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08

THE REPUBLIC OF INDONESIA

SUMMARY OF REPORT
ON
FEASIBILITY STUDY
OF
NEW RAILWAY LINE FOR CENGKARENG AIRPORT

July,1983

JAPAN INTERNATIONAL COOPERATION AGENCY

(JICA)

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PREFACE

In response to the request of the Government of the Republic of Indonesia, the Government of Japan decided to conduct a feasibility study on the Project to construct a New Railway Line linking the city of Jakarta with the Cengkareng Airport to be opened in December 1984, and entrusted the study to the Japan International Cooperation Agency (JICA). The JICA sent to Indonesia the study team headed by Mr. Akira Tachibana, Director of the Japan Railway Technical Service in September 1982 under the guidance of the Supervisory Committee chaired by Dr. Hideo Nakamura, Professor of the University of Tokyo.

The team held discussions with the officials concerned of the Government of the Republic of Indonesia on the Project and conducted a field survey over a period of three months in Indonesia. Subsequently, further studies were made in Japan and the present report has been prepared.

I hope that this report will serve for the development of the Project and contribute to the promotion of friendly relations between our two countries.

I wish to express my deep appreciation to the officials concerned of the Government of the Republic of Indonesia for their close cooperation extended to the team.

July 1983

Keisuke Arita
President
Japan International Cooperation Agency

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CHAPTER 1 INTRODUCTION

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1.1 Role of the New Airport Access Railway

Most of the major airports in the world are burdened with problems concerning airport access transportation, including traffic congestion and unpredictable travel time to the airport.

Therefore, rapid and reliable transportation modes such as railways or monorails have recently been adopted.

The existing airports in Jakarta, Halim and Kemayoran have almost reached their maximum capacity in the face of increasing air transportation demand, and a new airport is now under construction at the west border of Jakarta, about 20 km from the city center. The current problems which require urgent solutions are to provide excellent transportation means so as to reduce travel time to and from the airport and ease the traffic congestions on road network as well as to save petroleum consumption and to reduce traffic accident, air pollution, etc.

1.2 Comparison of Railway and Medium-Size Transportation

A comparison between medium capacity transportation modes (such as monorails and other newly developed modes) and conventional railways shows that conventional railways are preferable in terms of such aspects as utilization of the existing railway network, transport capacity, speed, construction cost, maintenance, etc. as shown in Table 1.

Table 1 Comparison between the Medium Size Transportation Modes and Railways

	Transportation capacity (1,000 persons per day)	Speed (km/h)	Cost of construction, double track Bil. Rp	Maintenance	Utilization of railway network	Evaluation
Railway	250	100	Approx. 4.5/km	Easy	Applicable	o
Medium size transportation modes	Upper limit 50 ∿ 100	60 ∿ 80	7.5 ∿ 15/km	Partially difficult (tire, boggie)	Not applicable	×

1.3 Purpose and Assumption of This Study

This report has two purposes:

i) A feasibility study on the New Railway Line for Cengkareng Airport

ii) Detailed planning of railway station and their facilities in the airport area

This report is based on the following premises.

i) The project area of this study is located in the North West area of Jakarta City and this area is designated as a development restriction area by DKI Jakarta. Construction of new railway stations is not allowed in this area in accordance with the policy.

ii) The New Railway Line is to offer transportation service to passengers but not to cargoes. The volume of air freight is not enough for railway transportation in addition that air freight, which consists of high valued goods, requires quick delivery and collection in small lot.

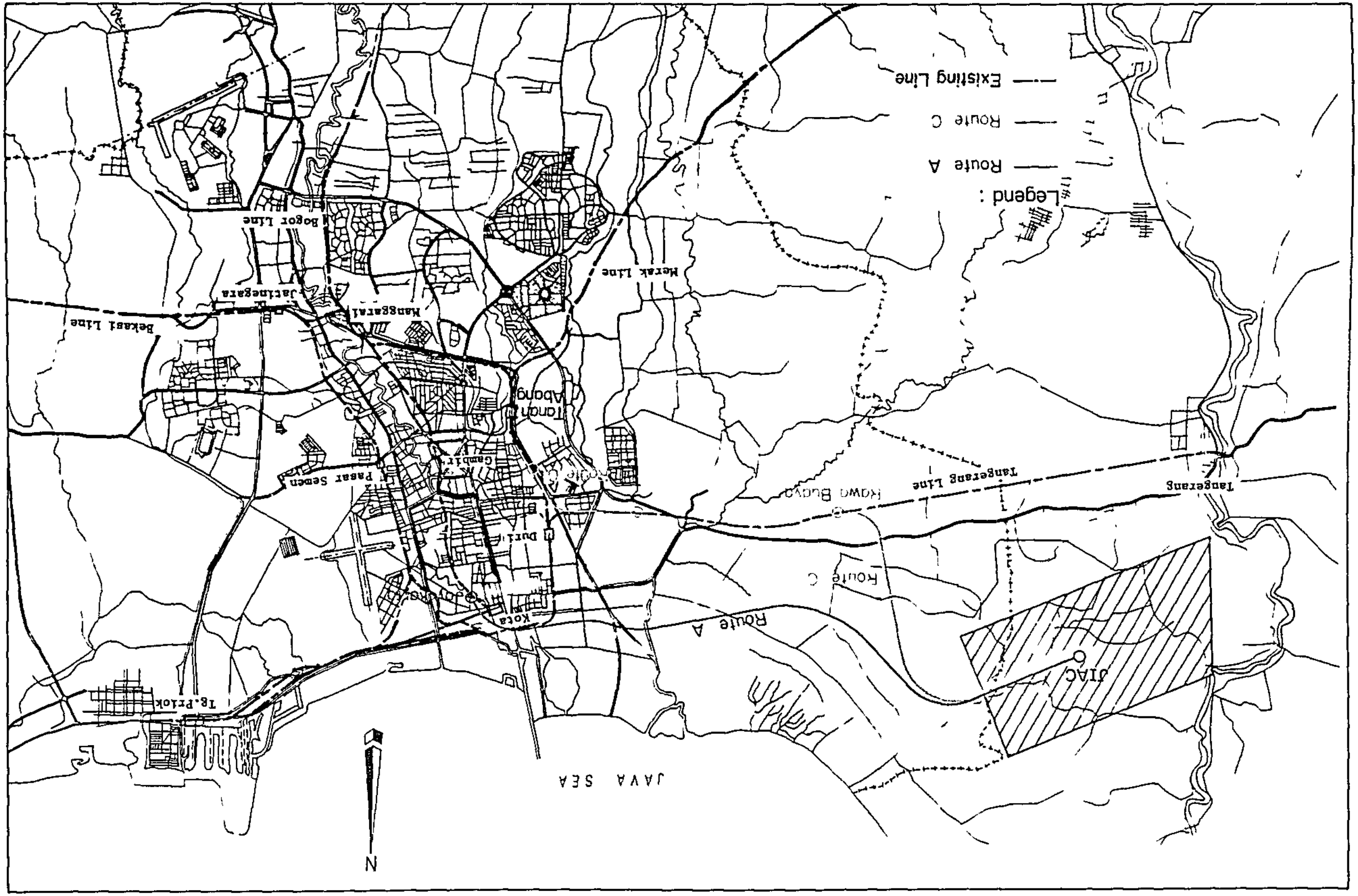

Fig. 1 Project Location Map

1.4 Alternative Routes for Further Studies

Two alternative routes, route A and route C, are selected for further study. These two routes were given the highest priority out of ten alternative routes as mentioned in Chapter 5 from the aspects of geology, land acquisition, difficulty of construction, traffic demand, and train operation, etc.

Route A and route C may be outlined respectively as follows.

Route A: This route connects to Western Line at Kota Intan Station after passing through the North West area of Jakarta, leaving from east side of the airport.
Then, the route runs in parallel with Western Line and connects to Central Line at Jayakarta Station after flying over the existing railway line near Kota Station.
Trains are operated up to Jatinegara Station via Sawah Besar, Gambir, New Cikini and Manggarai.

Route C: This route gets into the junction with Rawa Buaya Station on Tangerang Line after running to the south from the airport and goes further to the south after branching from Tangerang Line near Grogol until it finally connects to Western Line.
Trains are operated up to Jatinegara Station via Rawa Buaya, Tanah Abang, Dukuh and Manggarai.

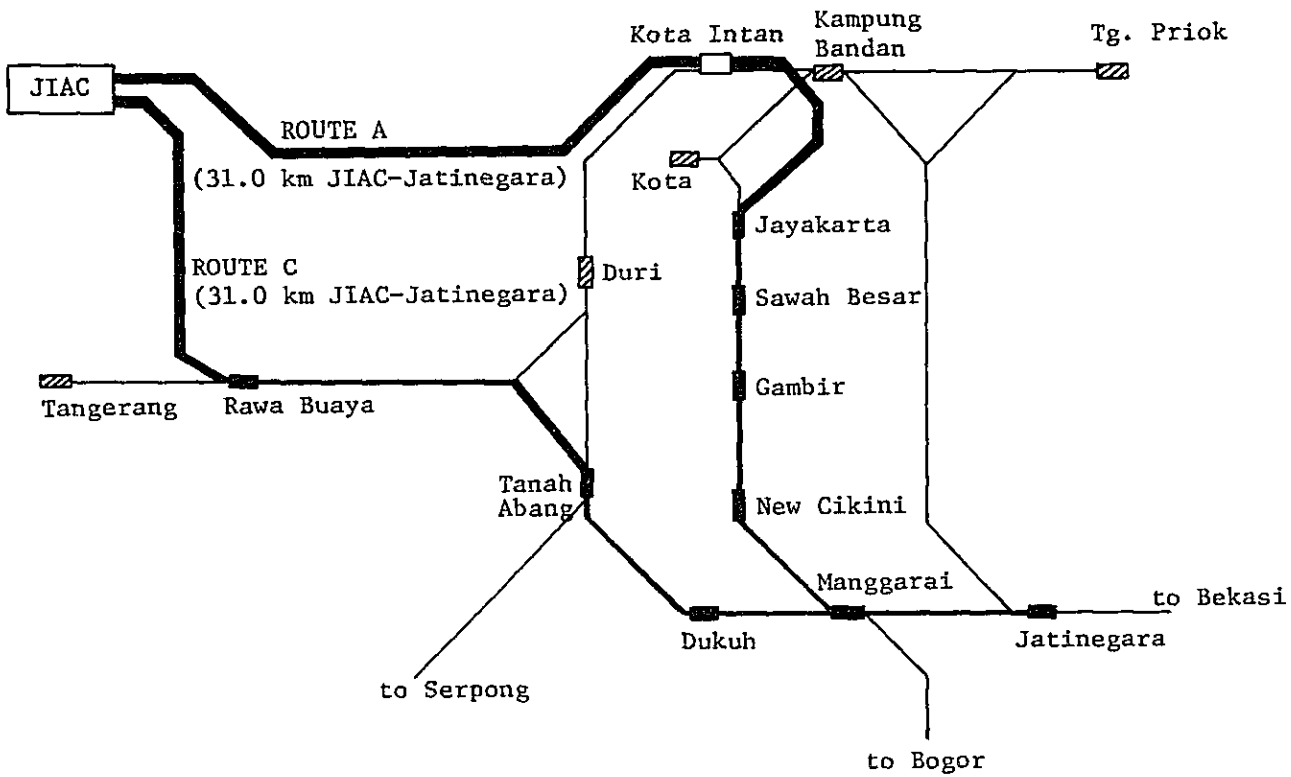

Fig. 2 Sketch of Route A and Route C

CHAPTER 2 LAND USE

CHAPTER 2 LAND USE

2.1 Existing Land Use

Study on existing land use and future development plan has been carried out to identify the existing land use and potential of future land use development along the New Railway Line.

