THE REPUBLIC OF INDONESIA
GTA-117

STUDY ON LONG-TERM AND MEDIUM-TERM PLAN FOR TELECOMMUNICATIONS NETWORK IN SURABAYA AND SURROUNDING AREAS (GERBANGKERTOSUSILA AREA)

FINAL REPORT

SUMMARY

JANUARY 1991

JAPAN INTERNATIONAL COOPERATION AGENCY

THE REPUBLIC OF INDONESIA

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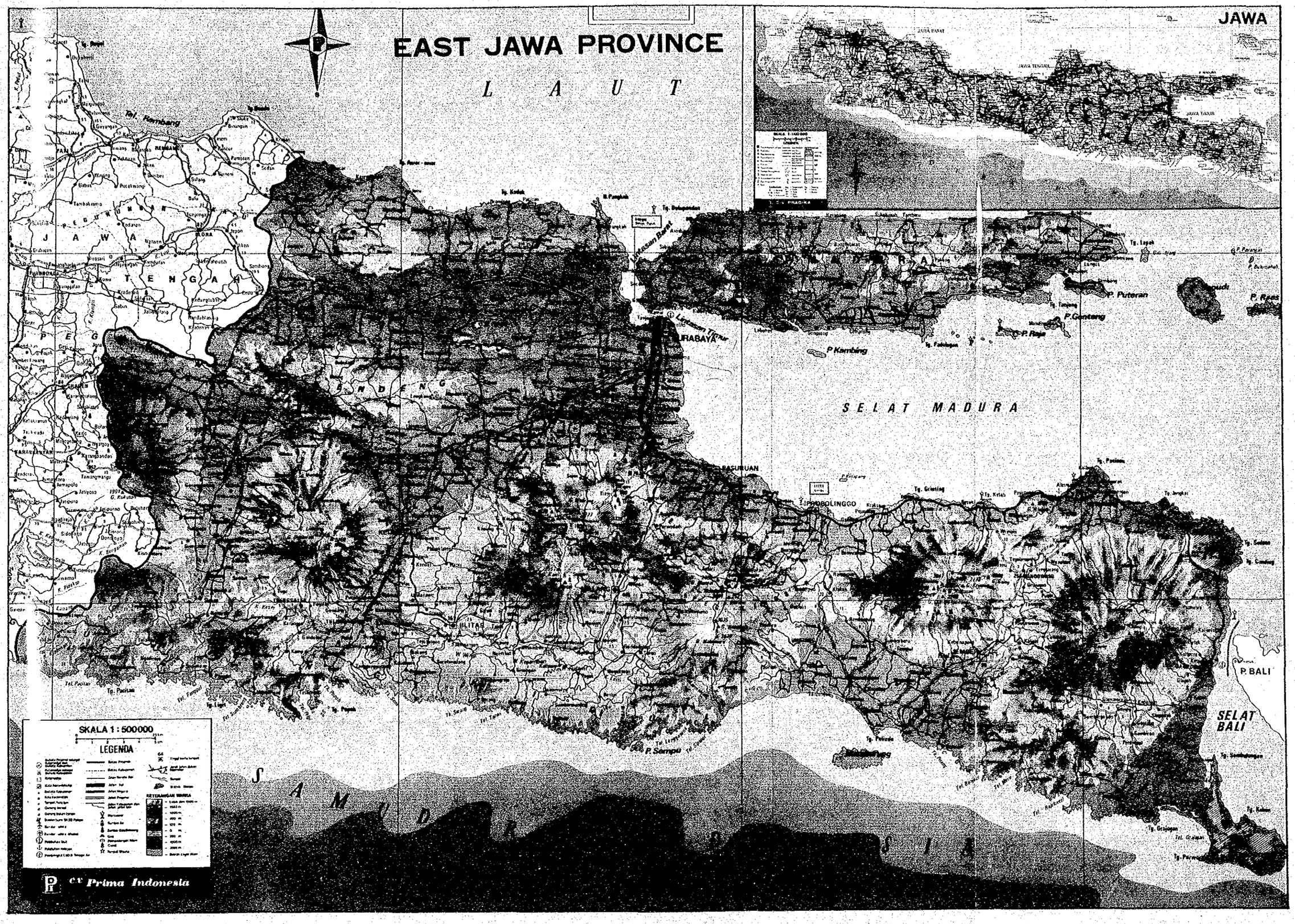
JAPAN INTERNATIONAL COOPERATION AGENCY

EAST JAWA PROVINCE



cv Prima Indonesia

P R E F A C E

In response to a request from the Government of the Republic of Indonesia, the Japanese Government decided to conduct a study on Long-Term and Medium-Term Plan for Telecommunications Network in Surabaya and Surrounding Areas and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Indonesia a study team headed by Mr. Satoru Kushida, The Nippon Telecommunications Consulting Co.,Ltd., twice between October 1989 and November 1990.

The team held discussions with the officials concerned of the Government of Indonesia and conducted field surveys. After the team returned to Japan, further studies were made and the present report was prepared.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

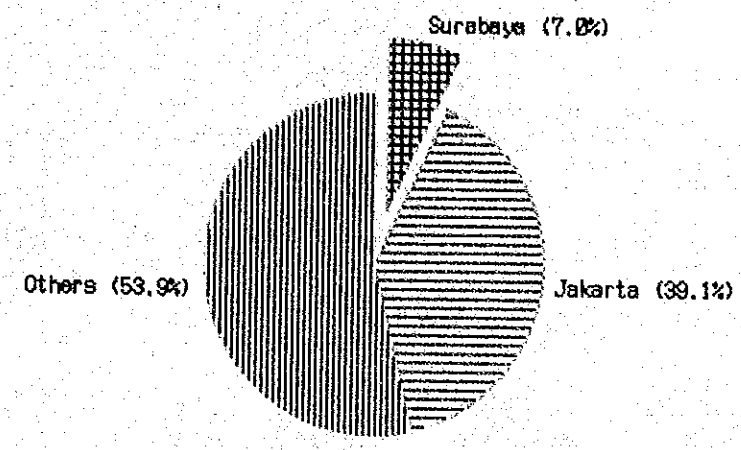
I wish to express my sincere appreciation to the officials concerned of the Government of the Republic of Indonesia for their close cooperation extended to the team.

January 1991

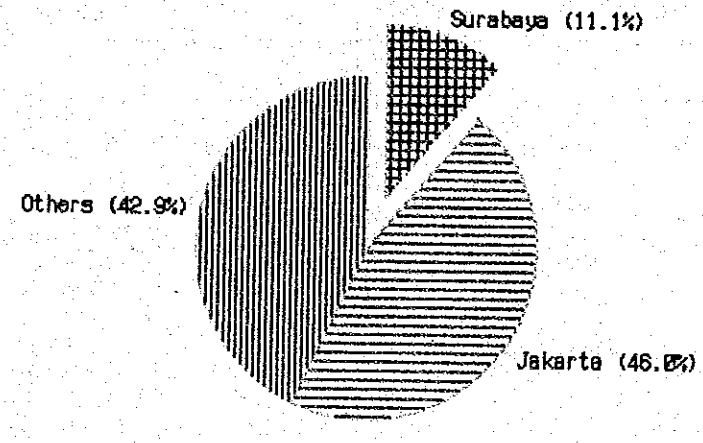
Kensuke Yanagiya

Kensuke Yanagiya
President
Japan International Cooperation Agency

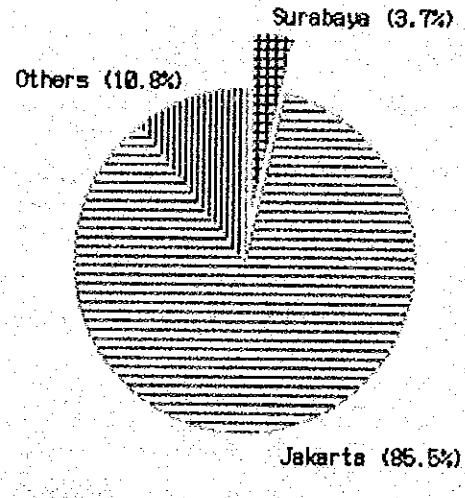
Telephone Service



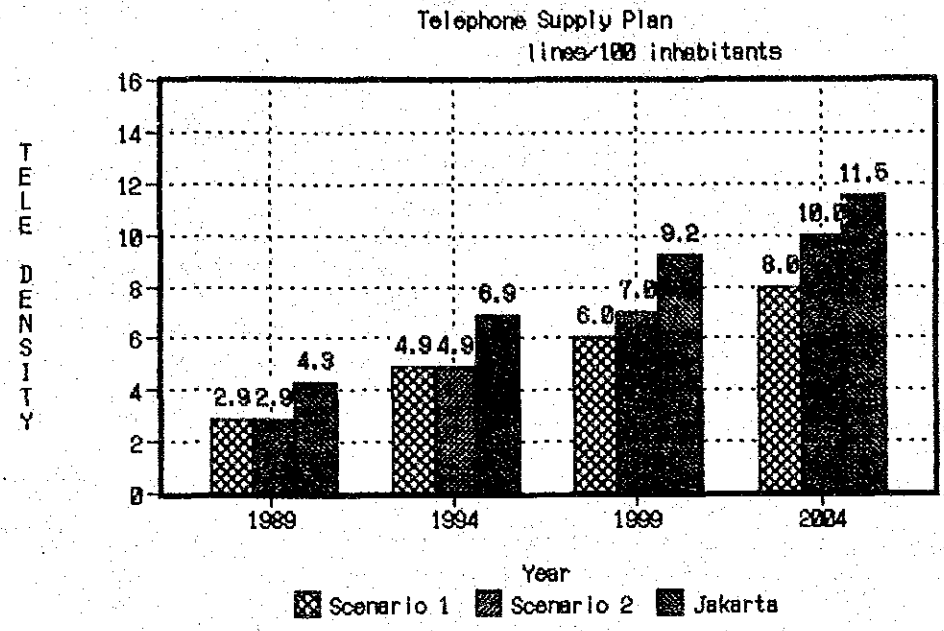
Telex Service

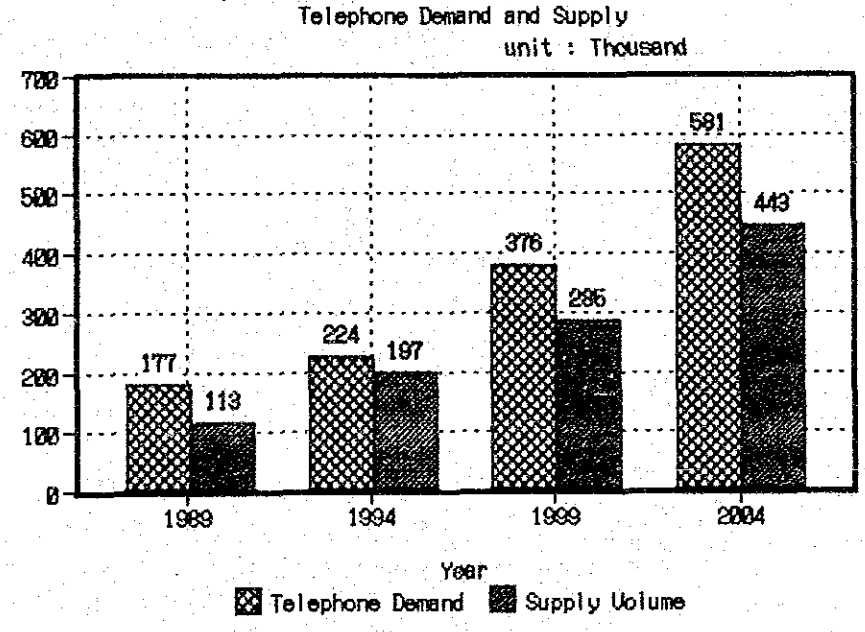


Data Communications



Present Conditions of Telecommunications Services
Share of Subscribers in each Service





Present Conditions of Telecommunications Services
Share of Subscribers in each Service

C O N T E N T S

ACRONYMS AND INITIALS

POSTEL	: Directorate General of Posts and Telecommunications
PERUMTEL	: PURUSAHAAN UMUM TELEKOMUNIKASI (Telecommunication Common Carrier in Indonesia)
WITEL	: WILAYAH USAHA TELEKOMUNIKASI (Regional Bureau of PERUMTEL)
BAPPEDA	: BADAN PERENCANAAN PEMBANGUNAN DAERAH (Regional Planning Board)
BKPMD	: BADAN KOORDINASI PENANAMAN MODAL DAERAH (Regional Investment Coordination Board)
BPN	: BADAN PERTANAHAN NASIONAL (Land National Board)
BPS	: BIRO PUSAT STATISTIK (Statistic Central Bureau)
JICA	: Japan International Cooperation Agency
REPELITA	: Five-Year National Development Plan
Kotamadya	: Municipality
Kabupaten	: Regency
Kecamatan	: Sub District
Desa	: Village
TC	: Tertiary Center
SC	: Secondary Center
PC	: Primary Center
LE	: Local Exchange
STDI	: SENTRAL TELEPON DIGITAL INDONESIA (Digital Switching Equipment in Indonesia)
M.E.A.	: Multi-Exchange Area
MAS	: Multi-Access Subscriber System
DAMA	: Demand Assigned Multiple Access
SKDP	: SAMBUNGAN KOMUNIKASI DATA PAKET (Packet Switched Public Data Network in Indonesia)

VSAT	: Very Small Aperture Terminals
MHS	: Message Handling System
IDN	: Integrated Digital Network
ISDN	: Integrated Services Digital Network
GRDP	: Gross Regional Domestic Product
FIRR	: Financial Internal Rate of Return
EIRR	: Economic Internal Rate of Return

LIST OF EXCHANGES AND STATIONS

Surabaya Multi-Exchange Area

BBE : Bambe
DMO : Darmo
GS : Gresik
IJK : Injoko
KBL : Kebalen
KDN : Kandangan
KJR : Kenjeran
KLK : Kalianak
KML : Kamal
KPL : Karang Pilang
KPS : Kapasan
MGO : Mergoyoso
MNI : Menganti(*)
MNR : Manyar
PRK : Tj. Perak
RKT-I : Rungkut-I
RKT-II: Rungkut-II (Jagir)
SB-I : Surabaya-I (Transmission)
SB-II : Surabaya-II (- ditto -)
SDA : Sidoarjo
SPJ : Sepanjang
TDS : Tandes
WRU-I : Waru-I
WRU-II: Waru-II
PR : Porong(*)

Surabaya Message Area

BKL : Bangkalan
CME : Cerme
KRN : Krian
SDY : Sedayu(*)

Mojokerto Message Area

JG : Jombang
MOJ : Mojoagung
MR : Mojokerto
MJS : Mojosari
POS : Ploso

Lamongan Message Area

BBT : Babat
LMG : Lamongan

Note (*) : proposed new location

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(3) Indonesia, Country Profile 1989 - 90, The Economist Intelligence Unit

(4) Urban Development Planning Study on GERBANGKERTOSUSILA Region, JICA 1983

(5) Rencana Umum Tata Ruang Wilayah, GERBANGKERTOSUSILA (GERBANGKERTOSUSILA Genaral Spatial Plan), Bappeda and ITS 1987

(6) Rencana Pembangunan Lima Tahun V (REPELITA V), Jawa Timur (The Fifth Five Year Plan, East Jawa), East Jawa Government 1989

(7) Tata Ruang Jawa Timur, 2008 (East Jawa Spatial Plan, 2008), East Jawa Government

(8) Long Term Planning for Development of Telecommunications System, JICA 1987

(9) Fundamental Study on Rural Telecommunications Network, JICA 1985

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(11) Basic Design Reports, PMC Option Services 1988

(12) Fundamental Technical Plan, POSTEL 1986

(13) Strategic Development Plan, POSTEL 1986

(14) Strategic Development Plan for Data Communications, POSTEL 1988

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S U M M A R Y

1. OVERVIEW

1.1 Background of the Study

Surabaya is the second largest city in Indonesia and the center of East Jawa in the fields of commerce, finance, industry and so on. The recent development of socio-economic activities in Surabaya city has been expanding toward its surrounding areas and various kinds of development programs are planned and under implementation.

Under the above circumstances, demands for telecommunications services in these areas are rapidly increasing, with increasing number of waiting applicants. To further encourage the socio-economic activities in these areas and to realize the regional development programs as planned, these demands must be satisfied urgently.

In view of the above, the Government of Indonesia intended to draw up a long-term and medium-term telecommunications network improvement plan up to the year 2004 for these areas, in line with the regional development program, and requested the assistance of the Government of Japan.

In response to this request, the Government of Japan entrusted the study of the long-term and medium-term plan for telecommunications network to Japan International Cooperation Agency (hereinafter referred to as "JICA"). JICA dispatched a preliminary study team to Indonesia from May to June 1989. The preliminary study team proposed the scope of work to be undertaken by the JICA Study Team, and after discussion with the officials concerned of the Government of Indonesia, the proposed scope of work was agreed upon by both parties.

