CHAPTER 5. MASTER PLAN

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5.1 Basic Principles

Railway development in JABOTABEK with the goal of assuming the role of the principal means of urban transportation requires the passing of two major upheavals, namely, the establishment of a full pledged, modern organization of highly disciplined personnel, and the transformation of the generally road oriented urban transportation demand market into a railway oriented one. In consideration of these, and also since:

1) A transition period of sufficient length to allow for the development of all basic conditions required for the effecting of a full scale development
2) To implement during the transition period facility development programs designed to meet the maximum future demand forecast on the basis of transportation engineering analysis of market conditions, without introducing any presumed factor of basic deviation from the foreseeable future situations.
3) To implement various other programs during the earlier half of the transition period, for the following purposes:
   i) To fully establish compatible personnel organization and operation management systems to the modernized facility system, to provide the base for subsequent expansion.
   ii) To fully establish the personnel training institution and the reliable source of personnel supply.
4) To make at least 2 major reviews of the facility development program during its earlier stage of implementation on the following basis:
   i) To adjust the actual situations and up-dated plans of personnel development after a time period of personnel program implementation, when more objective and realistic view of the future development of personnel supply situation can be held.
   ii) To adjust the requirements of the long term developments beyond the transition period.
   iii) To promote through long term major compaign public interest and understanding towards the necessity, features and safety requirements of the modern railway operation, and to establish social norms with regards to behaviours connected to railway facilities and operation.
   iv) To achieve complete views of future development tendencies in all urban transportation related sectors and to establish the long term urban railway development strategy and plan.
5) For the planning and development of a well organized and controlled operation management system, or for the establishment of the personnel training institutions and source of personnel supply, both to be accomplished within the first half of the transition period, 10 years at minimum will be required. A 20 year time span is therefore required for the transition period.

Since the planning period of this study covers the same time span as required for the above transition period, the output AD 2000 master plan of this study will be established in line with the concept of item 2) above, as the facility development plan for the 20-year transition period, to provide the basis for the subsequent period of full scale development. It's contents will have emphasis placed heavily on the engineering works.

Requirements 3) and 4) above will be the prerequisite to its use.

* Area of planning ranges between general matters such as railway personnel organization system chart and regulations to details including procedures, standards, and manuals for individual line and job (such as identification of content and scope of job assignment, stipulation on allocation of work, inspection and supervision responsibilities, specification of detailed procedure, process and methods of work performance, reporting, recording, and transferring, requirement for tolls, time, place, uniform, etc.) as well as methods of implementation and interim provisions.

5.2 Engineering Considerations

5.2.1 General

In order to upgrade the JABOTABEK railway system to contribute as much as possible to the share of urban-suburban transportation, projects required to be implemented are many, both for the escalation of railway transportation capacity and the conformity of the urban conditions with the facilities and operation of the developed urban railway system.

These can be grossly classified by main objectives into 3 categories as shown in Table 5.2.1.

Table 5.2.1 Types of Necessary Engineering Project by Objectives of Implementation

Category	Main Objectives	Type of Project
I	–Improvement of railway transportation capacity	–New line construction –Electrification –Operation system development –Upgrading road crossing installation –Right of Way clearance
II	–Creation of demand	–Track elevation, partial or continuous –Construction and development of station passenger facilities and station front areas –New line construction
III	–Enhancing compatibility with urban amenity requirements	–Continuous track elevation –Passenger terminal and station front facility development

Each type of engineering project is closely connected to and often overlap with others in scope

The following is a summary of their general consideration from urban transportation point of view, which constitute part of the basis of judgement in establishing the priorities of individual projects.

(1) New Airport Line

The development of a new airport connection line within the northern corridor of D.K.I. will contribute largely to the urban development and transportation conditions in this area. However, the relative benefit between its construction and the introduction of an airport bus service system together with upgrading of the existing Tangerang Line requires to be studied from the view points of land problems within urban built-up areas, the engineering and other considerations.

(2) Passenger Service Operation on the Contemplated Cibinong New Freight Line

In case of this freight line being constructed, shared use of the facility for passenger service operation is most desirable to facilitate means of passenger transportation which is in short supply along its line.

(3) Continuous elevation of the Central, West and East City Lines

Due to the rapid growth of road traffic, road crossings have generally become a mojor problem for safe and efficient operation of trains. Where traffic situation is so severe as to warrant earlier implementation of grade seperation before time matures for continuous elevation of the relevant track section, local grade separation should be implemented on individual basis with future ease of extention taking into consideration.

For the Western Line along which grade separation of road crossings has considerably been made, dissolution of the remaining major road crossings should be proceeded on by local grade separation on individual basis.

For the Central and Eastern Lines, continuous track elevation should be considered not merely from traffic operation point of view but also based on comprehensive judgement of its contribution in optimising landuse in the urban central business and administration zones, as well as its connection with passenger terminal facility development plans for major railway stations within the railway section.

(4) Circular Operation

Circular operation of the city lines in itself may not have much effect in diverting short distance intra-city passengers from the road to the railway. However, by facilitating passengers of the radial suburban lines with easier choice of railway trip origin and destination, it has the potential of enhancing the demand of railway use, and of increasing the flexibility of the railway operation.

(5) Other Considerations

In parallel with the escalation of the railway facility capacity, it is essential that due consideration be made regarding the following points:

1) Areas within walking distance from stations make up only a limited market of railway transportation demand, which alone does not justify the development of a railway system capable of catering to a substantial share of the urban transportation demand. lopment of the railway facility system should therefore be complemented by the development of feeder transport service facilities, including the station front area.

2) Implementation of the facility development program will directly upgrade the physical capacity of the railway system. This however requires a compatible personnel and operation management system in order to become functionable. Due effort should therefore be made in establishing the program of personnel training and mobilization as well as the

system of organization and management before the personnel problem developes into a major holdback to the railway operation and a denying factor to the operational feasibility of further development.

5.2.2 Project components and phase of implementation

In establishing the Master Plan for the year AD 2000, studies of the selection of project components and the sequence of implementation are made on the basis of the following concepts.

In this study full consideration is given to the plan so as to enable the master plan to be linked to the perspective image of the railway beyond the year 2000 without any significant change of its system.

1) Conceptual flow chart

Fig. 5.2.1 presents a conceptual flow chart indicating the process of study from the forecast of the future market of demand to the determination of engineering project requirements in all aspects of the railway facility system.

2) Time of Implementation

The total process of the AD 2000 Master Plan is conceptually divided by aims of implementation into the following 3 phase, at each of which investiment will be carried out by following characterizations.

i) Phase 1.

Projects aiming at improvement mainly of the existing lines with minimum requirement of improvement to comply with immediate needs to make those lines display their fullest function as the railway traffic system and with minimum requirement of strengthening in their transport capacity at the first priority.

Those projects include the following items:

a. Renewal of track and switches
b. Improvement of crossings
c. Improvement of rolling stock depot
d. Improvement of workshop
e. Doubling of track
f. Electrification
g. Installation of automatic signal
h. Improvement of station passenger facilities
i. Establishment of station front area
j. Additional supply of rolling stock

} Urgent items included in each of those projects are to be selected in Phase 1

ii) Phase 2.

Projects aiming at improvement, subsequent to the preceding stage or partly with continuity from the preceding stage, by strengthening of the transport capacity in both quantity and quality of the existing lines to be required to make the urban railway system fully display its advantage and function with the objective to lubricate the urban transit likely to increase it future demand significantly, thus contributing toward further growth of cities.

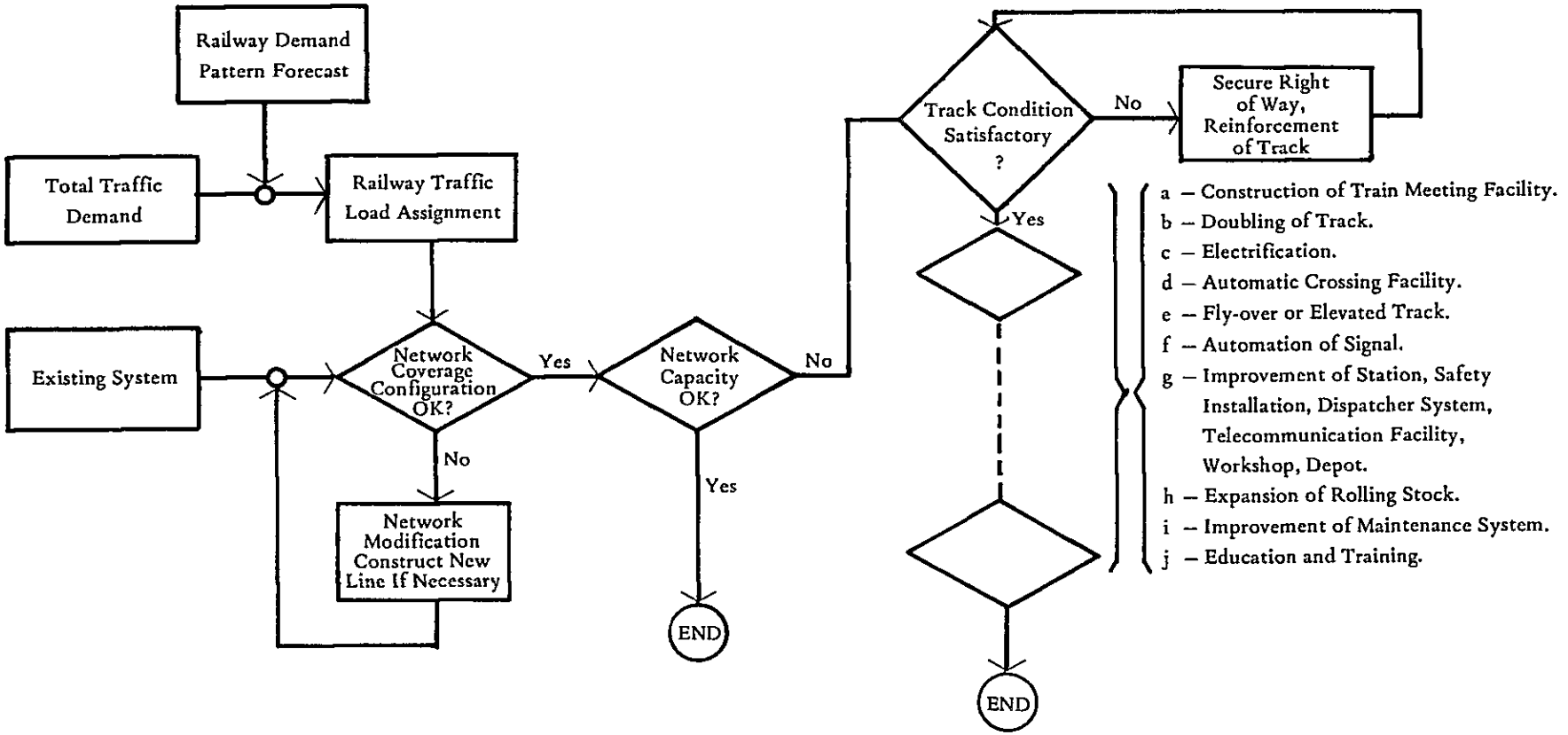

Fig. 5.2.1 Flow Chart of Increasing Transport Capacity

JABOTABEK Area Railway Transportation Study

Those projects include the following items:

a. Doubling of track
b. Electrification
c. Installation of automatic signal & introduction of ATS
d. Continuous track elevation
e. Station facility improvement
f. Expansion of station front area
g. Additional supplies of rolling stock
h. Additional supplies of rolling stock

iii) Phase 3.

Construction of new stations on the existing lines to cope with traffic demand increase creation, Construction of New Airport Line passenger station facilities on Cibinong freight line and passenger line connected to the fright line and other projects of improvement incidental to those construction works.

Those projects include the following items:

a. New station construction
b. New line construction
c. Rolling stock depot expansion
d. Rolling stock workship expansion
e. Additional supplies of rolling stock

Upon completion of the projects to the end of the Stage 3, it is expected that the railway system in the JABOTABEIC area will be operated at high frequency and speed all over the service territory and, coupled with improved station facilities and station front area, will be renewed entirely as the attractive transport facility to passengers.

In the perspective view after the year 2000, it is further expected that the future urban growth will be contributed greatly by the increased role of the railway as the backbone in the urban traffice, owing to a series of improvement and expansion projects, along with promotional activities for urban re-development and high utilization of land space by construction of new lines, quadrupling of track and partially by employment of the new traffic system.

3) Project components

The outline of each project including item, purpose and content under the Master Plan is as summarized in Table 5.2.2.

The project dealing with the grade separation crossing is detailed in Item 5.2.3 Grade Separation Crossing plan of the city Lines.

Table 5.2.2 Description of the Master Plan

	Project	Purpose of Project Execution	Project Outline
Fundamental Improvement for Existing Lines	Renewal of Track and Switches Project Nos.1~4 in Table	a) Renewal of all tracks to enable the City Lines to operate at 60km/h and the train operation outside the city area at 100 km/h b) The tracks which are proposed to be renewed under the Intermediate Program will be excluded from the proposed Plan.	(1) Contents: a) Replacement of deteriorated rails with new R14 type. b) Replenish ballast to maintain an adequate depth. c) Replacement of worn out sleepers. d) Improvement of roadbed drainage to hold down mud pumping. e) Replacement of roadbed mud where it is necessary. f) Readjustment of overhead wire in parallel with track renewal Replacement of old switching devices with new ones. (2) Sections to be covered: 1) The Bekasi Line: Jatinegara-Bekasi Stations The Central Line: Manggarai-Bogor Stations The Merak Line: Tanah Abang-Serpong Stations* *Sleepers are to be replaced at the time of the double-tracking construction The Tangerang Line: Duri-Tangerang Stations 2) Switches of the City Lines are to be replaced.
	Improvement of Crossings (Project Nos.1~4 and 7)	a) To enable safe and smooth train operations. b) To shorten the barrier time at crossings for the benefit of road traffic.	(1) Contents: a) Installation of crossing signals and automatic crossing gates (or barriers) b) The present asphalt surface will be converted into concrete crossing. (2) All crossings which require improvement will be undertaken by the Plan. However, the 42 crossings planned to be taken up under the Intermediate Program will be excluded from the Plan.
	Installation of Fences (Project Nos.1~4)	a) To block the right of way completely from people stepping in. b) To protect people from walking across the right of way other than assigned passage at the crossing	Fences will be installed at the boundary of the right of way at following places outside the City area and where fencing was not under-taken by the Intermediate Program: a) Those places where (i) Squatters have been eliminated and some measures are required to protect them from re-occupying the land again; (ii) There is a fair chance of squatters settling down in the future b) Both sides of crossing along the track to protect pedestrians and motorcyclists completely from crossing railway while the barrier is closed.
	5. Improvement Maggarai Workshop	a) Maintenance of diesel railcars (DC) and electric railcars (EC)	(I) Basic concept for improvement plan a) The inspection service includes both general overhaul and semi-overhaul for electric and diesel railcars and passenger cars. b) Priority will be given to improvement of electric railcar inspection facilities. However, improvement will be made, to the possible extent, for the inspection facilities of diesel railcars and passenger cars. c) Improvement will be made on a step-by step basis by precise grasp of increasing number of car assignment. (2) Major improvement items 1 Establishment of trainset inspection shop 2 Rehabilitation of test run track 3 Additional construction of carbody repair shop 4 New construction of painting shop 5 Purchase of electric railcar test and inspection apparatus (3) Others Review for improvement of material control system
	6. Improvement of Rolling Stock Depot at Jakarta Kota	a) To supplement the Bukitduri depot because of the insufficient capacity to store ECs as the number increases. b) Some electric railcars are stored in Jakarta Kota depot as a supplementary depot.	a) Storage sidings of ECs and a daily inspection shed are proposed to be newly constructed at the Jakarta Kota depot.

	Project	Purpose of Project Execution	Project Outline
Fundamental Improvement for Existing Lines	8. Additional Supplies of Rolling Stock	a) Additional supplies of electric railcars to cope with increasing demand on the electrified railway sections b) Additional supplies of diesel railcars to cope with increasing demand during transitional period berore electrification	1. Electric railcars a) In the view of importance in standardization of rolling stock from advantages in operation, maintenance and operating cost reduction, no significant modification will be made to the railcar technical specifications. b) Car doors will be corrected as partial future design alteration to be matched with elevation of platform elevation. c) It is advisable that electric railcars will be assembled locally on a gradual step-by-step basis, starting from car body fabrication as the first step in the near future. 2. Diesel railcar a) To operate diesel railcars to serve transitional demand increase before completion of electrification on Bekasi, Merak and Tangerang Lines b) To transfer diesel railcars to other lines after completion of electrification c) To make up each diesel train-set with 8 cars at maximum
Project execution items combined with electrification, doubling of track and track elevation	Installation of Automatic signal	a) To strengthen the security against the scheduled high speed and high frequency operations of the trains	a) Automatic signaling facilities will be installed in equal paces with electrification, doubling of track and track elevation work. b) Installation of automatic signal, as follows: 1 Block system The system will be of automatic block type by sensing of trains through the track circuit. Signal will be installed at each block section 2 Signal Colourlight electric signal 3 Interlocking system The relay interlocking system will be installed to operate both switch machine and signal electrically for overall control of train proceeding 4 High-voltage power distribution transformer and switch board will be installed on 6 KV distribution lines and their connected substations.
	Improvement of Station Passenger Facilities	a) The station facilities will be made more convenient, safe and confortable in order to induce more passengers to railways and also the efficiency of the station operations are expected to increase.	a) The main buildings of the terminal stations for long distance trains and of other main stations will be renovated or rebuilt. Part of the building space may be leased to outsiders as offices or shops or even a hotel business may be conducted. This kind of management would also contribute to diversify PJKA's revenues b) The middle-size stations with deteriorated main buildings will also be looked into under this Plan item. Total of 13 stations, including the main station referred in item a), will be rebuilt or renovated c) Platforms will be improved as follows for the of convenience and safety of passengers; i) Platforms for commuter trains will be raised to 95 cm from the ground and other platforms to 57 cm ii) More than a 8 m width will be secured for island platforms and more than 4 m for side platforms d) Construction of passenger sheds e) Construction of overbridges to connect between platforms f) Improvement of ticketing and gate facilities g) Construction of improvement of waiting rooms for passengers for long haul trains h) For certain stations the above-mentioned constructions works will be implemented together with the doubling of track (27 stations) and elevation of track (8 stations) i) Construction of free passage across the station. This will serve to develop the area by linking both side of the station and also offers a convenience to the residents
	Establishemnt of Station Front Area	a) To strangthen junction as a connecting point of railway and road b) To pave the way for future development of station influence area and station front which will be essential to induce more passengers to the railway	a) All the station front's in JABOTABEK Area will be developed step by step. In implementing the program, the basic idea of development plan, demarcation of station front, priority of stations, implementation schedule etc. will have to be determined. The facilities should at least include; (i) passenger car access (ii) bus terminal/stop (iii)taxi stand (iv) parking space (v) sidewalk and space for pedestrians (vi) other necessary facilities

		Project Items	Purpose of Project Execution	Project Outline
Expansion of traffic capacity	Central Line	Installation of ATS (Automatic Train Stop)	a) To grade up the security to cope with the high speed and frequency train operations.	a) Install on all the railway lines in JABOTABEK area a facility composed of wayside coils, control relays and control cables b) Install in the driver's cabin of every EC operated in JABOTABEK Area a facility composed of pick-up coil, alarm device and brake control device
		9. Track Elevation between Kota and Manggarai	(Refer to Item 5.2.3 'Grade-Separation Plan of the City Lines.')	a) Same as stated left. b) Expansion of station facilities and its front area, installation of automatic signal and new installation of ATS in parallel with elevation of track c) Temporary transfer and removal of existing overhead wire and new installation of overhead wire above the elevated track d) Abolition of crossing path
		10. Grade Separated Crossing in Manggarai Station	a) To solve the problem of level crossing between the Central Line and Western Line at the station.	a) Elevation of track of the Central Line in the station compound of Manggarai. However, this track elevation will be implemented at the same time in case the Central Line track is going to be elevated all the way between Jakarta Kota and Manggarai stations b) In case, the train operation route is Alternative A (i.e. all trains from Depok flow into the Western Line at Manggarai), the elevation of track in the Manggarai station compound will not take place
		11. Additional Track (Manggarai–Depok)	a) To increase track capacity to cope with the increase of passenger traffic.	a) Double tracking for the distance of 23 km between Manggarai and Depok Stations b) Installation of automatic signals and ATS and improvement of passenger facilities at 7 stations will be also carried out c) Installation of catenaries and 6 KV distribution lines. d) Establish a base for the remote supervisory control system at each substations e) Increase circuit breakers for feeder and silicon rectifiers and newly install transformers for power distribution in substations
		12. Additional Track (Depok–Bogor)	a) To increase track capacity to cope with the passenger traffic increase.	a) Double tracking for the distance of 22 km between Depok and Bogor b) Installation of automatic signals and ATS c) Improvement of passenger facilities at 4 stations d) Increase circuit breakers for feeder and sillicon rectifiers at substations as well as newly installing transformers for power distribution e) Installation of catenaries and 6 KV distribution line
		13. Track Elevation of Eastern Line (Kota ~ Gang Sentiong)	(Refer to Item 5.2.3. 'Grade Separation Crossing Plan for Urban Lines.')	a) Same as left b) Expansion of station facilities and station front area, automation of signalling and new installation of ATS in parallel with track elevation c) Temporary transfer and removal of existing contact wire and new installation of contact equipment about the elevated track d) Abolition of crossing path
	Eastern Line	14. Installation of Automatic Signal of Eastern Line (Gong Sentiong ~ Jatinegara)	a) To enhance safety of train operation in response to higher speed frequency train operation b) To improve passenger service c) To improve railway function as a point of contact with road	a) Automatic signalling control, improvement of station facilities and station front area and new installation of ATS
		15. Improvement of Station Facilities at Kampung Bandan	a) Abolishment of the switch back operations of the Western Line, thereby solving the problem of level crossing at Kampung Bandan. b) To enchance passenger services by connecting the Western and Eastern Lines.	a) The Western Line will be extended to Tanjungpriuk by abolishing switch back operations at the Kampung Bandan station. b) A short-cut line will be constructed to connect the Eastern and Western Lines at Kampung Bandan. c) The Eastern Line will be extended to Jakarta Kota via the new Kampung Bandan station. d) Other relative facilities of the station including those which serves the passengers to change cars will be also improved.
	Western Line	16. Installation of Automatic Signal and Station Facility Improvement	a) To enhance safety of train operation in response to high speed and frequency train operation b) To improve passenger service c) To improve railway function as a point of contact with road	a) Installation of automatic signal, improvement of track, station facilities and station front area, new installation of ATS and construction of new station b) New and additional installation of high-voltage power distribution facilities at substations and installation of 6 KV distribution line

		Project Items	Purpose of Project Execution	Project Outline
Expansion of traffic capacity	Western Line	17. Installation of Automatic Signal and Station Facility Improvement between kampungbandan and Tanjung Priuk	a) To cope with change of train operation system to result from increased traffic demand b) To improve passenger service and safety of train operation	a) Doubling of track for passengor transport over a length of 0.8 km between Kampung Bandang and Ancol b) Juncture with the Jakarta ~ Tanjung priuk Line (double track) near Ancol Station c) Installation of automatic signal, improvement of track, station facilities and plaza, new installation of ATS and construction of new station d) New and additional installation of high-voltage power distribution facilities at substations and installation of 6 KV distribution line e) Same improvement will be made between Ancol and Rajawali.
		18. Flyovers on Western Line	(Refer to 5.2.3 'Grade Separation Crossing plan for Urban Lines.')	a) Same as left b) Transfer and removal of obstacles to electrification work and improvement after removal
	Other Line	19. Electrification of Bekasi Line (Jatinegara ~ Bekasi)	a) To cope with traffic demand increase b) Efficient operation of rolling stock and formulation of parallel operation diagram c) To take the initial step toward future extension of electrification of the line to Cikampek	a) Electrification of about 15 km section between Bekasi and Jatinegara b) Installation of automatic signal, improvement of station facilities and station front area and construction of new station c) New installation of overhead equipment and 6 KV power distribution line and additional construction of substation
		20. Track Addition and Other Improvements on Merak Line	a) To increase track capacity b) To improve passenger service c) To enhance safety of train operation	About 23 km section between Serpong and Tanahabang will be improved as follows: a) Track will be doubled at the time when the operation diagram will require a headway below 15 minutes. Track will be electrified, at the time of the track being doubled, together with installation of automatic signal new installation of ATS and construction of new stations (8). b) Expansion of station front area, installation of ATS and construction of new stations.
		21. Track Addition and Other Improvements on Tangerang Line	a) To increase track capacity b) To improve passenger service c) To enhance safety of train operation	About 19 km section between Tangerang and Duri will be improved as follows. a) To cope with demand increase, for the time being, by addition (at existing stations) of side track b) Track will be doubled at the time the operation diagram will require a headway below 20 minutes. Doubling of track will be accompanied by electrification, installation of automatic signal and improvement of station facilities (9). c) Establishment of station front area, new installation of ATS and construction of new stations
	Car Depot	22. Establishment of New Electric Rail Car Depot at Depok	a) In order to secure a place to store ECs as their number increases and also as the depots at Bukitduri and Jakarta Kota reaches its maximum capacity.	a) Inspection and maintenance facilities will be installed and daily inspections, monthly inspections and truck inspections will be done at this new depot. b) Monthly inspections and truck inspections for all ECs will be done in the Depok depot in due course. c) The depot will be expanded gradually along with the increase of ECs.
		23. Reinforcement of Manggarai Workshop	a) To increase maintenance capacity with additional supplies of electric railcars.	Subsequent to the Stage 1 improvement under the 'Fundamental Improvement for Existing Lines,' the 2nd and 3rd stage reinforcements will be executed as follows: a) Stage 2 1. Additional construction of car-body repair workshop 2. Improvement of workshops for repair of bogie, wheel and axle, rotary machine and electrical and mechanical parts and new installation of various inspection and repair facilities 3. Improvement of workshop for mantling or dismantling of car body 4. New installation of painting equipment b) Stage 3 1. Introduction of modernized equipment of automatic control system for security of good quality of car body 2. Installation of ATS maintenance facilities

Project Items			Purpose of Project Execution	Project Outline
Expansion of traffic capacity	Car Depot	24. Establishment of Rolling Stock Depot for Passenger Coaches	a) To supplement the insufficient capacity of the Jakarta Kota depot. b) To accommodate a part of passenger cars in future when Manggarai Station becomes terminal for long distance passenger trains	a) The new depot will be constructed near the Jatinegara Station. b) All monthly inspection for PCs are proposed to be concentrated in the new depot. The depot will have to be so equipped with the facilities. c) The Jakarta Kota depot will then perform only the daily inspection. d) The site preferrable for construction of the new depot should be closer to Jatinegara in the freight yard of Cipinang.
	New Line	25. New Line for New Airport	a) To meet passenger traffic demand relating to the new airport at Cengkareng. b) To facilitate the area development along the railway line.	a) A new single-track electrified line of 10 km between the new airport and Rawabuaya station of the Tangerang Line will be constructed as the traffic demand increases in future to justifies the Plan item b) A traffic demand of 10.4 thousand passengers is presently estimated for the peak 2-hour in the year 2000
		26. Opening of Cibinong Line for Passenger Traffic Service	a) To utilize the new freight line of Cibinong Cakung Tanjung priuk for passenger traffic service b) To promote wayside area development	a) New Cibinong freight line will be extended over about 14 km to the Cibinong residential district. b) The new line will be constructed by single track of electrification system with stations at an interval of about 3 km. c) Future demand by the year 2000 is estimated at 7.83 thousand passengers in rush two (2) hours.