Though the Jakarta - Tangerang road is the only arterial road in this area at this time, the new tollway will be open to traffic at the southern part of the area as Jakarta - Tangerang Tollway which is now under construction and Cengkareng Access Highway is planned at the northern part of this area.

Existing land use data was collected from land use map of Tata Kota Jakarta Barat and Tata Kota Jakarta Utara, and also from the field observation surveys along the alternative new railway lines. The information collected from the inventory was plotted on a map.

Fig. 3 shows the land use in 1980.

Development force of this area is very high and many real estate development programs are in progress due to the high rate of population increase of DKI Jakarta in the past several years and excellent accessibility to the center of the city from the area.

The industrial development has been progressing along the Jakarta - Tangerang road and Tangerang Railway Line, especially facilities of medium and large scale manufactures.

Some of medium and small scale light industries are also located along the Kepuk street.

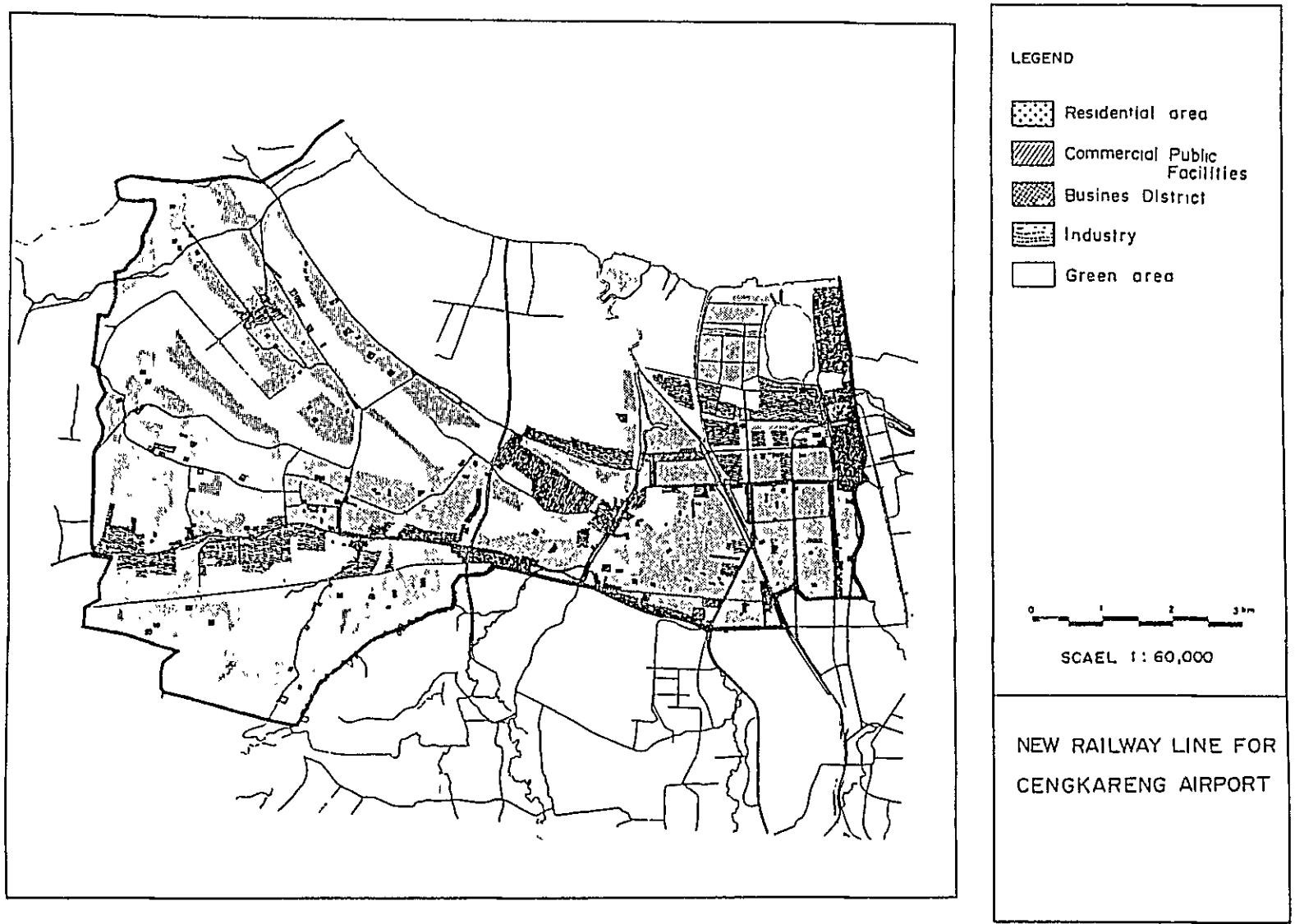

Fig. 3 Existing Land Use of Project Area

2.2 Land Use along the Alternative Routes

Route A goes along existing old Kampungs located on the coastal ridges. The existing land use the route goes through is mainly rice field and old Kampung area from the airport to the Kali Angke. Between Kali Angke and Central Jakarta area, the route goes through the commercial, industrial and residential mixed area.

Route C goes north - south direction, parallel to the DKI Jakarta western boundary.

Old Kampungs are located on the coastal ridges parallel to the coast. Because of the distance from Central Jakarta, the northern part of this route has not been developed yet.

However, in the southern part where it is close to the Tangerang Line, this area is already a built up area.

2.3 Future Land Use

The Indonesian Government has prepared the JABOTABEK Metropolitan Development Plan (JMDP) and it proposes the structural plan for Greater Jakarta.

This structure plan proposes the development along the East-West axis and conservation of coastal plain.

Residential development is planned mainly at the south of Tangerang Line and is to be expanded to the west. Fig. 4 shows JMDP Structural Plan, in which industrial area is planned to be located along the Tangerang line and also west of Tangerang city along the Jakarta-Tangerang Tollway.

According to the JMDP, the project area includes the coastal plain protection zone in the north, agricultural conservation zone in the middle and a part of industrial development area along the Tangerang Line.

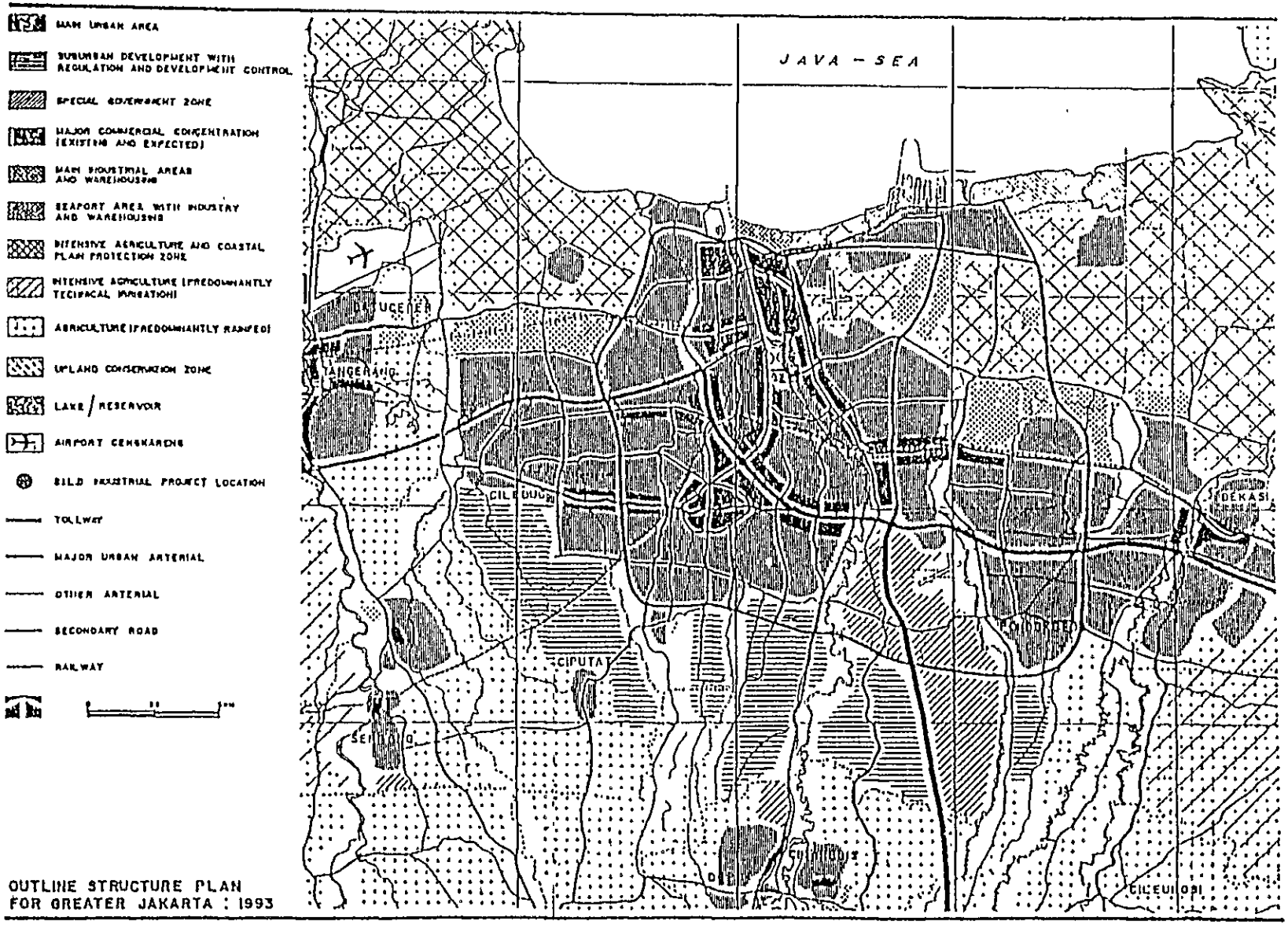

Fig. 4 JMDP Structure Plan

CHAPTER 3 TRAFFIC DEMAND FORECAST

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3.1 Existing Situations of Halim and Kemayoran Airports

Prior to the traffic demand forecast of the trips related to Jakarta International Airport Cengkareng (JIAC), interview and counting surveys were carried out at Halim and Kemayoran airports to obtain the basic data of trip characteristics of the airport related trips.

