1-3 Organization of the Study Team

1-3-1 Japanese Team Members

1) Preliminary Study

As shown in Table 1-3-1.

2) Main Study

As shown in Table 1-3-2.

1-3-2 The Concerned Indonesian Government Organizations and Members

The Indonesian government organizations responsible for the study are Directorate Jendral Pos dan Telekomunikasi (DITJEN POSTEL) and Perusahaan Umum Telekomunikasi (PERUMTEL) as shown In Figure 1-3-1. People from the Indonesian government organizations involved in the study are listed in Table 1-3-3 and 1-3-4.

Table 1-3-1 Preliminary Study Team Members
(From Oct. 28 to Nov. 13, 1985)

Name	Duty-in-charge	Affiliated to
Junichi IKEJIMA	Leader, Telecommunication Policy	Project Director, International Cooperation Division, Ministry of Posts and Telecommunications
Masami KATO	Member, Network Plan	Special Advisor, International Cooperation Division, Ministry of Posts and Telecommunications
Toshio FUKUHARA	Member, Data Communication	ditto
Takao YAMAZAKI	Member, Telecommunication System	Expert/Telecommunications International Cooperation Institute, JICA
Ryutaro TOTSUKA	Coordinator	Social Development Cooperation Department, JICA

Table 1-3-2 Main Study Team Members

Name	Duty-in-charge	Affiliated to
JICA Advisory Committee		
Shinichi TAKEUCHI	Chairman	Special Advisor, International Cooperation Division, Ministry of Posts and Telecommunications
Masami KATO	Member	ditto (until March 1986)
Shinji YOKOYAMA	Member	ditto (from April 1986)
Takao YAMAZAKI	Member	Expert/Telecommunications International Cooperation Institute, JICA
Ryutaro TOTSUKA	Coordinator	Social Development Cooperation Department, JICA
Study Team		
Junichi KUROBE	Team Leader, Communication System	Nippon Telecommunications Consulting Co., Ltd.
Shogo KATAKURA	Assistant Team Leader, Network Management	ditto
Keisuke SUGIMOTO	New Service	ditto
Yutaka TAKIDOUCHI	Network Planning	ditto
Tatsumi AMANO	Traffic Engineering, Demand Forecast	ditto
Tadahiko MIURA	Technical Standard	ditto
Mikio DANNO	Economic Analysis	ditto
Yasuyuki IZUMI	Outside Plant Engineering	ditto
Shigemi NITTA	Switching Plant Engineering	ditto
Takeshi TAKESHITA	Transmission System Engineering	ditto (until March 1986)
Keigo TAKEHARA	Transmission System Engineering and Data Processing	ditto (from May 1986)
Akira KONAKAYAMA	Development Planning	ditto

Table 1-3-3 Indonesian Government Members Concerned in the Preliminary Study

1. DITJEN POSTEL	
Ir. Rollin	Deputy Director General
Mr. R.I. Soemardi, BcTT	Chief of Planning Division
Ir. Koesmarihati Sugondo	Planning Division
Mr. Soedarpo, BcTT	Planning Division
Mr. Musnaldy	Planning Division
Mr. Soeroso, BcTT	Sub-Director of Operation
2. PERUMTEL	
(1) Headquarters	
Ir. Saleh Gunawan	Deputy Director, Directorate of Development
Ir. Rodyat	Chief of Switching Planning Division
Ir. Saleh Effendi	Chief of Terrestrial Transmission Planning Division
Ir. Walden Bakara	Satellite Planning Division
(2) WITEL-VII	
Mr. Willy Soewarso, BcTT	Assistant to Kawitel-VII in Radio Transmission
Mr. Sjafril Itam	Chief of North Telephone Office
Mr. Sjamsul Maarief	Chief of South Telephone Office
(3) WITEL-VIII	
Ir. Benny Nasution	Regional Director
Mr. Jono Sutisna	Chief of Transmission
Mr. Z. Arifin	Chief of Operation
Mr. I.B. Swiyn	Chief of Switching/Outside Plant
Mr. Laode M. Saleh	Chief of Telegraph & Telex
3. P.T. INTI	
Ir. Bambang Sumadi	
4. BAPPENAS	
Mr. Simatupang	Director, Department of Tourism, Posts and Telecommunications
5. DEPARTMENT OF INFORMATION	
Mr. E.H. Marentek	Director of Foreign Information Services

Table 1-3-4 Principal Indonesian Government Members Concerned in the Main Study (1/2)

1. **Department of Tourism, Posts and Telecommunications**

Ir. Suhana	Senior expert, Telecommunication and Mechanization Technology of Postal Service
Ir. D. Sinulingga	Chief, Planning Bureau
Mr. Rai Sardjana BcTT	
Mr. Astari	
Mr. Soedarmadi	

2. **DITJEN POSTEL**

Ir. Rollin	Deputy Director General
Mr. R.I. Soemardi, BcTT	Director, Planning Division
Ir. Agus Darman	Sub-Director of Telecommunication Planning
Mr. Soedarpo BcTT	Telecommunication Planning
Mr. Soekarmoen, BcTT	Chief of Administration
Ir. Koesmarihati Sugondo	Chief of Planning and Programming
Mr. Desemsi	

3. **HEAD QUARTER OF PERUMTEL**

Ir. Djoko Soelistijo Hadi, BcTT.	DIRPEMTEL
Ir. Saleh Gunawan	KA. SUBDITBINPROPEMTEL
Mr. R. M. Sri Slameto	KA. SUBDITNITEL
Ir. Remedi Peranginangin	KA. SUBDITDATATEL
Mr. Wiratno, BcTT.	KA. SUBDITTEKTEL
Drs. Paminto Adjie	KA. SUBDITGARTEL
Drs. Hiro Tugiman, Akt.	KA. SUBDITTANSITEL
Drs. Rubiyanto	KA. SUBDITBINPEGTEL
Ir. Soedarmadi, BcTT.	KA. PUSRENTEL
Ir. Rukman Wirasupena	KA. PUSDIKLATTEL
Mr. Hari Suroso BcTT.	KA. SEKRUTTEL

Table 1-3-4 Principal Indonesian Government Members Concerned in the Main Study (2/2)

Ir. Wisnu Askari Marantika	KA. BINPROSISTEL
Ir. Setiawan	KA. BINPROSENTEL
Ir. Guntur Siregar	KA. BINPROJARTEL
Ir. Saleh Effendi	KA. BINPROTRATEL
Ir. Taufik Akbar	KA. BINPROSATTEL
Mr. H.P. Pandjaitan, BcTT.	KA. BINPROBANGTEL
Mr. Tadjoedin	KA. MATEL
Mr. R.A. Hari Purnomo, BcTT.	KA. TRAFFICTEL
Drs. Sutjito, BcTT.	KA. MODATEL
Ir. Garuda Sugardo	KA. LABDATA
Ir. Mas Budiwasisto	Staff of BINPROSISTEL
Ir. Indro Wuryanto	Staff of BINPROSISTEL

4. **P.T. INDOSAT**

Ir. Sumitro Roestam	General Manager, Operations

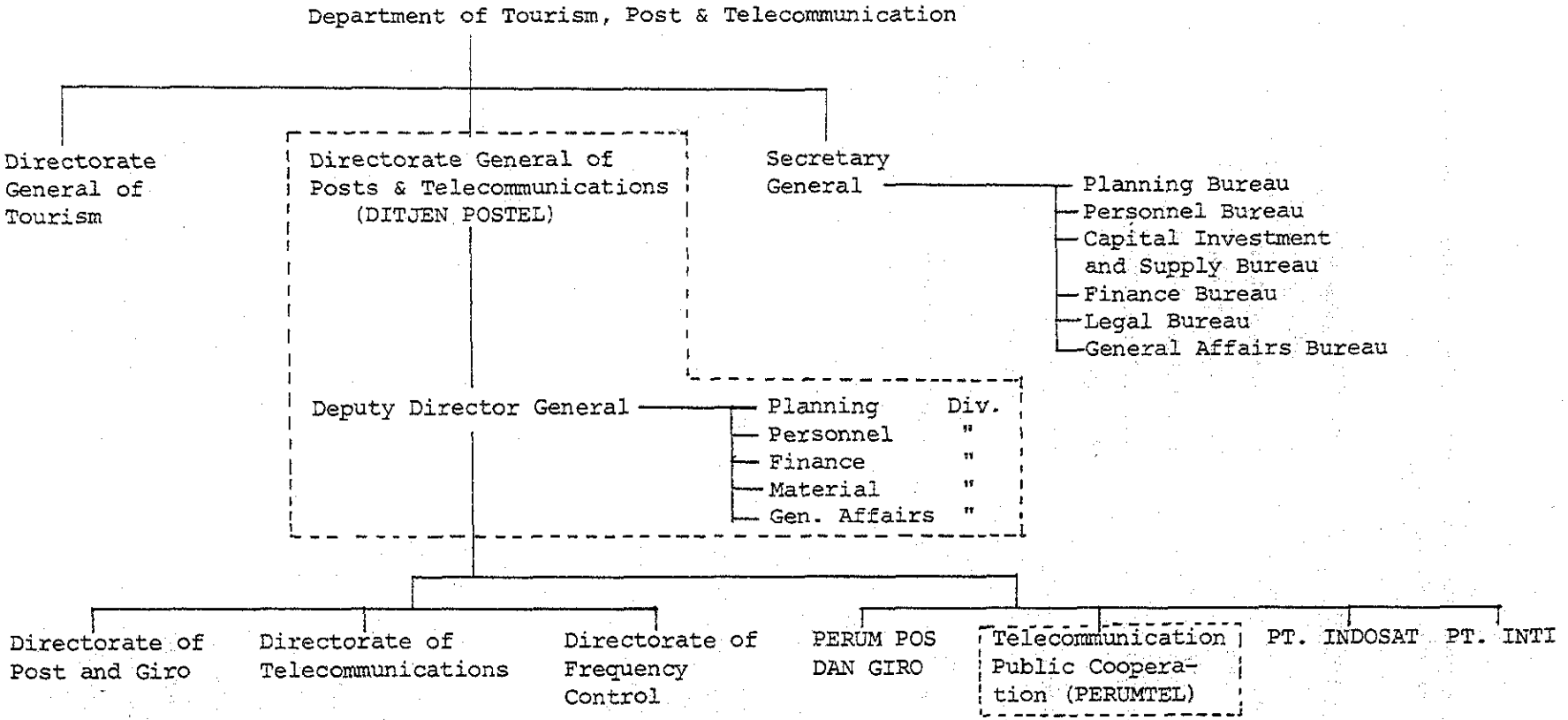

Figure 1-3-1 Organization of Department of Tourism, Posts and Telecommunications

CHAPTER 2
DEVELOPMENT OBJECTIVES AND STRATEGIES

CHAPTER 2 DEVELOPMENT OBJECTIVES AND STRATEGIES

2-1 Benefits of Telecommunications Development

The benefits of telecommunications development can arise for the nation of Indonesia as a whole in general and the operating entity, i.e. PERUMTEL, in particular. Some of the benefits are common for them and some are not. Hence, development plans must be designed to coordinate the benefits of the nation and the operating entity.

(1) Benefits to the Nation

The following three benefits are generally considered to arise for the nation;

- Promoting economic development
- Improving public services provision
- Enhancing national integration

1) Promoting Economic Development

Telecommunications can provide more efficient but less expensive, i.e. high cost effective, means of communications to the economy. Development of telecommunications can, thus, enable the economy to reduce transportation related costs, energy costs, information gathering and transmitting costs, and to promote development of telecommunications equipment manufacturing industries.

2) Improving Public Services Provision

Efficiency, accuracy and speed in communications among public institutions such as government offices, hospitals, transportation facilities, schools will be vastly improved. As a result, the quality and quantity of public services provision will be increased.

3) Enhancing National Integration

Efficiency, accuracy and speed in communications among the law enforcing and security systems will be vastly improved. As a result, the national integration will be enhanced.

(2) Benefits to the Operating Entity

The following three benefits are generally considered to arise for the operating entity.

- Improved provision of telecommunications services
- Improvement of financial conditions
- Expansion of telecommunications business

1) Improved Provision of Telecommunications Services

The provision of telecommunications services will be expanded in both quality and quantity through automatization of switching system, introduction of ISDN, and elimination of waiting applicants.

2) Improvement of Financial Conditions

Appropriate development planning enables PERUMTEL to operate more efficiently with the increased revenue and the reduced expenditures.

3) Expansion of Telecommunications Business

Expansion of business opportunities coupled with the improved financial conditions enables PERUMTEL to expand its operating size. Telecommunications business will increase its significance in the national economy.

2-2 Present Situations Concerning Telecommunications Development

It is essential to understand the situations in which the telecommunications sector is operated in order to establish long-term development plans.

The situations can be examined from two viewpoints.

(1) Macroscopic Viewpoint ... The Viewpoint of National Development

1) National development plans

The national development plans in Indonesia started in 1969. Since then, three five-year development plans have been implemented. The fourth five-year development plan (PELITA-IV) started in 1984 and is currently underway. The main objectives of PELITA-IV, REPELITA-V and REPELITA-VI are summarized in the following table.

Table 2-2-1 The Main Objectives of PELITA-IV, REPELITA-V and REPELITA-VI

Plan	Main Objectives
PELITA-IV (1984 - 1989)	Creation of a foundation which makes a self-growing economy possible 1) less dependence on oil production 2) creation of new job opportunities 3) development of the manufacturing sector
REPELITA-V (1989 - 1994)	Further advancement of the foundation created in PELITA-IV
REPELITA-VI (1994 - 1999)	"Take-off" to an affluent and fair society

2) Problems Associated with National Development

The following three problems are regarded as major obstacles in national development.

- Slow economic growth
- High population growth rate and existence of potential unemployment
- Unbalanced regional and urban/rural development

Slow economic growth

The GDP growth rate of Indonesia had sustained fairly high figures of 6% - 10% until 1981. However, the GDP growth rate went down to 2.2% in 1982, 4.2% in 1983, 5.2% in 1984 and 1.9% in 1985 due to the oil price declines. Thus, it became difficult to obtain necessary amounts of investment fund. This caused the recent delay of PELITA-IV. The government recently took policies of devaluing of Rupiah, reforming of the tax system, promoting exports of manufacturing goods to overcome economic problems.

High population growth rate and existence of potential unemployment

The population in Indonesia has been growing on average at the rate of 2.2% per year. The population growth rate in the urban areas is at 3 - 5% per year which exceeds the national average. This high urban population growth rate is partially caused by continuous inflow of people into the urban areas from the rural areas. This unbalance has become a heavy burden in provision of public services such as education, medical care, and social infrastructure. The number of new job openings cannot keep up with population growth and, hence, the unemployment rate in 1983 became 8.7%. The government has been promoting family planning,

transmigration, and increase of domestic production to overcome the problem.

Unbalanced regional and urban/rural development

Development of industries and infrastructure in the rural areas is far behind that in the urban areas. The unbalance in terms of income and consumption is very large. The regional unbalance is also large with respect to GDP per capita. The most prosperous province enjoys 5 to 10 times larger per capita income than the poorest province.

(2) Microscopic Viewpoint ... The Viewpoint of PERUMTEL Management

1) The past development plans and PELITA-IV in the telecommunication sector

The telecommunication sector has been developed according to the following objectives since 1969.

- Provision of the telephone service in the major cities
- Establishment of SLDD among the major cities
- Expansion of the networks to the major cities located in the remote areas by the satellite system

As the result, 523,000 L.U. have been added to the telephone system during PELITA-I through PELITA-III. The number of main telephone lines per 100 persons went up to 0.33 in 1984 from 0.15 in 1969.

In PELITA-IV, 950,000 L.U. (including 200,000 L.U. from PELITA-III as the carry over project) are planned to be added to the telephone system as a continuation of the PELITA-III policy and various projects for this target have been on-going.

2) Management Problems of PERUMTEL

The following six problems are noticeable as the management problems of PERUMTEL:

- Low telephone density
- Large number of waiting applicants
- Unsatisfied grade of services (manual exchanges, operator-assisted trunk calls, low successful call rate)
- Increasing annual O&M expenditures over the past several years
- Shortage of investment fund
- Long delays in project completion

Low telephone density

The total number of the telephone service subscribers at the end of 1984 is 536,000. The population is 161 million. This gives the telephone density rate of 0.33/100 persons, which is the lowest among all the ASEAN nations.

Large number of waiting applicants

The number of waiting applicants has been increasing at the annual rate of 25% - 60%. The number has reached to 400,000 at the end of 1985, which equals approx. 70% of the total number of telephone service subscribers.

Unsatisfied grade of services

The automatic telephone rate is high in 86%, but the automatic exchange rate is low in 26%. A large portion of long distance calls is handled by the operator assisted system and, hence, subscribers suffer from great inconvenience. The switching and transmission capacities is not well balanced in many areas. That is, some areas have a large (small) switching capacity and

a small (large) transmission capacity. As a result, the successful call rate is low.

Increasing operating and maintenance expenditures

The revenue per service subscriber of PERUMTEL has been increasing at the annual rate of 2% in real. At the same time, the O&M expenditure per subscriber of PERUMTEL has been increasing faster at the annual rate of 9% in real. The profits have been squeezed narrow and consequently, the operating ratio (before tax) went up to 87% in 1984 from 67% in 1980.

Shortage of investment fund

The capacity expansion plan in PELITA-IV is to increase the capacity at the annual rate of 20% to accommodate the increasing number of waiting applicants. The 60% of the investment fund to carry out PELITA-IV program depends on outside fund sources. The recent stagnation of the economy caused by the oil price declines makes the availability of investment funds difficult.

Long delays in project completion

The completion rate of PELITA-III was only one half of what had been planned to accomplish. The completion rate of PELITA-IV, which has already used up one half of the planning period, is estimated to be about 30% of what has been planned to accomplish. At the end of March of 1989, the last year of PELITA-IV, the large portion of the projects will remain unfinished as carry-over projects.

2-3 Development Objectives and Strategies

(1) Long-term Development Objectives

Development of the telecommunication sector is recommended to be proceeded in aiming to realize the following three policies for the next three five-year plans, when the benefits and the surrounding conditions are taken into account.

1) Provision of the telecommunication services which support national development (Development of infrastructure).

2) Improvement of the services in quantity and in quality (Reduction of waiting applicants and unsuccessful calls through automatization of services).

3) Improvement of financial conditions of PERUMTEL (Promotion of self-financing capability).

(2) Development Strategies

The following two methods will be generally considered in making development plans.

1) Find strategies to realize a given particular target.
2) Examine the consequences of adopting a particular strategy.

In this study, the first method was employed because of its simplicity in operating the simulation model.

1) Development Targets

The individual targets to be realized by the end of the year 2004 are set in comparison with other ASEAN nations as follows;

Service Categories	:	The main body of the nationwide services consists of telephone and telex. In the urban areas, various kinds of non-telephone services will be introduced through the realization of ISDN.
User Categories	:	The first priority of the service provision goes to the business and official-use customers. In the urban areas, some of residential demands will be also satisfied.
Network Coverage	:	The network will be developed mainly in the urban areas (Kotamadya and Kabupaten capitals), and that for telephone service will also be expanded to each rural area (Kecamatan and Desa centers). This realizes the rural development target in the ITU Kuala Lumpur Declaration, i.e., "Telephone service shall be available any 3 km radius for all people".
Telephone Density	:	5 - 10/100 persons in the urban areas (1.3/100 persons in 1985). 1.8-2.5/100 persons in the whole nation (0.3/100 persons in 1985).
Waiting Periods for Subscription	:	Minimum 2 weeks, maximum 3 years in the urban areas. Maximum 5 years in the rural areas.
Service Standard	:	The telephone service will be provided by automatic dialling. The telegrams will be delivered in one or two days.

Operating Standard of PERUMTEL : The operating ratio after tax will be less than 0.9. The IRR of investment will be more than 18%.

2) Development Strategies

To achieve the development targets discussed in the previous section, the following items are studied as strategic variables.

Investment Strategies

- Service categories
- User categories ..... Service offering plan
- Network coverage

- Impact of economic power
- Supply speed ..... Annual supply plan

- Regional priority ..... Regional distribution plan

Management Strategies

- Construction costs
- Manpower development ..... Expenditure management
- Operating expenditure

- Operating revenue ..... Revenue management

- Fund source ..... Fund plan

Technical Development Strategies

- Network configuration ..... Network development plan

- Automatization
- Digitalization ..... Facility modernization plan

- Backbone Transmission System ... Backbone transmission system development plan

The investment strategies are studied from the macroscopic viewpoint. The technical and management development strategies are studied from the microscopic viewpoint.

