4-7 Rough System Design of Submarine Cable System

When the optical fiber submarine cable system is adopted between Ende and Kupang, the schematic system design is as follows:

Submarine cable length between the supposed cable landing points is estimated to be 285 km. Distance from the cable landing point to the telephone exchange is about 3 km on Ende side and about 4 km on Kupang side. Therefore, the total optical fiber cable length between the two telephone exchanges becomes about 292 km.

Depth to the sea bottom where to lay submarine cable, as obtained from the sea chart, is in Figure 4-10. Maximum depth measures about 3,500 m. Thus, for the cable system in Ende-Kupang section, the optimum choice is to use armored cable in the shallow sea area only near both ends.

When repearters are to be installed at standard intervals of 50 km, six repearters will be required.

Optical fiber cable installed is to be dropped to the telephone exchanges at both ends. Optical terminal equipment is to be installed in the telepohne exchange building.

Transmission capacity of optical fiber cable to be used in this project is 140 Mbit/s (1,920 CH in terms of telephone channels). This transmission capacity is considered to be the smallest among all optical fiber cable systems so far developed in the world.

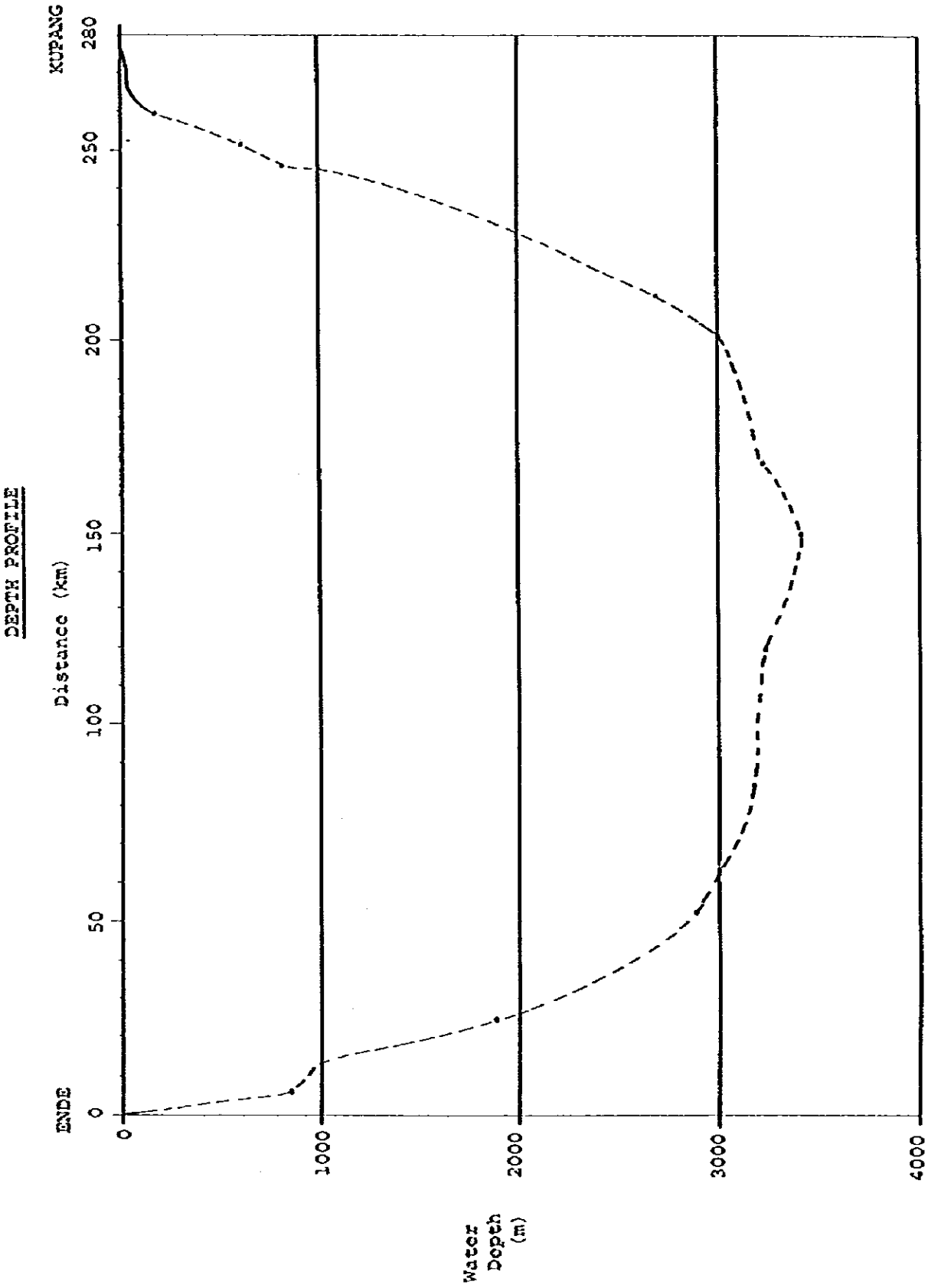


Figure 4-10 Depth Profile (Ende - Kupang)

4-8 Outline of Main Equipments

For main equipments to be used in this project, summary description appears below.

4-8-1 Radio Equipment

Digital radio system to be used in this project comprises two types, i.e., 6 GHz band (upper band), 68 Mbit/s system for main route and 2 GHz band, 4 Mbit/s, 8 Mbit/s or 17 Mbit/s system for spur route.

Radio equipment consists of transmitter/receiver equipment, antenna system and supervisory control equipment.

For remote supervisory and control of transmission network, remote supervisory and control equipment is to be installed at each Maintenance Center and Maintenance Sub-center. By this means, each Center carries out supervisory and control of radio stations and transmission route in its maintenance area.

Table 4-3 presents main parameters of radio system equipment.

4-8-2 Multiplex Equipment

Digital multiplex equipment to be installed at radio terminal and branch stations, as well as cable dropping stations, of this project is based on bit rate of 2,048 kbit/s recommended by CCITT. This equipment is composed of the following component equipment:

- Second order digital multiplex equipment
- Third order digital multiplex equipment

- Primary order PCM multiplex equipment
- 2,048 kbit/s repeater equipment
- 60 CH Transmultiplexer

For all the above equipment, characteristics are specified in relevant CCITT Recommendations.

At Poco Ranakah radio repeater station as an interface between the digital transmission system to be constructed by this project and the existing analog transmission system, the abovementioned digital equipment and FDM carrier multiplex equipment will be installed.

Since the transmission system operating in Nusa Tenggara Barat area is of analog system, radio stations to be established in this area will be provided with FDM carrier multiplex equipment.

4-8-3 Entrance Cable System

In this project, cable PCM system using pair cable (bit rate: 2,048 kbit/s) will be used for entrance cable system in Nusa Tenggara Timur. Aerial cable installation will be adopted.

In Nusa Tenggara Barat, cable entrance is to be by VF cable. (This applies to Taliwang - Lab-Balat section.)