The main studies were carried out by the JICA Study Team, based on the scope of work thus defined, as follows:

- Preliminary study in Japan : Sep. - Oct. 1989
- Study in Indonesia (1) : Oct. 1989 - Feb. 1990
- Study in Japan (1) : Feb. - Mar. 1990
Jun. - Jul. 1990
- Study in Indonesia (2) : Jul. - Sep. 1990
- Study in Japan (2) : Sep. - Nov. 1990

1.2 Objective of the Study

The objective of the study is to prepare a regional telecommunications network plan up to the year 2004, in line with the regional development plan in Surabaya and surrounding areas, comprising:

- **Long-term Plan : up to the end of Repelita VII (2004)**
- **Medium-term Plan : up to the end of Repelita VI (1999)**
- **Implementation Program of Essential Project : during Repelita V and VI**

Focus is placed on the formulation of a plan for telecommunications network well coordinated with the socio-economy and regional development framework in the area.

1.3 Study Area/Planning Area

The Study Area consists of 6 administrative areas, i.e., the area centered by Surabaya and surrounded by Gresik, Bangkalan, Mojokerto, Sidoarjo and Lamongan (hereinafter called "GERBANGKERTOSUSILA" or "GKS"). In planning, Jombang area (Kabupaten Jombang) is also included in the objective area, considering the present telecommunications network configuration of the area. Accordingly, following is defined:

- Study Area : **GERBANGKERTOSUSILA** (or GKS)
- Planning Area : **GERBANGKERTOSUSILA** (or GKS) and Kabupaten **JOMBANG** (Objective area)

Objective area is illustrated in Figure 1.1.

1.4 Method of Approach and Schedule of the Study

The Study is made, based on the major findings during the field study in Indonesia and the mutual understandings reached through the discussion between POSTEL/PERUMTEL and the JICA Study Team during the study period. The work flow covering the whole study is shown in Figure 1.2.

Main subjects of the study are set as follows:

- to formulate the regional development framework,
- to establish the development target for telecommunications network up to the year 2004 and to examine development strategies,
- to formulate long-term and medium-term plan in dimensioning the network scale and facilities required, and
- to select and evaluate an essential project to be implemented during Repelita V and VI and prepare the implementation program of the project.

The schedule and major items of the Study appear in Figure 1.3.

1.5 Organization

1.5.1 Japanese Team

(1) Preliminary Study Team (From 24 May to 2 June, 1989)

Mr. Satoru ITOH	: Team Leader
Mr. Akira MIZOBUCHI	: Member
Mr. Shunsuke NOGUCHI	: Member
Mr. Shigemaro AOKI	: Member
Mr. Hiroshi TAKAOKA	: Member
Mr. Takao SAKAGAMI	: Member

(2) Main Study Team

Mr. Satoru KUSHIDA	: Team Leader (Transmission)
Mr. Tatsumi Amano	: Network Planning/Demand Study
Mr. Yoichi MISHIMA	: Switching System
Mr. Yoshiaki KOBAYASHI	: Junction Network (Outside Plant)
Mr. Takashi SUZUKI	: Radio and Transmission System
Mr. Shin-ichi AOKI	: New Services (until March 1990)
Mr. Tatsuo SEKI	: Subscribers Network (from July 1990)
Mr. Haruo YAMANE	: Regional Development Planning and financial analysis
Dr.Ir. Agus Mulyanto (Local Consultant)	: Regional Development Planning (until February 1990)

(3) JICA Advisory Committee

Mr. Katsuharu NAKAMURA	: Chairman/Ministry of Posts and Telecommunications (until June 1990)
Mr. Takayuki SUZUKI	: Chairman/Ministry of Posts and Telecommunications (from July 1990)
Mr. Takashi SUGAWARA	: Member/ditto
Mr. Shigemaro AOKI	: Member/JICA
Mr. Kiyoshi NORITAKE	: Member/JICA (from July 1990)

1.5.2 Indonesian Members

Directorate General of Posts and Telecommunications (hereinafter referred to as "POSTEL") acts as the counterpart to the JICA Study Team and also as the coordinating body to the relevant organizations for the execution of the Study. POSTEL assigned counterpart engineers from PERUMTEL as shown below:

Mr. Suwandi Bc.TT	: DITOPTEK (Coordinator) (until February 1990)
Ir. Angger Pramunditto	: BINPROSIS (Secretary, Network Planning) (until February 1990)
Mr. Undang Sudirman	: - ditto - (from July 1990)
Ir. Mas Budiwasisto	: - ditto - (from July 1990)
Mr. Utang Supriatna BE	: PUSRENLITBAN (Regional Development) (until February 1990)
Mr. I.G.KD. Bambang	: - ditto - (from July 1990)
Mr. Suyanto	: BINPROSEN (Switching System)
Ir. Budhi Santoso	: BINPROTRA (Transmission System) (until February 1990)
Mr. Riadmadi Basutoro	: - ditto - (from July 1990)
Mr. Moch Iqbal	: BINPROJAR (Outside Plant) (until February 1990)
Mr. Hassan Ibrahim	: - ditto - (from July 1990)
Mr. Tumio	: TEKSEN (New Services) (from July 1990)
Ir. Arief Noormudia	: WITEL VII (Switching System) (until February 1990)
Mr. Agus Saptadi	: " (Transmission System)
Mr. Agung Yudanto	: " (New Services)
Mr. Yayat Hidiyat	: " (Outside Plant) (until February 1990)
Mr. Slamet Santoso	: " (Network Planning)
Ir. Syailendra	: " (Network Planning) (from July 1990)
Ir. Ben Aron F.S.	: " (Network Planning) (from July 1990)

The counterpart officials above have greatly contributed to the satisfactory completion of the field survey and study work.

During the second study period in Japan, two counterparts from Indonesia were dispatched to Japan to receive a training course conducted by JICA as the technology transfer for the study. The name of counterparts and period of training are as follows:

- Name of Counterparts:

Ir. Mas Budiwasisto	from BINPROSIS, PERUMTEL H/Q Bandung
Ir. Syailendra	from WITEL VII, PERUMTEL Surabaya

- Training Period:

25 September - 31 October 1990 (37 days)

Other persons from organizations concerned have also extended their cooperation to the Study Team for data collection, valuable suggestions and so on.

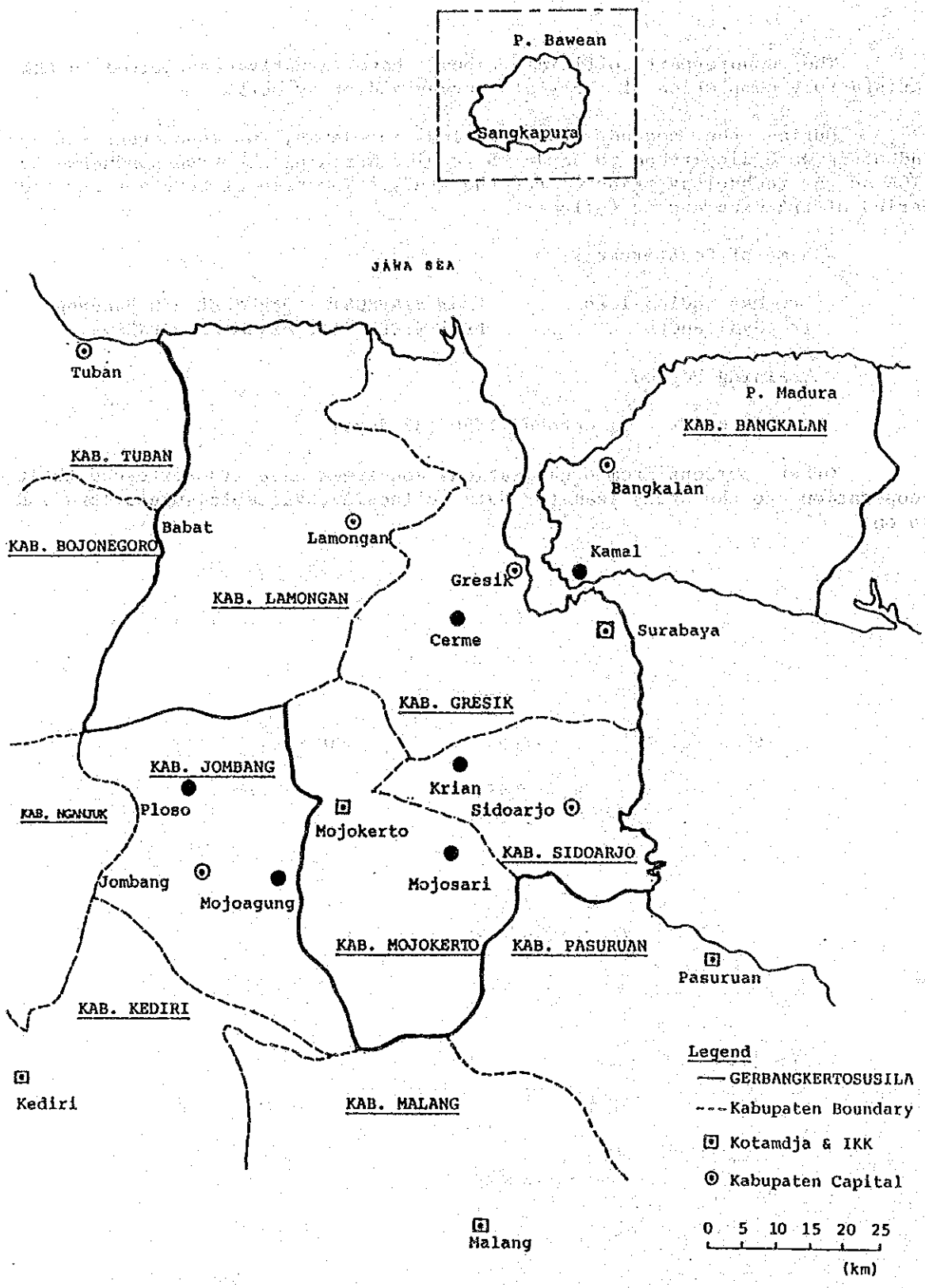

Figure 1.1 The Objective Area

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Figure 1.2 Study Flow

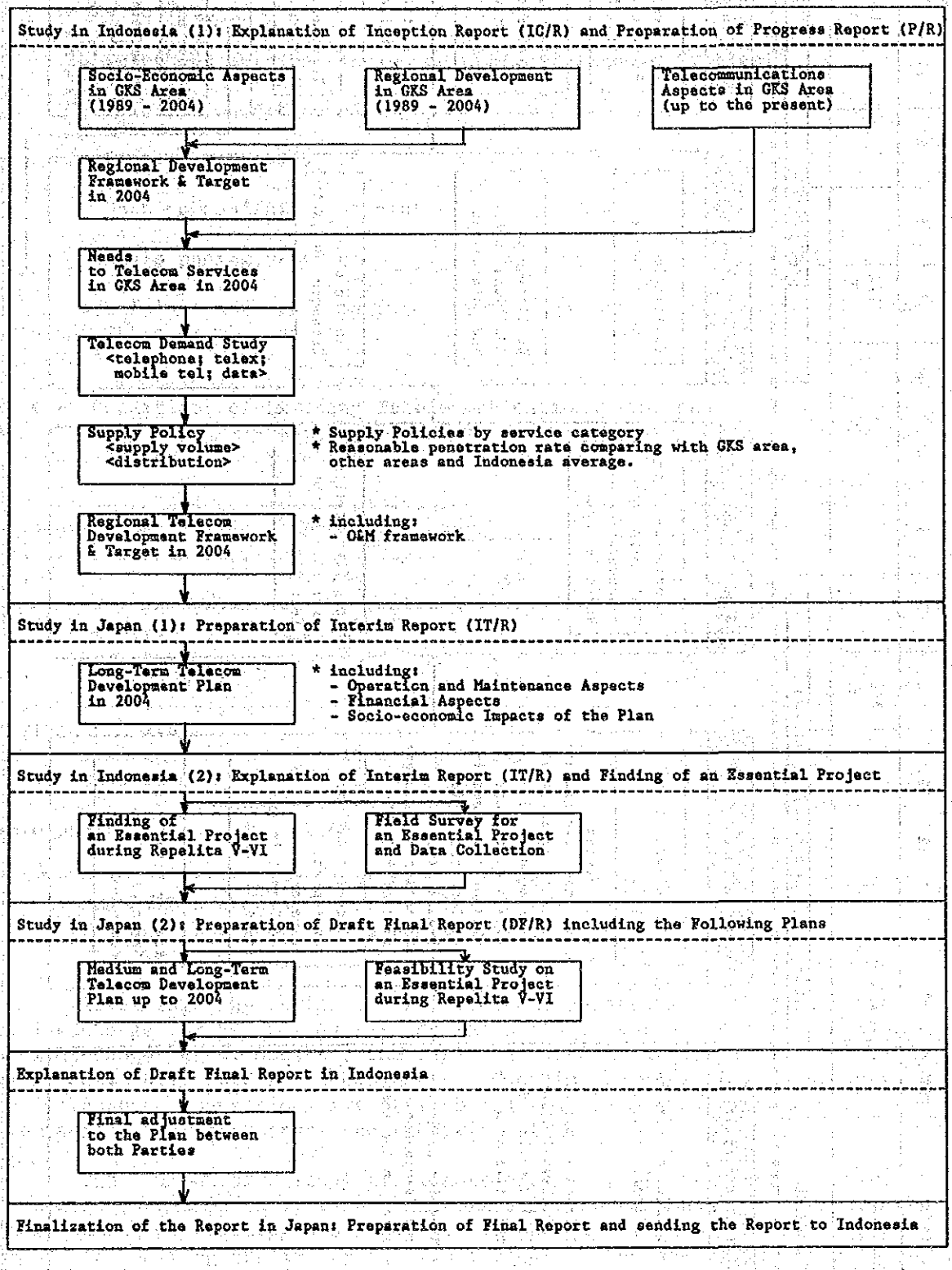
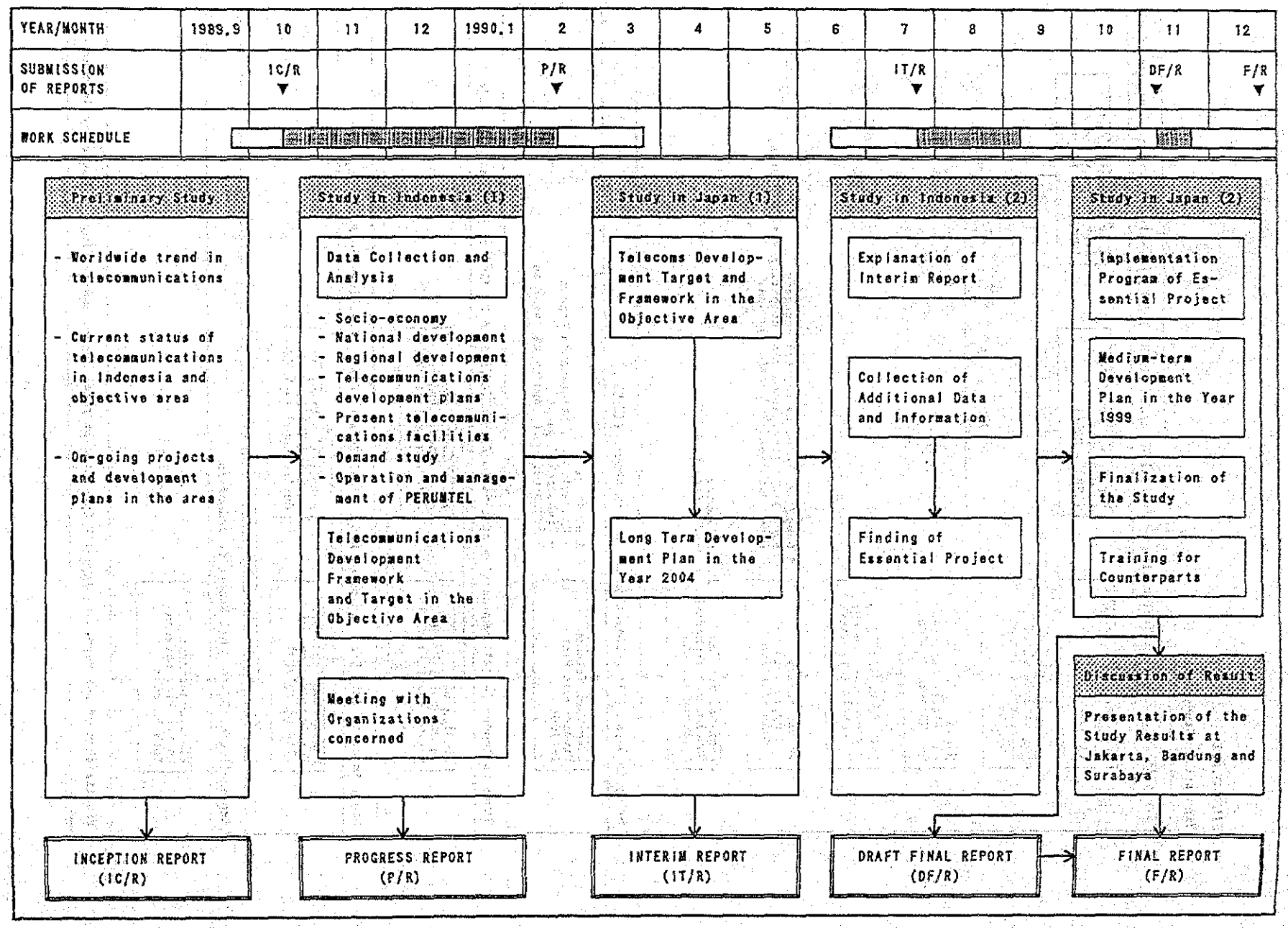


Figure 1.3 OVERALL SCHEDULE OF THE STUDY



2. THE CURRENT STATUS OF TELECOMMUNICATION SERVICES

The current telecommunication services provided in the objective area are as follows:

- **Telephone service (including Mobile Telephone Service)**
- **Telex/Telegraph service**
- **Facsimile service**
- **Data communication service**
- **Radio paging service**

Conditions of each service mentioned above are shown in the following Table 1:

Table 1 Conditions of Existing Telecommunications Services

Service category	Surabaya (A)	Jakarta (B)	Indonesia (C)	(A)/(B)	(A)/(C)
Telephone	60,510	337,254	861,888	18 %	7 %
Telex	1,774	7,341	15,943	24 %	11 %
Leased circuit:					
Data	12	604	657	2 %	2 %
Telegraph/Telex	3	389	455	less than 1 %	
SKDP(Packet Data):					
Dial-up	24	242	334	10 %	7 %
Dedicated	2	33	37	6 %	5 %
Radio paging	4,809	-	-		

Source: PERUMTEL's statistics as of 1989 (OPTEKTEL)
Figures show number of subscribers.