The survey was carried out at the both airports for 16 hours in October, 1982. The survey consisted of two kind of survey, namely, interview survey to airline passengers, airport employees and visitors to the airport excluding airline passengers and airport employees, and counting survey of persons and vehicles at the relevant entrance and exit.

Main output obtained from the survey are composed of trip distribution pattern in JABOTABEK area by trip purpose, characteristics of modal choice by trip purpose and hourly fluctuation pattern of the trips to and from the airports. These output are applied to the traffic demand forecast of JIAC.

3.2 Future Traffic Demand of JIAC

Table 2 shows the planning framework prepared for the JIAC construction project. According to this framework, the number of airline passengers per day is estimated to be 39 thousand and 86 thousand persons in 1990 and 2000, respectively and the tonnage of air freight per day is estimated to be 700 and 2,100 ton in 1990 and 2000, respectively.

This planned number of airline passengers in 2000 is supposed to be approximately 5 times of the present number of airline passengers in 1982 of Halim and Kemayoran airports or to fall between the total number of airline passengers of Heathrow and Gatwick airports in London and that of Narita and Haneda airports in Tokyo of 1981.

Table 2 Traffic Forecast of Jakarta International Airport Cengkareng

Unit: 1,000/year

		1980	1990	2000
Passengers (persons)	International	1,548	3,742	7,780
	Domestic	3,690	10,400	23,600
	Total	5,238	14,142	31,380
Freight (tons)	International	23.5	62.3	147.5
	Domestic	45.7	175.2	570.8
	Mail	6.2	21.1	57.8
	Total	75.4	258.6	776.1

Source: JIAC Project Office

Transportation of air freight by the New Airport Access Train is not taken into consideration because the tonnage of the air freight is too small to be carried by railway and air freight cargo does not fit for railway transportation from the viewpoint of quick delivery and lot size.

The planned number of airline passengers is applied in this study as it is. The number of visitors to the airport (excluding airline passengers and airport employees) is estimated based on the planned number of airline passengers and the parameters derived from the survey performed. The number of airport employees is estimated in relation with the planned number of airline passengers, the planned tonnage of air freight and the planned number of aircraft movement.

The estimated traffic demand of JIAC is as shown in Table 3. The number of person trips to and from JIAC per day is estimated at 166, 360 and 531 thousand trips in 1990, 2000 and 2010, respectively.

Table 3 Estimated Number of Person Trips of JIAC

	Persons (unit: 1,000)			Peron trips/day (unit: 1,000/day)		
	1990	2000	2010	1990	2000	2010
Passengers	39	86	-	39	86	128
Visitors	41	93	-	84	185	276
Employees	22	44	-	43	89	127
Total	102	223	-	166	360	531

Note: Number of person trips in 2010 was estimated by applying 1/2 of the growth rate from 1990 to 2000. Persons volumes are from the data of JIAC office.

The estimated number of person trips related to JIAC, consisting of airline passengers, visitors to the airport and airport employees, was then distributed to the established traffic zones in order to find out OD traffic volume. Trip distribution was estimated based on the result of the Interview Survey and future zonal residential population and person trips estimated by "Feasibility Study on Jakarta Harbour Road" (by JICA, 1981). The estimated pattern of person trip distribution is shown in a summarized form in Table 4 and Fig. 5.

Table 4 Summerized Distribution Pattern of JIAC

unit : 1000 person trips / day

		1990				2000				2010			
		Pas.	Vis.	Emp.	Total	Pas.	Vis.	Emp.	Total	Pas.	Vis.	Emp.	Total
DKI Jakarta	Central	14.7	23.1	13.0	50.8	26.6	44.6	19.8	91.0	30.8	56.9	18.0	105.7
	North	2.2	5.5	2.7	10.4	6.7	15.5	6.0	28.2	12.5	27.7	9.4	49.6
	West	4.9	9.3	2.6	16.8	11.7	23.2	6.2	41.1	18.2	37.9	10.2	66.3
	South	9.4	24.0	6.1	39.5	19.5	47.4	12.3	79.2	26.9	61.9	17.3	106.1
	East	4.7	14.3	10.5	29.5	12.9	34.0	17.8	64.7	23.0	54.1	20.5	97.6
	Total	35.9	76.2	34.9	147.0	77.4	164.7	62.1	304.2	111.4	238.5	75.4	425.3
Outside DKI Jakarta	Tangerang	0.6	1.4	5.4	7.4	2.5	5.5	22.4	30.4	5.8	12.5	48.8	67.1
	Bogor	0.9	2.6	1.8	5.3	2.9	7.1	2.5	12.5	5.2	11.9	1.8	18.9
	Bekasi	0.4	1.3	1.4	3.1	1.5	4.0	2.0	7.5	3.3	7.8	1.4	12.5
	Others	0.9	2.0	0.0	2.9	1.7	3.9	0.0	5.6	2.3	5.1	0.0	7.4
	Total	2.8	7.3	8.6	18.7	8.6	20.5	26.9	56.0	16.6	37.3	52.0	105.9
Total		38.7	83.5	43.5	165.7	86.0	185.2	89.0	360.2	128.0	275.8	127.4	531.2

Note: Pas. - Airline Passengers
Vis. - Visitors to JIAC
Emp. - Airport Employees

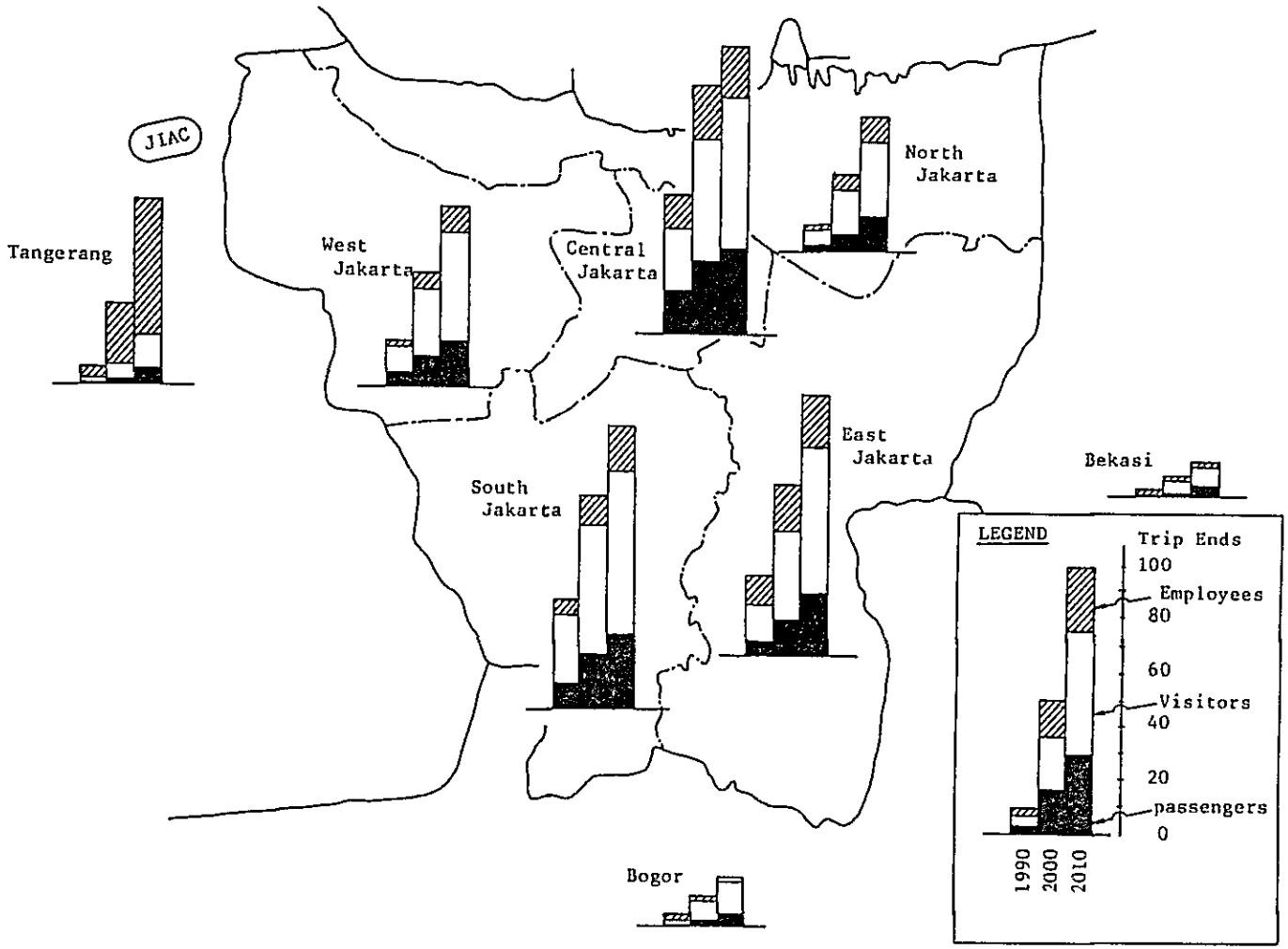


Fig. 5 Trip Distribution Pattern of JIAC

3.3 Forecast of Railway Passengers on the New Railway Line

3.3.1 Procedure of Traffic Demand Forecast

Two alternative routes of the New Railway Line was studied in this section. The one is called Route A on which the airport access train is to be operated between JIAC and Jatinegara Station by way of Central Line. The other is called Route C on which the airport access train is to be operated between the same stations by way of Tangerang Line and Western Line. Both routes have no intermediate stations between JIAC and a junction station with the existing railway network. This is due to the reason that most part of this area is designated as a conservation area where development impetus should be avoided.