An optimal combination of the annual supply plan, regional distribution plan, expenditure management and revenue management is determined by evaluating the financial results of the strategies simulation. A detailed discussion will be made in the following chapters.

2-4 Strategies Simulation Model

An econometric model of the PERUMTEL System has been developed as a planning tool to assist decision makings on long term investment projects.

The simulation model consists of a system of statistical equations which were estimated by using the operating data of the past five years of PERUMTEL and of the past ten years of telecommunications operating entities in other countries.

By this model, the following six items can be examined.

- GDP growth rate
- Tariff system
- Annual supply volume and speed
- Regional capacity distribution
- Operating expenditure
- Fund source

The impacts of the above variable changes can be evaluated by the following financial indexes.

- Operating ratio
- Internal rate of return
- Debt-service ratio

Figure 2-4-1 shows the flow chart of policy simulations.

The strategies simulation model is discussed in detail in ANNEX-1.

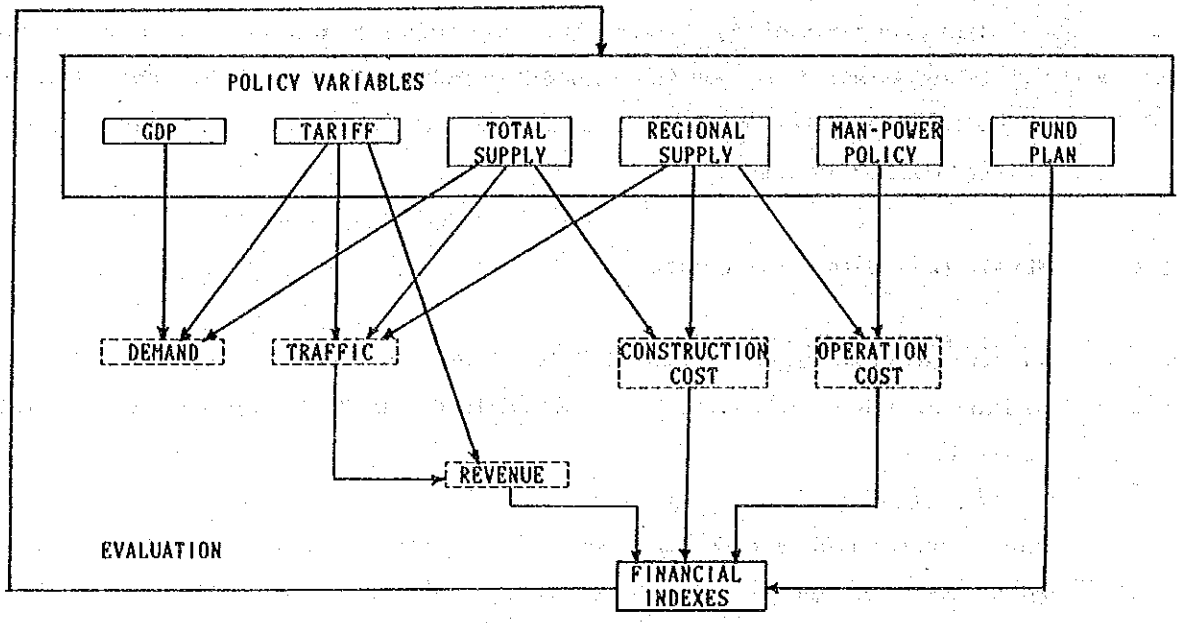

Figure 2-4-1 The Diagram of Policy Variable Impact

2-5 Development Scenarios

The optimum development scenario will be formulated by combining development strategies. The hierarchy order of the strategies was set by the following steps in considering the importance of the strategies and their financial impacts.

Step 1: Annual Supply Volume and Speed
Step 2: Regional Capacity Distribution
Step 3: Operating Expenditure
Step 4: Tariff System

Figure 2-5-1 shows how the strategies are organized into the development scenarios. For each branch, financial evaluation was made to find the optimum development scenario.

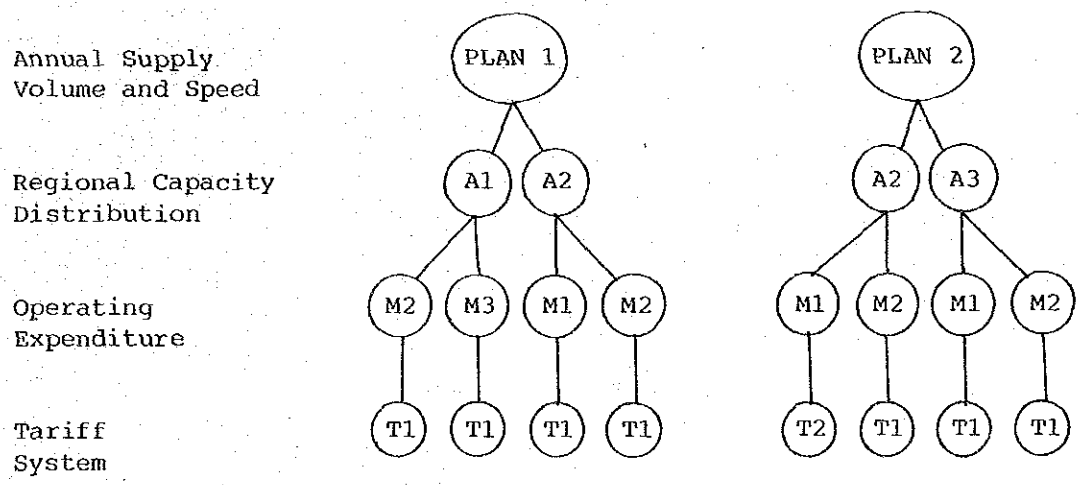

Figure 2-5-1 Development Scenarios Formulation Flow

CHAPTER 3
THE STATE OF TELECOMMUNICATIONS IN INDONESIA

CHAPTER 3 THE STATE OF TELECOMMUNICATIONS IN INDONESIA

3-1 The Current Socio-Economic Conditions

This section summarizes various aspects of the present socio-economic structure of Indonesia.

3-1-1 Population and Geography

1) Indonesia is the largest among the nations which consist of many islands. It consists of about 13,700 islands within the north-south range of 1800 km and the east-west range of 5000 km. About 150 million people live in the area.

2) Regional distribution of people is very uneven. The Jawa island, which takes only 6.9% of the total area size, has 62% of the whole Indonesian population.

3) The average population density of whole Indonesia is 77 people per 1 km^2. The breakdown of the figure is 693 people per 1 km^2 in the Jawa island, 13 people per 1 km^2 in the Kalimantan island and 3 people per 1 km^2 in Irian Jaya.

4) There are about 13000 small islands which have less than 1000 inhabitants.

5) Many different tribes who speak different languages and live in different customs. The national language is Indonesia language but about 25 other languages are also currently used in various areas.

6) Since Indonesia consists of many islands, there exist many value systems and cultures in various areas.

7) The urban population rate of Indonesia on average is 22.4% (in 1980), but 70% of the total urban population is in the Jawa island. Table 3-1-1 shows the urban population rates of the main islands.

Table 3-1-1 Urban-Rural Population in Indonesia in 1980

Area	Urban ($x10^3$)	Rural ($x10^3$)	Urban Pop Rate (%)
Jawa	22,626	70,951	24.2
Sumatera	5,653	20,096	22.0
Kalimantan	1,288	5,003	20.5
Sulawesi	1,832	8,637	17.5
Others	10,220	42,980	19.2
Indonesia	32,846	113,931	22.4

Source: Statistical Yearbook of Indonesia

8) The annual growth rates of urban population and rural population are 5.4% and 1.7% (in 1980), respectively. These figures reflect a recent trend of urban migrations, especially in the Jawa island. Table 3-1-2 shows figures of urban migration.

Table 3-1-2 Urban Migration Figures in 1980

Area	Urban		Rural	
	Inflows	Rate (per pop)%	Inflows	Rate (per pop)%
Jawa	991,614	4.3	225,527	3.3
Sumatera	474,836	8.7	2,695,820	12.0
Kalimantan	224,513	15.6	327,089	6.2
Sulawesi	81,616	4.9	210,243	2.4
Others	159,747	11.9	160,373	1.8
Indonesia	1,932,326	5.9	3,619,052	3.2

Source: Statistical Yearbook of Indonesia

The Indonesian government has been implementing the transmigration policy. The aim is to promote relocation of people from the Jawa island to the Sumatera island and the Kalimantan island.

9) The population growth rate is predicted to be 2.06% per annum from 1980 to 2000. Population will increase from 148 million in 1980 to 223 million in 2000.

10) Table 3-1-3 shows how population share changes in the main islands.

Table 3-1-3 Population Share Changes in Main Islands (%)

Island	1971	1980	2000
Jawa	63.83	61.88	56.75
Sumatera	17.75	19.00	23.09
Kalimantan	4.32	4.56	5.37
Sulawesi	7.15	7.65	7.19
Others	7.25	7.51	7.60

11) The urban population share will increase from 22.4% in 1980 to 37% in 2000. Table 3-1-4 shows how urban population shares change in the main islands.

Table 3-1-4 Changes of Urban Population Shares (%)

Island	1971	1980	2000
Jawa	18.0	25.1	46.4
Sumatera	17.1	19.6	26.0
Kalimantan	20.4	21.5	24.2
Sulawesi	16.1	16.8	18.5
Others	31.6	27.5	33.5
Indonesia	17.3	22.4	37.1

12) The Administrative System of Indonesia consists of 27 Provinces as the primary districts, 246 Kabupaten and 54 Kotamadya as the secondary districts, 3,539 Kecamatan as the tertiary districts, and 67,534 Desa as the smallest administrative districts.

3-1-2 National Economy

1) The growth rate of real GNP between 1972 and 1982 was 7.3% per year. The nominal GDP per capita became US$560 in 1981. Indonesia in 1981 was classified as a medium income nation according to the World Bank. The GDP growth rate, however, went down to 2.2% per year in 1982 due to the low oil revenue by the world-wide recession. The GDP growth rate went up to 4.2% per year in 1983 by devaluing the exchange rate. In 1984, the nominal GDP per capita, however, again went below US$500, though the GDP growth rate was 5.2%.

Indonesia became once again a low income nation according to the World Bank.

3-1-3 National Development Plans

(1) The Past Development Plans

The history of the development plans in Indonesia started from the first five-year development plan, PELITA-I, in 1969. Since then, two development plans have been completed, PELITA-II and III, and the fourth five-year development plan, PELITA-IV, is currently underway. Table 3-1-5 summarizes the development objectives of PELITA-I, II and III.

The first five-year development plan, PELITA-I, started in the year of 1969/70. It mainly aimed at developing self-supply capability of foods and building the infrastructures. The realized real GDP growth rate was 7.7% per year, which far exceeded the target growth rate of 5% per year.

The second five-year development plan, PELITA-II, started in the year of 1974/75. The realized real GDP growth rate was 6.9% per year, which was below the target growth rate of 7.5% per year because of the world recession caused by the first Oil shock. The 50% devaluation of Rupiah took place during PELITA-II.

The third five-year development plan, PELITA-III, started in the year of 1979/80. It's main aim was to develop an economic structure which depends on less oil production. Another devaluation of Rupiah, 38%, took place in 1983 because of the shortage in the government revenue caused by the oil market decline.

Table 3-1-5 The Outline of PELITA-I, II and III

Years	1969/70 - 1973/74 PELITA-I	1974/75 - 1978/79 PELITA-II	1979/80 - 1983/84 PELITA-III
	(Urgent stabilization of the National Economy)	(Making a foundation for "Take-off" and Balanced Development)	(Further Development and Fair Distribution)
Main Objectives	1) Expansion of the agricultural sector, especially in foods production. 2) Expansion of the textile and apparel industry, construction of infrastractures, development of agriculture supporting industries. 3) Control of inflation GDP growth rate Target 5% Realized 7.7%	1) Production expansion of goods, construction of infrastructures 2) Fair provision of social welfare, equalization of income distribution 3) Creation of job opportunities 4) Making a foundation to build the heavy industry GDP growth rate Target 7.5% Realized 6.9%	1) Faster economic growth 2) Stabilization of the healthy and dynamic society 3) Promotion of export of non-oil related goods 4) Development of labor-intensive industries, Development of leading firms. 5) Growth of the private sector 6) Self-sufficient supply of foods GDP growth rate Target 6.5% Realized 6.1%

Figure 3-1-1 shows how the economic growth rates were changed in the past.

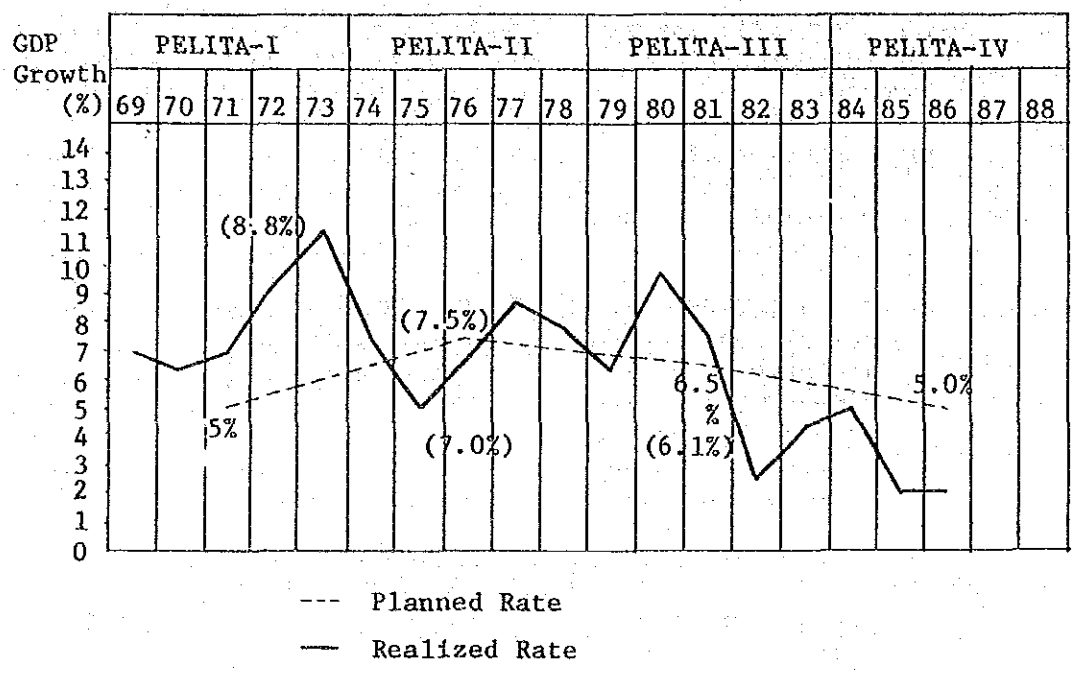

Figure 3-1-1 The GDP Growth Rate

(2) The Forth Five-year Development Plan, PELITA-IV

The PELITA-IV's aims are to improve the standard of living, the educational level, the welfare level and to build a strong foundation for future advancement. The most emphasized is economic development, especially building self-supplying capability of foods in the agricultural sector, and producing capital goods in the manufacturing sector.

The financial policy stresses the continuation of the balanced budget, together with the increase of the government revenue from non-oil sources and the increase of the government surplus by more efficient spending. The monetary policy stresses the promotion of

savings in the private sector and the control of inflation (8% per year). The trade policy stresses the increase of the export of non-oil related products, especially the export of manufacturing products, and the cautious management of foreign debts. The investment policy stresses the larger injection of the government funds into labor intensive activities which also depend less on imported goods. In general, the increase in efficiency in economic activities, simplification of trade procedures, rules, and regulations, the increase of activities initiated by the private sector are stressed.

The GDP growth rate per year during PELITA-IV is targeted at 5%, which is set far below the target levels of PELITA-II and III. The industrial growth rates are targeted as follows; 3% in the agricultural sector, 2.4% in the mining sector, 9.5% in the manufacturing sector, 5% in the construction service sector, 5.2% in the transportation/communication service sector and 5% in the other sectors. The manufacturing sector is expected to be the leading industry. As a result of PELITA-IV, by the end of 1988, the following are planned to be realized; the agricultural sector share in GDP goes down to 26.4% from 29.2% of 1983; the manufacturing sector share in GDP goes up to 19.4% from 15.8%; hence, the more balanced economic structure.

Population will be estimated to grow at 2% per year and to increase to approximately 175 million by the end of 1988. Hence, the GDP per capita growth rate will be estimated to be 3% per year. The labor force will grow at 2.5% per year. The new addition to the labor force during PELITA-IV will be approximately 9.3 million. The creation of new jobs will be expected to become the most important problem.

(3) The future problems

PELITA-IV is in a difficult situation in achieving its objectives due to the large decrease in the government revenue caused by the oil revenue decline. The GDP growth rates were 6.1% per year in 1984 and 1.9% per year in 1985.

The GDP growth rate will be expected to go down further in 1986. The government carried out the devaluation of Rupiah in 1986 to boost the oil revenue. Whether or not this policy will improve the economy is yet to be seen.

PELITA-IV plans to build the framework for "Take-off". REPELITA-V plans to strengthen the foundation. REPELITA-VI plans to achieve "Take-off".

"Take-off" means to put the economy on a steady growth path through less dependence of oil and more powerful private sector activities.

The central force to lead the economy is expected to be shifted from the government to the private sector. Hence, the agricultural products dominant export structure must be changed into the structure in which high value added manufacturing goods become main exporting goods.

At the same time, domestic capital goods production must be developed urgently but steadily.

The future policies must be designed to solve the following problems; creation of new job opportunities; development of the non-Jawa islands; domestic production of capital goods and export of high value added manufacturing goods; reduction of foreign debts.

3-2 The Current State of Telecommunications Services

3-2-1 Telecommunications Services in Nine Countries

(1) Telephone Service

Table 3-2-1 presents the current situation of the telephone service in nine countries of the world.

Table 3-2-1 Telephone Service in Nine Countries (1984)

Country	Main Lines (x1000)	Population (x1000)	Tel/100 persons	GDP/Capita (US$)
U.S.A.	96,500	236,600	40.8	15,470
Japan	43,811	119,483	36.7	9,780
France	22,086	54,979	40.2	8,100
Singapore	742	2,544	29.2	7,260
Malaysia	849	15,300	5.6	2,060
Thailand	519	50,583	1.0	830
Philippines	480	53,352	0.9	410
Indonesia	540	161,580	0.3	480
India	2,668	732,698	0.4	220

Source: ITU "Yearbook of Common Carrier Telecommunication Statistics", 1986

According to Table 3-2-1, Indonesia stands above the Philippines and Thailand in the number of main lines but in the telephone density takes the lowest position among the ASEAN countries. Even in comparison with India whose per capita GDP is one half of that of Indonesia, Indonesia has lower telephone density.

(2) Telegraph Service

Telegraph service in nine countries of the world is shown in Table 3-2-2.

Table 3-2-2 Telegraph Service in Nine Countries (1984)

Country	No. of Telegram (x1000)	Population (x1000)	Telegram /100 persons	GDP/Capita (US$)
U.S.A.	37,385	236,600	15.8	15,470
Japan	45,692	119,483	38.2	9,780
France	12,411	54,979	22.6	8,100
Singapore	348	2,544	13.7	7,260
Malaysia	1,183	15,300	7.7	2,060
Thailand	8,486	50,583	16.8	830
Philippines	13,456	53,352	25.2	410
Indonesia	8,500	161,580	5.3	480
India	61,872	732,698	8.4	220

Source: ITU "Yearbook of Common Carrier Telecommunication Statistics", 1986

1) The number of telegrams per 100 persons is highly demanded in the countries where GDP per capita is high except U.S.A. This may be the result of telecommunications service expansion; that is, the use of recorded communication media might have shifted from telegram to other media (e.g., telex and data communication service).

2) The number of telegrams per 100 persons in Indonesia is somewhat less than other ASEAN countries.

(3) Telex Service

The present situation of the telex service in nine countries of the world is in Table 3-2-3.