Regarding the telephone service, the penetration ratio in Surabaya multi-exchange area is 2.89 per 100 inhabitants, following 4.26 in Jakarta multi-exchange area; however, the ratio in surrounding areas of Surabaya is still only 0.13 per 100 inhabitants. Even in Kecamatan capitals, most of the telephone connections are still being made by manual exchange and open wire facility for both trunk and subscriber lines.

The number of waiting applicants for automatic telephone service in Indonesia is considerably large, approximately corresponding to 60 % of the total number of existing subscribers. In Surabaya multi-exchange area, the number of waiting applicants is almost equal to the number of the existing

subscribers. Judging from the past worldwide trend, it is anticipated that the gap between supply and demand will become larger.

Telephone service indexes in Indonesia as of 1989 are shown in the following Table 2:

Table 2 Telephone Service Indexes in Indonesia as of 1989

Areas	Sub.s/ 100 Pop	No.of Sub.s	Sub.s Share(%)	Pop (x1000)	Pop Share(%)	Waiting Applicants
SURABAYA	**2.89**	**60,510**	**7.0**	**2,097**	**1.3**	**63,422**
JAKARTA	4.26	337,254	39.1	7,914	4.8	194,364
INDONESIA	0.52	861,888	100.0	164,629	100.0	498,079
WITEL-I	0.52	65,076	7.6	12,438	7.6	42,759
WITEL-II	0.35	27,851	3.2	8,019	4.9	13,205
WITEL-III	0.34	41,771	4.8	12,262	7.4	13,114
WITEL-IV	2.69	346,300	40.2	12,864	7.8	199,578
WITEL-V	0.33	85,829	10.0	25,989	15.8	62,645
WITEL-VI	0.23	70,062	8.1	29,981	18.2	44,321
WITEL-VII	**0.36**	**113,447**	**13.2**	**31,373**	**19.1**	**64,136**
WITEL-VIII	0.35	32,860	3.8	9,369	5.7	21,507
WITEL-IX	0.34	26,284	3.0	7,749	4.7	10,577
WITEL-X	0.33	38,087	4.4	11,594	7.0	22,409
WITEL-XI	0.38	6,191	0.7	1,614	1.0	1,497
WITEL-XII	0.59	8,130	0.9	1,376	0.8	2,331

Sources:
Population : BPS data as of 1985 (Yearbook 1988).
Telecom data: Perumtel's telecom statistics as of 1989 (OPTEKTEL).
"Waiting applicants" are those for automatic service.

3. REGIONAL DEVELOPMENT FRAMEWORK

3.1 Development Policies of East Jawa Government

The policy of East Java Government is to achieve the targets aiming at developing a land use pattern emphasizing efficient use of land resources: increase of agriculture production in fertile areas and promotion of industrial growth in less fertile areas.

The basic strategy for the development of GKS area are formulated along these policies as summarized below:

- to promote industrial growth in the northern parts of GKS, especially Gresik and Lamongan, where agriculture productivity is low;
- to promote industrial growth in Bangkalan where agriculture productivity and economic level are low through constructing Surabaya - Madura Bridge; and
- to promote increase of agriculture production through further intensification in fertile areas Sidoarjo and Mojokerto.

The land use plan of East Java Province was prepared by East Java Government for the year 2008 reflecting the policies and strategy presented as above as shown in Figure 2.

3.2 Development Directions until 2004

The major directions of industrial growth in GKS area were projected for Repelita V (1989 - 1994), Repelita VI (1994 - 1999) and Repelita VII (1999 - 2004). Figure 3 presents the summary of the growth scenario.

The following are the basic concept underlying the projected growth scenario for each Repelita:

Repelita V (1989 - 1994)

- Major industrial growth is still directed toward southern area in Sidoarjo during the rest of Repelita V period.
- Some growth keeps taking place also toward Gresik and Surabaya.

Repelita VI (1994 - 1999)

- Major industrial growth is directed toward northwest in Gresik as access is improved and infrastructures are expanded.
- Industrial growth to south in Sidoarjo continues, but at a lower rate as it becomes increasingly difficult to find industrial land.
- Some growth to Bangkalan starts to take place.

Repelita VII (1999 - 2004)

- Bangkalan gains momentum as Surabaya - Madura Bridge is completed and infrastructures are improved.
- Gresik keeps growing at a higher rate.
- Some development starts to take place in Lamongan

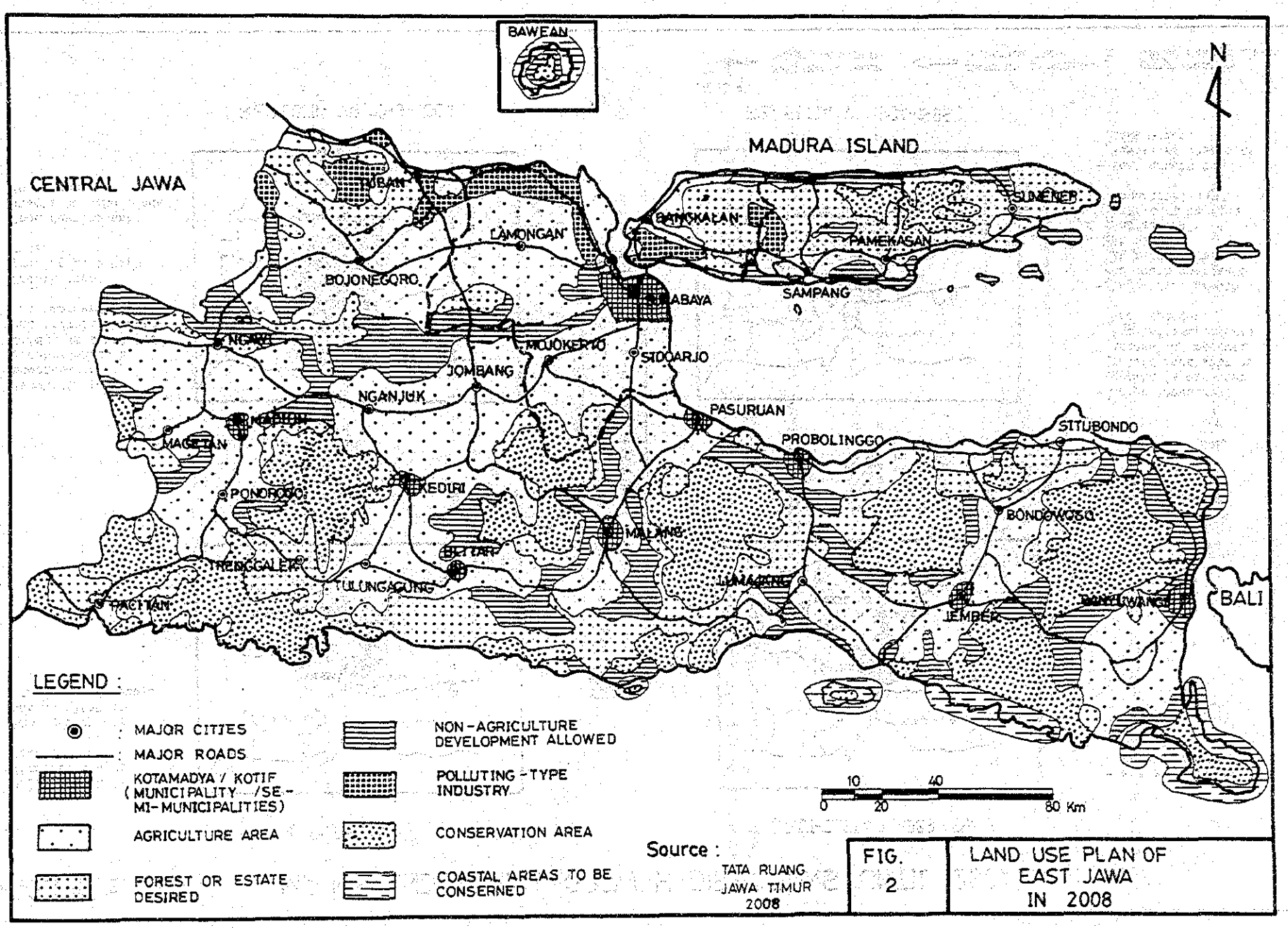
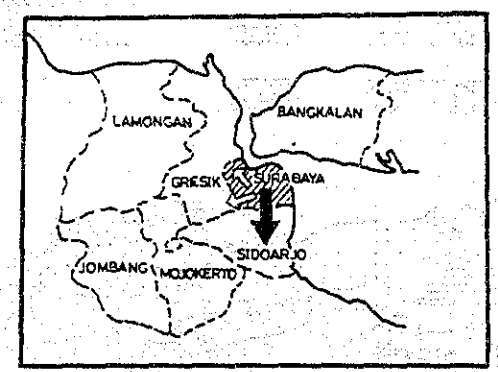

BAWEAN
N
MADURA ISLAND
CENTRAL JAWA
TUBAN
LAMONGAN
BOJONEGORO
BANGKALAN
PAMEKASAN
SUMENEP
SAMPANG
SURABAYA
NGAWI
MOJOKERTO
SIDOARJO
JOMBANG
NGANJUK
PASURUAN
MAGETAN
MADIUN
PROBOLINGGO
SITUBONDO
PONOROGO
KEDIRI
BONDOWOSO
MALANG
BLITAR
TRENGGALEK
TULUNGAGUNG
LUMAJANG
PACITAN
JEMBER
BANYUWANGI
BALI
LEGEND :
MAJOR CITIES
MAJOR ROADS
KOTAMADYA / KOTIF (MUNICIPALITY /SEMI-MUNICIPALITIES)
AGRICULTURE AREA
FOREST OR ESTATE DESIRED
NON-AGRICULTURE DEVELOPMENT ALLOWED
POLLUTING-TYPE INDUSTRY
CONSERVATION AREA
COASTAL AREAS TO BE CONSERNED
10 40
0 20 80 Km
Source :
TATA RUANG JAWA TIMUR 2008
FIG. 2
LAND USE PLAN OF EAST JAWA IN 2008

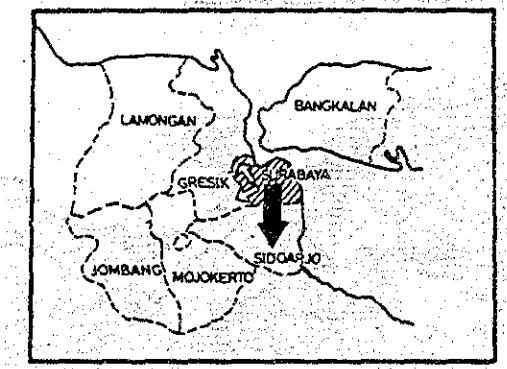
FIGURE 3 MAJOR INDUSTRIAL GROWTH DIRECTIONS UNTIL 2004

(PRESENT)

- Major growth is directed toward south.
- Some growth are taking place in Gresik and Surabaya.



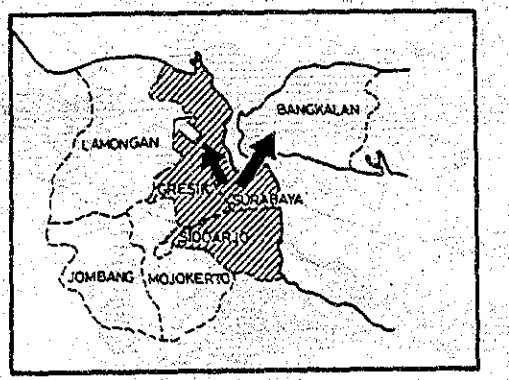
(REPELITA V, 1989-1994)



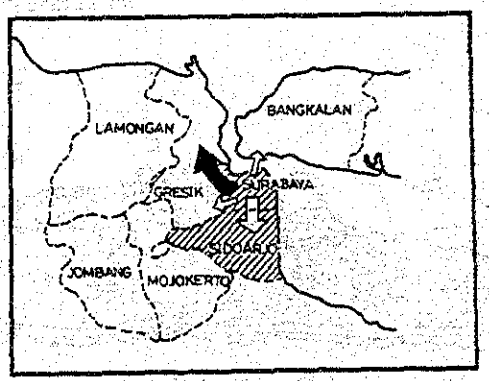
- Present pattern remains basically the same.

(REPELITA VII, 1999-2004)

- Bangkalan gains momentum as Surabaya-Madura Bridge is completed and infrastructures are improved.
- Gresik keeps growing at a high rate.
- Some development starts to take place in Lamongan.



(REPELITA VI, 1994-1999)



- Major industrial growth is directed toward northwest as access is improved and infrastructures are expanded.
- Industrial growth to south continues at a lower rate as it becomes increasingly difficult to find industrial land.
- Some growth to Bangkalan starts to take place.

LEGEND :

DIRECTION OF MAJOR INDUSTRIAL GROWTH

DIRECTION OF MODERATE INDUSTRIAL GROWTH

BUILT-UP INDUSTRIAL AREA

3.3 Regional Development Framework

(1) Population

The results of projection of the population in the objective area until 2004 are summarized as follows:

year	Population in GKS and Jombang (thousand)
1989	8,507
1994	9,425
1999	10,450
2004	11,577
average annual growth rate	2.1 %

(2) Gross Regional Domestic Product (GRDP)

GRDP in the objective area are estimated and projected for 1989, 1994, 1999 and 2004 in 1980 price. The projected GRDP are summarized as below:

year	Projected GRDP in GKS and Jombang (1980 price, unit: billion Rupiahs)
1989	3,312
1994	4,590
1999	6,430
2004	8,972
average annual growth rate	6.9 %

(3) GRDP per capita

Based on the projected population and GRDP, GRDP per capita are calculated for respective Kabupaten and Kotamadya. The projection shows GRDP per capita of GKS grows by 4.7 % per year between 1989 and 2004.

3.4 Industrial Estate Project in the Objective Area

(1) Industrial Estate Project

Along with the economic growth in Surabaya and its surrounding area, various kinds of industrial estate projects are planned in the objective area by private developers. The number of factories to locate in these industrial estates are estimated. These data shall be used as basic data for showing a model case of telecommunications development focusing on industrial demand.

The data obtained from BPN (Badan Pertanahan Nasional East Jawa or National Land Body) show that seventeen industrial estate projects have been proposed to BPN as of August 1990. In addition to these, information from Bappeda indicates that there is a development plan of an industrial estate in north of Kecamatan Gresik in an area of 500 ha. The following table summarizes the number of proposed industrial estate projects and the total area by Kotamadya and Kabupaten in the objective area.

Area	Number	Total Area (ha)
Kodya Surabaya	8	2,373
Kab Gresik	6	2,400
Kab Mojokerto	1	200
Kab Bangkalan	3	1,350
Total	18	6,323

Table 3 presents the names of developers, proposed area for development, location and an estimate of the number of factories to locate in the industrial estates. Figure 4 shows the locations of each industrial estate project.

(2) Estimate of the Number of Factories

The number of factories to locate in the industrial estates are estimated until the target year 2004 by each Repelita period as summarized in the following table.