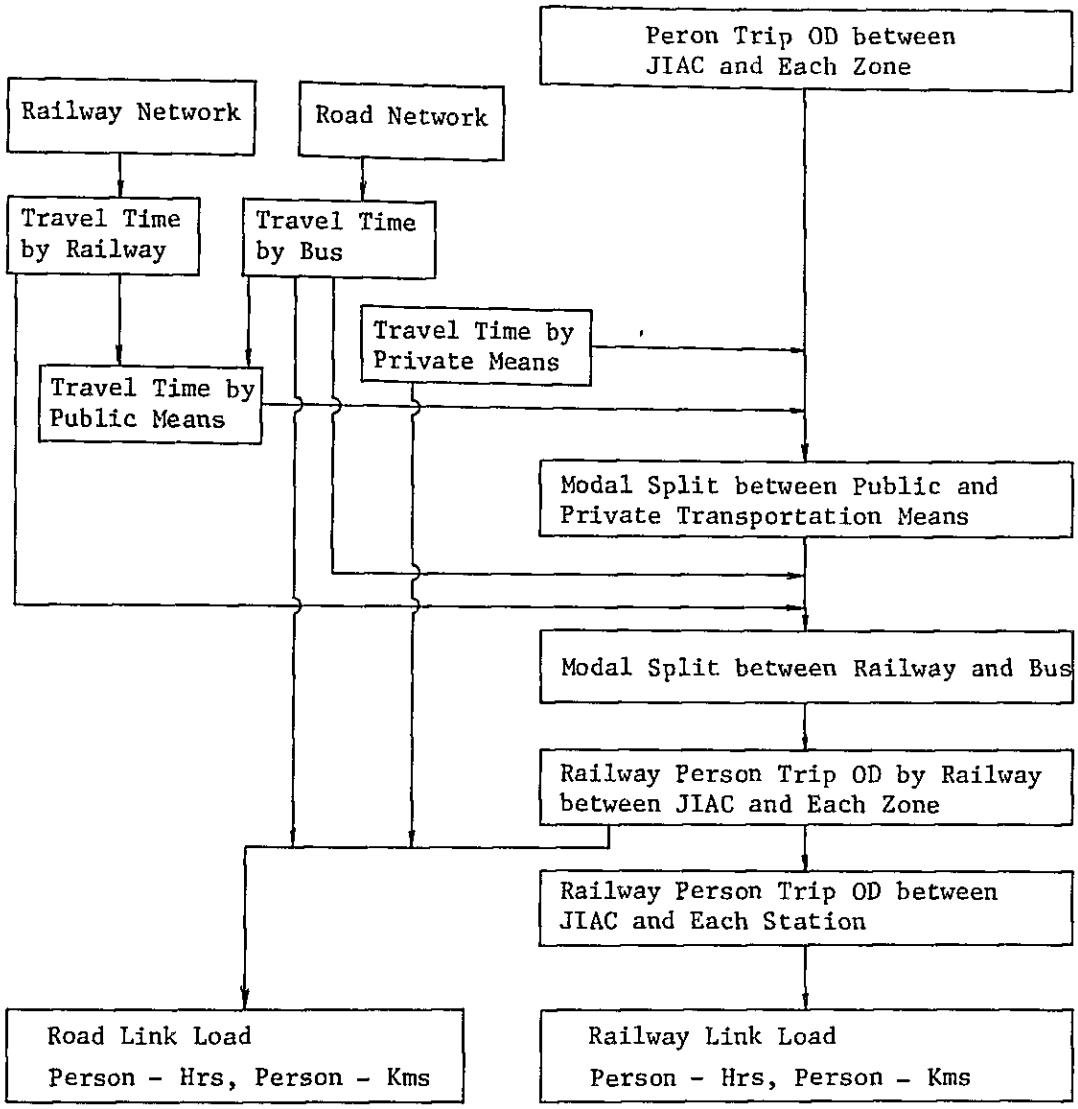
The procedure of traffic demand forecast is as shown in Fig. 6.

i) Travel time by railway, bus and private transportation means between JIAC and each traffic zone is calculated based on the transportation network including its future development plan.

ii) The estimated total person trip OD tables are divided into OD tables by public transportation means and OD tables by private transportation means based on the travel time derived from i) above and an established modal split curve. The OD tables by public transportation means are then divided into OD tables by railway and OD tables by bus.

iii) OD tables by railway including the New Railway Line are converted to OD tables between railway stations. As the result of traffic assignment on railway network, total travel time (person hours) and total travel distance (person kilometers) by railway are calculated for the case of "With the Project".

iv) OD tables by railway are assigned on road network so as to estimate travel time and travel distance by road transportation for the case of "Without the Project". The difference between iii) and iv) is defined as railway users' benefit.



Note: JIAC - Jakarta International Airport, Cengkareng
OD - Origin and Destination

Fig. 6 Procedure of Traffic Demand Forecast

3.3.2 Estimated Results of Modal Split

Modal split of the person trips related to JIAC are estimated following the above-explained procedure, and the results are as shown in Table 5 and Fig.7.

As to Route A, the number of railway passengers and the railway share are estimated to be 36 (22%), 85 (24%) and 168 (32%) thousand persons per day for the year of 1990, 2000 and 2010, respectively. As to Route C, they are estimated to be 33 (20%), 76 (21%) and 138 (26%) thousand persons per day for the respective years. The number of railway passengers on Route A is estimated to be greater than that on Route C by 3, 9 and 30 thousand persons for the year 1990, 2000 and 2010, respectively.

The estimated railway share of both routes is distributed in the range of 20 ∿ 32% for the respective years. Of the examples of the airport access railway in the world, the railway share of Frankfurt Airport and Kloten Airport shows approximately the same share with this estimated result. The railway share of Gatwick Airport and Haneda Airport account for the higher share of 40 ∿ 55%.

Railway share is estimated to increase in due course of time. The main reasons are that the operation frequency of the airport access train is increased when the railway track is developed into double track and that the travel speed on road network is lowered due to the traffic congestions for the future.

Table 5 Estimated Modal Split

Unit: 1,000 trips/day

	Route A			Route C		
	1990	2000	2010	1990	2000	2010
Private	95	191	247	97	200	274
Public	71	169	284	69	160	257
- Bus	35	84	115	35	85	119
- Railway	36	85	168	33	76	138
Total	166	360	531	166	360	531
Public share (%)	43	47	53	41	44	48
Railway share (%)	22	24	32	20	21	26

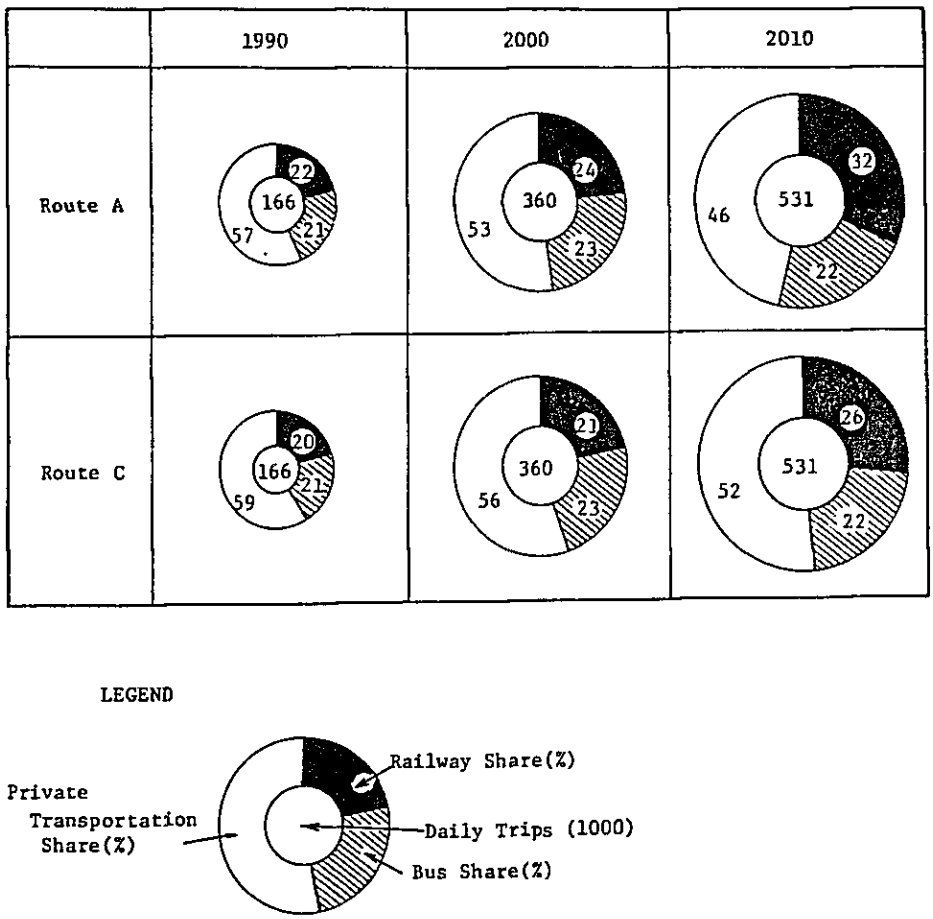


Fig. 7 Estimated Transportation Share of JIAC

3.3.3 Estimated Railway Passengers on the New Railway Line

The estimated distribution of railway passengers on railway network is illustrated in Fig. 8.

The number of railway passengers on Route A is estimated at 36, 85 and 168 thousand persons per day for the year of 1990, 2000 and 2010, respectively. In the year of 2010, 44% of the passengers take the train up to Gambir Station and 55% up to Manggarai Station. About 30% of the passengers transfer to Bogor and Bekasi Lines. Kota Intan Station is an important junction station with the existing railway network and 36% of the passengers transfer to the existing lines in the year of 2010.