Table 4-3 Typical Equipment Parameters of Digital Radio Systems

1.	Radio frequency band	2 GHz			6GHz (upper band)
2.	Transmission Capacity/RF CH				
	. Bit rate	2Mx2	8Mx1	8Mx2	34Mx2
	. No. of voice channels	60	120	240	960
3.	No. of RF CH (Maximum) (Working + Protection)	1+1	1+1	1+1	*3+1
4.	Modulation System	4 PSK	4 PSK	4 PSK	8 PSK
5.	Demodulation System	Coherent detection			
6.	Repeating System	Regenerative or Heterodyne			
7.	Transmitter Output (dBm)	27/23	30/20	30/20	27/23
8.	Antenna gain				
	3.6 m ϕ parabolic		35.0		45.5
	3.0 m ϕ "		33.4		44.0
	2.4 m ϕ "		31.4		42.0
9.	Feeder loss (dB)		0.044 dB/m		0.05 dB/m

Note: * In case of single polarization antenna

4-9 Power Supply System

This project is so characterized that, in not a few cases, radio repeater stations on terrestrial transmission route have to be established on inconveniently situated small islands. At those radio repeater stations, commercial power supply is not available so that stable in-house power generation equipment must be installed.

In this project, such geographically handicapped radio repeater stations are to be equipped, as far as possible, with solar battery system for power supply.

Radio terminal stations are to be established in telephone exchanges, in principle. Since power consumption of radio equipment is much smaller than that of switching equipment, power supply system for switching equipment is to be utilized for power supply to radio equipment also.

4-9-1 System Selection

Radio stations are to be classified into those where commercial power supply is available and those where commercial power supply is not available. For each group of stations, selection is made for optimum power system.

(1) Commercial Power Using Station

Power system for commercial power using stations is selected from among charge-discharge system, partial floating system and full floating system.

The difference among these three systems is in the way the storage batteries are used.

The full floating system is worth noting by reason of the following advantages:

(a) Storage battery capacity can be reduced to a great extent.

(b) Storage battery life can be prolonged.

(c) Maintenance is easy.

(d) Power conversion efficiency is high. Hence big economic effect.

Because of these advantages , the full floating system is extensively adopted as standard power system of commercial power using stations.

In this project also, the full floating system is to be adopted.

For standby power system at the time of commercial power failure, diesel engine generator is to be installed.

(2) Non-commercial Power Using Station

Power systems that can be used at non-commercial power using stations include the following:

1) Internal Combustion Engine System

This system uses 2 or 3 internal combustion engines (mainly diesel engines) and generates power by alternate operation of engines at fixed time intervals.

This system is technically stable and commands high degree of reliability.

When charge-discharge system is used for power supply to telecommunication loads, internal combustion engine rate of operation can be reduced but large storage battery capacity is required, and control circuit also becomes complicated. Hence high initial cost.

Load capacity at radio stations to be constructed by this project is about 100-3,000 W. This system is worth adopting at radio stations where load capacity is 300 W or more.

2) Solar Battery System

This system is for direct conversion of optical energy into electricity.

These days, solar battery system is becoming lower and lower priced. Its maintenance is easy and maintenance cost is low. Furthermore, it requires no fuel supply.

Because of these merits, this system is considered to be effective a great deal as power supply system for radio stations where load capacity is 300 W or less.

Typical examples wherein this system is adopted are shown in ANNEX-16.

3) Wind Power Plant System

This system is to generate power by driving propeller type or Dalius type windmill by wind energy.

In this project area, places where stable wind energy fit for power generation by this system can be obtained are few. Therefore, this system is impractical.

4) Thermoelectric Generator System

This system is for power generation from solid, liquid or gaseous fuel combustion heat by use of Seebeck effect.

In case where load capacity is 300 W or more, internal combustion engine system is less expensive and more commonly utilized than this system.

After careful comparative study of the foregoing power generating systems, decision is made that either internal combustion engine system or solar battery system be adopted as power system at non-commercial power using stations to be used in this project.

4-9-2 Equipment Design Parameters

Main equipment design parameters are as follows:

1) Commercial Power Using Station

- DC power supply system: Full floating system
- Standby power system: Diesel engine generator
- Battery holding time: 8 hours

2) Non-commercial Power Using Station

a) Where load capacity is 300 W or more

- Power generation system: Dual prime mover system by diesel engine
- DC power supply system : Full floating system
- Battery holding time : 8 hours
- Mobile Engine Generator: 5 (for Kupang, Ende, Waingapu, Kalabahi and Larantuka)

b) Where load capacity is below 300 W

- Power generation system: Solar battery system
- DC power supply system : Partial floating system
- Battery holding time: : 15 days
- Transportable engine generator (3.6 kVA) and rectifier (20 A x 2) : At each station

4-10 Station Buildings

In this project, station buildings are to be of the following types:

(1) For radio terminal stations to be established in Primary Center and Secondary Center and for stations where cable entrance is by cable PCM system, part of telephone exchange buildings will be utilized. Thus, for these stations, building construction cost is not considered in project cost estimate.

(2) Buildings for through repeater stations to be established at mountaintop and for branch stations are to be the shelter type. Shelter classification by sites follows:

a) Shelter for telecommunication equipment

b) Shelter for power suppply equipment

c) Shelter for diesel engine generator equipment

CHAPTER 5

MAINTENANCE

CHAPTER 5 MAINTENANCE

5-1 Maintenance Work

Maintenance work is to keep the constructed telecommunications system and facilities well maintained and in normal operation so that they can provide high quality services at all times. Also included in the objective of maintenance work is to make records of maintenance result and service performance, subservient for the subsequent maintenance plan and service quality improvement.

The ideal form of service is the service without interruptions and of extremely low fault rate.

Approaches to such ideal service are twofold. One is to design and manufacture equipments of high reliability and integrate them into a workable system. The other is to so arrange the maintenance work as to minimize system faults and to provide the best possible service.

5-2 Maintenance System

For the terrestrial transmission system to be constructed in this project area, maintenance will have to be carried out under much severer conditions than for terrestrial transmission systems in other areas.

This project area consists of Flores Island, Timor Island and Sumba Island plus small islands that surround those major islands. Therefore, some of radio repeater stations on the projected terrestial transmission route have to be constructed on inconveniently situated small islands.

How to carry out effective maintenance of radio repeater stations on those small islands poses a big problem.

Usually, major bottleneck in the maintenance of those radio repeater stations lies in the difficulty of maintenance of power supply system. Radio facilities of recent make have their reliability remarkably improved by the rapid advancement of electronics. Assisted by the effect of standby system, the fault rate of transmission system due to mechanical failure has become negligibly low at present.

In the implementation plan for this project, special emphasis is placed on easing of power supply system maintenance. From this viewpoint, consideration is made about the power supply system to be adopted.

As previously stated elsewhere, selection is made for solar battery system though it entails considerably high initial cost. This selection is from the viewpoint of easy maintenance.

For solar battery system, considerable price reduction can be expected in the coming several years. Besides, maintenance cost also may be curtailed broadly because the system requires no routine maintenance and overhaul of engine, still less fuel supply.

For maintenance system to be organized in this project area, study is made mainly about that covering Nusa Tenggara Timur where terrestrial transmission system will be newly established.

In Nusa Tenggara Barat, large capacity microwave transmission system is already in operation. Thus, for maintenance of small capacity microwave system to be newly established, the existing maintenance system will be sufficient.

For Nusa Tenggara Timur, the maintenance system concept is as described below. In this concept, geographical specialities of the area, as well as the sizes of radio terminal facilities and telephone exchanges are duly considered.

At Kupang and Ende, Maintenance Centers will be established. At Kalabahi, Waingapu and Larantuka, Maintenance Sub-centers will be established.

Maintenance Centers and Maintenance Sub-centers will exercise supervision over radio stations and entrance cable stations in the areas under their respective controls, and carry out periodical inspection, testing and trouble shooting of those stations.

