THE REPUBLIC OF INDONESIA

STUDY REPORT

ON

LONG TERM PLANNING

FOR

DEVELOPMENT OF TELECOMMUNICATIONS SYSTEM

(VOLUME [illegible])

A PROPOSAL FOR REPELITA V

FEBRUARY 198[illegible]

JAPAN INTERNATIONAL COOPERATION AGENCY

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CONTENTS

VOLUME II A PROPOSAL FOR REPELITA-V

LIST OF TABLES

LIST OF FIGURES

WORDS AND ABBREVIATIONS

DITJEN POSTEL	:	Directorate General of Posts and Telecommunications
PERUMTEL	:	Telecommunication Common Carrier in Indonesia
WITEL	:	Regional Bureau of PERUMTEL
JICA	:	Japan International Cooperation Agency
PELITA-IV	:	The 4th 5 Year National Development Plan
REPELITA-V	:	The 5th 5 Year National Development Plan
Kotamadya	:	Municipality
Kabupaten	:	Regency
Kecamatan	:	Sub District
Desa	:	Village
ISC	:	International Switching Centre
TC	:	Tertiary Centre
SC	:	Secondary Centre
PC	:	Primary Centre
LE	:	Local Exchange
RSU	:	Remote Switching Unit
L.U.	:	Line Unit
IDN	:	Integrated Digital Network
ISDN	:	Integrated Services Digital Network
PALAPA	:	Name of Indonesian Satellite
SBB	:	Large Type Earth Station
SBS	:	Medium Type Earth Station
SBK	:	Small Type Earth Station
SCPC	:	Single Channel Per Carrier
GDP	:	Gross Domestic Product
IRR	:	Internal Rate of Return

Abbreviation of Exchange/Radio Station Name (1/6)

Abb.	Name	WITEL	Abb.	Name	WITEL
All	Alue Billie	I	Beb	Bejurbang	III
Amh	Amahai	XI	Blw	Belawan	I
Ab	Ambon	XI	Bks	Bekasi	IV
Apr	Amlapura	VIII	Bs	Bengkalis	II
Aph	Ampah	IX	Bek	Bengkayang	IX
Apn	Ampana	X	Bn	Bengkulu	III
Apl	Ampelu	II	Beo	Beo	X
Arl	Anyer Kidul	IV	Bia	Biak	XII
Agr	Argamakmur	III	Bim	Bima	VIII
Aja	Arjasa	VII	Bji	Binjai	I
Atb	Atambua	VIII	Bti	Bintuni	XII
Baa	Baa	VIII	Bir	Bireuen	I
Bag	Bagansiapi-api	I	Btg	Bitung	X
Bjw	Bajawa	VIII	Bbs	Blang Basah	I
Bui	Bakahuni	III	Bbg	Blang Bintang	I
Bak	Bakongan	I	Bkj	Blang Kejeren	I
Blk	Balaikarangan	IX	Bgg	Blang Lancang	I
	Balai Metereologi		Bpd	Blang Pidie	I
Bmm	Medan	I	Bl	Blitar	VII
Blg	Balige	I	Bla	Blora	VI
Bpp	Balikpapan	IX	Boo	Bogor	V
Bug	Balung	VII	Bj	Bojonegoro	VII
Bna	Banda Aceh	I	Bo	Bondowoso	VII
Bd	Bandung	V	Btn	Bonthain	X
Bdhm	Bandung Hegarmanah	V	Bpa	Bonto Pataha Kayua	X
Bka	Bandung Komatau	V	Bse	Bonto Seretene	X
Bgi	Banggai	X	Bto	Bonto Tino	X
Bg	Bangil	VII	Bbr	Borobudur	VI
Bkl	Bangkalan	VII	Bsm	Bukit Asam	III
Bgk	Bangkinang	II	Bbk	Bukit Bakan	VIII
Bko	Bangko	VII	Bbt	Bukit Balat	VIII
Bjr	Banjar	V	Ppg	Bukit Papagar	I
Bjb	Banjarbaru	IX	Bba	Bukit Batu Tiga	I
Bjm	Banjarmasin	IX	Bbn	Bukit Bunut	III
Bjw	Banjawa	VIII	Bki	Bukit Imum	I
Ba	Banjarnegara	VI	Bjk	Bukit Jorongkoak	VIII
Bte	Bantaeng	X	Bkm	Bukit Kemuning	III
Bw	Banyuwangi	VII	Bpk	Bukit Paku	III
Bau	Bau-bau	X	Bpj	Bukit Panjang	III
Bcu	Baucau	VIII	Bdk	Bukit Pedukuh	III
Brh	Barahaau	III	Brk	Bukit Sarik	II
Brs	Barus	I	Bsb	Bukit Subang	II
Btg	Batang	VI	Bsp	Bukit Sulap	III
Bmn	Bathe Tamon	I	Bsl	Bukit Sulasih	II
Btu	Batu	VII	Btb	Bukit Tambulun	II
Br	Batu Ampar	II	Bth	Bukit Tengah	VIII
Bta	Batu Raja	III	Bkt	Bukit Tinggi	II
Bsk	Batu sangkar	II	Bua	Bunta	X
Bts	Batu Tulis	V	Bnt	Buntok	IX
Bwn	Bawean	VII	Cag	Calang	I

Abbreviation of Exchange/Radio Station Name (2/6)

Abb.	Name	WITEL	Abb.	Name	WITEL
Crb	Caruban	VII	Gen	Genteng	VII
Cpr	Ceper	VI	Gsr	Geser	XI
Cpu	Cepu	VI	Gin	Gianyar	VIII
Cm	Ciamis	V	Gmk	Gilimanuk	VIII
Cj	Cianjur	V	Gc	Glecut	I
Cbd	Cibadak	V	Gla	Gohor Lama	I
Cbt	Cibatu	V	Gb	Gombing	VI
Cbb	Cibeber	V	Gl	Gendang Logi	VI
Cbi	Cibinong	IV	Gt	Gorontalo	X
Clk	Cicalengka	V	Gs	Gresik	VII
Ccr	Cicurug	V	Gbl	Gunung Balau	III
Ckp	Cikampek	V	Gbd	Gunung Benda	V
Cpa	Cikupa	IV	Gbs	Gunung Besek	VII
Cp	Cilacap	VI	Ggj	Gunung Gajah	III
Clg	Cilegon	IV	Gge	Gunung Gebug	VII
Cmi	Cimahi	V	Ggd	Gunung Gending	VII
Cns	Cipanas	V	Gkg	Gunung Gerakan Lalang	VII
Cps	Cipasung	V	Gls	Gunung Geulis	IV
Cjg	Ciranjang	V	Gkn	Gunung Karamaian	IX
Crt	Cirata	V	Gkw	Gunung Kuwarakan	VII
Cbn	Cirebon	V	Gmn	Gunung Medan	II
Crg	Cireungas	V	Gmw	Gunung Melawang	VII
Clb	Cisarua Lembang	V	Gml	Gunung Mengkol	III
Cwd	Ciwidey	V	Gpd	Gunung Pandan	VIII
Cml	Comal	VI	Gpg	Gunung Pandan Palembang	III
Cmg	Cot Mancang	I	Gpn	Gunung Pinang	IV
Cmn	Cot Mineui	I	Grj	Gunung Rajabasa	III
Cug	Curug	IV	Gsn	Gunung Sandangan	VII
Crp	Curup	III	Gsl	Gunung Slawi	VI
Dbs	Dobo Singkep	II	Gst	Gunung Sitoli	I
Dyk	Dayeuh Kolot	V	Gtp	Gunung Tumpa	X
Dwn	Dawuan	V	Hlb	Haloban/P.Banyak	I
Dl	Delanggu	VI	Hls	Hulusiau	X
Dm	Demak	VI	Id	Idi	I
Dpr	Denpasar	VIII	Idg	Indarung	II
Dli	Dilli	VIII	Im	Indramayu	V
Dob	Dobo	XI	Jll	Jailolo	XI
Dmg	Dolok Martimbang	I	Jkt	Jakarta	IV
Dsh	Dolok Sibohi	I	Jcc	Jakarta Conoco	IV
Dsg	Dolok Simarjarunjung	I	Jfp	Jakarta Five Pilars	IV
Dsk	Dolok Singkut	I	Gts	Jakarta Gatotsubroto	IV
Dtl	Dolok Tolong	I	Jkm	Jakarta Kemayoran	IV
Dpu	Dompu	VIII	Jrp	Jakarta Ratu Plaza	IV
Ff	Fak-fak	XII	Jsb	Jakarta Slumberger	IV
Gk	Gadok	V	Jb	Jambi	III
GLg	Galang	I	Jli	Jangli	VI
Gda	Gandaria	IV	Jto	Jatiroto	VII
Grt	Garut	V	Jap	Jayapura	XII
Gdn	Gedangan	VII	Jef	Jefman	XII
Gem	Gempol	VII	Jr	Jember	VII

Abbreviation of Exchange/Radio Station Name (3/6)