The number of railway passengers on Route C is estimated at 33, 76 and 138 thousand persons per day for the year of 1990, 2000 and 2010, respectively. In the year of 2010, 19% of the passengers take the train up to Tanah Abang Station and 49% up to Manggarai Station. Route C has no such good junction station with the existing railway network as Kota Intan Station on Route A. The composition ratio of the passengers to and from the direction of Kota, Gambir and Pasar Senen accounts for only 14% in the year of 2010.

The average trip length of the railway passengers is estimated to be about 33 km for Route A and about 36 km for Route C in the year of 2010. The railway users' benefit in the year of 2010 is estimated at 5.3 km and 16 minutes per passenger for Route A and 2.8 km and 14 minutes per passenger for Route C compared with road traffic.

Route A is more desirable than Route C in terms of traffic demand as New Railway alternative to the airport.

The reasons are ① Route A can attract more rail passengers from wider area utilizing the existing railway network, and ② from the viewpoint of benefit, not only as total benefit but also by per person basis, Route A generates more benefit.

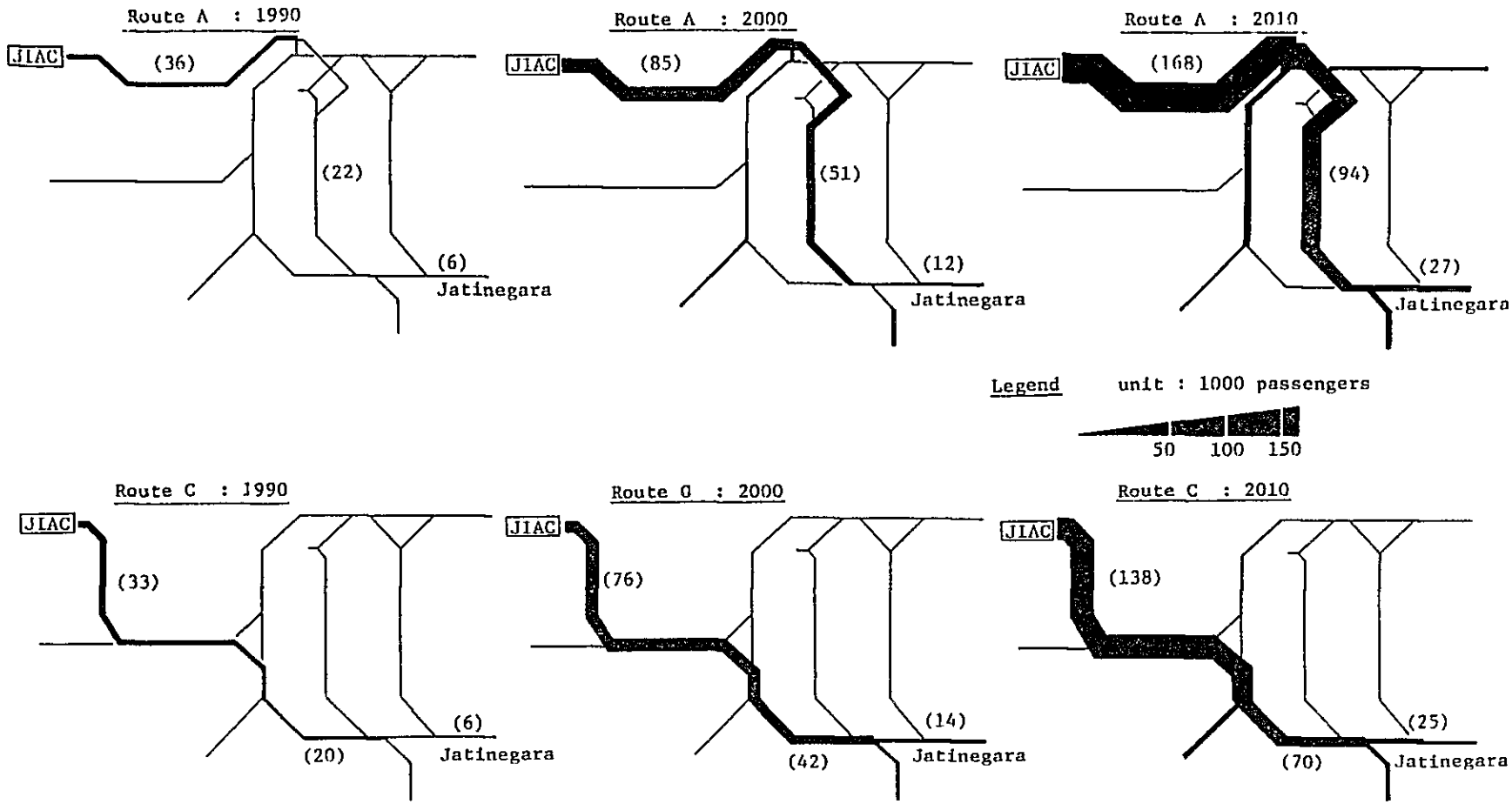


Fig. 8 Estimated Railway Link Load/Day (2 ways)

CHAPTER 4 GEOLOGICAL AND TOPOGRAPHICAL CONDITIONS

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4.1 Topography

The planned area of this project is located on the coastal plain, and the sites are divided into three categories.

- Cengkareng Airport area: Flood micro ridge and backmarsh consisting of natural levees and point bars
- Between airport and Jakarta : Beach ridges and swamp between ridges
- Jakarta City : Delta plain

4.2 Geological Conditions

It consists of unconcrete alluvium which forms the coastal plain, with a tertiary formation underneath.

Suggested Routes A and C have the following geological conditions:

- Route A: Close the shore line, the land is very soft, with a 8 ∿ 12 mm top layer (N value: below 5), so the track should not be laid in this area and should be laid in beach ridges area.
- Route C: This route is the furthest from the shore line and passes beach ridges area, not pass soft ground area.

4.3 Design and Work Execution

4.3.1 Embankment

The soft ground which adversely affects the embankment work is observed mainly in the Delta plain and much less in the inland area beach ridges area. Therefore, area near shoreline is not recommended considering difficulties of embankment work and maintenance.

4.3.2 Elevated Structure

The depth of the stabilized bearing layer fluctuates considerably from an area to another. This is probably due to differences in solidification and weathering. Boring tests revealed that reliable layers with N-values of more than 30 appear only at 8 meters depth. Therefore, piling foundation is inevitable.

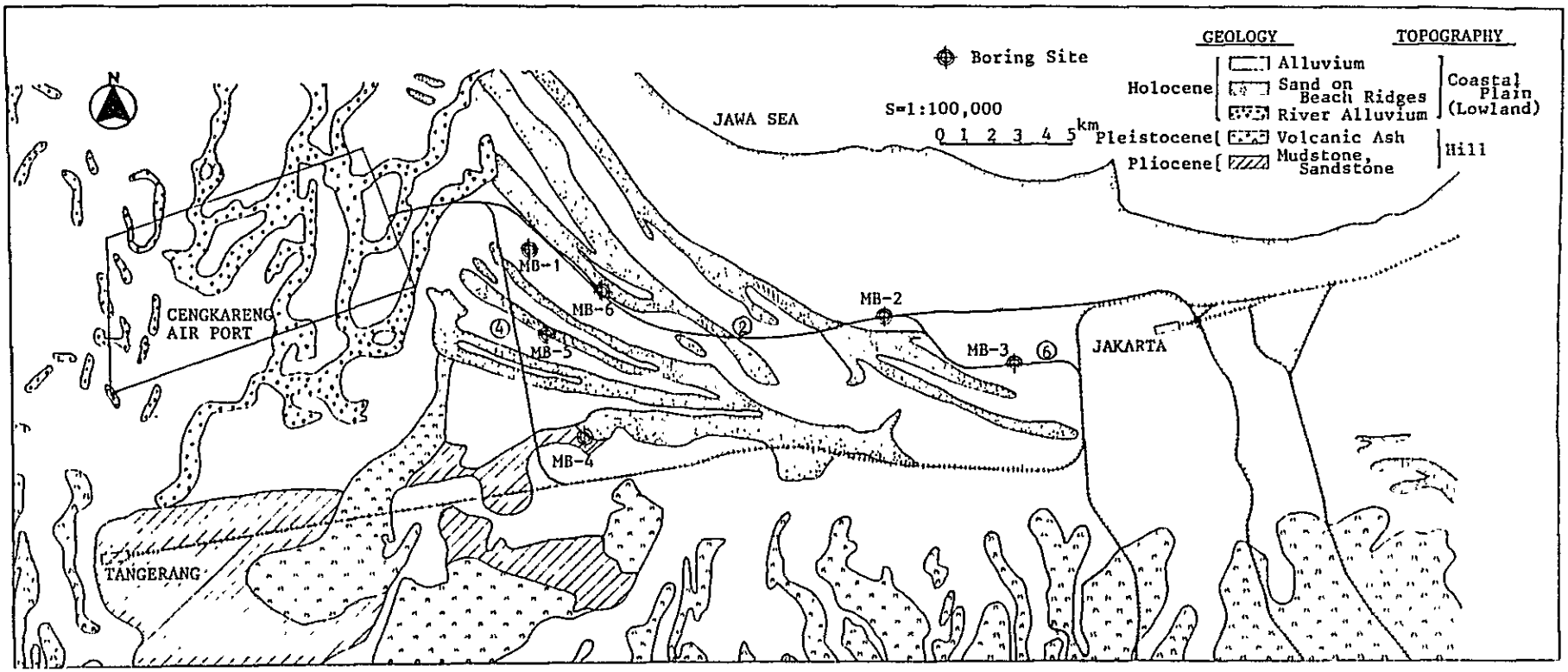

Fig. 9 Location Map

CHAPTER 5 ROUTE SELECTION

CHAPTER 5 ROUTE SELECTION

5.1 Alternatives Proposed

There are two important factors in locating the alternative routes of the New Railway Line. One is the route location of the main line between the New Airport and the urban area and the other is the location of the junction where the New Railway Line connects with the existing railway network.

Three (3) alternatives were proposed for the former and eight (8) alternatives for the latter. Of the combination of these, ten (10) alternative routes were proposed and studied.

These alternatives were evaluated in terms of geological conditions, land acquisition, constructional problems, construction cost, traffic demand, train operation, etc. The outcome of the evaluation is as shown in Table 6.