Districts of jurisdiction of those maintenance organizations are as follows:

Kupang Maintenance Center:	Timor Island
	Rote Island
Ende " "	Flores Island
Waingapu Maintenance Sub-center:	Sumba Island
Kalabahi " "	Alor Island
	Pantar Island
Larantuka " "	Adonara Island
	Lembata Island

For distribution of maintenance equipment and tools, as well as vehicles, to the maintenance organizations, the following arrangement is contemplated:

Measuring equipment of the type that is frequently used will be distributed to Maintenance Centers and Sub-centers and radio terminal stations. Measuring equipment of the type that is less frequently used will be collectively distributed to Maintenance Centers.

Maintenance tools and spare parts will be distributed to Maintenance Centers and Sub-centers. Spare panels will be collectively distributed to Maintenance Centers.

As for maintenance vehicles, two will be distributed to each Maintenance Center and one to each Maintenance Sub-center.

Maintenance staff will be organized as under:

- Maintenance Center

Chief	1	
Sub-chief	1	
Radio engineers	6	(2-man team on 3 shifts)
MUX "	3	(1-man team ")
Power "	3	(")
Total	14	

- Maintenance Sub-center

Chief	1	
Radio engineers	3	(1-man team on 3 shifts)
MUX "	3	(")
Power "	3	(")
Total	10	

5-3 Training of Personnel

For maintaining of high quality transmission system in desirable condition at all times, training and education of maintenance personnel to elevate their technical level are indispensable.

Terrestrial transmission system to be constructed, this time, is of digital system in which PERUMTEL holds no experience yet. Hence the importance of familiarizing PERUMTEL staff with all technical aspects of the system.

Training can be divided into three main segments. First is the basic classroom lectures in the Contractor's factory. Second is the participation in all kinds of tests during the construction work. Third is on-the-job training by the engineer to be dispatched by the Contractor for one year after system commissioning.

CHAPTER 6
CONSTRUCTION WORK COST

CHAPTER 6 CONSTRUCTION WORK COST

For construction work cost estimate, the following three plans were studied:

Plan A: Case where initial year is 1990 and final year is 2005.

Plan B: Case where initial year is 1990 and final year is 2010.

Plan C: Case where submarine cable system is introduced between Ende and Kupang.

In Plan A and Plan B, the amount of initial investment is the same because in both cases the transmission capacity of radio equipment is designed to fulfill circuit requirement as of 2010.

In Plan C, the cost of submarine cable system causes the amount of initial investment to be much greater than that in Plan A and Plan B.

The amount of initial investment includes the cost of basic equipment to meet circuit requirement as of final year and the cost of carrier terminal equipment to meet circuit requirement five years after system commissioning.

Equipment replacement by reason of service life termination is to be carried out when necessary, and additional installation of carrier terminal equipment is to be made every five years, both financed by PERUMTEL's fund on hand.

Construction work is divided into Stage I and Stage II. This division is in consideration of the period of transfer of telephone exchanges to digital switching system, traffic growth forecast, and domestic satellite communication network construction plan.

In the aforementioned Plan B, main works are as follows:

- Construction of microwave transmission system (6 GHz, upper band, 960 CH, 68 Mbit/s) as part of main system, extending from the existing Poco Ranakah radio repeater station and connecting Ende and Kupang. (16 sections in Stage I.)

- Construction of spur microwave transmission system (2GHz, 60/120 CH, 4/8 Mbit/s) branching from the above main system to Maumere, Kalabahi, Kefamenanu and Baa (Stage I) and to Waikabubak and Larantuka (Stage II). (6 sections in Stage I; 4 sections in Stage II.)

- Construction of 800 MHz band spur transmission system (120 CH, analog system) branching from the existing microwave transmission system to Dompu and Taliwang. (3 sections in Stage I.)

- Extension of the existing 400 MHz band analog transmission system. (1 section, Poco Ranakah - Ruteng, in Stage I; 1 section, Poco Ranakah - Waingapu, in Stage II.)

- Construction of entrance cable systems between radio terminal stations and telephone exchanges (PCM cable system; 2 Mbit/s). (6 sections of Bajawa, Ende, Atambua, Kupang, Baa and Taliwang in Stage I; 2 sections of Waingapu and Waikabubak in Stage II.)

Construction cost estimates in the case of Plan A, Plan B and Plan C follow:

Plan A and Plan B

	Foreign Currency Portion (¥ million)	Local Currency Portion (Rp. million)
Stage I work	4,628 (19,694)	2,878 (2,922)
Stage II work	732 (3,115)	417 (423)
Total	5,360 (22,809)	3,295 (3,345)

Plan C

	Foreign Currency Portion (¥ million)	Local Currency Portion (Rp. million)
Stage I work	8,797 (37,434)	2,878 (2,922)
Stage II work	732 (3,115)	417 (423)
Total	9,529 (40,549)	3,295 (3,345)

Note: 1. Parenthesized is the U.S. dollar equivalent (in US$ 1,000). The rate of exchange used is Rp. 985 = ¥ 235 = US$ 1 (as of the upper part of November 1983).

2. Breakdown of Plan B is in Table 6-1 and Table 6-2.

3. Breakdown of Plan C is in ANNEX-3.

Conditions used for construction cost calculations are:

- Construction work contract be on turn-key basis.

- Calculations are based on price levels as of the end of 1983.

- Radio terminal equipment be installed in telephone exchanges except in the case of installation by entrance cable.

- Power supply to radio terminal equipment be by shared use of power supply system in telephone exchanges.

- Synchronizing signal for transmission system be supplied from switching system.

- For non-telephone services facilities, up to voice channels in terms of the number of circuits required be installed by this project. This applies to all exchanges.

- Radio station buildings be the shelter type except in the case of radio terminal stations to share buildings with switching equipment.

- Access roads to radio repeater stations where solar battery system is to be adopted, be footpaths only. This is to do with itinerary maintenance at long intervals and in consideration of no necessity of fuel supply.

- Commercial power supply to mountaintop radio repeater stations be of low tension (220/380 V). This is because power requirement at those stations is limited and in consideration of local power supply situation.

- Entrance cable installation be by shared use of power cable poles, in principle. This is to save cost.

Construction work fund is to be raised in foreign and local currencies. Breakdown of coverage follows:

(1) Foreign Currency Portion

- Radio equipment, remote supervisory equipment, multiplexing equipment, power supply system and antenna system
- Antenna towers
- Shelters for radio repeater stations
- Work materials, tools, measuring equipment and spare parts
- Marine transportation cost and insurance fee
- Part of equipment installation work, as well as tests and adjustment
- Part of tower construction and foundation works
- In-factory and at-site training of personnel
- Part of consultant service

(2) Local Currency Portion

- Procurement of site lands and lands formation (to be carried out by PERUMTEL)
- Access road construction (ditto)
- Entrance cable

- Domestic transportation and insurance

- Part of equipment installation work, as well as tests and adjustment

- Part of tower construction and foundation works

- Procurement of maintenance vehicles

- Part of consultant service

Table 6-1 Project Cost (Stage I; Plan A, Plan B)

Unit: Foreign Currency (Million Yen)
Local Currency (Million Rupiah)