Area	No. of Factories by Repelita		
	V	VI	VII
Kodya Surabaya	570	1,090	1,090
Kab Gresik	146	1,110	1,110
Kab Mojokerto	45	90	90
Kab Bangkalan	0	55	630
Total	761	2,345	2,920

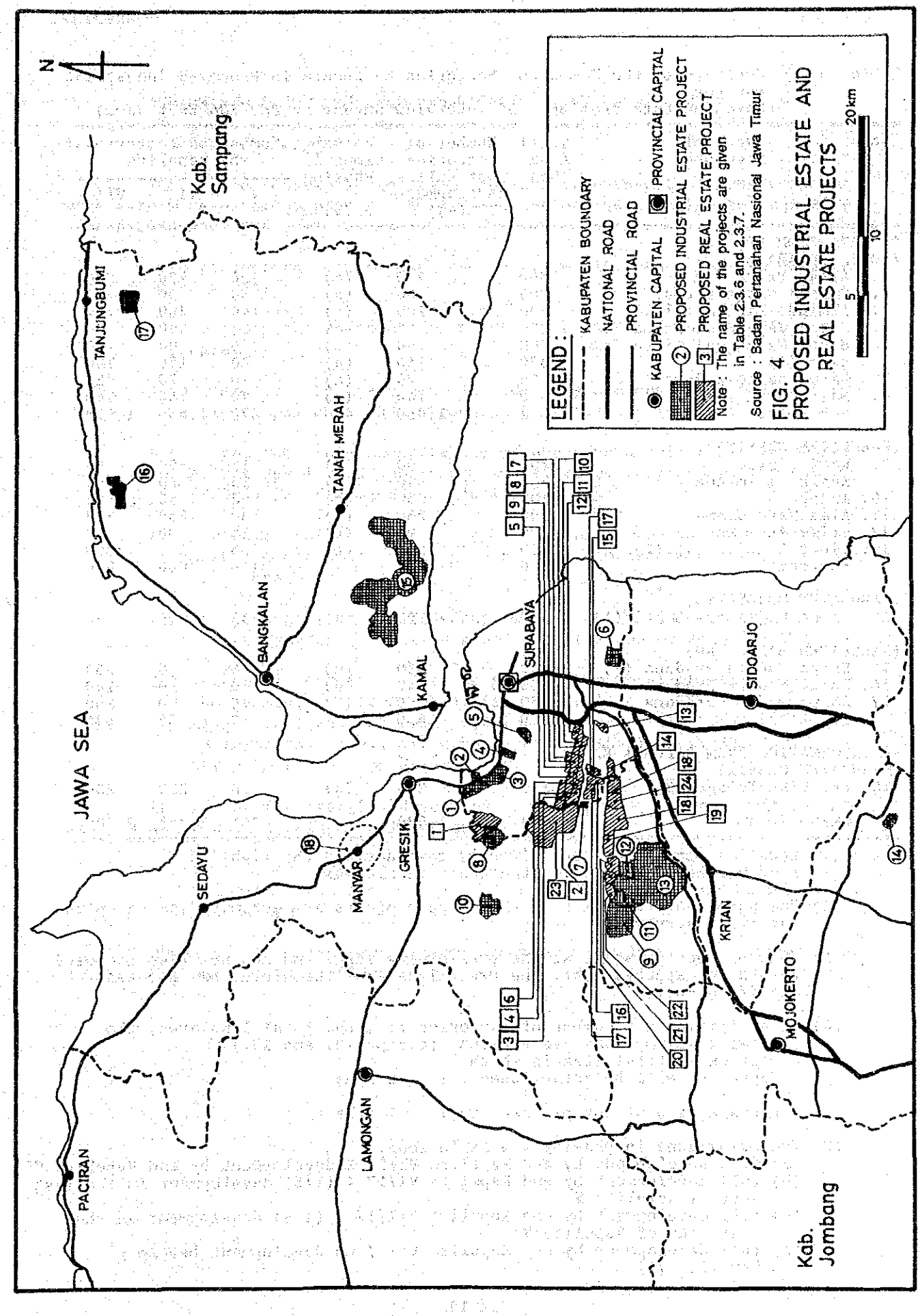

N
JAWA SEA
Kab. Sampang
TANJUNGBUMI
TANAH MERAH
BANGKALAN
KAMAL
SURABAYA
SIDOARJO
GRESIK
MANYAR
SEDAYU
PACIRAN
LAMONGAN
KRIAN
MOJOKERTO
Kab. Jombang
LEGEND:
KABUPATEN BOUNDARY
NATIONAL ROAD
PROVINCIAL ROAD
KABUPATEN CAPITAL
PROVINCIAL CAPITAL
PROPOSED INDUSTRIAL ESTATE PROJECT
PROPOSED REAL ESTATE PROJECT
Note : The name of the projects are given in Table 2.3.6 and 2.3.7.
Source : Badan Pertanahan Nasional Jawa Timur
FIG. 4
PROPOSED INDUSTRIAL ESTATE AND REAL ESTATE PROJECTS
20km
5
10

Table 3 Estimate of the Number of Factories to Locate in Proposed Industrial Estates
(Based on Data from BPN and Interview Survey at BAPPEDA East Jawa)

No.	Name of Developer	Total Area (ha)	Number of factories at full development (4)	Assumptions in Phasing (5)	Number of factories by Repelita V	VI	VII
** DATA FROM BPN **							
(KODYA SURABAYA)							
1.	Altap Prima I.E	500	230	(a)	120	230	230
2.	Sarana Wisma Permai	200	90	(a)	50	90	90
3.	Almindo Lightmetal I.	600	280	(a)	140	280	280
4.	Surya Jaya Bumi Prima E.	200	90	(a)	50	90	90
5.	Hasta Manunggal Citra Tama	200	90	(a)	50	90	90
6.	Sier (1)	320	150	(a)	80	150	150
7.	Darmo Santosa Raya	53	20	(a)	10	20	20
8.	Maspion	300	140	(a)	70	140	140
	Sub-total	2,373	1,090	-	570	1,090	1,090
(KABUPATEN GRESIK)							
9.	Kasih Jatim	200	90	(b)	15	90	90
	Kasih Jatimanda	200	90	(b)	15	90	90
10.	Injoko	100	50	(b)	8	50	50
11.	Alas Watu Utama	500	230	(b)	38	230	230
12.	Prima Anom Permai	200	90	(b)	15	90	90
13.	Sinar Satelit I.E (2)	700	330	(b)	55	330	330
	Sub-total	1,900	880	-	146	880	880
(KABUPATEN MOJOKERTO)							
14.	Darma Sejahtera Sakti (1)	200	90	(a)	45	90	90
(KABUPATEN BANGKALAN)							
15.	Dhipa Madura Pradana (2)	700	330	(c)	0	55	330
16.	Dhipa Madura Pradana	300	140	(d)	0	0	140
17.	Dhipa Madura Pradana	350	160	(d)	0	0	160
	Sub-total	1,350	630	-	0	55	630
** INFORMATION FROM BAPPEDA EJ **							
(KABUPATEN GRESIK)							
18.	Pt. Liku Telaga (3)	500	230	(e)	0	230	230
	GRAND TOTAL	6,323	2,920	-	761	2,345	2,920

Note: (1) Location permit has been given by governor and the right of land has been aqcuired. Others are in process.

(2) The number of factories in these two projects are estimated based on the interview surveys.

(3) This project is still at the preliminary stage and has not been proposed to BPN for approval yet. The exact location, therefore, has not been clarified yet.

(4) In estimating the number of factories from the total land area, the following assumptions are applied: (except 13. and 15.)
- Portion of total area in which factories will be established : 70 % ha
- Average size of lot per factory : 1.5 ha

(5) The assumtions in phasing are as follows.
(a) full development by end Repelita VI/50 % development by end Repelita V
(b) full development by end Repelita VI/17 % (1/6) development in the last year of Repelita V
(c) full development by end Repelita VII/17 % (1/6) development in the last year of Repelita VI
(d) full development by end Repelita VII / no development before Repelita VII

4. MEDIUM AND LONG TERM TELECOMMUNICATIONS DEVELOPMENT PLAN

4.1 Development Target

The basic concepts to be established the target of long-term and medium-term development plan for telecommunications network in the objective area are as follows:

- to prevent the magnification of service difference between Jakarta and Surabaya
- to support the socio-economic activities and regional development program
- to improve the services in quantity and quality (reduction of waiting applicants and introduction of new services)

Based on the above concepts and in due consideration of nationwide telecommunications development policies, target to be realized by the end of Repelita VII (2004) is determined as mentioned below:

(1) Surabaya multi-exchange area will be expanded toward adjacent areas along with the growth of socio-economic activities in urban area.

(2) The present supply difference between Jakarta and Surabaya in penetration ratio will be kept up to the end of Repelita VII.

(3) Telephone service will be expanded up to all Desas to support the administrative activities and realize civil minimum. This target realizes the rural development target in ITU Kuala Lumpur Declaration, i.e., "Telephone service shall be available within any 3 km radius for all people".

To reach the target described in the above, following items are studied as network development strategy:

- Network configuration
- Development scenario of telecommunications network up to 2004
- Introduction of new services

Summary of telecommunications network development strategy and implementation is illustrated in Figure 5.

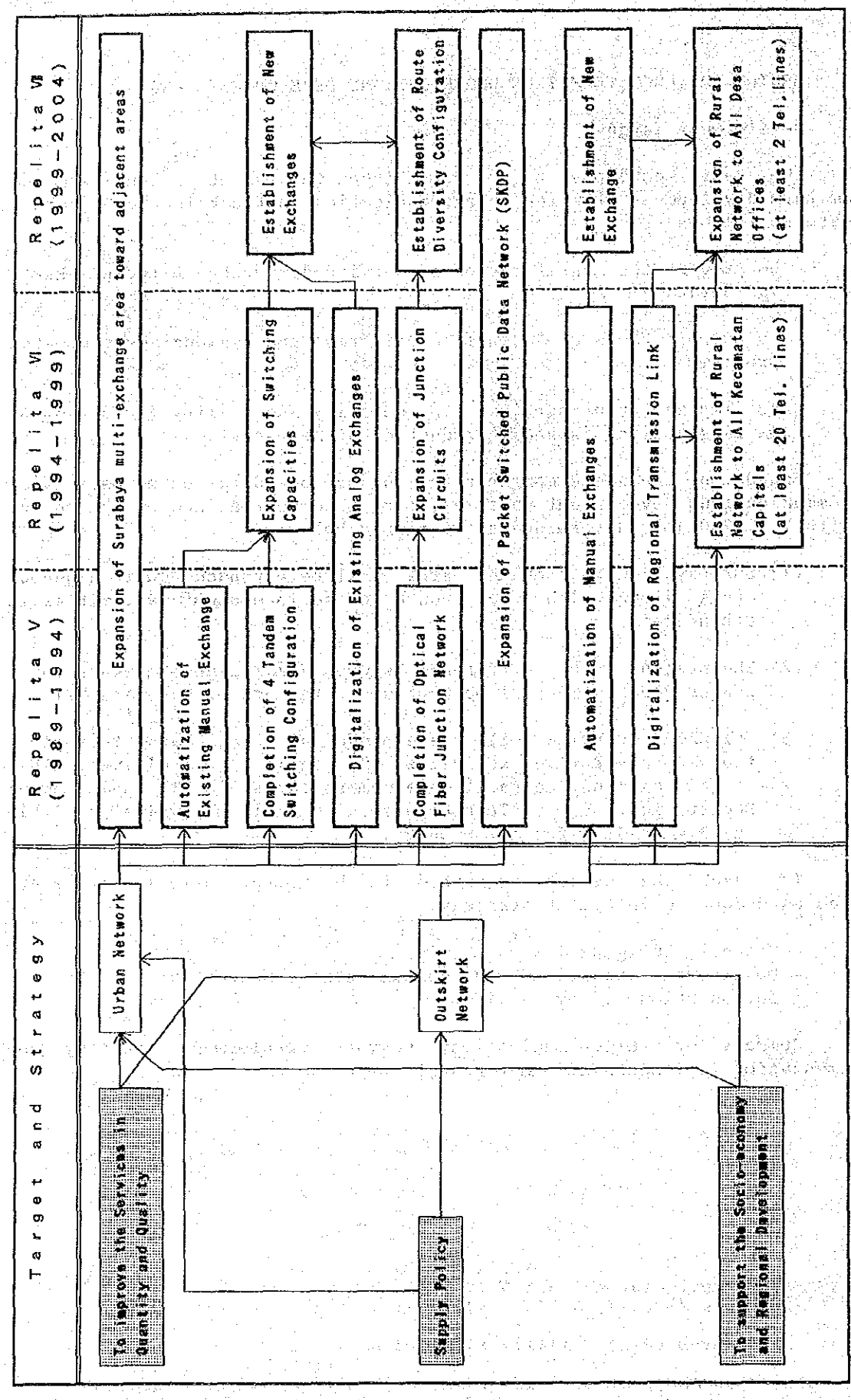


Figure 5 Summary of Network Development Strategy

4.2 Telephone Network Development Plan

(1) Network Configuration

The regional telephone network in the objective area at the end of Repelita VII can be broadly divided into two, i.e., "Urban Network" covering Surabaya multi-exchange area and "Outskirts Network" covering its surrounding areas.

A concept of urban and outskirts networks and message area configuration in 2004 is given in Figure 6. A target telephone switching network configuration in 2004 is shown in Figure 7.

(2) Network Development Strategy

Telephone network development strategies for the objective area including Kabupaten Jombang consist of the following:

- A development scenario of telephone network up to 2004

  The development scenario is established, in due consideration of the area priority in regional socio-economic development and aiming at the effective investment on telecommunications system expansion.

- An expansion strategy for Surabaya multi-exchange area up to 2004

  Surabaya multi-exchange area is to be expanded by each Repelita phasing, keeping pace with the expansion of socio-economic activities in the area. (Refer to Figure 8)

(3) Subscription Demand

The subscription demand study in Surabaya multi-exchange area was already carried out by Program Management Consulting Option Service (PMC-Option) financed by the World Bank during the period from 1987 to 1988. The long-term network plan in this study is continued on the basis of the results of the demand study done by PMC-Option Project as shown below:

Category / Year	1994	1999	2004
Macroscopic demand	180,000	304,000	458,000

The demand study for the surrounding areas was made by using Kabupaten Model developed in JICA Study on Rural Telecommunications Network Development in Indonesia (1985) and the findings of the field survey result. The subscription demands estimated by using Kabupaten Model are as follows:

Area / Year	1994	1999	2004
Gresik (Kab)	9,484	17,474	33,963
Bangkalan (Kab)	3,705	4,957	7,679
Mojokerto (Kab+Kodya)	4,507	5,666	7,285
Sidoarjo (Kab)	16,135	31,500	56,273
Lamongan (Kab)	5,893	7,758	12,251
Jombang (Kab)	4,093	4,590	5,162
Total	43,817	71,945	122,613

(4) Telephone Supply Strategy

a) Surabaya multi-exchange area

In expanding the telephone service in the number of subscribers, top priority has always been given to Jakarta area. Consequently, the difference in supply volume between Jakarta and other areas has been gradually magnified. The difference between Jakarta and Surabaya area as of 1989 is 1:0.7 in penetration ratio and 1:0.2 in the real number of line units. In order to improve such difference, the following two scenarios are established:

Scenario 1 (realistic Scenario)

The present supply difference between Jakarta and Surabaya area in penetration ratio per 100 inhabitants will be kept up to the year 2004 to stop a magnification of the difference.

Scenario 2 (Optimistic Scenario)

The present supply difference between Jakarta and Surabaya area in penetration ratio per 100 inhabitants will be improved and the supply level in Surabaya area will become almost the same with that of Jakarta by the year 2004.

For each of the above two supply scenarios, a supply plan in the penetration ratio up to the end of Repelita VII is established as summarized below:

Area	Repelita V	Repelita VI	Repelita VII
<Surabaya M.E.A on Scenario 1> Capacity Density (LU/100 Pop)	4.9	6.0	8.0
<Surabaya M.E.A on Scenario 2> Capacity Density (LU/100 Pop)	4.9	7.0	10.0
<Jakarta M.E.A> Capacity Density (LU/100 Pop)	6.9	9.2	11.5

Note: M.E.A.: Multi-Exchange Area
The figures for Jakarta area are from JICA JABOTABEK Report.

The Scenario 1 which follows the trend of past investment balance between both areas is recommendable, considering the national development policy. In conclusion, the long-term and medium-term plans for regional telecommunications network development in Surabaya and surrounding areas are prepared, based on the **realistic scenario** 1 mentioned above.

b) Surrounding areas

The automatic telephone supply strategy for surrounding areas is drawn up as mentioned below, in accordance with the area priority in the national socio-economic development:

By the end of Repelita V

- All the Kabupaten capitals

By the end of Repelita VI

- All the Kecamatan capitals (at least 20 telephones)

By the end of Repelita VII

- All the Desas which are not Kecamatan capitals (at least 2 telephones for administration and public)
- Improvement of the telephone penetration ratio in the Kabupaten capitals up to the same level as that in the multi-exchange area

The supply volumes based on the above-mentioned supply strategy are summarized in the following table:

Objective area	Repelita V	Repelita VI	Repelita VII
Surabaya M.E.A	179,108 (186,356)	265,000 (331,885)	408,000 (514,757)
Surrounding area	17,528 (37,461)	19,506 (44,060)	34,676 (65,856)

Note: Figures in ( ) show the demands, when the multi-exchange area boundary is expanded by each Repelita.

