Prabumulih and Kertapati. Besides, during the period of relocation as well as the period for relocates to attain their stable living and earning conditions in new relocation sites, the execution of a monitoring program on resettlement proceedings is considered necessary. The details of these programs will be notified in LARAP.

The Project will be implemented in 3 Stages, but similar to the 1st Stage, since partial double tracking works will be implemented within station premises only and the construction of a short branch line of about 700m is located in the remote area of Merapi village in the 2nd Stage, it will, in principle, need no resettlement works.

But in the 3rd Stage, the project implementation, which entails whole double tracking works from Sukacinta to Kertapati with new constructions of coal stockyard, unloading rail lines and a conveyor installation toward Musi River in areas around Kertapati station, will require a full scale of resettlement works in these areas. The preparation of LARAP (Land Acquisition & Resettlement Action Plan), therefore, will be carried out. Besides, along with the increasing number of daily train traffic and new constructions of these related installations around Kertapati station, the necessary measures for securing safety for local people as well as a proper living

environment in the areas will be implemented accordingly.

For LARAP preparation, the social survey in Project area was carried out to collect the basic social data and related resettlement information. And with the formation of SPC for Project implementation, where LARAP will be duly prepared, the TOR for this preparation was made. By its application the related resettlement works will be carried out accordingly.

8.2.3. Organizational Aspect

While PT. BA is exclusively transporting coal by rail to Tarahan and Kertapati in South Sumatra State at present, most of the private coal mines are transporting coal by track except for PT. BAU which use rail to Kertapati with minimal volume due to limited railway traffic capability. On road transportation of coal by heavy duty truck has a limitation of traffic volume due to road breakage, traffic congestion and environmental concern. Night time transportation is already restricted and further decline of road transportation capacity is expected in the future, therefore the shift from on road transportation to railway transportation is in the urgent necessity.

As it was stated in 2.3. (P. 2-12), effective use of resources by developing coal mine is one of the highest priority agenda for the South Sumatra State government, and since the railway sector development is also among the very high priority, there is no serious obstacle in implementing this project.

Main purposes of the New Railway Law promulgated in 2007 are to accept participation to railway operation of not only the Central Government but also the Local Governments and private companies. A business unit to be assigned to manage this project will be, as it is stated in Chapter 5 of the Law, private enterprise which obtained management concession and governmental cooperation in accordance with Central Government guidelines. However it is also the fact that there is no actual application in the railway operation so far in terms of SPC selection procedure and environmental and social compliance. In addition, It is note worthy that there remain other uncertainties such as right of way boundary between the government and PT. KAI.

The SPC to be established in this project is planned to cooperate with PT. KAI in a "B to B business" manner under the governmental guidance based on the New Railway Law in order to expand the transportation capacity thereby make the existing railway work as a public railway. SPC will run a coal transportation business on the public owned railway facilities and infrastructure having concession from the government, and repair, upgrade and reinforce the existing facilities. And, as it has been described, the train operation and maintenance work including repair, upgrade and reinforcement of facility and infrastructure will be entrusted to PT. KAI on a contract basis, because it has sufficient experiences in the railway operation and management.

Although there is a history that the state owned Railway Company was privatized and PT. KAI was established, but this can be recognized as a special case and no private company has ever participated in the railway business in Indonesia. It implies that procedural difficulties such as government permission, cooperation contract, concession contract, and so forth will be anticipated before this project will be materialized.

8.3. Estimation of Climate Change Mitigation Effect

The project could promote a modal shift from road to rail due to the expansion of the rail transportation capacity. The project can achieve not only the mitigation of both traffic congestion and air pollution but also GHG emission reduction. In order to estimate GHG emission reduction of the project, the study team will apply JICA Climate-FIT (JICA Climate Finance Impact Tool) which is established by JICA.

However, this calculation is just for reference. In order to implement the project as CDM project, the project responsible body has to apply a CDM methodology approved by UNFCCC (UN Framework Convention on Climate Change) to the project. Whether existing CDM methodology can be applied to this project or not still has not confirmed, therefore an economic analysis of this study does not include the effect of GHG emission reductions.

GHG emissions reduction due to the project is calculated as the difference between the GHG emissions without the project, which is the baseline emission, and those after the success of the modal shift to the project railway which is the project emission. Based on relevant data collected in the project, the study team will estimate GHG emission reduction with JICA Climate-FIT. Baseline emissions (BEy) and project emissions (PEy) are calculated as follows.

(1) Baseline emission

$$BE_y = TC_{dt,y} \times EF_{CO2,x} \quad , \quad TC_{dt,y} = \frac{\left(1-\alpha_{x,dt}\right)\times DD_y}{SEC_{x,dt,y}}$$

BE_y : Baseline emission: GHG emissions of non-electrified trains (t-CO_2/y)

$TC_{dt,y}$: Total annual fuel consumption of non-electrified trains (diesel trains or internal-combustion locomotives) after the project has completed (L/y)

$EF_{CO2,x}$: CO_2 emission factor of fuel category x (gr-CO_2/L)

$SEC_{x,dt,y}$: Specific fuel consumption (km/L)

DD_y : Total annual trip distance of freight trains (train km/y)

$\alpha_{x,dt}$: Mixing ratio of bio-fuel (ratio: 0 – 1)

(2) Project emission

$$PE_y = TC_{dt,y} \times EF_{CO2,x} \quad , \quad TC_{dt,y} = \frac{\left(1-\alpha_{x,dt}\right)\times DD_y}{SEC_{x,dt,y}}$$

PE_y : Project emissions: GHG emissions of freight trains (diesel train /internal-combustion locomotive) after the project has completed (t-CO_2/y)

$TC_{dt,y}$: Total annual fuel consumption of freight trains after the project has completed (L/y)

$EF_{CO2,x}$: CO_2 emission factor of fuel category x (gr-CO_2/L)

$SEC_{x,dt,y}$: Specific fuel consumption (km/L)

DD_y : Total annual trip distance of freight trains (train km/y)

$\alpha_{x,dt}$: Mixing ratio of bio-fuel (ratio: 0 – 1)

JICA Climate-FIT (JICA Climate Finance Impact Tool) applies to estimations of GHG emission reductions quantitatively with this project. Data required for estimating both baseline emissions and project emissions in the JICA Climate-FIT are shown in [Table 8-4-1] and [Table 8-4-2]. The study team collected these data in this study. In case of implementing this project, GHG emission reductions based on the data are shown in [Table 8-4-3].

[Table 8-3-1] Data Required for Estimation and Monitoring (Baseline Emission)

Items	Data type	Data contents	(Post Construction)	(Post 2nd year Operation)	(Post 7th year Operation)	Source
$P_{PJ,i,y}$	Freights by existing transport systems (t/year)	Freights of existing transport systems that would be shared in the absence of the freight train project. The total freights of existing transport systems is equal to the freight carried by freight trains	1,000,000	3,500,000	18,500,000	Study team
DD_y	Total annual trip distance driven by freight trains (Non-Electric) (km/year)	Total annual trip distance driven by freight trains after the project starts	6,969,300	7,199,400	11,638,900	Study team
$SEC_{x,dr,s}$	Specific fuel consumption of freight trains (Non-Electric) (km/L)	Specific fuel consumption of diesel car/ locomotives	0.25	0.25	0.25	PT. KAI
$N_{x,i}$	Total number of existing vehicles in fuel type x, and vehicle category i	Existing vehicle is coal transportation truck and fuel type is diesel	2,010	2,010	2,010	PT. BAU
N_i	Number of each vehicle	Coal transportation truck only	2,010	2,010	2,010	PT. BAU
OD_i	Average trip distance driven by existing vehicles in vehicle category i (km/day)	Trip distance for coal transportation truck before the project starts	180	180	180	PT. BAU: distance to Palembang
OC_i	Average occupation rate of existing vehicles in vehicle category i (ton)	Occupation rate of coal transportation truck before the project starts	10	10	10	Study team
$SEC_{x,i}$	Specific fuel consumption of existing vehicles in fuel type x, vehicle category i	Fuel consumption rate per liter of coal transportation truck (km/L)	4	4	4	Source 1
$EF_{CO2,x}$	CO_2 emission factor of fuel	CO2 emission factor of diesel per liter (gCO2/L)	2,661	2,661	2,661	IPCC value
$\alpha_{x,i}$	Mixing rate of biofuel (ratio)	Mixing ratio of biofuel in diesel	0	0	0	Assumed as zero

(Source 1: Kikkawa Tetsuji, Indian Road Transport and The Dedicated Freight Corridor Project, Nittsu Research Institute and Consulting report 2009.6)

[Table 8-3-2] Data Required for Estimation and Monitoring (Project Emission)

Items	Data type	Data contents	(Post Construction)	(Post 2nd year Operation)	(Post 7th year Operation)	Source
DD_y	Total annual trip distance driven by freight trains (Non-Electric) (km/year)	Total annual trip distance driven by freight trains after the project starts	6,969,300	7,199,400	11,638,900	Study team
$SEC_{x,dr,s}$	Specific fuel consumption of freight trains (Non-Electric) (km/L)	Specific fuel consumption of diesel car/ locomotives	0.25	0.25	0.25	PT. KAI
$EF_{CO2,x}$	CO_2 emission factor of fuel	CO_2 emission factor of diesel	2,661	2,661	2,661	IPCC value
$\alpha_{x,i}$	Mixing rate of biofuel (ratio)	Mixing ratio of biofuel in diesel	0	0	0	Assumed as zero

[Table 8-3-3] GHG Emission Reductions

(Unit: tCO_2/year)

Implementation Stage	The 1st Stage	The 2nd Stage	The 3rd Stage
Measuring timing	(Post Construction)	(Post 2nd year Operation)	(Post 7th year Operation)
Baseline emission (by Truck) (A)	11,975	41,911	221,528
Project emission (by Railway) (B)	1,954	6,837	36,140
GHG emission reduction (A-B)	10,021	35,073	185,388

(Source: Study team)

Chapter 9

Environmental and Social Impact Assessment

9.1. Environmental Considerations

9.1.1. Legal Framework of Indonesia

(1) Legal Framework

Laws related to environmental considerations of Indonesia are shown in [Table 9-1-1]. In Indonesia, the Environmental Protection and Management Act No.32 correspond to the Environment Basic Law. The old act issued in 1982 was revised in 1997. In the current act revised in 2009, the power of relevant environmental agencies and the punishment were strengthened considerably. Decrees and regulations related to each environmental element such as pollution, noise and biodiversity are ordered.