	Cost		Remarks
	Foreign Currency	Local Currency	
I. Equipment			
(1) Radio Transmission System	1,404	-	
(2) Power Supply System	430	-	
(3) Antenna Tower	469	-	
(4) Shelter	312	-	
(5) Entrance Cable System	35	-	
(6) Test Equipment, Spares	190	-	
(7) Installation Materials	142	-	
(8) Sub Total (1) ∿ (7)	2,982	-	F.O.B.
(9) Freight and Insurance	179	-	
(10) Sub Total (8) & (9)	3,161	-	C.I.F.
II. Installation & Engineering			
(11) Installation	715	1,285	
(12) Training	20	-	
(13) One year Maintenance Assistance	36	-	
(14) Sub Total	771	1,285	
(15) Sub Total I. & II.	3,932	1,285	
III. Civil Works and Others			
(16) Access Road	-	214	
(17) Land Procurement	-	160	
(18) Fuel Tank	-	130	
(19) Maintenance Vehicles	-	60	
(20) Entrance Cable System	-	135	
(21) Commercial Power Line	-	460	
(22) Sub Total	-	1,159	
(23) Total I. ∿ III.	3,932	2,444	
IV. Consulting Services			
(24) Consulting Service Fee	275	171	
(25) Total I. ∿ IV.	4,207	2,615	
V. Contingency	421	262	
(26) Grand Total	4,628	2,878	

Table 6-2 Project Cost (Stage II; Plan A, Plan B)

Unit: Foreign Currency (Million Yen)
Local Currency (Million Rupiah)

	Cost		Remarks
	Foreign Currency	Local Currency	
I. Equipment			
(1) Radio Transmission System	183	-	
(2) Power Supply System	98	-	
(3) Antenna Tower	75	-	
(4) Shelter	56	-	
(5) Entrance Cable System	17	-	
(6) Test Equipment, Spares	30	-	
(7) Installation Materials	26	-	
(8) Sub Total (1) ∿ (7)	485	-	F.O.B.
(9) Freight and Insurance	29	-	
(10) Sub Total (8) & (9)	514	-	C.I.F.
II. Installation & Engineering			
(11) Installation	151	174	
(12) Training	-	-	
(13) One-year Maintenance Assistance	-	-	
(14) Sub Total	151	174	
(15) Sub Total I. & II.	665	174	
III. Civil Works and Others			
(16) Access Road	-	25	
(17) Land Procurement	-	40	
(18) Fuel Tank	-	20	
(19) Maintenance Vehicles	-	24	
(20) Entrance Cable System	-	46	
(21) Commercial Power Line	-	50	
(22) Sub Total	-	205	
(23) Total I. ∿ III.	665	379	
IV. Consulting Services			
(24) Consulting Service Fee	-	-	
(25) Total I. ∿ IV.	665	379	
V. Contingency	67	38	
(26) Grand Total	732	417	

CHAPTER 7
CONSTRUCTION WORK SCHEDULE

CHAPTER 7 CONSTRUCTION WORK SCHEDULE

Procurement and construction schedule for this project is given in Table 7-1. As seen in this table and as stated in the preceding CHAPTER, the work is divided in two, i.e., Stage I and Stage II.

Initiation period for Stage II is provisionally set for 1992. Final decision should be made in due consideration of telephone exchange construction period and trunk traffic increase, together with other related factors.

In Stage I, employment of Consultant is scheduled. However, in Stage II, PERUMTEL is to manage project implementation.

Field survey to be carried out by the Consultant in Stage I should preferably include field survey scheduled in Stage II. This is to ensure consistency of project implementation and to promote early completion of Stage II work.

Table 7-1 Procurement and Construction Schedule for Stage I and Stage II

	Stage	Stage I						Stage II			
	Number of Months	12	24	36	48	60	72	84	96	108	
	Calender Year Expected	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
		8 12	8 12	8 12	8 12	8 12	8 12	8 12	8 12	8 12	8 12
	Progress / Service Items	Tender Opening; Tender Closing	Signing of Contract		Commencement of Service			Tender Opening; Tender Closing	Signing of Contract	Commencement of Service	
PERUM-TEL's Task	Tender Opening and Closing	△ △						△ △			
	Signing of Contract										
	Land Procurement, Construction of Access Road, Building										
Consultant's Task	Detailed Design										
	Preparation of Tender Documents										
	Evaluation of Tender Proposal										
	Assistance of Contract Negotiation										
	Check of Installation Drawings										
	Witness to Factory Test										
	Supervision and Acceptance Test for Installations										
Contractor's Task	Preparation of Installation Drawings										
	Construction of Tower Foundations										
	Manufacturing and Factory Tests										
	Transportation										
	Installation of Equipment and Tower										
	Acceptance Tests										
	Commencement of Service				△						△
	Training of Manufacturer's Country										
	Training in Indonesia										

CHAPTER 8
FINANCIAL AND ECONOMIC ANALYSES

CHAPTER 8 FINANCIAL AND ECONOMIC ANALYSES

8-1 Financial Analysis

8-1-1 General

Financial analysis is to evaluate financially implementation worthiness of the Nusa Tenggara Area Terrestrial Transmission Network Construction Project for PERUMTEL as responsible party for implementation of the project. In this study, profit ratio of total liabilities and net worth, and net profit to net worth ratio are used as evaluation criteria.

For both financial and economic analyses, inflation is not to be taken into consideration. That is to say, revenue and expenditure during the period of project life are to be calculated, based on constant price of 1983. The reason is that it is extremely difficult to predict and establish by prediction the tariff system of PERUMTEL for all foreseeable services including telephone and telex services.

Financial analysis is carried out, based on Plan A, Plan B and Plan C for system construction described in CHAPTER 6.

8-1-2 Equipment Investment

Necessary equipment investment for implementation of this project is threefold, i.e., initial investment, additional installation cost and replacement cost.

(1) Plan A

(Project life: 1990 - 2005)

- Initial Investment

  Stage I (1986 - 1989)

  Foreign currency portion: ¥4,628 million

  Local currency portion: Rp. 2,878 million

  Stage II (1992 - 1994)

  Foreign currency portion: ¥732 million

  Local currency portion: Rp. 417 million

Note: Above figures include contingency.

Initial investment disbursement plan by year, prepared according to the construction schedule, appears in Table 8-1.

- Additional Installation Cost

This cost is the cost required for additional equipment installation to meet demand growth after the completion of initial stage work. Disbursement of ¥20 million for 1997 is on the schedule.

- Replacement Cost

Equipment and facilities used to implement the project must be replaced at fixed time intervals according to the durable periods of equipment and facilities. Equipment to be replaced are power generation system (dual prime mover system) and storage batteries. Disbursement plan by year appears in Table 8-3.

Durable period and annual depreciation rate of each equipment/facilities category are as under. For equipment/facilities to be procured and installed by foreign currency budget, the durable period and annual depreciation rate are determined, based on the Japanese practice. For equipment/facilities to be procured and installed by local currency budget, the durable period and annual depreciation rate are determined, based on PERUMTEL's practice.

	Durable Period (years)	Annual Depreciation Rate (%)
Telecommunication equipment	20	5
Rectifier equipment	20	5
Motor generator (Dual prime mover system)	4	25
Ditto (Spare)	20	5
Storage batteries	8	12.5
Tower	40	2.5
Shelter	40	2.5
Fuel tank	20	5
Maintenance work vehicle	5	20
Entrance cable	20	5

(2) Plan B

(Project life: 1990 - 2010)

Amount of initial investment is the same as in Plan A.

For additional installation cost, disbursement of ¥20 million in 1997 and ¥40 million in 2004 is on the schedule. Replacement cost according to the durable period of equipment/facilities appears in Table 8-3.

(3) Plan C

(Submarine cable system adopted. Project life: 1990 - 2010)

Amount of initial investment for Stage I only is greater than in Plan A.