5.2.3 Grade separation plan of city lines

Since both roads and railways are the means of land transportation, it is difficult to avoid crossings on same level. Needless to say, railway crossings in the city often obstruct road traffic flow and renders adverse effects for harmonious functions and economic activities of urban areas.

D.K.I. Jakarta consists of Central, Northern, Eastern, Southern and Western Jakarta. Although there still remains much to be developed within its territory, it signifies a typical large city pattern, in that it has a population density of 9,000 persons per km^2 and also has about 75 % of the total working population engaged in the tertiary industry.

In the nearly center zone of Central Jakarta, both Central and Eastern Lines run through in the south-north direction and the Western Line runs on the boundary to Western Jakarta. This causes inconvenience to interconnection with the other areas, especially hindering the present road traffic flowing in the east-west direction. (Fig. 5.2.2) Therefore, if the existing level crossing between road and railway remains as it is in the future, it would give rise adversely affected to the harmoneous growth of the whole metropolitan area.

In the perspective for the future urban growth, it goes without saying that the best way to solve the problem would be to convert all the road-railway crossings into the grade-separated crossing type. It should be noted, however, the method and timing for such conversion should be determined carefully after full review, since the conversion work should require the vast sum of investment.

(1) Transportation Plan

1) Estimation on crossing traffic volume

The recipient of direct benefit from the conversion of the road-railway crossing into grade separation will be the road vehicle traffic flow which would otherwise be hindered by the crossing barrier. On the urban lines in Jakarta, there exist the greatest number of crossings on the Central Line, as shown in Fig. 5.2.3, at a rate of one per 520 m distance at average. On the Western Line where road flyovers are

now completed at 7 points, the crossing still exists at a rate of one per 1,499 m distance, which is distanced much longer from one crossing to the other.
Table 5.2.3 shows average distance between crossings.

Table 5.2.3 Average Distance between Crossings

Item \ Line	Central Line Jakarta Kota ∿ Gambir ∿ Manggarai	Eastern Line Jakarta Kota ∿ Paser Senen ∿ Jatinegara	Western Line Jakarta Kota ∿ Duri ∿ Manggarai
Section length	9km890m	11km750m	14km990m
No. of crossings	19	14	10
Average distance between crossings	520m	839m	1km499m

The road traffic volume over the crossing was estimated basically from the result of status survey in 1980 (at 8 crossings on Central Line, 4 on Eastern Line and 2 on Western Line), including the estimated volume at those crossings out of the scope of survey. The result of comparison by lines reveals that the Central Line ranks the top in the total crossing traffic volume with an estimate of 727,000 vehicles per 12 hours between Jakarta Kota and Manggarai. Table 5.2.4 summarizes the result of forecast on the crossing vehicle traffic on each line.

Table 5.2.4 Estimated Road Traffic Volume at Crossing

(7:00 AM ~ 7:00 PM)

Item \ Line	Central Line Jakarta Kota ∿ Gambir ∿ Manggarai	Eastern Line Jakarta Kota ∿ Pasar Senen ∿ Jatinegara	Western Line Jakarta Kota ∿ Duri ∿ Manggarai
Total crossing traffic volume	727,000	293,000	381,000
Average traffic volume per crossing	38,000	21,000	38,000

(2) Estimated crossing traffic volume
Estimation on the future crossing traffic volume is made by use of the forecasted results on population growth and vehicle trips in the D.K.I. Jakarta.
Table 5.2.5 summarizes the result on vehicle traffic forecast in Jakarta.

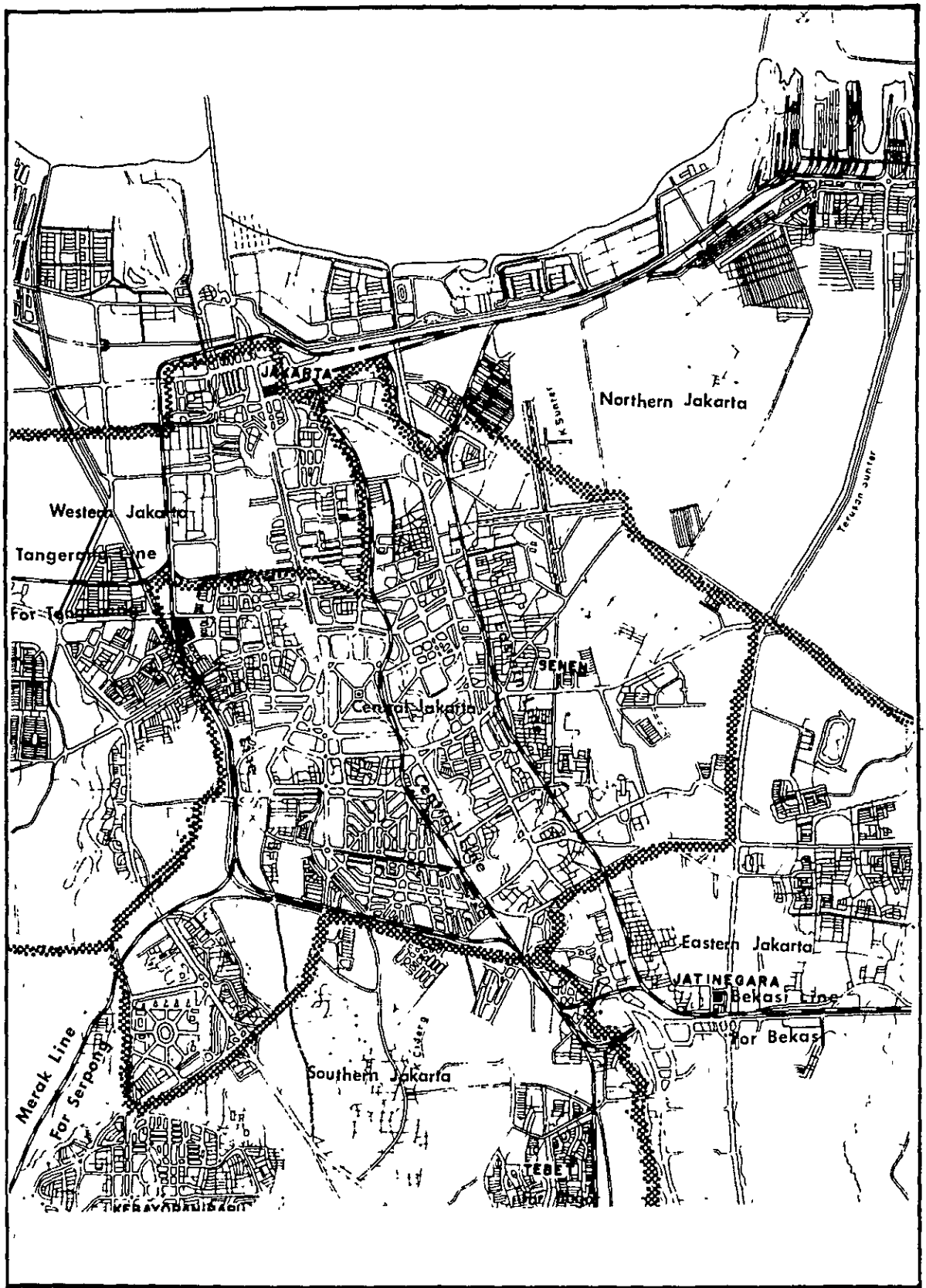

Fig. 5.2.2

Map of Municipal Boundary

JABOTABEK Area Railway Transportation Study

Legend

Municipal Boundary

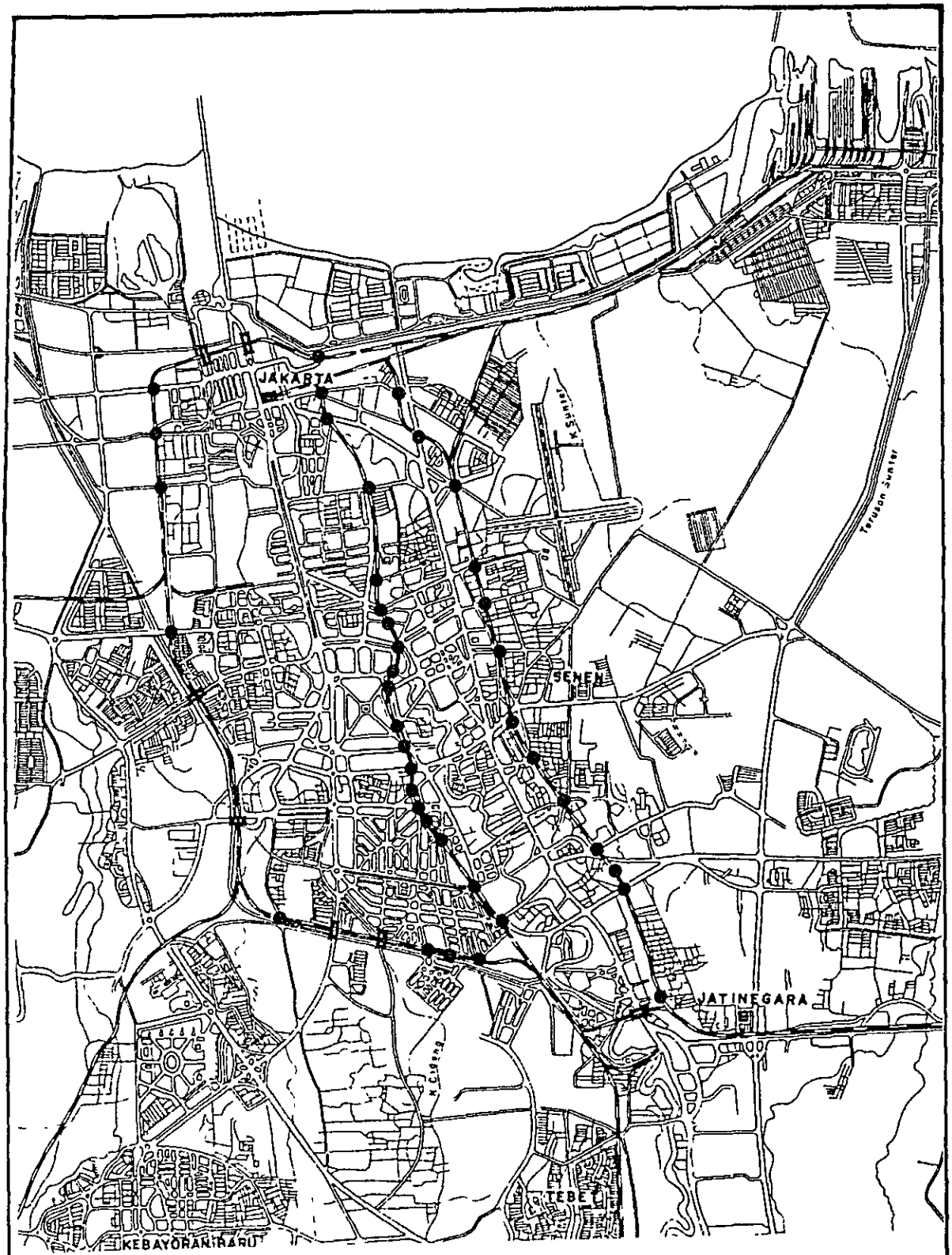

Fig. 5.2.3

Location of Railway Crossings

JABOTABEK Area Railway Transportation Study

Legend

● LEVEL CROSSING

▭ GRADE SEPARATION

Table 5.2.5 Population and Daily Vehicle Trips

(Unit: x 10^3)

	Population in D.K.I. Jakarta	Daily Vehicle Trips			
		Sedan	Bus	Truck	Total
1976*	5,700	1,398	94	111	1,603
1980	6,500 " (1.00)	1,803 (1.00)	113 (1.00)	154 (1.00)	2,070 (1.00)
1985*	7,500 " (1.15)	2,310 (1.28)	137 (1.21)	208 (1.35)	2,655 (1.28)
1990	8,335 " (1.28)	2,820 (1.56)	164 (1.45)	278 (1.81)	3,262 (1.58)
1995*	9,140 " (1.41)	3,330 (1.85)	190 (1.68)	347 (2.25)	3,867 (1.87)
2000	9,845 " (1.51)	4,053 (2.25)	221 (1.96)	518 (3.36)	4,792 (2.31)
2005*	10,550 "	4,776	251	689	5,716

* marked are figures estimated from "The Consulting Engineering Service for Jakarta Urban Tollways, September 1978." Figures in other years are obtained from the interpolation method.

The future increase of population and vehicle trip is indexed at 1.51 and 2.31 respectively by the year 2000 on the basis of 1.00 in 1980. From this result of forecast, it is noted that if the present level crossing remains as it is there would be considerable degree of vehicle traffic congestion to be anticipated with concern, thus impeding future growth of both urban areas being severed by the railway.

(2) Construction Plan

1) Review on grade separation structure

There are two alternative methods to dissolve the road-railway level crossing, either the one to separate the road from the ground surface or the other to separate the railway, whichever practicably feasible, depending upon public priority on either road or railway, topographic restriction in the planned section and impact to the land use plan

Table 5.2.6 shows structural types in those alternative cases.

Table 5.2.6 Structural Types of Grade Separation

Road & Railway	Type	Road Structure	Railway Structure
Grade Separation – Road	Flyover	Bridge or Embankment	Level
	Underground	Underground or Cutting	
Grade Separation – Railway	Elevated	Level	Continuous Bridge or Embankment
	Underground		Underground or Cutting

The grade separation structure may be divided into underground or elevation type. This plan adopts the elevation type after comparative study on the following points, apart from the fact that the underground type takes higher cost in general.

a. Necessary space for construction work can be secured.
b. The ground condition up to a depth of 10 to 15 m is relatively unfavorable with high ground water level and the ground level is close to zero at the proposed site. This would result in higher construction cost.

Fig. 5.2.4~5 shows the standard elevated structure of railway and road.

2) Review on grade separation type by railway lines

Fig. 5.2.6 shows the vehicle traffic flow as forecasted for the year 2005 in Jakarta at morning rush hours. In case of the Eastern and Western Lines, the vehicle traffic would be concentrated relatively into the trunk roads while on the Central Line there would be traffic congestion to be anticipated at each crossing because of wide dispersion of the traffic into all the trunk and feeder roads.

Study is made herein to determine the applicability of either road flyover or railway elevation by lines, with due consideration to the future vehicle traffic flow and the type of road running the railway wayside.

i) Central Line

The railway elevation type will be adopted. On the Central Line there exist 19 crossings between Jakarta Kota and Manggarai, which are relatively of high crossing density, as compared with any other lines, with an average distance of 520 m from one crossing to the other. The fact that there exist a lot of crossings in the limited section signifies that both of the two areas segregated by the railway line have sufficient absorptivity to each other. In this sense, the railway elevation type is preferred over the road elevation type if effective land use for future is taken into consideration.

Alongside many railway divisions of the Central Line there are roads running in parallel. Therefore, if the road elevation type is adopted, the flyover structure would be required not only for the railway but also for the parallel road, which would affect the grand view of the urban scenery unfavorably. Although the elevation plan may require further study in detail, the proposed section for this conversion is determined from 1 km 300 m to 9 km 160 m. Fig. 5.2.7 shows the plan and longitudinal views of the crossing section.

ii) Eastern Line

Since it is anticipated that the vehicle traffic flow now crossing the Eastern Line would be concentrated into the existing main roads of Jl. Kramat Bundar and Jl. Pramuka, it is advisable that the road flyover type should be adopted when compared solely by construction cost.

However, if consideration is given to such different aspects that as the future aspiration the Pasar Senen Station is proposed for the terminal station and that there exist the flourishing wayside areas such as Jl. Industri and Jl. G. Sahari, the railway elevation type may also be taken up for selection. Whichever the case may be, it is necessary as the prerequisite to this elevation plan that the