The environmental law system of South Sumatra (Sumatera Selatan) is as shown in [Table 9-1-2].

[Table 9-1-1] Environmental Laws in Indonesia

Category	Law and Regulations
Environment management	Environmental Management Act No. 23 of 1997 (EM 23/1997)
	Government Regulation No. 38/2007
	Environmental Protection and Management Act No. 32 (EPMA 32/2009)
Air	Government Regulation No. 41/1999: Air quality management and pollution control
	Decree of Ministry of Environment No. 45/1997: Air Pollutant Standard Index
Noise	Decree of Ministry of Environment No. 48/MENLH/11/1996: Noise standards
Vibration	Decree of Ministry of Environment No. 49/MENLH/11/1996: Vibration standards
Odor	Decree of Ministry of Environment No. 50/MENLH/11/1996: Odor standards
Water	Government Regulation No. 82: Water quality management and pollution control
Waste	Government regulation No. 18 of 1999: The Management of the waste of hazardous and toxic materials
	Government regulation No. 74: Hazardous waste material management
Protected area	Presidential Decree No. 32/1990: Management of protected area
Flora, Fauna, Biodiversity	Government Regulation No.7/1999: Protection of plant and animal species
	Act of Republic of Indonesia No. 5/1990: Conservation of living natural resources and their ecosystem
	Law No. 40/1990: Forestry
EIA	Decree of State Minister of Environment No. 56/1996: Criteria on significant environmental impact
	Decree of Head of BAPEDAL No. KEP299/11/1996: Guideline of social aspect in AMDAL
	Decree of Head of BAPEDAL No. KP124/12/1997: Guideline of public health aspect in AMDAL
	Governmental Regulation No. 27/1999: Environmental Impact Analysis (AMDAL)
	Presidential Decree No. 10/2000: Environmental Impact Management Agency (BAPEDAL)
	Decree of Minister of Environment No. 2/MENLH/02/2000: Guideline of AMDAL document evaluation
	Decree of Ministry of Environment No. 8/MENLH/02/2000: Public involvement and information release on the analytical process concerning AMDAL
	Decree of Ministry of Environment No. 9/MENLH/02/2000: Designing guideline of environmental impact assessment
	Decree of Ministry of Environment No. 17/2001: Type and size of business and/or activities requiring AMDAL document
	President Regulation No. 9/2005: Regarding Position, duty, Function, organization structure and workflow of the Ministry in accordance to amendment in President regulation No. 62/2005
	Regulation of the State Minister for Environmental Affairs No. 8/2006: Guidance for the preparation of environmental impact analysis
	Regulation of State Minister of Environment No. 11/2006: Type of business plan and/or activity that require analysis of environment impact

(Source: Study team)

[Table 9-1-2] Environmental Laws in South Sumatra

Category	Law and Regulations
Air and Noise	South Sumatra Governor Regulation on Air Ambient Quality Standard and Standard Noise Level No. 17/2005
Water	South Sumatra Governor Regulation on Allocation of Water and River Water Quality Standards No. 16/2005
Waste	South Sumatra Governor Regulation on Liquid Waste Quality Standard (BMLC) For Industrial Activities, Hotels, Hospitals, Domestic and Coal Mining No. 18/2005
	Muara Enim Regulation on Disposal Liquid Waste Permit No. 38/2001
	Lahat Regulation on Water and Liquid Waste Quality Standard No. 14/2005
	Lahat Regulation on Utilization Permit and Management of Liquid Waste No. 2/2006

(Source: Study team)

(2) Implementing Procedure of AMDAL

The AMDAL process in Indonesia dates back more than 20 years, and it is specifically mandated by the newly approved Environmental Protection and Management Law (Article 22) dated 8 September 2009 replacing Environmental Law No.23 of 1997. The Ministry of Environment Regulation No.8 of 2006 provides the latest guidance on the AMDAL process.

The Indonesian government imposes a “positive list” for a project and/or activity that requires AMDAL according to the type, scale and location of activity through Minister of Environment Regulation No.11. Projects not listed are obliged to prepare Environmental Management Effort or Upaya Pengelolaan Lingkungan (UKL) and Environmental Monitoring Effort or Upaya Pemantauan Lingkungan (UPL) documents in accordance with the newly approved Environmental Protection and Management Law 2009 (Article 34).

The type of activity and scale of projects that require a full AMDAL process are defined in Minister of Environment Regulation No.11 of 2006 covering the following sectors: (1) defense, (2) agriculture, (3) fishery, (4) forestry, (5) transportation, (6) satellite technology, (7) industry, (8) public work, (9) energy and mineral resources, (10) tourism, (11) nuclear development, (12) hazardous waste processing, and (13) genetic engineering. Any project located at the border or inside a protected area, no matter of type or scale, requires an AMDAL.

The AMDAL process in Indonesia is an integrated and comprehensive assessment of project impacts taking into account biological, geo-physical/chemical, socio-economic-cultural, and public health aspects. The AMDAL process aims to evaluate the environmental feasibility of a project and is the means by which the authority grants the necessary permits for the project or activity.

Implementing procedure is as follows and summarized in [Table 9-1-3]. The first step of the AMDAL process is the preparation of the Terms of Reference (KA-ANDAL) to be approved by

the AMDAL Committee. The scoping process includes to be defined as follows; (Source: Minister of Environment Regulation No. 08 of 2006).

- Scope of the study,
- Type of activities of the project that may cause impact to environment,
- Environmental parameters likely to be affected by the project,
- Method of data collection and analysis,
- Potential and serious impact identification and
- Methods of impact prediction and evaluation

[Table 9-1-3] EIA Process in Indonesia

<table>
<tr><th rowspan="2">Undertaken by this Study</th><th colspan="2">Implementation Agency Part</th></tr>
<tr><th>KA-ANDAL approval</th><th>AMDAL approval</th></tr>
<tr><td>●Project site survey
└→●Screening by JICA guideline
└→●Verification by JICA guideline's check list
└→●Scoping proposal
└→●Preliminary stake holders meeting
└→●Compile draft KA-ANDAL</td><td rowspan="2">●Screening by AMDAL committee (PD11/2006)
(When EIA is necessary for forward)
└→●Advertize
└→●Compile KA-ANDAL
└→●Public discussion
└→●Scoping
└→●Evaluate KA-ANDAL (in 75days)
└→●Amend/Approve</td><td rowspan="2"></td></tr>
<tr><td><Note>
・AMDAL: Indonesian version of EIA
・KA-ANDAL: TOR for AMDAL compilation
・RKL: Environmental management plan
・RPL: Environmental monitoring plan</td><td>└→●Compile AMDAL,RKL,RPL (EMD09/2000)
└→●Evaluation (in 75days)
└→●Approve</td></tr>
</table>

(Source: Study team)

9.1.2. Present Conditions of Site

Present conditions of the Project site are summarized for every targeted section of EIA (environmental impact assessment).

(1) Natural Environment around the Project Site

① Topography and Soil Conditions

East side of South Sumatra is mainly lowland or wetland which is affected by tidal variation. On the other hand, east side is mountainous region with 900 – 2,000 meters h8. Geological type of soil is river deposit or volcanic deposit. The Project site spreads in relatively flat terrain with forest or wetland. As of now, any special topography or soil condition is not observed.

Wetland

Rubber trees

[Pic. 9-1-1] Typical Landscape around the Project Site

② Hydrological Regime

There are a number of big rivers which are navigable with big vessels, however it becomes unable because of recent sediment deposition.

Musi river

Local river

[Pic. 9-1-2] Rivers around the Project Site

③ Flora, Fauna and Biodiversity

Flora found in Sumatera Selatan are Lauan, Merubana, Beech, Rubber, Oil palm and others.

④ Meteorology

South Sumatra belongs to tropical climate with dry season from May to October and rainy season from November to April. Observed meteorological data at “Kenten observatory in Palembang, 2010” shows as follows:

- Minimum monthly mean temperature is 26.6 degree Celsius in January.
- Maximum monthly mean temperature is 28.5 degree Celsius in May.
- Minimum monthly mean relative humidity is 84 % in October.
- Maximum monthly mean relative humidity is 88 % in February.
- Minimum monthly precipitation is 91.1 mm in July.
- Maximum monthly precipitation is 541.7 mm in March.

⑤ Landscape

As of now, any special landscape to be preserved is not found around the Project site.

⑥ Protected Area

As of now, any designated protected area is not found around the Project site.

(2) Current Situations of Pollutions

① Air pollution

Atmospheric environment is considered rather well, because exhaust gas from diesel locomotive is almost only source of air pollution and there is no significant industrial area around the Project site. Atmospheric environmental parameters are measured in the Project area, and are shown in [Table 9-1-4].

