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No. 27

THE STUDY ON TRAFFIC IMPROVEMENT MEASURES IN [illegible]

IN

THE PEOPLE'S REPUBLIC OF BANGLADESH

FINAL REPORT

(SUMMARY)

(VOLUME 1 OF 3)

JULY 1984

JAPAN INTERNATIONAL COOPERATION AGENCY

THE STUDY ON LONG-TERM AND MEDIUM-TERM PLAN FOR TELECOMMUNICATIONS NETWORK IN JABOTABEK AREA IN THE REPUBLIC OF INDONESIA (GTA-96A)

[VOLUME I]

JULY 1989

JAPAN INTERNATIONAL COOPERATION AGENCY

Note:
The land use map originally prepared by BKSP classifies land use into more detailed level. For the Study, land use classification was simplified so as to focus on the distribution of population and economic activities.

Source:
Badan Kerja Sama Pembangunan (BKSP) JABOTABEK

Residential Area

Commercial and Governmental Area

Industrial Area

Other Areas (Mainly Agricultural Areas)

Major Arterial Road

Railway

Jakarta Multi-Exchange Area Boundary by the end of Repelita VII

Jakarta Multi-Exchange Area
(Boundary by the End of Repelita VII)

Superimposed

on

Land Use Map/2005

PREFACE

In response to a request from the Government of the Republic of Indonesia, the Japanese Government decided to conduct the STUDY ON LONG-TERM AND MEDIUM-TERM PLAN FOR TELECOMMUNICATIONS NETWORK IN JABOTABEK AREA IN THE REPUBLIC OF INDONESIA and has entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Indonesia a survey team headed by Mr. Kan-ichi TAKAGI of the Nippon Telecommunications Consulting Co., Ltd. from 18th July to 25th October 1988, 16th January to 17th March and 8th to 22nd June 1989.

The team held discussions with the officials concerned of the Government of the Republic of Indonesia and conducted a field survey. After the team returned to Japan, further studies were made and the present report has been prepared.

I hope that this report will serve for the development of the project and will 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, 1989

Kensuke Yanagiya

Kensuke Yanagiya
President
Japan International Cooperation Agency

LETTER OF TRANSMITTAL

Mr. Kensuke YANAGIYA
President
Japan International Cooperation Agency

July, 1989

Dear Mr. President:

I have the honor to submit to you our final report of the Study on LONG-TERM AND MEDIUM-TERM PLAN FOR TELECOMMUNICATIONS NETWORK IN JABOTABEK AREA IN THE REPUBLIC OF INDONESIA. It is our great pleasure to note that this assignment has been completed through the close cooperation between two Governments of Japan and Indonesia.

The final report was prepared during the past 10 months by the Study Team organized by members of the Nippon Telecommunications Consulting Co., Ltd. and headed by Mr. Kan-ichi TAKAGI. It comprises the Main Report composed of a Summary, 10 Chapters and 10 Annexes and the Drawings.

In preparing this report, our Team benefited a great deal of the cooperation from officials and experts of the Japan International Cooperation Agency and other authorities concerned of the Government of Japan.

On behalf of the Study Team, I would like to express my deepest appreciation to the Republic of Indonesia including POSTEL/PERUMTEL and to other related agencies of the Government for the unlimited cooperation and assistance and the warm hospitality extended to the Study Team members during their stay in Indonesia.

We sincerely hope that this report will be an important basis for the development of the Republic of Indonesia.

Yours truly,

Yoshimasa SEKIGUCHI
President
The Nippon Telecommunications
Consulting Co., Ltd.

FINAL REPORT
FOR
THE STUDY ON LONG-TERM AND MEDIUM-TERM PLAN
FOR
TELECOMMUNICATIONS NETWORK IN JABOTABEK AREA
IN
THE REPUBLIC OF INDONESIA
(GTA-96A)

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2.	Bekasi	(BEK)	22.	Kelapa Gading	(KGD)
3.	Bogor	(BOO)	23.	Klender	(KLD)
4.	Cawang	(CW)	24.	Kota 1	(KT1)
5.	Cempaka Putih	(CPP)	25.	Kota 2	(KT2)
6.	Cengkareng	(CKG)	26.	Meruya	(MER)
7.	Cibinong	(CIB)	27.	Palmerah	(PLM)
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12.	Gambir 1	(GB1)	32.	Rawamangun	(RMG)
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LIST OF ABBREVIATIONS FOR EXCHANGE AREAS

(1) Expanded Jakarta Multi-Exchange Area

NO.	Exchange Area	Abbreviation	No.	Exchange Area	Abbreviation
1	Ancol	ANC	29	Kelapa Gading	KGD
2	Bantar Gebang	BGG	30	K.G. Permai	KGP
3	Bekasi	BEK	31	Klender	KLD
4	Bekasi Barat	BKB	32	Kota 1	KT1
5	Cawang	CW	33	Kota 2	KT2
6	Cempaka Putih	CPP	34	Kota 3	KT3
7	Cengkareng	CKG	35	Meruya	MER
8	Cibinong	CIB	36	Palmerah	PLM
9	Ciledug	CDG	37	Pasar Minggu	PSM
10	Cileungsi	CL	38	Pasar Rebo	PSR
11	Cilincing	CIL	39	Penggilingan	PGG
12	Cinere	CNE	40	Pluit	PLT
13	Cipete	CPE	41	Pondok Gede	PDG
14	Cipondoh	CPD	42	Pondok Kelapa	PDK
15	Ciputat	CPA	43	Rawamangun	RMG
16	Depok	DEP	44	Sawangan	SWG
17	Gambir 1	GB1	45	Semanggi 1	SM1
18	Gambir 2	GB2	46	Semanggi 2	SM2
19	Gandaria	GAN	47	Serpong	SER
20	Jagakarsa	JAG	48	Serpong Barat	SRB
21	Jatinegara	JT	49	Serpong Utara	SRU
22	Jati Uwung	JUG	50	Slipi	SLP
23	JIA Cengkareng	JIA	51	Sukma Jaya	SKJ
24	Kalibata 1	KL1	52	Tangerang	TAN
25	Kalibata 2	KL2	53	Tanjung Priok	TPR
26	Kebayoran	KB	54	Tebet	TB
27	K. Bintaro	KBB	55	Tegar Alur	TGA
28	Kedoya	KED			

(2) Jakarta Suburban Area

NO.	Exchange Area	Abbreviation	No.	Exchange Area	Abbreviation
1	Balaraja	BLJ	6	Parung Panjang	PPG
2	Cikarang	CK	7	Pasar Kemis	PSK
3	Cikupa	CKP	8	Serang	SRG
4	Curug	CUG	9	Sukatani	STN
5	Jonggol	JGL	10	Tigaraksa	TGS

(3) Bogor Multi-Exchange Area and Suburban Area

NO.	Exchange Area	Abbreviation	No.	Exchange Area	Abbreviation
1	Bogor	BOO	5	Jasinga	JSG
2	Ciampea	CAA	6	Leuwiliang	LWL
3	Cisarua	CSA	7	Semplak	SPL
4	Ciawi	CWI			

1. EXECUTIVE SUMMARY

1. EXECUTIVE SUMMARY

1.1 Overview

1.1.1 Background of the Study

(1) Long-Term Network Planning in Coordination with Regional Development Framework

The Metropolitan Jakarta area 1/ has been expanding and developing toward its suburban area. It is urgently needed that the long-term and medium-term plan for telecommunications network in Jabotabek area be set up in a coordinated manner with the regional development framework.

The number of waiting applicants throughout Indonesia amounted to 530,000, out of which 240,000 applicants reside in Jakarta as of September 1988. (Source: Materials for Meeting with World Bank Mission/PMC Main Task 2/, Dec. '88)

1/ To be defined in Section 1.3.2.

2/ Program Management Consultants/the World Bank

(2) Major Constraints

The major constraints found during implementation period of Pelita IV program are as follows as pointed out in "Material for Meeting with the World Bank Mission."3/

- Pelita IV was programed without confirmation of **available fund;**
- **OSP design** work was delayed by two and half years as compared with the original plan;

3/ By PMC Main Task, April 1989.

- **Land acquisition** was delayed;
- **Mal-synchronization** among the project implementing bodies;
- The **capability** of the contractors, especially for OSP was insufficient;
- A single project was **fragmented** into too many particles.

(3) Carry-Over Projects from Pelita IV

A number of projects are to be carried to Repelita V (1989-1994) mainly due to the lack of available external funds and delay of civil work prior to the installation of facilities.

Nationwide carry-over projects and those in WITEL IV out of the planned are given in the following table:

Table 1.1 Carry-Over Projects from Pelita IV 1/

	Switching (x 1,000 l.u.)		OSP 2/(x 1,000 pairs)	
	Planned	Implemented	Planned	Implemented
Nationwide	1,052	313 (30%)	1,833	590 (32%)
WITEL IV	**325**	**191 (59%)**	**558**	**342 (61%)**
Other WITELs	727	122 (17%)	1,275	248 (19%)

1/ PMC Main Task, April 1989
2/ No. of pairs of primary cable

1.1.2 Method of Approach

The Study is carried out in accordance with the work flow shown in the following page aiming at:

- **establishing the Target Network; and**
- **programing implementation of a priority project.**

The priority project here is meant the project that would be a bottleneck, at the beginning of Repelita V, against realization of

the target network toward ISDN; the detailed method of approach follows:

a) Telecommunications Network Development

The long-term plan is to be made aiming at establishing the **target network of the year 2004** in Jabotabek area. The medium-term plans to be derived from the long-term plan shall comprise the essential projects to be implemented during respective planning periods.

b) Regional Development Framework

The **regional development framework** to form the necessary conditions for the telecommunications network development is derived in due consideration of existing regional development plans in Jabotabek area.

c) Financial Aspects

The following are considered:

- **fund raising; and**
- **financial condition** of WITEL IV and PERUMTEL.

In addition, financial analysis of the priority project is carried out.

d) Network Planning

Starting from the present telephone-service-oriented network, the transition stages toward ISDN are to be clarified.

e) Guideline for Data Communications

In the transition period of the networks toward ISDN, it is very important to have a guideline for **interworking the existing data communications network (SKDP) with ISDN** in an appropriate

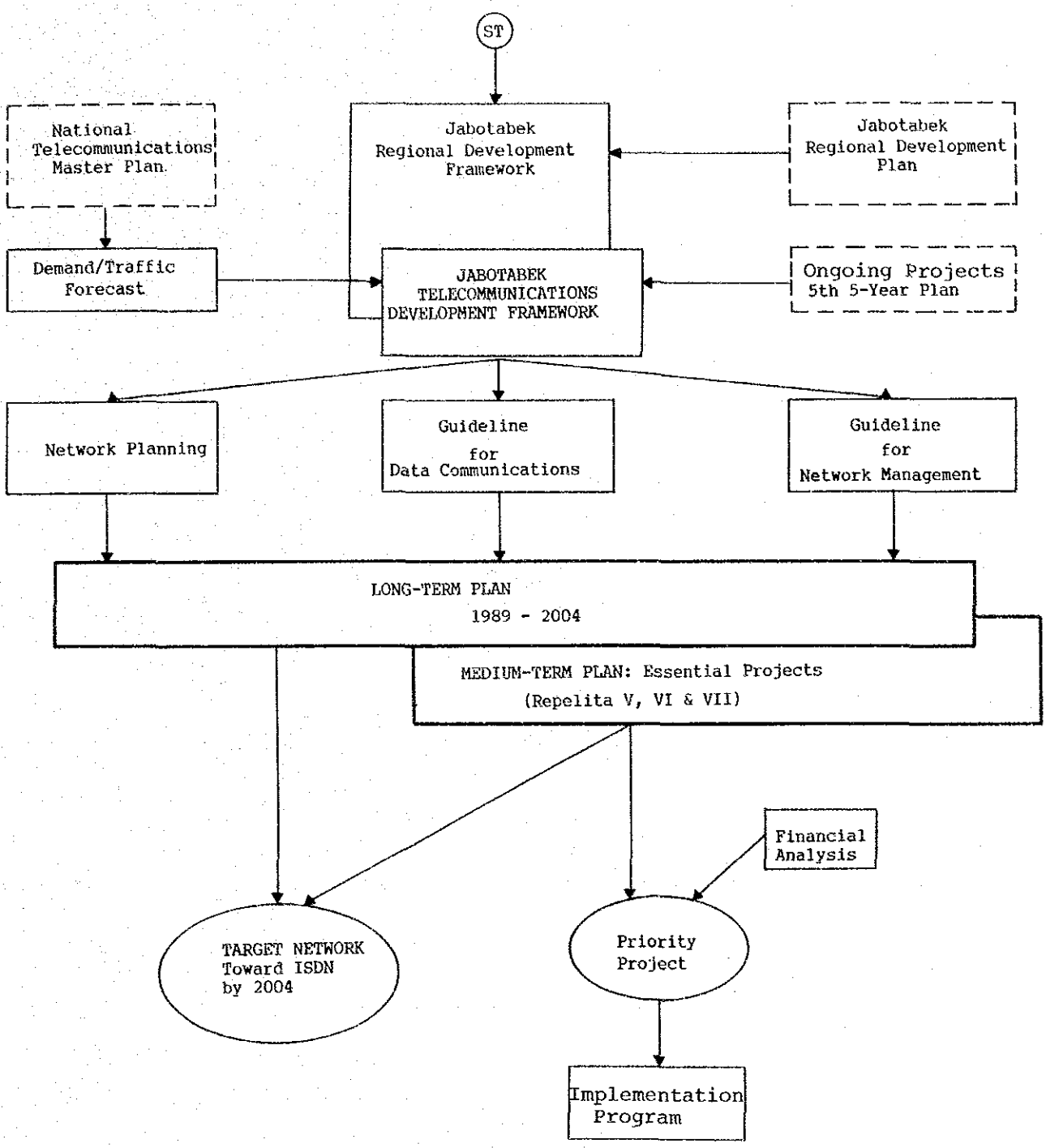
manner. The guideline for network development from the viewpoint of data communications is set forth.