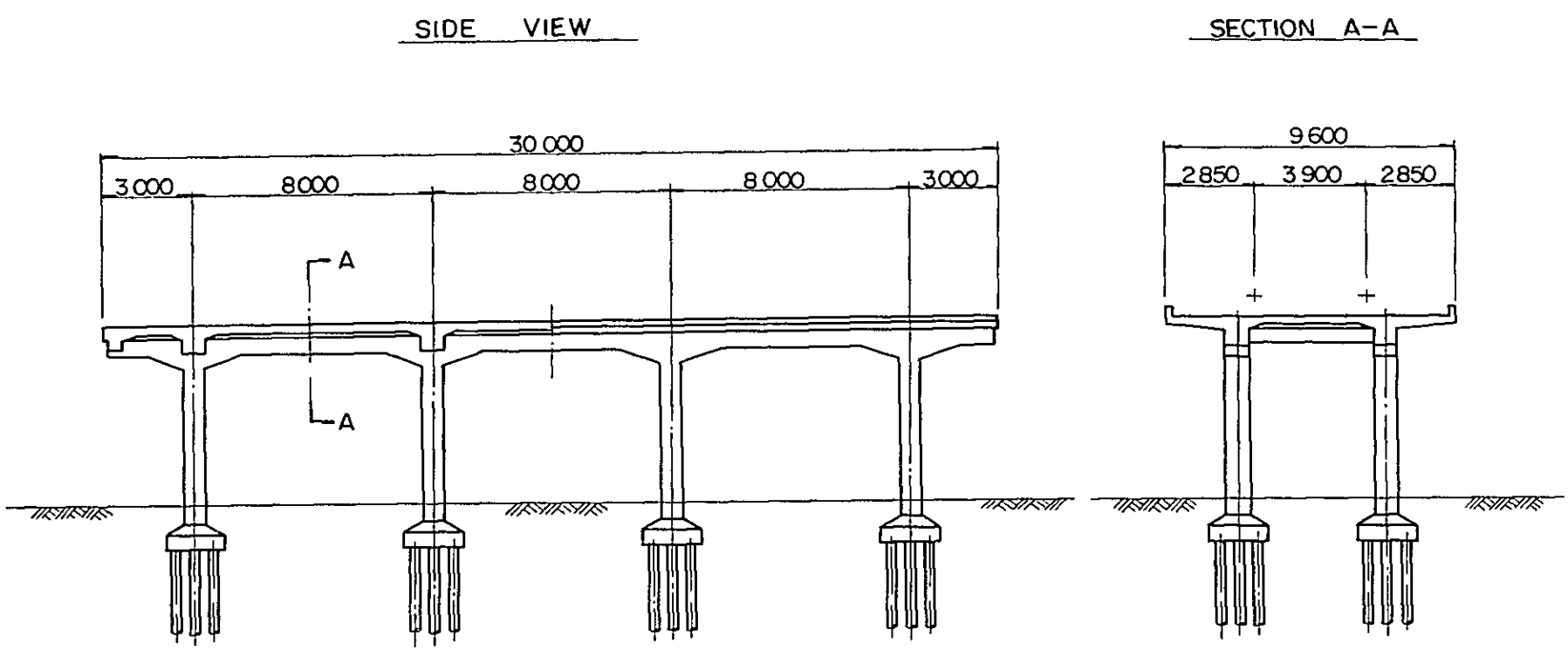

Fig. 5.2.4

Standard Desing of Railway Elevated Track

JABOTABEK Area Railway Transportation Study

Legend

UNIT IN : METER

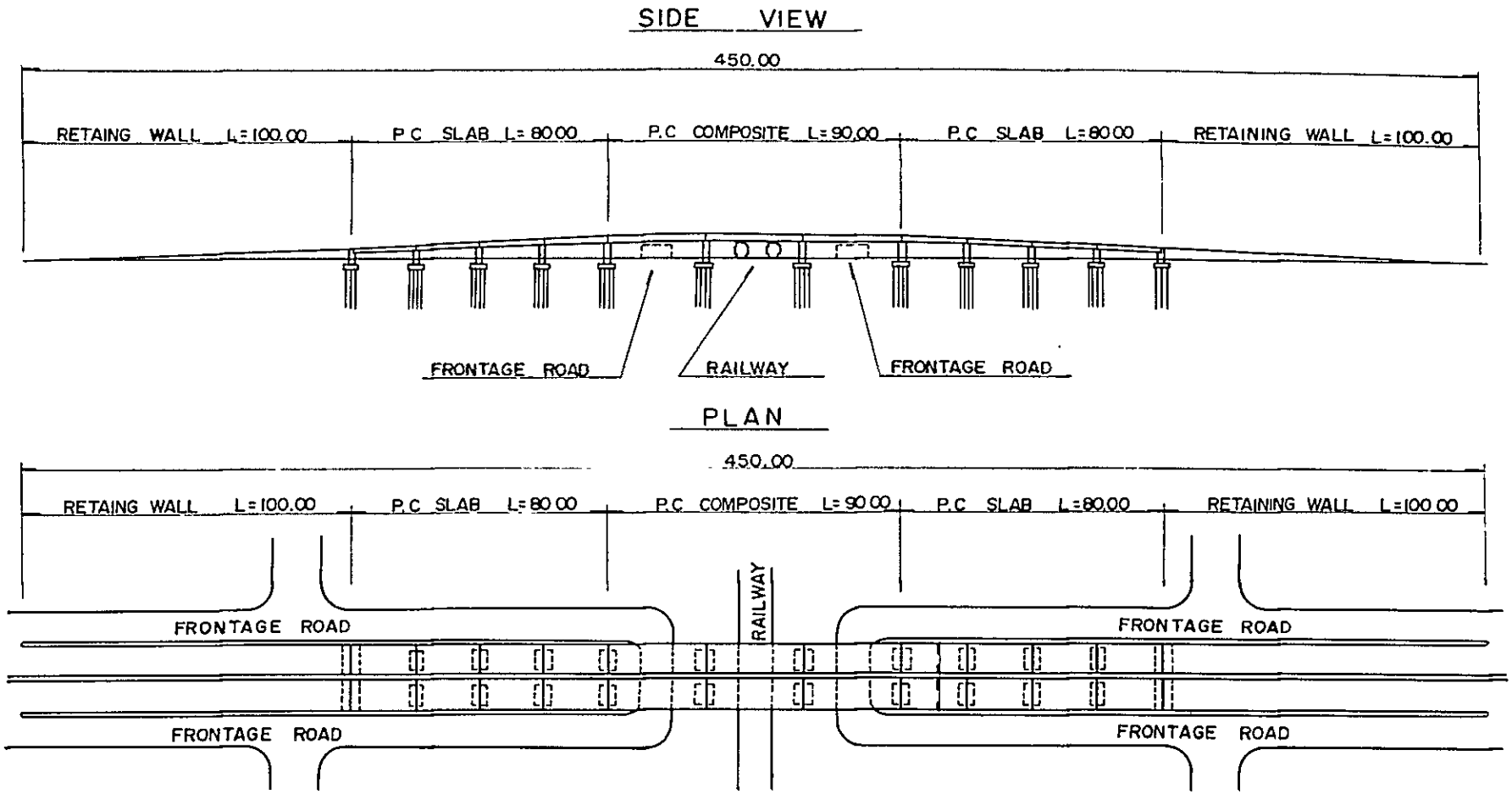

Fig. 5.2.5

Standard Desing of Road Flyover

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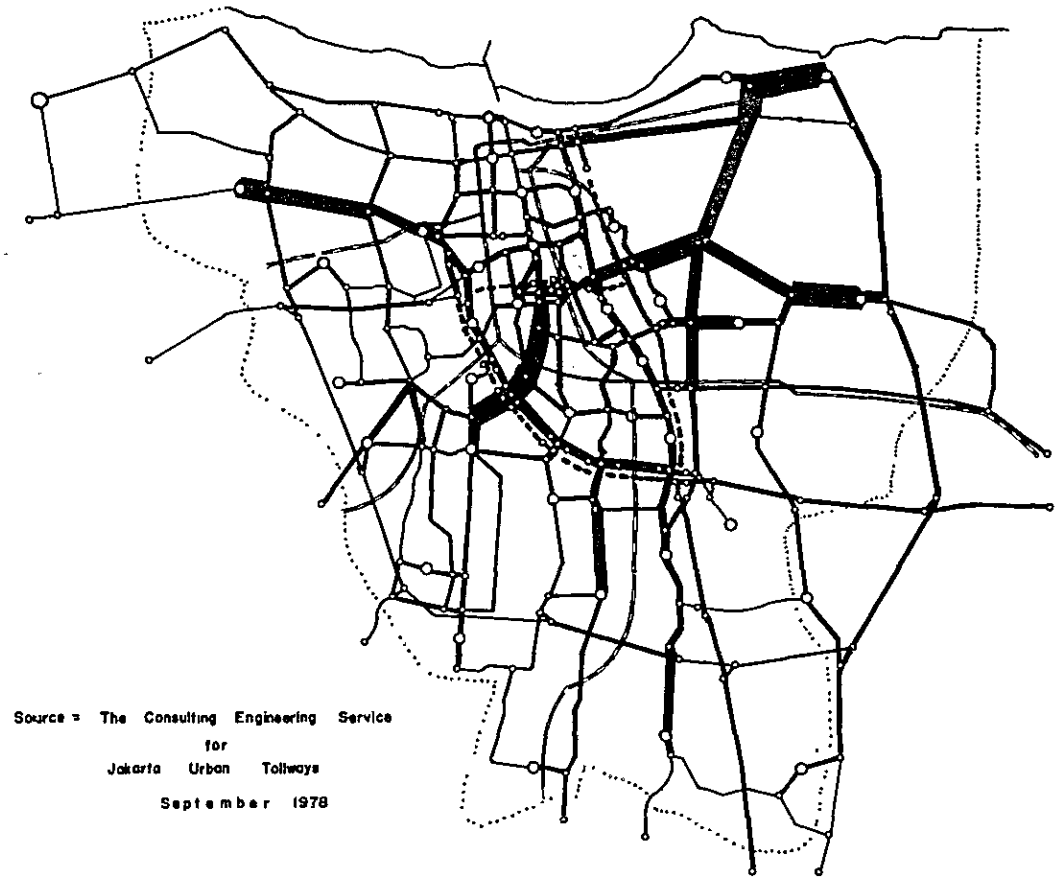


Source = The Consulting Engineering Service
for
Jakarta Urban Tollways
September 1978

Fig. 5.2.6

Estimated Traffic Flow – 2005 A. D.

JABOTABEK Area Railway Transportation Study

Legend

O Zone Centraid
D.K.I Jakarta Baundary
Intra Urban Railway

20000 40000 60000

vihiclies in the morning peak 2 hour
(7^{00}–9^{00})

Rail Line

re-development plan for the wayside area of the proposed section for elevation should be advanced into further steps to take concrete aspects. Since applicability of either one of two elevation types is hard to determine at the present stage, it should still require further study on the part of the municipal and road authorities concerned. Fig. 5.2.8 shows the arrangement plan for conversion into railway elevation of the crossing to cover the planned section from 1 km 119 m to 7 km 580 m. The road flyover system is applied to the road of Jl. Pramuka.

iii) Western Line

The road flyover is preferrable for the following reasons.

- There exist 7 road flyovers completed on the line and the other crossings are located relatively for apart from each other.
- The railway elevation type would be less effective, even though adopted, because the Banjir Kanal on the western side of the Western Line would still remain as the dividing line to split the whole area into eastern and western parts.

3) Review on timing for implementation of the elevation conversion project

In view of the future urban growth, it is desirable that the conversion project should be executed at the earliest possible date. However, since the construction work should require vast amount of investment, any erroneous decision on the timing may bring a great loss of social costs.

In determining the appropriate timing, comprehensive judgment should be required, together with the economic analysis result (See Annex). As for the technical feasibility study, investment timing should be determined in considering the traffic volume on crossing and the effectiveness implementation.

i) Central Line

The Central Line proposed for railway elevation is anticipated to be congested with excessive traffic, in the very early future, at its crossings of Jl. Veteran, Jl. Juanda and Jl. Perwira, then to be followed by other crossings. With this prospect in mind, the target year, in which the train will be operated on the elevated track, is set at 1990 with commencement of work scheduled for 1985 allowing for 5 years until completion.

ii) Eastern Line

The Eastern Line seems to be in no urgent need of grade-separation, except the crossing of Jl. Pasal Senen now in the growing tendency of traffic congestion. Therefore, if the project aims at the immediate dissolution of congestion, the road flyover type should be adopted for this purpose. On the other hand, however, if it aims at the harmonous urban growth of Central Jakarta which is halved by the Eastern Line, it is preferrable to adopt the elevated railway type.

This study is, therefore, purposed to make review of appropriate timing for execution of the elevated track project.

In the judgement of the present traffic volume at crossings, it is advisable that the project is not in immediate need of execution but should be carried out by coincidence with such timing that increased social benefits could be expected

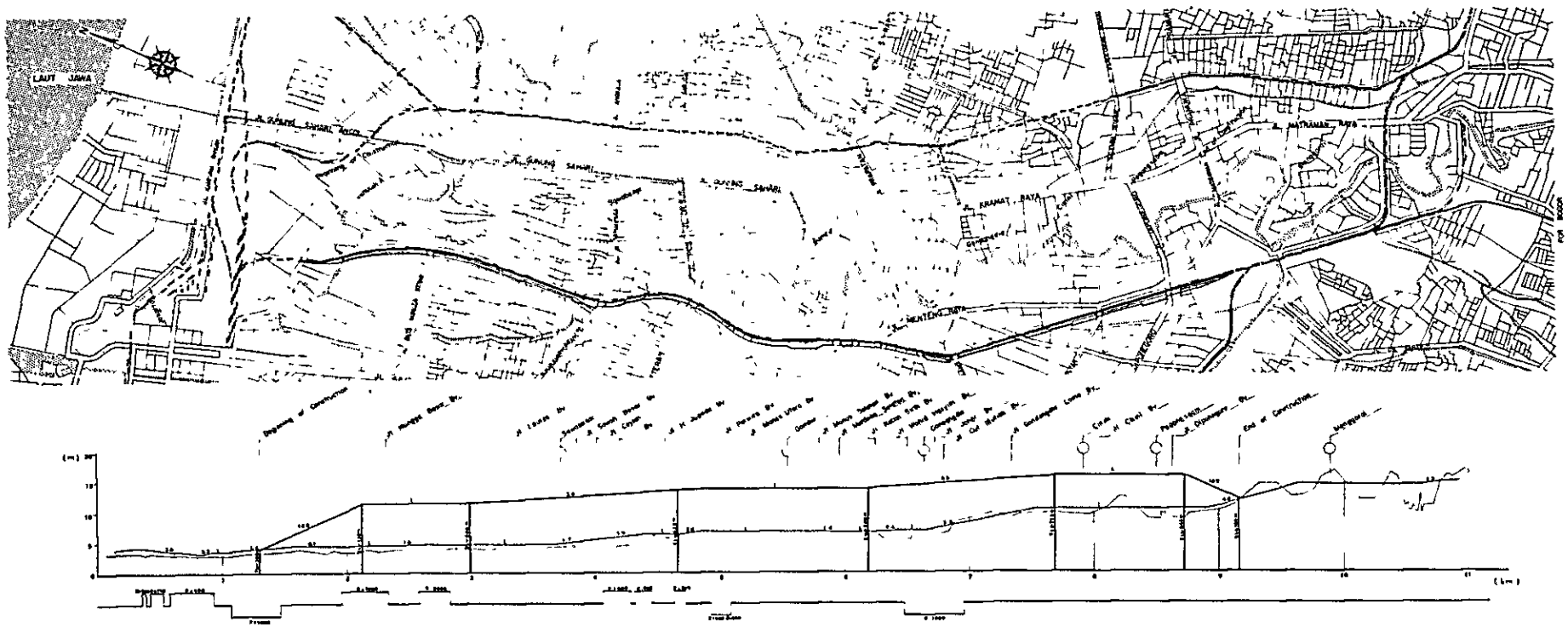


Fig. 5.2.7	Legend
Elevation Planning of Central Line	
JABOTABEK Area Railway Transportation Study	

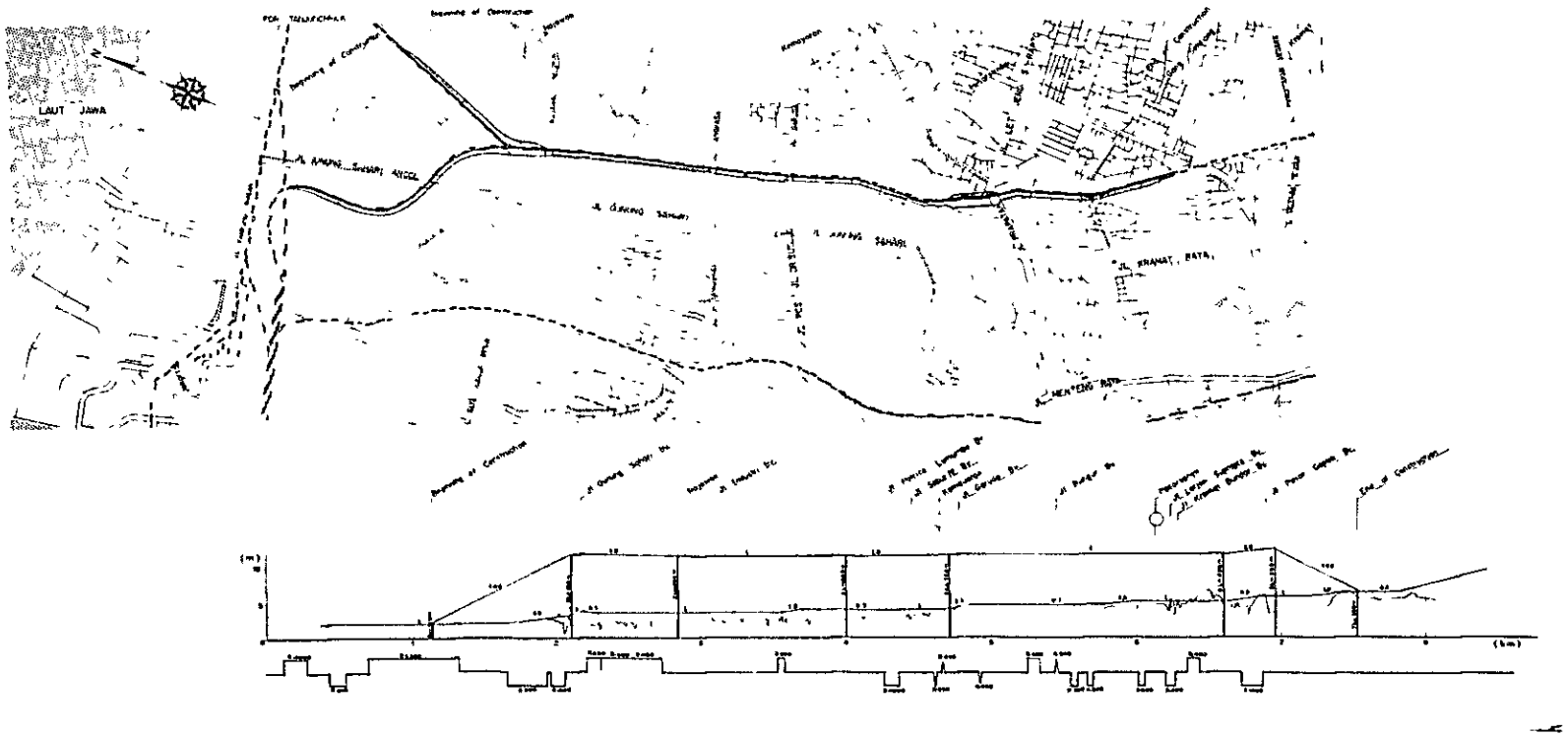


Fig. 5.2.8

Elevation Planning of Eastern Line

JABOTABEK Area Railway Transportation Study

Legend

from its completion.

Whatever the circumstance may be, it is preferrable that for the reasons mentioned below the time of work commencement should differ from that scheduled for the Central Line rather than coincidence in time schedule.

- The railway elevation work must be carried out with full caution to running trains all the time since the work site will be right above the existing railway line or in close proximity to the line. Furthermore, the work should require many other associated works for tentative relocation of railway track, passenger facilities, contact wire, signal and telecommunication systems. During performance of the work, the transport capacity of the existing line would be reduced to a great extent by many restrictive factors involved in train operation.

  Therefore, in consideration of

  a. operation of commuting service trains from the suburban to Jakarta Kota
  b. operation of the long-distance trains between Jakarta Kota and Bandung, Surabaya and
  c. return of trains forwarding to Jakarta Kota

  It is necessary that the conversion work for the Eastern Line should be deferred in timing from that scheduled for the Central Line, so that the maximum possible transport capacity to Jakarta Kota can be secured during the during the work performance to avoid any possible decline of capacity which would otherwise occur on the line.

In addition

- The railway elevation and other associated changeover works should require skilled workforce specialized in various engineering fields.
- The railway elevation conversion work should require vast sum of investment, which therefore should be dispersed by commencement of the work at different phases, sequentially one after the other of the proposed Lines.

With all those things in mind, this Feasibility Study proposes that the work should commence in 1991 toward the target operation of trains on the elevated track by 1995. In this instance, the crossing at Jl. Kramat Bundar must be improved to dissolve the traffic congestion.

Fig. 5.2.9 shows both plan and section views of Jl. Kramat Bundar. As indicated, the width of crossing road (7.20 m) is narrowed by 2.20 m against the road width (9.40 m) on the incoming route. Since this poses a bottle neck to the vehicle traffic flow, the crossing road must be broadened at the earliest possible time.

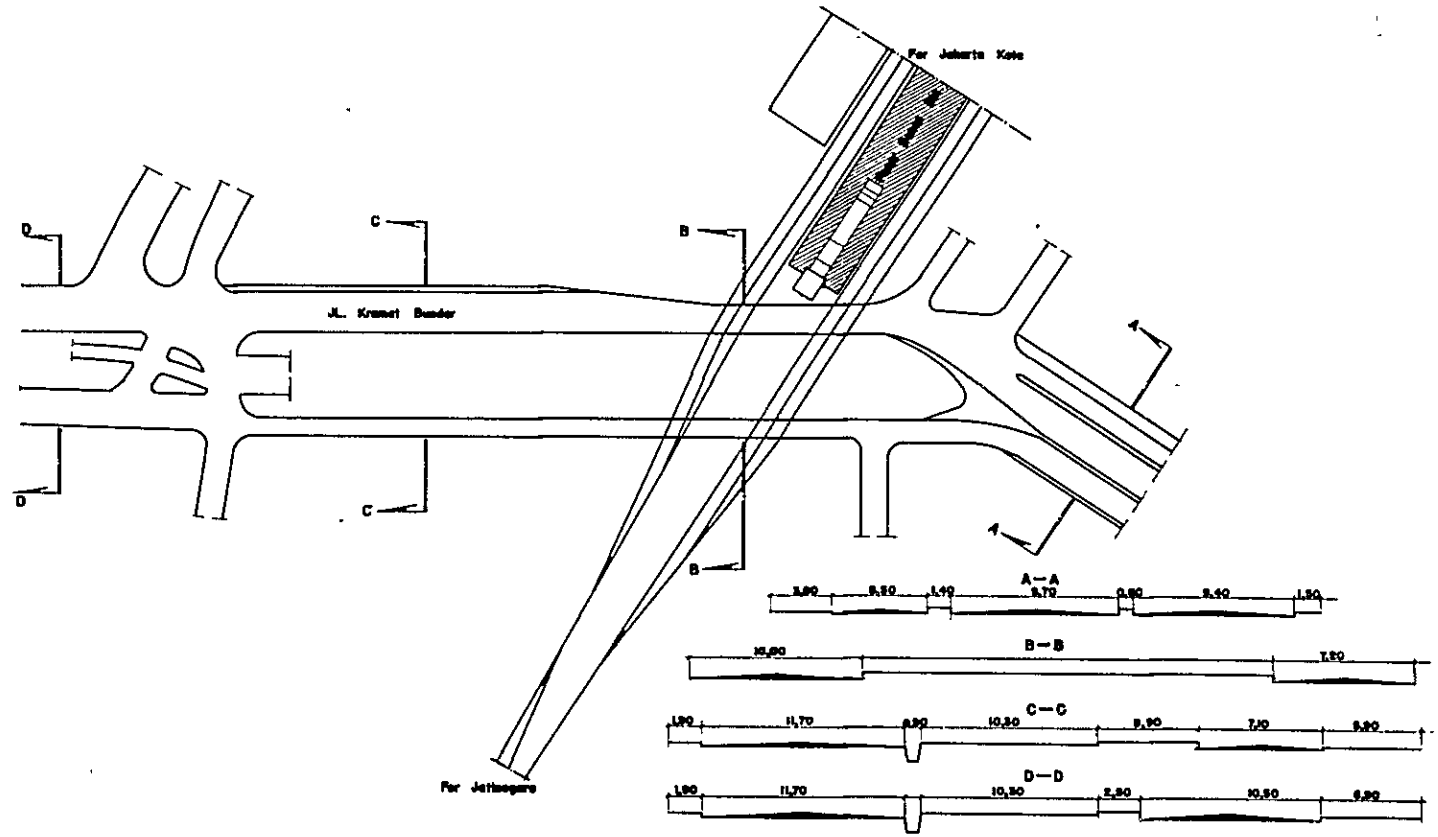


Fig. 5.2.9 Present Situation of Kramat Bundar

JABOTABEK Area Railway Transportation Study

Legend

5.3 The Scale and Program of the Investment

A summary was prepared from the result of site observation and any other data available concerning the traffic demand trend, present status of JABOTABEK Railway and ideal pattern of future urban traffic and reviewed from various aspects of engineering, administration, operation and finance. This is prepared with special emphasis upon the following matters.

1) To make maximum use of the railway now existing in the JABOTABEK Area and gain maximum effect from minimum investment to the urban traffic system.
2) The railway traffic covers a wide range of diversity and completity as the large total system, each component system of which must be well-coordinated with each other as the requirement of utmost importance. The system would be unable to perform its fullest function if it lacks such well-coordinated relations between components. With this view in mind, effort must be made to strengthen the transport capacity of the system gradually and sequentially by dissolving the bottlenecks in an efficient manner.
3) The Master Plan should be practicably feasible. The period under this plan should be deemed as the basic preparatory period for realization of the ideal pattern of urban traffic network in the 21st Century.

The investment program will be carried out in continuity with the Intermediate Program, initiating from the fiscal year 1984 toward the target year 2000. Items and sums of investment being covered under the planned period are summarized in Table 5.3.1.

According to this budgetary list, it is estimated that the gross railway investment in the JABOTABEK Area for the 17-year period from 1984 to 2000 would reach such tremendous sum as indicated in the total of both foreign and local currency portions. This total sum is calculated at the price level as of June 1980, therefore precluding any price escalation and social situation change in the future thereafter.

It is necessary that the investment program, along with the items contained, should be reviewed every 5 years to cope with the future changing situations.

The phase of project implementation up to the year 2000, as referred to in the preceding Item 5.2.2, are divided as follows:

1) Phase 1
   Projects scheduled for completion by 1987
2) Phase 2
   Projects scheduled for completion by 1991
3) Phase 3
   Projects scheduled for completion by 2000

Projects of new line construction and grade separation are planned as follows after various studies.

1) Cengkareng New Airport Line
   In the anticipation that the airport passengers will be increased to more than 4,300 persons per day with astonishing growth of Indonesia by the year 2000 and that the wayside development along the new line achieve great advantages, the new line will be constructed toward the target year 2000.

2) Passenger traffic on Cibinong Freight New Line

The new freight traffic line construction project is now under study on the Indonesian side to connect between the Cibinong Cement Factory and Tanjungpriuk with the major objective to cope with prisk future demand for cement transport and carriage of foreign trade goods. When completed, the new line will be extended with provision of passenger facilities from the Cibinong Cement Factory to the Cibinong Housing Complex, taking into consideration the rapid future growth of urban population, the commuting demand by inhabitants in the planned Cibinong Housing Complex and, still more, the potentiality of future wayside area development.

3) Elevation of track for the Central Line (Jakarta Kota ~ Manggarai) and Eastern Line (Jakarta Kota ~ Gang Sentiong)

The plan for continuous grade separation of the railway lines will be carried out in full consideration of the availability, hindrance rate of the road traffic, train accident and time value of both railway and road traffics and, besides that, the future traffic and land utilization at high efficiency in Jakarta as the typical 10 million population city.

4) Flyovers for the Western Line

The Western Line is partially completed with road traffic flyovers. In some sections, the track line runs through the low land because of topographic restrictions. The river runs off in close access to and in parallel with the track line, thus giving restriction to the land development. For those reasons, flyover of roads is considered as the economic method of preferrable choice.

5) Short-cut line for loop operation

Both Eastern and Western Lines in Jakarta are better suited for loop operation when viewed from both distance and track conditions. If the lines are put into loop operation, the railway traffic network would add great convenience through transfer of passengers in the east-west direction and higher usage of the Central Line. Other advantages could be expected from the benefit in the operational assignment of both vehicles and manpower, along with the benefit in the reduced chance of accidents attributable to false operation.