Abb.	Name	WITEL	Abb.	Name	WITEL
Jpr	Jepara	VI	Kng	Kuningan	V
Jm	Jeuram	I	Kp	Kupang	VIII
Jg	Jombang	VII	Kut	Kuta	VIII
Kbj	Kabanjahe	I	Ktn	Kutacane	I
Kmn	Kaimana	XII	Kdg	Kwandang	X
Kai	Kalanahi	VIII	Lhj	Labuan Haji	I
Klt	Kalisat	VII	Lba	Labuha	XI
Kln	Kaliwungu	VI	Lha	Laha/Pelud Pattimura	XI
Kmg	Kamojang	V	Lt	Lahat	III
Kan	Kandang	I	Lhw	Lahewa	I
Kad	Kandangan	IX	Lai	Laiwui	XI
Ka	Karang Anyar	VI	Lmg	Lamongan	VII
Krg	Karang Joang	IX	Lno	Lamno	I
Krw	Karawang	V	Lgs	Langsa	I
Krj	Karimun Jawa	VI	Lrt	Larantuka	VIII
Ksn	Kasungan	IX	Lr	Larat	XI
Kay	Kayu Agung	III	Lw	Lawang	VII
Km	Kebumen	VI	Lem	Lembang	V
Kd	Kediri	VII	Lsl	Leksula	XI
Kef	Kefamenanu	VIII	Lek	Leok	X
Kl	Kendal	VI	Lwa	Lewoleba	VIII
Kdi	Kendari	X	Loa	Lhok Nga	I
Kdn	Kendawangan	IX	Lsm	Lhok Sumawe	I
Kts	Kertosono	VII	Lsk	Lhok Sukon	I
Ktp	Ketapang	IX	Lrg	Lirung	X
Kis	Kisaran	I	Lpg	Lompong	VI
Kba	Koba	III	Lrk	Lorok	III
Kko	Kokonao	XII	Lps	Lospalos	VIII
Kka	Kalaka	X	Lku	Lubuk Arau	II
Kol	Kolonedale	X	Llg	Lubuk Linggau	III
Kta	Kotoagung	III	Lbp	Lubuk Pakam	I
Ktb	Kotabaru P. Laut	IX	Lbs	Lubuk Sikaping	II
Kb	Kotabumi	III	Ln	Lumajang	VII
Ktg	Kotamobagu	X	Lk	Luwuk	X
Kk	Klakah	VII	Mn	Madiun	VII
Kt	Klaten	VI	Mg	Magelang	VI
Klo	Klino	VII	Mat	Magetan	VII
Kw	Krawang	V	Mja	Majalaya	V
Krn	Krian	VII	Mjl	Majalengka	V
Kya	Kroya	VI	Ml	Malang	VII
Kur	Krue	III	Mjn	Majene	X
Kgh	Krueng Geukeuh	I	Mia	Maliana	VIII
Kra	Krueng Raya	I	Mln	Malinau	IX
Kkp	Kuala Kapuas	IX	Mmj	Mamuju	X
Kkn	Kuala Kurun	IX	Mo	Manado	X
Kpa	Kuala Pembuang	IX	Mai	Mandai	X
Kjg	Kuala Tanjung	I	Mw	Manokwari	XII
Ktl	Kuala Tungkal	III	Ma	Maos	VI
Ksg	Kuala Simpang	I	Mrb	Marabahan	IX
Ks	Kudus	VI	Mra	Marisa	X

Abbreviation of Exchange/Radio Station Name (4/6)

Abb.	Name	WITEL	Abb.	Name	WITEL
Mrs	Maros	X	Pd	Padang	II
Msh	Masohi	XI	Pp	Padang Panjang	II
Mtr	Mataram	VIII	Psp	Padangsidempuan	I
Mme	Maumere	VIII	Pgk	Pagak	VII
Mdn	Medan	I	Pgt	Pagatan	IX
Mlk	Melak	IX	Pgm	Pagimana	X
Mpw	Mempawah	IX	Pyn	Paguyaman	X
Mgl	Menggala		Pai	Painan	II
Mrk	Merauke	XII	Pbr	Pakanbaru	II
Mca	Merica	VI	Plk	Palangkaraya	IX
Met	Metro	III	Pg	Palembang	III
Mbo	Meulaboh	I	Plp	Palopo	X
Mid	Midai	II	Pal	Palu	X
Moj	Mojo Agung	VII	Pm	Pamekasan	VII
Mr	Mojokerto	VII	Pda	Pandaan	VII
Mrt	Morotai	XI	Pdg	Pandeglang	V
Mam	Muaro Aman	III	Ppg	Panggung Pinang	III
Mbn	Muara Bulian	III	Pkn	Pangkajane	X
Mab	Muara Bungo	III	Pbd	Pangkalanbrandan	I
Mae	Muara Enim	III	Pbu	Pangkalanbun	IX
Mkt	Muara Ketalo	III	Pgp	Pangkal Pinang	III
Mmt	Muara Muntai	IX	Pgr	Pangururan	
Mar	Muara Rupit	III	Pma	Panorama	I
Mbt	Muara Siberut	II	Pyb	Panyabungan	I
Msk	Muara Sikabaluan	II	Pmn	Pariaman	II
Mtw	Muara Teweh	IX	Pgi	Parigi	X
Mc	Muncar	VII	Pe	Pare	VII
Nab	Nabire	XII	Pre	Pare-pare	X
Nra	Naira	XI	Psw	Pasir Srewen	V
Nla	Namlea	XI	Pwl	Pasir Walad	V
Nas	Namosira-sira	I	Ps	Pasuruan	VII
Ngp	Nangaipinoh	IX	Pt	Pati	VI
Ngt	Nanggatayap	IX	Ph	Pauh	III
Ntl	Natal	I	Py	Payakumbuh	II
Nsr	National Semi Conductor	V	Pen	Pedan	VI
Ngr	Negara	VIII	Pk	Pekalongan	VI
Nhl	Negara Bumihilir	III	Pml	Pemalang	VI
Nwn	New Town	I	Pms	Pematang Siantar	I
Ngb	Ngabang	IX	Pta	Pengaran Tonga	I
Nj	Nganjuk	VII	Pwg	Perawang	II
Nw	Ngawi	VII	Pdo	Pelud Adi Sucipto	VI
Npj	Nipah Panjang	III	Pds	Pelud Adi Sumarno	VI
Nbs	Ngalau Basurat	II	Pas	Pelud Atang Senjaya	V
Nys	Notog Banyumas	VI	Pbi	Pelud Branti	III
Nnk	Nunukan	IX	Pbt	Pelud Buluh Tumbang	III
Nda	Nusa Dua	VIII	Pc	Pelud Cengkareng	IV
Nbn	Nusakambangan	VI	Pet	Pelud Eltari	VIII
Ot	Ot Palaning	VIII	Phn	Pelud Hasanuddin	X
Pn	Pacitan	VII	Pkt	Pelud Kalijati	V
Pdl	Padalarang	V	Pmh	Pelud Mau Hau	VIII

Abbreviation of Exchange/Radio Station Name (5/6)

Abb.	Name	WITEL	Abb.	Name	WITEL
Pnr	Pelud Ngurah Rai	VIII	Rgt	Rengat	II
Ppi	Pelud Pangkalpinag	III	Rgj	Rogojampi	VII
Ppm	Pelud Patimura/Laha	XI	Rtg	Ruteng	VIII
Psi	Pelud Samratulangi	X	Rbi	Rumbai	II
Psn	Pelud Sepinggan	IX	Sab	Sabang	I
Pst	Pelud Simpang Tiga	II	Sa	Salatiga	VI
Psd	Pelud Supadio	IX	Smr	Samarinda	IX
Pss	Pelud Syamsuddin Noor	IX	Sbs	Sambas	IX
Ptb	Pelud Tabing	II	Spt	Sampit	IX
Pwm	Pelud Wolter Monginsidi	X	Snn	Sahana	XI
Prl	Peureula	I	Sag	Sangau	IX
Pir	Piru	XI	Spr	Saparua	XI
Plh	Pleihari	IX	Smi	Sarmi	XII
Pch	Ponccranakah	VIII	Srw	Sarolangun	III
Poc	Pondok Cabe	IV	Sml	Saumlaki	XI
Po	Ponorogo	VII	Swl	Sawahlunto	II
Ptk	Pontianak	IX	Seb	Seba	VIII
Pso	Poso	X	Sna	Sedanau	II
Pbm	Prabumulih	III	Sdd	Sedandang	VI
Ppt	Prapat	I	Sbr	Sei Brombang	I
Pya	Praya	VIII	Sky	Sekay	III
Pge	Prigen	VII	Skn	Sekupang	II
Pb	Probelinggo	VII	Slp	Selat Panjang	II
Phg	Pulau Halang	I	Sly	Selayar	X
	Pulau Panjang	IV	Smn	Selimban	IX
Pls	Pulau Sambu	II	Slr	Seloduwur	VI
Pja	Pulau Tanah Jarpea	X	Sel	Selong	VIII
Pto	Pulau Telo	I	Sm	Semarang	VI
Pps	Pulau Pisau	IX	Stu	Semitau	IX
Pck	Puncak (Pasir Sumbu)	V	Stn	Sentani	XII
Pbg	Purbalingga	VI	Spj	Sepanjang	VII
Pkc	Puruk Cahu	IX	Sg	Serang	IV
Pwk	Purwakarta	V	Srs	Serasan	II
Pwt	Purwokerto	VI	Srp	Serpong	IV
Pwd	Purwodadi	VI	Sru	Serui	XII
Pwr	Purworejo	VI	Sak	Siak Sri Indrapura	II
Pj	Pusri Jakarta	IV	Sbg	Sibolga	I
Plg	Pusri Palembang	III	Sib	Siborong-borong	I
Pta	Putu Sibau	IX	Sdk	Sidikalang	I
Rha	Raha	X	Sda	Sidoarjo	VII
Rlg	Raja Lenang	I	Sdg	Sidolegi	VII
Rbp	Rambi Puji	VII	Sgi	Sigli	I
Rai	Ranai	II	Sjj	Sijunjung	II
Rck	Rancaekek	V	Skk	Sikakap	II
Rdu	Rangdu/Gunung Tumpeng	VIII	Sik	Simpang Perikanan	III
Rk	Rangkas Bitung	IV	Spu	Simpang Ulin	I
Rap	Rantau Prapat	I	Snb	Sinabang	I
Rsk	Ransiki	XII	Sgr	Singaraja	VIII
Rtp	Rantepao	X	Sw	Singkawang	IX
Rst	Rasam Tapanggang	II	Skl	Singkil	I

Abbreviation of Exchange/Radio Station Name (6/6)