f) Network Management

The network managerial aspect becomes a very critical issue as the size of the network is enlarged toward the target network; a guideline for network management is prepared.

g) Priority Project

The priority project to be implemented at the beginning of Repelita V is highlighted, out of the essential projects in terms of its system design, implementation schedule, cost estimate and financial viability.



Study on Long-Term and Medium-Term Plan
for
Telecommunications Network in Jabotabek Area

Fig. 1.1 Method of Approach

1.1.3 Overall Schedule of the Study and Organization of the Study Team

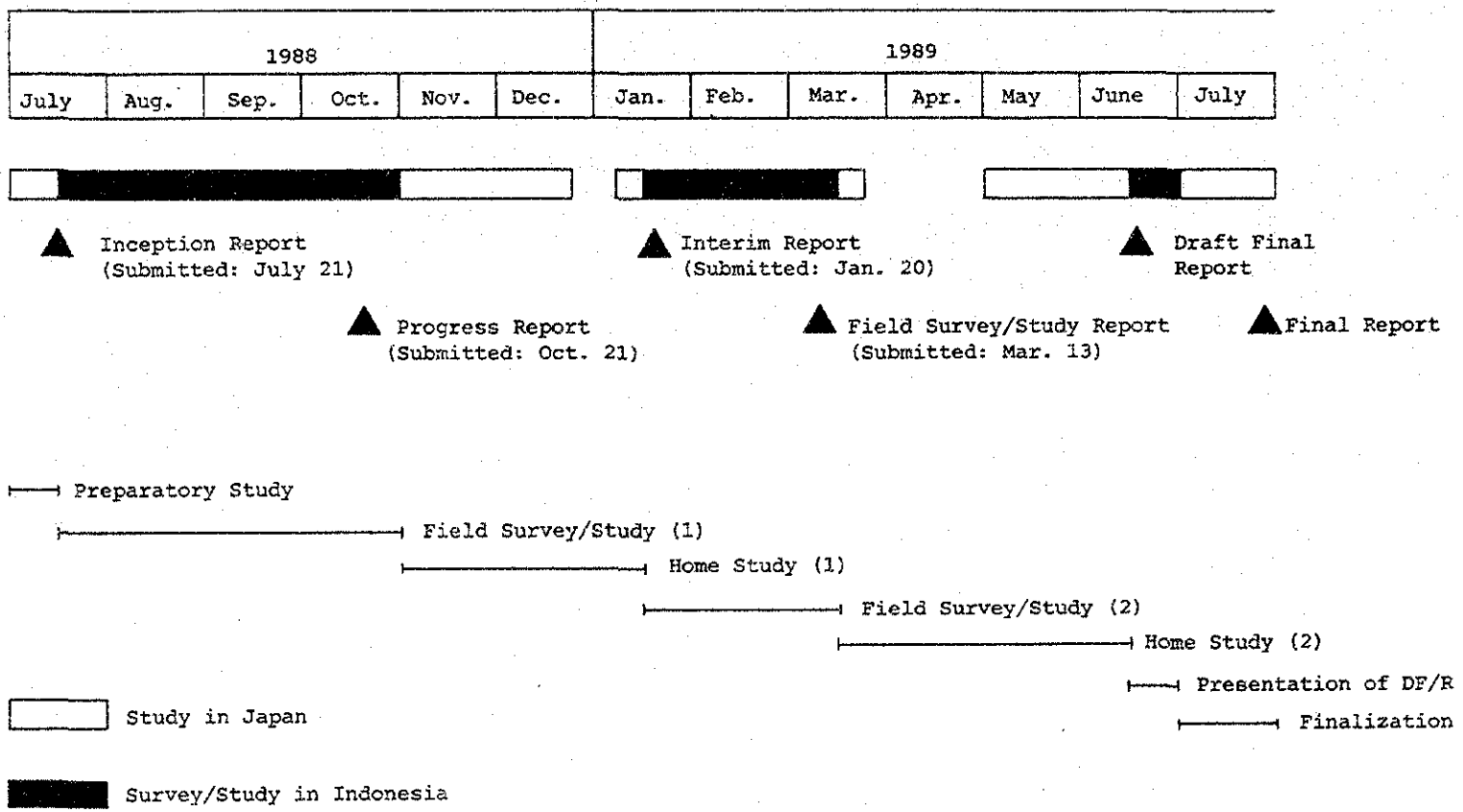
(1) Overall Schedule of the Study

The Study, thus far carried out, comprises:

a)	Preliminary survey	Nov. 16 - Nov. 28, 1987
b)	Field survey (1) in Indonesia	July 18 - Oct. 25, 1988
	- submission of Inception Report	July 21, 1988
	- submission of Progress Report	Oct. 21, 1988
c)	Analysis (1) in Japan	Oct. 26 - Dec. 29, 1988
		Jan. 4 - Jan. 15, 1989
d)	Field survey (2) in Indonesia	Jan. 16 - Mar. 17, 1989
	- submission of Interim Report	Jan. 20, 1989
	- submission of Survey Report	Mar. 13, 1989
e)	Analysis (2) in Japan	Mar. 18 - Mar. 24, 1989
		Apr. 25 - Apr. 28, 1989
		May 8 - June 7, 1989
f)	Presentation and discussion of Draft Final Report	June 8 - June 22, 1989
	- submission of Draft Final Report	June 10, 1989
g)	Preparation of Final Report	June 23 - July 21, 1989

Table 1.2 in the following page depicts the overall schedule of the Study.

Table 1.2 Overall Schedule of the Study



LONG-TERM & MEDIUM-TERM PLAN FOR TELECOMMUNICATIONS NETWORK IN JABOTABEK AREA

(2) Organization of the Study Team

Japanese Side:

a) JICA Advisory Committee

Jun-ichi AOKI	Chairman/Ministry of Posts and Telecommunications
Yoshihiko KAMBAYASHI	Member/Ministry of Posts and Telecommunications
Hideaki KOBAYASHI	(do.)
Kin-ichi UMEYA	Coordinator/Japan International Cooperation Agency

b) Study Team

Kan-ichi TAKAGI	Team Leader
Kazuyuki TSUZUKI	Acting Team Leader/Transmission Systems
Takahiko ADACHI	Network Planning
Jun-ichi KOMADA	Demand/Traffic Forecast and Signalling Systems
Gen-nai NAKANIWA	New Services
Haruo YAMANE	Regional Development Planning and Economic/Financial Analysis
Hiroshi TAKIDOUCHI	Outside Plant Planning
Hitoshi TANII	Subscriber Network
Tatsuhiko NAKASHIMA	Junction Network

Indonesia Side/Counterparts:

Lumumba Sirait	BINPROSISTEL/PERUMTEL
Arko Maryono	(do.)
Syarif S.A.	BINPROJARTEL/PERUMTEL
Dedi Mutakin	(do.)
Koesharijanto	PUSRENTEL/PERUMTEL
Asmari B.E.	BINPROTRATEL/PERUMTEL
Agus Budi Tjahjono	BINPROSENTEL/PERUMTEL
Undang Sudirman	BINPROSISTEL/PERUMTEL
Sajidin	SUBBAGTEKSENPON/WITEL IV
Hadi Sutrisno	DINTEKSENPON/WITEL IV
K. Pidjath	SUBBAGTEKJAR/WITEL IV

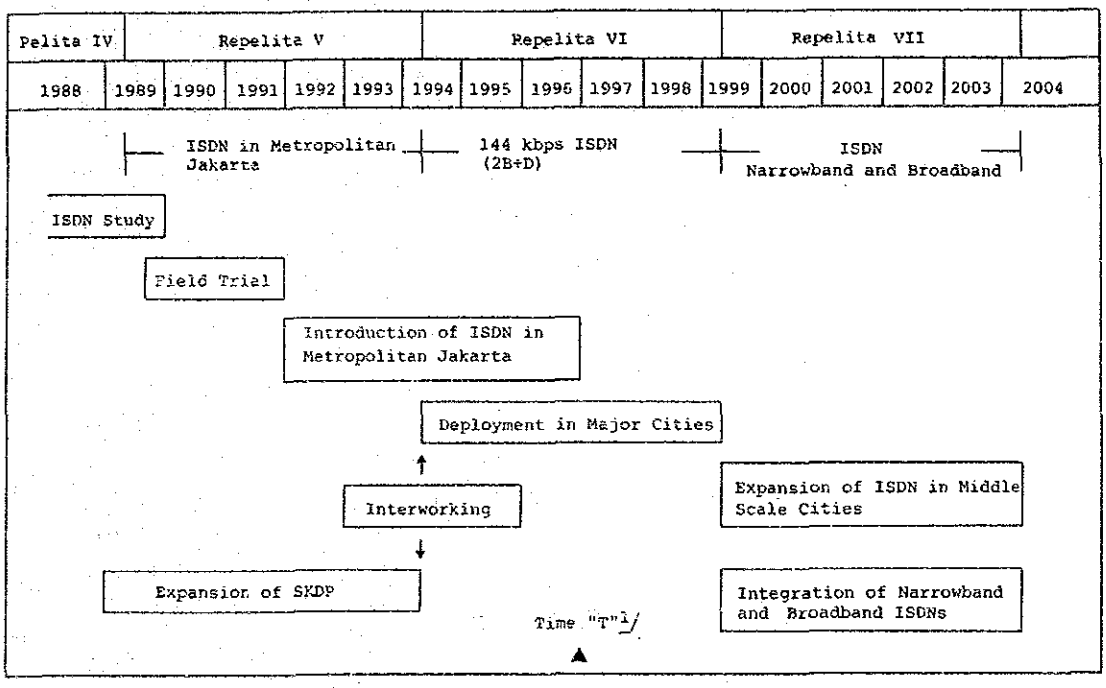
1.1.4 Long-Term Network Development Plan

The target network in Jabotabek area for the year 2004 is recommended to have the following major features:

a) Jakarta multi-exchange area will be expanded up to the 30km-radius zone from the center of DKI Jakarta incorporating its suburban area in coordination with the regional development framework. (Refer to Fig. 1.2 through 1.5.)

b) ISDN services will be introduced in Metropolitan Jakarta area by the end of Repelita V following the ISDN field trial/pilot project, to be expanded throughout Indonesia by the end of Repelita VII in parallel to the maturity of ISDN market. (Refer to Table 1.3 hereunder.)