Foreign currency portion:	¥8,797 million
Local currency portion:	Rp. 2,878 million

Additional installation cost and replacement cost are the same as in Plan B.

8-1-3 Working Capital

Working capital constitutes investment in current assets, including cash, income receivable, and material stock. In this study, working capital is provisionally set at 30% of revenue difference between the year concerned and the year before.

Working capital is not of the nature to be depreciated but is redeemable in full when project life terminates. Therefore, full amount of balance as of final year is entered on debit account.

Table 8-1 Yearly Expenditure Plan of Initial Investment (Plan A, Plan B)

(Unit: 1 Million Yen & 1 million Rp)
(At 1983 Constant Price)

Year	1986	1987	1988	1989	1990	1992	1993	1994
Equipment & Installation (1) ∿ (12)		2,883.04 (950.9)	701.28 (231.3)	311.68 (102.8)			598.5 (156.6)	66.5 (17.4)
One-year Maintenance Assistance (13)					36			
Access Road (16)	(21.4)	(64.2)	(128.4)			(17.5)	(7.5)	
Land Procurement (17)	(32)	(128)				(40)		
Fuel Tank, Vehicles, Cable, Power Line (18) ∿ (21)		(78.5)	(471)	(235.5)			(126)	(14)
Consulting Service Fee (24)	137.5 (85.5)	55 (34.2)	55 (34.2)	27.5 (17.1)				
Total	137.5 (138.9)	2,938.04 (1,255.8)	756.28 (864.9)	339.18 (355.4)	36	(57.5)	598.5 (290.1)	66.5 (31.4)

Remarks: . The numbers (1) ∿ (24) indicate cost items in Table 6-1.

. The figures enclosed by parentheses indicate local currency portion.

Table 8-2 Yearly Expenditure Plan of Initial Investment (Plan C)

(Unit: 1 Million Yen & 1 Million Rp)
(At 1983 Constant Price)

	1986	1987	1988	1989	1990	1992	1993	1994
Equipment & Installation (1) ∿ (12)		5,582.56 (950.7)	1,357.92 (231.3)	603.52 (102.8)			598.5 (156.6)	66.5 (17.4)
One-year Maintenance Assistance (13)					36			
Access Road (16)	(21.4)	(64.2)	(128.4)			(17.5)	(7.5)	
Land Procurement (17)	(32)	(128)				(40)		
Fuel Tank, Vehicles, Cable, Power Line (18) ∿ (21)		(78.5)	(471)	(235.5)			(126)	(14)
Consulting Service Fee (24)	236.9 (85.5)	69.2 (34.2)	55 (34.2)	55.9 (17.1)				
Total	236.9 (138.9)	5,651.76 (1,255.8)	1,412.92 (864.9)	659.42 (355.4)	36	(57.5)	598.5 (290.1)	66.5 (31.4)

Remarks: . The numbers (1) (24) indicate cost items in Table 6-1.

. The figures enclosed by parentheses indicate local currency portion.

Table 8-3 Replacement Cost

(Unit: 1 Million Yen & 1 Million Rp)
(At 1983 Constant Price)

Year	1993	1994	1997	1999	2001	2004	2005
Engine Generator	81		81		81		81
Battery			200				200
Maintenance Vehicle		(60)		(84)		(84)	
Total	81	(60)	281	(84)	81	(84)	281

Remarks:
- The amount of Plan A is included from 1993 to 2001.
- The amount of Plan B or Plan C is included from 1993 to 2005.
- The figures enclosed by parentheses indicate local currency portion.

8-1-4 Operating Expenses

(1) Maintenance Expenses

1) Personnel Expense

Required maintenance staff is of the following strength:

Maintenance Centers (14 persons x 2 centers)	28
Maintenance Sub-centers (10 persons x 3 sub-centers)	30
Management members	2
Total	60

According to financial report of 1982, average annual income per capita of WITEL VIII personnel amounts to Rp. 1,646,365. In this study, it is assumed that the amount mentioned will remain unchanged until 2010.

2) Non-personnel Expense

Non-personnel expense required for maintenance comprises power supply expense and vehicle fuel expense.

(2) General Administrative Expenses

Administrative expenses mentioned here are expenses required by the administrative division of WITEL VIII. Main items are personnel expense and non-personnel expense.

For calculation of the number of WITEL VIII administrative division personnel required for implementation of this project, the ratio between engineers and administrative staff of WITEL VIII during 1979-1983 is used.

The number of administrative division staff required for this project, calculated as per above, is

60 persons x 0.38 = 23 persons

Non-personnel expense comprises lighting and fuel expense, as well as safety expense, of each exchange station and personnel training expense. In this study, based on financial report of 1982, non-personnel expense is set at 20% of personnel expense.

Breakdown of annual total operating expenses is given in the table below.

(Unit: Rp)

Year	Maintenance Expense		General Administrative Expense	Total
	Personnel Expense	Non-personnel Expense		
1990-1994	98,781,900	53,016,480	45,439,674	197,238,054
1995-2010	98,781,900	61,129,440	45,439,674	205,351,014

8-1-5 Salvage Value

Generally, for salvage value of equipment at the durable period termination, net salvage value, i.e., the amount after substraction of equipment withdrawal cost, is used. However, in this study, net salvage value is set at nil according to depreciation method adopted by PERUMTEL, except for towers and shelters. For these two items, withdrawal cost of 20% is considered so that net salvage value is -20%.

Thus, for each equipment category, the value prior to durable period termination is used as salvage value at the time of project life termination.

For durable period and annual depreciation rate of each equipment category, detailed description is made in Paragraph 8-1-2.

8-1-6 Tariff System

Services contemplated by this project are fourfold. They are:

- Telephone service
- Telegram service
- Telex service
- Leased circuit service

Summarized below is the tariff system as of 1983 pertaining to each of the three service categories.

(1) Telephone Tariff

Telephone tariff consists of three items, i.e., telephone installation charge, basic tariff and calling charge.

Telephone installation charge is levied on subscriber having telephone installed. This charge includes installation work cost to be shared by subscriber.

In Indonesia, telephone installation charge is divided into seven categories, i.e., Category I to Category VII. Fittest category charge is chosen in consideration of local situation concerned. Applicable to Nusa Tenggara area are Category IV - VII.

Basic tariff is levied on subscriber in the fixed amount every month regardless of the number of calls. In Indonesia, the amount of basic tariff differs according to the type of exchange, i.e., automatic exchange or manual exchange, and depending upon the number of subscribers accommodated in the exchange concerned. (For details, see Table 8-4.)

Inter-region calling charge is levied on subscriber every month in the amount corresponding to the number of originating calls. In Indonesia, tariffs vary according to service distance and service time length. (For details, see Table 8-4.)

(2) Telegram Tariff

Tariff consists of Rp. 10 per word. For emergency service, tariff is Rp. 20 per word and applies to the required minimum of 10 words.

(3) Telex Tariff

Telex service fee comprises terminal installation charge, message tariff, and terminal rental (monthly rental) charge.

In WITEL VIII area, telex exchange exists in Denpasar only so that subscribers belonging to the coverage area of this project must pay circuit rental charge in addition to regular tariff.

Terminal installation charge is of the same rate as telephone installation charge.

Message tariff consists of Rp. 50 per pulse. This tariff is subject to restrictions by service distance and service time length as follows:

Distance (km)	Time Length (sec.)
- 50	12
50 - 300	8
300 - 750	6
750 -	3

Terminal rental charge is Rp. 7,500/month.

Circuit rental charge varies according to exchange group as shown below.