(5) Traffic and Circuit Demands

Traffic and circuit demands between exchanges are estimated separately for Surabaya multi-exchange area and its surrounding areas.

Following are average calling rates adopted in the study:

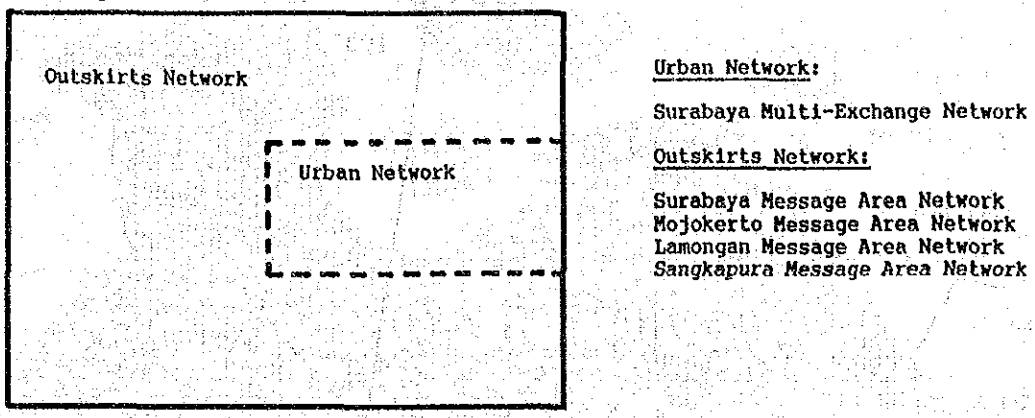
<Surabaya multi-exchange area>

- Originating calling rate (local) : 52 mErl
- Originating calling rate (toll) : 10 mErl
- Special : 1 mErl

<Surrounding areas>

- Originating calling rate : 48 mErl

A concept on Urban and Outskirts Networks



A concept on Message Area Configuration in GERBANGKERTOSUSILA Area in 2004

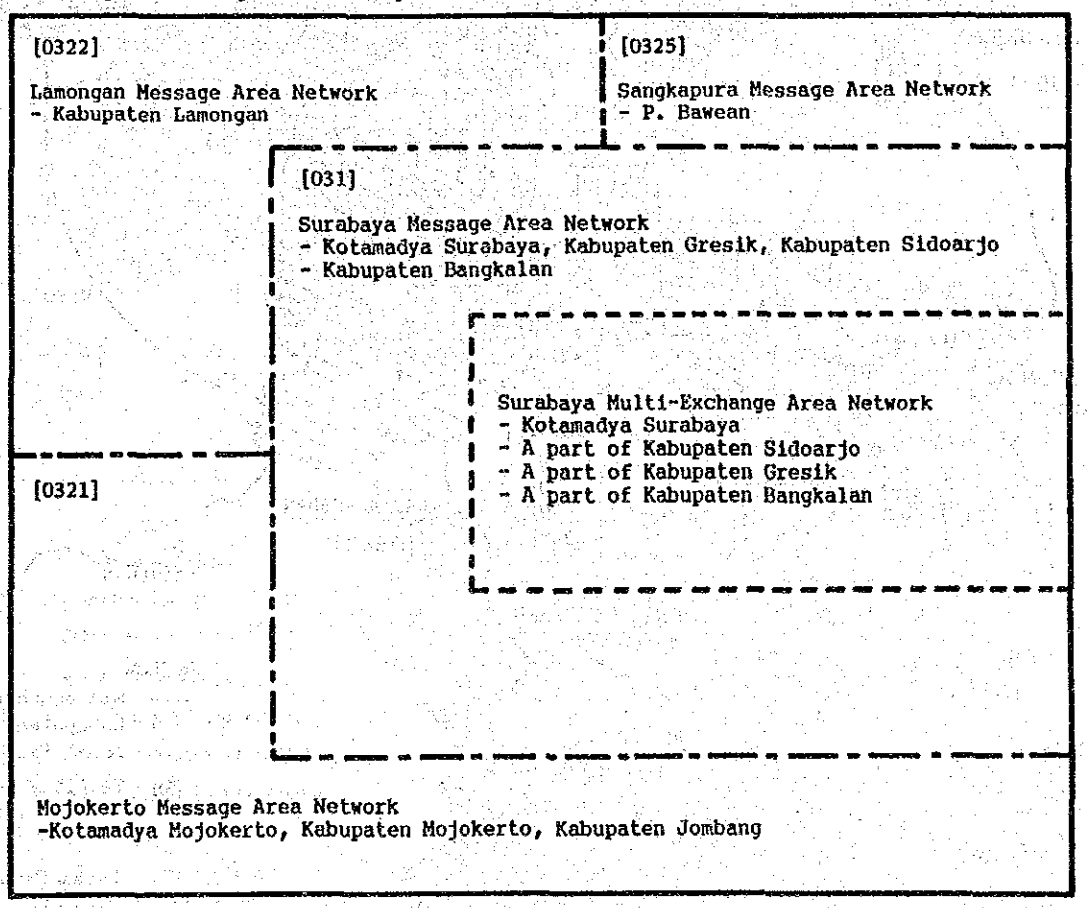


Figure 6 A Concept on Telephone Network in 2004

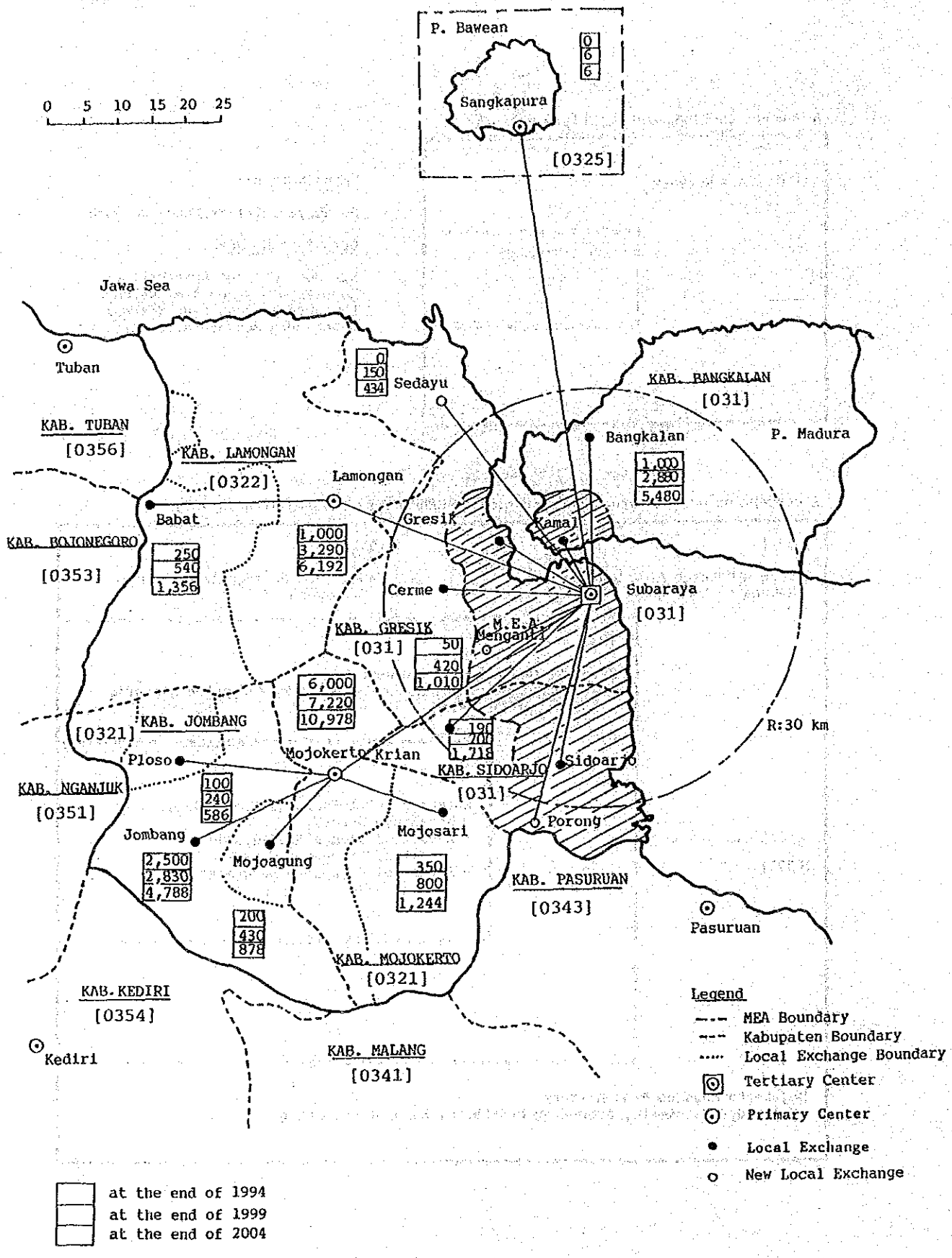


Figure 7 Telephone Switching Network Configuration in 2004

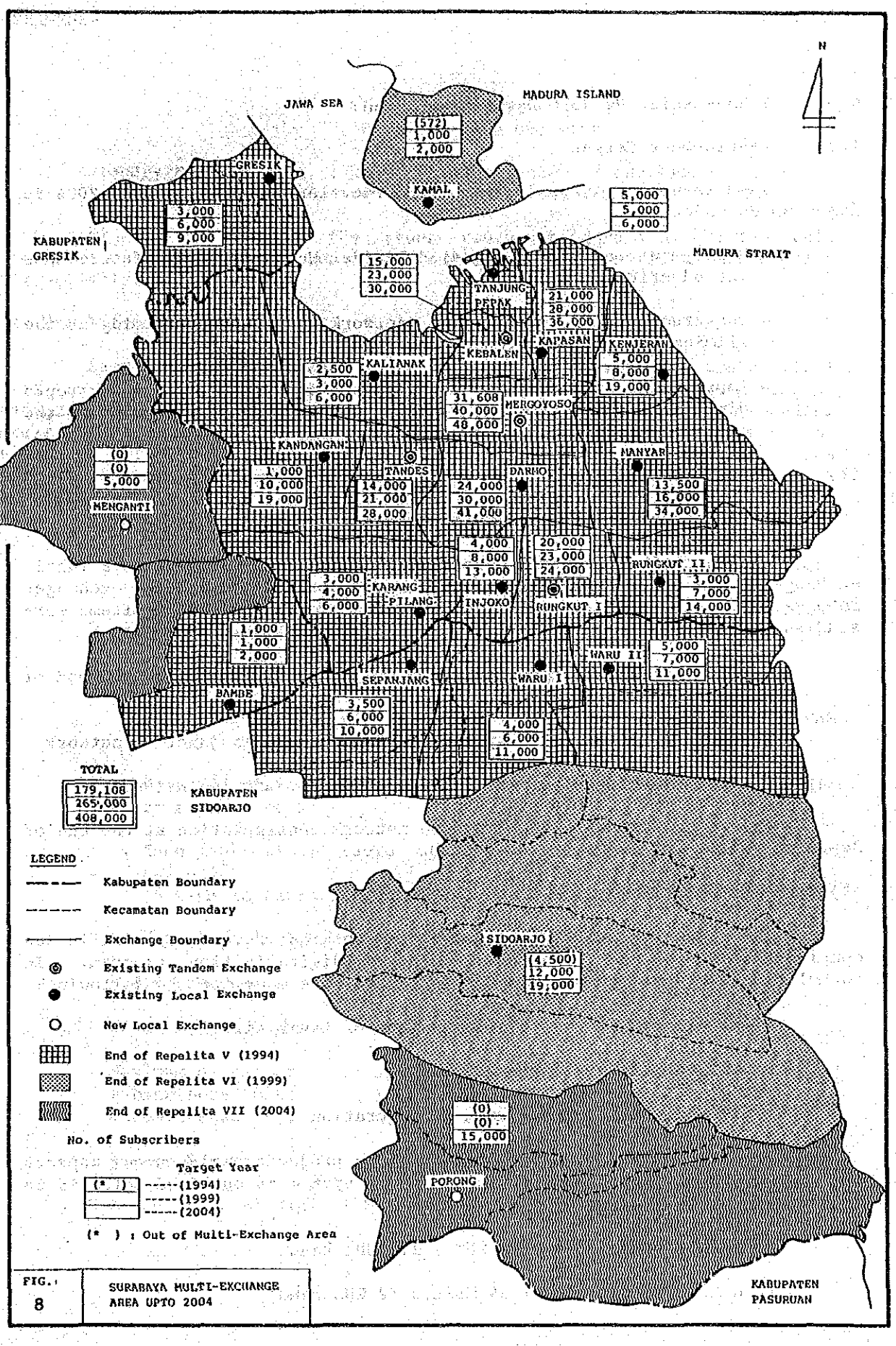


FIG. 8 SURABAYA MULTI-EXCHANGE AREA UPTO 2004

4.3 Transmission Network Development Plan

(1) Development Target

The target of transmission network development for the year 2004 is drawn up as under:

- Deployment of IDN (Integrated Digital Network) toward future ISDN introduction
- Construction of rural area network in all Desas, aiming at the elimination of "no telephone service community"
- Improvement and expansion of junction network, including route diversity configuration, keeping pace with the expansion of the multi-exchange area.

(2) Development Framework

a) Junction Network in Surabaya Multi-Exchange Area

The junction network development framework for Surabaya multi-exchange area has been formulated, based on the telephone exchanges integration plan. In formulating the framework, following items were studied:

- Calculation of required number junction systems in each end of Repelita
- Study of transmission systems to be employed in junction network
- Study of route diversity configuration on junction network

Figure 9 presents the junction network configuration at the end of Repelita VII.

b) Trunk Network

The trunk network development framework has been formulated in due consideration of the telephone exchanges digitalization program. In formulating the development framework, studies were made for the following:

- Calculation of the required number of trunk circuits
- Study of the systems employed
- Study of the trunk network configuration

In view of required capacity, on-going projects, maintenance aspects and so on, the medium capacity digital radio system as outlined below is to be adopted for this network, in principle.

Frequency band : 2 GHz / 1.5 GHz band

Transmission Capacity : 34 Mbit/s (2 GHz band)

17 Mbit/s (2 GHz band)
8 Mbit/s (1.5 GHz band)

Standby System : Route standby system (2 GHz band)
Equipment standby system (1.5 GHz band)

Figure 10 presents the trunk route configuration, while circuit requirements and network configuration are given in Figures 11 and 12, respectively.

c) Rural Area Network

Based on the telephone supply strategy for surrounding areas, rural area network development plan has been formulated. This network will be categorized as subscribers network covering all the Desas in surrounding areas to provide the telephone circuits at minimum requirements for socio-economic and administrative activities. In order to realize the rural area network, following systems are adopted:

Supply by means of subscribers cable network:

To realize a proper transmission quality, telephone circuits are supplied by subscribers cable to the areas within a 6 km radius from local exchange. (8.4 km in cable length, when 0.8 mm diameter cable is used)

Supply by means of digital MAS radio system:

To the areas beyond 6 km radius from local exchanges, digital MAS radio system is applied. Coverage of the system is as follows:

. Maximum distance from local exchange to subscriber radio station is 40 km.

. Each subscriber radio station covers subscribers within 4 km radius.
(6.0 km in cable length, when 0.8 mm diameter cable is used.)

Outlines of digital MAS radio system is given below:

- Radio Frequency : 1.5/2.4/2.6 GHz band
- Transmission Capacity : 4 Mbit/s
- Maximum number of subscribers to be accommodated : approx. 500 subs in case loss probability is 0.01 and average traffic is 0.096 erl/sub.
- Access System : DAMA (Demand Assigned Multiple Access)

Configuration of digital MAS radio system is available in Figure 10.