Table 1.3 Evolution of ISDN Centering around Metropolitan Jakarta Area



1/ Time "T" - 23° 59' Dec. 31, 1996
Change-over to ISDN numbering scheme.
(CCITT Rec. E165)

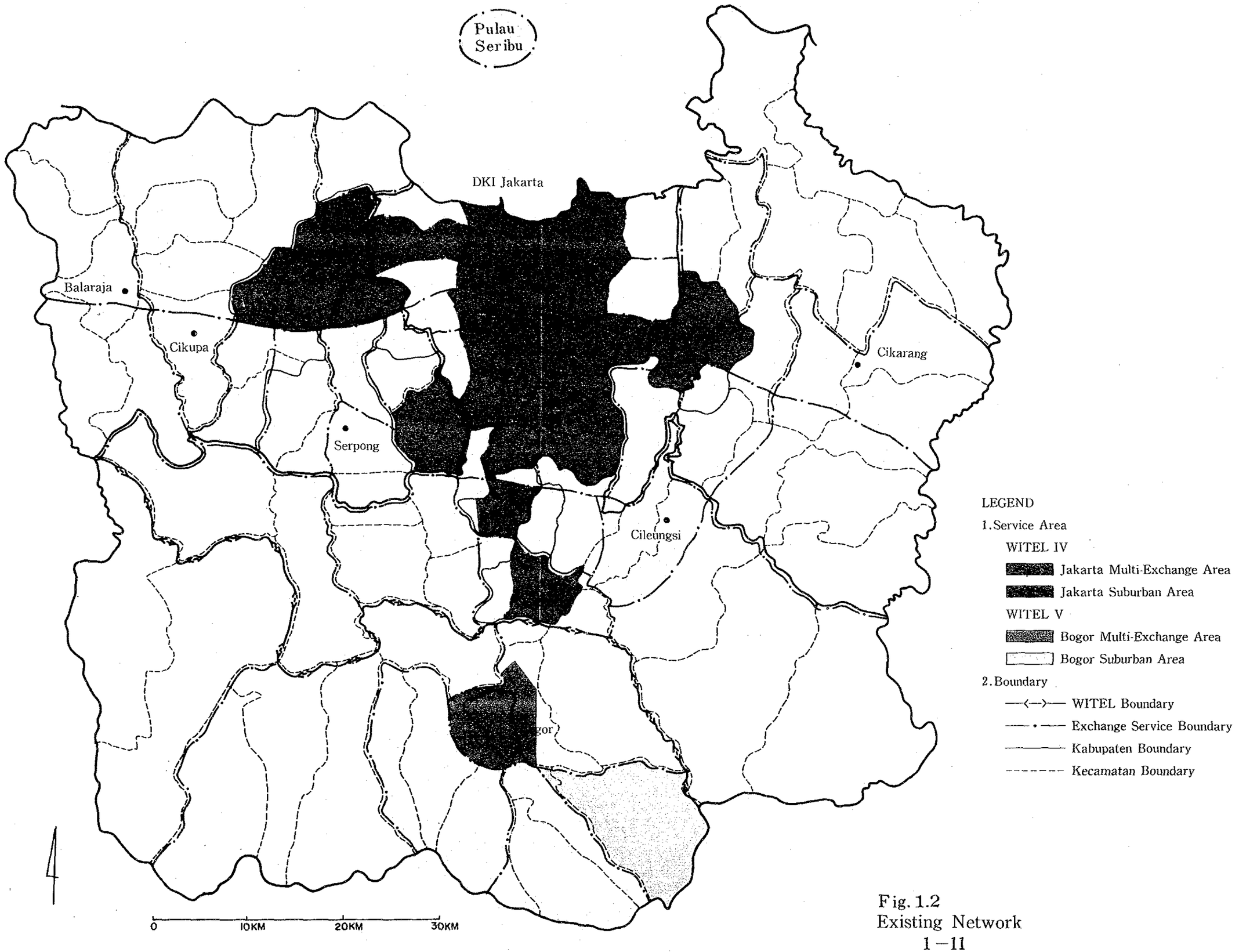


Fig. 1.2
Existing Network

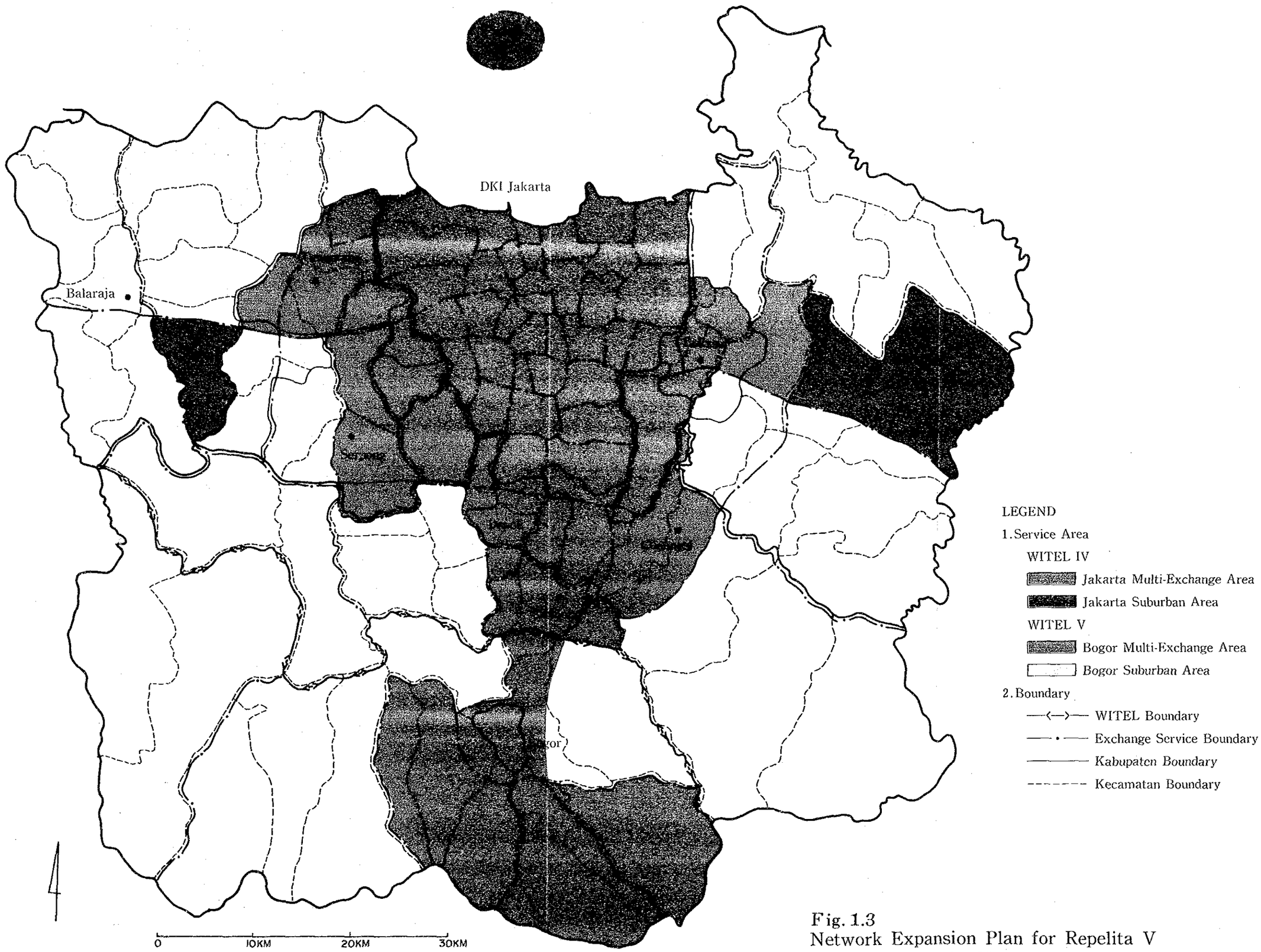


Fig. 1.3
Network Expansion Plan for Repelita V

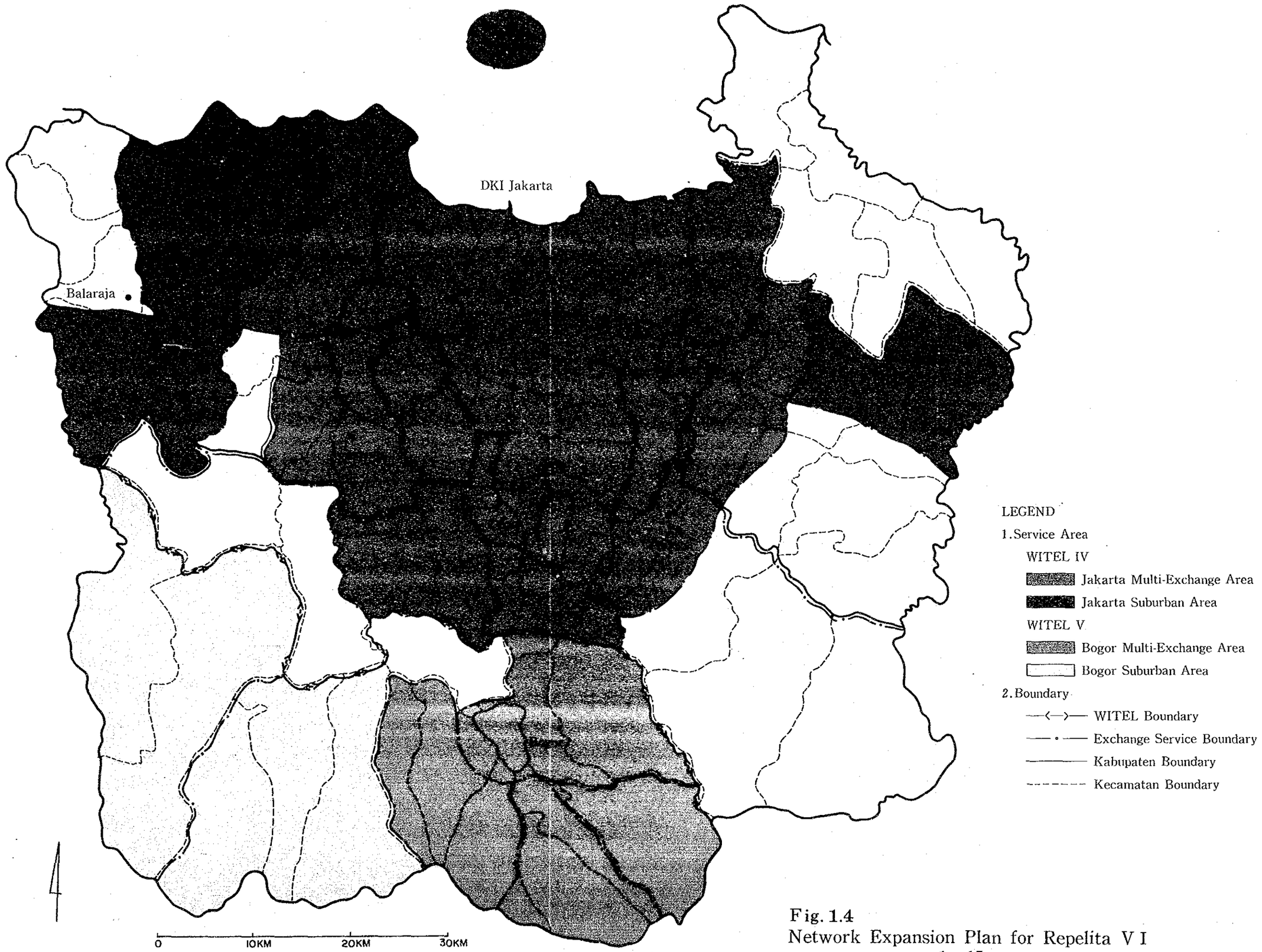


Fig. 1.4
Network Expansion Plan for Repelita V I

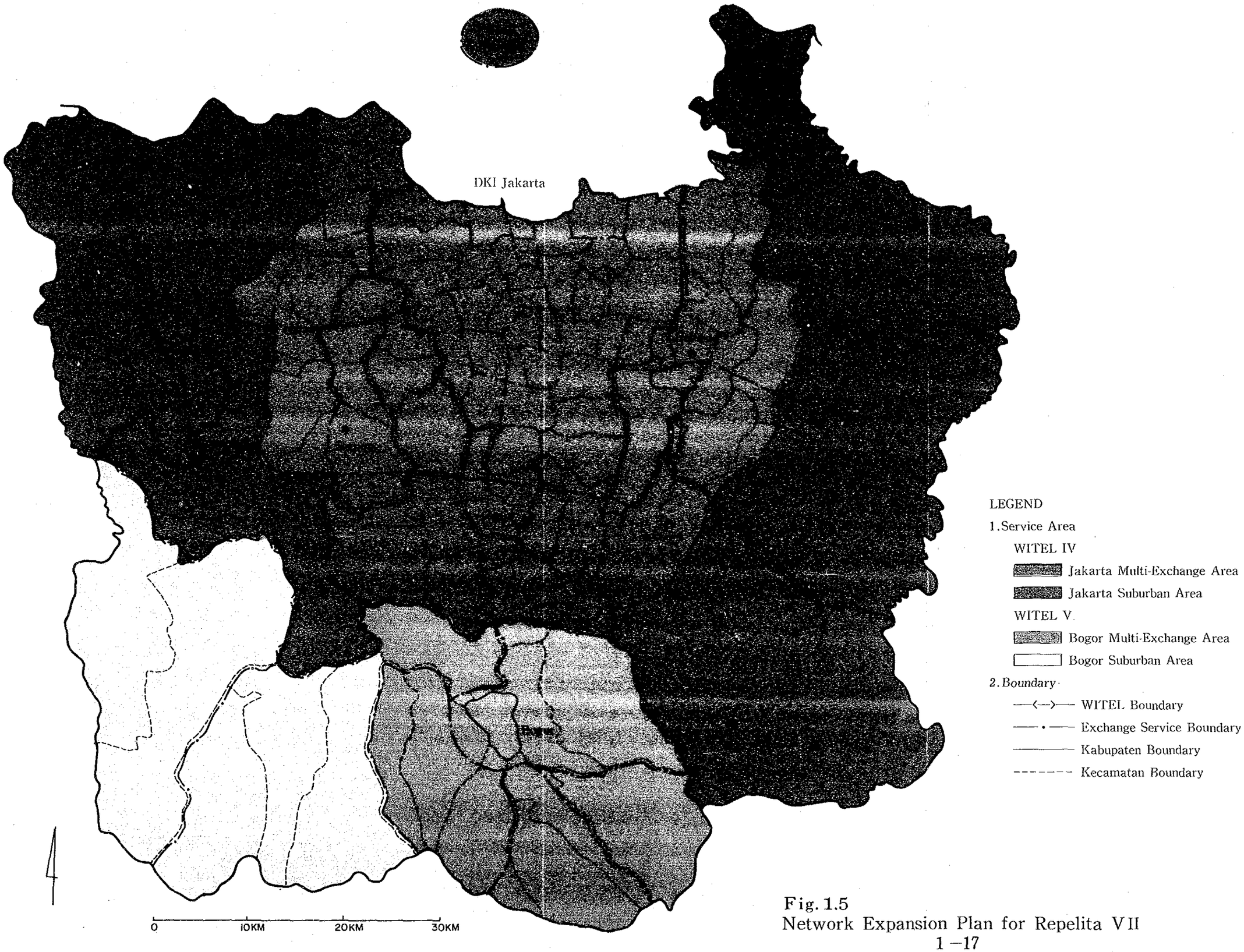


Fig. 1.5
Network Expansion Plan for Repelita VII

1.1.5 Medium-Term Network Development Plan

(1) Essential Projects of Respective 5-Year Development Plans

Repelita V (1989-1994)

- Full implementation of **carry-over** projects from Pelita IV (600 k l.u.);
- Further penetration of telephone services in major cities;
- **Digitalization** of networks;
- Nationwide **expansion of data communication network** based on the user-oriented market research;
- **ISDN field trial**/pilot project in Jakarta multi-exchange area;
- Introduction of **computer-aided O & M** scheme especially for outside plant (OSP); and
- Establishment of **OPMC** (Outside Plant Maintenance Center) in major cities.

Repelita VI (1994-1999)

- Further penetration of telephone services in medium-scale cities;
- Deployment of ISDN services based on the experiences through Repelita V; and
- Interworking of packet switched data communications network (SKDP) and ISDN.

Repelita VII (1999-2004)

- Introduction of broadband ISDN[1/] based on the trend and experiences of worldwide standardization; and
- Integration of 144 kbps (2B+D)/narrowband ISDN[2/] with broadband ISDN.

1/ Broadband ISDN provides telecommunication services with high transmission rates, e.g., 156 Mbps and 620 Mbps. (Refer to Section 7.3.4, for details.)

2/ Narrowband ISDN provide the services based on relatively low transmission rates of 1.544/2 Mbps.

(2) Supply Plan in Jakarta Multi-Exchange and Suburban Areas

Presented here is the **demand-oriented** 1/ supply plan.

Table 1.4 Switching Expansion Plan

	Switching Capacity (Unit: x 1,000 l.u.)		
	Jakarta Multi-Ex Area	Jakarta Suburban	Digitalization 3/
Current 2/	430	-	29%
Repelita V	950	10	72%
Repelita VI	1,430	30	82%
Repelita VII	1,990	90	97%

Table 1.5 Subscriber Cable Network Expansion Plan

	Capacity of Primary Cable 4/ (Unit: x1,000 pairs)	
	Jakarta Multi-Exchange Area	Jakarta Suburban
Current 2/	650	-
Repelita V	1,590	20
Repelita VI	2,210	60
Repelita VII	2,970	140

Table 1.6 Telephone Density (No. of Subscribers/100 Inhabitants)

	Telephone Density			
	Jakarta Multi-Ex Area			Jakarta Suburban
	DKI Jakarta	Other than DKI	Average	Area
Current 2/	3.4	0.4	2.5	-
Repelita V	8.7	2.9	6.9	1.0
Repelita VI	11.3	4.4	9.2	1.8
Repelita VII	14.1	5.9	11.5	2.7

Note 1/ The demand forecast of the Study is, in principle and to the extent possible, based on the microscopic and macroscopic forecasting method of PMC Option Services. (Refer to Chapter 4 for details.)

2/ It was announced by POSTEL/PERUMTEL that the former suburban areas, i.e., Bekasi, Tangerang, Depok and Cibinong were incorporated in the same message area (MA) as in Jakarta area under WITEL IV on Dec. 2, '88 (effective date: Nov. 20, '88); the figures in the row of "Current" of the tables above indicate those including the former suburban areas.

3/ "Digitalization" stands for the term that indicates the ratio of the number of line units of the digital/ISDN local switches to the total number of line units.

4/ The figures are set forth in accordance with the target years of the detailed design work carried out by PMC Option Services, i.e., 1997, 2002 and 2007 for Repelitas V, VI and VII, respectively.

(3) Supply Plan for Repelita V in Jakarta Multi-Exchange Area

The nationwide planning figure of 1,400 k l.u. was set forth for Repelita V (1989-1994). 600 k (43%) out of 1,400 k l.u. is allocated for the expansion of the network in Jakarta multi-exchange area in order to cater fully for the rapidly growing demand in that area.

600k l.u.1/ is three times as large as that realized during Pelita IV (191 k l.u.).