Exchange	Circuit Rental Charge
Kupang	Rp. 180,000/month
Waingapu	"
Ende	"
Ruteng	"
Sumbawa Besal	Rp. 90,000/month
Bima	"

Table 8-4 Telephone Tariff

(Unit: 1 Rp, At 1983's price)

Charge for Installation of a New Telephone	Yearly Basic Tariff			Distance (km)	Manual Trunk Call	Subscriber Long Distance Dialling			
	Size of Local Network	Without Flat Rate for Local Call (Automatic)	With Flat Rate for Local Call (Manual)		Fee for One Minite	Metering Pulse Interval (sec)		Fee for One Minite	
					Day 06:00 22:00	Day 06:00 22:00	Night 22:00 06:00	Day 06:00 22:00	Night 22:00 06:00
I 200,000	Five big cities	42,000		0 - 25	60	60	60	60	60
II 175,000	Other cities with automatic exchange	24,000		25 - 100	600	6	12	600	300
III 125,000				100 - 200	720	5	10	720	360
IV 90,000	Manual exchange < 750 L.U.		12,000	200 - 300	900	4	8	900	450
V 75,000				300 - 1000	1200	3	6	1200	600
VI 50,000	Manual exchange > 750 L.U.		24,000	1000 -	1800	2	4	1800	900
VII 25,000									

8-1-7 Project Revenue

Revenue to accurue from commissioning of system constructed by this project is of four categories, i.e., telephone service revenue, telegram service revenue, telex service revenue and leased circuit service revenue.

Besides those four categories of revenue, there also is miscellaneous revenue, e.g., non-operating revenue, such as advertisement revenue. However, in this study, miscellaneous revenue is not taken into account because miscellaneous revenue cannot be properly estimated as project revenue component.

Conditions used in project revenue estimation are as follows:

- Tariff system of PERUMTEL as of 1983 to remain unchanged for the whole project period (1990-2010).

- Exchanges having to do with project revenue be as under. (Depending upon project completion year, applicable period changes according to exchanges.)

	1990-1994	1995-1999	2000-2010
Taliwang	0	0	0
Dompu		0	0
Ende	0	0	0
Maumere	0	0	0
Larantuka			0
Bajawa	0	0	0
Ruteng	0	0	0
Waingapu		0	0
Waikabubak			0

Kupang	0	0	0
Soe		0	0
Kefamenanu	0	0	0
Atambua		0	0
Baa	0	0	0
Kalabahi		0	0

- For traffic distribution between domestic satellite (PALAPA-B) link and terrestrial transmission network to be constructed by this project, distribution ratio is already determined by distance.

  From the viewpoint of revenue, traffic distribution signifies calling charge revenue distribution. In the case of new subscribers after the completion of terrestrial transmission system, installation charge and basic tariff revenue in telephone service and installation charge, equipment rental and circuit utilization fee revenue in telex service be also distributed according to traffic distribution ratio.

- Subscribers as revenue source (except for calling charge revenue) from services by new system to be constructed by this project be new subscribers in and after 1990. That is to say, revenue from subscribers up to 1989 is considered to be revenue from the existing facilities.

- For calling charge revenue, all subscribers except those of Ruteng and Waingapu Exchanges covered by the existing UHF system be the revenue source. In other words, calling charge revenue from Ruteng and Waingapu Exchange subscribers is considered to be revenue from the existing UHF system.

In other exchanges where both the domestic satellite communication network and new terrestrial transmission system will be used, all subscribers be the calling charge revenue source and the revenue portion of terrestrial transmission system be determined according to the aforementioned traffic distribution ratio.

In the case of exchanges to utilize terrestrial transmission system after 1990, subscribers as source of revenue from that system be subscribers newly listed in and after the year wherein the exchange concerned has begun utilizing the new system.

- Demand forecast and traffic forecast are made every five years after 1990. Thus, annual average growth rates of demand and traffic calculated from forecasts for every five years is applied for annual revenue estimation.

Annual Revenue by service and by exchange are calculated as follows;

- Telephone Revenue

  Installation Charge:

  Number of new subscribers by year x Installation charge by exchanges

  Basic Tariff:

  Number of newly accumulated subscribers by year x Basic tariff by exchanges

  Calling Charge:

  Mean busy-hour traffic by destination basis x Calling charge (per minutes) x 1/traffic concentration ratio into busy-hour x 60 minutes x 302 days.

Here, mean busy-hour traffic by destination basis is obtained by multiplying total busy-hour trunk traffic by distribution ratio to each Secondary area.

Revenue from an increase of incoming traffic:

As the telecommunication system has been improved, an outgoing traffic volume increase to the other region.

However, incoming traffic volume to the project area increase too. This is called as "Network Effect". In this project, revenue from incoming traffic is estimated at 35% of the revenue from calling charge.

- Telegram Revenue:

Number of total messages by year x Number of words per message (30 words) x Rp. 10

Number of total messages by year is estimated on the following assumptions.

1) Existing HF system is to be withdrawn after the new system is completed.

2) At Ende and Kupang Exchanges which utilize the existing satellite link for sending and receiving of messages at present, number of messages generated from new gentex terminals installed after 1990 only is to be accounted for the terrestrial transmission system.

Average 30 words per message used above are based on the past record.

- Telex Revenue:

Installation charge:

Number of new subscribers by year x installation charge by exchange

Terminal Rental Charge:

Cumulative total of new subscribers by year x Rp. 90,000

Circuit Rental Charge:

Cumulative total of new subscribers by year x annual circuit rental charge by exchange

Message tariff:

Message tariff revenue per exchange by year is calculated by:
Total number of subscribers per exchange x Total number of pulses per year by telex terminals (6,000 pulses) x Tariff per pulse (Rp. 50)

The existing telex message tariff is by service distance and by service timelength. In this study, calculation is made on the assumption that the total number of pulses per telex terminals exchange per year is 6,000.

Revenue from an increase of incoming messages: This is estimated at 35% of message tariff revenue.

- Leased circuit service revenue:

  Estimate is made at 25% of total telex service revenue excluding the revenue from incoming messages. Data used for this estimate are based on the past financial report of PERUMTEL and WITEL VIII.

8-1-8 Analysis of Profit Ratio of Total Liabilities and Net Worth

Based on project cost and revenue estimates, profit ratio of total liabilities and net worth, i.e., internal rate of return (IRR), is to be calculated.

Cash flows for Plan A, Plan B and Plan C are given in Table 8-5, Table 8-6 and Table 8-7, respectively.

Cost and revenue calculations are made in Rupiah, based on the currency exchange rate of US$ 1 = ¥235 = Rp. 985 as of 1983.

With Plan A where project life is set at 15 years from 1990 through 2005, IRR turns out to be 6.9%. With Plan B where project life is set at 20 years from 1990 to 2010, IRR turns out to be 10.0%. With Plan C where submarine cable system applies between Kupang and Ende, IRR turns out to be 5.7%.

Plan B produces the highest IRR. The reason is that revenue on the upgrade, compared with Plan A, broadly exceeds cost required by project life extension. In the case of Plan C, even if project life is set at 20 years that constitute an advantageous period from the viewpoint of project revenue, IRR is lower than in the case of Plan A. This is because the amount of initial investment required is excessive.