However, there still remain some problems to be solved as follows by the time the existing lines will be put into use for the planned loop network operation.

i) Improvement or transfer of Jakarta Kota Station

In order to eliminate the turn-back operation of trains at the Kampung Bandan station, the two alternatives must be chosen either by construction of the new liaison line to connect the Western Line directly to the Jakarta Kota Station or by transfer of the Jakarta Kota Station from its present location to the north. The former would take large work volume and the latter would require transfer of the Jakarta freight station and the Jakarta Kota Depot, for either case of which immense sum of investment would be required.

ii) Construction of new short-cut line near Jatinegara Station

To dissolve turn-back operation at the Jatinegara Station it will be necessary to construct a new short-cut line connecting both Eastern and Western Lines near the Jatinegara Station. Because of the closely-densed human settlement to exist along-

Table 5.3.1 Investment Schedule

	Project Items	Detail	Cost (Rp x 10^9) Total	Foreign	Local	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	2000
Rehabilitation Program	1. Renewal of Track between Depok and Bogor	Track, crossing, fence (ex. station yard)	4	2	2				—	—															
	2. Renewal of Bekasi Line	Track, crossing, fence (ex. station yard)	4	3	1				—	—															
	3. Renewal of Merak Line	Track, crossing, fence (ex. station yard)	2	1	1					—	—														
	4. Renewal of Tangerang Line	Track, crossing, fence (ex. station yard)	4	2	2				—	—															
	5. Improvement of Manggarai Workshop	Track, civil work, building, machinery, electrification	8	5	3				Stage 1																
	6. Improvement of Rolling Stock Depot at Jakarta Kota	Track, civil work, structure machinary, electrification	5	4	1				—	—															
	7. Improvement of Railroad Crossings on East and West Lines	Signal, track	0.5	0.4	0.1				—	—															
	8. Additional Supplies of Rolling Stock		33	32	1				—	—	—														
Transport Capacity Expansion Program — Central Line	9. Track Elevation between Kota and Manggarai	Track elevation, track, station facilities, station front area, electrification, automatic signal, ATS	52	32	20					—	—	—	—												
	10. Grade Separated Crossing in Manggarai Station	Track elevation, track, station facilities, station front area, electrification, automatic signal, ATS	34	22	12							—	—	—	—										
	11. Track Addition (Manggarai – Depok)	Track addition, track, station facilities, station front area, electrification, automatic signal, ATS, new station, rolling stock	57	45	12				—	—	—	—		ATS					New station					
	12. Track Addition (Depok – Bogor)	Track addition, track, station facilities, station front area, electrification, automatic signal, ATS, rolling stock	37	28	9							—	—	—	—										
Eastern Line	13. Track Elevation of Eastern Line (Kota – Gong Sentiong)	Track elevation, track, station facilities, station front area, electrification, automatic signal, ATS	61	37	24										—	—	—	—	—						
	14. Installation of Automatic Signal of Eastern Line (Gong Sentiong – Jatinegara)	Track, station facilities, station front area, electrification, automatic signal, ATS	4	2	2								—	—											
	15. Improvement of Station Facilities at Kampung Bandan	Track, station facilities, station front area, electrification, automatic signal, ATS	11	7	4								—	—											
Western Line	16. Installation of Automatic Signal and Station Facility Improvement	Track, station facilities, station front area, electrification, automatic signal, ATS, new station	22	14	8								—	—			New station								
	17. Installation of Automatic Signal and Station Facility Improvement between Kampung Bandan and Tanjung Priuk	Track, station facilities, station front area, automatic signal, ATS, new station, electrification	12	7	5								—	—			New station								
	18. Flyovers on Western Line	Bridge	13	8	5								Stage 1					Stage 2							
Other Line	19. Electrification of Bekasi Line (Jatinegara – Bekasi)	Track, station facilities, station front area, electrification, automatic signal, ATS, rolling stock	75	65	10					—	—	—		ATS											
	20. Track Addition and Other Improvements on Merak Line	Track addition, track, station facilities, station front area, electrification, automatic signal, ATS, new station, rolling stock	109	95	14							—	—	—	—					New station					
	21. Track Addition and Other Improvements on Tangerang Line	Track addition, track, station facilities, station front area, electrification, automatic signal, ATC, new station, rolling stock	63	52	11								—	—	—			New station							
Car Depot	22. Establishment of New Electric Rail Car Depot at Depok	Track, civil work, building machinery, electrification, signal	18	11	7				Stage 1			—							Stage 2					Stage 3	
	23. Reinforcement of Manggarai Workshop	Civil work, track, structure, machinery	12	8	4										Stage 2									Stage 3	
	24. Establishment of Rolling Stock Depot for Passenger Coaches	Civil work, track, building, machinery electrification, signal	3	2	1																				
New Line	25. New Line for New Airport	New line, track, station facilities, station front area, electrification, automatic signal, ATS	36	24	12																				
	26. Cibinong Line for Passenger Traffic Service	New line, electrification, signal, track, station facilities, station front area, electrification, automatic signal, ATS	64	44	20																—	—	—	—	
	Total		743.5	552.4	191.1																				

Note: Cost is based on the price as of June, 1980.

Legend: ——— : Project Items of Feasibility Study ——— : Others

side the planned route for the short cut-off, there would be a difficult problem involved in land acquisition and necessity to provide the CTC system for train operation at the juncture between the short-cut line and the Eastern Line.

iii) Even after solution of those problems raised in the preceding i) and ii), there still remains one more problem with regard to sufficiency of the line capacity because of joint use of the same track line by the trains to be operated on the loop line and the incoming trains from Bekasi or from Merak and Tangerang.
All those things considered, the plan for loop operation of trains poses lots of problems to be solved, though much benefit can be expected from completion of the project. Therefore, it is advisable that by any time after the year 2000, when the urban lines would necessarily be converted into the quadruple track system for expansion of the line capacity to cope with future increasing demand, new urban double track line should be completed (Fig. 3.1.2 and 3.1.3) so as to operate suburban and long distance trains separately on the individual track line and to realize the loop operation.

Table 5.3.2 Investment Sum by Phases

(Unit: billion Rp)

Item		Phase 1 (1984~1987)	Phase 2 (1988~1991)	Phase 3 (1992~2000)	Total
Ground facilities	Foreign currency	65	154	130	349
	Local currency	35	78	71	184
	Total	100	232	201	533
Rolling stock	Foreign currency	56	54	94	204
	Local currency	2	2	3	7
	Total	58	56	79	211
Total	Foreign currency	121	208	224	553
	Local currency	37	80	74	191
	Total	158	288	298	744

Rolling stock figures denote the total of both electric and diesel railcars. Additional supplies of the diesel railcar will be required to cope with the transitional demand increase until completion of the electrification projects for Bekasi, Merak and Tangerang Lines. Additional number of electric and diesel railcars by Phases will be as shown in Table 5.3.3. The required increase of electric railcars for the phases 3 includes 78 vehicles to be used for New Airport Line and Cibinong Line.

Table 5.3.3 No. of Estimated Railcars Increaseing by Phases

Item	Phase 1 (1984 ~ 1987)	Phase 2 (1988 ~ 1991)	Phase 3 (1992 ~ 2000)	Total
Electric railcar	116	128	240	484
Diesel railcar	36	12	–	48
Total	152	140	240	523

Table 5.3.4 indicates the future reinforcing trend of transport capacity by stages and lines resulting from improvement of ground facilities and additional supplies of rolling stock.

Table 5.3.4 Estimated Transport Capacity by Phases (Rush 2 hours)

(Unit: 1,000 passengers)

Transport capacity / Line	1980	At completion of Intermediate Program 1983	1st stage	2nd stage	3rd stage
		1983	1987	1991	2000
Central Line	7.9	15.8	22.6	27.2	45.3
Bekasi Line	2.2	4.5	15.4	18.1	38.5
Western Line	1.6	4.5	13.6	27.2	83.8
Merak Line	2.2	2.2	10.9	18.1	40.8
Tangerang Line	0.5	0.5	6.5	10.9	22.6
Total at entrance of urban lines	12.8	23.0	55.4	74.3	147.2

Note:
1. Transport capacity is calculated on a basis of rush 2-hour, 200 % carload factor.
2. Transport capacity is representative of the following section for each line.
3. 'Total at entrance of urban lines' includes total transport capacity at the urban line inlet from suburban lines, that is, the total of transport capacity as estimated immediately before Manggarai, Jatinegara, Tanahabang and Duri Stations, therefore, not including any transport capacity on the Western Line.

Table 5.3.5 shows the maximum transport capacity by years and by lines, which is calculated on a basis of 8-car train-set with a passenger load factor of 200% both for electric railcars and for diesel ones. It is the capacity which is attainable with cars assigned to the limit of ground facilities. In other words, the ground facilities planned under the Master Plan are to have the capacity in the Table, if railcars will be increased accordingly.

Table 5.3.5 Maximum Transport Capacity for Each Line by Fiscal Years
(Rush 2 hours)

(Unit: 1,000 passengers)

Line \ Fiscal year		1980	1983	1985	1986	1987	1988	1989	1990	1991
Central Line	Manggarai ∿Depok	29.4	〃	〃	〃	92.8	〃	〃	〃	〃
	Depok ∿Bogor	24.9	〃	〃	〃	〃	〃	〃	92.8	〃
Bekasi Line		34.8	〃	〃	〃	92.8	〃	〃	〃	〃
Western Line		19.6	30.5	〃	〃	〃	〃	92.8	〃	〃
Merak Line		10.9	〃	〃	15.2	〃	23.9	〃	92.8	〃
Tangerang Line		4.4	〃	6.5	〃	〃	15.2	〃	〃	92.8
Total of maximum capacity on suburban lines		104.4	104.4	106.5	110.8	232.2	249.6	249.6	386.4	464.0

↑ Completion of the Intermediate Program

↑ Completion of Phase 1 in M/P

↑ Completion of Phase 2 stage

Figs. 5.3.1 thru 5.3.9 are graphic conversion of Table 5.3.1 thru 5.3.5.

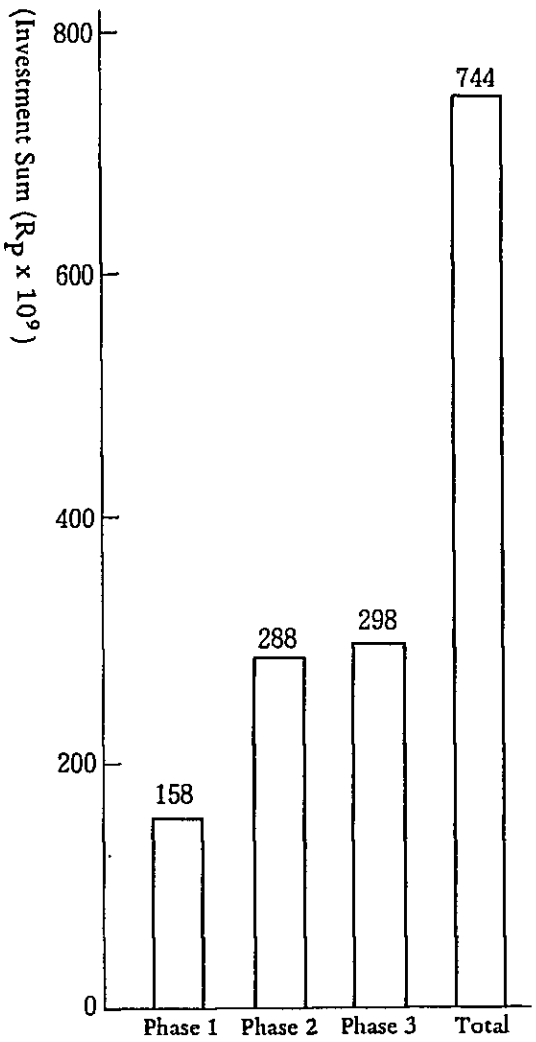


Fig. 5.3.1 Investment Sum by Phases
(Ground facilities and railcars)
(Total of foreign and local currencies)

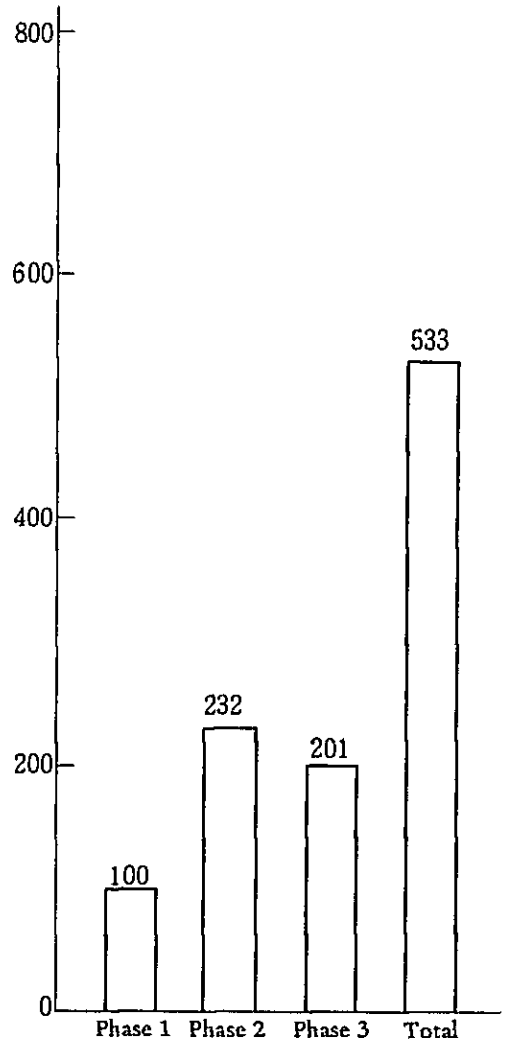


Fig. 5.3.2 Estimated Investment for Ground Facilities by Phases
(Total of foreign and local currencies)

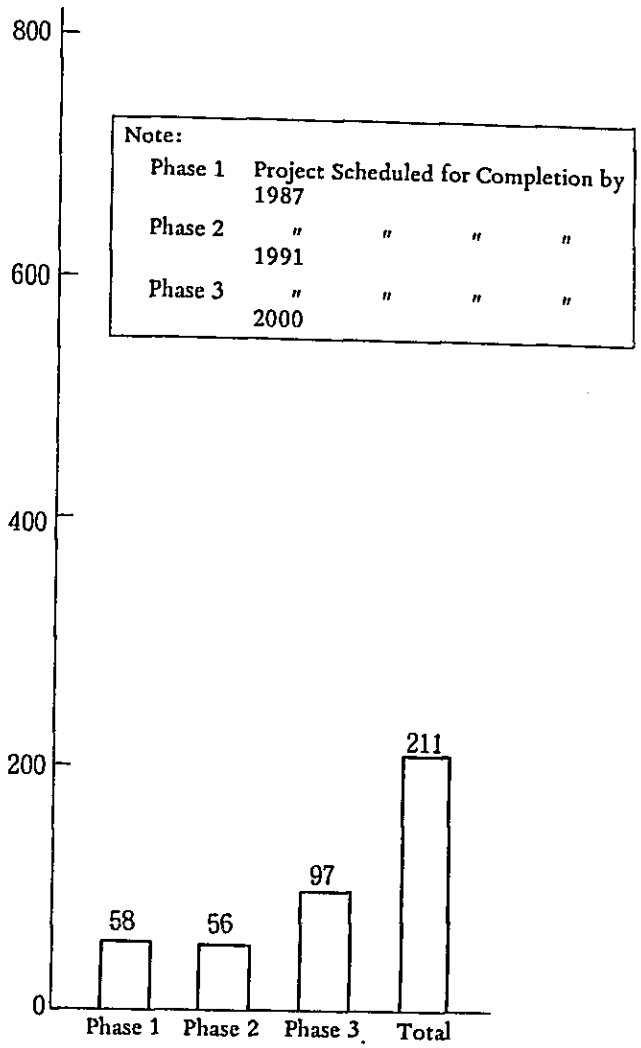


Fig. 5.3.3 Estimated Investment for Railcars by Phases.
(Total of foreign and local currencies)

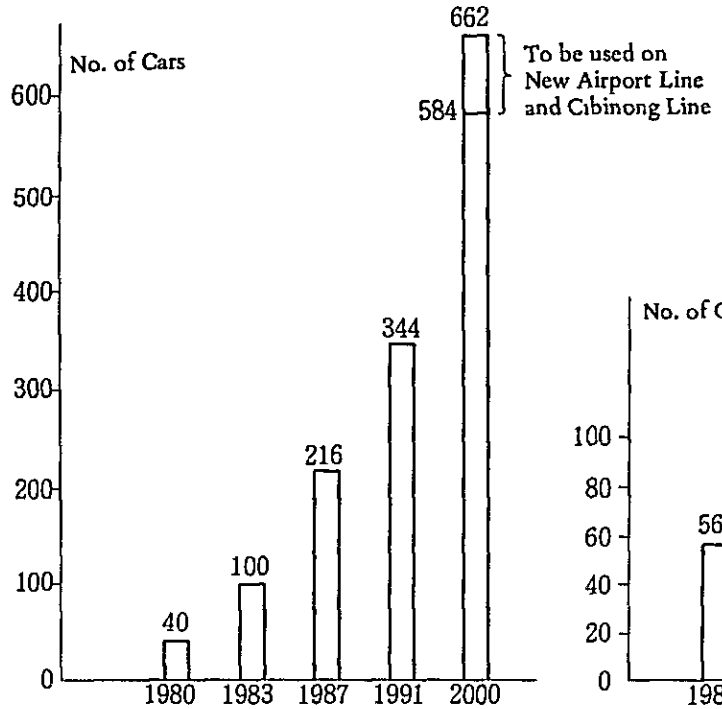


Fig. 5.3.4 Electric Railcar Increases

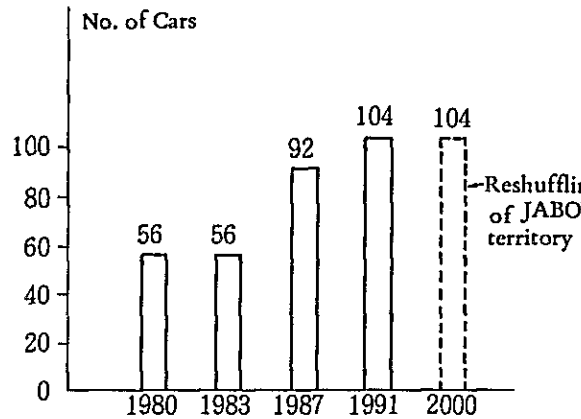


Fig. 5.3.5 Diesel Railcar Increases

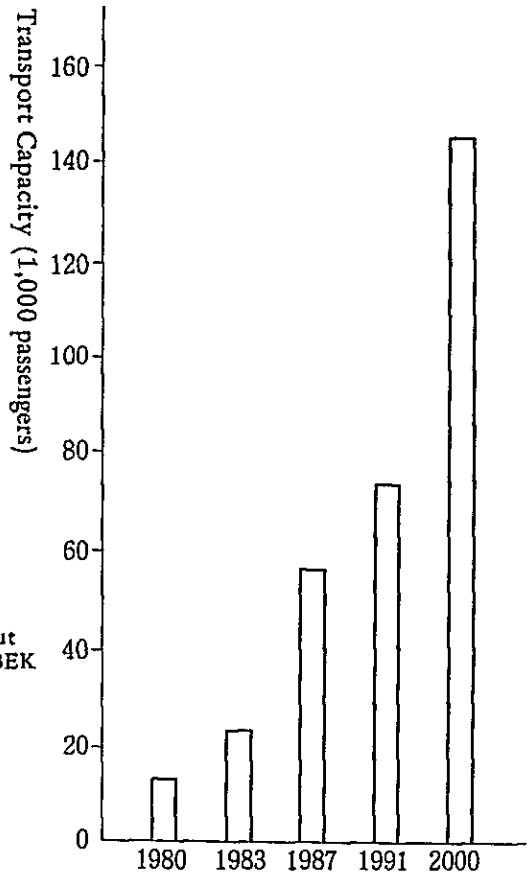


Fig. 5.3.6 Transport Capacity at Enhance of Urban Line

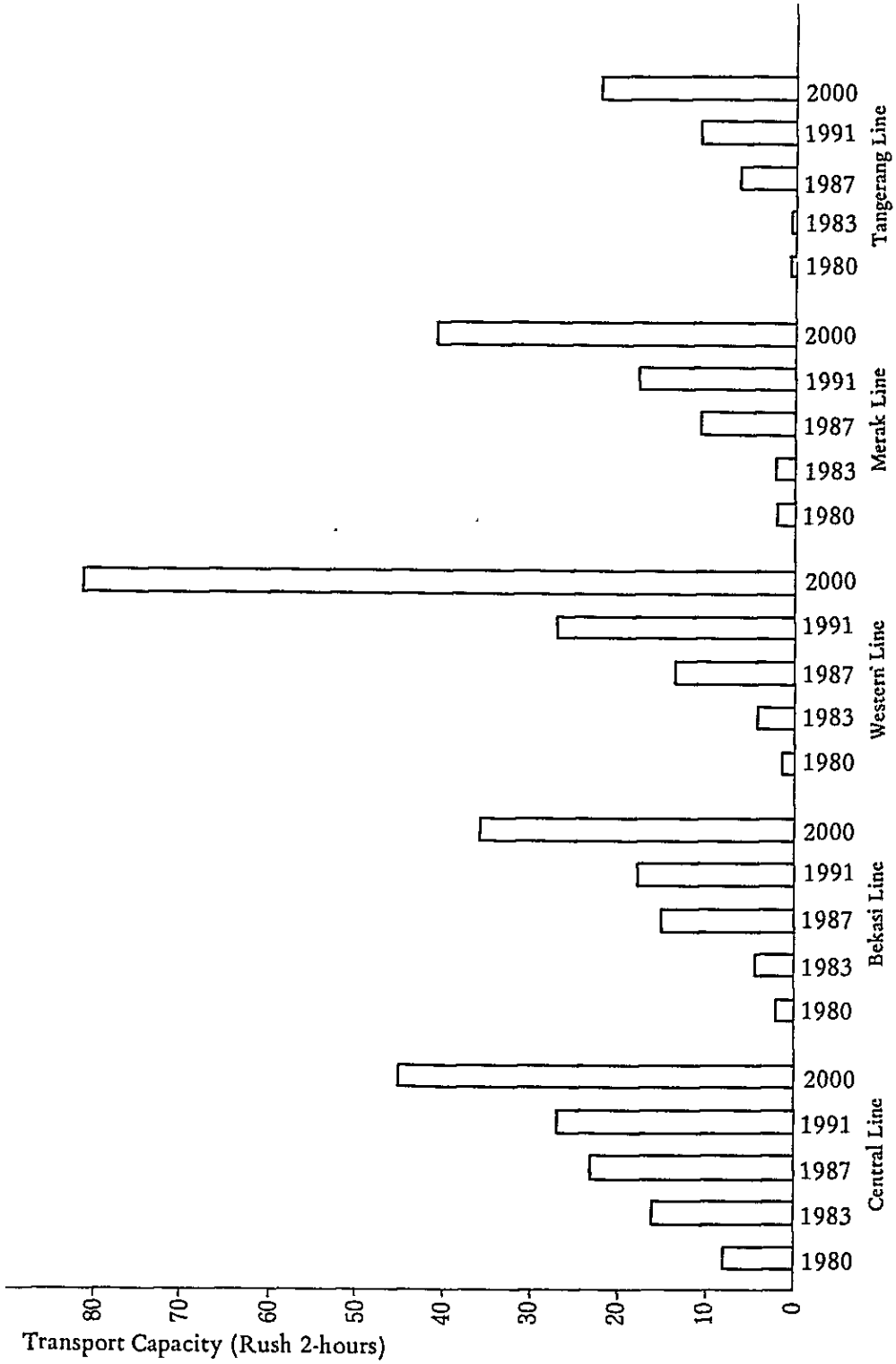


Fig. 5.3.7 Comparison of Transport Capacity by Phases and Lines

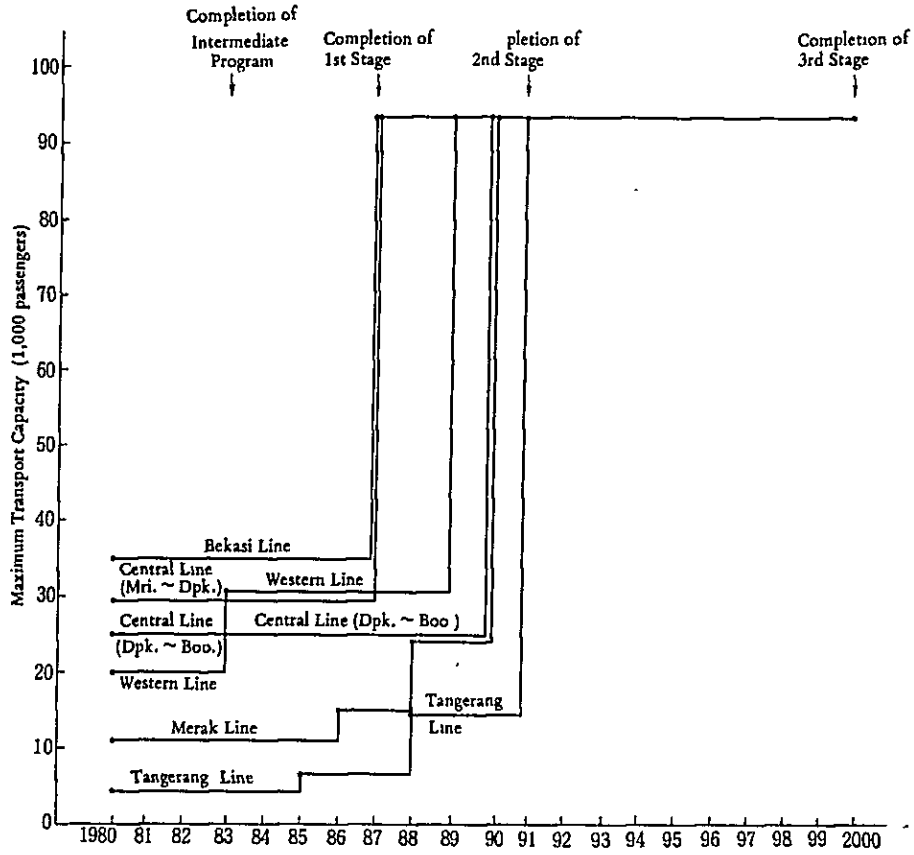


Fig. 5.3.8 Future Increasing Trend of Maximum Transport Capacity by Fiscal Years

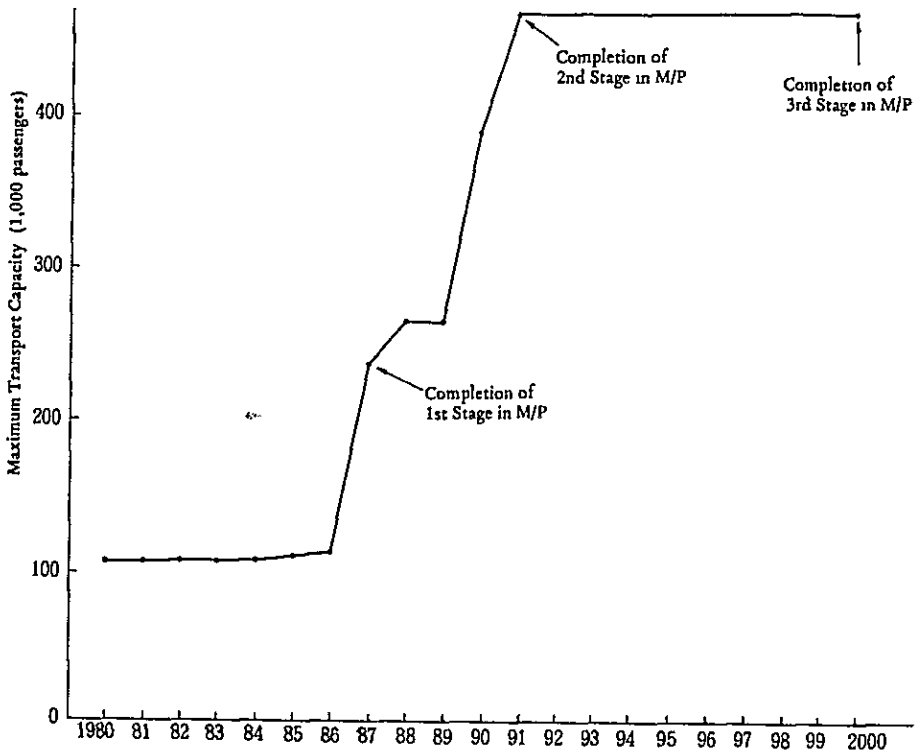


Fig. 5.3.9 Future Increasing Trend of Total Maximum Capacity on Suburban Lines

5.4 Feasibility Study Item

Among all the items indicated in Table 5.3.1, the following items are taken up as objects for the Feasibility Study.