1/ Even though "the expansion of junction network for expanded Jakarta multi-exchange area (Jakarta message area)" is taken up in the Study as a priority project, the expansion of junction network shall be synchronized with the progress of implementing supply plan within the period of Repelita V. (Refer to Table 8.4 for details.)

(4) Mobile Telephone Services

Currently accessible in Jakarta are the cellular mobile radio telephone systems over the frequency bands of 450 MHz and 900 MHz (Refer to Section 5.2 (6) for details); one of these systems, STKB-C had been planned to extend up to Bandung along the highway between Jakarta and Bandung as described in Section 5.2. Shown below is the growth of the STKB-C subscribers:

Table 1.7 No. of Mobile Subscribers in STKB-C

As of:	Dec. '86	Dec. '87	July '88	May '89
No. of Sub.	2,507	4,201	5,557	7,448

In addition to the existing cellular mobile telephone systems, the decision to introduce high-capacity CMT system over the frequency band of 900 MHz was made by the government on revenue sharing basis in February 1989, expecting further growth of mobile telephone services.

1.2 National Development Policy and Telecommunications

Development of the telecommunications sector contributes to the economic growth of Indonesia and regional development of Jabotabek in the following aspects.

(1) Promotion of Industrial Growth

Direct investment from abroad, particularly those from Japan and NIES (Newly Industrializing Economies), is at present booming Indonesia. Substantial portion of investment is directed to the Jabotabek area. It would be an important and urgent task of the Indonesian government to upgrade the level of infrastructure services to maintain or even accelerate this industrialization trend: a major objective of Repelita V. **The development of the telecommunications sector in particular is urgently required,** considering that its level of service remains still low compared with other Asian countries.

(2) Promotion of Regional Development

The telecommunications development in a concerted effort with the transport sector could be an effective tool to promote the government's regional development policies: promoting growth in Botabek' area along an east-west axis. Intensive development of telecommunications and transport systems coupled with other measures would lead to higher rate of regional development in areas where growth is to be promoted (Tangerang and Bekasi). In this sense, the perspective of regional development promotion should be added to the orthodox investment criteria of PERUMTEL emphasizing the reduction of waiting applicants.

1.3 Regional Development Framework

1.3.1 Basic Development Policies of Jabotabek

The development of Jabotabek is being promoted by the government based on the following two basic policies.

a) Accelerated Development of Botabek

DKI Jakarta is suffering from a number of urban problems caused by over-concentration of population and economic activities. The surrounding Botabek area, on the contrary, is yet to be developed with high growth potentials. **From the viewpoints of limiting further overcrowding of DKI Jakarta and promoting balanced growth of Jabotabek, development is to be accelerated in Botabek area,** especially at the urban centers designated as the growth centers as shown in Fig. 3.6.

b) East-West Development

The development of Jabotabek is to be promoted in the east and west direction. The southern area to DKI Jakarta is aquifer recharge area supplying water to DKI Jakarta and where growth should be controlled. Further growth of Kabupaten Bogor, especially the central part, is also to be limited. On the contrary, Kabupaten Bekasi and Tangerang have high growth potentials and no environmental problems, therefore are suitable for urban and industrial growth.

The following figure shows the concept of basic development policies of Jabotabek.

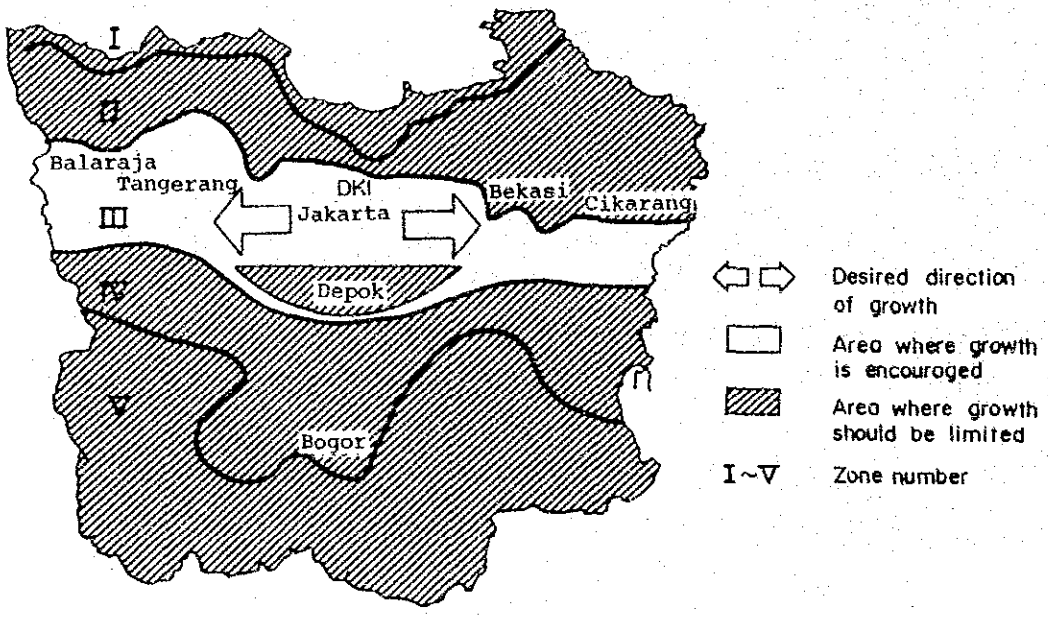


Fig. 1.6 Development in Jabotabek

1.3.2 Regional Development Framework

a) Land Use

Based on the basic regional development policies and population framework, the land use plan for 2005 was prepared as presented in Fig. 3.7.

b) Population

The population of Jabotabek in 1985 and 2005 are as follows.