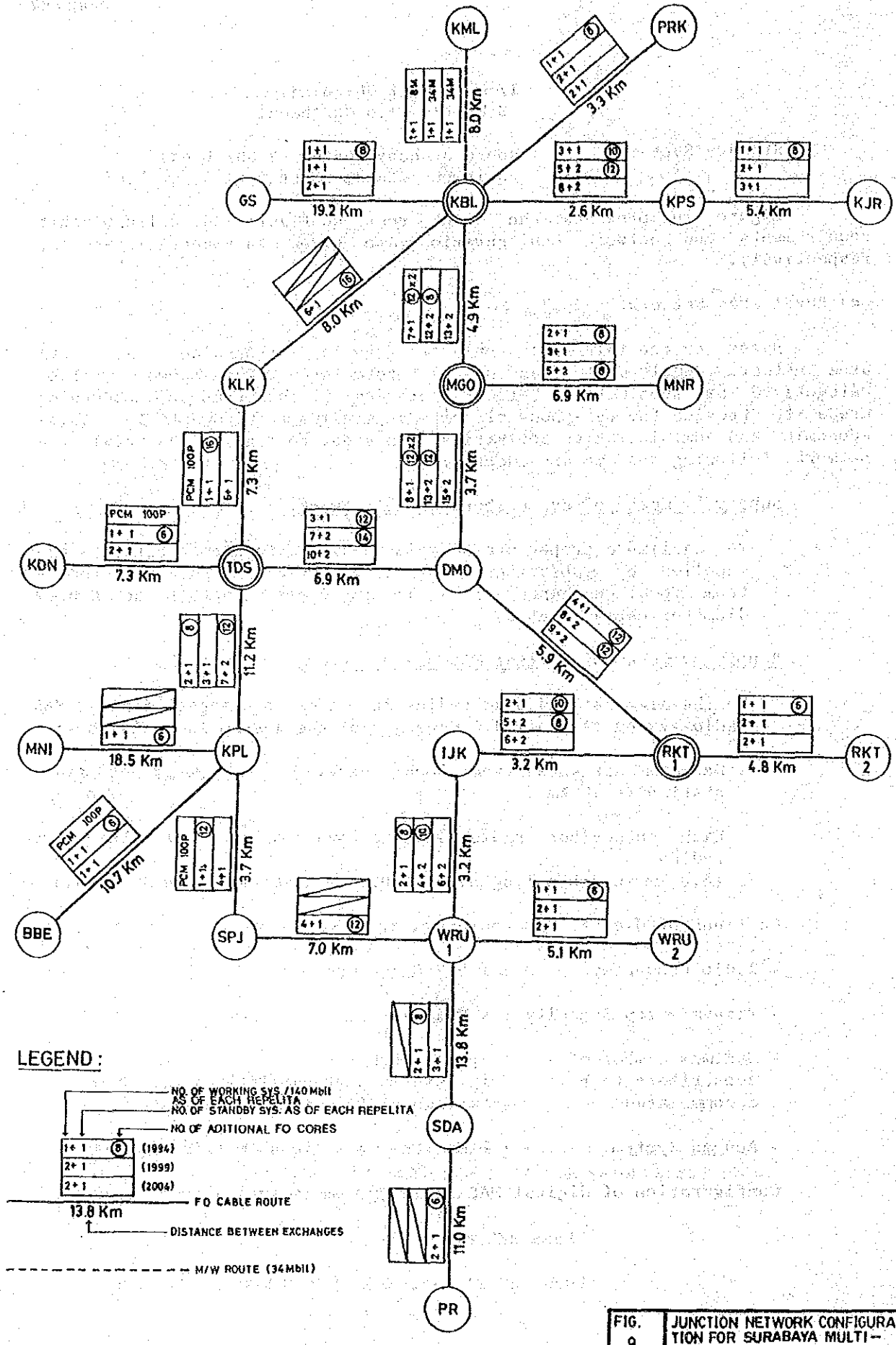


FIG. 9 JUNCTION NETWORK CONFIGURATION FOR SURABAYA MULTI-EXCHANGE AREA

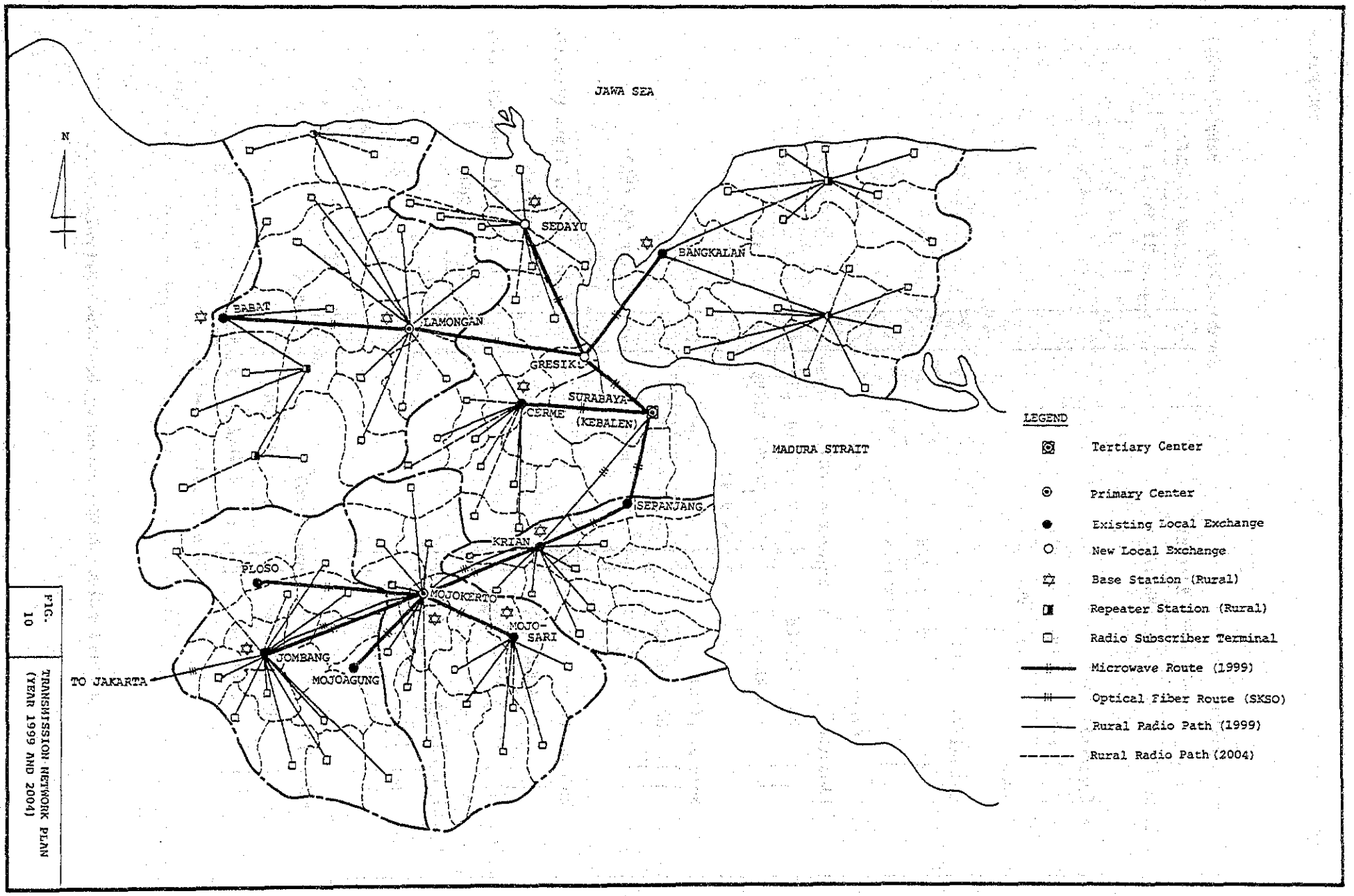


FIG. 10 TRANSMISSION NETWORK PLAN (YEAR 1999 AND 2004)

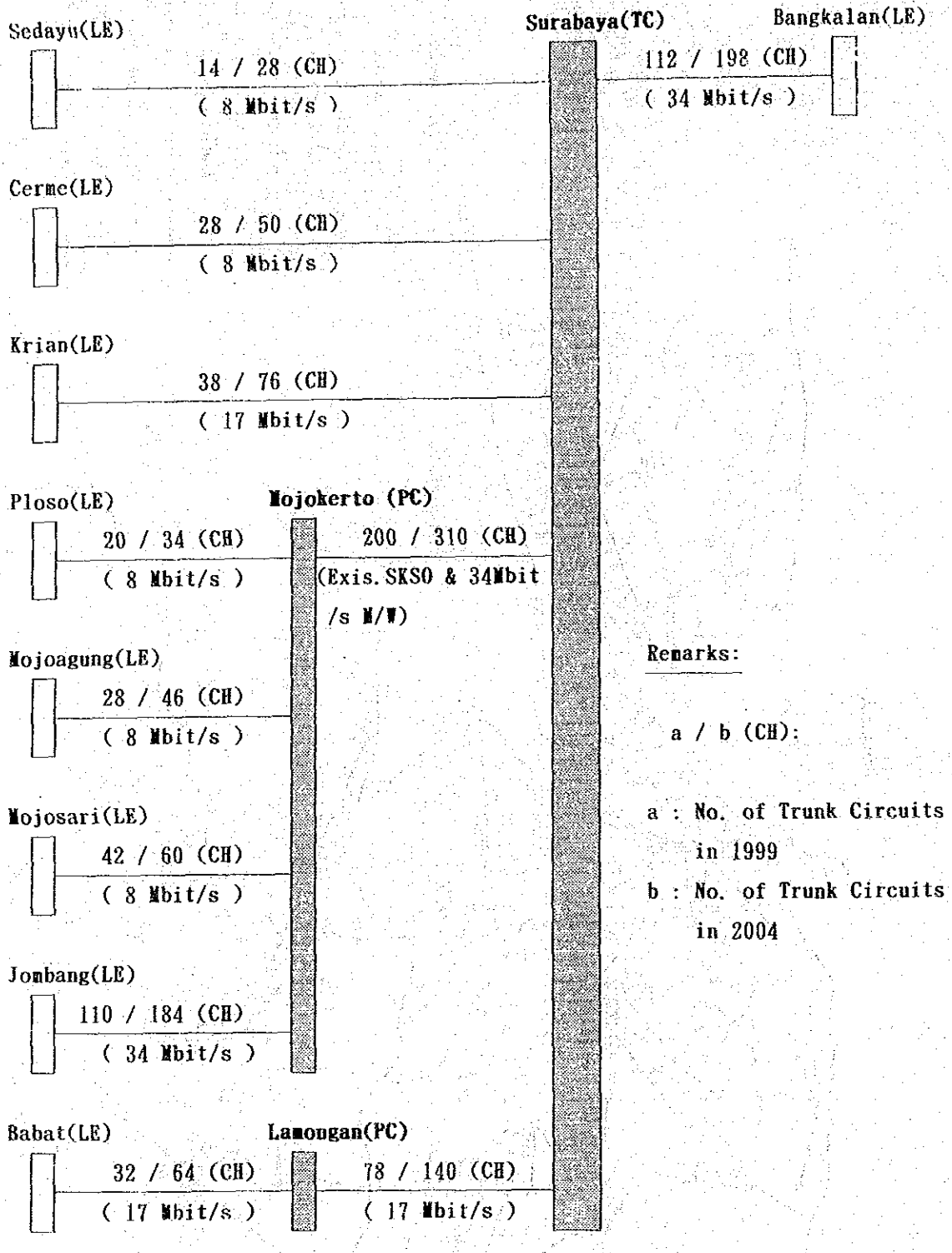


Figure 11 Circuit Requirements for Trunk Network

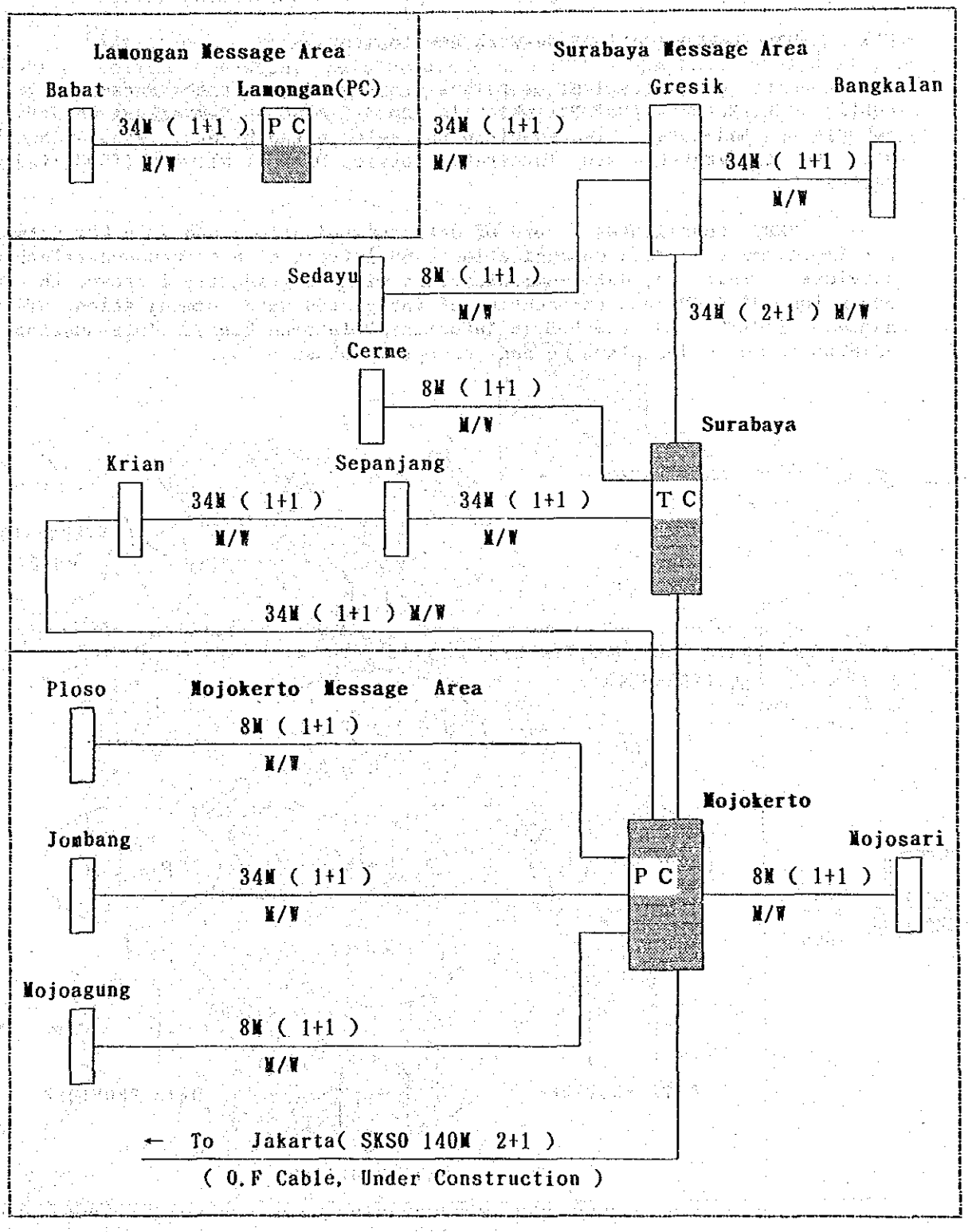


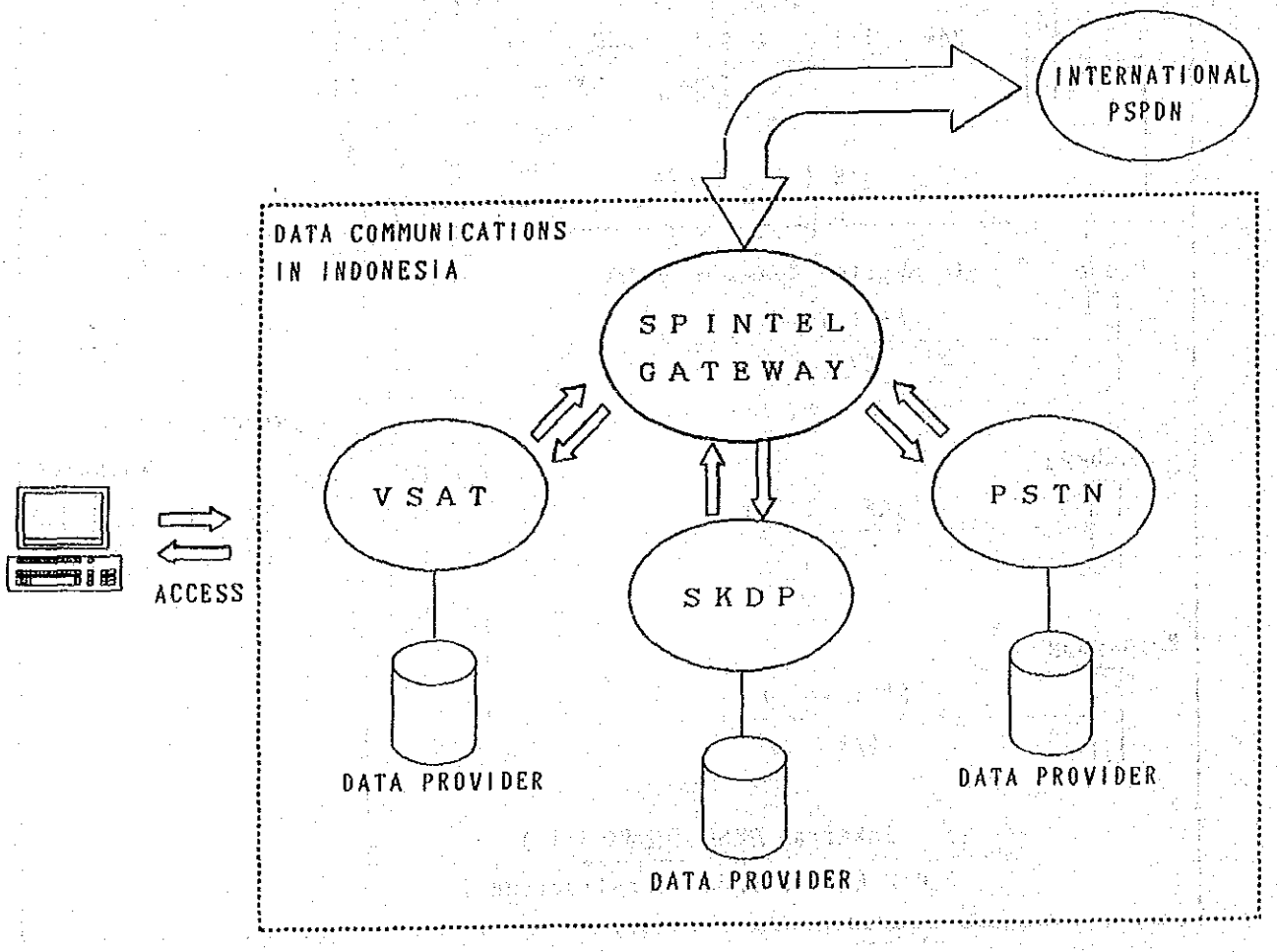
Figure 12 Network Configuration of Trunk Network (2004)