Table 6 Comparison of Alternatives

Case	Route	Passenger's convenience	Train operation	Traffic demand	Constructional problem	Construction cost	Evaluation
①	①—②	o	o	o	×	×	
②	②—②	o	o	o	△	△	Good
③	③	×	×	×	o	o	
④	③—④	△	o	△	△	△	Good
⑤	②-⑥-⑤	△	×	△	×	×	
⑥	②—⑥	△	△	△	×	×	
⑦	②—⑦	△	×	△	△	△	
⑧	②—⑧	×	×	△	△	△	
⑨	②—⑨	o	o	o	×	×	
⑩	②—⑩	×	×	△	△	△	

o : Preferable △ : Normal × : Not preferable

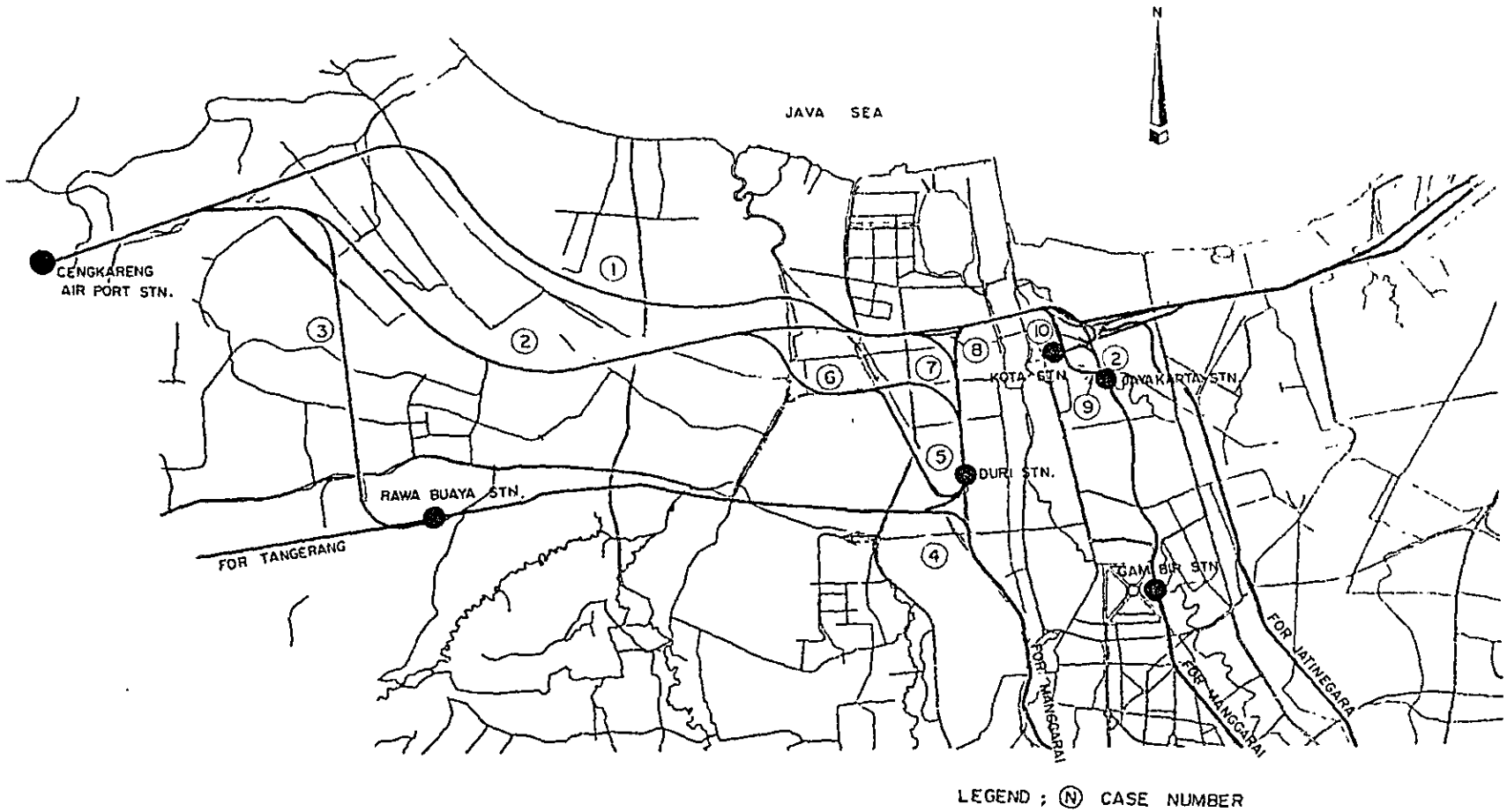

Fig. 10 Plant Alternatives

The characteristics of each route can be summarized as follows.

Route 1 passes closer to the coastal line than Route 2, although other aspects are almost similar to Route 2. Since Route 1 passes through longer section of soft ground area than Route 2, its construction cost would be greater and construction works and involve more difficulties than Route 2.

Route 3 connects Western Line at Duri toward northward. However, this section has a high frequency of train operation and a shuttling service would be required at the section between Kp. Bandan and Kota. This would result in a long travel time. Furthermore, the termination of train operation at Kota Station would cause inconvenience for the passengers from south area and inappropriate connection with other radiating railway lines.

Route 5, 7 and 8 have the same problems as Route 3.

Route 6 would require an enormous construction cost to improve the existing Duri Station.

Route 9 is located nearer to Kota Station. However, it would require a higher construction cost due to a great number of houses to be compensated in the vicinity of Kota area.

Route 10 terminates as Kota Station and would not be convenient for passengers.

Based on the above considerations, case 2 and case 4 are considered as the most feasible routes for implementation. Therefore we refer case 2 and case 4 as Route A and Route C, and the detailed consideration is given in 5.2.

5.2 Comparison between Route A and Route C

Table 7 shows the merits and demerits of both alternative routes.

Table 7 Comparison on Alternative Routes

Route	Merits	Demerits
Ⓐ	1. Smooth connection between city center and airport by direct trackage into the Central Line passing through the centers of administration and commerce, without any passage on the existing line on the way to join the Central line. This Route can enter into commercial operation earlier than Route C. 2. Convenient to railway passengers traveling over rather long distance to Bogor and Bekasi. Other passengers to and from Tanah Abang and Merak directions can utilize the new line on this Route by Kota Intan Station. Therefore, this Route will attract more passengers than Route C. 3. Because of close coordination with the track elevation of Central Line of high feasibility, operation on Route A will be stabilized earlier than on Route C. Besides, tickets can be strictly checked and collected because of the elevation. 4. Easy work performance as compared with Route C.	1. Higher construction cost than Route C. 2. Track rearrangement may be required as the Route passes through the freight yard and the station yard of Kota on the existing line.
Ⓒ	1. Lower construction cost than Route A. 2. Direct linkage to each radial line is possible.	1. New line is scheduled to start up operation at the completion of improvement work of existing lines (Western and Tangerang Lines). If such work is delayed, it would cause delay to New Line. 2. Being far from city center, this Route will be inconvenient to passengers to and from north and northeast of Jakarta. 3. Construction cost of flyover of Jl. Khhasym Asyhari will be expensive. 4. Land acquisition will be more difficult than Route A because the section of high density inhabitance is longer. 5. Because of longer section of passage on the existing line as compared with Route A, the airport access train will be affected easily by interference of trains running on the existing line.

CHAPTER 6 AIRPORT STATION

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6.1 Location of Airport Station

There are three alternatives for the location of the airport railway terminal. Location 1 plans to construct the railway terminal at ground level in the center of the airport area as is envisioned by the Cengkareng Airport Construction Project.

Location 2 plans to construct an elevated railway terminal adjacent to a terminal building for the convenience of passengers.

Location 3 plans to construct the railway terminal at the same place with Location 2 but with underground structure from scenic considerations.

Location 1 was chosen after evaluating such factors as construction cost, aesthetic consideration, effect on airport facilities now under construction, security and maintenance.

6.2 Layout of Airport Railway Terminal

There are five alternatives for the layout of the airport railway terminal, of which the details are shown in the main report.

Layout 1 has two platforms as shown in Fig. 11. Trains will arrive and leave from between these two platforms. Bus service will be available from the opposite sides of both platforms making it easy for railway passengers to transfer to and from buses.

Layout 2 has a comb-like three platforms. This is to enable the separation of arriving and departing passengers. Departing passengers could easily choose the train that departs first, but their walking distance would be made longer.

Layout 3 has two platforms between which bus service is available. Passengers could easily choose the train that departs first.

However, it is dangerous for buses to cross railway tracks and it is very dangerous if passengers dare to cross over the bus lanes.

Layout 4 has a wider space between two platforms with bus service available there. However, this layout also involves the possibility that the passengers would cross over the bus lanes and a greater number of personnel would be necessary to serve the separated platforms.

Layout 5 has grade separated platforms; ground level for trains and upper level for buses. However, passengers are required to go up or down more than one level to the other. The construction cost of this plan would be the highest of the alternatives.

After an evaluation of the above plans, Layout 1 was found to be better alternative than other ones.