Table 3-2-3 Telex Service in Nine Countries (1984)

Country	Subscriber Lines	Telex Term. /100 persons	Telex Term. /Tel. Line	GDP/Capita (US$)
U.S.A.	151,996	0.064	0.0016	15,470
Japan	51,000	0.043	0.0008	9,780
France	114,320	0.208	0.0052	8,100
Singapore	15,975	0.628	0.0219	7,260
Malaysia	9,774	0.064	0.0115	2,060
Thailand	4,856	0.010	0.0093	830
Philippines	12,860	0.024	0.0268	410
Indonesia	10,289	0.006	0.0191	480
India	22,552	0.003	0.0087	220

Source: ITU "Yearbook of Common Carrier Telecommunication Statistics", 1986

1) The telex terminal density per 100 persons seems to increase as GDP per capita grows. However, in U.S.A. and Japan, the density is lower than that in France. The use of recorded communication media might have shifted from telex to data communication and facsimile services.

2) The ratio of the number of telex terminals to the number of main telephone lines seems to become low in the countries where GDP per capita is high.

(4) New Services

The introductory states of new services in major countries of the world are shown in Table 3-2-4.

Table 3-2-4 Currently Provided Telecomm. Services in the World

(1986)

Category	Services		U.S.A.	JAPAN	U.K.	FRANCE	F.R.G.	SWITHERLAND	SINGAPORE	MALAYSIA	INDONESIA
LOW SPEED 64 Kbit/s	Teletex		◎	◎	◎	◎	◎	◎	◎	◎	◎
	Tele Writing		◎	◎						◎	
	Facsimile		◎	◎	◎		◎		◎	◎	◎
	Image		◎	○							
	Data Communication	Packet	◎	◎		◎	◎	◎	◎	◎	◎
		Circuit	◎	◎			◎			△	
	Teletext		◎	◎	◎	◎	◎				△
HIGH SPEED	TV Conference		◎	◎	◎	◎	◎	◎			
	TV Telephone		◎	○							
	Video Tex		◎	◎	◎	◎	◎	○	△	△	
	Facsimile	H.S.	◎	◎	◎		◎				
		Color		△							
MOBILE	Paging		◎	◎	◎		◎				
	Telephone on Ship		◎	◎							
	Telephone in Car		◎	◎	◎	◎	◎	△	◎	◎	◎
	Telephone in Train		◎	◎			◎				
	Telephone in Air Plane		◎	◎							
OTHERS	High Speed Digital Comm.		◎	◎	◎						
	Satellite Comm.		◎	◎	◎	◎	◎	◎			◎
	Card Telephone		◎	◎		◎	○		◎		

LEGEND

◎ In Service

○ Trial Operation

△ Under Planning

3-2-2 Telecommunications Services in Indonesia

(1) Telephone Service

Table 3-2-5 and Figure 3-2-1 present the telephone service development in Indonesia, categorized in the number of telephones installed and line units, as well as the automatic service rate.

Table 3-2-5 Telephone Service in Indonesia

Item	PELITA-I 1974	PELITA-II 1979	PELITA-III 1984	PELITA-IV 1989 (Expected)
Main Telephone	197,571	317,115	536,102	1,450,000
Branch Telephone	91,403	124,169	252,263	680,000
Exchange Capacity	232,964	547,872	697,816	1,700,000
No. of Exchanges	544	569	683	752
Automatic Telephone Rate	54%	84%	86%	96%
Automatic Exchange Rate	7%	18%	26%	47%
Population (x1000)	128,616	143,457	161,580	179,000
Main Tel/100 persons	0.15	0.22	0.33	0.81

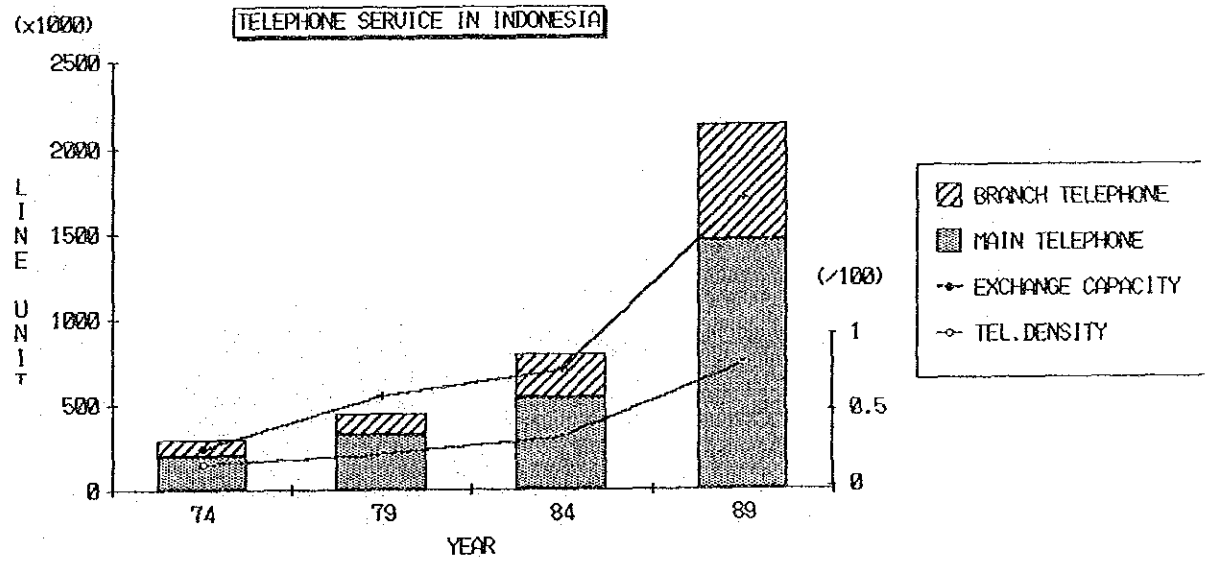

Figure 3-2-1 Telephone Service in Indonesia

1) During the 10 years from 1975 through 1984, the main telephone lines increased by 10.5% per year.

2) The ratio of the number of the branch telephones to the total number of the main telephones is about 30%.

3) The ratio between the number of main telephones and that of line units at telephone exchanges in 1984 was about 0.77.

4) In relation to the increase in the number of line units at telephone exchanges, the increase in the number of telephone exchanges lags behind. This fact shows the greater development emphasis has been placed on capacity expansion of facilities than on network expansion.

5) The automatic service rate in 1984 in terms of the number of main lines is as high as 88%. But considerable number of small capacity manual exchanges still remain at work.

(2) Telegraph Service

The telegraph service development in Indonesia, categorized in the number of messages and of facilities, is shown in Table 3-2-6 and Figure 3-2-2.

Table 3-2-6 Telegraph Service in Indonesia

Item	PELITA-I 1974	PELITA-II 1979	PELITA-III 1984	PELITA-IV 1989 (Expected)
Domestic Telegram (x1000)	3,776	5,503	8,419	10,200
International Telegram (x1000)	494	268	81	30
No. of Telegraph Office	592	622	641	670
GENTEX Terminal	-	273	599	1,300
Telegraph Leased Circuit	96	202	543	1,500
Population (x1000)	128,616	143,457	161,580	179,000
Telegram/100 persons	3.3	4.0	5.3	5.7

Source: PERUMTEL "TRAFFIC 82/83, 83/84" and "PELITA-IV"

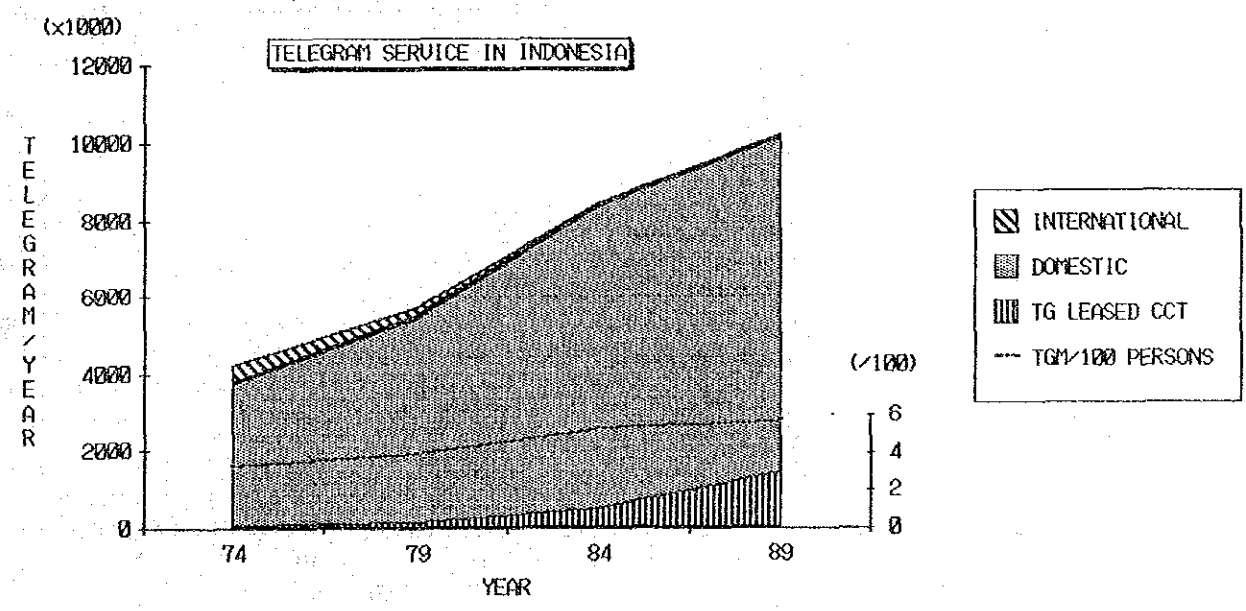

Figure 3-2-2 Telegraph Service in Indonesia

1) The number of domestic telegrams increased by 8.3% annually during the 10 years from 1975 through 1984.

2) The number of international telegrams decreased by 16.5% during the 10 years from 1975 through 1984.

3) In relation to the increase in the number of messages handled, the increase in the number of telegram offices falls short, indicating that the network expansion has not been carried out positively. Since GENTEX terminals as automatic telegram send/receive system have been rapidly increasing, quick delivery service areas have been certainly expanded.

4) The number of leased telegraph circuits grew seven times faster in 10 years between 1975 and 1984 than the decade ago. This fact shows that the demand for data communication has been growing.

5) The telegraph service demand increased by 4.7% per year in 10 years between 1975 and 1984.

(3) Telex Service

The telex service development in Indonesia, categorized in the number of pulses and of facilities, are shown in Table 3-2-7 and Figure 3-2-3.

Table 3-2-7 Telex Service in Indonesia

Item	PELITA-I 1974	PELITA-II 1979	PELITA-III 1984	PELITA-IV 1989 (Expected)
Total Pulses (x1000)	15,400	63,115	595,839	1,075,000
No. of Telex Terminals	1,194	4,009	10,289	24,600
Telex Exchange Capacity	1,810	9,230	12,790	32,300
No. of Telex Exchanges	16	20	29	33
No. of Mail Telephones	197,571	317,115	536,102	1,450,000
Telex Term./Telephone	0.006	0.013	0.019	0.017

Source: PERUMTEL "TRAFFIC 82/83, 83/84" and "PELITA-IV"

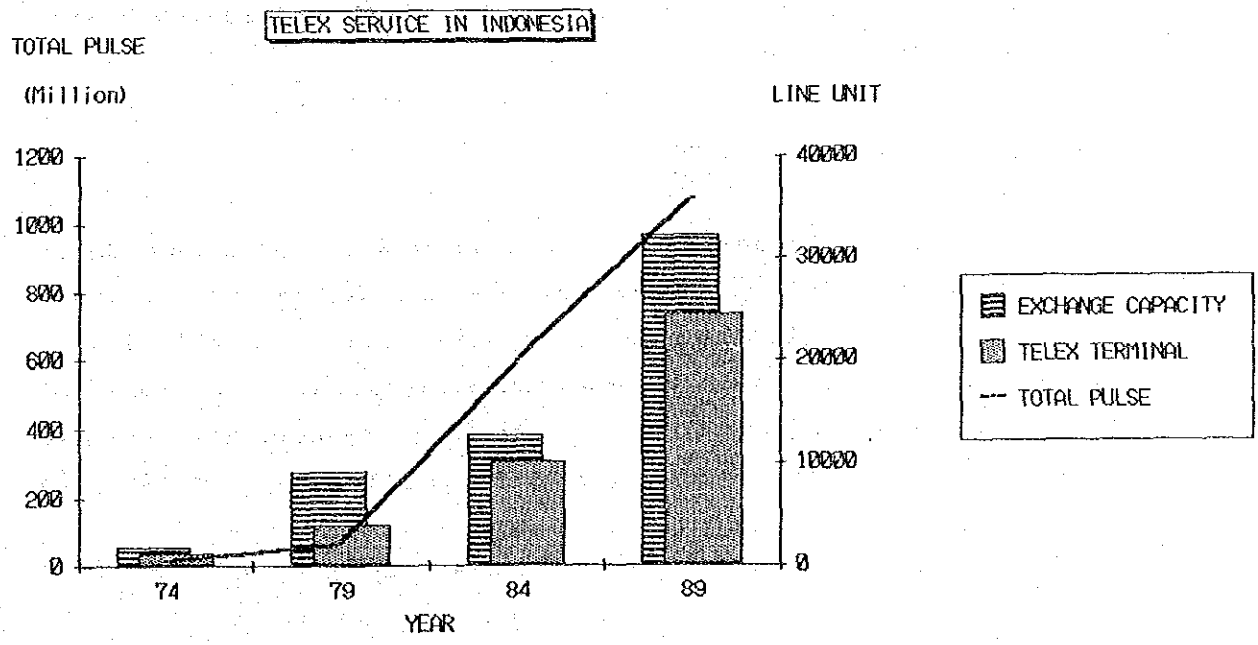

Figure 3-2-3 Telex Service in Indonesia

1) The number of pulses in telex communication has increased by as much as 44% per year during the 10 years from 1975 through 1984.

2) The number of telex terminals has increased by more than 24% per year during the 10 years from 1975 through 1984. This growth rate, however, is smaller than that of the pulses.

3) The growth rate in the number of telex offices falls short of the growth rate in the number of telex terminals. However, the network expansion in 10 years between 1975 and 1984 is 1.8 times as much.

4) The ratio in the number of telex terminals to the total number of main telephones has been improving every year. The figure is 0.019 in 1984. This fact shows that the growth rate in the number of telex subscribers is higher than that of telephone subscribers.

(4) New Services

The development of new services, such as data communication, facsimile, radio paging and land-mobile radiotelephone, in Indonesia, is summarized as follows;

1) Domestic Data Communication

Since about 10 years ago, large scale business organizations such as PERTAMINA and GARUDA have been operating their private data communication networks by utilizing PERUMTEL's leased circuits or their private transmission systems. The number of leased telegraph circuits used for those purposes has increased remarkably by seven times in 10 years between 1975 and 1984, as previously stated.

For the public data communication network, PACKSATNET began its test service in 1985. The new packet switched data communication network service (Sambungan Komunikasi Data Paket, abbreviated as SKDP) was introduced in 1986. This SKDP system is to operate with 200 proposed subscribers for an initial stage, interconnecting subscribers in Jakarta, Surabaya, Medan and Bandung.

2) International Data Communication

PT. INDOSAT started its international packet service to Singapore and the USA in September, 1984 before the domestic service was offered. Since then, the service has been extended to other countries via the TELEPACS system of Singapore and the ITT-UDIS system of the USA. Eighteen countries including Singapore, the USA, Australia, West Germany, France, Japan are currently accessible.

3) Facsimile

The facsimile service is currently offered by utilizing the public telephone network. The subscribers are supposed to purchase PERUMTEL authorized facsimile terminals and connect them with the network.

The number of the authorized facsimile terminals is about 30 kinds and the number of the registered facsimile terminals is about 250.

4) Radio Paging Service

As of 1986, the radio paging service is not yet introduced. However, the service is to be introduced in the near future in seven cities, i.e., Jakarta, Surabaya, Bandung, Medan, Semarang, Palembang and Denpasar. Nine companies have already submitted their service applications. This service is to be realized as a joint venture with PERUMTEL.

5) Land-Mobile Radiotelephone

Land-mobile radiotelephone introduced in 1979 is now in service in Jakarta and Surabaya. The total number of subscribers in both cities as of March 1986 is 1,750. In PELITA-IV Program, the service areas are to be expanded to Bandung, Medan and Semarang. Now, the adopted system for this service is a small capacity, large zone system. However, along the road from Jakarta to Bandung, a large capacity with small zone system is installed in parallel with the former system. The number of subscribers as of August, 1986 is as follows;

Area	No. of subscriber
Jakarta, Bandung	
Conventional type	1,000
Cellular type	1,000 (capacity: 10,000)
Surabaya	
Conventional type	750

3-3 The Current State of Telecommunications Facilities in Indonesia

(1) Outline of the Facilities

Current distribution of telephone and telex exchange and transmission facilities by region as of 1984 is shown in Table 3-3-1.

The public telecommunication networks at present are the following 4 networks;

1) Telephone network
2) Telex network
3) Packet switched data network
4) Non-switched network (leased lines)

Table 3-3-1 Existing Facilities by Region (As of Dec. 1984)

Category	Island	SUMATERA	JAWA	NUSA TENGGARA	KALIMANTAN	SULAWESI	MALUKU/ IRIAN JAYA	WHOLE INDONESIA
Telephone	Exchange Capacity (Auto) L.U.	99,752	439,120	16,526	14,696	20,696	10,600	601,390
	Exchange Capacity (Man) L.U.	22,628	42,828	7,782	7,395	12,643	3,150	96,426
	No. of Exchange (Auto)	40	101	9	9	8	8	175
	No. of Exchange (Manual)	123	247	35	39	45	19	508
Telex	Telex Exchange Capacity L.U.	2,490	8,000	300	1,100	650	250	12,790
	Number of Telex Exchange	7	11	1	4	3	3	29
Transmission	Terrestrial Circuit (FDM/TDMA)							9,085
	Terrestrial Circuit (HF)	65	7	76	41	32	11	232
	No. of Stations (FDM/TDMA)	124	481	26	5	39	-	675
	No. of Stations (HF)	80	13	23	47	48	51	262
	Satellite Channels							3,831
	No. of Earth Stations	35	9	11	21	18	22	116

(2) Telephone Network

The telephone network is organized by five hierarchical switching centers. Switching centers operating by automatic and/or manual switching system are linked by terrestrial and/or satellite transmission systems.
The number of centers are as follows;

1)	International switching center (ISC)	2
2)	Tertiary center (TC)	7
3)	Secondary center (SC)	33
4)	Primary center (PC)	190
5)	Local exchange (LE)	453

The existing automatic subscriber dialing telephone network (SLDD network) configuration is shown in Figure 3-3-1.

(3) Telex Network

The telex network consists of three hierarchical automatic exchanges linked by terrestrial and/or satellite transmission systems. They are as follows;

1)	Tandem international exchange	2
2)	Tandem national exchange	5
3)	Terminal exchange	33

Configuration of existing telex network is illustrated in Figure 3-3-2.

(4) Packet Switched Data Communication Network

Two kinds of the networks are now in use.

1)	PACKSATNET	Packet switched network by satellite transponder
2)	SKDP	Packet switched network by digital switching system

The configurations are shown in Figure 3-3-3 and Figure 3-3-4. Figure 3-3-5 shows the network configuration of SKDP, managed by PT. INDOSAT.

(5) Terrestrial Long Distance Transmission Systems

Four kinds of transmission systems are now in use. Among them, the microwave system and short wave system are becoming obsolete and almost reaching to their service life.

Application of the Transmission Systems

Category	Backbone Link	Spur Link	Terminal Link
Microwave system	o	o	o
UHF/VHF system	-	o	o
Coaxial cable system	-	o	o
Shortwave system	-	o	o

The existing backbone microwave systems and constructed years are shown in Figure 3-3-6.

(6) Satellite Transmission System

The domestic satellite communication system in Indonesia is presently operated by PALAPA-B1. The numbers of transponders in operation and earth stations are shown below;

	Facility	As of 1986 Quantity
Satellite	PALAPA B1	24 Transponders
Earth station	Master control	1
	High traffic station (SBB)	19
	Medium traffic station (SBS)	20
	Low traffic station (SBK)	82

Eight transponders out of 24 transponders are leased to the ASEAN countries and domestic users.