Table 1.8 Present and Projected Population of Jabotabek

Area	1985		2005	
	(x1,000)	(%)	(x1,000)	(%)
DKI Jakarta	7,829	56.9	12,000	51.1
Botabek area	5,925	43.1	11,500	48.9
(Kodya. Bogor)	(242)	(1.8)	(1,000)	(4.3)
(Kab. Bogor)	(2,713)	(19.7)	(3,870)	(16.5)
(Kab. Tangerang)	(1,688)	(12.3)	(3,730)	(15.9)
(Kab. Bekasi)	(1,282)	(9.3)	(2,900)	(12.3)
Jabotabek area	13,754	100.0	23,500	100.0

c) Concept of Metropolitan Jakarta Area

An area within 30 km from the central Jakarta is defined as Metropolitan Jakarta area as the following figure shows.

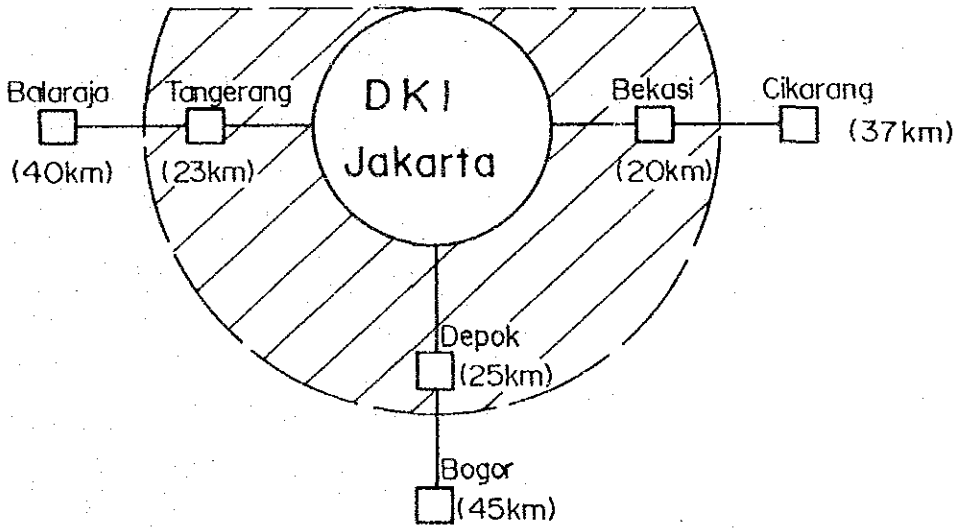


Fig. 1.7 Metropolitan Jakarta Area

The Metropolitan Jakarta area approximately reaches Tambun to the east, Jati Uwung to the west and Depok to the south. Considering recent development trends of Jabotabek area, this area is expected to grow into an area under direct influence of DKI Jakarta by 2005. Within this area, day to day basis demands for telecommunications and transportation services are expected to occur. In this sense, **the improvement of telecommunications and transportation systems in Metropolitan Jakarta area is essential.** The growth centers outside the Metropolitan area are to be developed as self-contained cities.

1.4 Demand/Traffic Forecast

1.4.1 Telephone Demand Forecast

The following table shows the forecasted telephone demand in Jabotabek area for the years, 1994, 1999 and 2004:

Table 1.9 Telephone Demand in Jabotabek (By Administrative Boundaries)

Area	1994		1999		2004	
DKI Jakarta[1/]	849,200	(82%)	1,227,800	(79%)	1,673,700	(76%)
Kodya./Kab. Bogor	81,900		136,500		203,200	
Kab. Tangerang	61,200		116,200		188,800	
Kab. Bekasi	42,200		78,400		125,500	
(Total)	1,034,500		1,558,900		2,191,200	

1/ 33 exchange areas including Cinere.

The total telephone demand in DKI Jakarta will amount to 1.7 million, 76% of the total demand of Jabotabek amounting 2.2 million by the end of Repelita VII (2004).

The forecasted figures for DKI Jakarta above have been derived by interpolating the macroscopic demands, obtained through PMC Option

Services[1/]; for the years 1987, 1992, 1997, 2002 and 2007 based on the facts below.

1/ PMC Option Services: Detailed design of subscriber cable network/the World Bank

- The results of microscopic demand survey for 17 exchange areas carried out by PMC Option Services agree with the exchange-by-exchange macroscopic forecasts.
- The detailed design work have been carried out, prior to the current study, based on the microscopic demand forecast.
- The demand forecasted through the analysis of household's "**affordability**" in the Study agrees with the macroscopic exchange-by-exchange demand.

The demand for Botabek area (Bogor, Tangerang, Bekasi), where the telephone services are scarce has at this moment been estimated taking into account the following:

- affordability of residential telephone services judging from household expenditures;
- industrial development plans; and
- expressed demands in the existing exchange areas.

1.4.2 *Telephone Traffic Forecast*

Actual yearly traffic data have been categorized into local, SLDD and suburban calls to estimate the traffic intensity per subscriber. The following table shows the estimated average traffic intensity in Jakarta multi-exchange area by traffic category.

Table 1.10 Average Traffic Intensity in Jakarta Multi-Exchange Area

(Unit: mE)

Traffic Cetegory	1994	1999	2004
Local	49.2	48.1	47.7
SLDD	4.03	3.79	3.66
Suburban	0.27	0.25	0.25

In estimating the figures above, data collected during the first field survey (July - Oct. 1988) have been analyzed taking into account:

- past trend; and
- future prospect of regional development.

Estimated total traffic volumes for the respective category are summarized in the following table.

Table 1.11 Traffic Volume in Jakarta Multi-Exchange Area

(Unit: Erlang)

Traffic Category	1994	1999	2004
Local	46,570	68,900	95,200
SLDD	3,800 (x2)	5,400 (x2)	7,300 (x2)
Suburban	260 (x2)	360 (x2)	490 (x2)

1.5 Long-Term Network Planning

The long-term telecommunications network development plan in Jabotabek area has been set forth as under.

- **Jakarta multi-exchange area will be expanded up to 30 km-radius zone from the center of DKI Jakarta in a coordinated manner with urbanization trend.**
- **The telephone density in DKI Jakarta will be raised from present 3.4 to 14.1 subscribers per 100 inhabitants by the end of Repelita VII.**
- **The stage-by-stage introduction of ISDN will be implemented.**

(1) Expansion of Jakarta Multi-Exchange Area

Population and economic activities of DKI Jakarta have been expanding and spreading into suburban area of DKI Jakarta. This area up to 30 km (1- to 2-hour mileage) from the center of DKI Jakarta could be regarded as Metropolitan Jakarta area where the demand for telecommunications services is anticipated to grow year by year. The network plan shall be prepared in a coordinated manner with this concept of Metropolitan Jakarta area. The expansion plan of Jakarta multi-exchange area is prepared as below:

Areas to be covered in Jakarta multi-exchange area

Current	:	Approx. 860 km^2
End of Repelita V	:	Approx. 1,540 km^2
End of Repelita VI	:	Approx. 2,030 km^2
End of Repelita VII	:	Approx. 2,030 km^2

Number of exchange areas in Jakarta multi-exchange area

Current : 34
End of Repelita V : 50
End of Repelita VI : 54
End of Repelita VII: 55

(2) Telephone Density

Even if existing telecommunications facilities are fully utilized by the end of Pelita IV, the telephone density in DKI Jakarta would barely reach 6 per 100 inhabitants. This might hamper the further development of Metropolitan Jakarta area in the information-oriented society giving rise to the obstacles against telecommunications innovation.

The telephone density of DKI Jakarta will be tripled by the end of Repelita VII under the condition that the plans proposed by the Study be completed.

Table 1.12 Telephone Density in DKI Jakarta

	No. of Main Telephones	Telephone Density
End of Repelita V	855,000	8.7
End of Repelita VI	1,240,000	11.3
End of Repelita VII	1,702,000	14.1

(DKI Jakarta)

(3) Optimum Exchange Size

The optimum exchange sizes for respective subscriber density have been derived from the comparative study of installation costs of switching facilities, subscriber cable network and others as concluded below:

Table 1.13 Optimum Exchange Size

Subscriber Density	Optimum Exchange Size
Up to 1,000 sub./km^2	20,000 l.u.
Up to 5,000 sub./km^2	50,000 l.u.
More than 5,000 sub./km^2	70,000 l.u.

(4) Transition from Analog to Digital Network toward ISDN

a) Numbering Plan

The numbering plan adopted in the Study is based upon the projected number of subscribers in 50 years time covering the four message areas of Jabotabek, i.e., Jakarta, Bogor, Jakarta suburban and Bogor suburban areas.

Jabotabek area is subdivided into 10 numbering areas; eight (8) for Jakarta and two (2) for Bogor. The maximum number of digits of subscriber number is seven (7) to accommodate 10 million subscribers at most in Jabotabek area.

b) Introduction of ISDN

- **CCITT No. 7** signalling system will be adopted for the use of digital interexchange signalling.
- **the network architecture fit for the digital network**/ISDN is to be employed.
- **analog switches will be replaced** gradually with digital/ISDN ones.

Further briefs as for ISDN and medium-term plan for expansion of telecommunications network are given in Sections 1.7 and 1.8 respectively.

1.6 Network Management

As the size of the network expands, much more attention shall be paid to the aspects of network management.

The network in Metropolitan Jakarta area above all in Jabotabek area is expected to expand dramatically in parallel to the regional development in that area.

WITEL IV is the key to the sound operation of PERUMTEL as a whole as shown below in terms of operating ratio and work efficiency.

Table 1.14 Operating Ratio of WITELs (as of 1987)

	Revenue	Operating Ratio
WITEL IV	53%	25%
Other WITELs/Average	47%	159%
PERUMTEL /Whole	100%	83%

Table 1.15 Work Efficiency

(= No. of employees/1,000 sub., as of 1987)

	No. of Employees per 1,000 Subscribers
WITEL IV	25
Other WITELs/Average	72
PERUMTEL /Whole	53

It is focused upon to encourage WITEL IV as a key WITEL to play a dominant role to improve work efficiency of PERUMTEL as a whole with respect to:

- **institutional framework;**
- **computer-aided O & M.**

1.7 Non-Voice Services and ISDN

(1) ISDN

ISDN (Integrated Services Digital Network) is defined as a network that provides digital **end-to-end connections to the users offering voice as well as non-voice services.**

The required functions of user-network interface for **basic access services** (2B+D; B=64 kbps, D=16 kbps) and **primary rate services** (30B+D/23B+D) have been set forth in CCITT I-series Recommendations during the latest CCITT IXth Plenary Assembly held in November 1988 in Melbourne.

ISDN has the following features:

- to offer **new services** of high speed and quality;
- to lower the prices of terminal equipment by employing the **standardized user-network interfaces;**
- to simulate the demand for the new services; and
- to secure the capital expenditures already invested especially for subscriber cable networks 1/.

1/ Capital expenditures for subscriber cable networks amount to 40 - 50% of the whole telecommunications investments.

(2) First ISDN to be Implemented in Metropolitan Jakarta

Major non-voice communications services currently available in Metropolitan Jakarta area, especially in DKI Jakarta, are the following:

- telex;
- data communications services over leased circuits; and
- packet switched data communications services (SKDP).

Circuit switched data communications services are not available yet.

Stage-by-stage introduction and expansion of ISDN taking off in DKI Jakarta is recommended, in accordance with the progress of the following necessary measures toward the establishment of ISDN:

- digitalization of switching nodes including interexchange transmission links;
- network synchronization;
- introduction of CCITT signalling system No. 7; and
- digitalization of subscriber transmission system.

Following matters have been considered in preparing the guiding timetable in Table 1.3.

a) The study for ISDN is currently undertaken by some other consultants to be followed by ISDN field trial in 1990-1991.

b) Interworking of SKDP (packet switched public data network) and ISDN is made at an appropriate stage of network evolution toward full-ISDN to secure the software/hardware/human resources developed under CCITT X-series Recommendations.

c) Broadband ISDN might be taken into consideration at the end of Repelita VII when the market is matured.

d) Circuit switched public data network shall not be provided independently from ISDN.

(3) Strategy for Introducing ISDN

Repelita V (1989-1994) : ISDN in Metropolitan Jakarta
- ISDN study;
- field trial; and
- expansion of SKDP.

Repelita VI (1994-1999) : ISDN connecting Metropolitan Jakarta and major cities

Repelita VII (1999-2004): Full-ISDN
- interworking of narrowband and broadband ISDNs; and
- nationwide deployment of ISDN.

1.8 Medium-Term Plan

(1) Expansion Plan of Telephone Services

Expansion of telephone services is planned to cater for the estimated telephone demand for the respective Repelitas.