Abb.	Name	WITEL	Abb.	Name	WITEL
Sgs	Singosari		Ttn	Tapak Tuan	I
Stg	Sintang	IX	Tar	Tarakan	IX
Sir	Sipora	II	Trt	Tarutung	
Sit	Situbondo	VII	Tsm	Tasikmalaya	V
Smt	Smelter	I	Tpw	Tebing Pelawi	III
Ssu	Soa-Siu/Tidore	XI	Ttk	Tebing Tangkas	III
Se	Soe	VIII	Tbt	Tebing Tinggi	I
Slo	Solo/Surakarta	VI	Tl	Tebing Tinggi	III
Slk	Solok	II	Tg	Tegal	VI
Son	Sorong	XII	Tyo	Telemoyo	VI
Sod	Sorong Doom	XII	Tdm	Teluk Dalam	I
Sba	Subah	VI	Tlk	Teluk Kuantan	II
Su	Subang	V	Tld	Teluk/Tanjung Leidong	I
Sus	Subus Salam	I	Tmg	Temanggung	VI
Si	Sukabumi	V	Tbn	Tembilahan	II
San	Sukadana	IX	Tmb	Teminabuan	XII
Ski	Sukamandi	V	Tta	Tentena	X
Sbw	Sumbawa Besar	VIII	Tea	Tepa	XI
Smd	Sumedang	V	Ter	Terempa	II
Smp	Sumenep	VII	Tt	Ternate	XI
Slt	Sungai Liat	III	Tla	Tilamuta	X
Spn	Sungai Penuh	II	Tob	Tabelo	XI
Sb	Surabaya	VII	Toi	Toili	X
Sla	Suralaya	V	Tli	Toli-Toli	X
Tbn	Tabanan	VIII	Tmh	Tomohon	X
Tlg	Tagulandang	X	Tna	Tonasa	X
Thn	Tahuna	X	Tgs	Tongas	VII
Tkn	Takengon	I	Tul	Tual	XI
Tbu	Talang Betutu/Pelud	III	Tn	Tuban	VII
Tly	Taliwang	VIII	Tub	Tuban	VIII
Tmi	Taman Mini	IV	Ta	Tulung Agung	VII
Tbe	Tambelan	II	Tu	Turen	VII
Tml	Tamiang Layang	IX	Ubr	Ujung Berung	V
Tgt	Tanah Grogot	IX	Up	Ujung Pandang	X
Tmr	Tanah Merah	XII	Ula	Ulu Air Silaja	I
Tng	Tanggerang	IV	Usk	Ulu Sikakanan	IX
Tgl	Tanggul	VII	Whi	Wahai	XI
Tse	Tangse	I	Wkb	Waikabubak	VIII
Tan	Tanjung	IX	Wgp	Waingapu	VIII
Tjb	Tanjung Balai	I	Wki	Wakai	X
Tbk	Tanjunng Balai Karimun	II	Wlr	Waleri	VI
Tjt	Tanjung Batu	II	Wam	Wamena	XII
Tjk	Tanjung Karang	III	Wnr	Wanaraja	V
Tma	TanJung Morawa	I	Wci	Wanci	X
Tjn	Tanjung Pandan	III	Wtp	Watampone	X
Tpi	Tanjung Pinang	II	Wda	Weda	XI
Tas	Tanjung Sari	V	Wng	Wonogiri	VI
Tjs	Tanjung Selor	IX	Ws	Wonosobo	VI
Tnr	Tanjung Redeb	IX	Wri	Wonreli	XI
Tgu	Tanjung Uban	II	Yk	Yogyakarta	VI

CHAPTER 1
INTRODUCTION

CHAPTER 1 INTRODUCTION

The objectives of national development in Indonesia during REPELITA-V plan are to establish the self-supplying capability of foods in the agricultural sector and to promote and establish business firms manufacturing capital goods. The role of telecommunications is to support firmly the realization of these national development objectives.

To meet this requirement, development of the telecommunications services during the REPELITA-V period is mainly focused on reduction of ever increasing waiting applicants and expansion of subscriber automatic dial network as far as to the rural areas.

The proposed number of new line units to be installed during the REPELITA-V period is 1,000,000 in addition to the carry over program from PELITA-IV. To realize this target, necessary planning policies, facility expansion plans and detailed project lists are proposed.

In this proposal for REPELITA-V, the following basic conditions were considered;

1) The average annual growth rate of GDP will be 5%.
2) The carry over from PELITA-IV program will be 200,000 L.U.
3) The necessary fund for facility expansion will be available sufficiently.

If these conditions are changed, the modification of this plan will be necessary.

CHAPTER 2
DEMANDS FORECASTS AND DEVELOPMENT TARGETS

CHAPTER 2 DEMANDS FORECASTS AND DEVELOPMENT TARGETS

2-1 The Planning Policies

(1) Service Offering Plan

Proposed public telecommunication services up to 1994 are as follows;

1) Telephone Service
   - Ordinary telephone service
   - Following new telephone service by digital switching system
     a) Teleconference
     b) Call rate display
     c) Caller number identification
     d) Call transfer
   - The SLDD service to the all Kotamadya and Kabupaten capitals

2) Telegraph Service
   - Quick delivery service to the all Kecamatan capitals

3) Telex Service
   - Low speed telex service
   - Teletex service (in the all Kotamadyas)

4) Facsimile Service
   - Subscriber facsimile (G-III)
   - Public facsimile by BIROFAX (at the all telegraph offices)

5) Packet Switched Data Communication Service (in the all Kotamadyas)

6) Radio Paging Service (in principal cities)

7) Land Mobile Telephone Service (in principal cities)

8) Non-switched Line Service
   - Telephone
   - Telegraph
   - Data Communication
   - Others

(2) Facility Development Policies

The policies employed during the REPELITA-V period are as follows;

1) Development is to be mainly in the urban areas, while in rural areas, the network will be extended up to the Kabupaten capitals and principal Kecamatan capitals.

2) Fully supply to waiting applicants at the end of REPELITA-IV

3) Reduction of waiting time for telephone installation
   - In urban area, 2 weeks (min.) to 5 years (max.)
   - In rural area, 7 years (max.)

4) Replacement of obsolete facilities

5) Promotion of automatization and digitalization

6) Larger traffic distribution ratio to terrestrial transmission systems than satellite systems

7) Improvement of the completion call rate

(3) Operation and Management Policies

The policies during the REPELITA-V period are as follows;

1) Reduction of number of staffs per subscriber

2) Reviewing of the tariff system

3) Enhancement of efficiency in the departments of planning, construction, operation and maintenance by the introduction of Network Management System

4) Expansion of the education and training centers

2-2 Telephone Service Development Plan

2-2-1 Demand Forecast

Based on the total national demand forecast reported in the VOLUME-I of this Report, telephone service subscriber demands for each WITEL, for Kotamadya and for Kabupaten are estimated.

(1) Demands for WITELs

The number of potential subscribers (demand size) for the WITELs in the end of REPELITA-V (1994) was estimated by distributing the total number of potential subscribers according to the distribution shares obtained by the WITEL model.

(2) Demands for Kabupaten and Kotamadya

1) Kabupaten demands

The number of potential subscribers (demand size) for the Kabupaten areas was estimated by using the Kabupaten model. (Refer to the VOLUME-I of this report.) Necessary corrections were made by taking into consideration the number of subscribers and waiting applicants as of December 1985, and the expected number of line units at the end of PELITA-IV.

2) Kotamadya demands

The number of potential subscribers (demand size) for the Kotamadya areas was obtained by subtracting the sum of the Kabupaten demand sizes in WITELs.

Demand size for each Kotamadya within a WITEL is calculated by distribution share of the corresponding number of subscribers plus waiting applicants as of December 1985. Necessary corrections were also made on the results by the same way as described in the calculation of the Kabupaten demands.

Table 2-2-1 shows estimated demands for the WITELs.

Table 2-2-1 Telephone Demand for WITELs in 1994

Name of WITEL	WITEL DEM By Wit-Mdl	WITEL DEM Share (%)	Shared INT DEM	KOTA DEM By WITEL	KAB DEM By WITEL
I	385,000	8.7	385,000	324,000	61,000
II	124,000	2.8	123,000	83,000	40,000
III	217,000	5.0	233,000	180,000	53,000
IV	1,344,000	29.8	1,286,000	1,245,000	41,000
V	547,000	12.4	566,000	438,000	128,000
VI	428,000	10.0	445,000	310,000	135,000
VII	692,000	16.0	716,000	528,000	188,000
VIII*	179,000	4.0	177,000	0	177,000
IX	198,000	4.5	198,000	150,000	48,000
X	239,000	5.4	240,000	175,000	65,000
XI	31,000	0.7	32,000	22,000	10,000
XII*	30,000	0.7	30,000	0	30,000
TOTAL	4,414,000	100.0	4,431,000	3,455,000	976,000

Note: 5% of GDP annual growth rate
Plan 2 in supply speed
* WITEL without KOTAMADYA

2-2-2 Capacity Expansion

(1) Expansion Policies

1) To expand capacity in the urban areas centered around Kotamadya.

2) To plan network expansion and automatization of manual exchanges in the rural areas centered around the Kabupaten capitals.

(2) Proposed Capacity Expansion

1,000,000 line units and associated facilities will be newly added to the system during REPELITA-V.

(3) Distribution of Capacity

1) Capacity Expansion of the WITELs

The new addition of 1,000,000 L.U. is distributed among the WITELs according to respective exchange capacities at the end of PELITA-IV.

Distribution among Kotamadya/Kabupaten was made for each WITEL.

The distribution of new additions was decided by the expected exchange capacity shares at the end of PELITA-IV. As the result, Kotamadya/Kabupaten distribution share ratio become about 78:22.

2) Capacity Expansion of Kotamadya

According to PELITA-IV, capacity expansion is proposed in 45 Kotamadyas (83%) out of 54 Kotamadyas, while by REPELITA-V capacity expansion into all the Kotamadya areas is proposed.

The capacity distribution to each Kotamadya is made by the share of the expected capacity expansion amount in each WITEL at the

end of PELITA-IV. Some corrections was made considering the existing capacity and demand.

3) Capacity Expansion of Kabupaten

Capacity expansion of Kabupaten will be determined by taking into account the following policies and the situations of capacity and demand in the exchanges;

a) Installation of telephone exchanges in all the Kabupaten capitals currently without the service.
b) Automatization of manual PC exchanges.
c) Reduction of waiting applicants in automatic exchanges.
d) Automatization of other important manual local exchanges.

Based on the above policies, the number of Kabupaten proposed for new capacity expansion during the REPELITA-V period is 189 which accounts for the 77% of 246 Kabupatens in the country.

Table 2-2-2 shows the Kotamadya/Kabupaten distribution share of capacity expansion in REPELITA-V. The telephone supply plan for each Kotamadya and Kabupaten is shown in ANNEX-1.

Table 2-2-2 Telephone Supply Plan for REPELITA-V

WITEL	Capacity Share(end of IV)			Supply Volume for REPELITA-V		
	Total(%)	Kota(%)	Kab(%)	Total(LU)	Kota(LU)	Kab(LU)
I	9.0	79.5	20.5	90,000	71,000	19,000
II	2.9	63.2	36.8	29,000	18,000	11,000
III	5.0	73.6	26.4	50,000	37,000	13,000
IV	32.5	96.9	3.1	325,000	315,000	10,000
V	11.0	70.2	29.8	110,000	77,000	33,000
VI	8.9	70.8	29.2	89,000	63,000	26,000
VII	15.0	81.5	18.5	150,000	122,000	28,000
VIII	4.1	0	100.0	41,000	0	41,000
IX	4.6	72.3	27.7	46,000	33,000	13,000
X	5.5	68.3	31.7	55,000	38,000	17,000
XI	0.8	56.1	43.9	8,000	5,000	3,000
XII	0.7	0	100.0	7,000	0	7,000
Total	100.0	77.9	22.1	1,000,000	779,000	221,000

2-3 Non-Telephone Service Development Plan

2-3-1 Telex Service

Estimated telex subscriber demand in 1994 is 39,182, but suppose 20% of this demand is shifted to facsimile service as mentioned in the VOLUME-I of this report, the telex demand goes down to about 31,000.