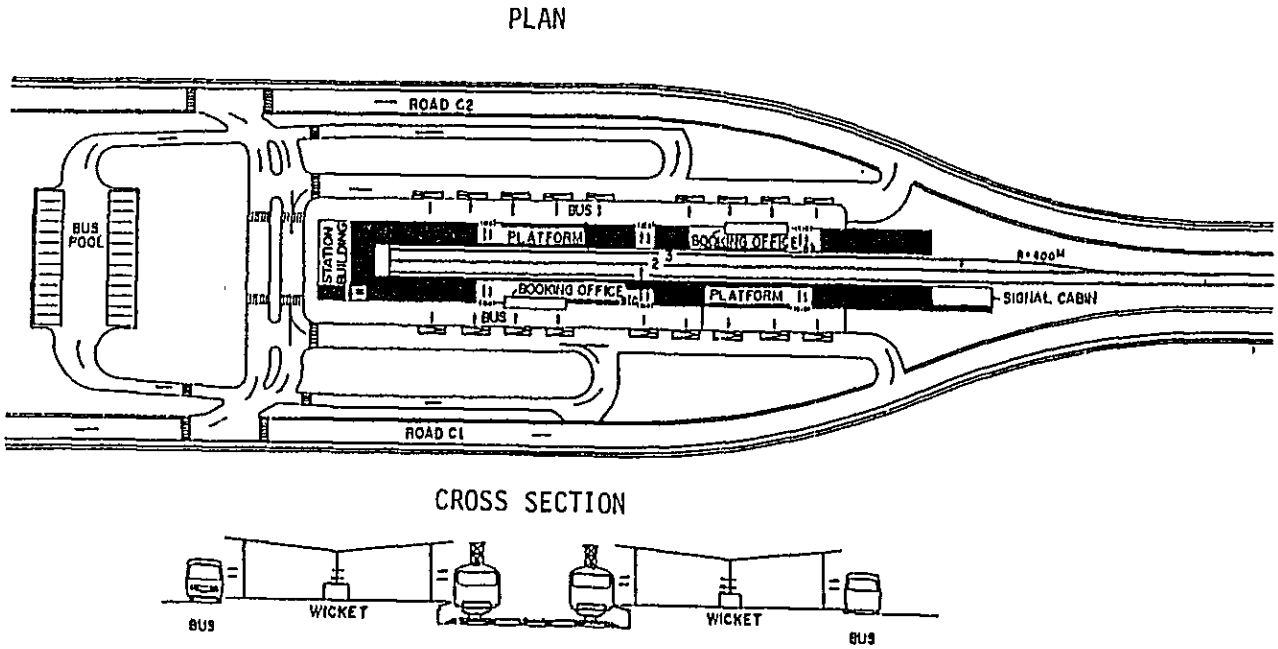

Fig. 11 Layout of Airport Station

CHAPTER 7 TRAIN OPERATION

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7.1 Basic Concept

The train operation plan is formulated based on following basic concept as role of Airport Access Train is to offer good accessibility for Cengkareng Airport passenger.

a. New railway line for Cengkareng Airport under this project is able to offer good accessibility for Airport passenger applying railway network.

b. Airport train operating section is between JIAC and Jatinegara through Central line for Route A and through Tangerang line and Western line for Route C, via Manggarai which is considered as future railway terminal of Jakarta so as to attract many passenger and not to change Airport Train operation route even in future.

c. At the first stage of Airport Train Operation, line is constructed as single track and has train of 4 railcar formation with 20 minutes headway. In accordance with increase of traffic demand, train formation will be enlarged to 8 railcar formation. For further expansion of traffic demand, line is increased to double track and headway of train is shortened to 10 minutes. Train headway and scale of train formation are adjustment factors to cope with increasing traffic demand.

d. Criteria of track is same as one of Master Plan, but on planning of train operation, care is taken to remaining power for restoring train delay.

e. For high speed train operation with safety, automatic blocking system with automatic signalling system and ATS (Automatic Train Stop device) are adopted.

f. Railcar with same characteristics as JABOTABEK railcar now in use is adopted.

7.2 Premising Condition

Above concept is subjected to completion of following projects which are suggested in Master Plan.

a. Improvement and electrification of Western Line (Master Plan item No. 7, 16 and 18)

b. Track elevation of Central Line and grade separated crossing of Manggarai (M/P No. 9 and 10)

c. Improvement, electrification and track doubling of Tangerang Line (M/P No. 4 and 21)

d. Improvement of Jakarta Kota Depot (M/P No. 6) and construction of Depok Depot (M/P No. 22)

e. Rehabilitation of Manggarai Workshop (M/P No. 5 and 23)

Therefore, train operation is planned under the assumption that above projects have been completed.

7.3 Train Operation Plan

a. Routes and intermediate stations

Routes and intermediate stations are shown below.

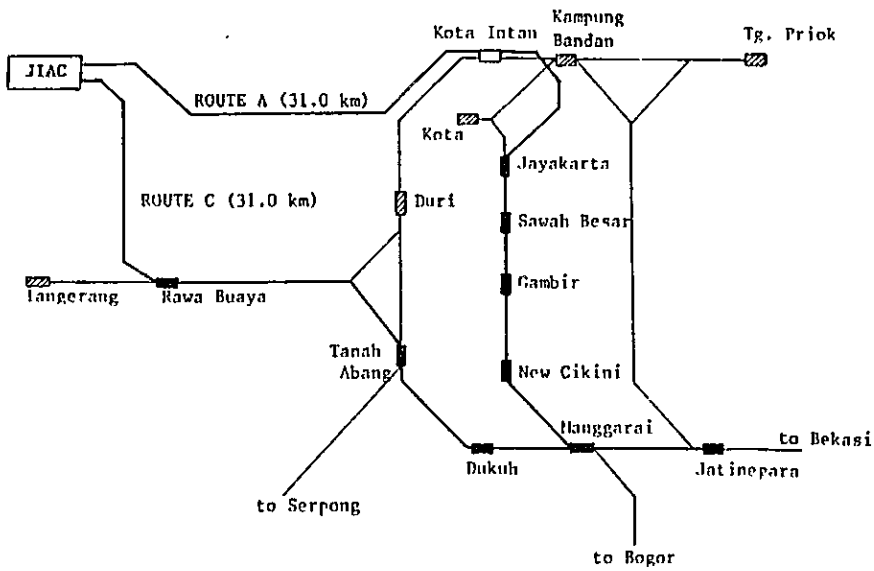

Fig. 12 Routes and Intermediate Stations

Intermediate stations are as follows:

Route A: Kota Intan, Jayakarta, Sawah Besar, Gambir, New Cikini, Manggarai

Route C: Rawabuaya, Tanah Abang, Dukuh, Manggarai

b. Travel time

Travel time from key stations in Jakarta are shown in Table 8 as follows.

Table 8 Travel Time (Minutes : Second)

	Tanah Abang	Gambir	Manggarai	Jatinegara
Route A		25:00	32:00	36:30
Route C	21:00		30:30	35:00

Remark 1: Table indicates travel time on year 2010 (double track).

2: In the period of single track, additional 2 - 2:30 is necessary for train crossing work.

c. Transportation capacity

Transportation capacity according to each phase is shown in Table 9.

Table 9 Transportation Capacity (One Way)

Year	Transportation capacity (1,000 person)	Period		Remarks
		Route A	Route C	
1990	30.6	- 1997	- 1998	Single track, 4 railcar formation, 20' headway
2000	61.2	1998 - 2006	1999 - 2008	Single track, 8 railcar formation, 20' headway
2010	122.3	2007 -	2009 -	Double track, 8 railcar formation, 10' headway

7.4 Number of Train and Train Headway on Existing Line

As the Train operates down to Jatinegara through existing JABOTABEK Railway network, operation of the Train pushes up density of total train in existing lines.

Therefore, number of trains and train headway of both trains, Airport Train and existing trains, should be checked. Table 10 indicates, as a result, total number of trains and train headway for peak 2 hours in existing lines.

Table 10 indicates railway links which are considered as high traffic demand, with number of trains and train headway.

Table 10 Number and Headway of Trains Estimated for Peak 2 Hours

	Year	Route A		Route C	
		Number	Headway (min.)	Number	Headway (min.)
Kampung Bandan - Duri	1990	20	6.0	20	6.1
	2000	26	4.6	25	4.8
	2010	37	3.3	35	3.5
Duri - Tanah Abang	1990	16	7.5	21	5.7
	2000	21	5.8	26	4.7
	2010	30	4.0	41	3.0
Tanah Abang - Manggarai	1990	15	8.0	24	4.9
	2000	20	5.9	31	3.8
	2010	28	4.3	37	3.2
Tanah Abang - Serpong	1990	14	8.3	15	8.3
	2000	19	6.4	19	6.4
	2010	28	4.3	28	4.3
Manggarai - Depok	1990	13	9.4	13	9.4
	2000	24	5.0	24	5.0
	2010	33	3.7	32	3.7
Gambir - Manggarai	1990	16	7.5	10	11.8
	2000	21	5.6	15	7.9
	2010	33	3.6	21	5.7
Manggarai - Jatinegara	1990	13	9.1	13	9.0
	2000	17	7.1	17	7.0
	2010	26	4.6	26	4.6

Remarks: Duri - Tanah Abang, in case of Route C, means the section from the junction of New Airport Line and Western Line to Tanah Abang.

7.5 Number of Railcars

Route C has less number of stations compared with Route A although the length of both routes are same. Travel time by Route C is shorter than that by Route A, accordingly.

For double track operation, one cycle time of train set in case of Route C is calculated at 80 minutes, including the time necessary for shuttling at both terminals. At the train headway of 10 minutes, the train set which leaves JIAC railway station 80 minutes before, will be again ready to leave JIAC railway station. On the other hand, one cycle time of train set in case of Route A is calculated at 83 minutes. The train set which leaves JIAC railway station 80 minutes before is now on the way back to JIAC railway station. Therefore, one additional train set is necessary for Route A.

For single track operation, one cycle time of train set needs additional 2 ~ 2.5 minutes for train crossing work. Therefore, one cycle time exceeds 80 minutes on both case. Consequently, same number of train set is required.

Table 11 Number of Railcars

	1990	2000	2010
Route A	22	43	86
Route C	22	43	70

7.6 Train Operation Diagram

Pattern train operation diagrams are indicated on following Fig. 13 and 14.