Those object items should fall under the category of the preceding '5.2.2 (2) Time of Implementation' and include the concrete objects as itemized hereunder.

a. Track improvement of each line
b. Crossing improvement of each line
c. Improvement of Manggarai Workshop
d. Improvement of Jakarta-Kota Depot
e. Doubling of track between Manggarai and Depok on the Central Line (including installation of automatic signal, station facility improvement and station front area establishment)
f. New depot construction at Depok (Stage 1)
g. Electrification of the section between Jatinegara and Bekasi on the Bekasi Line (including installation of automatic signal, station facility improvement and station front area establishment)
h. Additional supply of railcars

Apart from those study objects, feasibility study for continuous track elevation on the Central Line must commence at the earliest possible time.

CHAPTER 6. EDUCATION AND TRAINING

CHAPTER 6 EDUCATION AND TRAINING

6.1 Present Status on Personnel Education and Training

Education and training for employees of the Indonesian State Railways are provided through the two educational facilities of Railway Engineering College and Training Center, in addition to the on-the-job training within each organization they belong to.

1) Railway Engineering College

The Railway Engineering College is established in 1980 in Bandung, providing four (4) educational courses, such as Operation (due to open in 1981), Track Maintenance & Civil Work, Signal & Telecommunication (due to open in 1981) and Mechanical Work, for the purpose of training the technical supervisory personnel of the railway. Each course accepts 30 trainees for a period of 3 years.

In Indonesia, the similar training course for the supervisory personnel was provided by the Railway Operational Academy of 4 school-year system for the past period of 1950 to 1960. The fact that this educational institute has been reorganized to make restart as the Engineering College signifies their renewed understanding of how important it is to train the personnel, especially the supervisory personnel ranking the middle, in the Indonesian State Railways.

This Railway Engineering College admits those eligible trainees who are recommended by the Chief of each office as being remarkably outstanding in service and screened by the entrance examination from among those railway personnel with 2 ~ 4 year job experience after graduation from high schools.

2) Training Center

The Training Center is established at two (2) places in Bandung and at one (1) place in Yogyakarta for the purpose of training supervisory and middle-class personnel working in field offices.

The Training Center institute in Bandung provides such curriculums as Traffic & Commerce, Signal & Telecommunication, Civil Work, Management and Mechanical Administration, for the training period of either 3 months or 6 months, admitting about 30 trainees per each training course. Training is carried out 2 to 4 times each year for a total number of 60 to 120 trainees.

The Training Center in Yogyakarta is neighbored to the railway workshop, providing training for diesel locomotive operators, rolling stock inspection personnel and other workshop workers. The training period is scheduled for 13 weeks as the course for locomotive operators, 19 days as the course for vehicle inspection personnel and 2 months for the workshop employee. 25 trainees are admitted into each training course at one time. In 1979, the institute sent out 100 locomotive operators, 50 vehicle inspection personnel and 25 workshop employees, the total of which amounts to 175 persons.

The training method in those Training Centers makes combined use of both classroom lesson and practical job training. The classroom lesson accounts for 70 to 80 percent of the whole training time length.

The Railway authority provides, in addition to the training cources as aforementioned, four (4) different grades of basic education, according to each school education degree, to the newly recruited personnel for a period of nearly one year. This training is provided mainly by the on-the-job training exercise.

6.2 Reinforcement and Improvement of Educational Training System

In order that the Indonesian State Railways may be able to accomplish its mission as the public transport means in the sector of overland transportation, it is necessary that the plan for modernization of motive power, for instance, for conversion of steam locomotives into either diesel locomotives or electric or diesel railcars should be pushed forward at powerful paces, not to mention of the necessity to improve the overall existing facilities.

It should be noted, however, that in order to operate most efficiently by performance of the fullest function, those improved transport facilities, the modernized motive power system and the newly introduced technology this operational aims can be achieved only by polished quality of workforce with higher sense of responsibility and ability of judgement as well as by modernized knowledge and skill of the technical personnel in charge of operation. The employees' training is, in a sense, an unattractive activity but is playing a vital role in the management of the enterprise.

Looking into the existing educational facilities being operated by the Railway authority, it can be pointed out that those facilities are time-worn as the whole and classrooms, together with various teaching materials, are in shortage. To further explain this from the example, it can be cited that the Training Center neighbored to the Manggarai Workshop is now at the stage of renewal with new facilities. Though partially completed in use for training purpose, it seems to be still far from the total completion of the improvement project.

In the case of the Railway Engineering College and its neighboring Training Center, the facilities are time-worn to a considerable extent and, still more, each institute has only 3 to 4 classrooms with shortage of teaching materials.

Lecturers and instructors are selected from those technical staff within the state Railways. Besides, professors of Bandung Technical University and Pajajaran University are appointed on a part-time commissioned basis. Those faculty members must be further reinforced in number.

In full recognition of the important role of the employees training, the Railway authority is contemplating expansion of the existing educational facilities and improvement of the educational level and content under the 'Indonesian State Railways 5 ~ 10 Year Development Plan (1979 ~ 1989)' and executing its educational plan including new construction of educational facilities, formulation of training program and strengthening of training system in the executing organization. It is hoped that the plan will be executed on a gradual and steady basis.

In view of the fact that the employee training is basically essential to future progress and growth of the Indonesian State Railways, it is proposed that the following procedural steps should be taken for execution of the training program.

1) The correspondence course of education should be provided to help all the railway employees improve their quality by spreading of necessary vocational education for fulfilment of their routine works. Prior to spreading of this educational system among the employees, texts and test questions to measure their ability of comprehension must be prepared. This method of education has such advantages that the employee can avail himself of his leisure time for study and can learn from texts about even any other knowledge not directly related to his own business, thus helping him acquire a broad scope of knowledge over the whole aspect of railway services.
   However, this sort of correspondence education can be effective and useful only if the learner himself takes his positive attitude with earnest desire to learn anything new. Therefore, appropriate guidance by the teacher as well as eagerness of the learner are considered as the essential factors for achievement.
2) The training program for technical staff may be divided into two categories, the one to provide trainees with knowledge and skill to operate and utilize vehicles, equipment and machines and the other one to train them to cultivate skill and ability on testing, maintenance and repair of those vehicles and machinery.
   In the latter case, it may be true to state that such maintenance skill and ability can be obtained solely from practical knowledge and experience in abundance, which should therefore be oriented to the practical training exercise on the job. On the other hand, however, it is also true to say that each trainee would be able to reach the highly skilled level even within an educational institute by his concentrated effort for learning to compensate shortage of actual job experience.
   To achieve this aim, introduction of a general culture course not relevant to any railway business may be considered as a method to enhance contemplative faculty of each trainee.
3) The training program within the educational institute must be carried out over a wide range of personnel atratums from the executive level to the rank-and-file in the field work division with job varieties.
   To do so, the educational system must be established and the facilities must be improved for expansion. Although the plan may require certain amount of investment, it should be carried out gradually and steadily on a long-term planning basis.

6.3 Immediate Tasks on Education and Training

The railway network existing in the JABOTABEK Area is planned for renewal, improvement and modernization of the whole transport facilities, ahead of any other service areas, with execution of the Railway Network Improvement Plan. On certain lines extra trains will be operated, for the time being, by use of diesel railcars before and ahead of execution of such facility improvement plan. Under such circumstance, it is considered necessary that sufficient workforce should be trained as planned to secure required staffing for operation after improvement.

Total number of staffing to be required for execution of the Railway Network Improvement Plan way be estimated as indicated in Tables 6.3.1~3. Especially, in view of the existing scale of educational facilities, it is necessary to formulate the personnel assignment and training program on a perspective basis.

In particular, a great number of personnel must be trained to meet future increase in the number of electric railcar operators, diesel railcar operators (including supplements to fill any vacancies after reshuffing to electric railcar operation), rolling stock inspection personnel and conductors. For those technical personnel handling the signal and telecommunication systems, the essential prerequisite to execution of the training program will be advanced procurement of teaching equipment and material and pre-training of lecturers and instructors by dispatch for study abroad because those new equipment and devices to be introduced into their job site are quite unknown or unfamiliar to them.

The Railway Network Improvement Plan envisages, over a long perspective period, track line improvement and addition, electrification, installation of automatic signal, station building reconstruction and expansion of car depot and workshop. A series of those construction and improvement works will certainly provide the best and rare opportunity for all the trainers and trainees as the visible teaching materials of a realistic pattern. With this view in mind, therefore, it is proposed that the training program should be formulated reflecting the positive intention to provide opportunities for as many trainees as possible to take part in those construction works, so that they may be able to acquire knowledge and skill relevant to new equipment and machinery.

From the viewpoint as aforementioned, the plan to newly construct the education center of modernized style and adequate accommodation capacity within the JABOTABEK Area, where plenty of practical and realistic teaching materials exist, may be worthy of review and evaluation at this stage.

It is advisable that the education and training for employees should be effectively promoted and railway development program should be smoothly implemented, with the cooperation of railway exparts of foreign countries.

Table 6.3.1 Required Number of Personnel Estimated for each Job Classification (at year beginning)

Unit: person

Jobs \ Fiscal year			1980 (As of July) present number	1980 (As of July) JABOTABEK only	1984 No. of personnel	1984 Plus or minus	1985 No. of personnel	1985 Plus or minus	1986 No. of personnel	1986 Plus or minus	1987 No. of personnel	1987 Plus or minus	1988 No. of personnel	1988 Plus or minus	1989 No. of personnel	1989 Plus or minus
Maintenance	Track maintenance		1,180	612	612	0	612	0	685	73	701	16	794	93	794	0
	Crossing			265	265	0	265	0	265	0	265	0	265	0	265	0
Service	Station		1,694	948	948	0	948	0	980	32	1,023	43	1,023	0	1,150	127
	Conductor		258	116	190	74	198	8	214	16	230	16	220	△10	254	34
Operation	Operator		1,698	116	190	74	198	8	214	16	226	12	218	△8	252	34
	Inspection & repair			83	131	48	154	23	182	28	207	25	222	15	232	10
	Others			25	40	15	43	3	46	3	50	4	67	17	69	2
Electrification			95	91	102	11	102	0	104	2	104	0	127	23	127	0
Signalling · Telecommunication			245	143	171	28	183	12	189	6	200	11	226	26	225	△1
Total			5,170	2,374	2,649	275	2,703	54	2,879	176	3,006	127	3,162	156	3,368	206
Insp. 1 Head Office	Insp. 1 Head Office		317		334	17	337	3	348	11	356	8	365	9	378	13
	Dispatching	Passenger	–		–	–	–	–	–	–	–	–	6	6	6	0
		Train operation	–		–	–	–	–	–	–	–	–	13	13	13	0
		Electric power	–		–	–	–	–	–	–	–	–	13	13	13	0
Inspection 1 Total			5,487		5,779	292	5,836	57	6,023	187	6,158	135	6,355	197	6,574	219
Workshop (Manggarai)			1,008		1,600	592	1,632	32	1,728	96	1,660	△68	1,556	△104	1,574	18

Notes: 1. No. of personnel estimated for Signalling - Telecommunication division is calculated on condition that they would be all engaged in the construction work from the initial stage of execution.

2. △ mark indicates reduced number.

Jobs \ Fiscal year			1990		1991		1992		1993		1994		1995		1996	
			No. of personnel	Plus or minus	No. of personnel	Plus or minus	No. of personnel	Plus or minus	No. of personnel	Plus or minus	No. of personnel	Plus or minus	No. of personnel	Plus or mmus	No. of personnel	Plus or minus
Maintenance	Track maintenance		811	17	951	140	1,012	61	1,048	36	1,058	10	1,076	18	1,091	15
	Crossing		167	Δ98	167	0	167	0	167	0	132	Δ35	129	Δ3	129	0
Service	Station		1,217	67	1.320	103	1,401	81	1,602	201	1,648	46	1,737	89	1,864	127
	Conductor		256	2	256	0	286	30	332	46	346	14	370	24	402	32
Operation	Operator		148*	Δ104	147	Δ1	144	Δ3	166	22	173	7	185	12	201	16
	Inspection & repair		252	20	210	Δ42	186	Δ24	207	21	220	13	233	13	255	22
	Others		71	2	58	Δ13	53	Δ5	56	3	62	6	64	2	68	4
Electrification			131	4	148	17	160	12	160	0	161	1	161	0	163	2
Signalling · Telecommunication			225	0	225	0	225	0	225	0	225	0	225	0	225	0
Total			3,278	Δ90	3,482	204	3,634	152	3,963	329	4,025	62	4,180	155	4,398	218
Insp. 1 Head Office	Insp. 1 Head Office		372	Δ6	385	13	394	9	414	20	418	4	428	10	441	13
	Dispatching	Passenger	6	0	6	0	6	0	6	0	6	0	6	0	6	0
		Train operation	13	0	13	0	13	0	13	0	13	0	13	0	13	0
		Electric power	13	0	13	0	13	0	13	0	13	0	13	0	13	0
Inspection 1 Total			6,478	Δ96	6,695	217	6,856	161	7,205	349	7,271	66	7,436	165	7,667	231
Workshop (Manggarai)			1,609	35	1,726	117	1,800	74	1,853	53	1,884	31	1,919	35	1,972	53

* Estimated on the basis of 1 person on boad.

Jobs \ Fiscal year			1997		1998		1999		2000		2001		Remark
			No. of personnel	Plus or minus	No. of personnel	Plus or minus	No. of personnel	Plus or minus	No. of personnel	Plus or minus	No. of personnel	Plus or minus	
Maintenance	Track maintenance		1,091	0	1,091	0	1,091	0	1,091	0	1,270	179	Not including personnel for building construction.
	Crossing		129	0	129	0	129	0	129	0	129	0	
Service	Station		2,097	233	2,097	0	2,204	107	2,204	0	2,204	0	
	Conductor		452	50	460	8	486	26	486	0	486	0	On the basis of 2 persons on board.
Operation	Operator		231	30	231	0	243	12	243	0	243	0	
	Inspection & repair		289	34	302	13	315	13	315	0	315	0	
	Others		77	9	78	1	80	2	80	0	80	0	Including personnel engaged in depot security clerical job and shunting in yard.
Electrification			163	0	164	1	164	0	164	0	174	10	
Signalling · Telecommunication			235	10	235	0	250	15	250	0	250	0	Including 28 radio and telegram service workers (fixed number per each year).
Total			4,764	366	4,787	23	4,962	175	4,962	0	5.151	189	
Insp. 1 Head Office	Insp. 1 Head Office		463	22	465	2	476	11	476	0	487	11	By application of the current ratio $\frac{317}{5170}$ = 0.0613 for administrative personnel.
	Dispatching	Passenger	6	0	6	0	6	0	6	0	6	0	To establish the dispatching system in and after 1988.
		Train operation	13	0	13	0	13	0	13	0	13	0	
		Electric power	13	0	13	0	13	0	13	0	13	0	
Inspection 1 Total			8,055	388	8,080	25	8,266	186	8,266	0	8,466	200	Including 2796 field workers (fixed number per each year) in any other areas than JABOTABEK
Workship (Manggarai)			2,057	85	2,089	32	2,121	32	2,201	80	2,201	0	

CHAPTER 7. MANAGEMENT AND OPERATION

CHAPTER 7 MANAGEMENT AND OPERATION

7.1 Organization

7.1.1 Management pattern

The railway in the Republic of Indonesia is Government-owned enterprise under the Law of Indonesian State Enterprises 1927 and is named Indonesian State Railways, Perusahan Jawatan Kereta Api. The State Railways is managed under the power of authority and control of the Minister of Transport and Communications. Actually, however, the President of Railways Authority assumes full responsibility for its management. (Fig. 7.1.1)

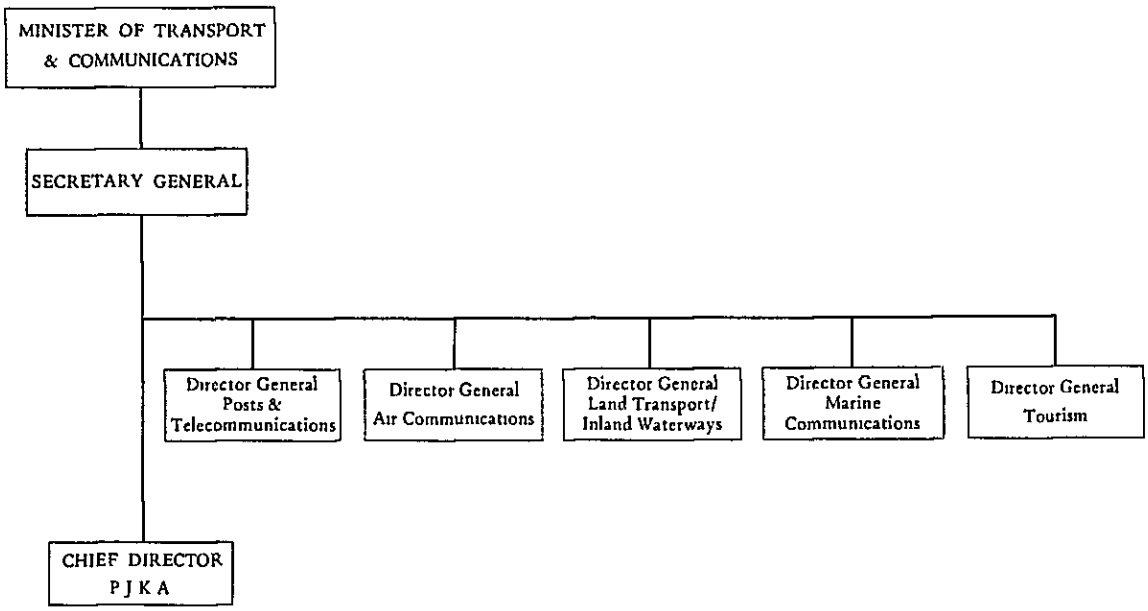


Fig. 7.1.1 Chart of Relation of PJKA to the Government

The power of authority for final decision-making on the managerial important matters of the State Railways may be divided as follows:

1) Matters subjected to the governmental power of authority
   a. Reformation or reorganization of departments within Head Office
   b. Drawing-up of budgetary fund for fiscal year and borrowing of long-term and short-term loans
   c. Approval of budgetary expenditure appropriation and decision-making on basic matters for execution of the budgetary spending
   d. Determination of levels for wage and allowance, including grant of special allowance, to railway personnel
   e. Lending, transfer and exchange of important assets

f. Decision on construction of new track lines
g. Planning for purchase of major materials such as rail, sleepers and rolling stock
h. Setting or revision of fare rate and fee
i. Determination of the required total number of personnel
j. Determination of number of retirement and retiring allowance
k. Appointment or discharge of President and each division director of Head Office

2) Matters subjected to the power of authority of the Minister of Transport and Communications
   a. Reformation and reorganization of local organizations (including Region and Inspection)
   b. Fiscal year accounting
   c. Investment to railway-subsidiary enterprise
   d. Suspension and abolition of commercial lines
   e. Matters related to basic application of fare rate and fee
   f. Appointment or discharge of Chief of Center within Head Office
   g. Appointment or discharge of Chief of Region

3) Matters subjected to the presidential power of authority of State Railways
   a. Spending of contingency fund within the designated limit of budget
   b. Works for new construction, addition and removal of main track lines
   c. Construction and reconstruction of buildings
   d. Fare rate and fee for carriage of baggage and percels
   e. Determination on total number of new recruitment
   f. Revision of train diagram
   g. Appointment or discharge of inspectors in local organizations
   h. Dismissal or suspension of personnel from office

As aforestated, the President of State Railways is responsible for operating the Indonesian State Railways and administering the estate and property in compliance with managerial decision at the highest level of the government and is authorized to represent the governmental authority inside and outside the court.

Note: All the foregoing items are summarized from the reply to the questionnaire prepared by reference to the example of the Japanese National Railways.

7.1.2 Present status of administrative and operational organization systems

The Indonesian State Railways has in its holding the track line of some 6,900 km in total length and the total workforce of 55,512 persons as of June 1980. The organizational system for administration and operation is divided into four different levels of Head Office → Region → Inspection → Field.

1) Head Office

   The Head Office as the administrative organization of the whole railway business operation is situated in Bandung. The internal office assisting the office of presidency comprises Personnel Division, Fixed Installation Division, Mechanical Engineering Division and Traffic & Commerce Division and, besides those, includes Corporate Secretary

Office, Finance & Accounting Department and other four (4) Centers such as Education & Training, Planning, Research & Development and Auditing.
Under the Corporate Secretary Office there are five divisions of Office General Administration, Legal Affairs, Store & Supply, Security and Public Relations. (Fig. 7.1.2)
In view of importance in the personnel education and training, the Indonesian State Railways separated from the Staff Administration Department in 1978 its Education & Training Section as an independent Training Center with the aim to strengthen the function of personnel education and training.

2) Region

The Region is the local operating organization for each region under the service territory of the State Railways. There exist six (6) Regions, three (3) in Java Island and the remaining three (3) in Sumatra Island.

Name		Location
West Java Region	–	Jakarta
Central Java Region	–	Semarang
East Java Region	–	Surabaya
South Sumatra Region	–	Palembang
West Sumatra Region	–	Padang
North Sumatra Region	–	Medan

The Region is organized internally by such divisions as Administration, Way and Works, Traffic & Commerce, Signalling & Telecommunication, Mechanical Engineering, Ferry and Public Relations. (Appendix Fig. 25)
As compared with the internal organization of Head Office, the Region is featured by such points of difference that the divisions dealing with personnel and finance are unified into 'Administration' while those divisions in charge of Way & Works and Signal & Telecommunication, as is unified into Fixed Installation Division within the Head Office organization, are organized respectively as an independent sector within the Region, in addition to the independent role of ferry transportation as an organ of the Region.