[Table 9-1-4] Air Ambient Analysis Result

No	Items	Unit	Survey Location											Threshold Value*
			1	2	3	4	5	6	7	8	9	10	11	
1	Temperature	℃	30.4	31.7	35.6	39.2	37.3	37.1	33.9	37.3	35.2	30.2	29.4	–
2	CO	ppm	5	4	3	4	5	4	4	3	4	4	4	–
		μg/Nm^3	6,170	4,930	3,700	4,930	6,170	4,930	4,930	3,700	4,930	4,930	4,930	30,000
3	Sox	μg/Nm^3	268	221	205	198	232	195	203	133	227	219	231	900
4	Nox	μg/Nm^3	233	215	212	207	176	212	153	122	176	212	153	400
5	HC	μg/Nm^3	9.3	6.5	4.4	4.8	6.5	4.8	4.4	3.8	5.5	3.8	6.4	160
6	TSP (dust)	μg/Nm^3	103.3	55.0	53.0	62.0	98.5	46.6	47.5	45.3	73.8	55.9	97.0	230

Remark		Date
Location 1	Kertapati Station	26 November 2011
Location 2	Simpang Station	26 November 2011
Location 3	Gelumbang Station	26 November 2011
Location 4	Lembak Station	26 November 2011
Location 5	Prabumulih Station	26 November 2011
Location 6	Niru Station	27 November 2011
Location 7	Gunung Megang Station	27 November 2011
Location 8	Ujan Mas Village	27 November 2011
Location 9	Muara Enim Station	27 November 2011
Location 10	Banjar - Sukacinta Village	27 November 2011
Location 11	Lahat Station	27 November 2011

Note: 1.*Threshold Value based on South Sumatra Governor Regulation No. 17/2005
2.Measurement locations are shown in [Fig. 9-1-1] (P. 9-11).

(Source: Study team)

② Water Pollution

Water qualities around the Project site are measured, and the results are shown in [Table 9-1-5]. Tributary of Musi river is flown around the site. But there is no significant indusrial area which causes water pollution. Sewage contamination around cities will be assumed.

[Table 9-1-5] Water Analysis Result

No	Items	Unit	Survey Location									Threshold Value*
			1	2	3	4	5	6	7	8	9	
1.	Temperature	℃	28.0	30.1	27.6	27.3	27.2	27.2	27.2	26.3	26.0	Dev ± 3
2.	P.H.	―	6.30	4.18*	5.27*	6.06	5.72*	6.58	6.71	7.15	6.88	6 - 9
3.	D.O.	mg/L	6.00	4.52	2.80	5.25	5.18	5.28	5.64	5.65	6.21	3
4.	Turbidity	mg/L	44	12	10	56	39	61*	39	31	51*	50
5.	Conduc tivity	mg/L	4	61	2	4	7	7	10	9	8	―
6.	C.O.D.	mg/L	7	5	8	13	7	12	9	15	6	50
7.	B.O.D.	mg/L	0.3	0.2	0.25	0.43	0.12	0.52	0.36	0.57	0.5	4
8.	T.S.S.	mg/L	152	186	194	146	214	142	160	116	148	1000

Remark		Date
Location 1	Ogan River near Kertapati Station	26 November 2011
Location 2	Branch of Keramasan River near Simpang Station	26 November 2011
Location 3	Kelekar River near Lembak Station	26 November 2011
Location 4	Niru Ruver near Niru Station	26 November 2011
Location 5	Branch of Lematang River near Gunung Megang Station	26 November 2011
Location 6	Lematang River near Ujan Mas Station	27 November 2011
Location 7	Lematang River near Muara Enim Station	27 November 2011
Location 8	Lematang River near Merapi Station	27 November 2011
Location 9	Lematang River near Lahat Station	27 November 2011

Note: 1.*Threshold Value based on South Sumatra Governor Regulation No. 16/2005
2.Measurement locations are shown in [Fig. 9-1-1] (P. 9-11).

(Source: Study team)

② Waste

It would be a big issue that a great amount of garbage and waste material is uncontrolled around the site.

[Pic. 9-1-3] Waste biside the Rails

③ Noise and Vibration

Noise and vibration are measured around the Project site, and shown in [Table 9-1-6]. Noise and vibration caused by passing trains are actually problem. Additionally, automobiles and motorbikes are also the main source in cities.

[Table 9-1-6] Noise Sampling Result

No	Location	Date	Hour	Noise dBA	Parameter
1	Kertapati Station	November 26, 2011	8:00	59.6	*South Sumatra Governor Regulation Number 17 Year 2005* **) For Settlement Area, threshold 55 dBA* ***) For Industrial Area, threshold 70 dBA*
2	Simpang Station	November 26, 2011	9:30	54.5	
3	Gelumbang Station	November 26, 2011	12:15	53.6	
4	Lembak Station	November 26, 2011	13:10	31.6	
5	Prabumulih Station	November 26, 2011	15:05	56.2	
6	Niru Station	November 26, 2011	16:15	48.2	
7	Gunung Megang Station	November 26, 2011	17:30	44.5	
8	Ujan Mas - Gunung Megang	November 27, 2011	11:40	46.8	
9	Muara Enim Station	November 27, 2011	10:05	50.2	
10	Banjar - Sukacinta	November 27, 2011	9:10	60.3	
11	Lahat Station	November 27, 2011	8:05	48.1	

Note: Measurement locations are shown in [Fig. 9-1-1] (P. 9-11).

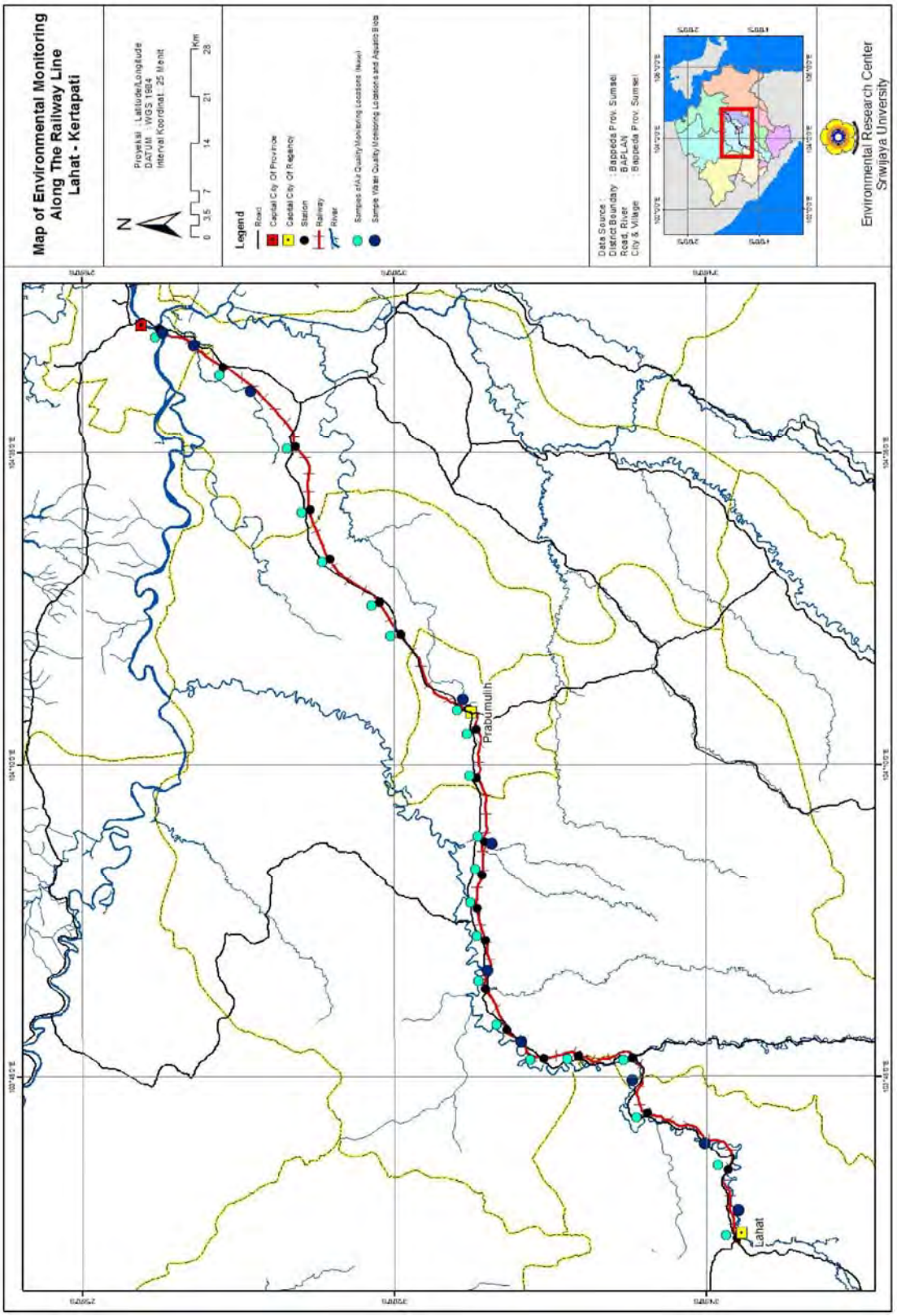
(Source: Study team)

[Pic. 9-1-4] Rail Crossing in a Town

④ Ground Subsidence

Ground subsidence is possibly occurred by civil engineering works and construction, because sedimentary soil is dominated in the site.

The locations of the measurement for ① - ④ are shown in [Fig. 9-1-1].



(Source: Study tam)

[Fig. 9-1-1] Locations for Measurements (Air, Water and Noise)

9.1.3. Positive and Negative Environmental Impacts of the Project

Environmental and social impacts by implementation of the Project are discussed using JICA's environment screening form. Assumed impacts to relevant environmental items around the site are summarized in [Table 9-1-7] to [Table 9-1-10].

- Zero-Option: Without the Project
- Option 1: The 1st Stage (Single Track)
- Option 2: The 2nd Stage (Partial Double Tracking)
- Option 3: The 3rd Stage (Whole double Tracking)

[Table 9-1-7] Comparative Matrix of Alternatives for Scoping

	Likely Impact	Alternative			
		Zero Option	Alterna tive-1	Alterna tive-2	Alterna tive-3
Natural environment	Topography and geology features			B	B
	Soil erosion				
	Groundwater				
	Hydrological situation				
	Coastal zone				
	Flora, Fauna and Biodiversity				
	Meteorology				
	Landscape				
	Global warming				
Pollution	Air pollution		B	B	A
	Water pollution				
	Soil contamination			B	B
	Waste		B	B	B
	Noise and Vibration		B	B	A
	Ground subsidence				
	Odor				
	Bottom sediment				
	Accidents		B	B	B
Environment evaluation			B	B	A
Social	Resettlement			B	A
	Livelihood			B	A
	Cultural heritage				
	Landscape				
	Minorities/ aborigines				
	Labor condition			B	B
	Hygiene (Waste/ Dust/ Sewage)		B	B	B
	Crossing/ Traffic safety		B	B	B
Social evaluation			B	B	A

Rating:

A: Serious impact is expected.