Figure 3-3-7 shows the locations of the earth stations.

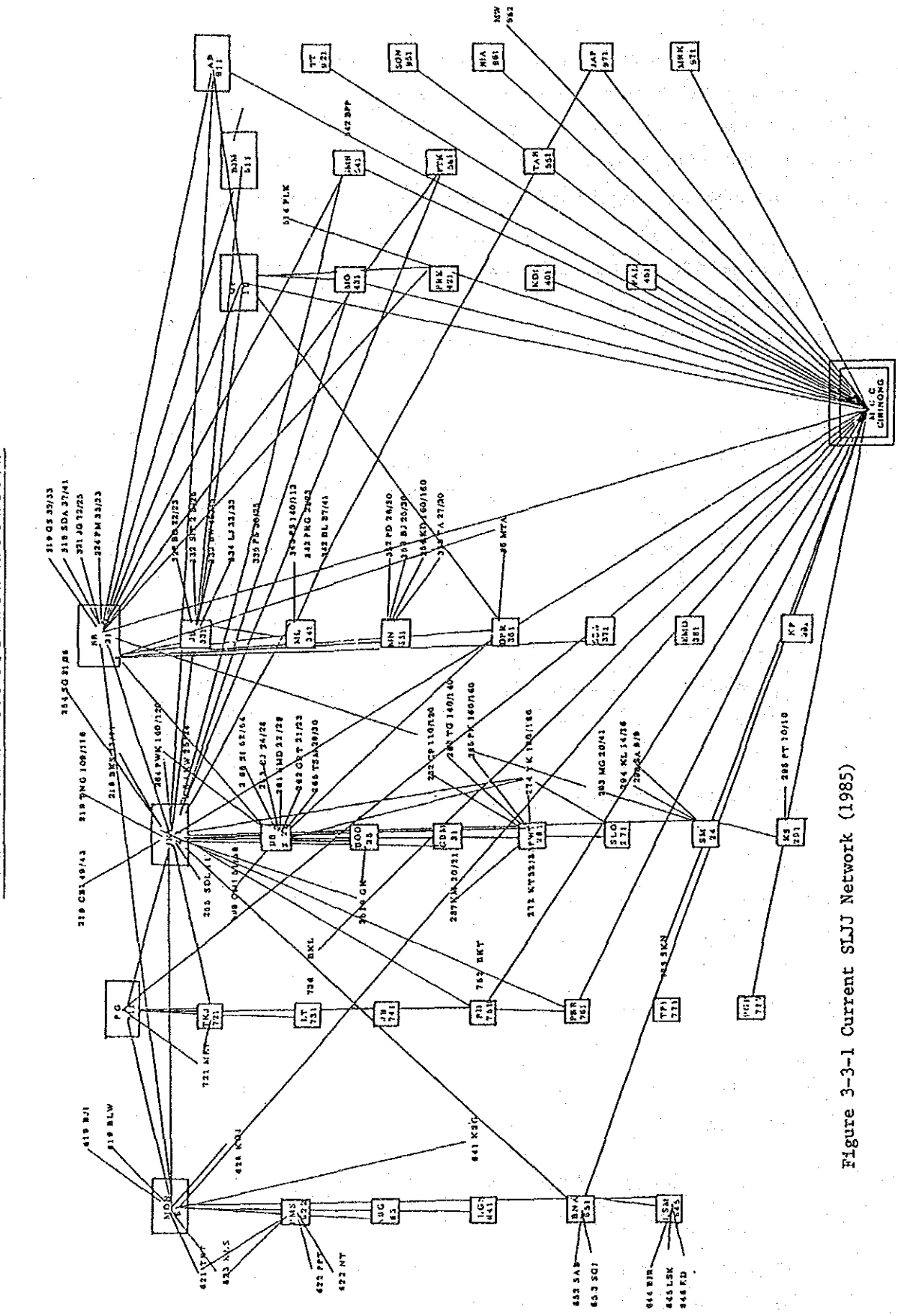

Figure 3-3-1 Current SLJJ Network (1985)

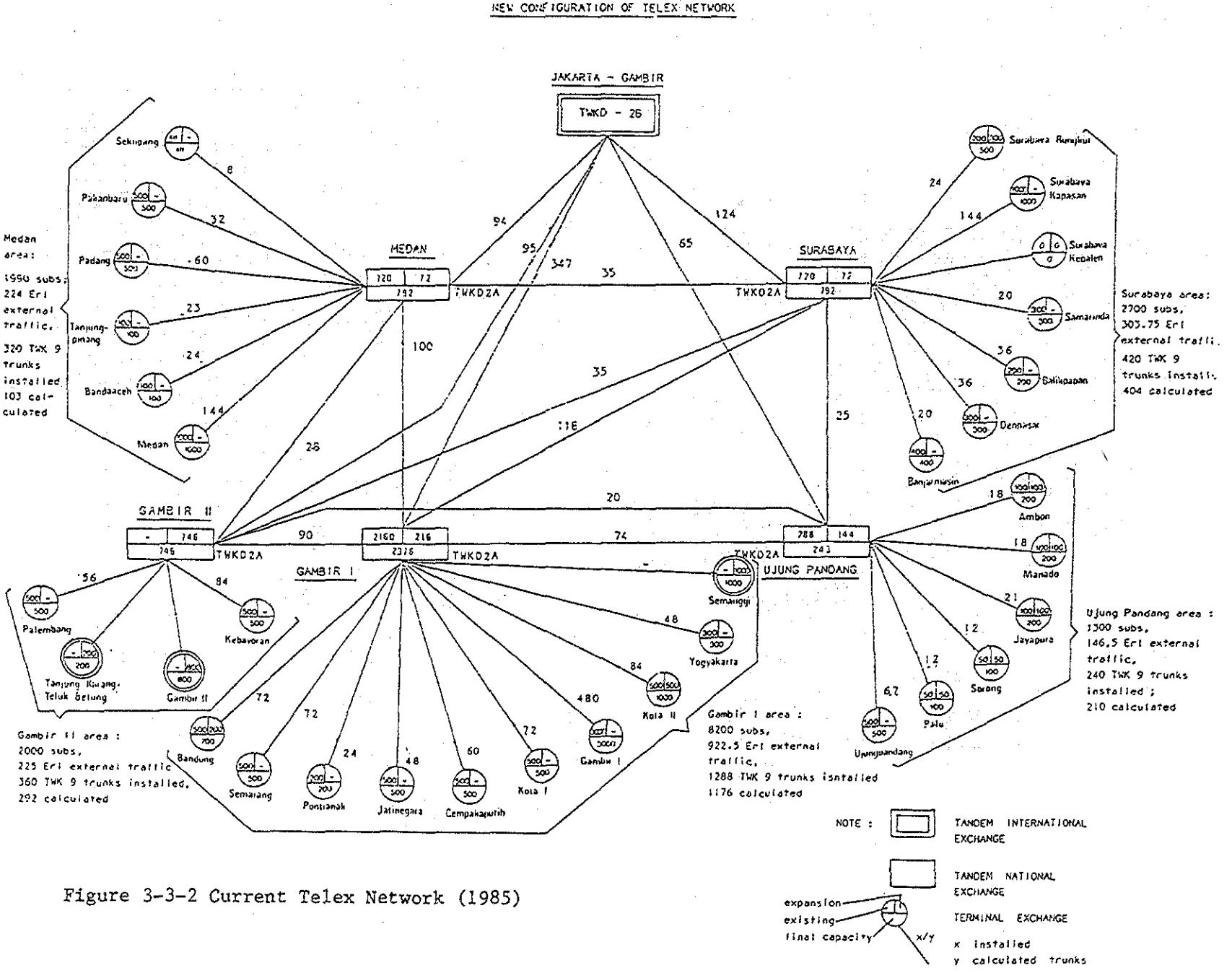

Figure 3-3-2 Current Telex Network (1985)

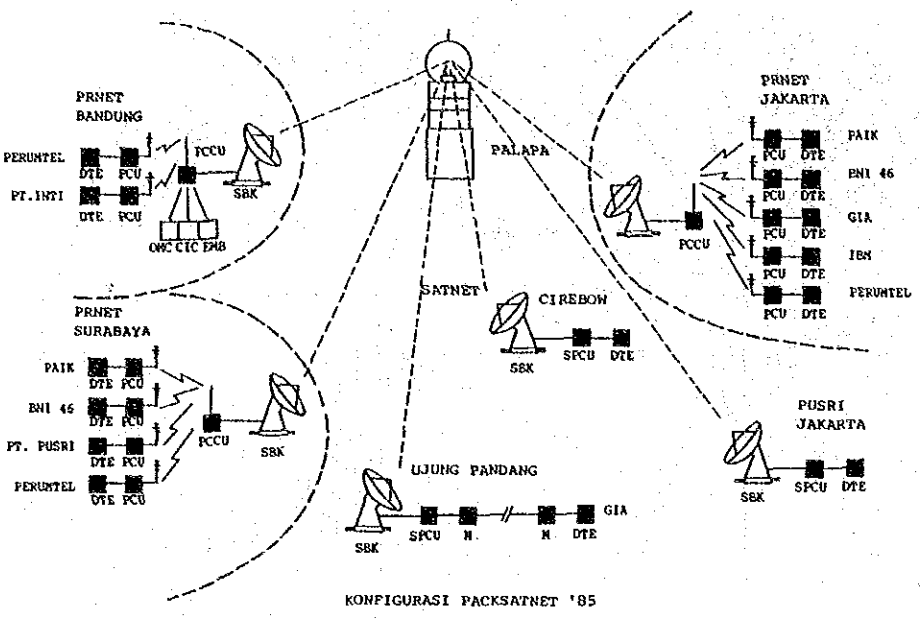

Figure 3-3-3 Configuration of PACKSATNET (1985)