3) Inspection

There are Inspections (or Sub-Regions) as the subordinate organs to the Region. Total number of Inspections amounts to 17, of which 11 are in Java Island and 6 are in Sumatra Island. Inspections under the jurisdictional administration of each Region are as listed hereunder:
Each Inspection office is responsible for providing direct guidance and supervision to the field organization and is internally organized by such divisions as administration, line maintenance, train operation, signal communication, rolling stock and sanitation. (Appendix Fig. 26)
The following are organization characteristics of each Inspection office.

i) The office has no post or position equivalent to Chief of Inspection as the general superintendent beyond each division. The Inspector as each Division Chief is responsible for his own routine work by receiving directly orders, instructions and directions from the Chief of Region.

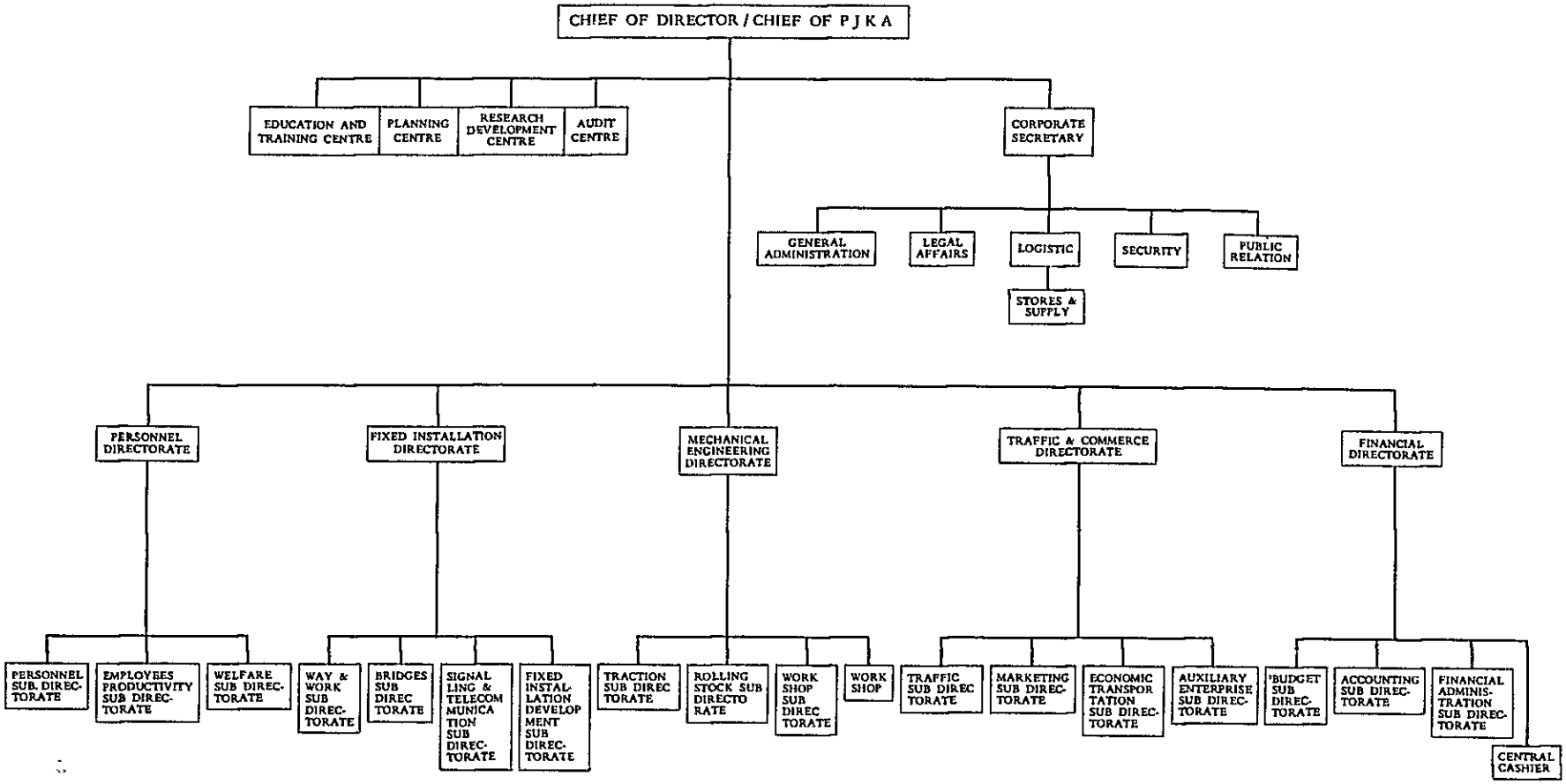
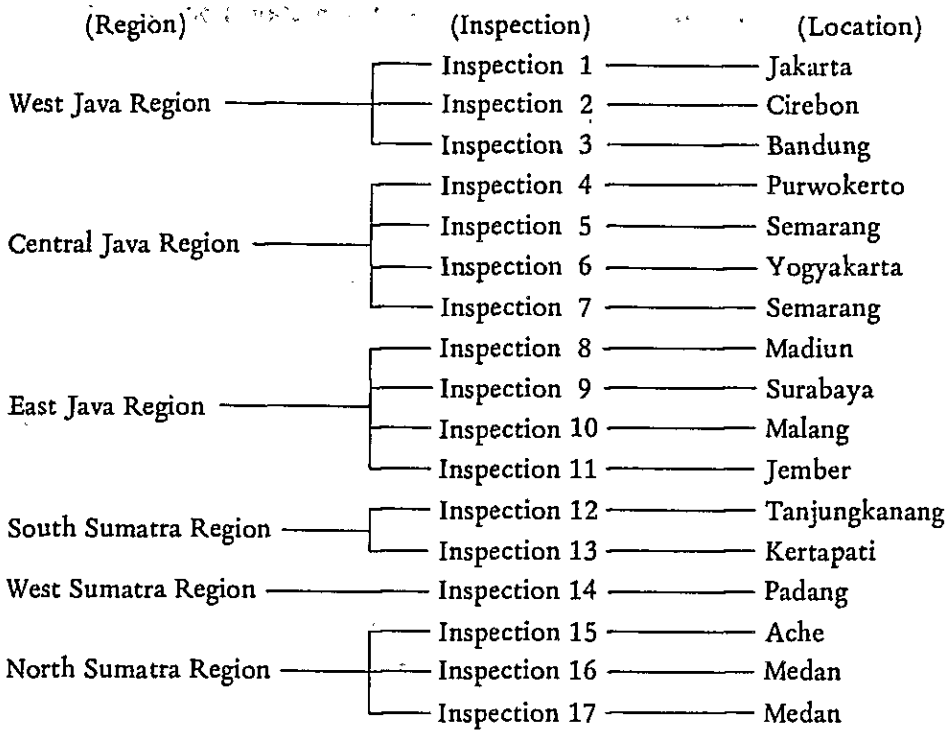


Fig. 7.1.2 Organization Chart of PJKA (Head Office)



ii) Plural number of supervisors are assigned to each division of Way & Works, Traffic & Commerce, Signalling & Telecommunications and Mechanical Engineering.

4) Field organs

Field organs under jurisdiction of each Inspection Office may be divided into railway station, maintenance of way depot, car depot, power section and telegraph & radio section. Conductors belong to main stations and security personnel are dispatched from Traffic & Commerce Division of the Inspection Office.

5) Workshop

Besides the Region, the State Railways establishes as its local organs Rolling Stock Workshop, Bridge workshop, Warehouse and Office for Customs Clearance.

7.1.3 General situation of business activities in case of Inspection 1 operating for JABOTABEK Area

The railway network in the JABOTABEK Area is operated under the control of Inspection 1 within the jurisdictional territory of West Java Region.

The office of Inspection 1 is located, together with the main office of West Java Region, within the station building of Jakarta Kota. Its internal organization is as shown in the Appendix Fig. 26 and its jurisdictional area covers the following eight (8) lines with total operating kilometerage of 461 km.

Line	Section	Operating km
Labuan Line	(Labuan – Rangasbitung)	56 km
Serang Line	(Merak – Rangasbitung)	69 km
	(Krenceng – Anyerkidul)	17 km
Parungpanjung Line	(Rangkasbitung – Tanahabang)	73 km
Tangerang Line	(Tangerang – Duri)	19 km
Jakarta Suburban Line	(Jakarta – Duri – Manggarai)	16 km
	(Jakarta – Gambir – Cipinang)	14 km
	(Jakarta – Rajawali – Jatinegara)	12 km
	(Jakarta – Tanjungpriuk)	8 km
	(Ancol – Kemayoran)	4 km
Cikampek Line	(Cipinang – Cikampek)	71 km
Bogor Line	(Manggarai – Bogor)	45 km
Sukabumi Line	(Bogor – Sukabumi)	57 km

Incidentally, the service territory of Inspection 1 may be drawn roughly by sketch as shown in Fig. 7.1.3. In terms of operating kilometerage, the total length under control of Inspection 1 reaches 152 km, which accounts for 33 % of the whole working kilometerage under the jurisdiction of Inspection 1. Those field service organs are as listed hereunder.

Classification	Inspection 1	JABOTABEK Area
Station	65	25
Service Stop	51	26
Service Stop by Agent	1	0
Stop Service Periodically	0	0
Stop without Service	7	0
Conductors-assigned Station	6	3
Way & Works Section	8	6
" (District)	28	15
Depot (including Sub-depot)	9	5
Power Section	4	4
" (Sub-section)	9	5
" (Substation)	4	4
Signalling Section	4	3
" (Sub-section)	9	5
Telecommunication Section	4	3
" (Sub-section)	10	6
Section of Telegraph & Radio Section	4	3
" (Sub-section)	10	6
Sub-section of Telegraph	7	5
Sub-section of Radio	2	1

Note: No. of field service organs in JABOTABEK Area is calculated from the address of each organ.

7.1.4 Matters of organizational review

In order that the railway in the JABOTABEK Area can be operated efficiently in a rationalized manner toward accomplishment of its mission as the urban transport means, it goes without saying that the most important thing to do is to improve the administrative system, together with reinforcement, improvement and modernization of the transport means including track structures, vehicles and other railway equipment. It should be noted that it is employees themselves to operate the railway system. Still more, their activities to perform their respective duty and obligation most efficiently in an individual job in which each of them is engaged must be well-coordinated with each other within the total frame of railway transport business. The organization is a system or a mechanism established to operate with organic and efficient efforts the cooperative work of a human group as the major force of the business operation.

Unlike all the other business enterprises, the railway business is featured by such special characteristics that its business activities cover a very wide range of territory, the business activities cover a very wide range of territory, the business organization is composed of vocational functions of many diversities which require high level of knowledge and technology, the business must be operated within strict time limit and the business is purposed for mass transit of passengers (human life) and freights (properties) at high speed. Therefore, the administrative system

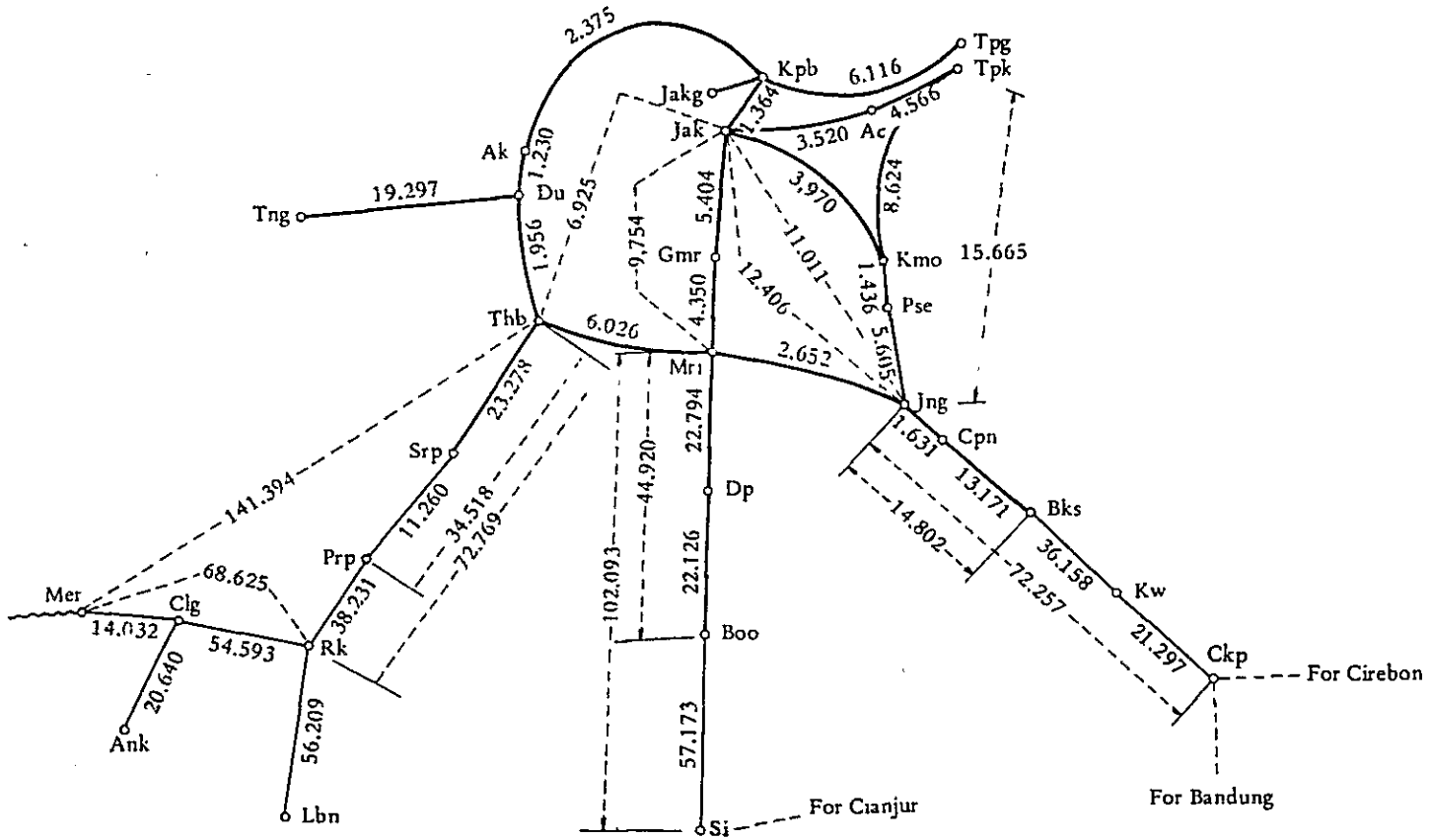


Fig. 7.1.3 Sketch on Service Territory of Inspection

JABOTABEK Area Railway Transportation Study

Note: 1. Thick line denotes JABOTABEK Area.
2. Figures stand for kilometerage.

must be organized on the basis of such characteristics.

When reviewed from the viewpoints as aforementioned, it is pointed out that the organizational systems of West Java Region and Inspection 1 as the local governing bodies for the railway in the JABOTABEK Area should require further studies as to the following points, though both of them seem to be complete with their organizational functions. It is proposed that improvement should be made to the executing system of business rather than the organizational system itself.

1) Office location

The offices of West Java Region and Inspection 1 are situated at the extreme north tip (at northwest in case of the Region office) of their respective administrative territory. It is generally preferrable, however, that they should be located nearly at the center of the whole territory instead of being located far from the center. It is advisable that if possible those offices should be relocated near the Manggarai Station. The said station will serve as the pivot for operation of incoming trains from the Central, Western, Bekasi and Merak Lines.

In the meantime, however, there still remain some difficulties to be considered in respect of the traditional and historical background with the local inhabitants of the Jakarta metropolitan area, the symbolic value of the Jakarta Kota Station and practically financing and land acquisition problems. Aside from those problems, the present office location is certainly worthy of further study.

2) Administrative scale of Inspection 1

The present scale of administration of Inspection 1 represents its total operating kilometerage extending to 461 km covering about 230 field service organs and about 6,400 personnel under its jurisdiction. It may be considerably sizable when compared as follows with the total scale of the States Railways or the railway system being operated in the Java Island.

	PJKA (a)	Java (b)	Insp. 1 (c)	$(\frac{c}{a})$	$(\frac{c}{b})$
Total line length (km)	5,881	4,113	585	9.9 %	14.2 %
No. of stations	754	601	65	8.6 %	10.8 %
Train-kilometers (km/day)	62,861	54,460	14,263	22.7 %	26.2 %
No. of personnel (person)	55,512	37,670	6,374	13.5 %	16.9 %

Furthermore, it is anticipated for Inspection 1 that both traffic volume to be handled and number of the personnel would be increased significantly, upon completion of all the improvement projects throughout the railway network in the JABOTABEK Area, as the result of extension of double-track, electrified sections, increase of train operation, additional supplies of rolling stock and new opening of New Airport Line and Cibinong Line.

Although any objective and theoretical indexes may be hard to obtain to determine the optimum scale of Inspection 1, it must be determined by inevitable use of such determinative judgments as to whether or not the planned scale would be within the controllable

range of capacity from the operating distance by due reference to total track length in km, number of field service organs and working kilometerage or whether or not the planned size of staffing could ensure complete transmission of orders and instructions necessary for administrative operation to every corner of the service territory.
The future administrative scale of Inspection 1 would most probably become relatively huge in comparison to any other Inspections. The divisional scope between Region and Inspection offices, in both vertical stratum and horizontal boundary of the administrative control must be further reviewed in the future from various aspects of local topography, administrative district, transport pattern and safety security.

3) Electric power service control system
With regard to electric power service control, Inspection 1 has Electrical Engineering Section under the Mechanical Engineering Division, dealing with overhead equipment, substation and lighting. However, in the future when the planned doubling of track and electrification for the whole railway sections within the JABOTABEK Area, it is anticipated that the administrative work for electrical engineering service will be increased with expansion of the maintenance area and work volume incidental to track addition and electrification. To prepare for such future needs the present operational system of Inspection must be strengthened for consolidation.
It is advisable in this connection that the electrical engineering division should be reorganized independently from the present Mechanical Engineering Division because it requires high technology as well as specialized knowledge and also to be prepared for introduction of new technology. On the other hand, however, there are to be considered some adverse factors, which may impede performance of the normal operation, for instance such as complexity of organization, increase of maintenance personnel, duplication with other job functions and influential rise of departmentalism. Therefore, those factors must be taken into full consideration in reviewing the necessary measures to be taken.

4) Control system for signalling and telecommunication service
For all the Indonesian Railways personnel, the safeguard equipment including signal apparatus, relay interlocking device and ATS system would be quite unknown and unfamiliar to them all when newly introduced for future train operation. This will be, in this sense, the overall innovation of the present signal and telecommunication technologies in Indonesia. The series of equipment may be likened to a nerve of the human body and should therefore require precise care of handling and constant effort of functional maintenance and control. At the same time, the appropriate training program for earliest acquisition of both knowledge and skill for handling of the new equipment must be established. The program should include the practical exercise by handling of the model apparatus provided for training purpose and compilation of the handling manual dealing with operation and maintenance of the equipment. Besides that, the administrative services to be provided by Inspection 1 should be reviewed wholly to be tailored to the operating system with such new equipment.

5) Total dispatching system
No dispatching service would be required in any event that trains are operated normally on time as set up by the operation diagram. In reality, however, there are many instances

where normal operation may be hindered by operational delay, failure or accident of the train. If this should take place, necessary measures must be taken for quickest recovery of train operation by accurate grasp with promptness of the operating and transport conditions and the general status of failure or accident.

It must be recognized, therefore, that the purpose of the dispatching service is not merely to handle such time delay or accident in an expost facts report but mainly to make quickest decision for necessary actions and issue prompt orders or instructions to the field service organs involved in an attempt to rehabilitate the train operation into the normal condition.

In view of the present train operation and the future operation plan for the railway network in the JABOTABEK Area, it is considered necessary that the dispatching service system for train operation, electric facilities and passenger transport should be established at the earliest possible date.

In anticipation with high probability that in the future train operation diagram the time schedule for the normal trains would get out of control in the grove consequence from delay or accident of even a electric train or long-distance train, it is emphasized that more importance should be added to the dispatching services for immediate remedies from accident, extra train addition for peakload operation and change-over of power supply system.

6) Information network system

In addition to the fact that the railway transport service covers a wide expansion of territory, a lot of field service organs are scattered over the whole area. In order to unify all of those dispersion units into the integrated transport system toward the common aim and purpose, free communication must be established functionally between the administrative organization and its subordinate field organs for issue or receipt of orders, instructions and reports, not to mention of the necessity to form up close information channel for transmission or exchange between each organizational sectors or divisions. The communication system plays, in this sense, a role of vital importance, in that it serves to promote better understanding within the management system of a corporate by surmounting the barrier of location and distance.

The information system of modernized pattern today covers a wide range of variety and diversity, still developing with rapid progress toward its no-end future. With this in mind, it is proposed for immediate needs of railway operation in the JABOTABEK Area that the present communication network should be improved, telephones (for exclusive use of railway operation and dispatching purpose) should be complete with additional numbers and facsimile transmitters and receivers should be installed additionally.

7.1.5 Establishment of maintenance service system

In the railway system consisting of many track structures and electrical, signalling and communication installations and rolling stocks, it is most important that the performance functions of all those component systems and equipment should be maintained at their best conditions in order to accomplish the transport service most efficiently.

Indeed, all the equipment would be able to sustain their proper function well if and after they are renewed entirely. However, such total renewal would require an immense sum of fund and would therefore produce very uneconomic burden. As long as and if any such easy-going attitude as may be taken to remedy any mechanical failure after outbreak of any trouble continues without precaution in constant maintenance care, it would be next to impossible in any event to secure safety of train operation, not to mention of inability to realize speed increase of running trains.

From the economic point of view, the prerequisite to the maintenance service of facilities is to maintain the constant operational function at or above the fixed standard, as a whole, with minimum cost. Furthermore, it is advisable that maintenance care should be taken, far beyond the conservative realm of service aiming merely at maintaining the status quo, with positive attitude to keep screening eyes upon any shortfalls at each point of the facilities, thus seeking the possibility to remove any cause of operational problems for improvement of the whole system.

By execution of the transport improvement projects the existing railway system in the JABOTABEK Area will be renewed in its entity with introduction of the new functions. In line with this future improvement, it is essential that full review should be made on the conventional maintenance standard and service criteria with the aim to establish a new maintenance control system so as to enable all new equipment to be maintained in good operating condition and prolonged to longer service life in the future. To achieve the aim, it is also considered necessary that each maintenance worker should fulfil his duty and obligation by full recognition of importance in the maintenance service, not to mention of the need to acquire both knowledge and skill in full sufficiency about the system structure and function.

Maintenance services are diversified into each sector of track structure, electrification, signalling and telecommunication and rolling stock inspection and repair, for which the maintenance control system must be reviewed into concrete details from the following viewpoints for improvement.

1) To uniform and homogenize equipment, materials and parts for higher reliability.
2) To set up the inspection standards concerning inspection classification, place of inspection and items of inspection.
3) To execute maintenance services under the maintenance work plan and schedule which is formulated, according to the purpose of work, by due reference to time of execution, sequence of work, time for procurement of materials, local conditions of territory, performance capacity, frequency of maintenance and unfavorable condition.
4) To make entry of failure or damage on each individual item of equipment and seek the cause by sorting and classification of the records to take appropriate action for remedies.
5) To make review of the present maintenance system and improve the operating method of work by mechanization of the working procedure.
6) To lubricate a series of business procedures for inventory control, purchasing request, procurement and supply of maintenance materials so as to ensure the optimum stock available at any time of requirement.

7.2 Financial Situation of PJKA

7.2.1 The principle of management

The Indonesian State Railway (PJKA) was a Government agency under the Ministry of Communication until the end of March 1979. However, through a Ministerial Decree, PJKA was reorganized into one of the bureaus under the same Ministry as from April 1979 and the control of the Ministry was strengthened. They have, however, been independent as an organization with responsibility for their own day-to-day management, and this situation will be further maintained.

The fiscal year was changed to April/March from the calender year after 1979. The last annual report was made on 31st March, 1979 using the operational results of 15 months, and the assets on the Balance Sheet as of 1st April, 1979 represented the initial operating assets for the new start. The recording of account or the preservation of materials are excellent, probably due to the good tradition influenced by the Netherlands, however, it is time-consuming to look for the appropriate data, because the filing system has not been updated.