B: Some impact is expected.

C: Extent of impact is unknown (Examination is needed. Impacts may become clear as study progresses.)

No mark: No impact is expected. IEE/EIA is not necessary.

(Source: Study team)

[Table 9-1-8] Matrix for Scoping (The 1st Stage)

	Likely Impacts	Overall Rating	Construction Phase			Operation Phase			Comments
			Extension of existing rail	Related facilities (ex: station)	Construction equipment operation	Increase in number of train	Exhaust gas, noise and vibration	Coal dust	
Natural environment	Topography and geology features								
	Soil erosion								
	Groundwater								
	Hydrological situation								
	Coastal zone								
	Flora, Fauna and Biodiversity								
	Meteorology								
	Landscape								
	Global warming								
Pollution	Air pollution	B	B	B	B	B	B		Emission of air pollutant from construction equipment in construction stage and locomotives increased in operational stage will be assumed.
	Water pollution								
	Soil contamination								
	Waste	B				B			
	Noise and Vibration	B	B		B	B	B		Noise and vibration will be occurred by equipment operation in construction stage and increased number of train in operational stage.
	Ground subsidence								
	Odor								
	Bottom sediment								
	Accidents	B				B			Incidence of traffic accident is assumed to increase by increased number of train in operational stage.

Rating:

A: Serious impact is expected.

B: Some impact is expected.

C: Extent of impact is unknown (Examination is needed. Impacts may become clear as study progresses.)

No mark: No impact is expected. IEE/EIA is not necessary.

(Source: Study team)

[Table 9-1-9] Matrix for Scoping (The 2nd Stage)

	Likely Impacts	Overall Rating	Construction Phase			Operation Phase			Comments
			Extension of existing rail	Related facilities (ex: station)	Construction equipment operation	Increase in number of train	Exhaust gas, noise and vibration	Coal dust	
Natural environment	Topography and geology features	B	B						Earthmoving for existing rail extension may cause topographical and geological impact.
	Soil erosion								
	Groundwater								
	Hydrological situation								
	Coastal zone								
	Flora, Fauna and Biodiversity								
	Meteorology								
	Landscape								
	Global warming								
Pollution	Air pollution	B	B	B	B	B	B	B	Emission of air pollutant from construction equipment in construction stage and locomotives increased in operational stage will be assumed. Dispersion of coal dust from the coal yard is assumed.
	Water pollution								
	Soil contamination	B	B						Existing rail extension may cause soil contamination by earthmoving and disposal of waste soil.
	Waste	B				B			
	Noise and Vibration	B	B		B	B	B		Noise and vibration will be occurred by equipment operation in construction stage and increased number of train in operational stage.
	Ground subsidence								
	Odor								
	Bottom sediment								
	Accidents	B				B			Incidence of traffic accident is assumed to increase by increased number of train in operational stage.

(Source: Study team)

[Table 9-1-10] Matrix for Scoping (The 3rd Stage)

	Likely Impacts	Overall Rating	Construction Phase			Operation Phase			Comments
			Extension of existing rail	Related facilities (ex: station)	Construction equipment operation	Increase in number of train	Exhaust gas, noise and vibration	Coal dust	
Natural environment	Topography and geology features	B	B						Earthmoving for existing rail extension may cause topographical and geological impact.
	Soil erosion								
	Groundwater								
	Hydrological situation								
	Coastal zone								
	Flora, Fauna and Biodiversity								
	Meteorology								
	Landscape								
	Global warming								
Pollution	Air pollution	A	B	B	B	A	A	A	Emission of air pollutant from construction equipment in construction stage and locomotives increased in operational stage will be assumed. Dispersion of coal dust from the coal yard is assumed.
	Water pollution								
	Soil contamination	B	B						Existing rail extension may cause soil contamination by earthmoving and disposal of waste soil.
	Waste	B				B			
	Noise and Vibration	A	B		B	A	A		Noise and vibration will be occurred by equipment operation in construction stage and increased number of train in operational stage.
	Ground subsidence								
	Odor								
	Bottom sediment								
	Accidents	B				B			Incidence of traffic accident is assumed to increase by increased number of train in operational stage.

(Source: Study team)

9.1.4. Preparation for Environmental Impact Assessment

In Regulation of State Minister of Environment No.11/2006, railway construction is categorized into “transport”, and the preparation and approval of AMDAL is required under the conditions listed in [Table 9-1-11]. PT. KAI presently implementing double tracking work between Mualaenim - Prabumuli X6, it is subject to AMDAL, because it is a railway construction for more than 25 kilometers. This Project, a railway improvement project between Lahat - Kertapati would be subject to AMDAL, if any condition in [Table 9-1-11] is applicable.

Through a screening based on JICA environmental guideline, this Project is classified as Category A. Therefore the implementation of EIA is a precondition for receiving Yen Loan, however AMDAL (Indonesian EIA system) has not yet been made. Accordingly, support for implementing agency to prepare AMDAL in accordance with JICA environmental guideline will be compiled in this study.

[Table 9-1-11] Railway Development Project Subject to AMDAL

No	Type of activities	Scale/Magnitude
1	Rail road	Length ≥ 25 km
2	Development train station	Area: ≥ 2 ha

(Source: Regulation of State Minister of Environment No. 11/2006)

The Project implementation plan prepared in this study consists of 3 stages as shown in [Table 9-1-12].

[Table 9-1-12] Project Implementation Plan Prepared in this Study

Project Stage	Contents
① The 1st Stage (Single Track)	●Target transport capacity = 2.5MTPA ●Traffic of train = 8 trains/day ●1 train = 1 loco + 25 fr8 wagon = 395m Extension of track effective length ●Running speed = 65 km/h Existing track improvement work including partial replacement of rail of existing track ●Capacity expansion of coal loading facility in Sukacinta ●Capacity expansion of coal unloading facility of PT. BAU in Kertapati
② The 2nd Stage (Partial Double Tracking)	●Target transportation capacity = 5.0MTPA ●Traffic of train = 10 trains/day ●1 train = 1 loco + 40 fr8 wagon = 615m Another extension of track effective length ●Complete the double tracking work between Muara Enim and X6 ●Add 2 signaling stations (The location is to be selected.) ●Construction of branch line of 700 m from Merapi to main line ●Construction of stock yard and unloading facility in the north end of Kertapati station area
③ The 3rd Stage (Whole double Tracking)	●●Target transportation capacity = 20.0MTPA ●Traffic of train = 21 trains/day ●1 train = 2 loco + 60 fr8 wagon = 930m Another extension of track effective length ●Whole double tracking work between Sukacinta and Kertapati ●No more work between Muara Enim and X6 ●Introduction of electric signaling system ●Development of coal stock yard in Kertapati station area of 20 ha and installation of belt conveyer system to reach Musi river

(Source: Study team)

In the current stage of implementation of the Project, drafts of screening, scoping, IEE (Initial Environmental Examination) and AMDAL can be prepared according to JICA Environmental Guideline.

Draft IEE is prepared in this study for the 1st and 2nd Stage of the project implementation, because these are not subject to AMDAL. As for the 3rd Stage of the implementation, draft of AMDAL is prepared, because the work of the stage includes a railway construction more than 25km and is subject to AMDAL.

(1) Summary of Draft IEE for the 1st Stage

The draft IEE for the 1st Stage was prepared but it is not attached in this report. At the 1st Stage, the constructions involve mainly an improvement of track, reinforcement of coal loading and unloading facility. During the construction period, environmental consideration is needed, even though no big environmental impact will be expected.

(2) Summary of draft IEE for the 2nd Stage

The draft IEE for the 2nd Stage was prepared but it is not attached in this report. At the 2nd Stage, the constructions which involve the partial double tracking work and reinforcement of unloading facility at Kertapati station will require environmental considerations, even though no big environmental impact will be expected. However, the branch line construction which is laid from Merapi to the main line (approximately 700m) will require an appropriate alignment and construction plan paying due attention to environmental considerations.

(3) Summary of Draft AMDAL for the 3rd Stage

The draft AMDAL for the 3rd Stage was prepared but it is not attached in this report.

① Construction Phase

- Air Pollution: As the number of construction machines and conveyance trucks and vehicles are limited, it seems that the impacts on the air quality are relatively small compared with the present condition. However, as the construction is mainly implemented during dry season, the countermeasures, sprinkling water, cleaning of road and so on are critical to reduce the dust and TSP. The construction plan involves coal loading and unloading facility at Kertapati station yard, the barge loading system. A construction site for coal loading and unloading facility is adjoining to the housing area. Therefore this work will especially require a construction plan paying due attention to environmental considerations.

- Noise: Noise of the construction machines and vehicles can be reduced by the regular maintenance and efficiently scheduled operation. The noise around the construction areas should be monitored so that countermeasures can be taken timely. For example, the noise impact could be reduced by a proper schedule of the operating hours of construction machines, especially near the hospitals, schools and mosques.

② Operation Phase

- Air Pollution: Although it is theoretically expected that negative environmental impact will occurred by increasing the number of trains for passenger and freight, the scale will be moderate because the absolute number of train is still small. However, the amount of air pollutant emission will be increased if maintenance for locomotives is not made properly. It

is important to give periodical maintenance for the rolling-stock. A construction site for coal loading and unloading facility is adjoining to the housing area. Therefore this work will especially require a construction plan paying due attention to environmental considerations.

- Noise: Although it is theoretically expected that negative environmental impact will occurred by increasing the number of trains for passenger and freight, the scale will be moderate because the absolute number of train is still small. However, it should be noted that the noise level will be worsend if maintenances for rolling-stock and track infrastructure are not made properly.