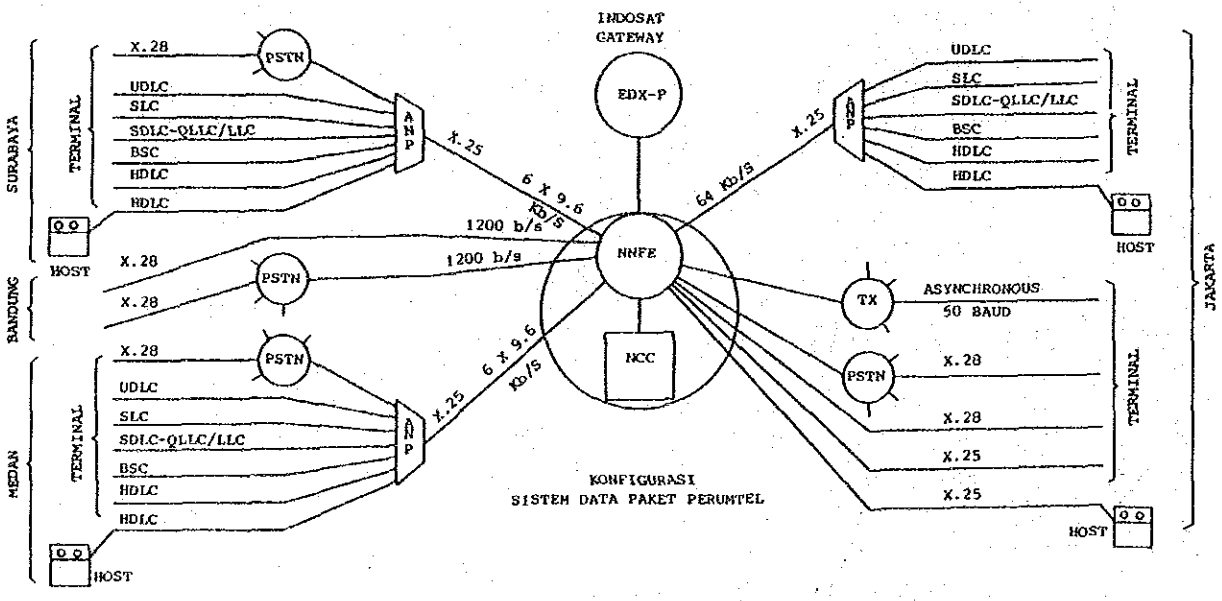

Figure 3-3-4 PERUMTEL's Packet Data Communication System

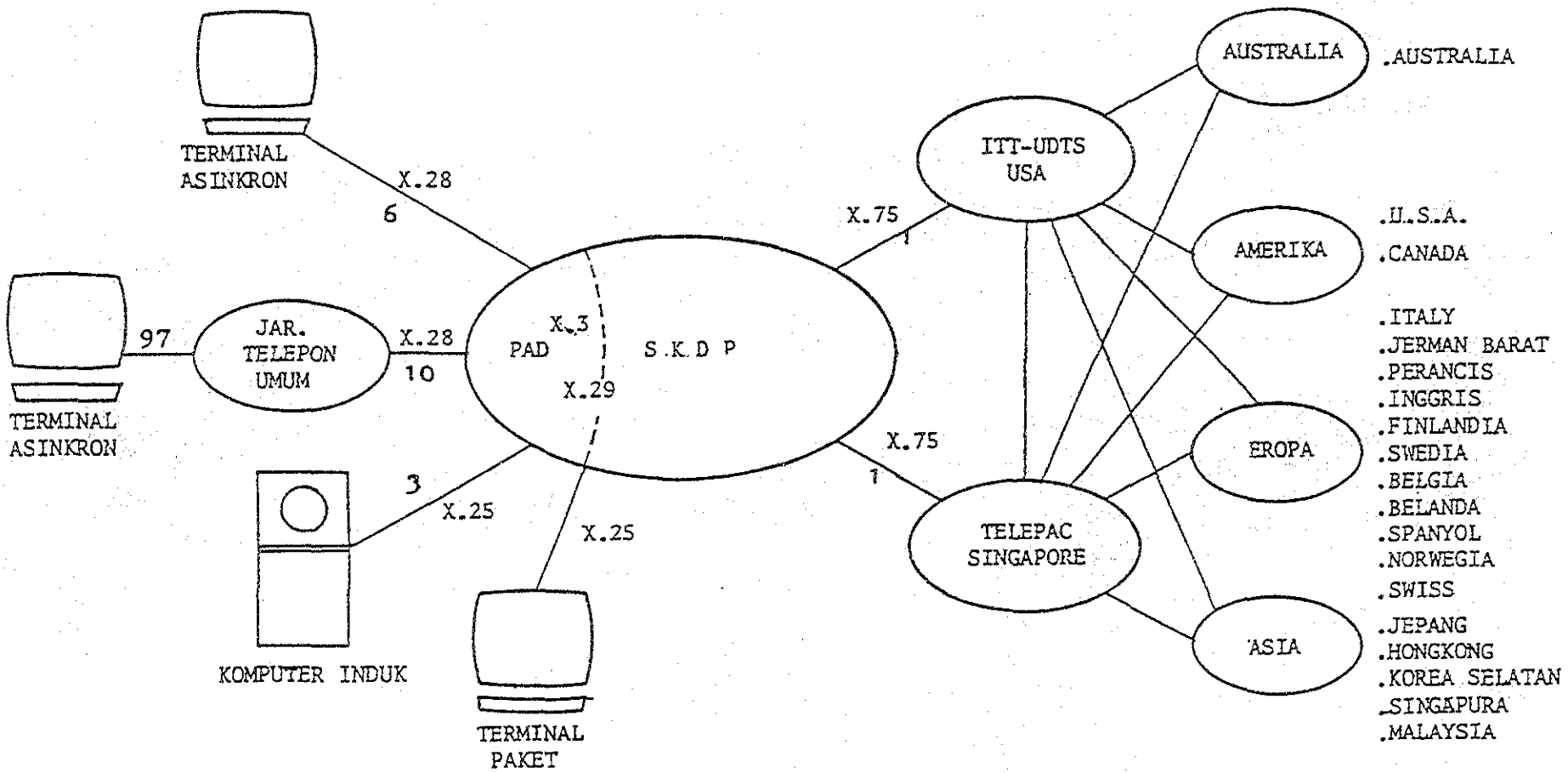

Figure 3-3-5 P.T. INDOSAT's Packet Data Communication System

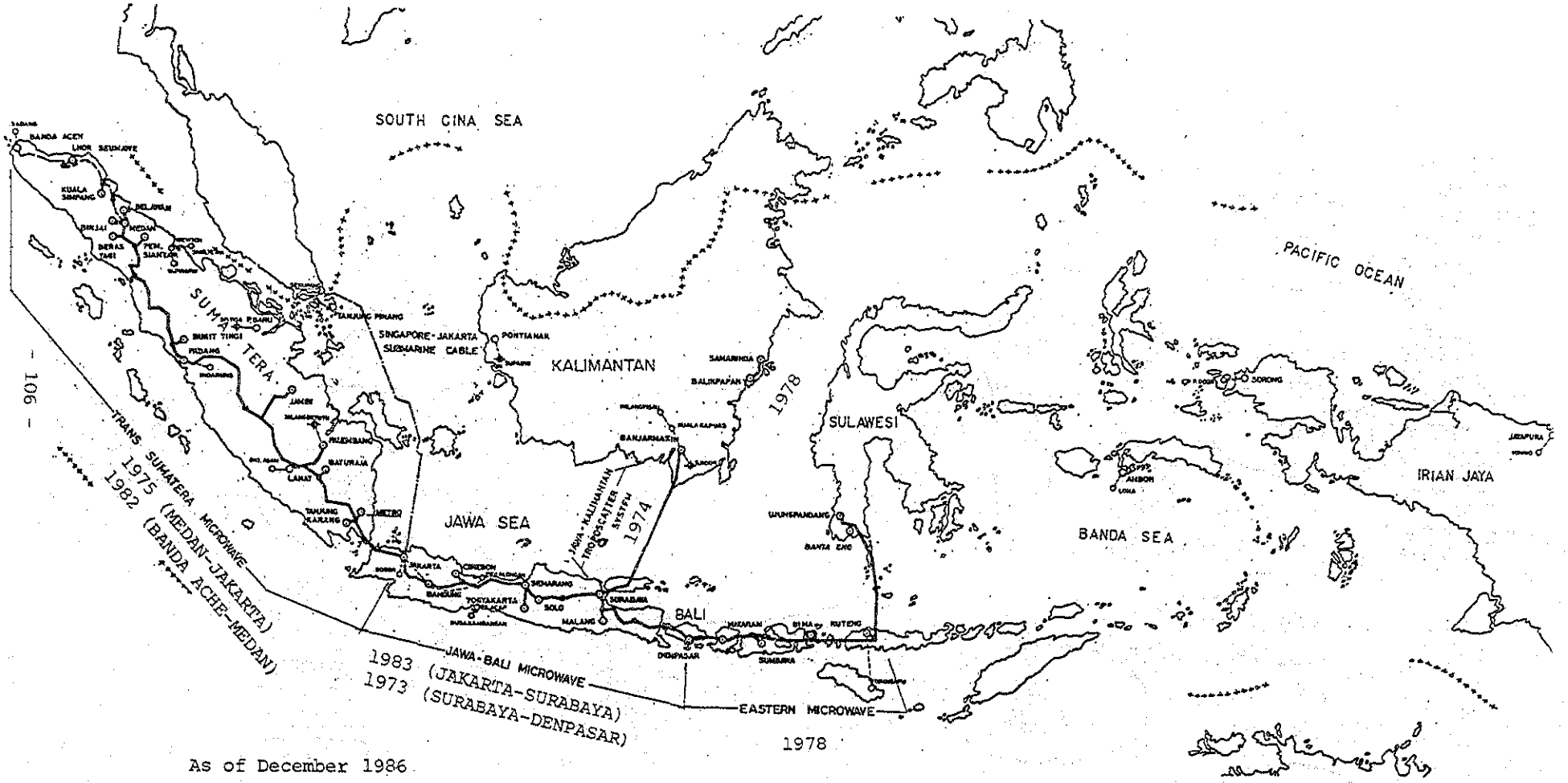

Figure 3-3-6 Existing Backbone Microwave Systems and Constructed Years

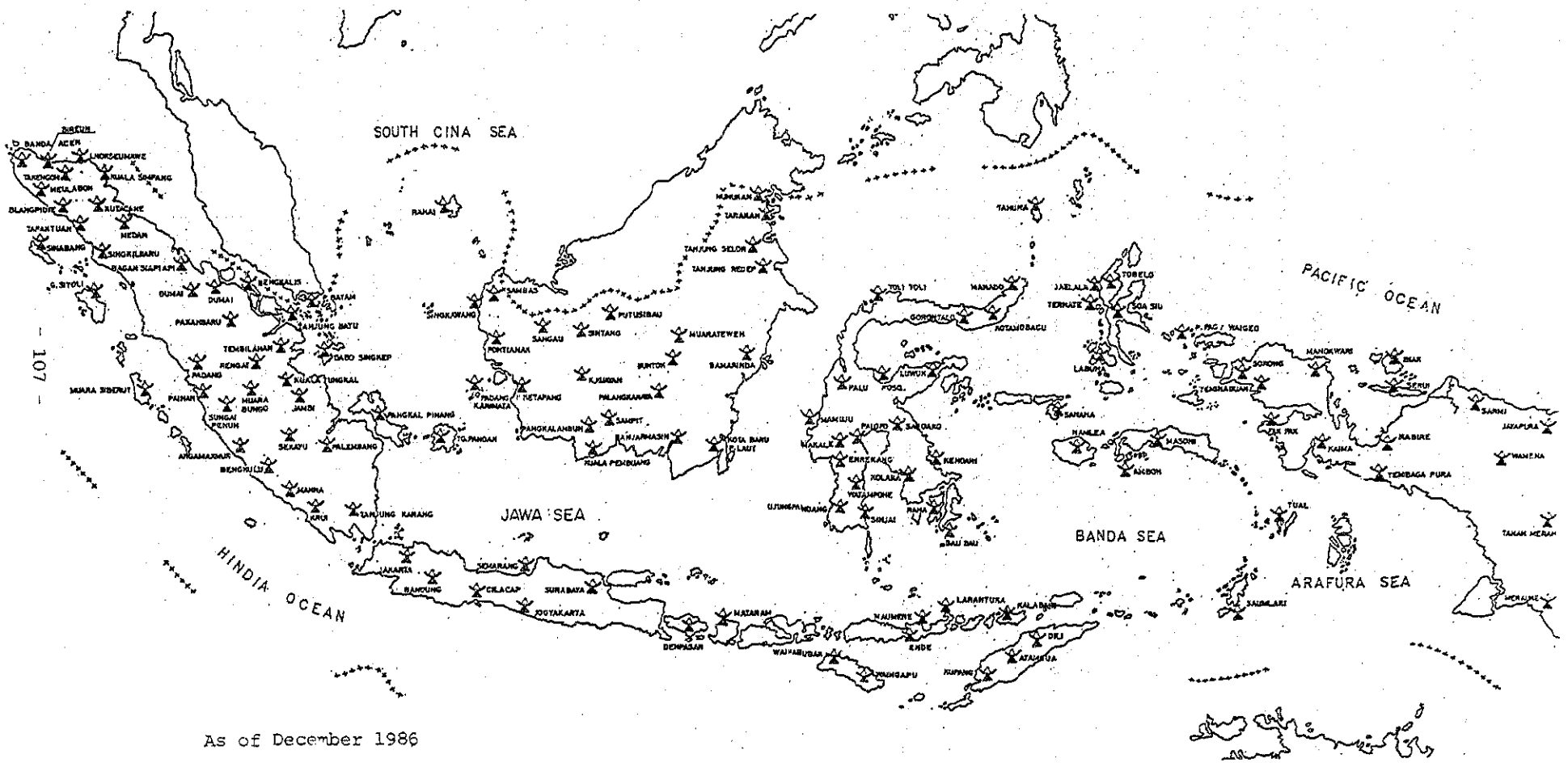

Figure 3-3-7 Existing Earth Stations for Domestic Satellite Communication System

3-4 The Current State of PERUMTEL Management

3-4-1 General

The telecommunication sector in Indonesia is administrated by the Directorate General of Posts and Telecommunications (DITJEN POSTEL) of the Department of Tourism, Posts and Telecommunications and by the Directorate General for Sea Communications of the Department of Transportation.

Under the DITJEN POSTEL, PERUMTEL--a state-owned public enterprise--is responsible for provision of all domestic land telecommunication services, while international services are handled by the Indonesia Satellite Corporation (P.T. INDOSAT) also a state-owned corporation. Sea communications are directly controlled by the Directorate General for Sea Communications in close coordination with the DITJEN POSTEL. The current managerial situations of PERUMTEL will be discussed in the following sections.

Organization, Management and Staffing

PERUMTEL is managed by a Board of Directors. Under the director general five directors are responsible for the Operations and Engineering, Personnel and Administration, Finance, Supply and Development (investment planning and implementation. The organizational chart is shown in Figure 3-4-1. The daily operation responsibility is decentralized into the 12 Regional Offices (WITEL).

At the end of 1985, PERUMTEL had 36,091 staff employees and 591,747 telephone service subscribers. The ratio of about 61 staffs per 1000 subscribers is far above the average figure of the ASEAN countries.

ORGANIZATION CHART OF PERUMTEL

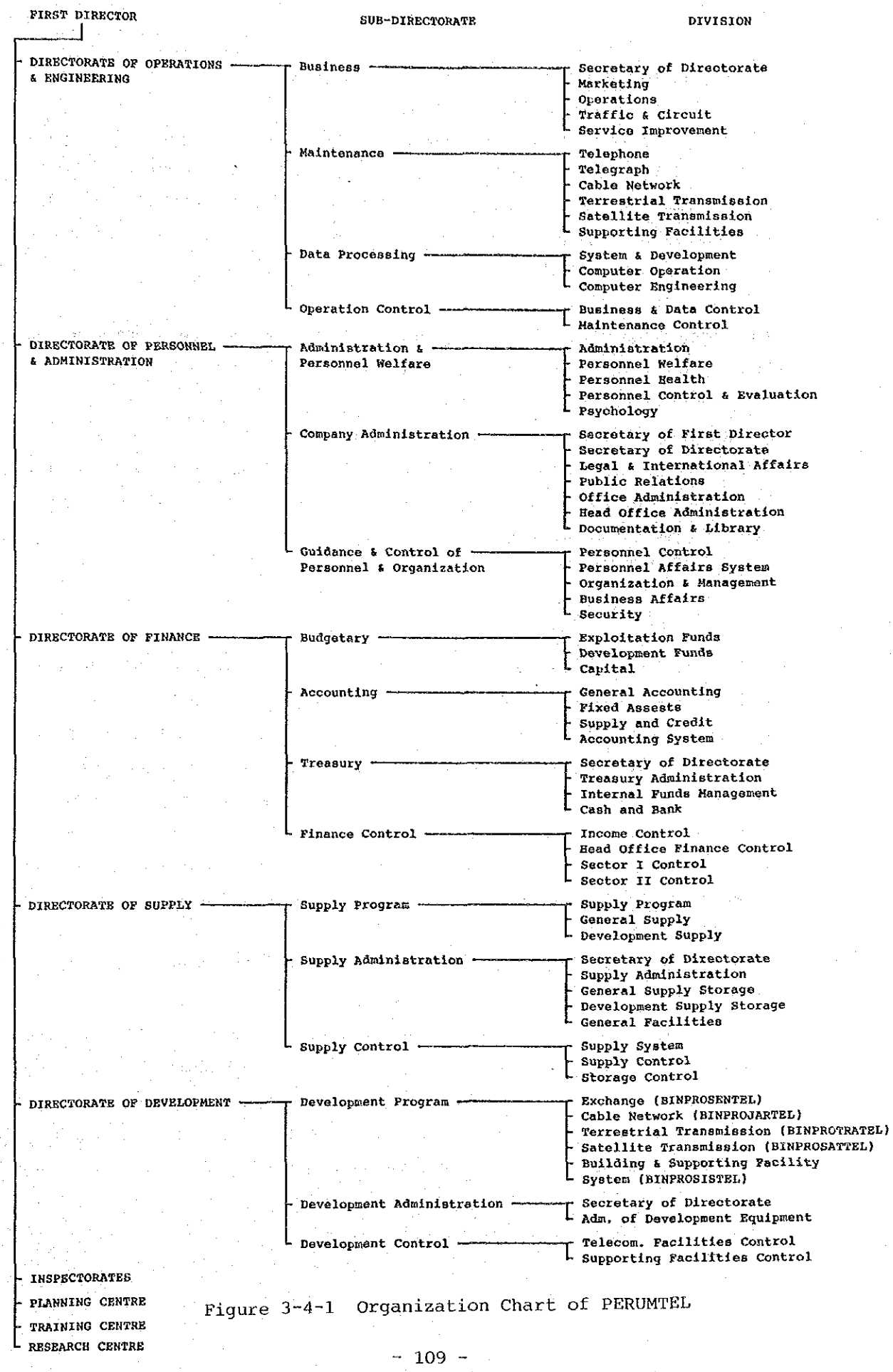

Figure 3-4-1 Organization Chart of PERUMTEL

Financial Performance

During the 1980-1984 period, the operating revenue per subscriber increased by about 2% per annum in real terms, while operating costs in the same period increased by about 9% per annum in real terms due to mainly increases in staff salaries and wages, which grew at about 10% per annum in real terms.

Therefore, the operating expenses must be reduced to a lower level than that of operating revenue for future healthy management.

At the end of 1984, the debt/equity ratio was 47/53, and the current assets were about 2.6 times larger than the current liabilities. The PERUMTEL's overall financial position is not unhealthy at present as far as these figures show.

Development Performance

Indonesia has the telephone density of about 0.33 per 100 people, the lowest among the ASEAN countries. This low density is mainly a result of small investment in this sector (a low proportion of GDP). On the other hand, the demand for the telephone service has been increasing, especially in large cities. At the end of 1985, there existed 370,000 registered waiting applicants. Potential demand must be larger than this figure because many people are discouraged from applying for the service by the long waiting period.

3-4-2 Current State of Indonesia in Comparison with Nine Other Countries

The following indexes were used to compare the current states of the various management aspects as well as the socio-economic environmental positions of nine countries during the years between 1980 and 1984. The data used are taken from ITU's "Yearbook of Common Carrier Telecommunication Statistics", 1986 edition. The nine countries are Indonesia, Thailand, Malaysia, Singapore, India, France, U.S.A., Philippines and Japan. They are classified as

Developing Country (India, Indonesia, Philippines), Middle Developed Country (Thailand, Malaysia, Singapore) and Developed Country (France, Japan, USA).

1) Telephone main lines per 100 inhabitants
2) Telecommunications investments as a share of GDP (%)
3) GDP per capita (real US$)
4) Waiting Applicants/Telephone service subscribers
5) Increased number of telephone service subscribers/Total number of telephone service subscribers
6) Increased number of telephone service subscribers/Waiting applicants
7) Telex service subscribers/Telephone service subscribers
8) Data communication service subscribers/Telephone service subscribers
9) Investment including Land & building (US$)/Telephone service subscribers
10) Total Staff/Telephone service subscribers
    Technical Staff Share
    Operating Staff Share
11) Operating Ratio
12) Total Revenue/Telephone service subscribers (US$)
13) Installation Tariff (US$)
    Monthly Rental Tariff (US$)

By using these indexes, Figures 3-4-2 to 3-4-10 were made. From the figures, the following preliminary findings are noticeable:

(1) GDP per capita vs. Telecommunication Investment Share to GDP

Country	GDP/Capita	Investment Share	
Developing Countries	Low	Low, High	0.1-7.0%
Indonesia	483		0.1-0.2%
Middle Developed Countries	Medium	High	0.8-5.0%
Developed Countries	High	Medium	0.5-0.8%

As GDP per capita increases, the investment share increases at first, but becomes almost constant at the level of 0.8% which is the level of the developed countries.

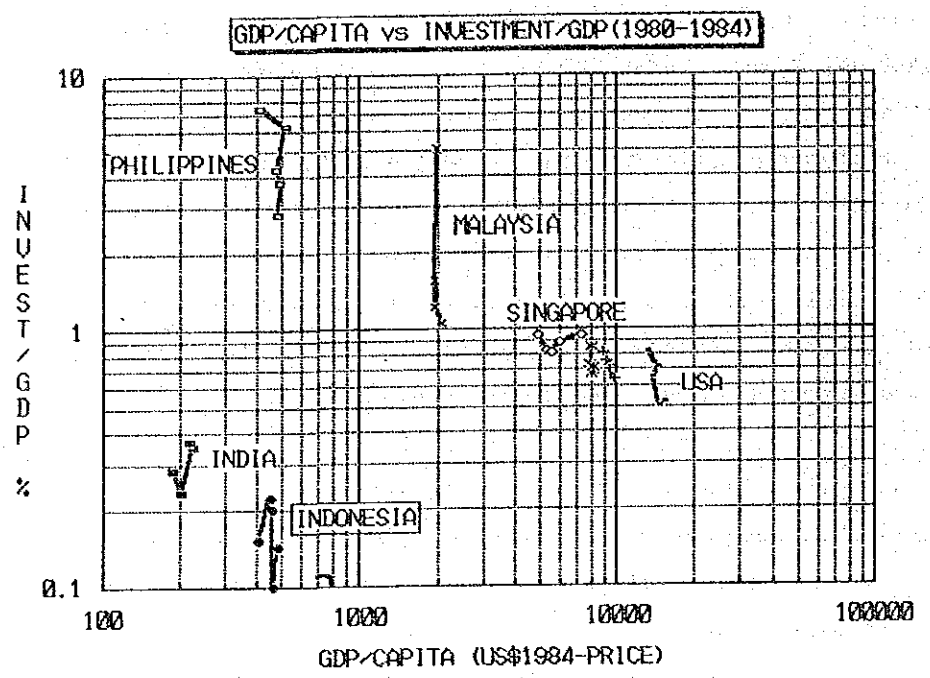

Figure 3-4-2 GDP per capita vs. Telecommunication Investment Share to GDP

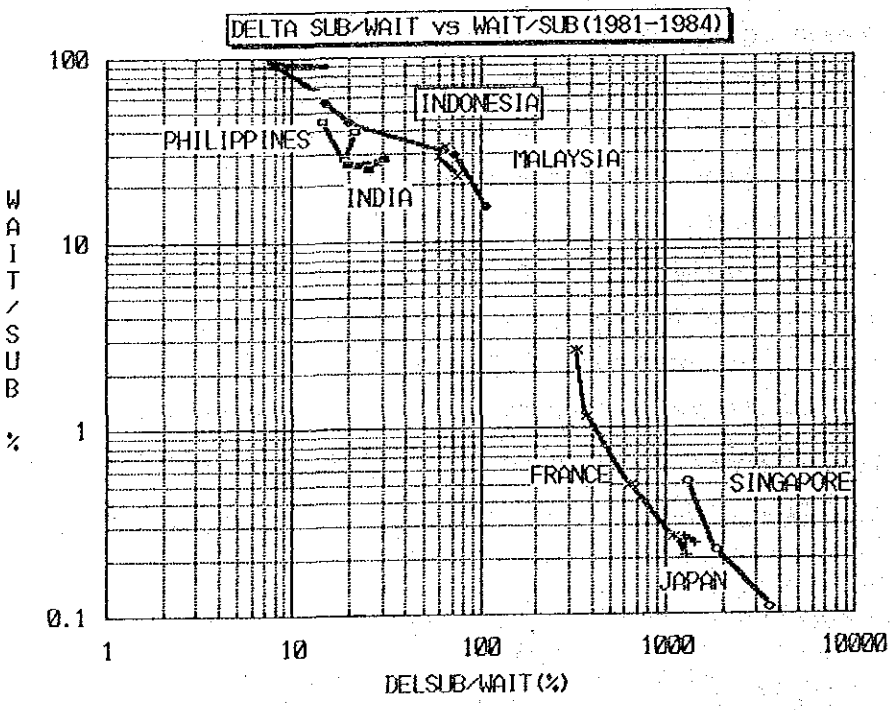

Figure 3-4-3 Increased Number of Subscribers/Waiting Applicants vs. Waiting Applicants/Sub.

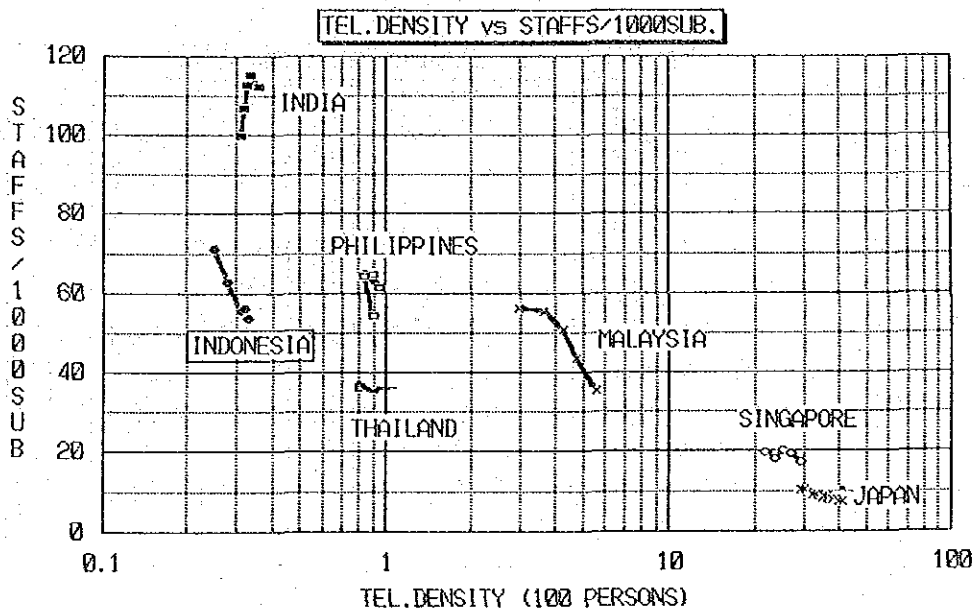

Figure 3-4-4 Telephone Density vs. Total Staff per Subscriber

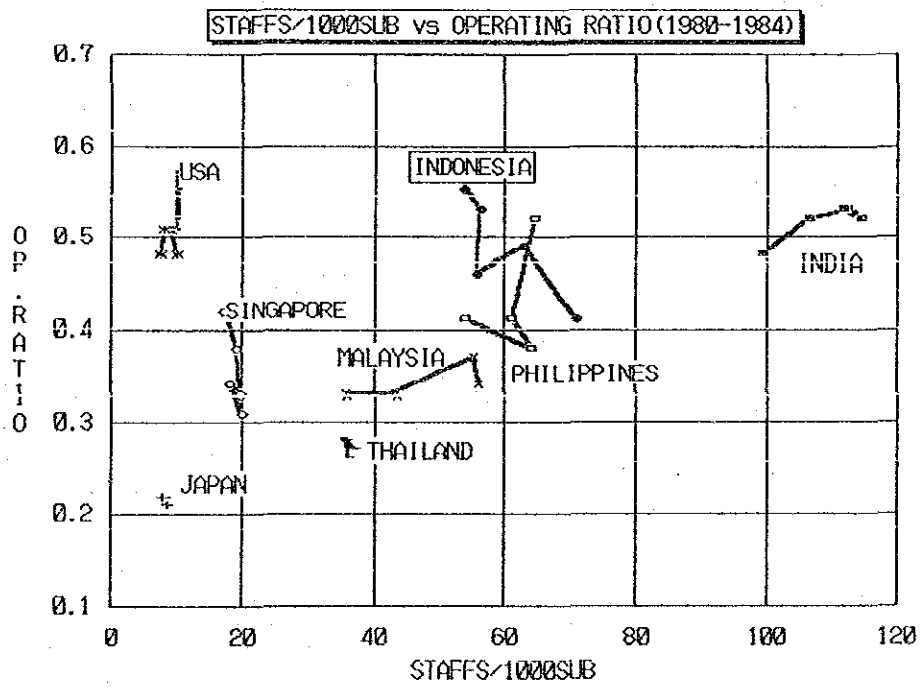

Figure 3-4-5 Total Staff per Subscriber vs Operating Ratio

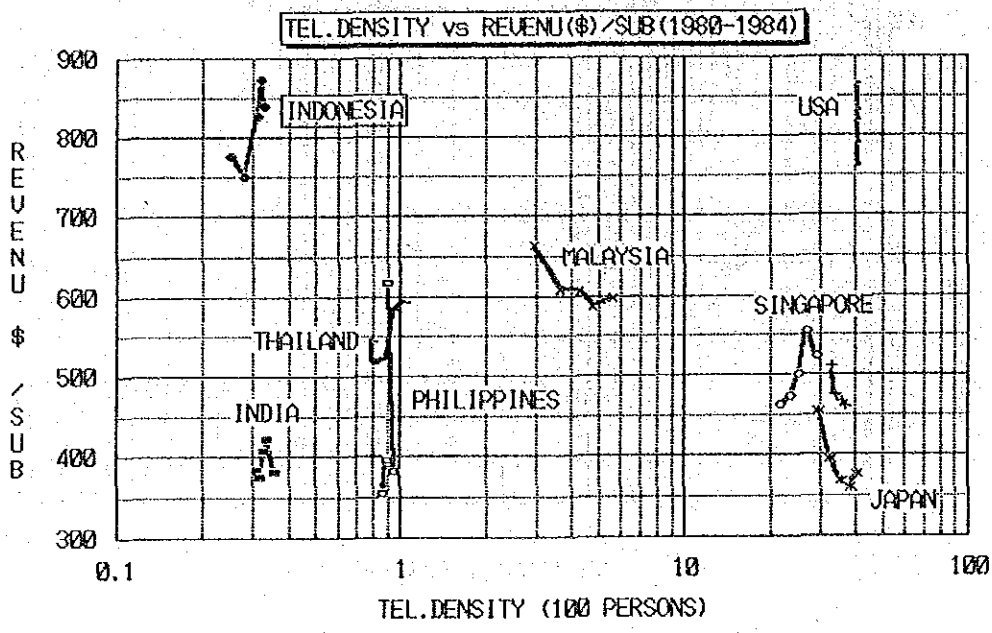

Figure 3-4-6 Telephone Density vs. Revenue/Subscriber

(2) Increased Number of Subscribers/Waiting Applicants vs. Waiting Applicants/Sub.