At the end of PELITA-IV, telex capacity is expected to reach 32,300 L.U. which can afford the expected demand until 1994. In view of this, expansion of telex facility is not proposed during the REPELITA-V period.

2-3-2 Facsimile Service

The estimated number of potential facsimile service subscribers in 1994 is 26,500. This figure represents only 1% of the telephone exchange capacity of 2,650,000.

Therefore, it is considered appropriate to provide the facsimile service by the telephone network. Furthermore, there will be no need for specific facsimile network plan.

Public service facsimile terminals will be installed in all telegraph handling offices. The number is about 1,000 units.

2-3-3 Data Communication Service

(1) Demand Forecast

The subscriber demand in 1994 is estimated to 2,075 in whole Indonesia. Since the demand sources of data communications service subscribers and telex service subscribers are considered to be the same, the data communications service subscriber demand is distributed to each WITEL by the WITELs telex service demand share. The results are shown in Table 2-3-1.

Table 2-3-1 Data Communication Service Subscriber Demand by WITEL in 1994

WITEL	Ratio	Data Demand	Principal City
I	0.08	166	Medan
II	0.04	83	Padan
III	0.05	104	Palembang
IV	0.42	872	Jakarta
V	0.06	124	Bandung
VI	0.06	124	Semarang
VII	0.12	249	Surabaya
VIII-XII	0.17	353	Denpasar, Banjarmasin, Ujungpandang
Total	1.00	2,075	

(2) Supply Targets

All demand in principal cities will be satisfied. The supply targets are proposed as indicated in Table 2-3-2.

Table 2-3-2 Data Communication Service Supply Plan

City	Data Terminals
Medan	200
Palembang	100
Jakarta	900
Bandung	200
Semarang	200
Surabaya	300
Denpasar	100
Batam Island	100
Total	2,100

2-3-4 Radio Paging Service

Based on the demand forecast as estimated in VOLUME-I, in principal cities where the demand exceeds about 2000, the service will be introduced. The supply plan is shown in Table 2-3-3.

Table 2-3-3 Radio Paging Service Supply Plan

City	Paging L.U.
Jakarta	26,000
Surabaya	7,000
Bandung	4,000
Medan	4,000
Semarang	2,000
Ujung Pandang	2,000
Total	45,000

2-3-5 Land-Mobile Radio Telephone Service

Based on the demand forecast as estimated in VOLUME-I, the service will be introduced to principal cities where the demand exceeds about 500. The supply plan is shown in Table 2-3-4.

Table 2-3-4 Land-Mobile Radio Telephone Service Supply Plan

City	Mobile Telephone
Jakarta	3,500
Bandung	1,500
Semarang	1,000
Surabaya	2,000
Total	8,000

2-4 Management Strategies

As the results of the study in the long-term development plan, the following service strategies are proposed for REPELITA-V;

(1) Marketing Plan

In the all service categories, i.e, telephone, telex and new services, the approx. 100% of facility capacity will be connected to subscribers. By this marketing plan, the facility utilization rate will increase, then the revenue from subscribers will increase. The total number of telephone subscriber will reach to 2,650,000 and the telephone density will be 1.33 per 100 persons in 1994.

(2) Manpower Plan

To reduce the operating and maintenance cost, the number of PERUMTEL staff personnel per 1000 subscribers will be reduced to 41 persons.

(3) Tariff System

For telephone service, the call fee will be increased to Rp.85/pulse in the real term (December 1986 price). The charging zone classification will also be changed from 5 zones to 7 zones. By these changes the revenue from subscribers will increase.

The installation fee and monthly rental fee will be increased, if possible.

(4) Fund Plan

The fund plan for facility expansion is proposed as follows;

-PERUMTEL internal reserve	30%
-Government equity	10%
-External fund	60%

CHAPTER 3
TRAFFIC FORECASTS AND CIRCUITS CALCULATION

CHAPTER 3 TRAFFIC FORECASTS AND CIRCUIT CALCULATION

3-1 Telephone Service Traffic Forecast

In Indonesia, since well organized real data of measured live traffic between centrals are not available, a statistical model is to be used inevitably for the traffic forecast.

To achieve an effective processing of the data required for the formation of traffic matrix and consequent circuit calculations, at first toll traffic forecast between Secondary Centers (SC) was made. Toll traffic forecast between SC and Primary Center (PC) was made later.

It is essential that an attention should be paid on the fact that the results obtained by the statistical model may not represent real traffic volume sometimes. Therefore, careful considerations are requested when dimensioning of facility is made.

3-1-1 Telephone Traffic between SCs

(1) Formulation of the Model

Through the regression analysis of actual traffic data in 114 sections, the following gravity model was formulated for the toll telephone traffic forecast.

$$\log X_{ij} = -4.095 + 0.510\log S_i + 0.570\log S_j - 1.653\log P_{ij} + 0.185D \times \log P_{ij}$$

$$R = 0.85$$

where

log : Natural logarithmic operator

X_{ij} : Traffic from the i th secondary area to the j th area (Erlang)

S_i : The number of subscribers in the i th secondary area

S_j : The number of subscribers in the j th secondary area

P_{ij} : The number of charging pulses for the minute-call from the i th secondary area to the j th area

D : Dummy variable (For incoming and outgoing with Jakarta D = 1, Others D = 0)

In this model, the number of charging pulses per unit time (P_{ij}) was introduced as a variable which explains both geographical and economic distance between SCs. The dummy variable (D) is also used to adjust characteristic difference between the traffic to/from Jakarta and other areas.

Data used for the regression analysis are outlined as follows;

1) Traffic Data between Exchanges (X_{ij})

Toll traffic data (busy hour traffic between principal exchanges) as of 1984 were obtained from TRAFFICEL of PERUMTEL (Data of 112 links in total). Unbalanced traffic between incoming and outgoing were modified to some extent.

2) Subscriber Data (S_i, S_j)

The number of subscribers for each exchange as of 1984 was obtained from BINPROSENTEL of PERUMTEL and summarized for each Secondary area.

3) Charging Pulse Data (P_{ij})

The number of charging pulses per minute between SCs was estimated by the tariff table effective as of 1984 obtained from MATEL of PERUMTEL.

(2) Traffic Estimation

The busy hour toll traffic between Secondary areas was estimated by using the regression model. The total exchange capacity in each Secondary area at the end of REPELITA-V was used for the number of subscribers, as shown in Table 3-1-1. The current tariff system was also applied for the charging pulse data. Some corrections were made on the forecasted results and the used data of 112 links so as to make the initial value the same as the actual value by modifying the constant of the model.

Results are shown in the form of 40x40 matrix in Table 3-1-2.

From the traffic matrix, total traffic originating and incoming for each Secondary area are summarized in Table 3-1-3.

Table 3-1-1 Exchange Capacity by Secondary Area in 1994

FILE:SECOND.CAP

Exchange capacity by Secondary Area for REPELITA V

Secondary Area		CAPACITY END OF	DURING REPELITA-V		CAPACITY FOR END OF REPELITA-V		
Code	Trunk Center	PELITA-IV	REMOVE	SUPPLY	TOTAL	DA	TER + PA
21	JAKARTA	568,390	-430	341,000	908,960	0	908,960
22	BANDUNG	130,675	-3,090	78,600	206,185	400	205,785
23	CIREBON	20,860	-1,700	15,400	34,560	0	34,560
24	SEMARANG	68,290	-1,310	38,600	105,580	0	105,580
27	YOGYAKARTA	47,800	-1,300	29,800	76,300	0	76,300
28	PURWOKERTO	31,930	-2,530	20,600	50,000	0	50,000
31	SURABAYA	166,865	-1,120	101,600	267,345	600	266,745
33	JEMBER	24,640	-300	13,600	37,940	0	37,940
34	MALANG	39,008	-640	21,000	59,368	0	59,368
35	MADIUM	19,490	-1,960	13,800	31,330	600	30,730
36	DENPASAR	38,310	-1,600	18,600	55,310	0	55,310
37	SUMBAWA BESAR	5,016	-440	5,400	9,976	400	9,576
38	ENDE	3,400	-850	4,600	7,150	200	6,950
39	KUPANG	22,380	-770	12,400	34,010	2,600	31,410
41	UJUNG PANDANG	42,560	-2,610	29,200	69,150	600	68,550
42	PARE-PARE	6,500	-2,500	8,400	12,400	2,000	10,400
43	MANADO	25,890	-1,000	14,000	38,890	600	38,290
45	PALU	9,636	-640	1,400	10,396	800	9,596
40	KENDARI	7,300	-1,300	2,000	8,000	1,400	6,600
51	BANJARMASIN	29,410	-2,610	18,000	44,800	2,000	42,800
53	SAMPIT	5,210	-860	2,400	6,750	1,250	5,500
54	SAMARINDA	26,500	-400	14,200	40,300	600	39,700
55	TARAKAN	1,700	-250	1,600	3,050	1,050	2,000
56	PONTIANAK	14,500	-2,150	9,800	22,150	2,050	20,100
61	MEDAN	122,590	-1,130	69,200	190,660	1,200	189,460
63	SIBOLGA	5,000	-850	4,800	8,950	1,000	7,950
64	LHOK SEUMAWE	8,660	-300	6,000	14,360	800	13,560
65	BANDA ACEH	13,980	-1,100	10,000	22,880	3,050	19,830
71	PALEMBANG	33,420	-800	19,800	52,420	1,600	50,820
72	TANJUNG KARANG	21,950	-300	11,800	33,450	600	32,850
73	LAHAT	13,323	-2,050	10,000	21,273	1,400	19,873
74	JAMBI	14,200	-1,000	8,400	21,600	2,200	19,400
75	PADANG	22,990	-430	13,600	36,160	1,800	34,360
76	PEKANBARU	15,386	-1,050	9,400	23,736	3,496	20,240
77	SEKUPANG	10,176	-720	6,000	15,456	800	14,656
91	AMBON	9,950	-150	6,000	15,800	1,200	14,600
92	TERNATE	3,594	-254	2,000	5,340	1,540	3,800
95	SORONG	1,550	-450	3,000	4,100	1,050	3,050
96	JAYAPURA	9,350	-700	3,000	11,650	1,000	10,650
97	MERAUKE	1,130	-50	1,000	2,080	1,080	1,000
	G TOTAL	1,663,509	-43,694	1,000,000	2,619,815	40,966	2,578,849

NOTE DA:Demand Assignment.
NOTE TER:Terrestrial link.
NOTE PA:Preassignment.