New exchanges are to be established in due consideration of regional development.

The following table shows the expansion plan of telephone services in Jabotabek area in Pelita IV through Repelita VII.

Table 1.16 Expansion Plan of Telephone Services in Jabotabek Area

Item	Pelita IV 1989	Repelita V 1994	Repelita VI 1999	Repelita VII 2004
Telephone Demand	530,000 1/	1,030,000	1,560,000	2,190,000
No. of Exchange Areas	39	58	64	72
Total Switching Capacity	450,000	1,010,000	1,540,000	2,190,000
No. of Primary Cable Pairs 2/	670,000	1,680,000	2,380,000	3,270,000

1/ Expressed Demand as of Sep. 1988 = (Waiting Applicants) + (No. of Existing Subscribers)

2/ The target years of detailed design carried out by PMC Option Services are 1997, 2002 and 2007 for Repelitas V, VI and VII respectively.

(2) Digitalization of Switches

Digitalization of switches is planned under the following conditions.

- EMD (step-by-step) switches are fully replaced with digital ones toward full digitalization during Repelita V.
- Manual switchboards are fully replaced with automatic switches by the end of Repelita VI.
- Gradual replacement of obsolete analog switches, e.g., PRX and MC-10C.

Digitalization of switches in Jabotabek area will proceed as shown in the following table:

Table 1.17 Digitalization of Switches (Jabotabek Area)

Item	Pelita IV 1989	Repelita V 1994	Repelita VI 1999	Repelita VII 2004
Digital Switch (x1,000)	130	728	1,260	2,123
Analog Switch (x1,000)	320	277	277	69
- PRX (SPC)	(246.6)	(266.6)	(266.6)	(68.7)
- MC-10C (SPC)	(10.0)	(10.0)	(10.0)	(-)
- N230 (XB)	(2.0)	(-)	(-)	(-)
- EMD (SXS)	(61.5)	(-)	(-)	(-)
- ABK (Manual)	(0.3)	(0.2)	(-)	(-)
Digitalization (%)	29	72	82	97

(3) Junction Network

The expansion of junction network is planned under the following conditions.

- The transmission systems to be employed for expansion of the junction network shall be, in principle, fiber optics and/or digital radio transmission systems.
- Existing metallic analog junction cables will be removed in accordance with the progress of switch digitalization.

Shown in Fig. 1.8 is the expansion plan for the junction network in Jabotabek area.

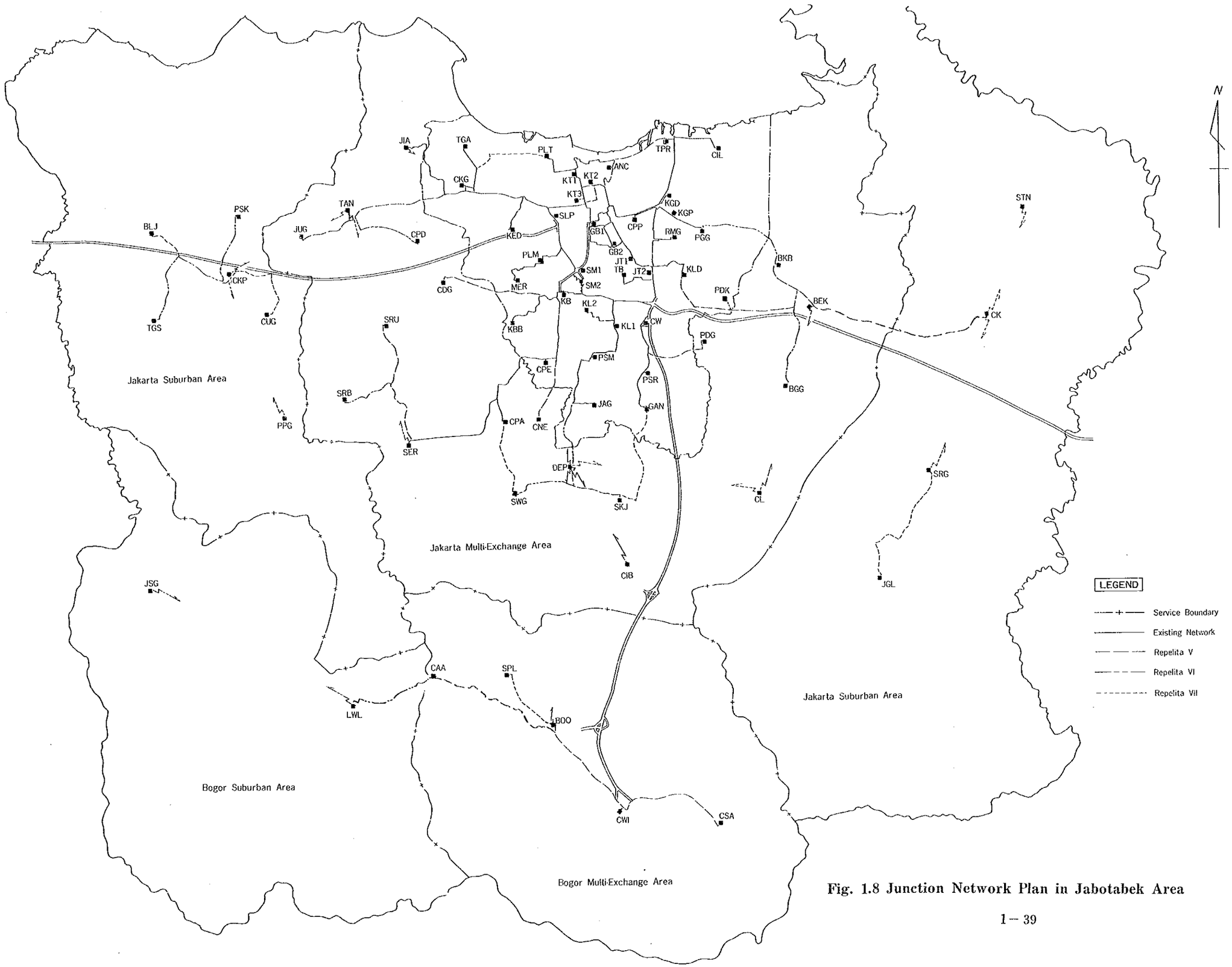


Fig. 1.8 Junction Network Plan in Jabotabek Area

1.9 Financial Aspects

(1) Background

Repelita V (1989-1994) sets forth the development target of 1,400,000 l.u. throughout Indonesia and about 600,000 l.u. in Jabotabek. The total investment fund required to achieve 1,400,000 l.u. is estimated to be Rp. 5,768 x 10^9. The actual investment realized by PERUMTEL during Pelita IV, on the other hand, amounted to Rp. 1,765 x 10^9, comprising Rp. 673 x 10^9 foreign currency and Rp. 1,092 x 10^9 local currency. **Repelita V, therefore, requires development fund more than three times larger than the actual fund raised during Pelita IV.** To realize this development target, it is necessary for PERUMTEL to look into new sources of development fund, external and internal, in addition to the fund sources on which PERUMTEL has depended until Pelita IV.

(2) Fund Raising

PERUMTEL has a plan to issue subscriber bond in the near future as a measure to raise development fund. PERUMTEL anticipates that it will be able to raise relatively large amount of development fund under favorable conditions in terms of interest and repayment period in comparison with loans from commercial banks. While these advantages could be expected, there are a number of issues to which PERUMTEL needs to pay attention in introducing the system such as,

- necessity of sufficient public propagation on the system;
- necessity of improving PERUMTEL's operation efficiency and development achievement; and
- prospect of future financial management.

Concerning revenue sharing approach, PERUMTEL plans to install 100,000 l.u. in Jakarta by this method. The application of revenue sharing concept to the telecommunications sector,

however, involves difficulty due to the particular nature of the sector. A major problem is how to keep operation and tariff system of a project consistent with the rest of the network, while maintaining incentive for private investors to participate in the project.

In consideration of the actual actions PERUMTEL is taking in promoting revenue sharing approach, the following aspects should be considered.

- understanding of behaviors of private investors;
- analysis on terms of revenue sharing based on long-term cash flow prospect for PERUMTEL; and
- provision of a number of privileges to private investors.

(3) Financial Condition of WITEL IV and PERUMTEL

Financial conditions of WITEL IV and PERUMTEL were analyzed to draw implications to the telecommunications development during Repelita V.

The following are the major findings.

- Annual revenue of WITEL IV increased faster than annual expense having led to larger annual income in 1987 than in 1985. In the case of PERUMTEL also, revenue grew faster than expenses between 1984 and 1987.

- While labor productivity of WITEL IV, expressed in terms of profit in 1985 price per one employee, improved between 1985 and 1987, that of PERUMTEL deteriorated.

- Capital productivity of WITEL IV and PERUMTEL in terms of profit in 1985 level per l.u. deteriorated between 1985 and 1987.

- Capital productivity of WITEL IV is about six times larger than that of PERUMTEL as a whole.

Demand for fund for developing telecommunications systems is expected to grow in the future in accordance with national economic growth. The government policy is to grow public corporations such as PERUMTEL into financially self-sustained bodies. In these circumstances, it will become increasingly necessary for PERUMTEL to raise the proportion of fund raised by PERUMTEL itself. Accordingly **the role of WITEL IV as the leading WITEL will become even more essential.**

The following measures need to be duly considered by PERUMTEL to improve investment and operational efficiency of WITEL IV and PERUMTEL.

- higher utilization of existing switches;
- organizational restructuring; and
- computerization.

1.10 Priority Project

The project of the highest priority to be implemented at the very beginning of Repelita V is taken up as a priority project in the Study with the following output:

- justification;
- system design;
- cost estimate;
- financial analysis; and
- implementation schedule.

a) Constraints

Even though the rapid growth of telephone demand is expected in the areas, Tangerang, Bekasi, Depok and Cibinong, the junction circuits connecting these areas to the core of Jakarta area suffer from the shortage.

b) Justification

It is urgently needed to study "the expansion of junction network for expanded Jakarta multi-exchange area (Jakarta message area)" in a coordinated manner with the regional development.

c) System Design

It is recommended that FO (Fiber Optics) cable transmission system should be employed for expanding the junction network as far as possible in order to avoid the future frequency congestion in Metropolitan Jakarta area.

d) Cost Estimate

The total cost required for the expansion of the junction network in Metropolitan Jakarta area is estimated at Rp. 59,826 million. (Refer to Section 10.2.3 for further details.)

e) Financial Analysis of the Priority Project

The financial viability of the priority project is found very good as the IRR of the project reaches **31.7% (before tax)** based on the assumptions given in Section 10.2.5.