③ Environment Management and Monitoring Plan

Effective environmental management during construction and post-construction requires the establishment of effective institutional arrangements for the implementation of the Environmental Management Plan (RKL) as well as the proper Environmental Monitoring Plan (RPL). The RKL has been prepared to deal with the following mitigation measures.

[Table 9-1-13] Outline of Mitigation Measures

Environmental Impact	Construction phase	Post-Construction phase
Air Pollution	● Conduct regular watering ● Back of trucks covered with tarpaulins ● Use of equipment / machinery / construction of transportation that meets vehicle emissions standards	Perform periodic maintenance on the locomotive / train transport
Noise,Vibration	● Use of equipment / machinery / transport that meets the standards of construction noise levels ● Perform engine maintenance / construction equipment at regular intervals ● Replacing the silencer / sound suppressor on the engine / generator to reduce noise levels ● Adjusting work schedules to reduce the exposure time	● Make a noise barrier ● Using the rails and ballast material, which can reduce noise
Waste	● Create a temporary shelter (TPS) for the Hazardous Waste Collection points and temporary shelters ● Submit Hazardous Waste to a third party who has had a Hazardous waste management license ● Create and implement Standard Operating Procedures (SOP) Hazardous Waste Management ● Increasing human resource capacity through the Course/Training Hazardous Waste Management	

(Source: Study team)

There exists a railway project in South Sumatra for which AMDAL was prepared. It was conducted by PT. KAI Regional Division III South Sumatera in 2011 for a double tracking work. Summary is shown in [Table 9-1-14].

[Table 9-1-14] Summary of AMDAL Prepared for a Railway Project in South Sumatra

<table>
<tr><th>Item</th><th>Content</th></tr>
<tr><td>Name of Project</td><td>● Development Double Railway Line
● Niru station – Muara Enim station and Muara Enim station – Tanjung Enim station</td></tr>
<tr><td>Project Executive Organization</td><td>● PT Kereta Api Indonesia (Persero) / (PT. KAI) Regional Division Ⅲ Sourh Sumatera
● Address: Jenderal A. Yani street 13 Ulu No. 541 Palembang
● Telephon No.: (0711) 517736</td></tr>
<tr><td>Adress of Project Site</td><td>Rambang Dangku Sub-district, Gunung Megang Sub-District, Ujan Mas Sub-District, Muara Enim Sub-District</td></tr>
<tr><td>Project Profile</td><td>Plan to build a double track railway between Niru station - Tanjung Enim station, has a length of 60 km
<table>
<tr><th>No</th><th>Activity</th><th colspan="2">2011</th><th colspan="2">2012</th><th colspan="2">2013</th></tr>
<tr><td>1</td><td>Project Socialization</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>2</td><td>Land Supply</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>3</td><td>Construction</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>4</td><td>Operational</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table></td></tr>
<tr><td>Year of AMDAL</td><td>2011</td></tr>
</table>

(Source: Study team)

A meeting with local residents of the community locating around Kertapati Station was held on 27th of January, 2012 to have opnions of the people. A hearing on environmental issues is also carried out in the meeting. Typical opinions raised are summarized in the following 2.

- Environmental problem is not to be expected in particular.
- In dry season or season with small rain, coal dust disperse to the area, and residents feel hard to breathe sometime. Drinking and bathing water are polluted by dispersion of coal dust.

9.2. Social Consideration

9.2.1. Basic Legal Framework

Concerning social consideration, there are 2 basic legal aspects, land acquisition and resettlement proceedings, subjected to the implementation of this Project. However, in comparison to the few legal materials recently issued for resettlement proceeding, the legal materials related to land acquisition as notified with details in Chapter 1 have been continuously issued since 1960s. With the results from various situations of field applications, the legal materials on land acquisition had been amended time by time. Actually, a new Land Acquisition Bill is still under the process of an amendment.

(1) Land Acquisition Related Legal Framework

① The Basic Agrarian Land Law (BAL) of Act No.5 of 1960: This law constitues a fundamental regulation governing agrarian principles which legitimately justified the sovereignty of national land of Republic of Indonesia after the independence in 1945. This basic law enforced the taking back of large land plots exploited by foreigners etc. as plantations under the Dutch era for making public land under national control; meanwhile protecting the traditional land use rights of localities. This legal framework of enforcing national sovereignty on land issue and, at the same time, protecting traditional land use rights of localities has been applied as up to now, making a so-called situation of “dual system of land laws” in this country.

② Revised Railwa Law (Law No.13/1992): At the time when railway land use law was established in 1960’s, the entity of railway business development had been continuously transferred from one to another in some decades for finally anchored at PT. KAI as endorsed by DGR of Ministry of Transport This was implied by Law No.13/ 1992 on Railway Monopoly for national operation and development; but lately modified by Law No.23/2007 on railway to supersede Law No.13/1992 for supporting local governments involving also in railway development. Based on this modification, the railway tracks themselves remain under state ownership but PT. KAI and even private companies can use the rail lines for passenger and fr8 transportation by paying a fee after getting an approval from the government. Currently, only Jawa and Sumatra islands have developed both fr8 and passenger trains but recently the Ministry of Transport has plans also for new railway lines in Kalimantan and Sulawesi also. Therefore, Indonesian Government has made various efforts including PPP approach for inducing foreign and private investments in railway development including SP (Special Purpose Railway) in Kalimantan and Sulawesi. The basic principle, however, is the mutual agreement .in business development among the participated parties.

③ 2 laws for land acquisition: Concerning land acquisition for development implementation for public interest, there are 2 major laws as hereunder.

1) The Land Acquisition Laws of Presidential Regulation of the Republic of Indonesia No.36/2005

The chaptering of the law is as follows.

- Chapter I covering Definition of Terms and Scope of Regulation
- Chapter II covering Functionalities and Classifications of Buildings
- Chapter III covering Requirements for A Construction on Administrative and Technical Aspects (rights over land, ownership status, construction permit, architectural requirements, environmental impacts control, landscape, infrastructural or public means, safety and health concerns, comfort and accessibility)
- Chapter IV covering Construction Implementation (technical planning, construction implementation and management, proper usage, maintenance, periodical inspection, preservation, and demolition)
- Chapter V covering Society's Role (order monitoring and preservation, offering input, opinion, & consideration, placing lawsuit and claim)
- Chapter VI covering Implications by Both Central and Regional Government
- Chapter VII covering Related Administrative Sanctions
- Chapter VIII covering Transitional Provisions

2) Presidential Regulation of the Republic of Indonesia No.65/2006 Concerning Amendment of No.36/2005

Meanwhile, in order to protect citizen losses of land properties and to make appropriate compensations for affected people in giving up their lands, buildings etc. for the implementation of public projects, the Presidential Regulation No. 65/2006 made some additions for the Presidential Regulation No. 36/2005 on Land Acquisition for Development Implementation for Public Interest, as follows:

- Compensations for Acquisition of Land, Building, etc
- Provision on Land Acquisition
- Detailed Definition of Public Needs
- Details of Institution acting as Initiator in Land Provision and its Duties
- Forms of Compensations
- Regulations on Lawsuit and Claim

For compensation matters, in principle, the owner of lost land can select from options

including cash payment, substitute land or resettlement, if available. The basic principle of the present Land Acquisition Laws, therefore, is the mutual agreement on compensations and related matters from both sides. In fact, due to difficulties for making affected people consent to the designated compensations through field applications as up to now, these Land Acquisition Laws have been faced with limited applications from time to time by causing substantial conflicts between both sides in land acquisition proceedings. In order to make a solution for this hampered situation, a new Land Acquisition Bill has been recently submitted to Parliament for a resolution since August of 2011, but still waiting for an approval resolution. If this new Land Acquisition Bill is approved by the Parliament, the compulsion application for land acquisition would be orderly proceeded in order to facilitate the implementation of public projects.

(2) Resettlement Proceedings Related Legal Framework

Since the era of post-independence in Indonesia, based on the Basic Land Law, the related land laws had been constantly issued for implementation. However, on the aspect of resettlement proceedings, the legal framework was formulated as recently for facilitating the project implementation at localities. Besides, while most land laws had been made for application on national level, the legal framework for resettlement proceedings was mainly made for application at local government level. This situation could be considered due to the differences in socio-economic conditions among localities.

In order to proceed to the resettlement matter, the Government of South Sumatra Province had issued the ”Statement of Governor of South Sumatra on Resettlement Compensations No.25 Year 2009” Besides, for a PT. KAI project, a “MOU (Cooperation) between PT. KAI and Judiciary High Court” and the “Chronology for Resettlement Proceedings” are also the basic legal materials for conducting this matter for project implementation.

Based on these legal matters and with the collaboration from local government etc, the solicitation meetings with people in affected areas will be organized. By obtaining the consent of people in affected people from these meetings, the negotiations for compensation, the payment formalities as well as the resettlement proceedings for land clearance etc. will be carried out accordingly.

Particularly, concerning the legal aspect of resettlement proceedings, as the resettlement works for this Project will be mainly carried out in the land premises controlled and managed by PT. KAI, the specific regulations of PT. KAI itself have been largely subjected to application.

According to PT. KAI officials interviewed on this matter in Kertapati, Prabumulih and Muara Enim stations, the basic proceedings have been made into 3 following steps:

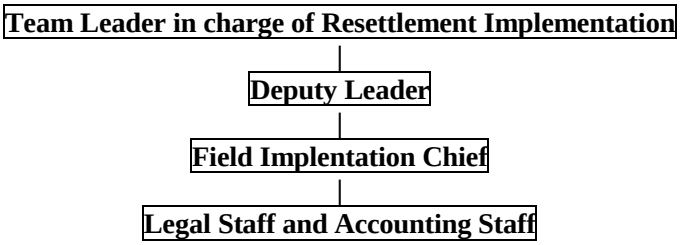
- Notice to households subjected to resettlement
- Meetings with affected people for making understanding explanations
- Negotiations for compensations

These 3 steps are basically similar to the implementation of other large-scaled public projects. However, the applications are totally simplified i.e. making only simple notices to localities but without distribution of formal leaflets with detailed explanations on project works and related items, conducting some meetings for explaining the project works to local people for their understanding but no organization of formal stakeholders meetings in 3 times, for getting all-side opinions, and only simple compensation negotiations but no grievance responses or relocation assistances.