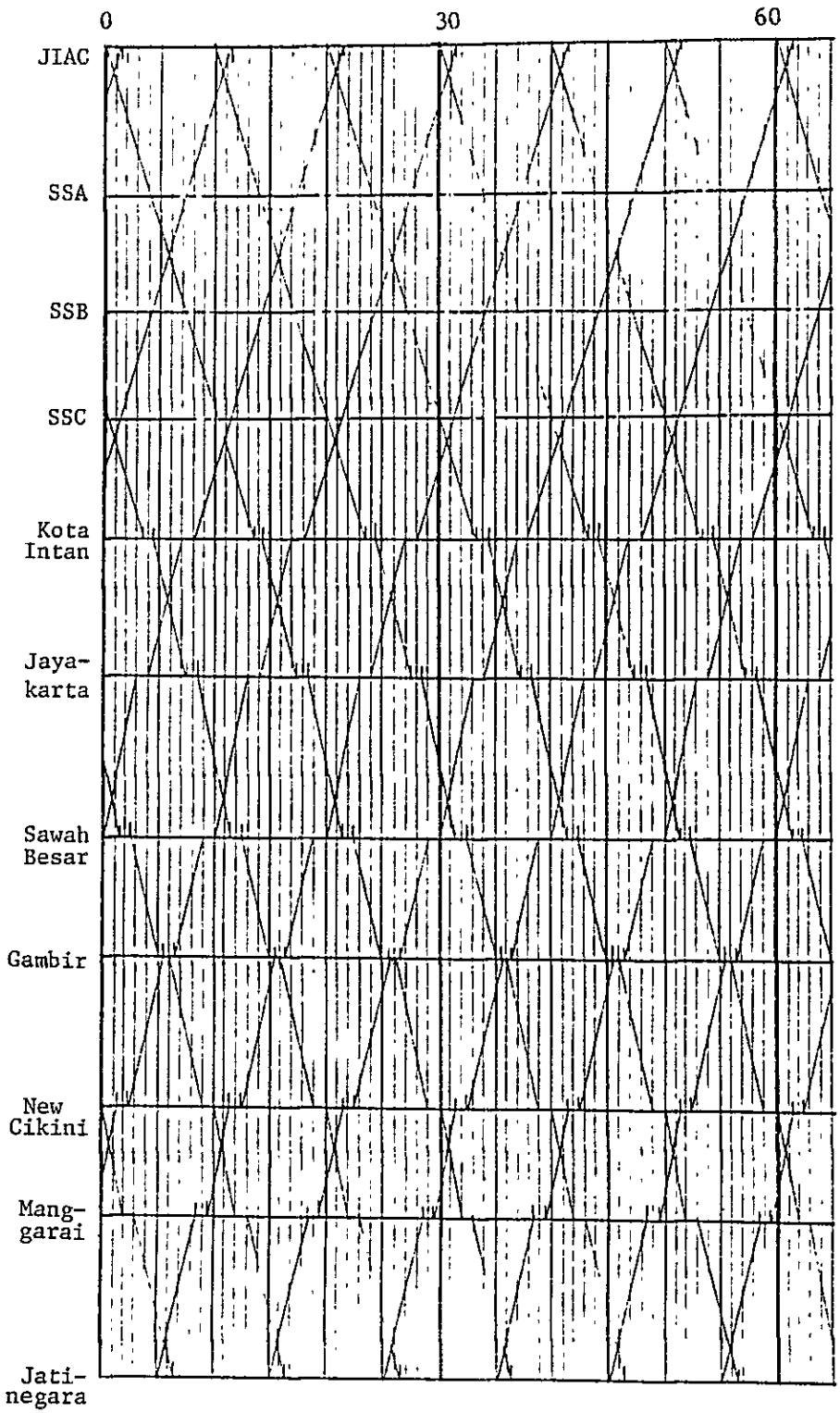

Fig. 13 Train Diagram (Route A, 2010)

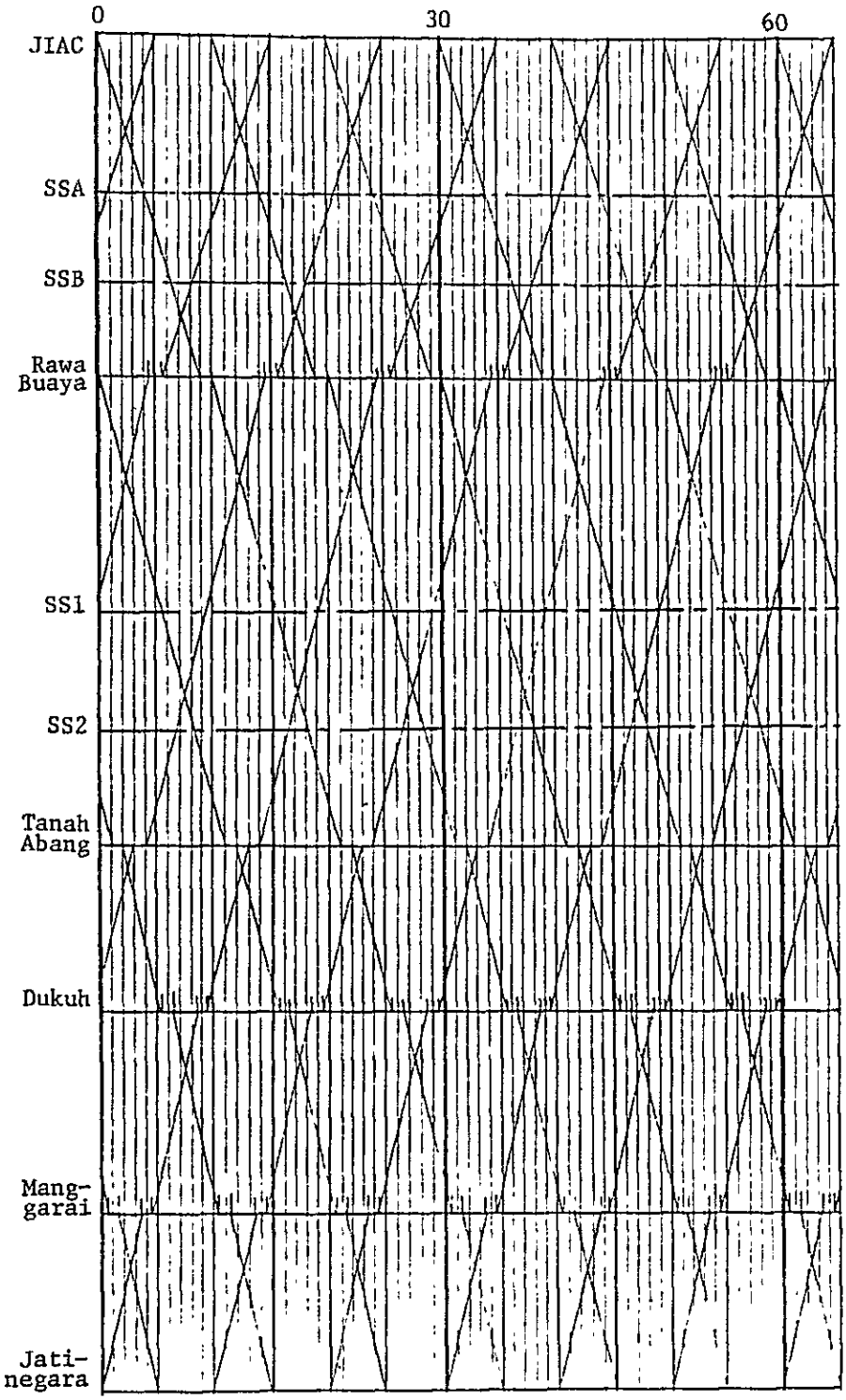

Fig. 14 Train Diagram (Route C, 2010)

CHAPTER 8 RAILWAY FACILITIES

CHAPTER 8 RAILWAY FACILITIES

8.1 Track Facilities and Structures

The design standard of railway track accords with the one adopted by JABOTABEK railway.

The tracks are to be constructed mainly by embankment for economical reasons, but in the urban area by elevated structure with reinforced concrete.

For maintenance reasons, grade separated girder crossing is to be constructed at crossings of 20 meters or less with roads, rivers, and the existing railway lines by utilizing reinforced concrete girders and at crossings of more than 20 meters by PS concrete girders.

8.2 Station Planning

8.2.1 Construction of Stations and Signal Stations

Intermediate stations are not constructed in principal because the line passes through a development restriction area and rapid transit service is required. However in Route A, Kota Intan station will be constructed for the convenience of the passengers to and from Western Line.

During single track operation period, signal stations are required at three (3) points on Route A and two (2) points on Route C to allow train crossing. Also on Route C, two (2) signal stations are provided at the junctions with Tangerang Line and Western Line.

8.2.2 Facilities at Stations and Signal Stations

The effective track length of stations and signal stations is 210 meters for 8 car trains.

A grade separated crossing is provided at the junction of the New Railway Line and the existing line in order to minimize the interference of train operation on both lines.

Station facilities consist of station main building, platform, platform roof, overbridge and station plaza. The platform is designed with appropriate height so that people can get on and off the train easily.

At signal station, signal cabin is provided to manage route of trains based on the information of train operation.

8.3 Electrification Plan

8.3.1 The Method of Electrification

(1) The railway length to be newly constructed for new airport, is around 20 km for route A, and around 15 km for route C (or around 21 km for including the Tangerang Line). Therefore, DC 1,500V electric traction system which is same as the electric traction system of existing line, is advantageous for new airport line's electric traction system as length of new line is considerably short and train operates into existing line directly.

(2) Sub station

Considering application of traction power supply system and voltage drop, 3 substations are provided for Route A and 2, for Route C.

(3) Facilities of traction power feeding lines

Overhead wire system is of simple catenary system with rigid cantilever arm for suspension of overhead wire, to facilitate maintenance and adjustment.

(4) High-voltage power distribution lines

To supply power to lighting and signalling facilities provided in the airport station, new stations and signal stations, high-voltage power distribution lines are equipped.

8.4 Plans for signalling and Telecommunications

(1) Signalling facilities

To assure safe and high-speed operations, the plan envisages to use the automatic block system and signalling devices comprised of color light signals, electric switch machines, track circuits, relay interlocking devices, etc. Automatic Train Stop device is adopted for better safety. Level crossings are provided with alarm system and automatic gates, and are controlled automatically.

(2) Telecommunication facilities

Telecommunication cables are installed for direct telephone system and remote control system for substations. Direct telephone system is used for train dispatcher, power supply dispatcher, and other dispatcher if necessary. In addition, the reliability of the entire information system is assured by the installation of facsimile machines, PCM carrier equipment, and train radios.

8.5 Electric Car and Workshop

Electric cars to be employed, are basically the same type as those being used in the JABOTABEK area so that electric cars maintenance and operation can be easier.

Regular inspection and repairs of electric cars to be operated on the new airport line should be handled according to the JABOTABEK Master Plan. General inspection and principal equipment inspection should be conducted at the Manggarai workshop in accordance with the above Master Plan.

A three phased improvement plan of the Manggarai workshop is recommended in the Master Plan, with the first phase scheduled for completion in 1987.

8.6 City Terminal

It is advised that facilities for information service and tourist service will be provided at a station in the center of Jakarta where larger number of passengers are expected, so that the station will serve functionally as the city terminal and attract more passengers to the railway traffic.

The information service will include both flight and train operation and the tourist service will provide necessary information for the convenience of passengers concerning hotel reservation, tour guide and rental car service.