Country	Supply Rate		Wait/Sub.	
Developing	Low	15-100	High	13-60
Indonesia		15-100		13-60
Middle Developed	Low, High	6-9000	Medium, High	8-20
Developed	High	300-2000	Low	0-3

(3) Telephone Density vs. Total Staff per Subscriber

Country	Telephone Density		Staffs/Sub.	
Developing	Low	less than 1	High	50-110
Indonesia		0.3		50-70
Middle Developed	Medium	0.8-30	Medium	20-60
Developed	High	30-40	Low	less than 10

(4) Total Staffs per Subscriber vs. Operating Ratio

Country	Staffs/Sub.		Operating Ratio	
Developing	High	50-110	High	0.4-0.6
Indonesia		50-70		0.4-0.6
Middle Developed	Medium	20-60	Medium	0.3-0.4
Developed	Low	less than 10	Low, High	0.2-0.6

(5) Telephone Density vs. Revenue/Subscriber

In both Developing and Developed Countries, the revenue per subscriber ranges between 350-900 US Dollars per year. The revenue per subscriber in Indonesia is the highest (US$ 750-900) among nine countries.

(6) Tariff

For the above nine countries, the following tariff data of installation and monthly rental fee of telephone service (1984) are compared.

Table 3-4-1 Telephone Service Fees (US$ in 1984)

Country	Installation Fee	Monthly Rental Fee	GDP per Capita
Japan	480	10	9,780
Singapore	110	9	7,260
Malaysia	130	10	2,060
Thailand	280	17	830
Philippines	100	14	410
Indonesia	180	3	480

The installation fee of Indonesia seems to be at reasonable level, though the monthly rental fee is low. It is noted that Thailand sets the tariff rate high and keeps a good financial position (Refer to Operating Ratio).

(7) Two-country comparisons of the indexes

Figures 3-4-7, 3-4-8, 3-4-9 and 3-4-10 show the comparisons of the indexes of PERUMTEL and those of Thailand, Malaysia, Japan and the USA. According to those figures, the operating situation of PERUMTEL is very similar to that of Thailand. In the near future, Malaysia is the one to follow as the PERUMTEL's operating target. Japan and the USA should be targeted as PERUMTEL improves its management conditions.

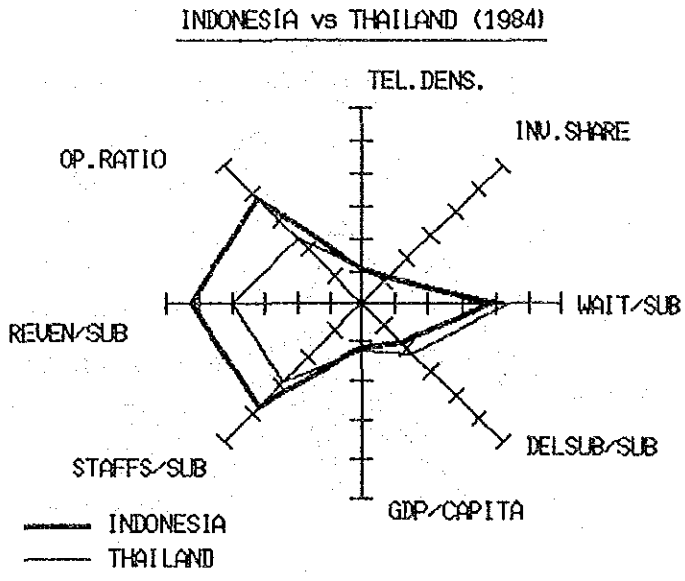

Figure 3-4-7 Comparison between Indonesia and Thailand

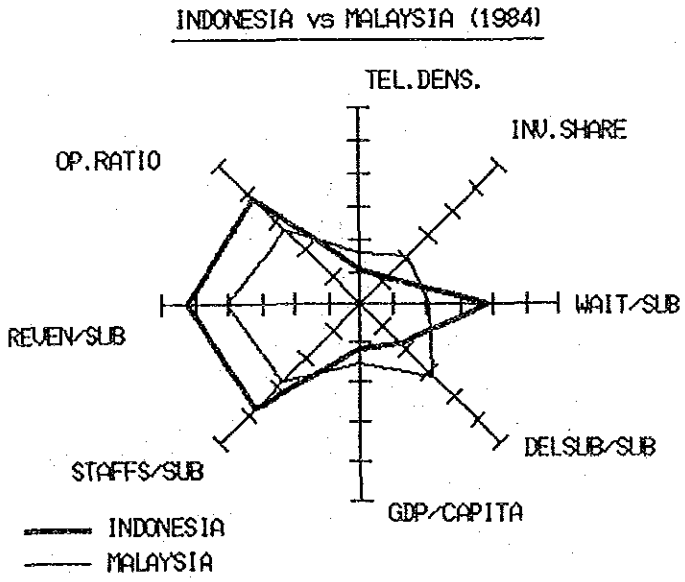

Figure 3-4-8 Comparison between Indonesia and Malaysia

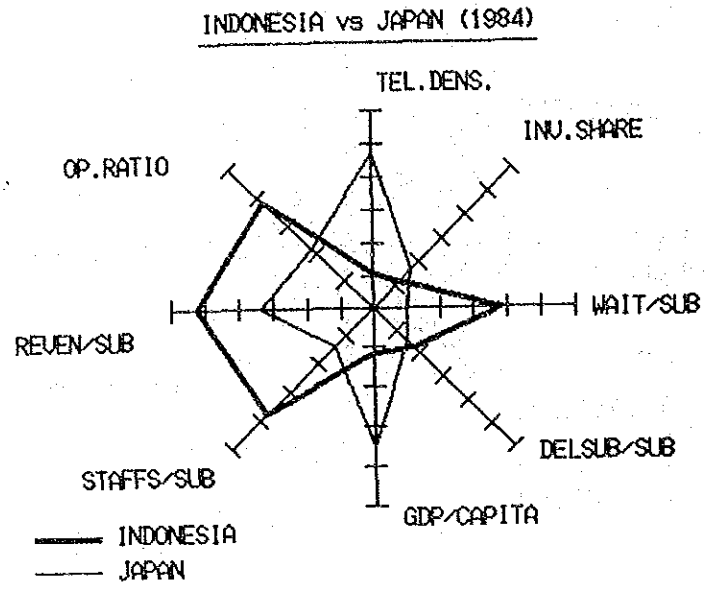

Figure 3-4-9 Comparison between Indonesia and Japan

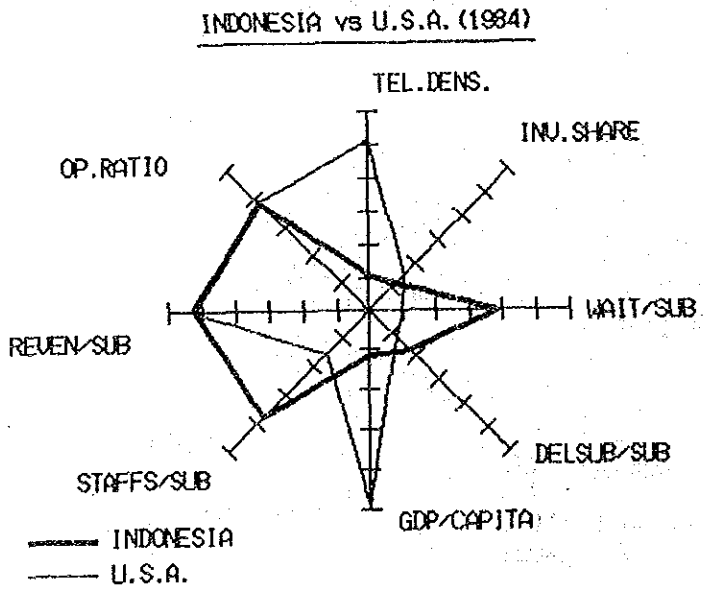

Figure 3-4-10 Comparison between Indonesia and U.S.A.

3-4-3 Current State of WITEL Management

(1) Past Operational Results

Table 3-4-2 shows the past record of each WITEL's operation. The operating ratio (the ratio of the current expenditure to the revenue) shows the distinctive differences among WITELs in their financial performances. Those WITELs having big cities such as Jakarta, Medan, Surabaya, are relatively in good conditions in comparison with other WITELs. The financial condition on average seems to be getting worse in the future due to rapid increase of operational expenditures.

Total staff per subscriber ranges from 27 in Jakarta to 166 in WITEL XI. There exists a positive correlation between the operating ratio and the number of staffs per subscriber.

Therefore, some policies are recommended to be taken to reduce the personnel expenditure for the future improvement.

(2) Past Investment Record

PERUMTEL invested the total amount of 894,626 million Rupiahs in 1984 which is 10 times larger than the 1975 investment of 88,898 million Rupiahs. The share of the total assets changed as follows:

Table 3-4-3 The Share of the Total Assets

(%)

Items	1975	1984
Land	26	3.9
Building	23	11.9
Switching System	21	21.8
Telegraph-Telex System	2	2.9
Transmission System	7	25.7
Local Cable Network	19	30.7
Electronic Data Processing System	-	1.2
Office Equipments	-	1.4
Motorized Vehicles	2	0.5

In the future, the share of switching and cable network are expected to increase according to the current international trend.

Table 3-4-4 shows the total assets share by WITEL in 1984. It is noted that WITELs in the Jawa island have the relatively high share in Telephone Installations and low in Land & Building.

Table 3-4-2 Past Operation Results of PERUMTEL (1982-1985)

Name/Year	Share of Personnel Cost	Operating Ratio	Share of TEKNIC	Staff per Telephone Subscriber	OM cost per(Mil.Rp Subscriber	Personnel Cost/ OM Cost	OM Cost (MIL.Rp) MKT Base	Personnel (MIL.Rp) MKT Base	Other (MIL.Rp) MKT Base
WITEL I 1982	0.58	0.31	0.37	56	0.19	0.58	7,835	4,570	3,265
WITEL II	0.59	0.64	0.50	103	0.37	0.59	5,228	3,084	2,144
WITEL III	0.50	0.41	0.48	80	0.28	0.50	5,567	2,803	2,764
WITEL IV	0.28	0.27	0.44	20	0.21	0.28	36,705	10,339	26,366
WITEL V	0.59	0.38	0.49	63	0.22	0.59	10,406	6,091	4,315
WITEL VI	0.65	0.37	0.51	69	0.22	0.65	9,952	6,437	3,515
WITEL VII	0.58	0.33	0.42	57	0.19	0.58	14,052	8,110	5,941
WITEL VIII	0.53	0.64	0.46	94	0.33	0.53	5,265	2,776	2,489
WITEL IX	0.52	0.38	0.53	99	0.34	0.52	4,884	2,542	2,342
WITEL X	0.55	0.44	0.30	118	0.27	0.55	6,644	3,630	3,014
WITEL XI	0.52	0.79	0.50	172	0.71	0.52	2,406	1,240	1,166
WITEL XII	0.48	0.73	0.44	161	0.72	0.48	3,420	1,638	1,782
HEAD	0.12	1.00	0.22	0		0.12	151,341	17,630	133,710
TOTAL			0.42	62	0.55	0.27	263,705	70,890	192,815
WITEL I 1983	0.59	0.36	0.38	52	0.25	0.59	11,068	6,519	4,549
WITEL II	0.62	0.67	0.50	95	0.44	0.62	6,742	4,197	2,545
WITEL III	0.53	0.50	0.47	73	0.38	0.53	8,136	4,326	3,810
WITEL IV	0.36	0.23	0.45	20	0.24	0.36	41,673	14,935	26,737
WITEL V	0.64	0.45	0.49	56	0.26	0.64	13,963	8,878	5,085
WITEL VI	0.69	0.39	0.51	68	0.26	0.69	12,186	8,468	3,717
WITEL VII	0.63	0.33	0.43	55	0.21	0.63	16,847	10,637	6,210
WITEL VIII	0.63	0.65	0.47	88	0.35	0.63	6,054	3,832	2,222
WITEL IX	0.57	0.39	0.53	96	0.42	0.57	6,253	3,568	2,685
WITEL X	0.56	0.49	0.47	74	0.35	0.56	8,831	4,931	3,900
WITEL XI	0.51	0.81	0.50	160	0.79	0.51	3,140	1,591	1,549
WITEL XII	0.49	0.66	0.45	149	0.82	0.49	4,186	2,067	2,119
HEAD	0.05	1.00	0.23	0		0.05	197,442	10,367	187,075
TOTAL			0.44	57	0.67	0.25	336,519	84,316	252,203
WITEL I 1984	0.51	0.45	0.42	57	0.32	0.51	14,972	7,711	7,262
WITEL II	0.57	0.77	0.46	109	0.52	0.57	8,359	4,785	3,574
WITEL III	0.47	0.57	0.45	80	0.45	0.47	10,268	4,819	5,449
WITEL IV	0.33	0.25	0.46	27	0.26	0.33	50,822	16,737	34,085
WITEL V	0.56	0.43	0.49	58	0.28	0.56	14,715	8,200	6,515
WITEL VI	0.58	0.47	0.50	74	0.31	0.58	15,469	9,005	6,464
WITEL VII	0.58	0.40	0.43	54	0.26	0.58	21,569	12,454	9,115
WITEL VIII	0.51	0.77	0.46	96	0.48	0.51	8,296	4,258	4,037
WITEL IX	0.55	0.45	0.52	96	0.49	0.55	7,669	4,188	3,481
WITEL X	0.53	0.67	0.45	76	0.45	0.53	11,514	6,062	5,451
WITEL XI	0.50	0.95	0.50	141	0.90	0.50	4,053	2,031	2,022
WITEL XII	0.51	0.87	0.46	148	0.94	0.51	5,065	2,579	2,486
HEAD	0.11	1.00	0.27	0		0.11	215,374	22,630	192,745
TOTAL			0.44	62	0.72	0.27	388,144	105,458	282,686
WITEL I 1985	0.50	0.51	0.42	59	0.41	0.50	20,617	10,390	10,227
WITEL II	0.54	0.87	0.51	86	0.64	0.54	11,663	6,333	5,330
WITEL III	0.50	0.64	0.45	72	0.49	0.50	14,007	6,934	7,073
WITEL IV	0.34	0.26	0.46	27	0.30	0.34	66,714	22,735	43,979
WITEL V	0.52	0.53	0.49	58	0.40	0.52	23,086	12,082	11,004
WITEL VI	0.59	0.53	0.50	69	0.42	0.59	21,723	12,887	8,836
WITEL VII	0.58	0.45	0.45	57	0.33	0.58	28,888	16,868	12,020
WITEL VIII	0.52	0.93	0.46	91	0.58	0.52	11,815	6,093	5,723
WITEL IX	0.50	0.53	0.53	92	0.66	0.50	11,337	5,706	5,630
WITEL X	0.53	0.72	0.45	78	0.55	0.53	15,382	8,132	7,250
WITEL XI	0.52	1.18	0.50	143	1.05	0.52	5,235	2,745	2,490
WITEL XII	0.51	1.11	0.45	166	1.37	0.51	7,521	3,836	3,685
HEAD	0.10	1.00	0.27	0		0.10	215,085	20,789	194,296
TOTAL			0.44	61	0.77	0.30	453,074	135,530	317,544

Table 3-4-4 Total Asset Share by WITEL 1984 (Million Rp.)

WITEL	Total Asset	Land & Building	Switching	Tlg & Tlx	Trans-mission	Cable	Other
Head	18,503	0.33	0.14	0.00	0.24	0.02	0.28
I	72,782	0.20	0.21	0.04	0.27	0.26	0.03
II	33,996	0.28	0.13	0.04	0.29	0.23	0.01
III	38,420	0.21	0.16	0.03	0.35	0.21	0.03
IV	345,187	0.09	0.29	0.03	0.23	0.34	0.02
V	67,579	0.18	0.22	0.02	0.16	0.37	0.07
VI	57,463	0.11	0.22	0.03	0.21	0.38	0.05
VII	78,014	0.13	0.26	0.03	0.18	0.37	0.05
VIII	40,312	0.25	0.13	0.02	0.29	0.29	0.01
IX	47,234	0.22	0.13	0.03	0.40	0.19	0.01
X	49,877	0.25	0.10	0.03	0.32	0.27	0.04
XI	16,715	0.22	0.09	0.01	0.38	0.26	0.01
XII	28,544	0.27	0.09	0.01	0.40	0.22	0.00
Total	894,626	0.16	0.22	0.03	0.26	0.31	0.03

(3) Review of Past Supply Results

Table 3-4-5 and 3-4-6 show the four-year transition of Telecommunication Service Supply in each WITEL. The installation fee in Table 3-4-5 was calculated by the average installation fee estimated by classifying each exchange according to their tariff codes.

The number of waiting applicants increased as telephone supply increased. The speed of supply rate was recorded less than that of the waiting applicants (Waiter/Total Subscribers). This difference became larger recently.

From the viewpoint of regional development, the supply policy to fulfill each regional demand should be considered at first.

The telephone density is almost at the same level in all WITELs except WITEL IV (Jakarta).