According to concerned PT. KAI officials, as the land premises for implementing this Project are under the management of PT. KAI, if no new installations to be established outside these premises, the said procedure for resettlement has been smoothly carried out as up to now. The compensation sum has been basically made, depending on the actual conditions of the house or building to be affected, but not for the land portion (as being belonged to PT. KAI).

In the section Prabunulih-Muara Enim being under works for double tracking construction, the resettlement works for about 200 affected households along the railway were completely finished last year without any serious problems. About half year was used for making notices and meetings, and another half year was for making compensation negotiations and demolition works.

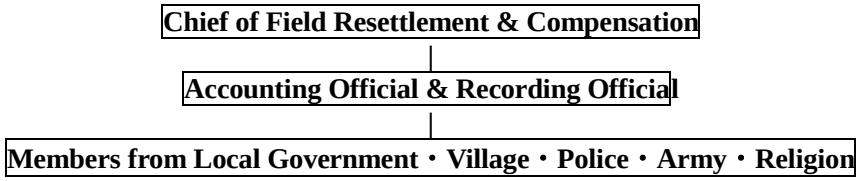
According to PT. KAI officials, based on the aforementioned legal base for this matter and with the collaboration of concerned local officials etc., the resettlement implementation teams were formed accordingly. Firstly, at top level, a Resettlement Implementation Team was organized in PT. KAI Regional Headquarters, which basic formulation is shown in the following [Fig. 9-2-1].



(Source: Study team)

[Fig. 9-2-1] PT. KAI Resettlement Implementation Team

At field level, the organization of Resettlement Compensation Group is shown in the following [Fig. 9-2-2].



(Source: Study team)

[Fig. 9-2-2] PT. KAI Resettlement Compensation Group

Along with the notices for land acquisition and resettlement matter by signboards or leaflets in the affected areas, this Group will organize the solicitation meetings with local people for 2 - 3 times, In these meetings, PT. KAI officials in charge will explain about the project outlines and implementation schedule as well as areas for land acquisition for project implementation, inquiries for local cooperation and compensation subjects. PT. KAI and local government officials will reply to all their inquiries for getting their basic consent for project implementation.

Regarding the details of compensation, the official price lists for compensation by subjects will be basically applied. The records of these meetings will be officially recorded. The scenes of receiving compensation as well as the receipt will be taken in photos as for evidences.

Besides, PT. KAI is planning to carry out land clearance of its land areas around Kertapati station for future construction of depots, related facilities etc. The land plot of about 90 households nearby the present coal stockyard of PT. BAU in Kertapati Station will be subjected to the first resettlement works next year with a reportedly compensation price of 400,000 – 600,000 Rp per m^2.

In the 3rd Stage of the Project, the double tracking works from Sukacinta to Kertapati and the construction of new related facilities in the areas around Kertapati station will be implemented. Despite these constructions will be carried out in the PT. KAI land areas, but with a large scaled resettlement (more than 350households along the railway and about 800 househols in the areas around Kertapati station), the preparation of LARAP, therefore, is considered necessary. Particularly, due to the aspect of in-city properties, the resettlement of households around Kertapati station will be very complicated, requiring high compensation costs and a long time of 3 - 5 years for resettlement. Resettlement proceedings, therefore, have to be started at an early stage.

9.2.2. Present Situation of Project Area

The Project Area is basically formed by 2 parts, the areas along the railway from Lahat to Kertapati and the areas around Kertapati station. Apart from some relatively dense agglomerations nearby some stations of this railway line, the areas along this railway are basically farming and plantation areas. Meanwhile, the areas around Kertapati station are the in-city areas, which were fused as grave lands in the past but being transformed as residential and business areas in nowadays.

However, these land areas are lands managed by PT. KAI. The original residents in these areas were people working or having some relations with PT. KAI for getting provisional living permits in these lands since some decades ago. Their families, however, have continued the residency by building new houses, farms etc.and even making (illegal) sale transactions, which PT. KAI could not control anymore.

The Project Area, covering the railway line between Lahat-Kertapati, is located in the central part of South Sumatra Province as for forming its backbone, This railway line is the top of this T-letter railway system in South Sumatra, starting from Lubukulinggau in the West for directing straightly to Palembang in the East with a diversion in the middle at Prabumulih for forwarding to the port of Taharan in the south The railway system, therefore, is originally developed for coal transportation; but lately for passenger transportation also, due to local demands from the convenience and safety of this transportation means.

Historically, this railway line was constructed and exploited in the Dutch era since 1864 for originally transporting coal exploited from Enim mines in the West for destinations to the ports of Palembang and Taharan for exportation. In 1942, Japan occupied Netherlands East Indies and made the unification administration of all railways in Java and Sumatra. In Sumatra, based on geographical characteristics, the three separate systems: Kita Sumatora Tetsudo (North Sumatra including Aceh), Seibu Sumatora Tetsudo (West Sumatra) and Nanbu Sumatora Tetsudo (South Sumatra) were formed for business management. After the independence in 1945, the Government of Republic of Indonesia continuously made the governance and management of these railways through various national entities, where PT. KAI is presently the last anchor from this transformation.

Sumatra Island, which has the shape of a baguette with 1,760km long and 400km wide, accounts for 25% of the total land area of this archipelago country. South Sumatra Province is bordered by Jambi Province to the north, Lampung Province to the south Bengkulu Province to the west and Bangka Islands to the east. It covers a large area of 87,017 km^2 but a population of more or less 7.25 million inhabitants (density of approx. 59 inhabitants per km^2), where more than 1.3 million inhabitants are living in Palembang, the provincial capital.

The western side of this province consists of the long mountainous wall Bukit Barisan (Parade of Mountains). This mountain range has an altitude of approximately 1,000m above sea level, where found more than 90 volcanic peaks with some high peaks such as Mount Seminung (1,964m), Mount Dempo (3,159m), Mount Pangkuk (2,125m) etc.. This western part has various large coal mines being exploited since longtime ago for supplying to domestic use as well as abroad exportation. The eastern side, however, is made of mostly marsh and swamp lands nearby the coastal areas, where laying Musi River with its attributes and some oil fields entouring Palembang. The lowland part inside this province has been partly observed with farmlands, paddy fields, plantations of rubber or palm trees as well as some gas/oil exploitation fields.

Administratively, South Sumatra Province is made from 15 regions, 217 sub-districts and 2,781 villages which detailed demographic features are shown as follows:

[Table 9-2-1] Present Situation of Administrative Units in South Sumatra Province

No	Region	Area (1,000ha)	Popul'n (million)	Density (per km^2)	Capital City	Sub-District	Village
1	OKU	277.25	0.255	96.3	Bataraja	12	138
2	OKI	1,705.83	0.230	41.5	Kayu Agung	18	297
3	Muara Enim	858.79	0.657	77.8	Muara Enim	22	305
4	Lahat	407.60	0.632	83.7	Lahat	21	359
5	Musi Rawas	1,213.45	0.546	41.7	Muara Beliti	21	258
6	Musi Banyuasin	1,447.70	0.475	36.1	Sekayu	11	209
7	Banyuasin	1,214.27	0.469	67.4	Pangkalan Balai	15	287
8	OKU Selatan	549.39	0.734	80.4	Muara Dua	19	249
9	OKU Timur	341.01	0.317	170.4	Martapura	20	286
10	Ogan Ilir	251.31	0.556	153.1	Indralaya	16	227
11	Empat Lawang	255.64	0.357	83.7	Tebing Tinggi	7	154
12	Palembang	37.40	1.340	3,847.0	Palembang	16	0
13	Prabumulih	42.16	0.130	326.8	Prabumulih	6	12
14	Pagar Alam	57.91	0.115	201.1	Pagar Alam	5	0
15	Lubuklinggau	41.98	0.175	443.2	Lubuklinggau	8	0
Total		8,701.74	7.223	About 59		217	2,781

(Source: Sumatra Selatan Dalam Angka 2010)

From this situation of administrative division and local populations, some densely regions have been found with many sub-districts and villages; meanwhile some remote regions i.e. Pagar

Alam and Lubuk Linggan have only a few sub-districts and almost no villages. This substantial disparity situation among localities could be basically caused by the inferiority of transportation means among these localities in the region.

This railway line between Lahat-Kertapati has 18 stations, namely Lahat, Sukacinta, Banjar, Muara Enim, Muara Gula, Ujan Mas, Gunung Megang, Belimbing, Niru, Penimur, K5, Prabumulih, Lembak, Karang Endah, Gelumbang, Serdang, Payakabung, Simpang and Kertapati. In fact, for passenger transportation, the passenger train generally stops at 6 stations only, which are Lahat, Banjar, Muara Enim, Prabumulih, Lembak and Kertapati., Besides, in comparison to more than 20 coal trains per day, the number of passenger trains has been limited to 4 trains per day from one direction.

Other 12 stations are basically used for temporary stops for waiting trains coming from another direction on a single track. This situation has caused sometimes long waiting times and substantial delays in departures as well as arrivals at both ends, sometimes up to some hours. In the future, if the expansion of double tracks for this line could be made, it will, therefore, definitely enhance the accessibility for local inhabitants, not only between localities but also to the capital city of Palembang as well as various tourist places in this province.

As for this purpose, PT. KAI has recently started the renovation of Kertapati Station in Palembang, the venue for SEA Games 26 in 2011, but the services for passengers have been still found in a very bad situation such as difficulties in purchasing train-tickets, non-comfortably in very crowded and old-fashioned trains for long trips. However, the situation of very crowded passengers implies the good business for this railway line.