5.4 Development Plan for New Services

(1) Data Communications Network Development

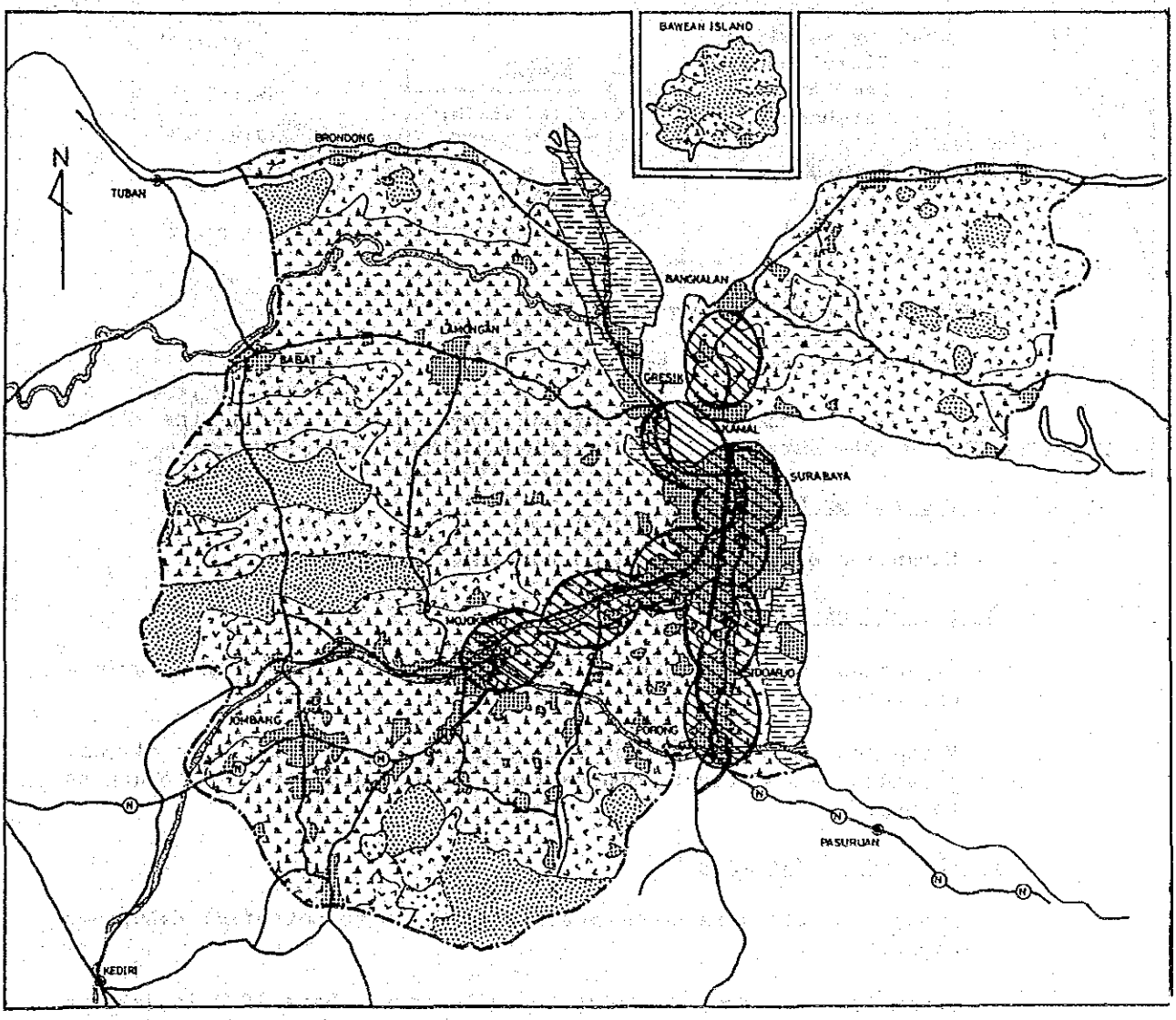
Data communications services are provided over the Packet Switched Public Data Network (PSPDN), which is named Sambungan Komunikasi Data Paket (SKDP) in Indonesia, leased circuits, telex network, etc. These networks will be integrated into Integrated Service Digital Network (ISDN) in the future.

SKDP constitutes a core of data communications and is a key network for improvement of data communications and introduction of new non-telephone services. That is, data communications will be gradually improved through expansion of SKDP and introduction of integrated data communications system named "SPINTEL" (Sistem Pebyan Informasi Telekomunikasi). Introduction of SPINTEL is now under planning and concept is shown below:



(2) Mobile Communications

Advanced cellular system will be installed in Surabaya as a new mobile telephone system. Service areas of mobile telephone service will be expanded toward its surrounding areas along with the national and provincial roads, taking the socio-economic activities and regional development into consideration. Proposed service areas are illustrated in the following figure:



(3) Integration of New Services Toward ISDN

New Services to be provided in the objective area are as follows:

- Teletex

- Videotex (Information service/Booking service)

  <Information service>
  - . 108 service (local directory information)
  - . Administration information
  - . Program and schedule of shows
  - . Schedule of flights
  - . Train and other transportation means

  <Booking service>
  - . Ticket booking
  - . Remote sales
  - . Telebanking

- Special services
  - . Telemetry
  - . Telecontrol
  - . Telealarm

- Facsimile (CCITT Group 4)

- MHS (Message Handling System)

Development strategies throughout the country until the end of Repelita VII for new services are summarized below:

By the end of Repelita V

- Expansion of new services to potential cities.

By the end of Repelita VI

- Expansion of data communication services to all the province capitals.

- Expansion of new services to potential cities which were already provided automatic telephone facility or were possible to access to SKDP.

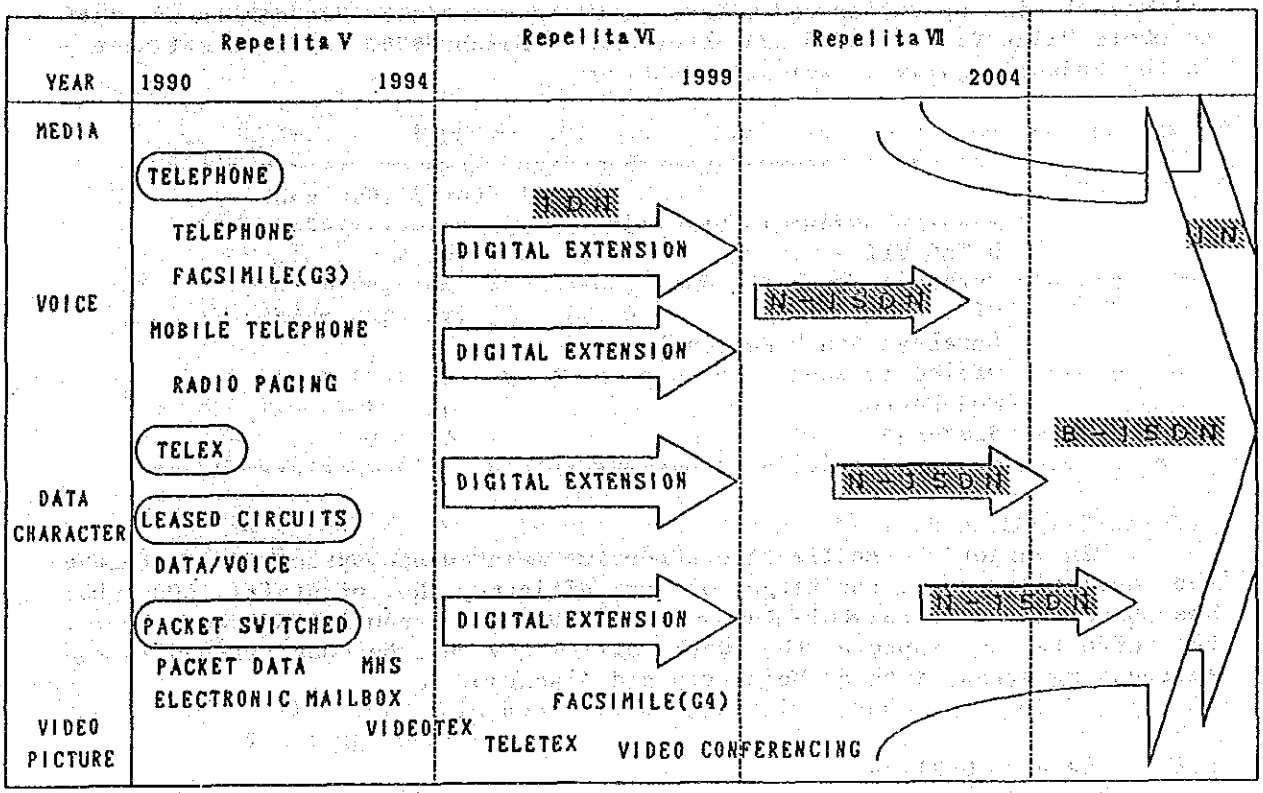
By the end of Repelita VII

- Expansion of data communication services to potential Kabupaten capitals

- Expansion of new services to build narrow band ISDN in Jakarta and in potential province capitals.

(4) Future Trend toward ISDN

ISDN service will be introduced in Metropolitan Jakarta area and and then expanded throughout Indonesia. Following figure shows the future trend toward ISDN in Indonesia.



5. OPERATION AND MAINTENANCE ASPECTS

As the telecommunications network expands in scale, its functions will become complicated, requiring more efficient operation and maintenance. To meet the requirement, most modern maintenance support system employing high technology should be introduced.

5.1 Work Efficiency

The number of staff is a key indicator to evaluate the work efficiency in operation and maintenance organization. The number of staff in whole WITEL VII totals 5,124 as of end of March 1990, and work efficiency in the objective area is summarized below:

	No. of staff/1,000 sub.
WITEL VII	45
Surabaya North Regional Office	15
Surabaya South Regional Office	11
Mojokerto	52
Sidoarjo	43

In order to realize the effective maintenance system and to reduce the operating cost, the target of work efficency (No. of staff/1,000 subs) has been set at 20 in whole Indonesia in 2004. As seen in the above table, the efforts to improve the work efficiency must be concentrated in the surrounding areas, such as Mojokerto and Sidoarjo.

5.2 Service Quality

Along with the recent growth of Indonesia's economy, poor quality of telecommunications services is often cited as a major constraint of economic growth. Low successful call ratio (SCR) and the high number of faults per line indicate a low quality of services. Especially, improvement of SCR is one of the most urgent matters in telecommunication services, not only in the objective area but also throughout Indonesia.

The current status of service quality in the objective area in terms of successful call ratio (SCR) is shown in the following table:

Exchange	Type of Switch	SCR (%)
Kebalen	Digital(STDI)	59
Kebalen	Analog(EMD)	41
Mergoyoso	Digital(STDI)	16
Mergoyoso	Analog(EMD)	24
Tj. Perak	Analog(EMD)	39
Mojokerto	Analog(EMD)	27
Sidoarjo	Analog(EMD)	24

Note: the above data are as of 1989 - 1990.

In order to improve the SCR, following must be taken into consideration:

- proper provision of local switching capacity;
- proper provision of local cable network well coordinated with switching capacity;
- proper provision of junction and trunk circuits, based on the traffic flow;
- effective utilization of existing facilities as much as possible;

In addition to the above, to reduce the incorrect dialling by subscribers, following must be taken into consideration:

- campaign for the subscribers to make dialling with telephone directory
- provision of telephone instrument with abbreviated dialling and re-dialling functions

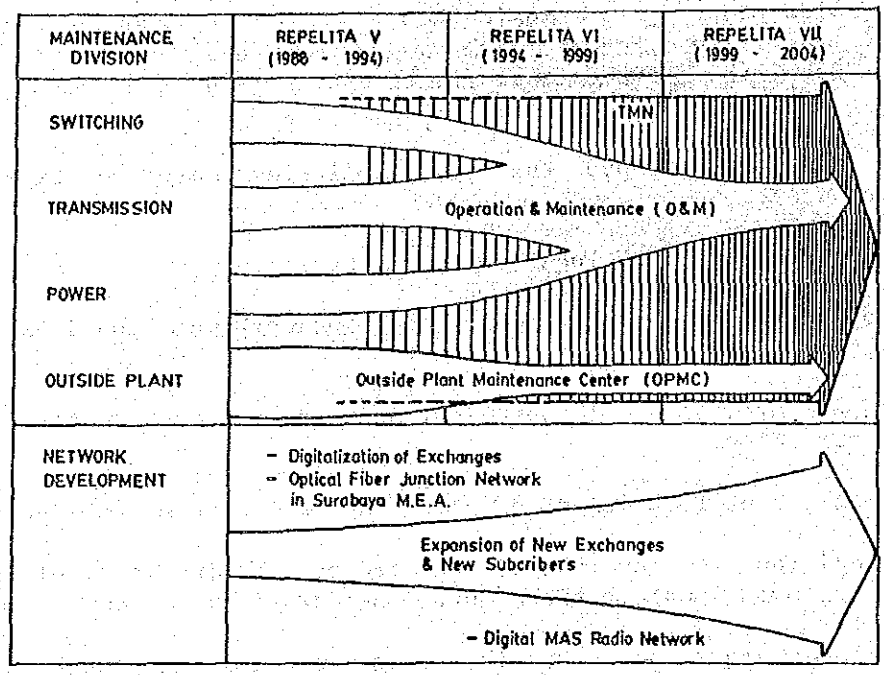
5.3 Modernization of Operation and Maintenance

Taking the effective maintenance organization into consideration, operation and maintenance organizations for inside plant facilities, such as switching, transmission, microwave and power plant must be integrated in operation and maintenance center (OMC) and modern maintenance support system employing high technology must be introduced.

Maintenance organization for outside plant will be improved by OPMC enhancement program.

By the end of Repelita VII, two categories of operation and maintenance organizations, i.e. OMC for inside plant and OPMC for outside plant, will be maintained respectively. However, above two organizations will be integrated in comprehensive operation and maintenance organization in the future ISDN environments.

Following is the concept of the integration plan for operation and maintenance organizations along with the development of telecommunication network.



6. SOCIO-ECONOMIC IMPACTS OF THE MASTER PLAN

6.1 General

The implementation of the proposed master plan is anticipated to give a variety of impacts on socio-economy of the study area. The anticipated impacts are identified and explained in the following parts for the following aspects:

- Impacts on regional development
- Impacts in urban and industrial areas
- Impacts in rural areas

6.2 Impacts on Regional Development

The development of telecommunications systems gives impacts on the pattern of regional development, especially in the aspects of locations of economic activities and settlements. The provision of telecommunications services in the areas where no services or only limited services have been available will change the locational advantages of these areas resulting in the development of new spatial development patterns.

In the study area, northern areas in Kabupaten Gresik and Lamongan and hinterland areas of Kamal in Kabupaten Bangkalan are planned to develop as the new industrial areas. Combined with the development of other infrastructure facilities, the development of telecommunications systems in these areas will play a major role in attracting private investors to these areas in accordance with the stipulated government policies.

So far, communications between Surabaya and these areas have been quite inconvenient. With these improvements, on-time communication between these areas become possible greatly improving the attractiveness of the areas as investment location.

For the telecommunications sector to effectively generate positive socio-economic impacts in the aspect of regional development, planning and implementation of the telecommunications systems in the future should be based on a wider perspective incorporating:

- future prospect in regional development,
- good understanding of development trends in other sectors, and
- quick and timely response to private investors' trends.

6.3 Impacts in Urban and Industrial Areas

Surabaya and the surrounding areas in Sidoarjo and Gresik have been the center of industrial production and tertiary sector activities as well as the hub of land, air and sea transportation systems in the East Jawa Province. Surabaya's role as the commercial and financial center of the region will become even larger as industrialization proceeds in the surrounding areas and opportunities for international transactions increase in the coming years.