Table 8-5 Cash Flow Statement (Plan A: 1990 - 2005)

(Unit 1,000 Rp, At 1983 Constant Price)

Year		Cash Outflow					Cash Inflow				Net Inflow
		Initial Investment	Replacement Cost	Working Capital	Operation Cost	Total Outflow	Telephone	Telegram	Telex & Leased Circuit	Total Inflow	
1	1986	715,025				715,025					-715,025
2	1987	13,566,188				13,566,188					-13,566,188
3	1988	4,033,713				4,033,713					-4,033,713
4	1989	1,776,564				1,776,564					-1,776,564
5	1990	150,840		372,520	197,238	720,598	1,206,658	6,997	28,079	1,241,734	521,136
6	1991			30,292	197,238	227,530	1,303,636	7,778	31,294	1,342,708	1,115,178
7	1992	57,500		33,236	197,238	287,974	1,409,751	8,652	35,092	1,453,495	1,165,521
8	1993	2,797,815	339,390	35,006	197,238	3,369,449	1,520,981	9,626	39,575	1,570,182	-1,799,267
9	1994	310,035	60,000	38,436	197,238	605,709	1,642,675	10,702	44,924	1,698,301	1,092,592
10	1995			306,841	205,351	512,192	2,649,681	15,238	56,184	2,721,103	2,208,911
11	1996			76,929	205,351	282,280	2,900,830	16,178	60,526	2,977,534	2,695,254
12	1997		1,177,390	83,345	205,351	1,466,086	3,172,972	17,186	65,192	3,255,350	1,789,264
13	1998			91,477	205,351	296,828	3,471,807	18,245	70,220	3,560,272	3,263,444
14	1999	83,800	84,000	99,291	205,351	472,442	3,796,222	19,379	75,640	3,891,241	3,418,799
15	2000			227,539	205,351	432,890	4,524,956	24,688	100,061	4,649,705	4,216,815
16	2001		339,390	134,447	205,351	679,188	4,966,379	24,688	106,796	5,097,863	4,418,675
17	2002			150,033	205,351	355,384	5,459,300	24,688	113,985	5,597,973	4,887,484
18	2003			164,663	205,351	370,014	6,000,499	24,688	121,664	6,146,851	5,776,837
19	2004	-4,374,965	-283,010	-1,844,053	205,351	-6,296,677	6,594,831	24,688	129,858	6,749,377	13,046,054
20	2005										
21	2006										
22	2007										
23	2008										
24	2009										
25	2010										

Table 8-6 Cash Flow Statement (Plan B: 1990 - 2010)

(Unit 1,000 Rp, At 1983 Constant Price)

Year		Cash Outflow					Cash Inflow				Net Inflow
		Initial Investment	Replacement Cost	Working Capital	Operation Cost	Total Outflow	Telephone	Telegram	Telex & Leased Circuit	Total Inflow	
1	1986	715,025				715,025					-715,025
2	1987	13,566,188				13,566,188					-13,566,188
3	1988	4,033,713				4,033,713					-4,033,713
4	1989	1,776,564				1,776,564					-1,776,564
5	1990	150,840		372,520	197,238	720,598	1,206,658	6,997	28,079	1,241,734	521,136
6	1991			30,292	197,238	227,530	1,303,636	7,778	31,294	1,342,708	1,115,178
7	1992	57,500		33,236	197,238	287,974	1,409,751	8,652	35,092	1,453,495	1,165,521
8	1993	2,797,815	339,390	35,006	197,238	3,369,449	1,520,981	9,626	39,575	1,570,182	-1,799,267
9	1994	310,035	60,000	38,436	197,238	605,709	1,642,675	10,702	44,924	1,698,301	1,092,592
10	1995			306,841	205,351	512,192	2,649,681	15,238	56,184	2,721,103	2,208,911
11	1996			76,929	205,351	282,280	2,900,830	16,178	60,526	2,977,534	2,695,254
12	1997		1,177,390	83,345	205,351	1,466,086	3,172,972	17,186	65,192	3,255,350	1,789,264
13	1998			91,477	205,351	296,828	3,471,807	18,245	70,220	3,560,272	3,263,444
14	1999	83,800	84,000	99,291	205,351	472,442	3,796,222	19,379	75,640	3,891,241	3,418,799
15	2000			227,539	205,351	432,890	4,524,956	24,688	100,061	4,649,705	4,216,815
16	2001		339,390	134,447	205,351	679,188	4,966,379	24,688	106,796	5,097,863	4,418,675
17	2002			150,033	205,351	355,384	5,459,300	24,688	113,985	5,597,973	4,887,484
18	2003			164,663	205,351	370,014	6,000,499	24,688	121,664	6,146,851	5,776,837
19	2004	167,600	84,000	180,758	205,351	637,709	6,594,831	24,688	129,858	6,749,377	6,111,668
20	2005		1,177,390	182,487	205,351	1,565,228	7,190,361	24,688	142,618	7,357,667	5,792,439
21	2006			216,756	205,351	422,107	7,900,922	24,688	154,577	8,080,187	7,658,080
22	2007			217,557	205,351	422,908	8,613,167	24,688	167,521	8,805,376	8,382,468
23	2008			236,182	205,351	441,533	9,388,193	24,688	179,769	9,592,650	9,151,117
24	2009	-1,263,158	-419,000	-2,877,793	205,351	-4,354,600	10,232,380	24,688	192,933	10,450,001	14,804,601
25	2010										

Table 8-7 Cash Flow Statement (Plan C: 1990 - 2010)

(Unit 1,000 Rp, At 1983 Constant Price)

Year		Cash Outflow					Cash Inflow				Net Inflow
		Initial Investment	Replacement Cost	Working Capital	Operation Cost	Total Outflow	Telephone	Telegram	Telex & Leased Circuit	Total Inflow	
1	1986	1,131,511				1,131,511					-1,131,511
2	1987	24,936,674				24,936,674					-24,936,674
3	1988	6,785,035				6,785,035					-6,785,035
4	1989	3,118,370				3,118,370					-3,118,370
5	1990	150,840		372,520	197,238	720,598	1,206,658	6,997	28,079	1,241,734	521,136
6	1991			30,292	197,238	227,530	1,303,636	7,778	31,294	1,342,708	1,115,178
7	1992	57,500		33,236	197,238	287,974	1,409,751	8,652	35,092	1,453,495	1,165,521
8	1993	2,797,815	339,390	35,006	197,238	3,369,449	1,520,981	9,626	39,575	1,570,182	-1,799,267
9	1994	310,035	60,000	38,436	197,238	605,709	1,642,675	10,702	44,924	1,698,301	1,092,592
10	1995			306,841	205,351	512,192	2,649,681	15,238	56,184	2,721,103	2,208,911
11	1996			76,929	205,351	282,280	2,900,830	16,178	60,526	2,977,534	2,695,254
12	1997		1,177,390	83,345	205,351	1,466,086	3,172,972	17,186	65,192	3,255,350	1,789,264
13	1998			91,477	205,351	296,828	3,471,807	18,245	70,220	3,560,272	3,263,444
14	1999	83,800	84,000	99,291	205,351	472,442	3,796,222	19,379	75,640	3,891,241	3,418,799
15	2000			227,539	205,351	432,890	4,524,956	24,688	100,061	4,649,705	4,216,815
16	2001		339,390	134,447	205,351	679,188	4,966,379	24,688	106,796	5,097,863	4,418,675
17	2002			150,033	205,351	355,384	5,459,300	24,688	113,985	5,597,973	4,887,484
18	2003			164,663	205,351	370,014	6,000,499	24,688	121,664	6,146,851	5,776,837
19	2004	167,600	84,000	180,758	205,351	637,709	6,594,831	24,688	129,858	6,749,377	6,111,668
20	2005		1,177,390	182,487	205,351	1,565,228	7,190,361	24,688	142,618	7,357,667	5,792,439
21	2006			216,756	205,351	422,107	7,900,922	24,688	154,577	8,080,187	7,658,080
22	2007			217,557	205,351	422,908	8,613,167	24,688	167,522	8,805,376	8,382,468
23	2008			236,182	205,351	441,533	9,388,193	24,688	179,769	9,592,650	9,151,117
24	2009	-1,263,158	-419,000	-2,877,793	205,351	-4,354,600	10,232,380	24,688	192,933	10,450,001	14,804,601
25	2010										

8-1-9 Fund Plan

Generally, fund for project implementation is procured in the form of owned capital and borrowed capital. Borrowed capital comprises overseas loan based on assistance from foreign country and domestic loan from financial institution in the country.