Table 3-1-2 Toll Telephone Traffic between SCs in 1994 (1/2)

***** Distributed Outgoing traffic in Erlang from Si to Sj *****

Xeij	JKT(21)	BD (22)	CBN(23)	SM (24)	YK (27)	PWT(28)	SB (31)	JR (33)	ML (34)	MN (35)	DPR(36)	SBW(37)	END(38)	KP (39)	UP (41)	PRE(42)	MO (43)	PAL(45)	KDI(40)	BJM(51)	SPT(53)
JKT(21)	0.00	885.45	72.94	240.28	128.72	113.38	461.79	91.33	48.17	80.99	99.61	22.98	19.14	45.22	116.91	24.08	91.60	23.00	18.58	58.51	30.38
BD (22)	868.90	0.00	71.80	46.57	12.58	35.42	77.27	24.60	31.75	21.81	4.50	5.74	4.78	11.30	17.63	6.02	12.65	5.75	4.64	26.35	8.18
CBN(23)	115.21	73.03	0.00	11.31	23.72	21.42	26.61	9.90	12.78	8.78	12.28	4.52	1.93	4.55	7.10	2.42	5.09	2.31	1.87	10.61	3.29
SM (24)	274.78	39.61	9.63	0.00	108.23	74.96	114.83	17.50	36.34	36.11	21.70	7.98	3.40	8.04	12.54	4.28	9.00	4.09	3.30	18.75	5.82
YK (27)	120.94	12.05	22.62	97.79	0.00	58.70	25.12	14.83	30.80	30.60	6.45	6.77	2.88	6.81	10.63	3.63	7.63	3.47	2.80	15.88	4.93
PWT(28)	125.06	31.82	19.97	59.37	84.50	0.00	36.33	11.95	15.43	17.06	14.82	5.45	2.32	5.49	8.57	2.92	6.15	2.79	2.26	12.80	3.98
SB (31)	465.29	73.02	14.51	86.30	25.58	32.86	0.00	65.32	171.56	57.93	37.37	8.91	5.46	12.90	40.74	13.43	7.60	6.56	5.30	49.48	9.34
JR (33)	110.50	27.22	9.85	18.61	15.46	12.15	73.43	0.00	31.18	14.82	29.95	4.74	3.95	4.77	14.55	4.97	5.34	2.43	1.96	11.12	3.45
ML (34)	47.67	34.21	12.37	37.62	31.26	15.27	214.03	30.36	0.00	26.92	26.03	5.95	4.96	5.99	18.28	6.24	6.71	3.05	2.46	13.98	4.34
MN (35)	98.24	24.45	8.84	38.88	32.31	17.56	65.95	15.00	28.01	0.00	11.56	4.25	1.81	4.28	13.07	4.46	4.80	2.18	1.76	9.99	3.10
DPR(36)	97.44	11.26	11.93	22.55	8.40	14.73	53.26	29.28	26.14	11.16	0.00	16.68	4.78	11.30	8.62	6.02	6.47	2.94	4.64	13.48	4.19
SBW(37)	30.19	6.90	4.88	9.22	7.06	6.02	12.73	5.15	6.64	4.56	21.75	0.00	1.96	4.62	7.21	2.46	2.65	2.35	1.90	5.51	1.71
END(38)	25.64	5.86	2.12	4.01	3.33	2.62	6.79	4.37	5.64	1.98	5.42	1.99	0.00	6.31	6.12	2.09	2.25	2.00	1.61	4.68	0.74
KP (39)	55.34	12.65	4.57	8.65	7.18	5.65	14.66	4.82	6.23	4.28	11.69	4.30	5.77	0.00	13.21	4.51	4.85	2.20	3.48	5.17	1.60
UP (41)	118.21	18.83	6.81	12.87	10.70	8.41	42.89	14.04	18.12	12.45	10.63	6.41	5.34	12.61	0.00	15.62	21.57	6.41	5.18	15.04	4.67
PRE(42)	31.49	7.20	2.60	4.92	4.09	3.21	16.31	5.37	6.93	4.76	6.65	2.45	2.04	4.82	17.49	0.00	5.40	2.45	1.98	5.75	1.79
MO (43)	80.28	13.99	5.06	9.57	7.95	6.25	15.63	5.34	6.89	4.73	6.62	2.44	2.03	4.79	22.67	4.99	0.00	4.77	3.85	5.72	1.78
PAL(45)	30.23	6.91	2.50	4.72	3.92	3.08	8.01	2.64	3.40	2.34	3.27	2.35	1.96	2.37	7.22	2.46	5.18	0.00	1.90	5.52	1.71
KDI(40)	24.97	5.71	2.06	3.90	3.24	2.55	6.62	2.18	2.81	1.93	5.28	1.94	1.62	3.82	5.96	2.04	4.28	1.94	0.00	4.56	0.72
BJM(51)	56.06	28.95	10.47	19.79	16.45	12.92	55.61	11.04	14.25	9.79	13.69	5.04	4.20	5.07	15.47	5.28	5.68	5.04	4.08	0.00	8.55
SPT(53)	41.27	10.17	3.68	6.95	5.78	4.54	11.79	3.88	5.01	3.44	4.81	1.77	0.75	1.78	5.43	1.85	1.99	1.77	0.73	9.66	0.00
SMR(54)	88.85	14.25	5.16	9.74	8.10	6.36	42.44	10.63	13.72	4.82	13.17	4.85	2.07	4.88	14.89	5.08	10.68	4.85	3.92	11.38	3.53
TAR(55)	13.58	3.10	1.12	2.12	1.76	1.39	3.60	1.18	1.53	1.05	1.47	0.54	0.45	1.06	3.24	1.11	2.33	1.06	0.85	2.48	0.77
PTK(56)	52.51	19.69	7.12	13.46	11.18	8.79	22.83	3.84	9.69	6.66	4.76	1.75	1.46	3.45	5.38	1.84	3.86	1.76	1.42	8.04	2.50
MDN(61)	446.29	43.69	11.44	21.62	17.97	14.12	33.92	12.06	15.57	10.70	14.96	5.50	4.59	10.83	16.90	5.77	12.13	5.51	4.45	12.92	4.01
SBG(63)	27.46	6.28	2.27	4.29	3.57	2.80	7.28	2.38	3.09	2.12	2.97	1.09	0.91	2.15	3.35	1.14	2.41	1.09	0.88	2.56	0.80
LSM(64)	36.06	8.24	2.98	5.63	4.68	3.68	9.55	3.14	4.06	2.79	3.90	1.43	1.19	2.82	4.40	1.50	3.16	1.44	1.16	3.37	1.05
BNA(65)	29.19	10.00	3.62	6.84	5.68	4.47	11.60	3.82	4.93	3.38	4.73	1.74	1.45	3.43	5.35	1.82	3.84	1.74	1.41	4.09	1.27
PG (71)	251.41	31.60	11.43	21.60	17.95	14.11	18.74	6.17	7.96	10.69	7.64	2.81	2.34	5.54	8.64	2.95	6.20	2.82	2.28	6.61	4.01
TJK(72)	124.89	25.30	9.15	17.29	14.37	11.29	29.33	9.65	12.45	8.56	6.12	2.25	1.88	4.43	6.92	2.36	4.96	2.25	1.82	5.29	3.21
LT (73)	78.46	19.58	7.08	13.38	11.12	8.74	11.61	3.82	4.93	6.62	4.74	1.74	1.45	3.43	5.35	1.83	3.84	1.74	1.41	4.09	1.27
JB (74)	78.49	19.34	6.99	13.22	5.62	8.63	11.47	3.77	4.87	3.35	4.68	1.72	1.43	3.39	5.28	1.80	3.79	1.72	1.39	4.04	1.26
PD (75)	91.88	13.24	4.79	9.05	7.52	5.91	15.35	5.05	6.52	4.48	6.26	2.30	1.92	4.54	7.08	2.42	5.08	2.31	1.86	5.41	1.68
PBR(76)	34.87	10.11	3.66	6.91	5.74	4.51	11.72	3.86	4.98	3.42	4.78	1.76	1.47	3.46	5.40	1.84	3.88	1.76	1.42	4.13	1.28
SKN(77)	68.03	16.76	6.06	5.86	4.87	3.83	9.94	3.27	4.22	2.90	4.05	1.49	1.24	2.94	4.58	1.56	3.29	1.49	1.21	3.50	1.09
AB (91)	29.01	8.56	3.10	5.85	4.86	3.82	10.64	3.26	4.21	2.89	4.05	1.49	2.43	5.73	8.94	3.05	6.41	2.91	2.35	3.50	1.09
TT (92)	18.85	4.31	1.56	2.94	2.45	1.92	4.99	1.64	2.12	1.46	2.04	0.75	0.62	1.48	2.30	1.54	5.19	1.47	1.19	1.76	0.55
SON(95)	16.85	3.85	1.39	2.63	2.19	1.72	4.46	1.47	1.90	1.30	1.82	0.67	0.56	1.32	2.06	0.70	2.89	0.67	0.54	1.57	0.49
JAP(96)	19.65	7.29	2.64	4.98	4.14	3.25	16.38	2.78	3.59	2.46	3.45	1.27	1.06	2.50	3.89	1.33	2.79	1.27	1.03	2.98	0.92
MRK(97)	9.54	2.18	0.79	1.49	1.24	0.97	2.53	0.83	1.07	0.74	1.03	0.38	0.32	0.75	1.17	0.40	0.84	0.38	0.31	0.89	0.28
TOTAL	4,335.58	1,596.06	391.56	912.78	676.07	562.01	1,618.04	451.53	619.49	436.83	450.70	158.19	109.92	234.97	484.55	159.81	304.46	125.74	105.18	391.17	135.33

Table 3-1-2 Toll Telephone Traffic between SCs in 1994 (2/2)