Through the development, convenience of the telecommunications services will be increased in the following aspects.

- Telecommunications services become accessible to a larger number of the population. (It is estimated that the number of subscribers in the Surabaya Multi-exchange Area grows from 60,000 in 1989 to 400,000 in 2004.)

- For subscribers, telephone services become more convenient (e.g. higher call completion rate).

- For subscribers in the Surabaya Message Area, it becomes possible to make phone calls to a more distant partner at a lower cost.

These improvements in telecommunication services are expected to generate a number of positive impacts on socio-economic activities in Surabaya and the surrounding areas as summarized below.

- increased efficiency of production process (e.g. in shipping, purchase of raw materials, communications with transport companies, obtaining information on market conditions, coordinating production with other factories, adjustment of stocks, etc.)

- improved efficiency of transportation system: the complimentary role of the telecommunications sector (e.g. full loading made possible, minimization of idle time, misrouting, unnecessary trips, badly timed trips, empty return trips etc.)

- energy saving through reduced travel generation: the substituting role of the telecommunications sector (Requirements for communication could partly be met by telecommunications services in stead of trips on road leading to reduced number of trips and smaller amount of energy consumed.)

- increased business opportunities, both domestic and international, and associated increase in production

- easier and quicker communications with partners in overseas markets or native countries enhancing efficiency in international business

- increased variety of new services made available in addition to telephone services, enabling highly efficient business operations

6.4 Impacts in Rural Areas

The study area encompasses a large proportion of rural areas and the rural population accounting for the majority of the total population in the study area. In the Master Plan, telecommunications services in rural areas are planned to be provided by rural radio telephone system.

The development and expansion of telecommunications systems in rural areas of the study area are anticipated to improve access of the rural people to a variety of information, thus leading to upgrading living standards and increasing productivity.

The following are the major socio-economic benefits of the proposed master plan in the rural areas.

- Improved emergency communications:
- Improved health services:
- Increased productivities in agriculture and fisheries:
- Improved efficiency of commercial activities:
- Transportation system and travel demand:

7. ESSENTIAL PROJECT

7.1 General

The project to be implemented during the latter half of Repelita V and former half of Repelita VI is selected as a essential project, to reach the targets established in the master plan. The project implementation program will be drawn up including the following:

- Necessity of the project implementation;
- Scope of essential project;
- Basic design;
- Project cost estimate;
- Implementation schedule; and
- Financial analysis and economic benefit.

The essential project covers the "Expansion and Improvement of Regional Telecommunications Network" and consists of the following:

- Expansion of junction network in Surabaya multi-exchange area;
- Improvement of trunk network connecting TC, PC and LE in the objective area; and
- Improvement of rural area network connecting subscribers in Kecamatan capitals.

7.2 Necessity of the Project Implementation

- Expansion of junction network

  Junction network in Surabaya multi-exchange area should be expanded urgently in consequence of the integration of Gresik and other cities into the multi-exchange area, and to cope with the demand increase in the multi-exchange area.

- Improvement of aged facilities in the trunk network

  Trunk network connecting SC (Surabaya), PC and LE in the objective area should be digitalized coordinated with telephone exchange digitalization program, aiming at the completion of IDN (Integrated Digital Network) toward future ISDN introduction.

- Construction of rural area network

  Rural area network should be constructed to expand the telephone service up to all the Kecamatan capitals to realize a medium-term development target established in the master plan.

7.3 Scope of Essential Project

Route map and network configurations of essential project are shown in Figures 13 through 15.

7.4 Project Cost Estimate

The project cost required for implementing the essential project is estimated as follows:

Foreign currency portion:	Yen	3,570 million
	(Rp.	44,625 million equivalent)
Local currency portion	: Rp.	6,373 million
Total Cost	: Rp.	50,998 million

Note: The exchange rate applied are:
US$ 1 = Rp. 1,850 = Yen 148 (as of August 1990)

7.5 Implementation Schedule

Implementation schedule of Essential Project is given in Table 4.

7.6 Financial Analysis of Essential Project

Based on the costs and revenues estimated, a cash flow of the essential project is prepared. From the cash flow, financial internal rate of return (FIRR) is calculated and the result reaches 14.05 % for a standard case before tax. It is found from the FIRR before tax that the essential project is financially sound and worth being promoted to the implementation stage. The FIRR in the standard case, 14.05 %, is higher than most of lending interest rates of international financing agencies such as the World Bank, the Asian Development Bank, the Overseas Economic Cooperation Fund of Japan, etc. This indicates that project generates revenues at a level high enough to earn profit to repay interests of the loan from these agencies.

7.7 Economic Analysis of Essential Project

The economic analysis tries to clarify the project's contribution to the national economy, while the financial analysis focused on the project's profitability for the government sector.

Costs estimated for the financial analysis are converted to economic costs that would closely reflect the true utilization of resources. Revenue estimated for the financial analysis are used as benefit regarding them as representing part of consumers' willingness to pay.

Economic internal rate of return (EIRR) is calculated based on the estimated costs and benefit and result reaches 14.85 %. The World Bank estimates that the opportunity cost of capital, a criterion compared with EIRR for judging the feasibility of projects, in developing countries ranges somewhere between 8 and 15 %. The essential project proposed in the Study, therefore, is highly likely to generate return at a rate higher than the opportunity cost of capital.

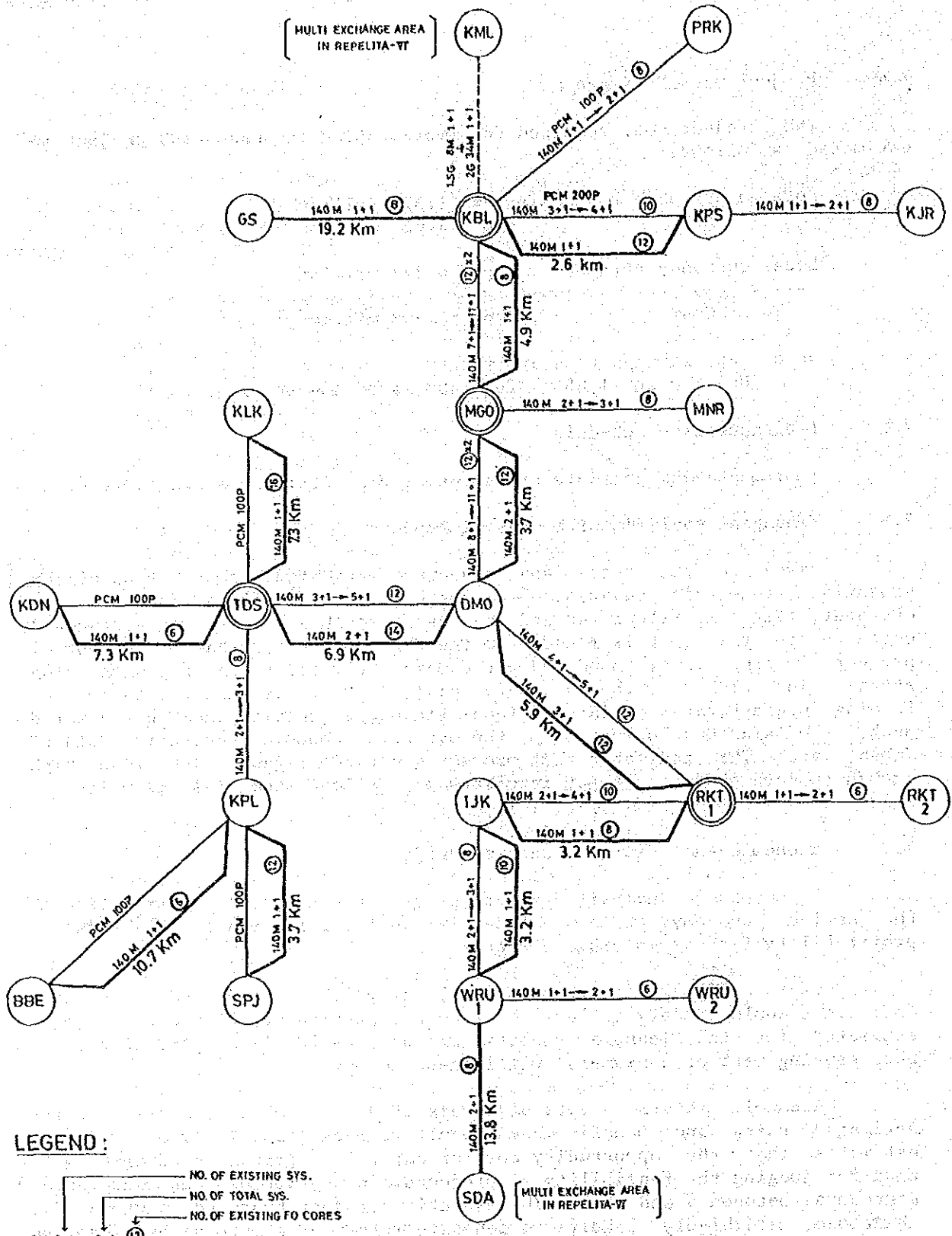


FIG. 13 — JUNCTION NETWORK CONFIGURATION FOR ESSENTIAL PROJECT IN MULTI-EXCHANGE AREA

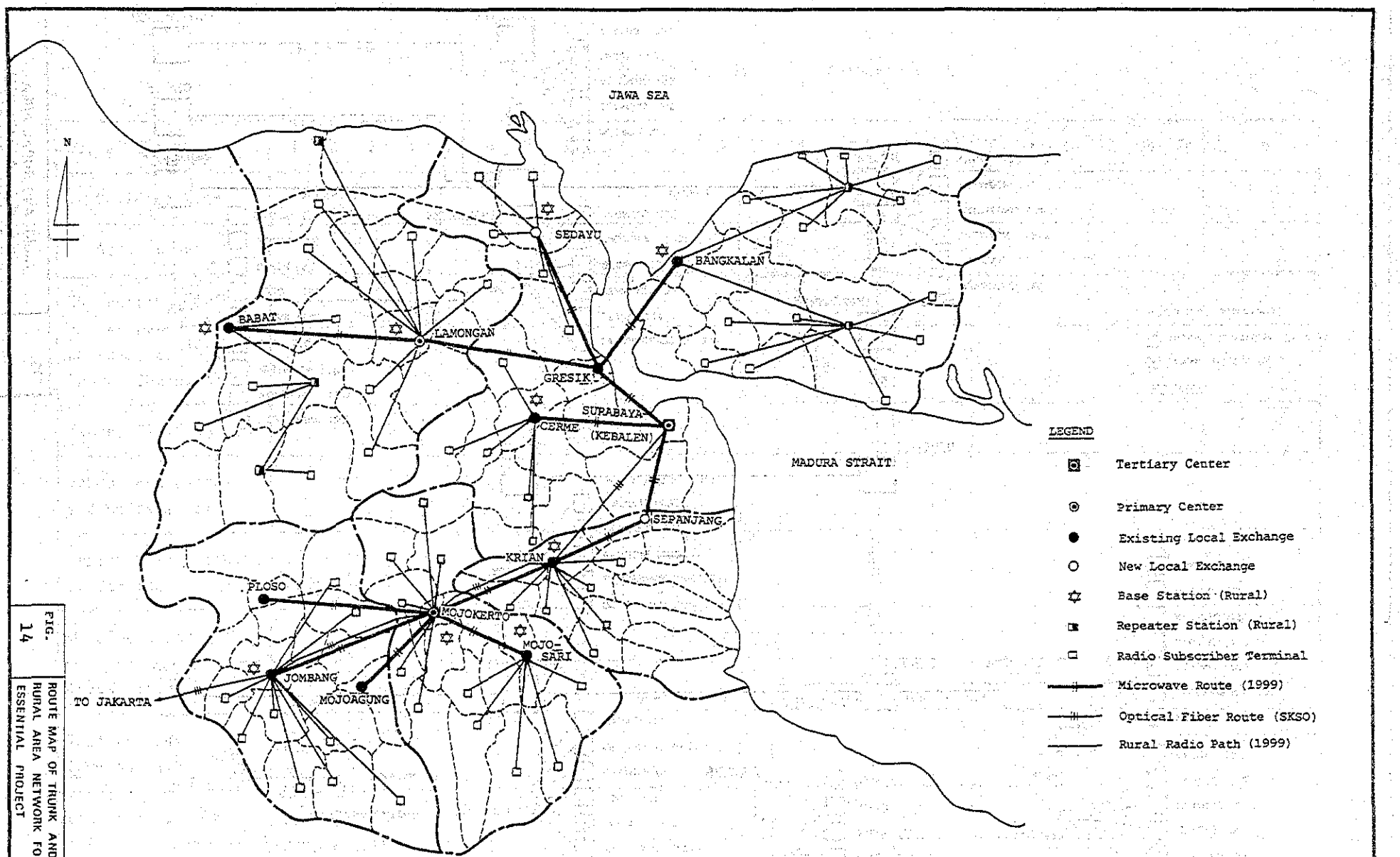


FIG. 14 ROUTE MAP OF TRUNK AND RURAL AREA NETWORK FOR ESSENTIAL PROJECT

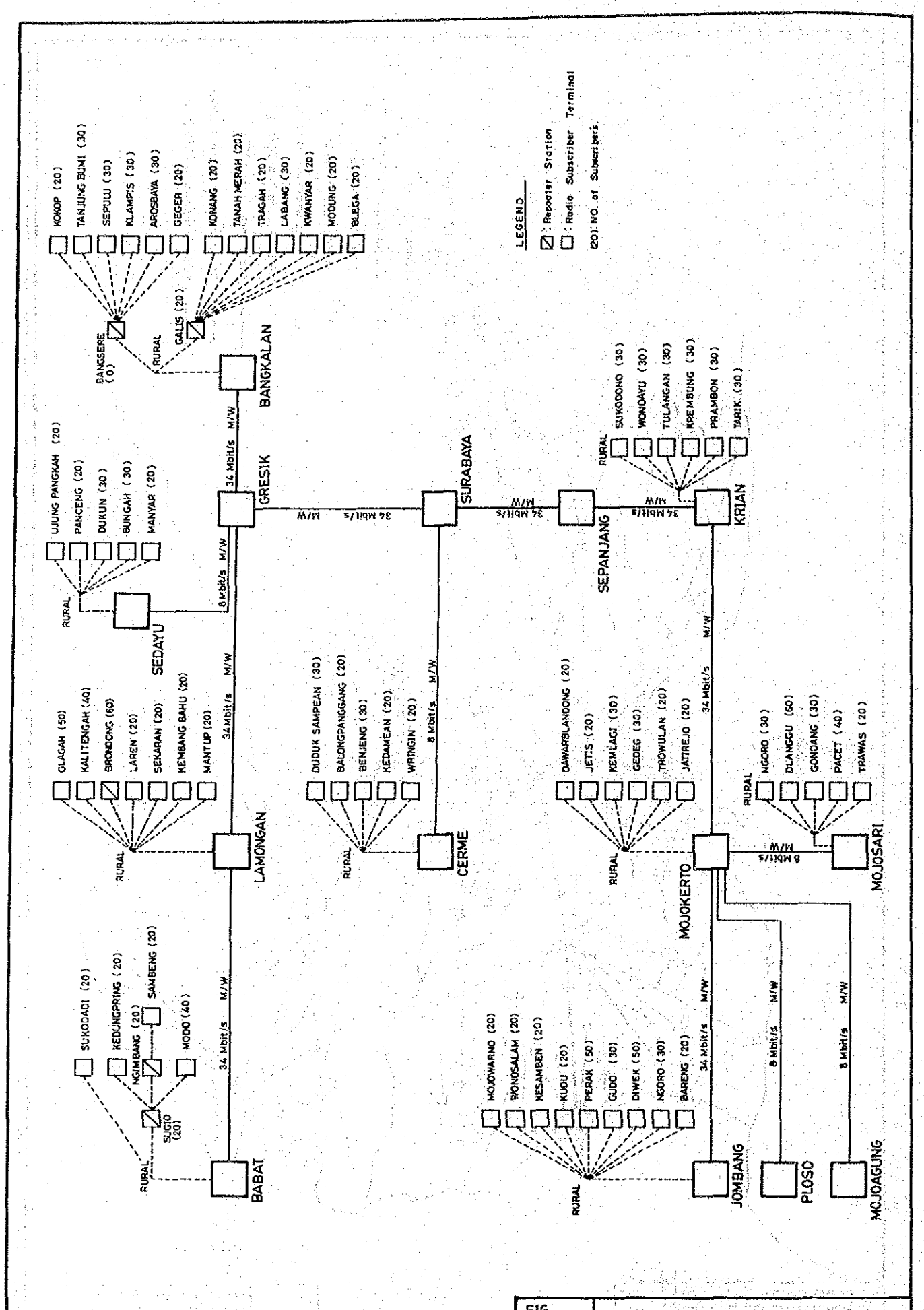


FIG. 15 TRUNK AND RURAL AREA NETWORK CONFIGURATION FOR ESSENTIAL PROJECT

Table 4 Implementation Schedule of Essential Project