Kertapati station in renovation

Its newly constructed platforms

Brick houses in project area

Farmlands along railway

[Pic. 9-2-1] Kertapati Station and Areas along Railway

In fact, this railway line is found passing through 3 major regions, Lahat, Muara Enim and Palembang, and about 60 villages of this province as follows:

[Table 9-2-2] Main Villages Along Railway Lahat - Kertapati

No	Section	Region	Village	Main VillageNames *
1	Lahat - Sukacinta	Lahat	12+	Agglomeration
2	Sukacinta - Banjar	Lahat	10	M. Temiang, Gunung Agung, Ilak Pandan
3	Banjar - Muara Enim	Lahat	6	Merapi, Gunung Kembang, Prabu Menang, Karang Raja, Pasarll
4	Muara Enim - M. Gula*	Muara Enim	7	Agglomeration
5	M.Gula - Ujan Mas*	Muara Enim	1	Small unit
6	Ujan Mas - Gunung Megang*	Muara Enim	3	Ujan Masa Lama, U. M. Baru, Penang Giran
7	Gunung Megang - Belimbing*	Muara Enim	7	Gunung Megano Dalam, G. M. Luar, Lubuk Mumb, Perjito, Tanjung Terang, Tanjung, Dar Kasih
8	Belimbing - Niru *	Muara Enim	4	Cinta Kasih, Belimbing, Buling, Muara Niru
9	Niru - Penimur *	Muara Enim	2	Kuripan, Gunung Raja
10	Penimur - K5 *	Prabumulih	4	Gunung Kemang, Galung, Wunosari, Pasar Prabu
11	K5 - Prabumulih *	Prabumulih	2	Prabum., Majasar
12	Prabumulih - Lembak	Prabumulih	8	Karang Raja, Gunung Ibul Bara, Cambai, Muara Sungai, Taous, Sindur, Pankul, Lembak
13	Lembak - Karang Endah	Muara Enim	3	Kemang, Kar. Endah Selatan, Karang Endah
14	Karang Endah - Gelumbang	Muara Enim	3	Sigam, Gelumbang, Bitis
15	Gelumbang - Serdang	Muara Enim	2	Gelumbang, Putak
16	Serdang - Payakabung	Ogan IÌr	1	Suak Batok
17	Payakabung - Simpang	Ogan IÌr	4	Lorok, Parit, Purnajaya, Parit
18	Simpang - Kertapati	Palembang	4	Karya Jaya, Agglomeration

* Village names were detected on Maps of Peta Jalur & Statium REL Kereta API (PT. KAI) and Provinsi Sumatera Selatan (Indo Prima Sarana)

* Shaded area between sections 4 - 11 were completed in land clearance for executing double tracking works

(Source: Study team)

The population in the Project area is mostly found from Malay and Java origins. Apart from Palembang, most people are generally living on small farms of fruits or paddy fields, and small business along the national roads or this railway, particularly in areas nearby big railway stations such as Lahat, Banjar, Muara Enim, Prabumulih and Lembak. Indigenous people could not be seen in the areas of the railway. This would be the same typical socio-economic picture for other rather developed parts in Sumatra Island.

The houses of local people are mostly made of light materials. Brick houses owned by

business owners or rubber plantation owners in the region are found very few. Water from wells is generally used by local people. Only houses along national roads have electric connection. For schooling, there are some sub-districts having local buses for schooling children but most families have to use motorbikes for daily carrying their children.

One of, the main difficulties in daily life in the Project area is the transportation means for inside localities, particularly for people in vicinities to access Palembang for works and businesses. From our firsthand observations, if the railway system in the Project area could be improved for having more passenger trains on daily schedules and more branching railways in the vicinities, the regional socio-economy in this province will be largely developed.

However, along with the Project implementation, even in case of single or double tracks, the number of trains will be significantly increased. The safety problem at train crossings with roads as well as village passages across the railway and the presently manual system for controlling tracks for trains passing stations, therefore, have to be more secured basically. At present, for these critical operations the manually operated system in based on one-person control through 3 shifts per day with radio communications means.

The results of social scooping in the Project Area and proposed mitigation measures are shown in [Table 9-2-3].

[Table 9-2-3] Results of Social Scoping and Proposed Mitigation Measures

No	Subject	Description of Influence	Influence At Each Phase	Influence Level	Proposed Mitigation Measures
1	Resettlement	By starting resettlement works people in resettlement areas will be basically affected.	1st Stage: Nil 2nd Stage: Yes 3rd Stage: Yes	 B A	● Resettlement assistance ● Good preparation of relocation sites ● Proper compensation
2	Livelihood	Livehood and incomes of resettlement people will be affected.	1st Stage: Nil 2nd Stage: Yes 3rd Stage: Yes	 B A	● Income generation measures i.e. job training programs ● Proper compensation
3	Cultural Heritage	No existence of considerable cultural heritages in Project Area.	1st Stage: Nil 2nd Stage: Nil 3rd Stage: Nil		
4	Landscape	No existence of considerable social views in Project Area.	1st Stage: Nil 2nd Stage: Nil 3rd Stage: Nil		
5	Minorities Aborigines	No existence of Minorities/ Indeneous Groups in Project Area.	1st Stage: Nil 2nd Stage: Nil 3rd Stage: Nil		
6	Labor Condition	Jobs and incomes of resettlement people will be affected.	1st Stage: Nil 2nd Stage: Yes 3rd Stage: Yes	 B B	● Offering project jobs ● Job trainings for local people
7	Hygiene (Dust, Waste, Sewage)	With increase of trains, hygienic environment in stations and railway areas will be affected.	1st Stage: Yes 2nd Stage: Yes 3rd Stage: Yes	B B B	Campaigns for cleaning stations and railway areas
8	Safety at Crossings	With increase of daily trains, safety risks at crossings/passages are considered.	1st Stage: Yes 2nd Stage: Yes 3rd Stage: Yes	B B B	● Reinforcement of warning control system ● Social education

Note A: Influence at High Level

B: Influence at Minor Level

C: No clear detection of influence at present; but influences may be detected after further investigation

No mark: No influence

(Source: Study team)

Regarding Palembang, the historical provincial capital laying by the Musi River at 80km upstream, was firstly developed as an important ocean commerce port of the world over 1,300 years ago. It was once made as the capital of the Sriwijaya Empire, which scholars have called “Phoenicia of the East”. Lately it has turned up to be a famous maritime base for exporting oil,

coal and lumber from Sumatra to the world. The city has the historical cultural vestiges of a Chinese Buddhist pilgrim when making a landing here on his way to India in 671 but gradually passed through various dominance conflicts. This city was finally made up as an Islamic city with the symbolic Masjid Raya Grand Mosque situated by the entrance of Ampera Bridge which was constructed by Japan as war reparations over the Musi River in 1960's. The major socio-economic and cultural features of Palembang are as follows:

[Table 9-2-4] Demographic Features of Palembang City

City Creation	14 August 1950; 11 Districts, 4 Towns, 160 Sub-districts and 2,756 Villages/ Wards
Area (Population)	374km^2 (Approx. 1.3 million inhabitants)
Races (Language)	Komering, Ogan, Pasemah and Palembang (Palembang)
Religions	Islam 95.3%, Christian 3.6%, Hindu 0.7% and Buddhist 0.4%
Traditional Items	Language: Palembang Songs: Dek Sangke, Kembanglah, Bungo Dances: Tari Gending Sriwijaya, TariTanggai, Tari Bekhusek
Produces	Lumber, Cofffee, Pepper, Coconut
Industries	Fertilizer, Cement, Plywood
Mines	Oil, Tin, Lead

(Source: Atlas Lengkap Indonesia & Dunia)

Meanwhile, the areas around Kertapati station, which were public lands in the past, but along with the development of Sumatra and railway system, had been lately made as PT. KAI controlled lands. These areas were used as common grave lands in the past but lately used as temporary living lands for PT. KAI workers and immigrants for Sumatra development works. However, the temporary residents and their families have continued to live in these areas, gradually making a city development for these areas. The 20ha area annexed to Kertapati station, which is subjected to constructions of new coal stockyard and coal loading conveyor, is presently covered by Simpang Sungki Road and still having many graves, where about 100 shops and 700 houses are found, making the busiest business area around Kertapati station.. This area has a mosque constructed in 1993 but no schools and appropriate clinics.

9.2.3. Preparations for LARAP

(1) Comparisons on Results from Preliminary Surveys

For the implementation of double tracking works for this railway in the future, the

preparation of a LARAP (Land Acquisition and Resettlement Action Plan) for households etc. established in the subjected land areas is considered necessary. The preliminary field surveys inform the presence of occupants in the government owned land along the railway line between Lahat-Kertapat. No matter the occupants are legal or illegal, LARAP preparation will be necessary if the number of involuntary resettlement of the occupants is expected to be substancial. A confirmation survey by train on this line was carried out at the First JICA Study Mission and the findings are as follows:

- In the section between Muara Enim-Prabumulih X6, the land clearance for double-tracking works was totally completed in 2011. According to PT. KAI officials in Prabumulih and Muara Enim stations, about 200 households were subjected to resettlement in this section and the resettlement proceedings were smoothly carried out with only cash payment negotiations on buildings etc. because of land areas belonged to PT. KAI managed lands. According to PT. KAI officer in charge of resettlement works, the compensation amount used for this resettlement (for about 70Km with about 200 households) was around 8 billion Rp.
- As the on-going double tracking works have been carried out on the northern side, the future double tracking works of this line, in principle, will be also on the northern side, as for the subjected resettlement works. The number of resettlement units for double tracking works by section is shown in the following [Table 9-2-5].