Xeij	SMR(54)	TAR(55)	PTK(56)	MDN(61)	SBG(63)	LSM(64)	BNA(65)	PG (71)	TJK(72)	LT (73)	JB (74)	PD (75)	PBR(76)	SKN(77)	AB (91)	TT (92)	SON(85)	JAP(96)	MRK(97)	Total
JKT(21)	73.34	9.41	55.61	466.79	20.66	28.02	29.53	251.90	128.79	63.17	62.31	91.19	37.65	53.11	28.41	13.57	11.97	14.79	6.34	4,119.62
BD (22)	12.91	2.35	17.12	52.46	5.16	7.00	8.69	29.06	22.66	17.01	16.78	11.89	8.80	14.30	7.30	3.39	2.99	6.10	1.58	1,545.79
CBN(23)	5.20	0.95	6.89	12.67	2.08	2.82	3.50	11.70	9.12	6.85	6.76	4.79	3.54	5.76	2.94	1.36	1.20	2.40	0.64	449.96
SM (24)	9.19	1.67	12.18	22.39	3.67	4.98	6.19	20.67	16.12	12.11	11.94	8.46	6.26	5.21	5.20	2.41	2.13	4.34	1.13	967.14
YK (27)	7.79	1.42	10.32	18.97	3.11	4.22	5.24	17.52	13.66	10.26	5.18	7.17	5.30	4.41	4.40	2.04	1.80	3.68	0.95	812.77
PWT(28)	6.28	1.14	8.32	15.29	2.51	3.40	4.23	14.12	11.01	8.27	8.16	5.78	4.27	3.56	3.55	1.65	1.45	2.96	0.77	575.76
SB (31)	13.37	2.68	19.55	34.24	5.89	7.99	9.92	16.97	25.86	9.94	9.80	13.58	10.04	8.35	7.41	3.87	3.41	4.28	1.81	1,398.42
JR (33)	10.66	0.99	3.70	13.29	2.18	2.96	3.67	6.28	9.57	3.67	3.62	5.02	3.71	3.09	3.08	1.43	1.26	2.58	0.67	481.88
ML (34)	13.39	1.25	9.08	16.69	2.74	3.71	4.61	7.89	12.02	4.62	4.55	6.31	4.67	3.88	3.87	1.80	1.59	3.24	0.84	654.45
MN (35)	4.90	0.89	6.49	11.93	1.96	2.65	3.30	11.02	8.59	6.45	3.26	4.51	3.33	2.77	2.77	1.29	1.13	2.31	0.60	471.65
DPR(36)	12.92	1.20	4.48	16.10	2.64	3.58	4.45	7.61	5.93	4.45	4.39	6.09	4.50	3.74	3.74	1.73	1.53	3.12	0.81	458.28
SBW(37)	5.28	0.49	1.83	6.58	1.08	1.46	1.82	3.11	2.42	1.82	1.80	2.49	1.84	1.53	1.53	0.71	0.63	1.28	0.33	184.10
END(38)	2.29	0.42	1.56	5.59	0.92	1.24	1.54	2.64	2.06	1.55	1.53	2.11	1.56	1.30	2.54	0.60	0.53	1.08	0.28	126.91
KP (39)	4.95	0.90	3.36	12.07	1.98	2.68	3.33	5.70	4.44	3.34	3.29	4.56	3.37	2.81	5.47	1.30	1.15	2.34	0.61	248.46
UP (41)	14.41	2.62	5.00	17.97	2.95	4.00	4.96	8.49	6.62	4.97	4.90	6.79	5.02	4.18	8.15	1.94	1.71	3.48	0.90	475.87
PRE(42)	5.51	1.00	1.91	6.87	1.13	1.53	1.90	3.24	2.53	1.90	1.87	2.59	1.92	1.60	3.11	1.45	0.65	1.33	0.35	180.09
MO (43)	10.71	1.95	3.72	13.35	2.19	2.87	3.69	6.31	4.92	3.69	3.64	5.04	3.73	3.10	6.05	4.52	2.48	2.59	0.67	300.67
PAL(45)	5.29	0.96	1.83	6.59	1.08	1.47	1.82	3.11	2.43	1.82	1.80	2.49	1.84	1.53	2.99	1.39	0.63	1.28	0.33	142.37
KDI(40)	4.37	0.80	1.52	5.45	0.89	1.21	1.50	2.57	2.01	1.51	1.49	2.06	1.52	1.27	2.47	1.15	0.52	1.06	0.27	121.77
BJM(51)	11.33	2.06	7.69	14.13	2.32	3.14	3.90	6.67	5.20	3.91	3.85	5.34	3.95	3.29	3.28	1.52	1.34	2.74	0.71	393.80
SPT(53)	3.98	0.72	2.70	4.96	0.81	1.10	1.37	4.58	3.57	1.37	1.35	1.88	1.39	1.15	1.15	0.53	0.47	0.96	0.25	161.34
SMR(54)	0.00	1.99	7.40	13.60	2.23	3.02	3.76	6.42	5.01	3.76	3.71	5.14	3.80	3.16	3.15	1.46	1.29	2.64	0.68	355.59
TAR(55)	2.38	0.00	1.61	2.96	0.49	0.66	0.82	1.40	1.09	0.82	0.81	1.12	0.83	0.69	0.69	0.32	0.28	0.57	0.15	63.48
PTK(56)	7.71	1.40	0.00	9.61	1.58	2.14	2.65	8.87	6.92	5.20	5.12	3.63	5.25	4.37	2.23	1.04	0.91	1.86	0.48	262.96
MDN(61)	12.38	2.25	8.40	0.00	15.57	21.11	44.11	30.36	11.11	16.31	16.09	22.26	16.48	13.71	7.00	3.25	2.87	5.85	1.52	975.58
SBG(63)	2.46	0.45	1.67	18.83	0.00	2.60	3.23	5.53	2.21	3.24	3.19	7.12	3.27	2.72	1.39	0.64	0.57	1.16	0.30	141.48
LSM(64)	3.23	0.59	2.19	24.72	2.52	0.00	6.83	3.71	2.90	2.17	4.19	5.81	4.29	3.57	1.82	0.85	0.75	1.52	0.40	178.29
BNA(65)	3.92	0.71	2.66	44.57	3.06	6.68	0.00	4.51	3.52	2.64	2.60	7.05	5.21	2.22	2.21	1.03	0.91	1.85	0.48	210.23
PG (71)	6.33	1.15	8.39	29.43	4.95	3.43	4.26	0.00	44.43	19.40	79.48	22.83	8.43	7.01	3.58	1.66	1.47	2.99	0.78	693.50
TJK(72)	5.07	0.92	6.72	12.35	2.03	2.75	3.41	81.86	0.00	10.74	6.58	9.12	6.74	5.61	2.86	1.33	1.17	2.39	0.62	486.04
LT (73)	3.92	0.71	5.20	18.68	3.06	2.13	2.64	20.52	11.07	0.00	8.20	7.06	5.22	4.34	2.22	1.03	0.91	1.85	0.48	296.47
JB (74)	3.87	0.71	5.14	18.45	3.03	4.10	2.61	80.90	6.79	8.21	0.00	6.97	8.29	6.90	2.19	1.02	0.90	1.83	0.47	348.64
PD (75)	5.18	0.94	3.52	23.18	6.52	5.49	6.82	37.39	9.09	6.83	6.74	0.00	16.05	5.74	2.93	1.36	1.20	2.45	0.64	346.72
PBR(76)	3.96	0.72	5.25	18.85	3.09	4.19	5.21	8.90	6.94	5.21	8.27	16.57	0.00	7.05	2.24	1.04	0.92	1.87	0.49	221.73
SKN(77)	3.36	0.61	4.45	15.99	2.62	3.56	2.26	7.55	5.89	4.42	7.02	6.04	7.19	0.00	1.90	0.88	0.78	1.59	0.41	228.70
AB (91)	3.35	0.61	2.27	8.16	1.34	1.82	2.26	3.86	3.01	2.26	2.23	3.08	2.28	1.90	0.00	1.72	1.52	1.58	0.41	161.81
TT (92)	1.69	0.31	1.14	4.11	0.67	0.91	1.14	1.94	1.51	1.14	1.12	1.55	1.15	0.96	1.86	0.00	0.76	0.80	0.21	84.10
SON(95)	1.51	0.27	1.02	3.67	0.60	0.82	1.01	1.74	1.35	1.02	1.00	1.39	1.03	0.85	1.67	0.77	0.00	0.71	0.18	71.66
JAP(96)	2.85	0.52	1.93	6.95	1.14	1.55	1.92	3.28	2.56	1.92	1.90	2.63	1.94	1.62	1.61	0.75	0.66	0.00	0.68	126.06
MRK(97)	0.85	0.16	0.58	2.08	0.34	0.46	0.57	0.98	0.77	0.58	0.57	0.79	0.58	0.48	0.48	0.22	0.20	0.79	0.00	39.61
TOTAL	312.09	50.89	254.40	1,050.57	122.79	159.55	204.67	750.88	425.70	268.55	321.09	330.30	216.24	202.84	151.44	70.02	58.64	102.30	30.22	19,343.75

Table 3-1-3 Toll Telephone Traffic by SA in 1994 (Busy hour traffic)

Secondary Area	Number of Subscribers	Outgoing (Erlang)	Incoming (Erlang)	Calling Rate(mErlang) Outgoing	Incoming
JKT (21)	908,960	4,119.62	4,335.58	4.53	4.77
BD (22)	205,785	1,545.79	1,596.66	7.51	7.76
CBN (23)	34,560	449.96	391.56	13.02	11.33
SM (24)	105,580	967.14	912.78	9.16	8.65
YK (27)	76,300	612.77	676.07	8.03	8.86
PWT (28)	50,000	575.76	562.01	11.52	11.24
SB (31)	266,745	1,398.42	1,618.04	5.24	6.07
JR (33)	37,940	481.88	451.53	12.70	11.90
ML (34)	59,368	654.45	619.49	11.02	10.43
MN (35)	30,730	471.65	436.83	15.35	14.22
DPR (36)	55,310	458.28	450.70	8.29	8.15
SBW (37)	9,576	184.10	158.19	19.23	16.52
END (38)	6,950	126.91	109.92	18.26	15.82
KP (39)	31,410	248.46	234.97	7.91	7.48
UP (41)	68,550	475.87	484.55	6.94	7.07
PRE (42)	10,400	180.09	159.81	17.32	15.37
MO (43)	38,290	300.67	304.46	7.85	7.95
PAL (45)	9,596	142.37	125.74	14.84	13.10
KDI (40)	6,600	121.77	105.18	18.45	15.94
BJM (51)	42,800	393.80	391.17	9.20	9.14
SPT (53)	5,500	161.34	135.33	29.33	24.61
SMR (54)	39,700	355.59	312.09	8.96	7.86
TAR (55)	2,000	63.48	50.89	31.74	25.45
PTK (56)	20,100	262.96	254.40	13.08	12.66
MDN (61)	189,460	975.58	1,050.57	5.15	5.55
SBG (63)	7,950	141.48	122.79	17.80	15.45
LSM (64)	13,560	178.29	159.55	13.15	11.77
BNA (65)	19,830	210.23	204.67	10.60	10.32
PG (71)	50,820	693.50	750.88	13.65	14.78
TJK (72)	32,850	466.04	425.70	14.19	12.96
LT (73)	19,873	296.47	268.55	14.92	13.51
JB (74)	19,400	348.64	321.09	17.97	16.55
PD (75)	34,360	346.72	330.30	10.09	9.61
PBR (76)	20,240	221.73	216.24	10.96	10.68
SKN (77)	14,656	228.70	202.84	15.60	13.84
AB (91)	14,600	161.81	151.44	11.08	10.37
TT (92)	3,800	84.10	70.02	22.13	18.43
SON (95)	3,050	71.66	58.64	23.50	19.23
JAP (96)	10,650	126.06	102.30	11.84	9.61
MRK (97)	1,000	39.61	30.22	39.61	30.22
TOTAL	2,578,849	19,343.75	19,343.75	7.50	7.50

(3) Traffic Concentration

1) Traffic routing

The traffic routing was determined in accordance with the Fundamental Plan 1985. The routing matrix is shown in ANNEX-2.