The British financial advisor, S.Parman & Co., is introducing an improved accounting system on the occasion of their audit of PJKA under the sponsorship of IBRD. The procurement of assets, including rolling stock, as well as the securing of the necessary funds for investment are the responsibility of the Government. The procured assets in use are all recorded in the Balance Sheet of PJKA as fixed assets (see Table 7.2.1 & 7.2.2)

PJKA is an organization which is empowered to manage railway transport operations, using these assets. In principle, PJKA should be operated so that revenue covers routine expenses, but actually operating revenue is not covering expenses. As a result of this, expenditure for the maintenance needed to achieve adequate standards of operational efficiency is sacrificed on the one hand, and the government has to provide subsidies to meet the deficit on the other hand.

7.2.2 Financial situation

Over 90% of the revenue of PJKA consists of railway (87-88%) and ferry service (others are custom clearance service, catering service of dining car, land lease, etc. Refer to Table 7.2.3).

Although the railway fares are revised from time to time, the fares for essential commodities and for the JABOTABEK train are being intentionally maintained at lower levels.

PJKA has intensively introduced railcars and diesel cars into the JABOTABEK Area under Japanese assistance since 1977 and the increase of passengers in that area is appreciated as a contribution to the increase of passengers for all of PJKA in recent years. However, the increase in passenger revenue has been relatively small, due to the low fares.

Personnel costs which make up 45% of total costs (equal to 60% of total revenue), includes the salary of non-active employees. The number of these personnels are 10% of total employees and 0.6% of total personnel costs.

Due to a large-scale salary increase in April 1980, personnel costs in the budget for FY 1980/81 will reach as much as 60% (equal to 86% of revenue) of total expenses, which will further diminish the amount to be spent on maintenance. The yearly increase in maintenance costs seems to derive not from the expansion of railway facilities but from the maintenance of aged rolling stock and facilities. Due to the lack of funds, the maintenance of facilities, which normally should be executed out of PJKA 's own budget, is governmental funds or foreign aid under rehabilitation programs. Accidents as a result of negligence in systematic maintenance over the past years have also caused unforeseen expenses.

Revenue and Expenses of PJKA[*1]

	1977	1978/79(Mos.)	1980/81(Budget)
	[*2] [*3] [*4]		
Total Revenue	27,175 (100) (72)	40,843 (100) (76)	44,275 (100) (70)
Total Expenses	37,773 (139) (100)	50,073 (133) (100)	63,335 (143) (100)
Personnel expenses	16,469 (61) (44)	24,408 (60) (45)	38,225 (86) (60)
Fuel, etc.	4,110 (15) (11)	5,278 (13) (10)	6,700 (15) (11)
Maintenance	12,268 (41) (32)	12,938 (32) (24)	10,550 (24) (17)
Others	5,926 (22) (15)	11,449 (28) (21)	7,860 (18) (12)

Note: [*1] Depreciation not included.
[*2] million R_p
[*3] as against revenue (%)
[*4] as against total exp. (%)

Source: PJKA Report

While PJKA's revenue doubled in 6 years (from 73 to '78), expenses increased 2.5 times and the inbalance between revenue and expenses expanded.
As a remedy for the future, it is important to increase transport services through the appropriate investment, and to decrease the unit cost of transport through more intensive utilization of railways.

The Western Regional Office, which includes both Jakarta and Bandung in its area, is the only Division showing an operating profit on the provisional income statement , while the other five Regional Offices are in deficit or their revenues are barely sufficient to cover working costs. The railway revenue of the Western Regional Office is supported by passenger revenue which reaches 80% of that office's total revenue in 1979 and 85% in 1980 (budget basis).

7.2.3 Relations of PJKA to the Pelita

The procurement of physical assets and the rehabilitation work are being performed under the Five-Year Plan of the Government (Pelita or Repelita), of which large scale works are taken up by DIP and others are called Non-DIP. As shown in Table 7.2.4, the majority of work under the 3rd Pelita (1979-1983) is devoted to the rehabilitation of locomotives and

tracks. This plan is consistent with the proposals made by the Canadian Consultant in the report "Five and Ten Year Development Plan (1979 - 1989)", which puts emphasis on the neccessity of the rehabilitation of time elapsed rolling-stock and facilities. (Table 7.2.4)

The procurement of necessary materials and equipment is executed by the Directorate General of Land Transport and Inland Waterways (PHBD) of the Ministry of Transport and Communications with the funds from either the Government or IBRD or bilateral assistance from various countries.

Table 7.2.1 PJKA Balance Sheet

(Unit: Million Rp)

	73	74	75	76	77	78/79
Assets						
Fixed Assets	93,470	106,301	119,148	146,285	172,515	179,383
less Depreciation	12,534	15,158	18,246	21,807	26,354	32,760
Fixed Assets (net)	80,936	91,143	100,902	124,478	146,161	146,623
Current Assets*	12,817	12,890	13,405	18,856	25,565	22,428
(Inventories)	(2,627)	(2,824)	(2,866)	(2,132)	(3,016)	(2,225)
Total Assets	93,753	104,033	114,307	143,334	171,726	169,051
Liabilities & Equities						
Current Liabilities	12,431	10,976	12,958	15,933	18,207	16,680
Government Equity	98,115	115,502	133,662	173,290	214,553	233,041
Accumulated Operating Deficits	16,793	22,445	32,313	45,889	61,034	80,670
Equity (net)	81,322	93,057	101,349	127,401	153,519	152,371
Total Liabilities	93,753	104,033	114,307	143,334	171,726	169,051

Note: * Shows current assets includes parenthesized inventories.

Table 7.2.2 PJKA Fixed Assets at the End of March 1979

(Unit: Million Rp)

		Purchase Value	%	Depreciation	Book Value
a1	Steam/electric locomotive	2,862	2.5	620	2,242
a2	Diesel locomotives	31,295	5	6,873	24,422
b	Coaches and wagons	33,884	2.5	4,441	29,443
c	Bridges and cluverts	11,337	2.5	1,778	9,559
d	Tunnels	364	0	0	364
e	Buildings	21,054	2	4,374	16,680
f	Ground ways	8,299	0	0	8,299
g	Tracks	46,662	2.5	7,677	38,985
h1	Motor vehicles	821	25	454	367
h2	Office equipment & furniture	5,827	10	3,161	2,666
i	Communication system	5,072	5	1,029	4,043
j	Fences, signs and gates	523	2.5	118	405
k	Signals	3,077	5	765	2,312
l	Electric installations	6,693	4	535	6,158
m	Wharves	207	2.5	33	174
n	Water/oil installations	428	2.5	81	347
o1	Motorised vesseles	909	10	792	117
o2	Unmotorised vessels	69	3-3/4	29	40
	Total	179,383		32,760	146,623

Table 7.2.3 Income Account of PJKA 1973 - 1979

(Unit: Million Rp)

	73	74	75	76	77	78/79
Operating Revenue						(15 months)
Passenger	7,478	9,213	10,554	12,086	14,257	22,152
Baggages	76	95	94	90	93	131
Parceles	470	647	625	697	710	1,002
Freight	6,408	7,530	7,121	6,287	8,494	12,042
Ferry Service	647	988	1,257	1,651	1,403	1,683
Ancillary Services	119	180	149	173	175	324
Miscellaneous	995	939	908	1,428	2,043	3,509
Total Operating Revenue	16,193	19,592	20,708	22,412	27,175	40,843
Operating Expenses						
Wages, Salaries	5,054	6,273	7,854	8,968	13,800	19,908
Rice	2,339	2,149	1,986	1,895	2,147	3,565
Health, etc.	508	822	719	551	522	935
Total Staff Costs	7,901	9,244	10,559	11,414	16,469	24,408
Fuel etc.	2,280	3,139	3,877	4,045	4,110	5,278
Maintenance	3,419	5,748	9,034	12,364	11,111	12,466
Accident repairs	187	183	156	146	157	472
Miscellaneous	3,391	4,306	3,862	4,458	5,926	11,449
Total Working Expenses	17,178	22,620	27,488	32,427	37,773	54,073
Net Revenue	△985	△3,028	△6,780	△10,015	△10,598	△13,230
Depreciation	2,442	2,624	3,088	3,561	4,547	6,406
Total Operating Expenses	19,620	25,244	30,576	35,988	42,320	60,479
Net Operating Revenue	△3,427	△ 5,652	△ 9,868	△13,576	△15,145	△19,636

Table 7.2.4 PJKA Development Plan Based on Repelita III

(Unit : F.C. = 1,000$
D.C = million Rp)

	DIP		Non DIP		TOTAL	
	F.C.	D.C.	F.C.	D.C.	F.C.	D.C.
1. Tracks	82,936	45,869	67,639	13,095	150,575	58,964
2. Bridges	3,713	8,957	4,647	5,383	8,360	14,340
3. Signals	865	10,927	16,247	1,632	17,112	12,559
4. Telecommunication	13,447	5,292	723	1,632	14,169	6,924
5. Buildings	-	104	-	2,564	-	2,668
6. Machines	19,336	13,106	-	-	19,336	13,106
7. Diesel locomotives	37,027	8,518	35,057	7,430	72,084	15,948
8. Steam locomotives	-	174	460	1,090	460	1,264
9. Railcars	30,010	2,218	8,892	3,012	38,902	5,230
10. Passenger cars	19,045	2,850	652	14,672	19,697	17,522
11. Freight cars	6,650	8,775	1,801	8,589	8,451	17,364
12. Miscellaneaus (workshop, electricity ferry, etc.)	21,972	12,160	264	4,477	22,236	16,637
Total	235,000	118,950	136,381	63,577	371,381	182,527
( ):in million Rp	(146,875)		(85,238)		(232,113)	
Grand Total (in million Rp)	265,825		148,816		414,640	

7.3 Subsidiary Enterprise

7.3.1 Present situation of subsidiary enterprise

The main lines of subsidiary enterprise now being undertaken by the State Railway of Indonesia include dining-car restaurant, leasing of land in possession and warehousing, in addition to stalls and refreshment rooms within the station. The earnings from such subsidiary enterprise may be estimated as follows, although it is found difficult to clarify the full particulars because of unavailability of the data specifying details of business lines and accounting items of the earnings.

Fiscal Year	Total Operating Revenue (Included Subsidiary Revenue) (a) Million Rp	Subsidiary Revenue (b) Million Rp	Ratio (b/a) %
1973	16,193	119	0.73
1974	19,592	180	0.92
1975	20,708	149	0.72
1976	22,832	593	2.60
1977	27,602	602	2.18
1978	31,270	714	2.28

Note: 1. Earnings indicated above are based upon 'Facts and Figures 1978' published by the State Railways of Indonesia.

2. Earnings are itemized by catering, hydroelectric power plant, clearance of goods and printing, etc. It is estimated that 'miscellaneous income' of 'earnings from railway business' may include a part of earnings from subsidiary enterprise.

The earnings by subsidiary enterprise at the office of Inspection 1 may be estimated as follows from the data furnished to the Survey Team.

Fiscal Year	Total Operating Revenue (Included Subsidiary Revenue) (a) Million Rp	Subsidiary Revenue (b) Million Rp	Ratio (b/a) %
1977	9,125	44	0.48
1978	12,094	57	0.47
1979	14,915	74	0.58

Note: The earnings from subsidiary enterprise at the office of Inspection 1 are the total sum of earnings (from book sales and meal) plus rents from leased land and from occupancy of buildings.

7.3.2 Necessity for expansion of subsidiary enterprise scale

The railway business in many countries is in deficit account, being supported by the Government and other public agencies with vast sum of subsidies.

Indeed, the railway plays an important role as the key transport means at home. With this in mind, the railway authority endeavors by its own effort to secure the earnings by every possible means, besides administrative and financial aids from the Government and increase of fare rate. As one of the possible measures, there is a need for expansion of the business scale associated with the railway.

Recently, beyond the conventional limit of range covering station stalls and refreshment rooms and dining-car restaurant, the subsidiary enterprise receives more attention as an undertaking to encourage increase of earnings and is intended for expansion of scale and business line from the following viewpoints.

1) The railway possesses its own land over a wide range of service territory. In particular, any land space under the elevated track or around the station in a city forms a part of urban space of significance. Consideration must be given to effective utilization of such real estate now lying idle.
2) The station in the large urban area should serve not merely as the terminal station for passengers as conventionally so, but also as the place of gathering by many inhabitants. In view of the latter function, it is recommended that the station should be utilized for growth of local community as well as promotion of railway traffic utilization with its compound function serving as the 'place for citizens', the 'rest place for people' and the 'forum of information exchange'.

The railway network in the JABOTABEK Area has a total track line length of 152 km and 26 stations (except service stops, etc.) in the urban center and its environs.

If the development project is implemented to realize the land utilization plan for those stations with high probability of rapid demand increase, this would increase the earnings from the subsidiary enterprise and contribute greatly toward growth of the future railway management. Since the local climate condition is featured by high temperature all the year round, a plan may be worked out to improve the station plaza and other space available with plantation for formation of a green zone where people can enjoy bleezing of cool air under dense trees. The railway traffic improvement plan proposes track elevation in the section between Jakarta Kota and Manggarai and between Jakarta Kota and Gang Sention. In this connection it is considered necessary that study should be made as to effective utilization of land space under the elevated track.

7.3.3 Subsidiary enterprise examples

The subsidiary enterprise covers a variety of business lines. The method of business operation may be divided largely into direct involvement in the business activity and indirect association by investment to subsidiary companies.

For referential purpose, some examples are cited hereunder from the subsidiary enterprise lines or from the invested items as incidental to the railway business of the Japanese National Railways.

1) Incidental business items
   i) Approval on business activities in direct connection with passengers (stall, dining-car restaurant and terminal bulding shopping)
   ii) Approval on advertisement
   iii) Approval on freight yard utilization (for warehousing and stock yard)
   iv) Land leasing
2) Invested business lines
   i) Commissioned agent business (for ticket sales, rolling stock maintenance and data processing)
   ii) Business closely related to railway transport subsidiary enterprise including bus terminal, warehouse and goods distribution terminal, passenger terminal and rental car service
   iii) Business making effective use of railway facilities (such as building rent, hotel, rental or installment housing, sports and recreational facilities, bus terminal, parking lot, restaurant and other commercial sales, advertising media, administration business of facilities under elevated track structure, drivers' training school and new traffic system)
   iv) Promotional business of railway lines (hotel accommodation and tourist facilities)

CHAPTER 8. ECONOMIC ANALYSIS

CHAPTER 8 ECONOMIC ANALYSIS

8.1 Introduction

8.1.1 Purpose

The Master Plan (the Plan), which outlines the urban and suburban railway system in JABOTABEK in the year 2000, consists of the rehabilitation program for the existing railway lines in the area and the expansion of railway capacity by improving and strengthening the present system as well as through construction of new lines. More specifically, it comprises rehabilitation of tracks, double tracking, electrification, improvement and expansion of workshops and depots, installation of automatic signals, supply of electric cars (ECs) and diesel cars (DCs), improvement of station facilities, construction of continuous elevation of tracks and new lines.

The Plan can be considered the extension of the Intermediate Program, which is presently being actively implemented and is scheduled to be completed by the end of 1983. The Plan calls for the railways to eventually play the major role in the urban and suburban transport system for commuters in the Greater Jakarta area. Although a huge investment and considerable operating expenses will be required during the Plan period, the Plan is expected to generate even greater benefits, having a favorable impact on the society as a whole. The purpose of this Chapter is to evaluate the economic feasibility of the Plan from a national point of view.

8.1.2 The basics of the analysis

The identification of economic benefits and costs, wherever possible, has been based on the "with and without principle." This refers to the principle that both benefits and costs attributable to the Plan are to be based on a comparison between the situations that would prevail if the Plan is implemented and if it is not. Investment and operational expenses required for transporting the assumed passenger volume were estimated for the two situations as "costs." The effects of the Plan on savings, etc., were identified as constituting "benefits." The economic viability of the Plan was evaluated and judged by the Economic Internal Rate of Return (EIRR or IRR) estimated on the basis of the economic benefits and costs of the Plan, as identified and valued.

1) With and Without project
   In this Chapter, as aforementioned, "with project" refers to the situation where the Plan is implemented, and "without project" assumes the situation if the Plan is not carried out and the passengers are to be carried by road transport (buses and motor cars) instead.
2) Items for estimating costs and benefits
   i) Investment
      The investment timing and amount are considered for railway facilities, road construction, and purchase of vehicles such as ECs and DCs for railways and buses and motor cars for road transportation. The investment in railway facilities was categorized into civil works, electrification, signals and telecommunications, facilities for workshops and other equipment.

ii) Operating and maintenance expenses
The estimation was made for expenses on personnel, spare parts necessary for routine maintenance and replacement, and energy or fuel, all required for operation of the invested facilities and vehicles.

iii) Benefits
Various benefits were derived by comparing "with project" and "without project." The quantified benefits were the cost saving benefit, the time saving benefits and the benefits generated from the continuous elevation of tracks.

3) The incremental method
The Plan, which includes construction of new railway lines, essentially is a large-scale improvement and expansion program of the existing lines in JABOTABEK. After the Plan is implemented, all system facilities in the project area comprise the portion already existing before the Plan is implemented and the portion attributable to the Plan.
However, in order to properly assess the benefits and costs as well as the traffic demand attributable to the Plan, only those additional or incremental portions due to implementation of the Plan will be considered in the study. All the sunk costs and the benefit therefrom are not included.

8.2 Assumptions and Methodology

8.2.1 Traffic volume

The assumed traffic demand of passengers expected to be carried by the proposed railway program consists of three kinds of demand.

1) Normal traffic demand: the demand that will exist even if the Plan is not implemented.
2) Diverted traffic demand: the demand which is switched to railway use away from roads as the Plan is implemented.
3) Developed traffic demand: an entirely new demand generated by the economic and social development in the project area that is induced by the Plan.

Based on the OD tables in Chapter 2.2.1, the three kinds of traffic demand are measured in passenger-km on each railway line and during different time periods (peak hours/ non-peak hours). The growth of the normal traffic demand is estimated on the basis of population increase in each district where the demand is generated. The developed traffic demand is estimated by taking into account the development of residential areas along the railway influence areas. The following distribution shares of these demands were assumed as basic data. (Table 8.2.1)

Table 8.2.1. Daily Passenger Volume on Each Line in 2000
(Incremental volume after 1984)

(Unit: 1000 passenger-km)

Traffic demand generated area	Normal Demand	Developed Demand	Diverted Demand	Total
Central Line (Bogor-Depok)	544 (21.8%)	1,253 (50.2%)	700 (28.0%)	2,497 (100.0%)
Central-Line (Dopok-Manggarai)	952 (19.0%)	2,011 (40.0%)	2,063 (41.0%)	5,026 (100.0%)
Bekasi Line (Bekasi-Jatinegara)	765 1 (15.5%)	1,470 (29.8%)	2,699 (54.7%)	4,934 (100.0%)
Merak Line (Merak-Tanahabang)	905 (13.3%)	3,599 (52.9%)	2,299 (33.8%)	6,803 (100.0%)
Tangerang Line (Tangerang-Duri)	290 (12.8%)	548 (24.2%)	1,426 (63.0%)	2,264 (100.0%)
City Lines	1,234(13.7%)	2,624(29.1%)	5,152(57.2%)	9,010 (100.0%)
Total	4,690(15.4%)	11,505(37.7)	14,339(46.9%)	30,534 (100.0%)

8.2.2 The scope of the plan ("With project")

The Plan consists of various rehabilitation, improvement and expansion programs as well as construction of new lines. The details of these programs can be referred to in Item 5.2.2. of Chapter 5.

8.2.3 "Without project"

The scheme of "Without project" is dealt with hereunder with the support of a flow chart indicating our basic considerations.

1) Passenger volume
   Only the normal and diverted demands are taken into account since the developed demand does not exist in the "Without" situation. Further, a certain portion of the normal demand which can be carried by the existing capacity (i.e., the capacity as at the end of 1983) is deducted from the demand volume.
2) Parallel road construction
   The passenger volume which is supposed to be carried by each railway line will be carried by road transport in case the Plan is not implemented. In this study, a road (7m wide, 2 lanes) with a length of 1.3 times the railway is assumed to be constructed along each line where necessary.

3) Traffic volume and running speed of road vehicles
The following equation indicating the amount that the running speed of road vehicles will decrease as traffic volume increases, is used in the study.

$V = Vo - aq$ *

V = the average running speed (miles per hour) of a motor vehicle

Vo = the average mileage per hour with the condition that there is very little traffic on roads as well as taking into account the characteristics of the road (i.e., number of intersections, traffic lights, etc.)

a = the coefficient of speed reduction due to road specifications, capacity, etc.

q = the traffic volume

* from "Traffic System Analysis" for engineers and planners, by M. Wohl and B.V. Martin

The following values were applied in this study:

	Suburban Areas	City Area
Vo (miles/hour)	24.86 *	18.65 *
a	0.017	0.021

* 24.86 miles = 40 km, 18.65 miles = 30 km

Based on the estimated average running speed per hour of passenger cars, the average speed of buses is calculated with the conditions given below:

	Suburban Area	City Area
Average distance between bus stops	1000 m	500 m
Average stoppage time	20 sec.	10 sec.

* The stoppage time includes deceleration and acceleration time of bus at each stop.

4) Road traffic congestion and road widening
The running speed of vehicles will be considerably reduced if the traffic volume exceeds road capacity. In this analysis, the minimum average speed is set at 10 km/hour within the city area and 15 km/hour in suburban areas. We presumed that construction of an additional road will be required if the speed of passenger cars falls below the minimum speed during the morning and evening peak hours.

5) Investment in road vehicles
As against the mass transport system of railways, buses with 45-seat capacity and 2000 c.c. medium-size passenger cars (excluding short range transport means such as oplet, bemo, helicak, bajaj, becak, etc.) were considered as the road transport fleet. The investment amount in road vehicles is determined by calculating the number of vehicles required to carry passengers during the peak hours.
The main factor to be considered in estimating the number of buses and motor cars required to carry the passenger volume is the share of passengers using bus services and the share using motor cars. The currently available data (see Tables 1.2.1 and 1.2.2.) indicate that out of the total number of passengers using buses and motor cars, 70% is allocated to buses and 30% to motor cars. In 8.5 of this Chapter, we assume three different cases of the "Without" situation with passenger share variation as the key parameter in estimating the economic internal rate of return (EIRR).
The flow chart showing the framework of "Without" project is indicated in Fig. 8.2.1.

8.2.4 Various assumptions

1) Time value
The average time value indicated below was used for the entire life of the Plan in estimating the time saving benefit dealt with in 8.4.2. and 8.4.3. (1).

Table 8.2.2 Average Time Value

Rp. per hour

Commuters using bus	300.-
Commuters using motor cars	1,040.-
Pedestrians	85.-

The above indicated figures may be regarded as being on the high side, but due to the non-availability of appropriate information, we used data obtained through interviews with construction firms in Jakarta. 2080 working hours per year (40 hours/week, 7 hours/day) was used to compute the hourly wage above. Income tax was adjusted to have economic value.