Table 3-4-5 Results of Telephone Supply by WITEL

Name/Year	Telephone Subscriber	No. of Waiter	Waiter/ Subscriber	Delta/ Subscriber	Telephone Density	Installation Fee(1000Rp.)
WITEL I 1982	40,866	10887	0.27		0.35	125
WITEL II	14,115	3016	0.21		0.24	75
WITEL III	19,843	8914	0.45		0.16	90
WITEL IV	171,894	45683	0.27		2.45	200
WITEL V	47,291	22603	0.48		0.16	90
WITEL VI	44,418	19096	0.43		0.15	90
WITEL VII	74,440	16430	0.22		0.25	125
WITEL VIII	15,929	2050	0.13		0.18	50
WITEL IX	14,302	4122	0.29		0.20	90
WITEL X	24,209	4624	0.19		0.22	75
WITEL XI	3,389	151	0.04		0.23	90
WITEL XII	4,753	377	0.08		0.38	75
HEAD	0		0.00		0.00	
TOTAL	475,459	137953	0.29		0.31	
WITEL I 1983	44,685	14169	0.32	0.09	0.38	125
WITEL II	15,251	4062	0.27	0.07	0.26	75
WITEL III	21,535	11001	0.51	0.08	0.17	90
WITEL IV	176,585	103018	0.58	0.03	2.42	200
WITEL V	53,027	27972	0.53	0.11	0.18	90
WITEL VI	46,463	22021	0.47	0.04	0.16	90
WITEL VII	79,495	22513	0.28	0.06	0.26	125
WITEL VIII	17,153	3256	0.19	0.07	0.19	50
WITEL IX	14,812	5778	0.39	0.03	0.20	90
WITEL X	25,131	6375	0.25	0.04	0.23	75
WITEL XI	3,984	459	0.12	0.15	0.26	90
WITEL XII	5,132	460	0.09	0.07	0.40	75
HEAD	0					
TOTAL	503,253	221084	0.44	0.06	0.32	
WITEL I 1984	47,318	16709	0.35	0.06	0.39	125
WITEL II	15,988	6323	0.40	0.05	0.26	75
WITEL III	23,008	16510	0.72	0.06	0.17	90
WITEL IV	194,091	149915	0.77	0.09	2.56	200
WITEL V	53,436	35426	0.66	0.01	0.18	90
WITEL VI	49,413	24913	0.50	0.06	0.17	90
WITEL VII	84,253	32073	0.38	0.08	0.27	125
WITEL VIII	17,440	6072	0.35	0.02	0.19	50
WITEL IX	15,715	10119	0.64	0.06	0.21	90
WITEL X	25,505	7859	0.31	0.01	0.22	75
WITEL XI	4,524	678	0.15	0.12	0.28	90
WITEL XII	5,411	613	0.11	0.05	0.41	75
HEAD	0					
TOTAL	536,102	307210	0.57	0.06	0.33	
WITEL I 1985	50,856	22169	0.44	0.07	0.41	200
WITEL II	18,362	8130	0.44	0.13	0.29	125
WITEL III	28,332	39570	1.40	0.19	0.20	175
WITEL IV	220,635	178273	0.81	0.12	2.80	500
WITEL V	57,589	32275	0.56	0.07	0.19	175
WITEL VI	51,283	25849	0.50	0.04	0.17	175
WITEL VII	88,859	36733	0.41	0.05	0.28	200
WITEL VIII	20,273	13260	0.65	0.14	0.22	90
WITEL IX	17,252	11635	0.67	0.09	0.22	175
WITEL X	27,796	8888	0.32	0.08	0.24	125
WITEL XI	5,004	516	0.10	0.10	0.30	175
WITEL XII	5,506	947	0.17	0.02	0.40	125
HEAD	0					
TOTAL	591,747	378245	0.64	0.09	0.36	

Table 3-4-6 Telegraph and Telex Services by WITEL

Name/Year	No. of Telegram	Telex Subscriber
WITEL I 1982	319,633	602
WITEL II	509,074	228
WITEL III	393,803	292
WITEL IV	897,712	4,325
WITEL V	454,813	366
WITEL VI	931,037	390
WITEL VII	1,083,088	836
WITEL VIII	496,682	191
WITEL IX	576,102	360
WITEL X	862,600	339
WITEL XI	294,608	73
WITEL XII	322,675	103
HEAD	0	0
TOTAL	7,141,827	8,105
WITEL I 1983	324,407	699
WITEL II	526,470	313
WITEL III	457,612	369
WITEL IV	941,064	4,857
WITEL V	532,881	445
WITEL VI	1,083,775	445
WITEL VII	1,210,413	951
WITEL VIII	575,386	220
WITEL IX	598,669	402
WITEL X	907,579	395
WITEL XI	336,451	87
WITEL XII	364,204	109
HEAD	0	0
TOTAL	7,858,911	9,292
WITEL I 1984	354,294	783
WITEL II	513,797	378
WITEL III	509,981	437
WITEL IV	1,005,569	5,186
WITEL V	547,028	478
WITEL VI	1,219,196	519
WITEL VII	1,398,780	1,030
WITEL VIII	618,551	239
WITEL IX	550,709	579
WITEL X	959,981	438
WITEL XI	353,331	96
WITEL XII	387,537	126
HEAD	0	0
TOTAL	8,418,754	10,289
WITEL I 1985	376,900	879
WITEL II	546,700	468
WITEL III	542,700	490
WITEL IV	1,069,900	5,407
WITEL V	582,000	490
WITEL VI	1,297,200	616
WITEL VII	1,488,300	1,185
WITEL VIII	658,200	291
WITEL IX	585,900	690
WITEL X	1,021,400	548
WITEL XI	375,900	97
WITEL XII	412,300	138
HEAD	0	0
TOTAL	8,957,400	11,299

CHAPTER 4
TELECOMMUNICATIONS SERVICES SUBSCRIBER DEMAND

CHAPTER 4 TELECOMMUNICATIONS SERVICES SUBSCRIBER DEMAND

4-1 Telephone Service Subscriber Demand

(1) Methodology of Subscriber Demand Forecasts

The "ITU forecasting method", i.e., correlating the number of telephone subscribers and GDP per capita is commonly used for telephone subscriber demand forecast as a simple but useful convenient method. This method is developed on the following three problems which should be noted by users of this method.

1) Ambiguous Distinction between Demand and Supply

In the ITU model, actual supply data are used as demand data. This creates no problem in the case where the telephone services development is being carried out under the condition of balanced demand and supply. However, when demand at a current price level exceeds supply, the ITU model is likely to underestimate the actual demand. For a better demand index, the number of new applicants that arises in each period plus the number of waiting applicants at the end of the preceding period should be adopted as new subscriber demand instead of the actual number of subscribers which can be classified as on going subscriber demand.

2) Insufficient Consideration of Consumer Responses to Price Changes

In the ITU model, GDP per capita is the sole variable to explain a demand trend. GDP per capita does explain the wealthiness of a country and hence the supplier's investment capability; however, it does not fully reflect consumers preference which is important for the consumer's selection behavior. The ITU model lacks explanation of how consumers respond to price changes.

3) Lack of Consideration for Time Series Data

In the ITU model, estimation is usually carried out by cross-sectional data. This may ignore time variations of economic activities such as investment activities in each country. In other words, the answer obtained may vary significantly over time depending upon the data used. Therefore, when this model is employed for a long term forecast, the result obtained may not be able to capture changes in environmental factors. Hence, the accuracy of prediction may not be high.

To eliminate the problems discussed above, this study proposes and employs a demand forecast method based on the basic theory of demand. The proposed method employs the same philosophy as that of the international model in the "Fundamental Study of Rural Telecommunications Network in the Republic of Indonesia" conducted by JICA in 1984/1985.

The international model referred to above is a forecast model by multiple regression analysis using 20 countries as sample points and tariff, income, population and existing number of subscribers as explanatory variables. In this study, the regional level demand forecasts are essential; therefore, the "WITEL Model" based on WITEL data of Indonesia using the theory of the international model is newly introduced.

To estimate the amount of potential demand in the areas which the telephone service is not currently available, Kabupaten Model specified in the "Fundamental Study on Rural Telecommunications Network" is also used.

Figure 4-1-1 presents the flow chart of formulation of telephone demand forecasting and supply planning in which the three models are used for the purpose of cross examination of the results.

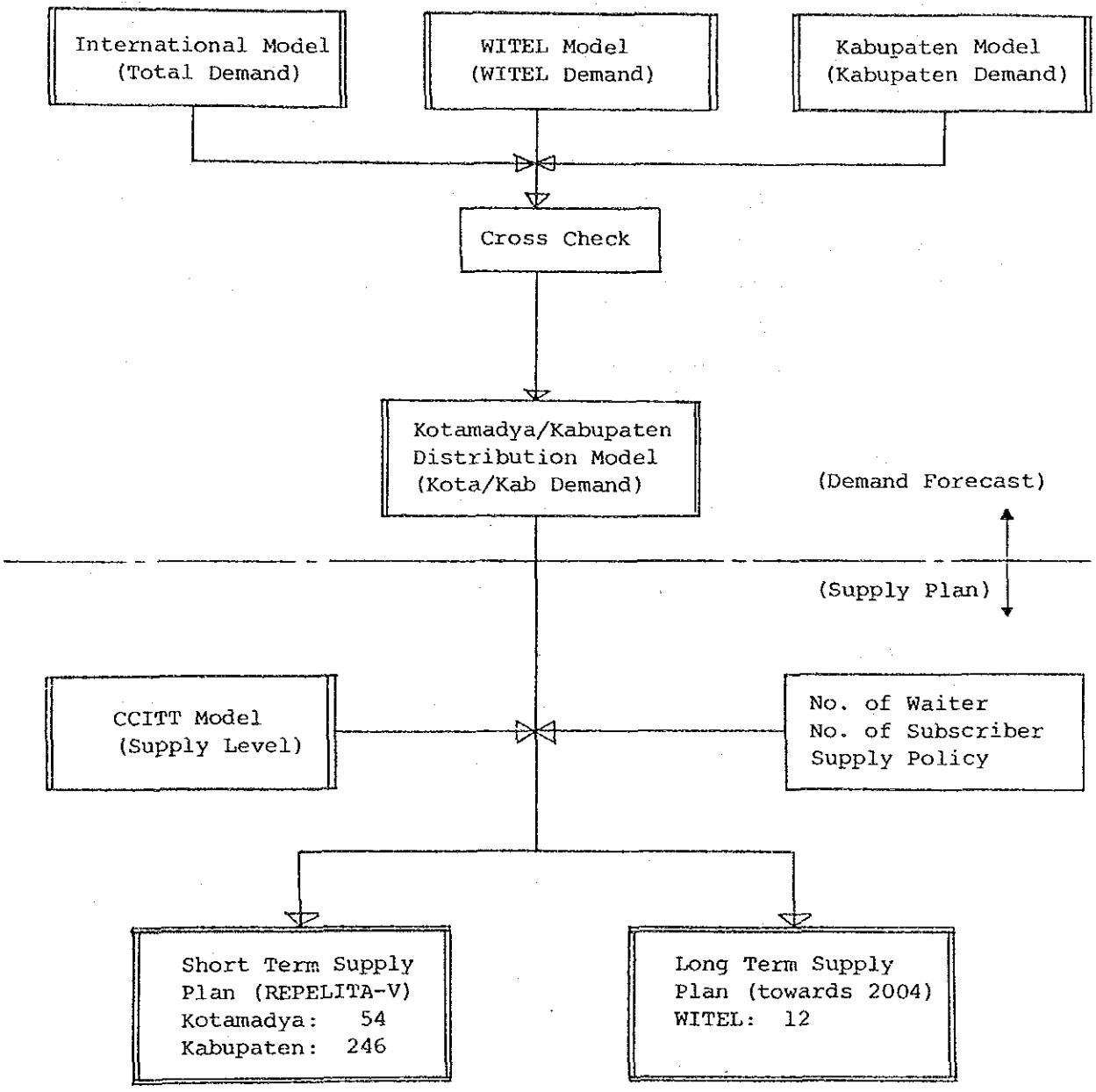

Figure 4-1-1 Demand Forecasting and Supply Planning Flow

(2) Nationwide New Subscriber Demand Forecast by International Model

Persons who constitute new subscriber demand comprise those who newly desire to receive telephone service plus waiting applicants since the preceding period. Persons who already enjoy telephone service are not considered to be new demand constituents.

Variables considered to exert influences on new telephone service subscription demand are influenced by four major variables. They are tariff, income, number of existing subscribers and population. The new subscriber demand function, in which these four variables are used as explanatory variables, can be specified as follows:

$$D_t = f\ (PI_t,\ PM_t,\ PC_t,\ Y_t,\ S_{t-1},\ N_t) \qquad (4\text{-}1)$$

where

D_t : The number of new telephone subscriber demand constituents in period t ($D_t = NA_t + W_t$)

NA_t : The number of new applicants in period t

W_t : The number of waiting applicants at the end of period t

PI_t : Real telephone subscription fee in period t

PM_t : Real monthly fee in period t

PC_t : Real call fee in period t

Y_t : Real income in period t

S_{t-1} : The number of subscribers at the end of period t-1

N_t : Population in period t

By the law of demand, all price variables are presumed to be in the negative relationship to the demand volume. Especially the subscription fee is considered to impose direct, i.e., the strongest, influence on subscriber demand. Income is assumed to be in the positive relationship to new subscriber demand.

S_{t-1} performs two roles. One is the new demand creating effect. In other words, the larger the number of telephone subscribers is, the greater the convenience of telephones as a communication medium becomes and therefore, the greater the number of persons who desire to receive telephone services becomes. Hence the presumption of S_{t-1} is in positive relationship to the subscriber demand volume.

The other role of S_{t-1} is to contribute to the reduction of demand source. That is to say, telephones are considered to be durable consumption goods so that as the number of subscribers increases; the number of non-subscribers decreases, causing the demand source to diminish and the demand itself to drop. This causality as seen in the relationship between telephone density and total demand is shown in Figure 4-1-2.

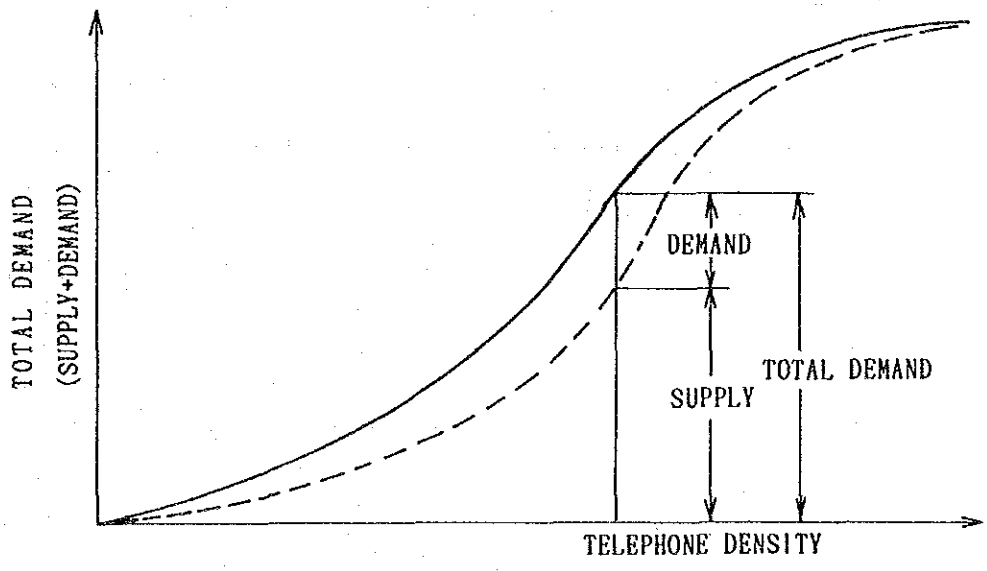

Figure 4-1-2 Telephone Density and Total Demand

With these ideas (4-1) can be further modified as follows:

$$D_t = f\ (PI_t,\ PM_t,\ PC_t,\ Y_t) \times (N_t - S_{t-1}) \qquad (4\text{-}2)$$

By using the data of 20 countries, between 1973 and 1982, the following regression result was obtained.

$$\log (NA_t + W_t + PS_t) = -1.819 - 0.408 \log PI_t + 0.385 \log (Y_t/N_t) + 0.590 \log (S_{t-1}/MPS_t) + \log (MPS_t - S_{t-1}) \qquad (4\text{-}3)$$

where

log : Natural logarithmic operator

S_t : The number of main lines in period t ($x10^6$)

S_{t-1} : The number of main lines in period t-1 ($x10^6$)

NA_t : The number of new applicants in period t ($x10^6$)

W_t : The number of waiting applicants in period t ($x10^6$)

PI_t : Real installation fee per main line in period t (in 1975 U.S. dollars)

Y_t : Real GDP in period t ($x10^6$) (in 1975 U.S. dollars)

N_t : Population in period t ($x10^6$)

MPS_t : Demand potential population in period t = N_t x 0.7 ($x10^6$)

PS_t : Potential demand

Assumed to be 10% of $NA_t + W_t$

The results of telephone demand forecast up to the year 2004, obtained by the above regression formula, are shown in Table 4-1-1, Table 4-1-2 and Figure 4-1-3.

Table 4-1-1 Forecasted Telephone Demand in Indonesia
(by the international model)

(Unit: 1000 L.U.)

Item	PELITA-III 1984	PELITA-IV 1989	REPELITA-V 1994	REPELITA-VI 1999	REPELITA-VII 2004
Plan 1					
Expansion/5 years	30 x 5	110 x 5	170 x 5	220 x 5	260 x 5
Total Capacity	700	1,250	2,100	3,200	4,500
Total Subscriber	540	1,250	2,100	3,200	4,500
Tel. Density /100 persons	0.33	0.70	1.06	1.46	1.84
Total Demand	1,213	2,330	3,709	5,496	7,633
Plan 2					
Expansion/5 years	30 x 5	150 x 5	240 x 5	330 x 5	380 x 5
Total Capacity	700	1,450	2,650	4,300	6,200
Total Subscriber	540	1,450	2,650	4,300	6,200
Tel. Density /100 persons	0.33	0.81	1.33	1.96	2.54
Total Demand	1,213	2,584	4,431	6,930	9,872
Plan 3					
Expansion/5 years	30 x 5	190 x 5	300 x 5	450 x 5	560 x 5
Total Capacity	700	1,650	3,150	5,400	8,200
Total Subscriber	540	1,650	3,150	5,400	8,200
Tel. Density /100 persons	0.33	0.91	1.58	2.47	3.36
Total Demand	1,213	2,833	5,074	8,300	12,345
Population	161,580	179,000	199,000	219,000	244,000

Conditions GDP annual growth rate : 5%
Population growth rate : approx. 2% (BPS data)
Tariff system : same as the system in 1985

Table 4-1-2 Sensitivity Analysis for Telephone Demand in Indonesia

Year	(GDP: 3% per annum)			(GDP: 5% per annum)			(GDP: 7% per annum)			GDP: 5% per annum (SPL-II)		
	SPL-I	SPL-II	SPL-III	SPL-I	SPL-II	SPL-III	SPL-I	SPL-II	SPL-III	SF(-20%)	NORM.	SF(+20%)
1984	1.213	1.213	1.213	1.213	1.213	1.213	1.213	1.213	1.213	1.278	1.213	1.164
1989	2.287	2.538	2.784	2.330	2.584	2.833	2.374	2.631	2.884	2.443	2.330	2.245
1994	3.582	4.287	4.915	3.709	4.431	5.074	3.843	4.583	5.241	3.878	3.709	3.581
1999	5.232	6.620	7.949	5.496	6.930	8.300	5.785	7.270	8.684	5.736	5.50	5.316
2004	7.167	9.315	11.699	7.633	9.872	12.345	8.162	10.504	13.078	7.957	7.633	7.39

Note:

Supply Scenario (10 6 main lines)

Rep.	PLAN 1	PLAN 2	PLAN 3
IV	0.11x5	0.15x5	0.19x5
V	0.17x5	0.24x5	0.30x5
VI	0.22x5	0.33x5	0.45x5
VII	0.26x5	0.38x5	0.56x5

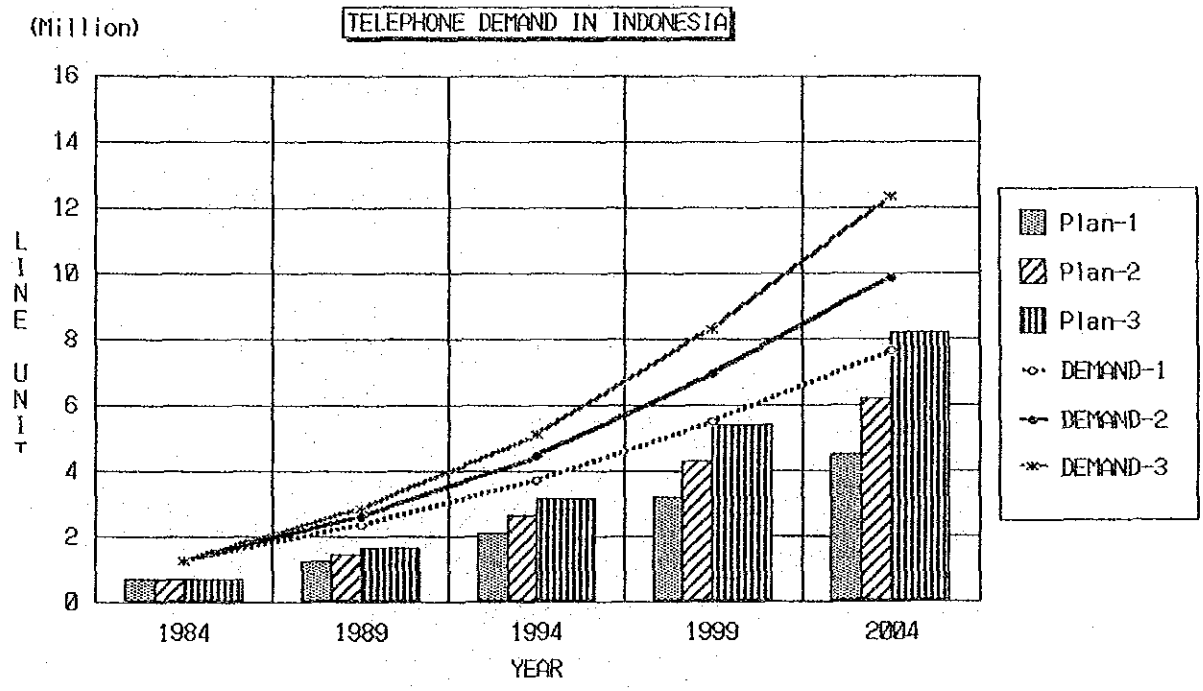

Figure 4-1-3 Results of Telephone Demand Forecast in Indonesia

(3) New Subscriber Demand Forecast by WITEL Model

By the same idea of the international model, the new subscriber demand function for 12 WITEL areas (i.e., WITEL model) can be specified as follows:

$$D_{it} = f\,(PI_{it},\ PM_{it},\ PC_{it},\ Y_{it}) \times (N_{it} - S_{it-1}) \qquad (4\text{-}4)$$

where

D_{it} : The new subscriber demand in WITEL i in period t

PI_{it} : Real installation fee of WITEL i in period t

PM_{it} : Real monthly fee of WITEL i in period t

PC_{it} : Real call fee of WITEL i in period t

Y_{it} : Real income of WITEL i area in period t

S_{it-1}: The number of subscribers in WITEL i at the end of period t-1

N_{it} : Population of WITEL i area in period t

The following regression result was obtained:

$$D_{it}/(N_{it} - S_{it-1}) = 0.1365 + 0.7773 \times (S/N)_{it-1} - 0.0108 \times PI_{it} + 0.00008 \times Y_{it}$$

$$i = I \ldots XII \qquad R^2 = 0.85 \qquad (4\text{-}5)$$

Data:

Period	:	1982-1984 annual data
Area	:	WITEL I to WITEL XII Areas
NA, W and PI:		By internal data of MATEL
S	:	By "Traffic" of MATEL
Y	:	By "Regional Income" of BPS
N	:	By "Population Census" of BPS

PI and Y are changed to real values as of 1975 price by GDP deflator. MATEL is a marketing division of PERUMTEL.