2) Traffic concentration

The concentrated traffic between links based on the routing matrix is shown in Table 3-1-4. The direct access traffic by SBK demand assignment circuits for small exchanges is shown in Table 3-1-5 separately.

3-1-2 Telephone Traffic between SC and PC

Traffic was estimated by the following formula with the assumption that all links between SCs and PCs are connected by high usage routes for the approximate dimensioning of transmission links.

$$TRF = SPA \times SCR \times 1.3$$

where,

TRF : Outgoing traffic from PCs to SCs
SPA : The number of subscribers within primary areas
SCR : Average calling rate from a SC to other SC
1.3 : Coefficient that converts the SCR to the average outgoing calling rate from a PC to a SC. (estimated by Strategy Development Plan of POSTEL)

The results are shown in ANNEX-3.

Table 3-1-4 Routed Traffic Matrix in 1994 (1/2)

FILE:RTRF-MX (IL-166)

ROUTED TRFFIC MATRIX FOR REPELITA V ##### (1/2)

TRFij	JKT(21)	BD (22)	CBN(23)	SM (24)	YK (27)	PWT(28)	SB (31)	JR (33)	ML (34)	MN (35)	DPR(36)	SBW(37)	END(38)	KP (39)	UP (41)	PRE(42)	MO (43)	PAL(45)	KDI(40)	BJM(51)	SPT(53)
JKT(21)	-	1120.88	262.36	435.41	329.87	328.46	556.8	82.2	43.35	72.89	89.65	20.68		40.7	176.75	30.64	122.96	25.8	22.71	137.08	34.61
BD (22)	977.26	-	64.62	41.91	12.58	31.88	99.81	22.14	28.58	19.63	4.5				16.41					49.02	
CBN(23)	245.48	7.89	-	11.31	21.35	2.31	78.69														
SM (24)	447.36	35.65	9.63	-	97.41	67.46	150.43		32.71	32.5	19.53				24.21					5.82	
YK (27)	299.28	12.05	20.36	88.01	-	52.83	60.53		27.72	27.54	6.45				6.27					4.93	
PWT(28)	315.12	28.64		53.43	76.05	-	105.22														
SB (31)	542.86	75.56	35.93	118.16	56.65	56.01	-	295.44	406.64	262.08	230.95	134.08	106.91	170.09	142.61	4.55	33.57	14.22	11.48	140.1	
JR (33)	99.45	24.5					305.09	-	28.06		26.96										
ML (34)	81.67	30.79		33.86	28.13		408.61	27.32	-	24.23	23.43										
MN (35)	126.05	22.01		34.99	29.08		236.64		25.21	-											
DPR(36)	116.8	11.26		20.3	8.4		205.19	26.35	23.53		-				22.22					17.67	
SBW(37)	27.17						128.37				19.58	-			4.25					1.71	
END(38)	75.23												-		5.86					4.59	
KP (39)	62.46						133.4							-	15.04					9.91	
UP (41)	189.14	7.2		17.79			146.15		6.93		17.28			17.43	-	124.81	106.41	76.2	67.07	49.96	
PRE(42)	28.34														152	-					
MO (43)	115.07						32.84								78.84		-			5.5	
PAL(45)	48.34						26.34								28.23			-		3.54	
KDI(40)	20.16						26.2								29.27				-	6.61	
BJM(51)	138.99	26.06					124.29				13.69				46.36					-	97.95
SPT(53)	68.26						21.44								6.34					48.71	-
SMR(54)	123.58						92.34								23.89		10.68	4.85		46.06	
TAR(55)																					
PTK(56)	107.5						52.16								8.88					42.87	
MDN(61)	512.73	53.84		29.38	8.25	6.48	144.38	0.91			6.87				52.94		17.7			28.8	
SBG(63)	2.97						3.09														
LSM(64)	32.45						4.06														
BNA(65)	56.88						35.08								8.81					7.85	
PG (71)	354.24	28.44		19.14			123.38								68.58					62.19	
TJK(72)	167.23	22.77					71.74								9.14					15	
LT (73)	131.41																				
JB (74)	124.44						34.68								8.7					10.27	
PD (75)	109.96	13.24					29.15								11.67					10.38	
PBR(76)	62.31						33.98								8.9					10.49	
SKN(77)	98.61						28.81								7.55					8.9	
AB (91)	55.43						34.7								23.66					10.21	
TT (92)	18.85																5.19				
SON(95)																					
JAP(96)							16.38														
MRK(97)																					
SAT(00)	76.37	20.73		14.16	11.78		40.7				9.8	3.61	3.01	7.11	17.74		8.85	4.85	3.92	9.68	3.01
TOTAL	5983.08	1520.78	392.9	903.69	667.77	545.43	3549.97	454.36	622.73	438.88	458.89	154.76	106.91	228.22	987.38	160	296.51	121.07	101.26	738.17	132.56

Note: Total traffic does not include traffic between SCs and Satellite
for the demand assignment.

Table 3-1-4 Routed Traffic Matrix in 1994 (2/2)

***** ROUTED TRAFFIC MATRIX FOR REPELITA V ***** (2/2)

TRFij	SMR(54)	TAR(55)	PTK(56)	MDN(61)	SBG(63)	LSM(64)	BNA(65)	PG (71)	TJK(72)	LT (73)	JB (74)	PD (75)	PBR(76)	SKN(77)	AB (91)	TT (92)	SON(95)	JAP(96)	MRK(97)	SAT(00)	Total
JKT(21)	107.38		87.76	531.76	13.6	40.64	45.74	349.75	165.82	94.34	88.12	108.27	53.26	81.04	52.03	13.57		14.79		42.3	5781.67
BD (22)				68.06				83.08	20.39											16.41	1539.87
CBN(23)																					367.03
SM (24)				20.15				18.6												11.68	861.46
YK (27)																				9.89	605.97
PWT(28)																					
SB (31)	60.52		25.58	146.33			27.77	111.88	63.86		27.42	24.42	28.09	23.36	30.41			4.28		33.64	3411.82
JR (33)																					484.06
ML (34)																					658.04
MN (35)																					473.98
DPR(36)																				8.39	451.72
SBW(37)																				3.44	181.08
END(38)				1.54				8.05												2.91	95.27
KP (39)				3.33				18.47												6.3	242.61
UP (41)	19.92			53.35				68.61					1.52		22.77					15.43	992.54
PRE(42)																					180.34
MO (43)	10.71			22.2				24.12								4.52				7.69	293.8
PAL(45)	5.29			4.37				11.91												4.59	128.02
KDI(40)				3.6				9.86												3.8	95.7
BJM(51)	81.51		122.97	28.45				52.08							9.81					8.37	742.16
SPT(53)				3.28				10.71												2.93	158.74
SMR(54)	-			22.61				24.58												8.06	348.59
TAR(55)		-																		63.48	
PTK(56)			-	15.98				30.49												5.09	257.88
MDN(61)	18.07		12.26	-	90.76	112.63	119.46	115.37		8.05	9.98	40.01	12.77	22.22	12.42					22.97	1436.28
SBG(63)				110.93	-																116.99
LSM(64)				135.43		-	6.83														178.77
BNA(65)				90.53			-													4.98	199.15
PG (71)				129.16				-	170.12	166.66	184.56	121.63	92.14	59.26	17.92					13.03	1597.42
TJK(72)								173.57	-											6.43	459.45
LT (73)								165.86		-											297.27
JB (74)				9.74				150.19			-	6.97								4.93	344.99
PD (75)				39.69				98.72			6.74	-	16.05	5.74						6.59	341.34
PBR(76)				12.49				65.18				16.57	-	7.05						5.04	216.97
SKN(77)				24.43				43.45				6.04	7.19	-						4.27	224.98
AB (91)				13.58				18.62							-					5.84	156.2
TT (92)																-				60.06	24.04
SON(95)																	-			71.66	
JAP(96)																		-		109.68	16.38
MRK(97)																			-	39.61	
SAT(00)	9.28	50.89	6.28	27.41			5.46	14.82	7.28		5.4	7.48	5.53	4.6	6.31	51.29	58.64	83.23	30.22	-	609.44
TOTAL	303.4		248.57	1490.99	104.36	153.27	199.8	1653.15	420.19	269.05	316.82	323.91	211.02	198.67	145.36	18.09		19.07		610.09	24641.04

Table 3-1-5 Traffic and Circuits for Demand Assignment in 1994

FILE:SAT-CCT (IL257)
***** Traffic and circuits for Demand Assignment at end of REPELIA V *****