Table 1.18 Implementation Schedule for Priority Project

Stage	1989	1990	1991
1. JICA/Jabotabek Telecom. Study	======= ***Final Report (July)**		
2. Engineering Services (Preparation of Tender Specifications)	==========		
3. Tender/Evaluation		=====	(1992) Commissioning*
4. Installation/Acceptance			----------

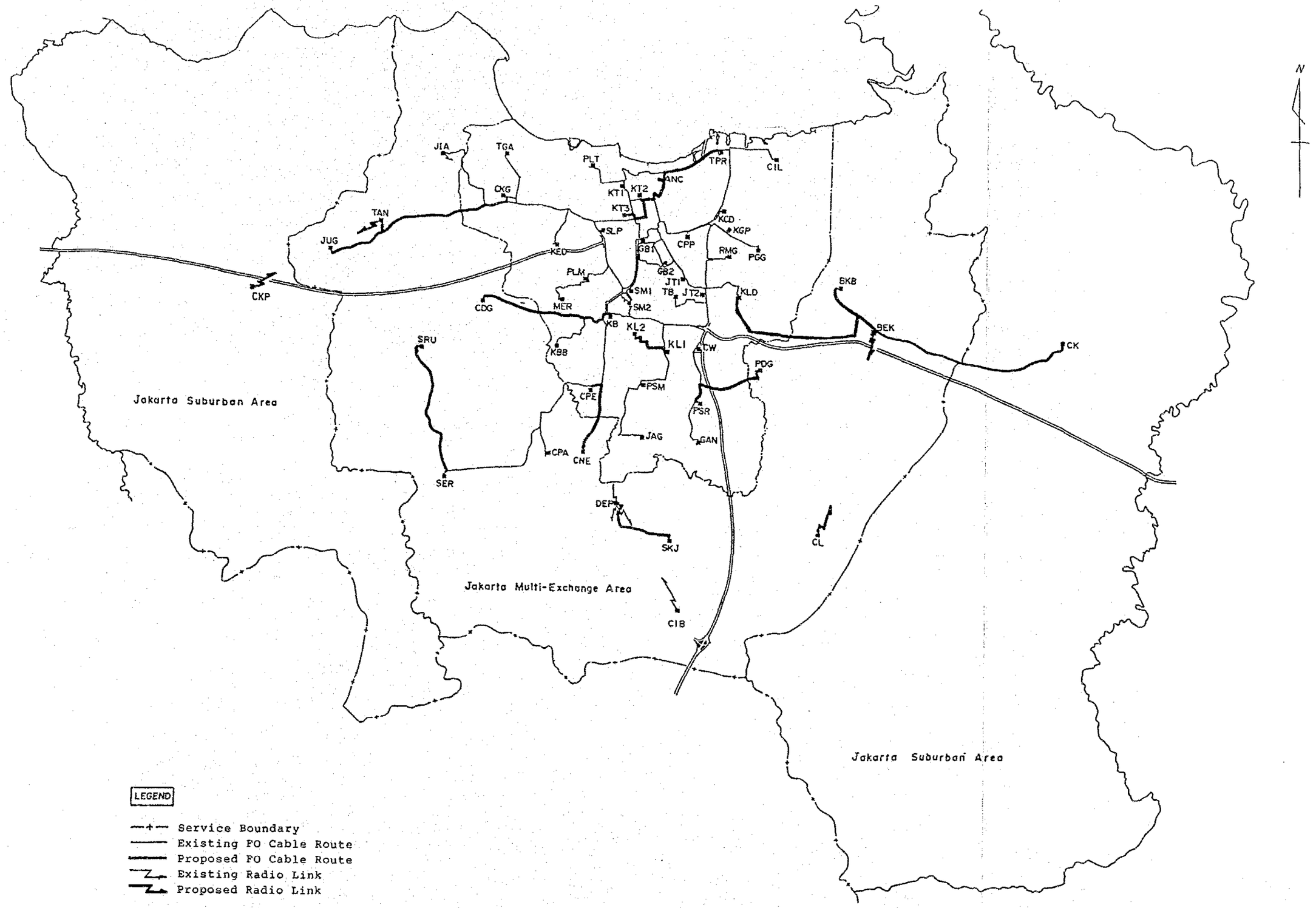


Fig. 1.9 Key Map of the Priority Project

2. NATIONAL DEVELOPMENT POLICY AND TELECOMMUNICATIONS

2. NATIONAL DEVELOPMENT POLICY AND TELECOMMUNICATIONS

2.1 Socio-Economy of Indonesia

(1) Population

Total population of Indonesia numbered 164.0 x 10^6 in 1985. Its regional distribution was as follows:

Table 2.1 Population of Indonesia in 1985

Area	($x10^6$)	(%)
Sumatera	32.6	19.8
Jawa	99.9	60.9
Nusa Tenggara	9.3	5.7
Kalimantan	7.7	4.7
Sulawesi	11.6	7.1
Maluk and Irian Jaya	3.0	1.8
Total	164.0	100.0

Source : Statistik Indonesia 1987

Nearly two thirds of Indonesian population lives in Jawa Island, though its proportion has been gradually declining in recent years.

The growth rates of Indonesian population were 2.3% and 2.2% per annum for 1971 - 1980 period and 1980 - 1985 period respectively. The decline of the growth rate could be largely explained by an active family planning program launched by government since 1970.

(2) Gross Domestic Product (GDP)

After experiencing a rapid economic growth in the 1970s (GDP growth of 7.5% per annum between 1973 and 1980), the economic growth slowed down in the 1980s due to a number of unfavorable conditions such as adverse weather conditions, stagnating international commodities market and decreased oil price since early 1983. An average annual growth rate of GDP was 4.5% for the 1980 - 85 period.

Table 2.2 presents the GDP structure in 1980 and 1986. During this period, the Indonesian economy went through a number of structural adjustments. The mining and quarrying sector decreased its share in GDP from 25.7% in 1980 to 11.1% in 1986 due mainly to reduced production of crude oil coupled with lowered oil price. The agriculture sector increased its GDP share from 24.8% in 1980 to 25.8% in 1986. During this period, rice production was significantly expanded reaching self-sufficient level in 1984. The manufacturing sector increased its share in GDP from 11.6% in 1980 to 14.4% in 1986. The service sectors such as (6) trade, hotel and restaurant, (8) banking and other financial intermediarises and (11) services also came to account for larger part of GDP: from 18.0% in 1980 to 24.4% in 1986.

(3) Trade

Indonesia's trade in the 1980s is characterized by a sharp decrease of trade surplus: US$ 13,116 x 10^6 in 1980 to US$ 4,087 x 10^6 in 1986. This drop of trade surplus was brought about by a reduction of exports by 32%, mostly due to decreased export of oil. Value of import rose sharply in the early 1980s and then went down to 1980 level in 1986. Table 2.3 shows trade pattern of Indonesia.

Table 2.3 shows the increased proportion of non-oil export from 25.8% in 1980 to 44.1% in 1986. In export value, however, non-oil export increased only slightly during the 6-year period, indicating that the increased proportion was caused by the reduction of oil export. Value of non-oil exports increased for such commodities as processed wood, textile, garments, aluminium and fertilizers.

Origin and destination of trade were concentrated in three countries of Japan, the USA and Singapore in 1986. The figures in Table 2.4 are proportions of the three countries in the total exports and imports.

Table 2.2 Gross Domestic Product (GDP) of Indonesia at Current Market Prices

(Unit: 10^9 Rupiahs)

Sector	1980	1986
(1) Agriculture, forestry and fishery	11,290	24,922
(2) Mining and quarrying	11,673	10,741
(3) Manufacturing	5,288	13,900
(4) Electricity, gas and water supply	225	858
(5) Construction	2,524	5,243
(6) Trade, hotel and restaurant	6,391	16,081
(7) Transportation and communication	1,965	6,392
(8) Banking and other financial intermediaries	752	3,280
(9) Ownership of dwelling	1,200	2,632
(10) Public administration and military	3,142	8,307
(11) Services	996	4,135
GDP	45,446	96,489

(in %)

(1) Agriculture, forestry and fishery	24.8	25.8
(2) Mining and quarrying	25.7	11.1
(3) Manufacturing	11.6	14.4
(4) Electricity, gas and water supply	0.5	0.9
(5) Construction	5.6	5.4
(6) Trade, hotel and restaurant	14.1	16.7
(7) Transportation and communication	4.3	6.6
(8) Banking and other financial intermediaries	1.7	3.4
(9) Ownership of dwelling	2.6	2.7
(10) Public administration and military	6.9	8.6
(11) Services	2.2	4.3
GDP	100.0	100.0

Source : Statistik Indonesia 1984 and 1987

Table 2.3 Trade Pattern of Indonesia

Item	1980	1986	Rate of Change (%/yr.)
		(in US$ 10^6)	
(1) Export	23,950	14,805	-7.7
Non-oil	6,169	6,528	0.9
Oil	17,781	8,277	-12.0
		(in %)	
Export	100.0	100.0	-
Non-oil	25.8	44.1	-
Oil	74.2	55.9	-
		(in US$ 10^6)	
(2) Import	10,834	10,718	-0.2
(3) Surplus	13,116	4,087	-17.7

Source : Statistik Indonesia 1987

Table 2.4 Trade Partner of Indonesia

(Unit:%)

Trade Partner	Export	Import
Japan	44.9	29.6
USA	19.6	13.6
Singapore	8.4	7.0
Others	27.1	49.8
Total	100.0	100.0

(4) Public Finance

Since the 1960s, Indonesia has pursued a policy of balancing the overall revenues and expenditures in its state budget. Table 2.5 shows that the budgeted receipts and expenditures were balanced at Rp. 22,783 x 10^9 for the 1987/88 fiscal year. In the mid-1980s, the Indonesian government introduced sweeping reforms of the country's tax structure including a new income tax system and the introduction of a value added tax. The objective of the reform was to transform the tax system from the one heavily dependent on oil company profits to the one based on revenues from wider groups of population. The tax reform resulted in decreasing proportion of direct tax in the total budgeted receipts from 67% in 1983/84 to 47% in 1987/88 as shown in Table 2.5.

Investments in the post and telecommunications sector accounted for the range of 0.7 - 1.0% of the total development expenditure during the four years. Total development expenditure for post and telecommunications amounted to Rp. 85 x 10^9 in the 1987/88 fiscal year.

Table 2.5 Budgeted Government Receipts and Expenditures of State Government

Item	1983/84	1984/85	1985/86	1986/87	1987/88
			(In billion Rupiahs)		
Receipts	16,565	20,560	23,046	21,422	22,783
Operating	13,824	16,149	18,678	17,383	17,236
(Direct tax)	(11,033)	(13,044)	(14,498)	(13,022)	(10,718)
(Indirect tax)	(2,289)	(2,490)	(3,449)	(3,857)	(5,469)
(Non-tax)	(502)	(615)	(731)	(953)	(1,049)
Development	2,741	4,411	4,368	3,589	5,547
Expenditures	16,565	20,560	23,046	21,422	22,783
Operating	7,275	10,101	12,339	13,126	15,026
Development	9,290	10,459	10,647	8,296	7,756
(Post and tele-communications)[1/]	(64)	(71)	(72)	(69)	(85)
Balance	0	0	0	0	0
(In %)					
Receipts	100.0	100.0	100.0	100.0	100.0
Operating	83.5	78.5	81.0	81.2	75.7
(Direct tax)	(66.6)	(63.4)	(62.9)	(60.8)	(47.1)
(Indirect tax)	(13.8)	(12.1)	(15.0)	(18.0)	(24.0)
(Non-tax)	(3.1)	(3.0)	(3.1)	(4.4)	(4.6)
Development	16.5	21.5	18.9	16.8	24.3
Expenditures	100.0	100.0	100.0	100.0	100.0
Operating	43.9	49.1	53.8	61.3	66.0
Development	56.1	50.9	46.2	38.7	34.0
(Post and tele-communications)[2/]	(0.7)	(0.7)	(0.7)	(0.8)	(1.0)

Source : Statistik Indonesia 1987 and 1984

Indonesia Handbook 1987

Remarks:

1/ Development expenditure only

2/ Percentage to the total development expenditure

2.2 National Development Policy

The Indonesian government launched Pelita IV (1984 - 1989) in April 1984. The two major objectives of Pelita IV were:

- to improve the standard of living, intelligence and welfare of the whole population in a more evenly and justly manner; and
- to lay a strong foundation for the next development stage.

The total investment during Pelita IV was planned to amount Rp. $145{,}224 \times 10^9$. The gross domestic product (GDP) was expected to grow by 5% per annum on average. The sectoral growth targets were as follows.

Table 2.6 Growth Targets of Pelita IV

Sector	(%/yr.)
Agriculture	3.0
Mining	2.4
Manufacturing	9.5
Construction	5.0
Transport & communication	5.2
Others	5.0
GDP	5.0

The main targets of Pelita IV were to place more stress on the agriculture sector, especially to promote the program of self-sufficiency in food and to step up industries both heavy and light. In terms of growth target, a heavy emphasis was placed on the manufacturing sector.

In the face of declining oil price and production resulting in lower economic growth rates in the 1980s, the Indonesian government introduced a number of economic reforms in an effort to create the economic structure that depends more on internationally competitive manufacturing sector. Especially, a number of policy packages have been introduced since 1986 that are designed to attract foreign investment and promote non-oil exports. Introduced measures include relaxation of investment regulations, provision of privileges to exporting industries and streamlining of administrative procedures. Increased job opportunities and export earnings led by the manufacturing sector are expected to cater for a rapidly increasing laborforce and cope with accumulating debt obligations.

The Indonesian government has started Repelita V in April 1989. The basic development policies stipulated in Repelita V follows in principle those of Pelita IV. It emphasizes agriculture development from the viewpoints of maintaining self-sufficiency of food crops and diversification of crops and development of the manufacturing sector with stress on export and labor-intensive-type industries. Non-oil export industries especially are expected to contribute to the national economic growth. Overall GDP growth target is on average 5% per year during the Repelita V period.

2.3 Role of Telecommunications

Anticipated contributions of the telecommunications sector to the national economic growth are briefly described in the light of the development targets stipulated in Pelita IV and Repelita V. The sectors which are likely to receive great benefits from telecommunications development are manufacturing and commerce and regional development.