In the above result, the monthly fee and call fee were not chosen as explanatory variables.

The present situation for telephone service demand and supply in Indonesia, using the above findings, produces the demand and supply curves shown in Figure 4-1-4.

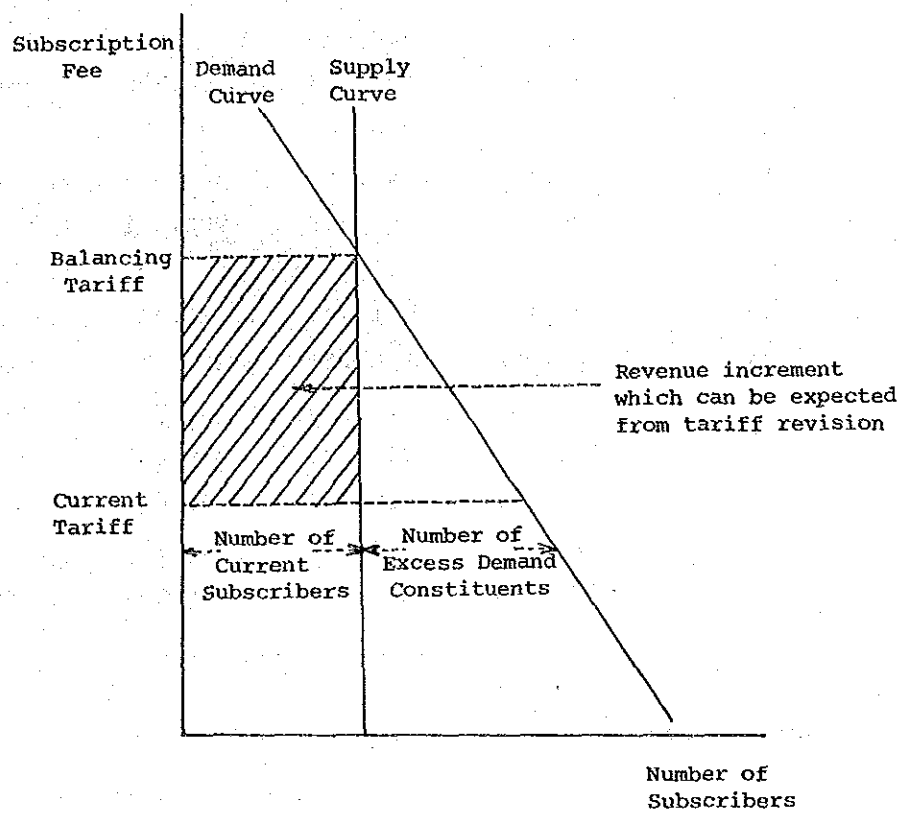

Figure 4-1-4 Telephone Subscribers vs Subscription Fee

The current tariff rate is established at a lower level than the equilibrium tariff that balances the demand and supply. Hence excess demand emerges at all times. This indicates that by raising the current tariff rate to the level of the equilibrium tariff, the demand and supply can be equalized. Furthermore, the service revenue increment indicated by the area of slant lines in the illustration can also be expected.

Results of the telephone demand forecast up to 2004 obtained by the WITEL Model are shown in Table 4-1-3, for the case of Plan 2 and 5% GDP annual growth.

Table 4-1-3 Telephone Demand by WITEL Model
(Plan 2, 5% GDP annual growth)

WITEL	1989	1994	1999	2004
I	183,185	384,883	642,511	950,336
II	64,226	124,625	206,798	304,643
III	116,895	216,561	370,127	561,502
IV	772,184	1,345,657	2,201,517	3,215,657
V	290,449	546,409	905,371	1,349,936
VI	213,213	427,639	705,995	1,043,750
VII	298,178	691,737	1,151,463	1,707,987
VIII	89,904	179,126	295,713	434,990
IX	75,750	198,593	330,833	490,169
X	101,333	238,773	398,046	589,500
XI	11,255	30,787	52,620	78,690
XII	11,384	29,653	49,199	72,569
TOTAL	2,227,956	4,414,443	7,310,194	10,799,728

(4) Subscriber Demand Forecast by Kabupaten Model

In the "Fundamental Study on Rural Telecommunications Network", the subscriber demand function by Kabupaten model was introduced. The purpose was to forecast Kabupaten level telephone subscriber demand for the whole of Indonesia. This demand function was obtained by regression analysis, based on the data resulting from the survey of 10 sample Kabupatens. The demand in this case differs from the demand forecasted by the previous two models in such a way that demand on Kabupaten level includes not only the existing subscribers but also potential applicants.

The definition of Kabupaten model subscriber demand:

The total number of business organizations and individuals of a certain Kabupaten in a certain year who own telephones, plus

business organizations and individuals who do not own telephones yet but desire to own telephones and to be able to pay tariffs.

There are four regression equations, each applying to each demand category.

1) Public Demand A (PDA)

$$\log PDA = -7.378 + (1.090 - 0.01351 \log PD) \times \log N$$
$$R = 0.904 \qquad (4\text{-}6)$$

2) Public Demand B (PDB)

$$\log PDB = -13.21 + (1.448 - 0.02239 \log PD) \times \log N$$
$$R = 0.934 \qquad (4\text{-}7)$$

3) Industrial Demand (ID)

$$\log ID = 0.307 + 0.0197 \log Y \times \log N$$
$$R = 0.857 \qquad (4\text{-}8)$$

4) Residence Demand (RD)

$$\log RD = -14.89 + 0.1401 \log (Y/N) \times \log N$$
$$R = 0.953 \qquad (4\text{-}9)$$

where

log : Natural logarithmic operator
Y : Kabupaten level real income (in Rupiah as of 1975 price)
N : Gross population of Kabupaten
PD : Population density of Kabupaten (Population/km^2)
R : Multiple correlation coefficient

By using the four regression equations, subscriber demand up to the year 2004 for all 246 Kabupatens in the country is forecasted. Kabupaten is a small area as a demand unit, though the number of Kabupatens is as large as 246. Since four regression equations are used to many Kabupatens, the result obtained for some Kabupatens may be over or under estimated due to regression errors. Therefore, the subscriber demand for Kabupatens obtained by the regression equations, is used to compute the demand growth rate for each period, and the level of subscriber demand for Kabupatens is to be calculated by the existing demand of Kabupatens (i.e. number of subscribers + number of waiting applicants + potential applicants of the present period). Results of the telephone demand forecast up to 2004 obtained by the Kabupaten Model are shown in Table 4-1-4, for the case of 5% GDP annual growth.

Table 4-1-4 Telephone Demand by Kabupaten Model
(5% GDP annual growth)

WITEL	1989	1994	1999	2004
I	72,356	97,853	132,334	178,965
II	24,517	30,599	38,190	47,664
III	65,309	86,916	115,671	153,941
IV	0	0	0	0
V	169,889	239,538	337,741	476,204
VI	103,114	133,189	172,036	222,213
VII	141,968	192,829	261,910	355,739
VIII	33,113	40,392	49,271	60,102
IX	39,658	50,568	64,480	82,218
X	47,954	60,009	75,094	93,972
XI	7,822	9,899	12,528	15,854
XII	14,748	19,948	26,980	36,492
TOTAL	720,449	961,739	1,286,235	1,723,364

(5) Summary of the Telephone Service Subscriber Demand Forecasts

Table 4-1-5 summarizes the forecasting results of the telephone service subscriber demand discussed in (2), (3) and (4).

Table 4-1-5 The Forecasting Results of the Telephone Service Subscriber Demand (GDP Growth Rate: 5%, Supply Plan 2)

(Unit: 1,000 subscribers)

Forecasting Method	Areas to be concerned	1989	1994	1999	2004
International Model	Urban + Rural	2,584	4,431	6,930	9,872
WITEL Model	Urban + Rural	2,228	4,414	7,310	10,800
Kabupaten Model	Rural	720	962	1,286	1,723

Up to 1994, the International Model and the WITEL Model yield almost the same forecasting result, but after 1994, their results start to show differences. By 2004, the forecasting result of the WITEL Model is about 9% larger than that of the International Model. The forecasting result of the International Model is considered to be more reliable because the International Model is based on the ten year time-series data while the WITEL Model is based on the three year time-series data. Table 4-1-6 summarizes the final forecasting result based on the International Model and the Kabupaten Model.

Table 4-1-6 The Final Forecasting Result of The Telephone Service Subscriber Demand (GDP Growth Rate: 5%, Supply Plan 2)

(Unit: 1000 subscribers)

Areas to be concerned	1989	1994	1999	2004
Urban (Kotamadya)	1,864	3,469	5,644	8,149
Rural (Kabupaten)	720	962	1,286	1,723
Total	2,584	4,431	6,930	9,872

4-2 Non-Telephone Service Subscriber Demand Forecast Method

To predict telex and data communication service subscriber demands, three different approaches are adopted. After the result of the three approaches are compared and cross-examined, the final forecasts are established. Three approaches are summarized as follows:

1) Subscriber demand functions by the regression analysis using time-series data of 19 countries for the past five years are estimated. For the telex service and data communication service, WITEL data are not available in a suitable form for the regression analysis used for the telephone service. Hence, the forecasts are made for the nationwide demands in Indonesia by international models.

2) A forward projection for each service category is made by using the Japanese past growth rate of the subscribers.

3) A forward projection for each service category is made by using the regional distribution of the administrative organizations, social facilities and business entities in Indonesia.

For other non-telephone services, a forward projection for each non-telephone service category (Facsimile, Radio Paging, and Land Mobile Radio-telephone Services) is made by using the Japanese past growth rate of the subscribers and by using the regional distribution of the administrative organizations, public service facilities and business entities in Indonesia.

In Indonesia, the past data concerning the new services do not exist in an well-organized form. Collection of microdata and updating of them through consumer questionnaires and business organization surveys are needed for better forecasting results and for better plannings in the future.

4-3 Telex Service Subscriber Demand

(1) Forecasting Model

To make a forward projection on the amount of demand for the telex service in Indonesia, a regression model was estimated by the Ordinary Least Squares Method using the data compiled by ITU (pooled time series cross section data of 19 countries and 4 year-periods of 1981-1984). The data used are taken from ITU's "Yearbook of Common Carrier Telecommunication Statistics", 1986 edition. 19 countries were chosen because in these countries telex and data communication services data are well organized between 1981 and 1984. The 19 countries are Austria, Chile, Cyprus, El Salvador, Finland, France, Germany, Indonesia, Italy, New Zealand, Norway, Panama, Papua New Guinea, Philippines, Singapore, Spain, Sweden, Switzerland and Thailand.

Figure 4-3-1 shows the data plotted on the graph of the telephone density and the telex service subscribers per telephone service subscribers. As the telephone density increases, the telex service subscribers per telephone service subscribers become almost constant as evident in the European countries, though the number of the telex service subscribers is determined by other factors, too. Hence, as the general trend of the data, the telex service subscribers increase faster than the telephone service subscribers when the telephone density is low, but the growth rates of both service subscribers approach to the same rate as the telephone density becomes higher. After the preliminary results were examined, the European countries were dropped out of the sample because their trend pattern is quite different from that of other countries.

It is assumed that there exists only a small gap between the number of potential subscribers and that of actual subscribers, because none of the countries used for the estimation has a serious waiting problem for the telex service, not like the telephone service.

Hence, the actual subscribers are regarded to represent the potential subscribers. The estimated model based on eight countries is as follows;

$$\text{Log } (SX/S) = -1.7934 + 0.72074 \times \log (SX/S)_{t-1} - 0.03506 \times \log (SD/S)_{t-1} + 0.35164 \text{ ID}$$

$$R^2 = 0.998$$

where

SX : The No. of telex service subscriber demand (x1000)
S : The No. of telephone service subscribers (x1000)
SD : the No. of data terminals (x1000)
ID = 1 for Indonesia
= 0 for other countries

In order to explain the difference in starting points of prediction, a country dummy for Indonesia (ID) was introduced. By this variable, the initial number of telex subscribers in Indonesia is adjusted for its own figure, not the world average.

As the explanatory variables, no economic variable such as price or income was significant. This model relates the potential subscribers of the telex service to the telephone service subscribers and the data communication service subscribers. In other words, the demand source for the telex service is the telephone subscribers. And, what percent of this demand source will develop into the actual demand, however, differs in each country. That depends on how data communication service is developed. Some functions of the telex service can be substitutable by the data communication service. Hence, the larger the number of the data communication service subscribers becomes, the more telex service subscribers may switch to the data communication services.

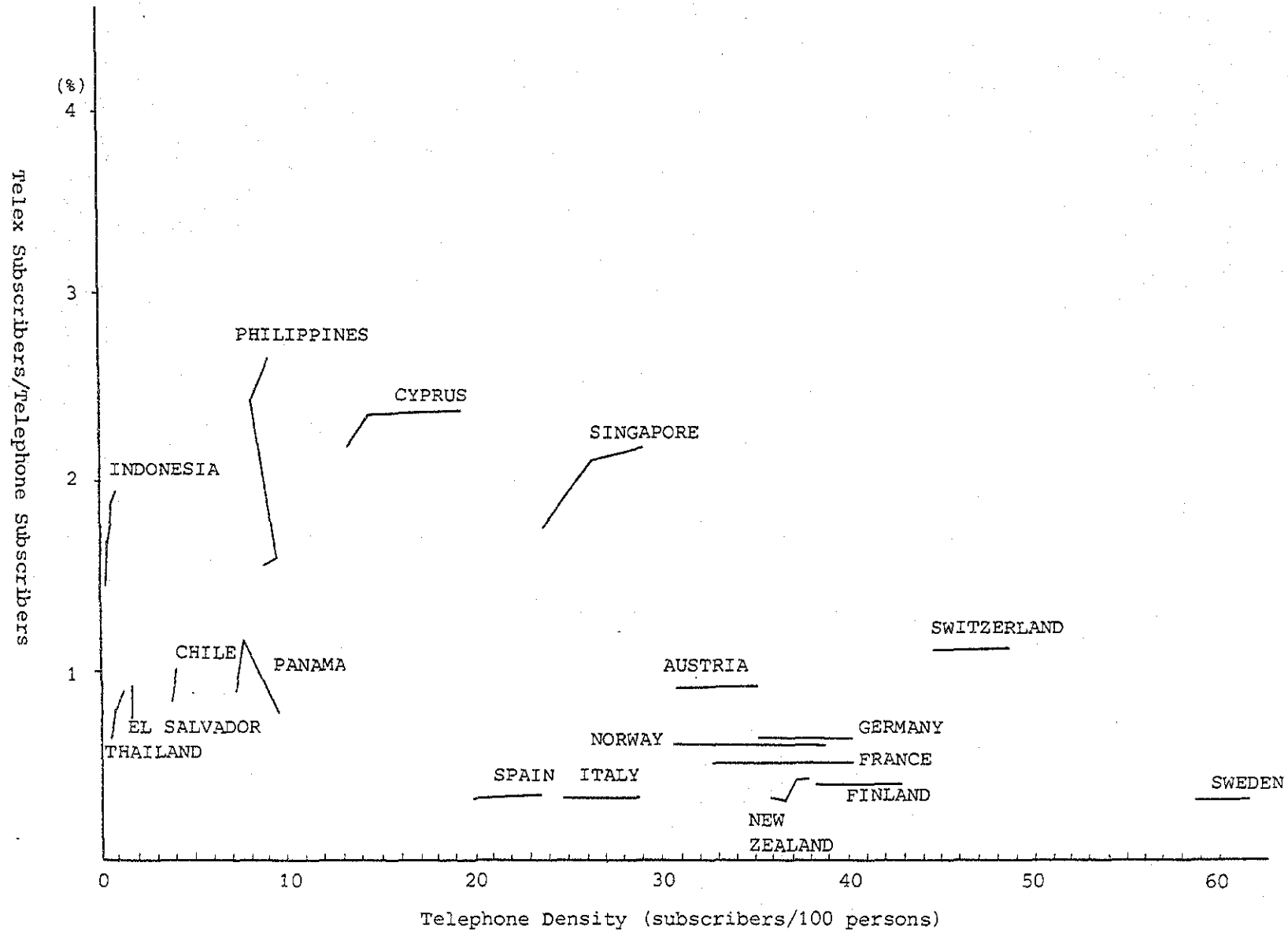

Figure 4-3-1 International Data of Telex Service (1981-1984)

(2) Forecasted Results

Table 4-3-1 shows the summary of the simple forward projections of the telex service subscribers by the estimated model. There are two cases in the table. The cases assume that telephone subscribers will increase according to the Plan 1 and Plan 2 discussed in the section of the telephone supply plan.

Table 4-3-1 Projections of Telex Service Subscribers

Case 1 (TELEPHONE SUPPLY PLAN 1)

	1984	1989	1994	1999	2004
TEL. DENSITY	0.33	0.70	1.06	1.46	1.84
DATA/TEL. SUB	0.001	0.001	0.001	0.001	0.002
TELEX/TEL. SUB	0.019	0.020	0.015	0.014	0.014
TELEX SUB	10,289	24,596	32,304	45,964	62,612

Case 2 (TELEPHONE SUPPLY PLAN 2)

	1984	1989	1994	1999	2004
TEL. DENSITY	0.33	0.81	1.33	1.96	2.54
DATA/TEL. SUB	0.001	0.001	0.001	0.001	0.002
TELEX/TEL. SUB	0.019	0.017	0.015	0.014	0.013
TELEX SUB	10,289	24,596	39,182	60,068	83,635

As the economy advances and the change of industrial structure proceeds, demand for telecommunication services will become diversified in kinds and upgraded in quality. In the non-telephone services, the so-called new services will become more important. Hence, some portion of the predicted telex service subscribers will further switch to the facsimile service. It may be more reasonable to regard that the predicted number of the telex service subscribers includes the potential subscribers of the facsimile service.