[Table 9-2-5] Estimated Numbers of Resettlement Units for Double Tracking Works by Section

Railway Section	Units for Resettlement	Difficulty Level for Clearance
1. Kertapati - Simpang	About 5	Low
2. Simpang - Payakabung	About 1	Low
3. Payakabung - Gelumbang	About 5	Low
4. Gelumbang - Kerang Endah	About 10	Medium
5. Kerang Endah - Lembak	About 15	Medium
6. Lembak - Prabumulih	About 200	High
7. Prabumulih - K5	Clearance Completed	None
8. K5 - Penimur - Niru	Clearance Completed	None
9. Niru - Blimbing	Clearance Completed	None
10. Blimbing - Gunung Megang	Clearance Completed	None
11. Gunung Megang - Penganggiran	Clearance Completed	None
12. Peganggiran - Ujan Mas	Clearance Completed	None
13. Ujan Mas - Muara Gula	Clearance Completed	None
14. Muara Gula - Muara Enim	Clearance Completed	None
15. Muara Enim - Banjarsari	About 100	High
16. Banjarsari - Sukacinta	About 30	Medium
Total Units for Clearance (Sukacinta - Kertapati)	About 366 units	
17. Sukacinta - Lahat	About 70	No Clearance
Total Units (Kertapati - Lahat)	About 436 Unita	

(Source: Study team)

- In a project in Indonesia which requires land acquisition and/or resettlement of household, preparation of LARAP is considered necessary in case both land acquisiton and resettlement of household are required, while RAP is sufficient in case for resettlement of household alone.
- Based on preliminary survey results, the 2 sections of Lembak-Prabumulih (about 200 units) and Miuraenim-Banjarsari (about 100 units) will be the most important sections for carrying out resettlement works. However, due to not being subjected to coal transportation, the section of Sukacinta-Lahat is not subjected to double tracking works for carrying out resettlement (70 units).
- The total resettlement units along the railway from Sukacinta to Kertapati will be reduced to about 366 units. The 2 sections, Banjarsari-Miuraenim and Prabumulih-Lembak, will be the most crucial sections for resettlement works.

(2) Results from Hearing Surveys

Concerning the regulations and formalities in case of proceeding resettlement works, interviews to concerned officials of DGR in Jakarta and PT. KAI in South Sumatra (Palembang and Muara Enim), and the following information was obtained.

- According to these officials, the general proceedings for resettlement of PAP will be made in three basic steps as follows:
  1) Notices to affected localities
  2) Organization of stakeholders meetings
  3) Starting compensation negotiations
- For making notices to affected localities, with the authorization and collaboration of implementing agency, the contractor will make notices to affected localities by signboards and distribution of leaflets describing outlines of the project works and affected areas
- In collaboration with the local government, the implementing agency, will organize the stakeholders meetings (by generally three times) for explaining the project works and areas, the affected households, measures for proceeding resettlement and getting opinions from local people for discussions towards consent for this matter..
- Compensation negotiations will be made on house-by house basis. Cash compensation is the general application.
- With references to PT. KAI information and related legal materials for implementing the resettlement works of section Muara Enim - Prabumulih X6, the TOR for LARAP preparation was prepared.

(3) Analysis of Social Survey Results

In order to collect the detailed information and data for the preparation of LARAP in case of making double tracks in the future, the attached survey questionnaires for Village Social Survey and PAP Household Census Survey as well as the translation versions into Indonesian language were prepared. The content of surveys is based on the JICA Specifications for Environmental and Social Considerations.

The social survey was entrusted to PUSKOPKA Team, which is an affiliate consulting company under the surveillance of Humas (Public Relations Section) of PT. PESERO, Division Regional III of PT. KAI. The scope of survey consists of socio-economic surveys of 50 villages and 100 households in the areas along the railway from Sukacinta to Kertapati and the areas annexed to Kertapati station for finalizing in a report.

A Social Survey Group at Work

Field of Social Surveys

Meeting with People in Kertapati Area

PT. KAI Officers and Study Team in Meeting

[Pic. 9-2-2] Social Survey and Meeting with Local People in Kertapati Areas

The survey team of PERSERO had conducted the surveys of 60 villages and 137 households. After analysis of the survey results, the “Final Report-Survey Works on Socio-Economic Impacts And Resettlement Matter of the Project” was compiled accordingly. According to this report, the number of surveyed villages and households by section are shown in the following [Table 9-2-6].

[Table 9-2-6] Number of Surveyed Villages and Households by Section

Section	Surveyed Vilages	Surveyed HH
1. Sukacinta - Banjar Sari	14	18
2. Banjar Sari – Muara Enim	15	20
3. Prabumulih – Lembak	12	31
4. Lembak - Karang Endah	5	5
5. Karang Endah - -Gelumbang	5	10
6. Gelumbang – Sendang	2	2
7. Sendang - PayungKudung	1	3
8, Payung Kudung - Simpang	1	3
9. Simpang – Kertapati	3	24
10. 20ha Area (A B C D Areas)	2	15
11. Area nearby Musi River	0	6
Total	60	137

(Source: Study team)

From the survey results on socio-economic impacts of this report, the additional hearing surveys to local inhabitants were carried out. The problems faced by villages as well as their requests for the Project implementation are shown in the following [Table 9-2-7].

[Table 9-2-7] Problems and Requests from Surveyed Villages

	Problems	Requests
LAHAT : Sukacinta, Merapi, Banjar Sara, Arahan, Gunung Kembang, Bira Pulan, Ulak Pardan, Muara, Telatan, Muara Mau, Tanjung Pina	● Umemployment ● Low Family Income ● Coservation of Grave (Puyang Depati Putih)	● Job Creation ● Life Improvement ● Conservation
MUARA ENIM : Muara Enim, Tungkai, Lembak, Talung Tali Sigam1, Gelumbang, Gelumbang Ling III, Karang Endah, Karang Endak Utara,	● Price Unstabikity of Rubber etc ● Market Unstability of Produces ● Thief of Agri.Produces	● Stability measures ● Thief Prevention ● Income Generation
PRABUMULIH : Pasar1, Sindur, Pankung V, Mangga Besar, Sukajadi, Karang Reja, Gurung Ibul, Cambai	● Price Unstabikity of Rubber etc、 ● Lack of Market for Produces ● Lack of Irrigation	● Market for Produces ● Construction of Irrigation ● Income Generation Program
OGAN IIR : Sei Rambutan	● Unemployment, Low Income ● Lack of Water for Domestic and Agriculture ● Lack of Social Infrastructures	● Skill Training ● FindingWater Source ● Making Social Infrastructures
KERTAPATI : Simpang, Kemang Agung, Organ Baru, Rambutan	● Lack of Drinking Water ● Isolation by Water Logging ● Safety for Crossing Railway ● Noise, Vibration, Air Pollution ● Unhigienic Living Environment	● Finding Water Source ● Water Logging ● Safety Measures ● Prevention of Noise, Vibration, Air Pollution ● Good Living Environment

(Source: Study team)

Besides, apart from the data of socio-economic and living conditions (family-structure, inhabiting years, housing conditions, occupations, revenues, living conditions etc.), the report showed also the opinions of people on the Project.implementation.

Particularly for the areas of dense populations around Kertapati station, subjected to the new constructions of coal stockyard and belt conveyor for loading coal to barges, a meeting session with local people for hearing their voices was held with the collaboration of PT. KAI officials on Jan. 27, 2012. The 5 following items are the most concerns:

- Sufficient Time for Relocation After Resettlement Notice
- Proper Compensation
- Nearby Places for Relocation
- Implementation of Assistance Programss for Livelihod Recovery After Relocation

- Construction of Social Infrastructures in Relocation Places

(4) Applications and Works for Each Stage of Project Implementation

As pre-conditions, the Project implementation will be carried out in each 3 Stages. In the 1st Stage, as the existing single track will be used but only the related facilities will be improved for expanding the transportation capacity, the resettlement works, therefore, will not be carried out. However, along with the increase of fr8 and passenger trains in the future, the following applications in three stages have been subjected to implementation plan.

① Applications and Works in the 1st Stage:

- Additional transportation capacity target from the present: 2.5MTPA
- Additional trains per day: 8 round trips per day
- Train composition: 1 Locomotive + 25 Fr8 wagons (container type)
- Total train length: 395m
- Expansion of effective length: From present effective length to be expanded, but not so long as for train length of 60 wagons in the future
- Average train travel speed: 65km/hr
- Expansion of coal stockyard capacity at Sukacinta
- Expansion of PT. BAU coal stockyard capacity at Kertapati station

② Applications and Works in the 2nd Stage:

- Additional transportation capacity target from the present: 5.0MTPA
- Additional trains per day: 10 round trips per day
- Train composition: 1 Locomotives + 40 Fr8 wagons (container type)
- Total train length: 615m
- Average train travel speed: 65km/hr
- Expansion of effective length: From present effective length to be expanded, but not so long as for train length of 60 wagons in the future
- Double tracking works for Section Muara Enim-Prabumulih X6
- Construction of 2 signaling stations
- Construction of a 700m branch line from Merapi to Sukacinta soal stockyard
- Renovation works for container yard in Kertapati station

③ Applications and Works in the 3rd Stage:

- Additional transportation capacity target from the present: 20.0MTPA
- Additional trains per day: 12 round trips per day
- Train composition: 2 Locomotives + 60 Fr8 wagons
- Total train length: 930m

- Average train travel speed: 65km/hr
- Introduction of electric signal system
- Construction of a belt conveyor system to barges from the 20ha land area annexted to Kertapati station based on PT. KAI construction plan

In the 3rd Stage, along with the whole double tracking works, the construction of new coal stockyard as well as belt conveyor in the areas surrounding Kertapati station for loading coal on barges will require a large scaled resettlement of inhabitants in these areas. As proceedings required for JICA study, LARAP will be prepared.

However, at the moment, as the SPC for project implementation is not formulated as yet, The organizations relating to resettlement execution could not be made for confirming the clearance limits as well as the exact number of affected households for land acquisition at each village. Stakeholders meetings, compensation costs as well as compensation payment proceedings and schedules for related programs could not be planned. This means the basic factors for LARAP preparation are not ready. Therefore, in order to make this preparation for the next step of the implementation, the T. O. R. for LARAP Preparation was made.