2) Economic prices
In principle, the transfer payment items such as taxes need to be excluded from and subsidies included in the economic calculations. However, since the sales tax on essential commodities, which presently ranges between 0% - 2.5% due to the

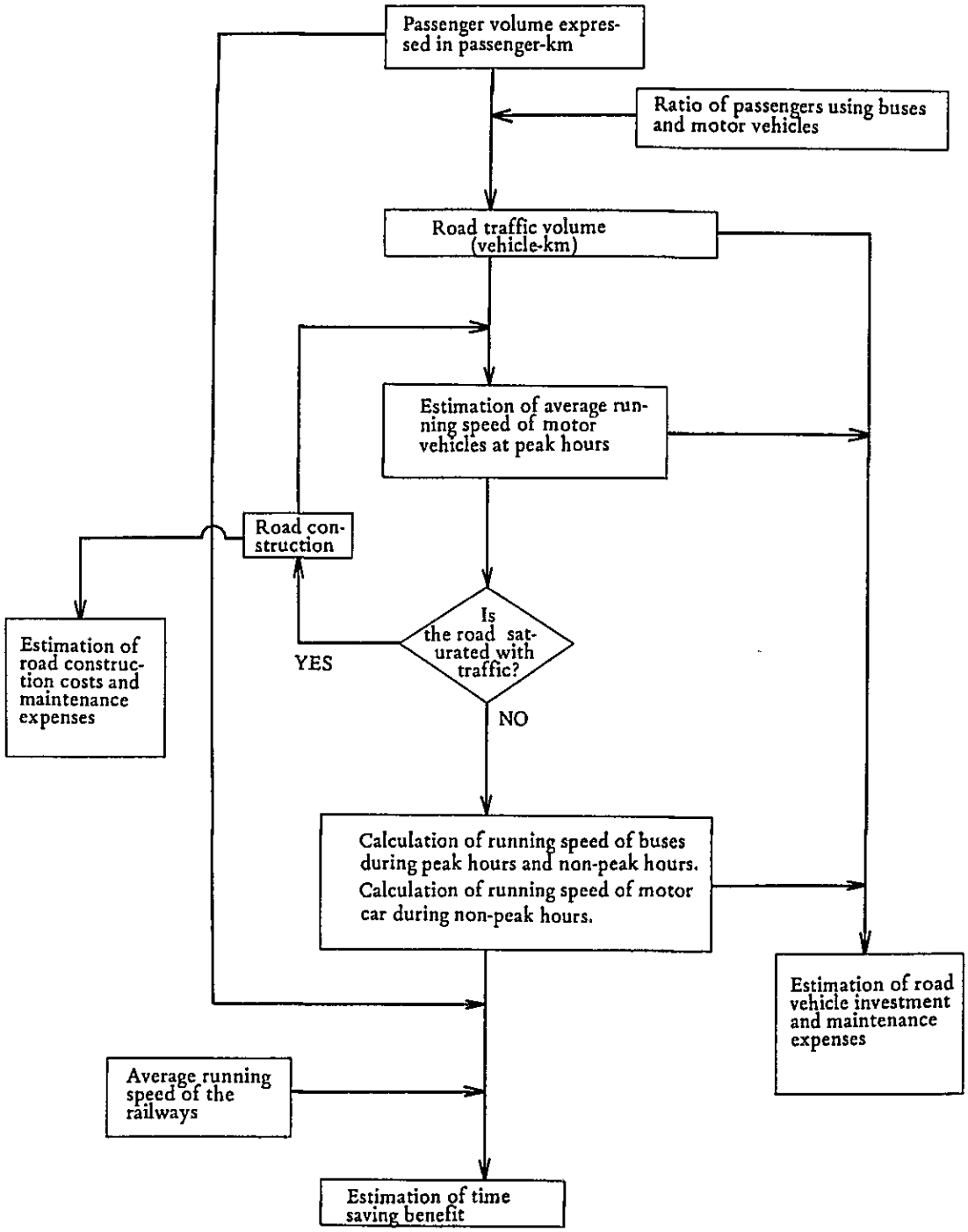


Fig. 8.2.1 Framework of "Without" Project

revision that took place in March 1979, can be considered very low and negligible, this tax was not adjusted.

The main commodities to which the economic prices are applied in the present examination are indicated below together with the market prices.

Table 8.2.3 Relevant Economic Prices

(Unit: Rp.)

	Market Prices	Economic Prices
Gasoline (per litre)	150	108.15
Diesel Oil (")	52.5	99.65
Engine Oil		
Motor Vehicle (per litre)	1,350	1,080
Bus (")	650	520
Motor Vehicle (per vehicle)	11,725,000	5,003,640
Bus (")	28,806,000	27,024,516
Tyre for Motor Vehicle (per tyre)	28,000	22,568
Tyre for Bus (")	102,000	82,212

Source: (1) Gasoline & Diesel Oil - Directorate Oil Revenue, Ministry of Finance

(2) Others: Interviews with dealers

3) The life of physical assets

In determing the life of fixed assets, PJKA's depreciation rates were used as basic figures. An assumption was further made that after reaching the life of a physical asset, a new investment of the same amount will take place to replace the asset.

The lives of main facilities are given below:

	Life of Physical Asset	Depreciation Rate
ECs, DCs (rolling stock)	25 years	4%
Bridges	40 "	2.5%
Buildings	40 "	2.5%
Ground Ways	-	0%
Tracks (steel)	40 "	2.5%
Telecommunication	20 "	5%
Crossings	20 "	5%
Signalling	20 "	5%
Electrical installations	20 "	5%

Source: Article 13 of Joint Decree of the Minister of Finance and Minister of Communications, 30 March 1979

A seven-year life and a ten-year life were assumed for buses and motor cars, respectively, according to information from PPD.

4) Life of the Plan and salvage value

The 30-year life of the Plan was considered appropriate on the following reasoning:

i) The investment of the Plan lasts for 17 years (1984 - 2000) while the life of the facilities is around 20-25 years. The average durability of the fixed investment, therefore, is approximately 30 years.

ii) On the other hand, if the life of the Plan should be more than 30 years, the 17 years of the traffic demand forecast may be regarded as too short.

Certain fixed investment, of course, will remain functional after the 30-year period. In this connection, salvage value of the fixed investment is computed at the end of the period of the Plan, and is deducted from the costs (i.e. considered as "benefits") of the last year.

5) Other assumptions

i) Inflation Factor

The inflation factor is left out of our analysis for the following reasons:

a. General inflationary price increases which influence both cost and benefit streams in about the same way are nullified and can be left out in computing the IRR.

b. The implementation of the Plan is expected to have a marginal impact on the prices of resources (land, labor, materials, etc.) in the project area.

c. The investment under the Plan starts in 1984 and extends as far as the year 2000, a period which is too far ahead from the time of the study for any kind of price increase forecast.

ii) Exchange Rate

The foreign exchange rate of US$1 = R_p.625 = Yen 220.- is used in this Report. A shadow exchange rate (SER) was not used because the simple method of estimating SER by using a weighted average of custom duties in Indonesia proved that there is scarcely any difference from the current foreign exchange rate.

8.3 Investment Plan

1) Investment under the Master Plan

Table 8.3.1. indicates the investment made each year for the period of 1984-2000 for the purpose of the economic analysis. The details of the investment plan according to project items can be referred to in 5.3 of Chapter 5 of Master Plan Report. However, the investment amount given in that Chapter differs from those in Table 8.3.1 for the following reasons:

i) In Table 8.3.1, those DCs which can be transferred to other lines outside JABOTABEK Area as the electrification program in the Project area gradually progresses are estimated as negative investments.

ii) The Manggarai Workshop is designed to handle not only the JABOTABEK trains but also other medium and long haul trains. In view of this point, Table 8.3.1 only includes the amount corresponding to the proportionate handling share of the rolling stock belonging to the JABOTABEK trains.

2) Investment regarding the "Without" situation
The investment consists of road construction and road vehicles such as buses and motor cars as mentioned in 8.2.3.

8.4 Economic Benefits

8.4.1 The cost saving benefit

The difference of the operating and maintenance expenses of "With" and "Without" is regarded as the benefit.

1) The expenses under the Plan

i) Installed Facilities
The expenses for the installed facilities comprise the maintenance and replacement costs, which we calculated by applying certain maintenance rates and replacement rates to the invested amount, and the personnel costs for operation and maintenance, which are obtained by estimating the incremental portion of the PJKA personnel due to implementation of the Plan.

ii) Rolling Stock
The expenses for the rolling stock include the energy cost, the maintenance and replacement cost, and personnel cost.

a. Energy Cost (power supply and diesel oil)
PJKA's payment for power supply is based on the number of substations and vehicle-km of trains operated, and that of diesel oil is calculated according to the DC vehicle-km operated.

b. Maintenance and Replacement Cost
The routinely required material costs of the workshop and the depot are regarded as the maintenance and replacement cost.

c. Personnel Cost
The personnel cost consists of those relating to the operation of ECs and DCs, the depot and the workshop.

2) The expenses of the "Without" situation

i) The annual maintenance cost of roads is estimated as Rp. 200 million per 100 km.

ii) Road vehicle* operating and maintenance costs are calculated by applying equations that have the running speed of vehicles as variables.

Table 8.3.1 Investment Schedule of the Master Plan

(Unit: Rp. million)

Item \ Year	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	TOTAL
INVESTMENT	28225	58664	51643	61496	72396	75253	68125	44155	26965	37361	28913	20643	31315	32774	38721	26905	25237	728791
LOCAL CURRENCY	6943	13428	14773	14517	21004	24816	15198	9163	8033	11908	8727	2282	4701	4990	8896	9243	8965	187587
FOREIGN CURRENCY	21281	45236	36870	46979	51392	50437	52927	34992	18932	25453	20186	18361	26614	27784	29825	17662	16273	541203
CIVIL WORK	15562	28877	25486	28158	43612	44061	25549	17272	17487	24202	16628	4104	5882	6965	15542	16231	18398	354026
LOCAL CURRENCY	5957	10366	9912	10658	17092	17522	9449	6497	6735	10440	7361	1528	3416	2624	5915	6126	6807	138405
FOREIGN CURRENCY	9605	18511	15574	17500	26520	26540	16099	10776	10752	13762	9277	2577	2466	4341	9628	10105	11591	215624
SIGNALS AND TELECOM	865	3608	2967	2159	6850	5934	2060	754	881	668	425			1859	2906	2146	1723	35805
LOCAL CURRENCY	118	630	748	591	1111	1624	600	231	148	212	149			293	576	612	419	8062
FOREIGN CURRENCY	747	2977	2219	1568	5739	4310	1460	523	733	457	276			1565	2330	1534	1304	27742
ELECTRIFICATION	1523	12906	9820	6438	21935	20900	9786	2946	4017	2826	2185	427	6104	7840	9874	7791	4480	131798
LOCAL CURRENCY	288	1761	3456	2526	2801	5539	3937	1449	713	966	927	271	706	1590	1976	2364	1614	32884
FOREIGN CURRENCY	1236	11145	6364	3912	19133	15361	5849	1497	3304	1861	1257	156	5398	6250	7898	5426	2866	98913
ROLLING STOCK	8997	11996	12183	24742		4358	28994	21447	3269	9665	9665	16111	19329	16111	9661			196528
LOCAL CURRENCY	270	360	365	742		131	869	643	98	290	290	483	580	483	289			5893
FOREIGN CURRENCY	8727	11636	11818	24000		4227	28125	20804	3170	9375	9375	15628	18750	15628	9372			190635
MANGGARAI WORK SHOP	1277	1277	1187				1735	1735	1311						737	737	636	10634
LOCAL CURRENCY	311	311	292				343	343	339						141	141	125	2347
FOREIGN CURRENCY	966	966	895				1392	1392	972						597	597	511	8287

a. Fuel Cost: gasoline, diesel oil and engine oil
b. Maintenance and replacement cost: tyre replacement, spare parts, maintenance labor and insurance
c. Personnel Cost: the drivers and assistants of buses

* See the report "The Consulting Engineering Services for Jakarta Intra Urban Tollway," by Pacific Consultants International, September 1978.

8.4.2 Time saving benefit

The commuting time in the project area will be reduced due to the rehabilitation of tracks, improvement of signal and telecommunication systems, double tracking and electrification, etc., under the Plan. On the other hand, a longer commuting time is assumed to be required should there be no Plan. By comparing these two commuting times, we can estimate the time saved. The time saving benefit is measured by multiplying the time difference by the average time value of the commuters assumed in 8.2.4.

8.4.3 The benefit of the continuous elevation of tracks

Enumerated below are the benefits considered for the continuous elevation of tracks for the Central Line between Jakarta Kota Station and Manggarai Station (five-year construction period required between 1985 - 1989) and the Eastern Line between Jakarta Kota Station and Pasar Senen Station (four-year construction, 1991-1994).

1) Time saving benefits at railway crossings
   i) Saving of time expended at railway crossings, such as barrier-time, etc.
   ii) Saving of detour time for pedestrians, who could previously only cross at crossings
2) Saving of fuel consumed by road vehicles for waiting and acceleration at railway crossings
3) Utilization of land after removing railway tracks and of the space under the elevated tracks
4) Avoidance of accidents at railway crossings
5) Saving of costs for the personnel working at crossings

8.4.4. Other benefits

Among other secondary benefits which were not quantified in the study are:

1) The benefits that will also be enjoyed by the long distance passenger trains and freight trains, such as cost and time savings as well as increased train frequency due to the enormous increase in transport capacity.
2) Improvement of station front areas will activate the feeder transport service.
3) The effects of development and transfer of technology by introduction of various new systems and generation of effective demand due to the investment and expansion of the railway system.

8.5 Economic Evaluation

If the Plan is not implemented, that is, if the idea of giving the railways the major role in the urban transport system is abandoned, road transport will obviously have to face an enormous traffic demand in future and a much more costly burden will be imposed, thereby greatly hindering the balanced and dynamic development of economic and social activities essential to the expansion of the metropolis.

According to the data given in Table 1.2.2, the shares of passengers utilizing buses (city buses, mini-buses) and motor cars (taxis, private cars, business cars) during the peak hours are 70 % and 30 %, respectively. On the other hand, considering the general tendency of the central government to pursue energy saving policies, even in the "Without" situation, more importance and attention should be given to mass transport media on roads, i.e., buses.

Three cases were set up and the economic feasibility was evaluated by estimating the EIRR for each case. (Table 8.5.1)

Table 8.5.1 Internal Rates of Return

Cases	1	2	3
Bus/Motor car Passenger shares	70%/30%	90%/10%	100%/0%
EIRR	19.3%	10.8%	5.6%
Reference	Appendix Table-A	Appendix Table-B	Appendix Table-C

The implication is that if compared with the present road transport situation the IRR is 19.3 %, but even supposing a situation where various energy saving policies are taken by the Government, the IRR still is 10.8 %; that is to say, in addition to the 10.8 % rate of return, we should take into account various energy saving benefits already generated in achieving Case 2.

Savings expected from Case 2 in comparison with Case 1 during the life of the Plan are given below:

a. Road construction: Rp. 45.5 bil (40 %)
b. Motor vehicles: Rp. 219.5 bil (38 %)
c. Operating and maintenance expenses: Rp. 535.9 bil (38 %)
d. Comparison of operating/maintenance expenses between "With" and "Without"
   Case 1 : 4.3 times
   Case 2 : 2.7 times

Even considering the case with the energy saving policy, the EIRR is 10.8 % and the Plan can be regarded as economically feasible. If the following points are taken into account, the viability of the Plan will even be enhanced.

1) The Plan includes such investment as the new Cibinong Line, the benefits of which have not been estimated in the study because the construction is expected to be completed only in the year 2000.
2) The energy saving effects in terms of cost are:

	Case 1	Case 2
Without/With	19.5 times	9.1 times

The energy cost of the railway is based on the number of substations and train-km. The number of buses and motor cars and their running speed are the variables in estimating the fuel cost of road vehicles.

3) The total personnel expenses during the Plan period add up to Rp. 71.2 bil. (construction Rp. 40.6 bil., operation/maintenance Rp. 30.6 bil.)

CHAPTER 9. FINANCIAL EVALUATION

CHAPTER 9 FINANCIAL EVALUATION

9.1 Purpose and Assumption

9.1.1 Purpose of the evaluation

As mentioned in Chapter 7.2.1, "Financial Situation of PJKA," the investments for the railway facilities and the rolling stock are the responsibility of the Government, while PJKA is responsible for the day-to-day management of the railway operations.

PJKA's financial discipline has been governed by the principle that operating costs should not exceed operating revenue. However, PJKA has been recording operational deficits for many years, resulting in the provision of the Government subsidies and unduly restricted funds available for operation and maintenance.

While both freight and passenger tariffs in general were raised by PJKA from time to time, the fare for the JABOTABEK train has been maintained on the same relatively low level for the last few years.

Although PJKA is not necessarily required to operate on a financially viable basis (i.e., in a commercial sense), it is expected to be a financially self-supporting organization to the greatest possible extent.

In light of the above circumstances, instead of estimating the financial internal rate of return (FIRR), the following points were examined in this Chapter;

i) Whether the Government subsidy is needed in implementing the Master Plan (the Plan), and

ii) Estimation of the debt service due to funding needed for the Plan and whether the debt will be repayable from the revenue generated by the Plan.

The above-mentioned aspects should receive equal attention in evaluating the feasibility of the Plan together with the results of the economic analysis.

9.1.2 Assumptions in projecting cash flow profiles

Cash flow profiles on an incremental basis were prepared to carry out the study in this Chapter. Based on the incremental method, the additional traffic demand realized by the expansion of JABOTABEK railway capacity, the operational revenue and expenditure from the invested properties under the Plan, and the funding necessary for the investment and the debt service therefrom were estimated.

As was the case in the previous Chapter, the 30-year life of the Plan and the exchange rates of Rp.625 = US$1 = Yen 220 were used and inflation was not considered in this study. Import duties and income taxes were also not considered, as operation as well as investment are done by a government entity or the Government itself. For that reason, the same investment amount and operating cost as those estimated in the economic evaluation were used in this Chapter.

Three cash flow profiles are projected as the Base Case, Case I and Case II (see Appendix Tables D,E and F), depending on the financing program assumed in 9.2.2(2).

9.2 Components of the Cash Flow Profile

9.2.1 Revenue and expenses of PJKA

(1) Operational Revenue

PJKA's revenue was calculated by multiplying the prevailing passenger fare by the passenger volume on the basis on the OD tables given in Chapter 2.2.1, which have been prepared for each railway line in the project area. The tariff in Table 9.2.1 applied for the estimation throughout the Plan period are indicated.

Table 9.2.1 Passenger Fare Tariff

Distance (km)	Passenger Fares (R_{P_i})
1 ~ 10	50
11 ~ 20	75
21 ~ 30	100
31 ~ 40	125
41 ~ 50	150
51 ~ 60	175
61 ~ 70	200

(2) Operational expenses

The operational expenses consist of maintenance and operating costs of rolling stock and facilities, personnel cost, fuel cost, and depreciation cost. PJKA's depreciation rates* were used to estimate the cost.

* Article 13 of The Joint Decree of the Minister of Finance and the Minister of Communications issued on 30th March, 1979.

(3) Operational profit and net profit

The operational profit is the difference between the operational revenue and the operational expenses. The net profit is obtained by deducting "interest on total assets" which the PJKA is supposed to pay to the government, from the operational profit; this may correspond to the net profit after taxes for private companies.

PJKA is supposed to pay 3% interest on the assets supplied by the government in accordance with the Joint Decree of the Minister of Finance and Minister of Communication. However, as PJKA has been for many years in operational deficit, the payment of this interest has never been practiced. In our study, the 3% interest amount corresponds to 3% of the value of fixed assets after depreciation.

9.2.2 Investment plan and financing program

(1) Investment Plan

The same investment plan given in Table 8.3.1 was used in the cash flow profile.

According to the Plan, the total investment up to the year 2000 amounts to R_p.729 bil. (annual average of R_p.42.9 bil.), and approximately 60% of which is concentrated in the years between 1985 and 1991. Of the total investment amount, about 75% is the foreign currency portion and the rest is the domestic currency.

The investment to replace rolling stock and other facilities with the same amount is assumed after the depreciation is completed.

(2) Financing Program

We assumed that the Government arranges the necessary funds for investment. We also assumed that the financing of the foreign currency portion is sought from bilateral or multilateral sources and the domestic currency portion from the national budget or borrowing from financial institutions in Indonesia.

Although net profit is expected in the cash flow projection, we did not assume that the net profit will be used for the investment. We considered it more realistic to assume that the investment fund is to be supplied 100% from outside PJKA, because PJKA's financial situation as a whole is currently in deficit: the project area covers only a small part of PJKA's total operational system and the profit generated by this project will be absorbed in the account of the entire PJKA.

Based on terms and conditions of the official external assistance to Inndonesia in 1978/79 and of the prevailing domestic money market, the following average financing conditions (only indicative) can be quoted:

1) Loans from overseas
   - i) the average conditions of the overseas official lending (including IBRD, ADB);
     - Interest : 6.0% p.a.
     - Term : 27 years (incl. grace period of 7 years)
     - Repayment : 20 years with equal annual installments
   - ii) the average conditions of the bilateral aid (excl. IBRD, ADB);
     - Interest : 3.0% p.a.
     - Term : 30 years (incl. grace period of 10 years)
     - Repayment : 20 years with equal annual installments
2) Domestic funds
   - i) the following conditions were assumed for the borrowing from the State Banks (the interest rate may be relatively lower than that of the rates prevailing in the market.);
     - Interest : 13.5% p.a.
     - Term : 12 years (incl. grace period of 2 years)
     - Repayment : 10 years with equal annual installments

ii) Rupee funds from the Government budget;
Neither the payment of interest nor the repayment of debt is necessary.

The three financing packages given in Table 9.2.2 were assumed in this study. The Base Case is supposed to be the average financing package.

Table 9.2.2 Financing Programs

	Foreign Currency	Local Currency	Reference
Base Case	6.0% p.a. 27 yrs. incl. 7 yrs. grace period	Government budget	Appendix Table D
Case I	3.0% p.a. 30 yrs. incl. 10 yrs. grace period	Government budget	Appendix Table E
Case II	6.0% p.a. 27 yrs. incl 7 yrs. grace period	13.5% p.a. 12 yrs. incl. 2 yrs. grace period	Appendix Table F

9.3 Income Statement of PJKA

In the cash flow profile, an operational profit is expected from the first year of the Plan and the government subsidy will not be needed. Net profit is also expected except for a few years (1987 - 1992) which will record deficit.
An annual average Rp. 37 bil. of operational revenue and Rp. 22 bil. of operational profit is expected.

It may be pointed out that the cash flow is projected in the incremental approach and it may also be noted that the area covered by the Plan is only a part of the total PJKA operation. However, it is clear that the operational return will certainly contribute to PJKA's financial situation.

9.4 Analysis of the Cash Flow

9.4.1 Base case

The details of the cash flow profile of the Base Case are shown in Appendix Table-D. The following table is a summary of the profile.

Table 9.4.1 Cash Flow of the Base Case

	1984 - 1988	1989 - 1993	1994 - 2000	2001 - 2013	Total
Revenue	44,289 (8,858)	118,101 (23,620)	289,347 (41,335)	652,509 (50,193)	1,104,246 (36,808)
Operating Profit	23,603 (4,720)	58,268 (11,654)	169,042 (24,149)	398,754 (30,673)	649,667 (21,656)
Net Profit	2,163 (433)	−6,470 (−1,294)	43,780 (6,254)	138,530 (10,656)	178,003 (5,933)
Investment	272,423 (54,487)	251,859 (50,372)	204,508 (29,215)	114,486 (8,807)	843,276 (28,109)
Debt Service	32,598 (6,526)	107,116 (21,423)	274,731 (39,247)	554,044 (42,619)	968,489 (32,283)
Net Cash Flow	−3,566 (−713)	−31,102 (−6,220)	−68,228 (−9,747)	−84,182 (−6,476)	−187,078 (−6,236)

( ) average per year

Net cash flow is in the negative throughout the period of the Master Plan. This means that the cash flow is not enough to meet the debt service (repayment of principal plus interest) incurred.

Debt service reaches its peak in 2000 and remains more or less at the level of R_p.43-45 bil. thereafter. The burden of debt service against the revenue (net cash flow/revenue) is largest (25% ∿ 27%) in the period between 1989 and 1998. (The average through the Plan period is 17%).

Therefore, assuming that the traffic demand is constant, it is desirable that the passenger fare of the JABOTABEK train be raised by approximately 20%, in order to achieve a positive net cash flow (on a cumulative basis) at the end of the life of the Plan.

If the fare is raised by 30%, the PJKA's operational profit for the Plan as a whole will be increased and the net cash flow will be over the breakeven point throughout the life of the Plan.

That is to say, if the tariff increase can be realized, payment of interest and repayment of the debt will be covered by the operational profit generated by the Plan and no additional financial burden of the government relating to the debt service need be expected. However, it should be noted that the inflation factor is not included in the discussion of raising the tariff.

9.4.2 Case I

An external borrowing on a concessional basis was assumed in this case. As indicated in Appendix-Table E, a positive net cash flow can be expected more or less throughout the Plan period. However, a 10% decrease in the traffic demand (provided that the passenger tariff remains unchanged) will be the breakeven point in this case: i.e., the increase of tariff would have to be considered depending on the extent of the demand decrease.

9.4.3 Case II

The heaviest debt burden is assumed in Case II and a substantial amount of negative cash flow is forecasted throughout the life of the Plan, as is clearly shown in Appendix – Table F. During 1988–1994, the amount of negative cash flow would be approximately 100% $\sim$ 120% of that of the revenue. Provided that the passenger volume forecasted remains unchanged, a substantial tariff increase of more than 50% will be required to have a positive net cash flow (on a cumulative basis) at the end of the life of the Plan.

9.4.4 Conclusion

Considering that the passenger fare for the JABOTABEK train is maintained at a low level, we may conclude that the Plan is financially viable if the revenue generated from the Plan covers the operational expenses and the relevant debt service. In such circumstances, PJKA's operational profit as well as net profit from the Plan will be secured and can be expected to contribute greatly to the improvement of PJKA's financial position as a whole.

To achieve the above-mentioned goal, the following financing conditions will have to be satisfied in implementing the Plan:

1) Domestic currency portion is to be supplied by the Government budget,
2) Concessional loans are desired for the foreign currency financing, and
3) Passenger tariffs may have to be raised depending on the terms and conditions of overseas loans obtained and the level of traffic demand achieved.