	SAT(TRF)			SAT(CCT)		
SC NAME	OG(TRF)	IC(TRF)	TOTAL(TRF)	OG(CCT)	IC(CCT)	TOTAL(CCT)
JKT(21)	105.10	139.17	244.27	123	158	281
BD (22)	29.42	33.74	63.16	41	46	87
CBN(23)	0.00	0.00	0.00	0	0	0
SM (24)	18.35	20.83	39.18	28	31	59
YK (27)	14.71	16.60	31.31	24	26	50
PWT(28)	0.00	0.00	0.00	0	0	0
SB (31)	58.59	65.65	124.24	73	81	154
JR (33)	0.00	0.00	0.00	0	0	0
ML (34)	0.00	0.00	0.00	0	0	0
MN (35)	0.00	0.00	0.00	0	0	0
DPR(36)	11.89	13.30	25.19	20	22	42
SBW(37)	4.05	4.22	8.27	10	10	20
END(38)	3.35	3.45	6.80	9	9	18
KP (39)	8.29	9.10	17.39	16	17	33
UP (41)	20.42	22.73	43.15	31	33	64
PRE(42)	0.00	0.00	0.00	0	0	0
MO (43)	10.11	11.27	21.38	18	20	38
PAL(45)	5.20	5.46	10.66	12	12	24
KDI(40)	4.22	4.34	8.56	10	10	20
BJM(51)	11.08	12.39	23.47	19	21	40
SPT(53)	3.28	3.36	6.64	9	9	18
SMR(54)	10.57	11.79	22.36	19	20	39
TAR(55)	63.61	51.02	114.63	79	65	144
PTK(56)	6.96	7.55	14.51	14	15	29
MDN(61)	36.30	40.74	77.04	49	54	103
SBG(63)	0.00	0.00	0.00	0	0	0
LSM(64)	0.00	0.00	0.00	0	0	0
BNA(65)	6.23	6.71	12.94	13	14	27
PG (71)	17.50	19.29	36.79	27	29	56
TJK(72)	8.51	9.36	17.87	16	17	33
LT (73)	0.00	0.00	0.00	0	0	0
JB (74)	6.16	6.63	12.79	13	14	27
PD (75)	8.76	9.65	18.41	16	17	33
PBR(76)	6.32	6.81	13.13	13	14	27
SKN(77)	5.20	5.53	10.73	12	12	24
AB (91)	6.76	7.23	13.99	14	14	28
TT (92)	60.30	51.53	111.83	75	66	141
SON(95)	71.85	58.83	130.68	87	73	160
JAP(96)	110.35	83.90	194.25	128	100	228
MRK(97)	39.67	30.28	69.95	52	42	94
TOTAL	773.11	772.46	1545.57	1070	1071	2141

3-2 Non-Telephone Service Traffic Forecast

3-2-1 Telegraph Service Traffic

(1) Forecasting Method

To explain the traffic flow of the telegraph service in Indonesia, a forecasting model was estimated by the Ordinary Least Squares Method with using the data compiled by ITU (pooled time series cross section data of 21 countries and 5 year-periods of 1980-1984). The detailed explanation of the data is provided in Section 5-2 in VOLUME-I.

The estimated model is as follows;

$$TLG = -5.652 + (122.36 + 523.5\ TD) \times N + (0.33 - 147\ TD) \times Y - 131.98\ ID$$

$$R^2 = 0.974$$

where,

TLG : The no. of domestic telegrams (10^5)

N : The size of population (10^6)

TD : Telephone density per 100 persons

Y : Real GDP of 1980 price in US dollars (10^9)

ID = 1 for Indonesia
0 for other countries

(2) Forecast Results

Table 3-2-1 shows the summary of the simple forward projections of the telegraph traffic by the estimated model. The condition is assumed that the real GDP grows by 5% per year and telephone subscribers will increase according to the Plan 2 in discussed in VOLUME-I.

Table 3-2-1 Projections of Telegraph Service Subscribers

Item	1984	1989	1994
GDP (Billion US$)	47,555	60,694	77,462
TEL. DENSITY (/100 persons)	0.33	1.35	1.97
TELEGRAM (10^6)	8	10	13

3-2-2 Telex Service Traffic

(1) Forecasting Method

To explain the traffic flow of the telex service in Indonesia, a forecasting model was estimated by the Ordinary Least Squares Method with using the traffic data of 27 propinsi of 3 year-periods of 1982-1984. The estimated model is as follows;

$$\log (XTX) = 6.2730 + [0.36966 + 0.06061 \times \log (Y/N)] \times \log (SX)$$

$$R^2 = 0.943$$

where,

log : Natural logarithmic operator

XTX : The No. of pulses (10^5)

N : The size of population (10^6)

Y : Real GDP of 1975 price in Rp. (10^9)

SX : The No. of telex service subscribers

(2) Forecast Results

Table 3-2-2 shows the summary of the simple forward projections of the telex service traffic by the estimated model for the case of 5% GDP annual growth.

Table 3-2-2 Projections of Telex Service Traffic

Item	1984	1989	1994
GDP (Billion US$)	47,555	60,694	77,462
TELEX SUBSCRIBERS		24,596	39,182
TELEX TRF (1000 PLS)		1,074,811	1,559,943

3-3 Establishment of Toll Circuits

3-3-1 Toll Circuit Requirements

In order to make an easy processing by computer possible, the same figures as those for the PELITA-IV program was used. They are;

Final Route : loss is 1%
High Usage Route : loss is 10%

The estimated toll circuit requirements for telephone service are shown in Table 3-3-1 and ANNEX-3.

3-3-2 Circuit Grouping

(1) Terrestrial Backbone Link

To solve over provision due to the traffic forecast error, the toll circuits to be established were decreased to 70% of the estimated telephone service circuit requirements.

Non-telephone service toll circuits such as the telex service and the data communications service were estimated to take 10% of the toll telephone service circuits.

The total number of toll circuits were distributed between terrestrial and satellite systems by the distribution curve proposed in VOLUME-I. It was determined that satellite TDMA circuits were to be installed when the required number becomes larger than 30 circuits.

The results of the distribution between terrestrial and satellite systems are shown in ANNEX-4.

The terrestrial circuits after the distribution were grouped for each section. The result of the circuit grouping is shown in Chapter 4, Table 4-3-1.

FILE:RCCT-MTX

Table 3-3-1 Toll Telephone Circuit Requirements in 1994 (1/2)

ROUTED CIRCUIT MATRIX FOR REPELITA V ##### (1/2)

TRFij	JKT(21)	BD (22)	CBN(23)	SM (24)	YK (27)	PWT(28)	SB (31)	JR (33)	ML (34)	MN (35)	DPR(36)	SBW(37)	END(38)	KP (39)	UP (41)	PRE(42)	MO (43)	PAL(45)	KDI(40)	BJM(51)	SPT(53)
JKT(21)	-	1,150	285	461	354	353	584	99	57	89	106	31		54	197	42	141	37	33	156	47
BD (22)	1,007	-	80	55	21	44	117	33	40	30	11				26					63	
CBN(23)	268	15	-	20	32	7	95														
SM (24)	474	48	17	-	115	83	170		45	44	30				35					12	
YK (27)	323	21	31	105	-	67	75		39	39	13				13					11	
PWT(28)	339	40		68	92	-	123														
SB (31)	570	91	48	136	71	70	-	319	432	285	253	153	125	191	162	11	46	23	20	159	
JR (33)	117	35					329	-	39		38										
ML (34)	98	43		46	40		434	39	-	35	34										
MN (35)	145	32		47	41		259		36	-											
DPR(36)	135	20		30	16		227	37	34		-				33					27	
SBW(37)	38						147				30	-			10					6	
END(38)	91												-		12					11	
KP (39)	77						152							-	24					18	
UP (41)	210	14		27			166		14		27			27	-	143	124	92	82	64	
PRE(42)	40														172	-					
MO (43)	133						45								95		-			12	
PAL(45)	62						37								40			-		9	
KDI(40)	30						37								41				-	14	
BJM(51)	158	37					143				23				60					-	115
SPT(53)	84						32								13					62	-
SMR(54)	142						109								35		19	11		60	
TAR(55)																					
PTK(56)	125						66								17					56	
MDN(61)	540	68		41	16	13	164	5			14				67		27			40	
SBG(63)	8						8														
LSM(64)	44						10														
BNA(65)	71						47								16					15	
PG (71)	379	40		29			142								84					77	
TJK(72)	188	33					87								17					24	
LT (73)	150																				
JB (74)	143						47								16					18	
PD (75)	128	22					41								20					18	
PBR(76)	77						46								17					19	
SKN(77)	116						40								15					17	
AB (91)	70						47								34					18	
TT (92)	29																12				
SON(95)																					
JAP(96)							26														
MRK(97)																					
SAT(00)	92	31		23	20		54				18	9	8	14	27		16	11	10	18	8
TOTAL	6,609	1,709	461	1,065	798	637	4,052	532	736	522	579	184	125	272	1,271	196	369	163	135	986	162

Note:Total number of circuits does not include circuits between SCs and Satellite for the demand assignment.

Table 3-3-1 Toll Telephone Circuit Requirements in 1994 (2/2)

ROUTED CIRCUIT MATRIX FOR REPELITA V ##### (2/2)

TRFij	SMR(54)	TAR(55)	PTK(56)	MDN(61)	SBG(63)	LSM(64)	BNA(65)	PG (71)	TJK(72)	LT (73)	JB (74)	PD (75)	PBR(76)	SKN(77)	AB (91)	TT (92)	SON(95)	JAP(96)	MRK(97)	SAT(00)	TOTAL
JKT(21)	125		104	559	22	54	59	375	186	111	105	126	67	97	66	22		24		55	6,378
BD (22)				83				99	31											26	1,740
CBN(23)																					437
SM (24)				30				28												20	1,131
YK (27)																				18	737
PWT(28)																					662
SB (31)	75		37	166			39	130	79		39	35	39	34	42			10		46	3,890
JR (33)																					558
ML (34)																					769
MN (35)																					560
DPR(36)																				16	559
SBW(37)																				9	231
END(38)				6				15												8	135
KP (39)				9				28												13	308
UP (41)	30			67				84					6		33					25	1,210
PRE(42)																					212
MO (43)	19			33				35								11				15	383
PAL(45)	12			10				20												11	190
KDI(40)				9				18												10	149
BJM(51)	98		142	40				66							18					16	900
SPT(53)				9				19												8	219
SMR(54)	-			33				35												15	444
TAR(55)		-																		78	
PTK(56)			-	25				42												12	331
MDN(61)	28		21	-	108	131	138	134		15	18	53	21	33	21					34	1,716
SBG(63)				129	-																145
LSM(64)				155		-	14														223
BNA(65)				107			-													11	256
PG (71)				148				-	191	187	205	140	109	74	28					22	1,833
TJK(72)								194	-											13	543
LT (73)								186		-											336
JB (74)				18				170			-	14								11	426
PD (75)				52				116			14	-	25	12						13	448
PBR(76)				21				80				26	-	14						11	300
SKN(77)				35				57				13	14	-						10	307
AB (91)				22				28							-					12	219
TT (92)																-				75	41
SON(95)																	-			87	
JAP(96)																		-		128	26
MRK(97)																			-	52	
SAT(00)	17	65	13	39			12	24	14		12	15	12	11	13	65	73	100	42	-	886
TOTAL	387		304	1,766	130	185	250	1.959	487	313	381	407	281	264	208	33		34		880	28.952

(2) Terrestrial Spur Link

Circuit grouping of spur links is made according to the required number of circuits between SC and PC. Based on the results of the circuits grouping, new terrestrial spur links during the REPELITA-V period are illustrated in ANNEX-5.