(1) Manufacturing and Commerce

As described in Section 2.2, the export-oriented manufacturing sector is expected to play a leading role in the national economic growth. Direct investment by foreign investors, especially, is expected to trigger the acceleration of manufacturing sector growth. Indonesia is generally endowed with a number of favorable conditions in attracting foreign investors: political stability, low labor cost, abundant raw materials, low land cost and provision of incentives and measures favoring export industries.

The telecommunications sector, however, still remains at an unsatisfactory level in terms of attracting foreign investors compared with the neighboring ASEAN countries. The telephone density of Indonesia is compared with those of the four ASEAN countries as follows.

Table 2.7 Telephone Densities of ASEAN Countries

Country	Telephone Density 1/
Indonesia	0.3
Singapore	29.2
Malaysia	5.6
Thailand	1.0
Philippines	0.9

1/ Number of main telephones per 100 population in 1984

Inadequate telecommunications services are likely to be regarded by potential foreign investors as an unnegligible disadvantage in

selecting new location for investment. This is particularly so for manufacturing and trading companies that require day-to-day communication with their originating countries and market countries for their commodities.

Timely reinforcement of the telecommunications sector will possibly succeed in attracting a larger number of foreign investors particularly those from Japan and NIES[1/]. In recent years the Japanese economy has been going through a major economic restructuring in response to external pressures to increase import and rapid appreciation of the yen. In this process, a large number of industries have been relocating their production base abroad, particularly to Thailand and Malaysia, to increase their export competitiveness. It is said that Indonesia is a year behind these two countries in accepting increasing number of foreign investment.

In 1988, a symptom was observed that indicates the fact that foreign investors began to pay attention to Indonesia as a potential country for investment. For example, the value of investments from Japan approved by BKPM[2/] amounted US$ 109 x 10^6 in the first half of 1988, which is 78% increase over the same period of 1987. In the coming years, it is highly likely that the shift of the investment flow will further accelerate along with rising prices of land and bottlenecks of infrastructures in Thailand and Malaysia. It is essential for the Indonesian government to take advantage of this international environment and make every effort to attract foreign investments to Indonesia. The improvement of the telecommunications system is one of the most crucial issues to be tackled for this purpose.

1/ Newly Industrializing Economies (usually refers to South Korea, Taiwan, Hong Kong and Singapore)

2/ BKPM: Badan Koordinasi Penanaman Modal (Investment Coordinating Board)

(2) Regional Development

With regard to the regional development aspect, Pelita IV emphasized a harmonious and balanced growth of regions throughout Indonesia. More specifically, Pelita IV stipulated the following items as the main directions of development.

- compatibility between regional development and sectoral development;
- harmony of the inter-regional growth rates;
- stepping-up of regional income;
- mitigation of uneven population distribution.

The telecommunications development contributes to the achievement of these targets effectively by promoting the improvement of telecommunications facilities in an integrated manner with other sectors. An effective approach to promote harmonious and balanced growth of regions is to guide locations of economic activities to areas where growth is expected to accelerate. Telecommunications development in concert with the improvement of access is especially conducive to attracting job opportunities to areas where economic growth is desired. With good telecommunications systems and access, companies could choose locations where most efficient operation is possible.

A study in the USA[1/] supports the positive role of the telecommunications and transport facilities in promoting a balanced regional development. It reveals that regional income inequality and out-migration of population could be mitigated through reinforcing telecommunications and transportation facilities. As these facilities substitute for physical proximity to cities, it becomes possible for jobs to come to the people rather than people to the jobs, leading to more even distribution of jobs, income and population.

1/ Preece R.S. "The Role of Telecommunication in Economic Growth and Income Distribution", Speaker's Papers for World Telecommunication Forum held in Geneva, Switzerland in October 1987 under the sponsorship of International Telecommunication Union.

The discussion so far could be translated into the context of the regional development policies of Jabotabek and the role of the telecommunications. Within the framework of harmonious and balanced development of regions, growth of Jabotabek is encouraged in the areas along an east-west axis in Botabek as explained in Chapter 3. It is desirable that telecommunications improvement and expansion in Jabotabek be planned and implemented in such a manner as to support this regional development policy. To effectively link the regional development policy and telecommunications development, it is recommended that the aspect of regional development be added to the orthodox investment criteria of PERUMTEL emphasizing reduction of waiting applicants. In the organizational aspect, coordination of works among PERUMTEL and related government offices should be reinforced.

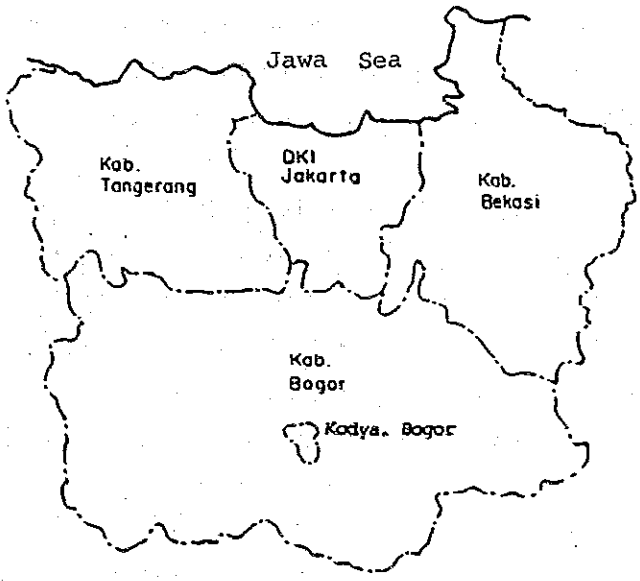
3. REGIONAL DEVELOPMENT FRAMEWORK

3. REGIONAL DEVELOPMENT FRAMEWORK

3.1 Present Condition of Jabotabek Area

3.1.1 General

Jabotabek stands for DKI Jakarta, Kabupaten and Kotamadya Bogor, Kabupaten Tangerang and Kabupaten Bekasi of West Jawa Province as shown in the figure below.



The total area of Jabotabek is about 6,800 km^2 constituting 0.36% of the national land area. Population of Jabotabek was about 13.8 x 10^6 in 1985 accounting for 8.4% of the national population, indicating high concentration of population in Jabotabek.

DKI Jakarta is the seat of the national government and plays the central role of the nation in a wide spectrum of activities including economic, cultural, transportation and social aspects. As the hinterland of DKI Jakarta, Botabek (Bogor, Tangerang and Bekasi) has been supplying food and agriculture products to DKI Jakarta. In recent years, however, economic function of DKI Jakarta has been

expanding into the adjacent Botabek area, beginning to form the Metropolitan Jakarta area.

3.1.2 Socio-Economy of Jabotabek Area

(1) Population

The population of Jabotabek numbered about 13,800 x 10^3 in 1985, accounting for 8.4% of the national total. As shown in Table 3.1, the population of Jabotabek grew at annual average rates of 4.1% and 2.9% in the 1970s and 1980s respectively. These rates surpassed those of the Indonesian population (2.4% in the 1970s and 2.1% in the 1980s) indicating the inflow of population into the Jabotabek area during these periods.

In the 1970s, the populations of DKI Jakarta and Botabek grew at almost same rates (4.1%/year for DKI Jakarta and 4.2%/year for Botabek). Since 1980, growth of the population slowed down slightly in DKI Jakarta (3.8%/year), while that of Botabek dropped to 1.8% per year. This difference in the growth rates led to a higher concentration of population in DKI Jakarta.

While population growth of Botabek since 1980 was relatively low, some Botabek kecamatans, especially those adjacent to DKI Jakarta, experienced rapid population increases. Population, area and population density of the Jabotabek kecamatans are attached in ANNEX 3-1.

Table 3.1 Population of Indonesia and Jabotabek

Area	(Population, 10^3)			(Growth Rate, %/yr.)	
	1971	1980	1985[1/]	71 - 80	80 - 85
	(population in 10^3)				
Indonesia	119,208	147,490	163,876	2.4	2.1
Jabotabek area	8,308	11,916	13,754	4.1	2.9
DKI Jakarta	4,546	6,503	7,829	4.1	3.8
Botabek area	3,762	5,413	5,925	4.2	1.8
(Kodya. Bogor)	(195)	(247)	(242)	(2.7)	(-0.4)
(Kab. Bogor)	(1,669)	(2,494)	(2,713)	(4.6)	(1.7)
(Kab. Tangerang)	(1,067)	(1,529)	(1,688)	(4.1)	(2.0)
(Kab. Bekasi)	(831)	(1,143)	(1,282)	(3.6)	(2.3)
	(in %)				
Jabotabek area	100.0	100.0	100.0	-	-
DKI Jakarta	54.7	54.6	56.9	-	-
Botabek area	45.3	45.4	43.1	-	-
(Kodya. Bogor)	(2.3)	(2.1)	(1.8)	-	-
(Kab. Bogor)	(20.1)	(20.9)	(19.7)	-	-
(Kab. Tangerang)	(12.8)	(12.8)	(12.3)	-	-
(Kab. Bekasi)	(10.1)	(9.6)	(9.3)	-	-

Source: (1) Sensus Penduduk 1980

(2) Arterial Road System Development Study in Jakarta Metropolitan Area (ARSDS)

Remarks: 1/ 1985 figures for Botabek are from Biro Pusat Statistik (BPS). They are numbers of registered population. It was judged that these figures closely represent the actual population, since discrepancies between 1980 BPS figures and 1980 census figures were within 3 % for Botabek. However, since the discrepancies for DKI Jakarta was more than 10%, the SUPAS (Intermediate Population Census) figure given in ARSDS was used for 1985 for DKI Jakarta.

(2) Gross Regional Domestic Product (GRDP)

The following table summarizes the Gross Regional Domestic Product (GRDP) of Jabotabek area.

Table 3.2 Summarized GRDP of Jabotabek

(Unit: 10^9 Rp.)

Area	GRDP in 1985 in Current Prices	(%)	Growth Rate[1/] (%/yr.) 75-80	80-85
DKI Jakarta	9,877	78.8	10.0	8.6
Kodya. Bogor	130	1.0	n.a.	7.5[2/]
Kab. Bogor	949	7.6	5.5	4.8[2/]
Kab. Tangerang	960	7.7	15.9	15.4
Kab. Bekasi	623	5.0	14.6	12.9
Total	12,538	100.0	-	-

Note: 1/ Growth rates in constant price
2/ between 1981 and 1985

In terms of GRDP size, DKI Jakarta plays the dominant role in Jabotabek, accounting for 79% of the total GRDP of Jabotabek. Other four areas play minor roles in the size of economic activities.

Kabupatens Tangerang and Bekasi experienced amazing rates of economic growth (80-85: 15.4%/yr. and 12.9%/yr. respectively), while Kabupaten Bogor's growth was at a moderate level (80-85: 4.8%/yr.) slightly above the GDP growth rate (80-85: 4.5%/yr.). This comparison implies growth momentum in the last decade had been directed toward east and west rather than to south of Jabotabek.

Table 3.4 presents GRDP structures of each Jabotabek area in the last decade. DKI Jakarta and Kotamadya Bogor are characterized by urban-type structure with high proportions of the tertiary sector[1/] accounting for 76.1% and 70.8% of GRDP respectively in 1985. Three kabupatens are characterized by higher proportions of the primary[1/] and secondary sectors[1/].

In terms of structural change of GRDP, DKI Jakarta and Kotamadya Bogor maintained almost the same structure, while the three kabupatens experienced significant changes of the GRDP compositions over 10 years. A common feature among the three kabupatens is the increasing share of the secondary sector and the decreasing share of the primary sector as shown below.

Table 3.3 Structural Change of GRDP

(Unit: %)

Area	Primary		Secondary		Tertiary	
	1975	1985	1975	1985	1975	1985
DKI Jakarta	2.1	1.3	20.8	22.6	77.1	76.1
Kodya. Bogor	n.a.	2.7	n.a.	26.5	n.a.	70.8
Kab. Bogor	27.7	20.2	22.4	39.3	49.9	40.5
Kab. Tangerang	29.1	16.7	18.5	35.0	52.4	48.3
Kab. Bekasi	43.1	24.0	12.1	39.7	44.8	36.3

1/ Primary sector : agriculture
Secondary sector : mining and quarrying, manufacturing, construction
Tertiary sector : all sub-sectors not included in the primary and secondary sectors