In this study, assumption is made that borrowed capital be limited to overseas loan and all other requirements be met with owned capital.

For overseas loan, different terms and conditions are conceivable. In the case of Yen Credit of 1982, for example, interest rate was 3.5% per annum, grace period was 10 years and repayment period was 20 years. In the case of World Bank loan, these are 7-11.6%, 3-10 years and 4-20 years, and in the case of Asian Development Bank loan, 8.1-11%, 2-8 years and 8-22 years. Judging from the aforementioned IRR, loan for Plan A should preferably be of interest rate of 6.9% or less and loan for Plan B should likewise be subject to interest rate of 10% or less.

In this study, the assumption is that the loan invited is of interest rate of 4%, grace period of 10 years and repayment period of 20 years, and that this loan is to cover foreign currency portion only out of Stage I work initial investment. Then, loan repayment conditions are assumed as under:

(1) Loan principal to be repaid in equal annual instalment with once a year repayment at each fiscal year end.

(2) Interest payment to begin at end of fiscal year wherein loan is granted.

(3) Upon project life termination, loan principal balance plus outstanding interest to be cleared in bulk. (This, however, is the book procedure. Actually, loan principal balance plus interest continues to be repaid by the foregoing conditions after project life termination.)

8-1-10 Analysis of Profit Ratio of Net Worth

Profit ratio to owned capital, exclusive or borrowed capital, must be analyzed. At the same time, analysis must be made from the angle of capital turnover based on loan repayment conditions. By this means, project implementation feasibility must be examined.

When calculated under terms and conditions applicable to overseas loan procurement and repayment as described in the preceding Paragraph 8-1-9, profit ratio of net worth, i.e., profit ratio to owned capital, turns out to be 12.5% in Plan A and 17.7% in Plan B.

Cash flow for Plan A appears in Table 8-8 and that for Plan B in Table 8-9. Accumulation of gross income in the case of Plan A as of the year of project life termination (2004) turns out to be Rp. 14,428,443,000, and that in the case of Plan B wherein the year of project life termination is 2009 amounts to Rp. 53,238,390,000. Now, the initial investment required for Stage I work only reaches as much as Rp. 20,242,330,000 so that, in the case of Plan A, the accumulation of gross income as of the year of project life termination cannot provide necessary fund for project renewal.

Therefore, in spite of low interest, long term loan conditions, Plan A can never be considered to be financially feasible. Hence the conclusion that Plan B is optimum when financially considered.

Table 6-8 Income Statement (Plan A)

(Unit 1,000 Rp, At 1983 Constant Price)

Year		Operating Revenue	Foreign Loan	Total Revenue	Initial Investment	Replacement Cost	Working Capital	Operation Cost	Repayment of Loan & Interest	Total Expenditure	Gross Income	Accumulation of Gross Income
1	1986		576,125	576,125	715,025				23,045	738,070	-161,945	-161,945
2	1987		12,310,388	12,310,388	13,566,188				515,461	14,081,649	-1,771,261	-1,933,206
3	1988		3,168,813	3,168,813	4,033,713				642,214	4,675,927	-1,507,114	-3,440,320
4	1989		1,421,164	1,421,164	1,776,564				699,061	2,475,625	-1,054,461	-4,494,781
5	1990	1,241,734	150,840	1,392,574	150,840		372,520	197,238	705,095	1,425,693	-33,119	-4,527,900
6	1991	1,342,708		1,342,708			30,292	197,238	705,095	932,625	410,083	-4,117,817
7	1992	1,453,495		1,453,495	57,500		33,236	197,238	705,095	993,069	460,426	-3,657,391
8	1993	1,570,182		1,570,182	2,797,815	339,390	35,006	197,238	705,095	4,074,544	-2,504,362	-6,161,753
9	1994	1,698,301		1,698,301	310,035	60,000	38,436	197,238	705,095	1,310,804	387,497	-5,774,256
10	1995	2,721,103		2,721,103			306,841	205,351	705,095	1,217,287	1,503,816	-4,270,440
11	1996	2,977,534		2,977,534			76,929	205,351	732,749	1,015,029	1,962,505	-2,307,935
12	1997	3,255,350		3,225,350		1,177,390	83,345	205,351	1,322,495	2,788,581	466,769	-1,841,166
13	1998	3,560,272		3,560,272			91,477	205,351	1,448,824	1,745,652	1,814,620	26,546
14	1999	3,891,241		3,891,241	83,800	84,000	99,291	205,351	1,484,928	1,957,370	1,933,871	1,960,417
15	2000	4,649,705		4,649,705			227,539	205,351	1,457,216	1,890,106	2,759,599	4,720,016
16	2001	5,097,863		5,097,863		339,390	134,447	205,351	1,421,961	2,101,149	2,996,714	7,716,730
17	2002	5,597,973		5,597,973			150,033	205,351	1,386,706	1,742,090	3,855,883	11,572,613
18	2003	6,146,851		6,146,851			164,663	205,351	1,351,452	1,721,466	4,425,385	15,997,998
19	2004	6,749,377		6,749,377	-4,374,965	-283,010	-1,844,053	205,351	14,615,609	8,318,932	-1,569,555	14,428,443
20	2005											
21	2006											
22	2007											
23	2008											
24	2009											
25	2010											

Table 8-9 Income Statement (Plan B)

(Unit 1,000 Rp, At 1983 Constant Price)

Year		Operating Revenue	Foreign Loan	Total Revenue	Initial Investment	Replacement Cost	Working Capital	Operation Cost	Repayment of Loan & Interest	Total Expenditure	Gross Income	Accumulation of Gross Income
1	1986		576,125	576,125	715,025				23,045	738,070	-161,945	-161,945
2	1987		12,310,388	12,310,388	13,566,188				515,461	14,081,649	-1,771,261	-1,933,206
3	1988		3,168,813	3,168,813	4,033,713				642,214	4,675,927	-1,507,114	-3,440,320
4	1989		1,421,164	1,421,164	1,776,564				699,061	2,475,625	-1,054,461	-4,494,781
5	1990	1,241,734	150,840	1,392,574	150,840		372,520	197,238	705,095	1,425,693	-33,119	-4,527,900
6	1991	1,342,708		1,342,708			30,292	197,238	705,095	932,625	410,083	-4,117,817
7	1992	1,453,495		1,453,495	57,500		33,236	197,238	705,095	993,069	460,426	-3,657,391
8	1993	1,570,182		1,570,182	2,797,815	339,390	35,006	197,238	705,095	4,074,544	-2,504,362	-6,161,753
9	1994	1,698,301		1,698,301	310,035	60,000	38,436	197,238	705,095	1,310,804	387,497	-5,774,256
10	1995	2,721,103		2,721,103			306,841	205,351	705,095	1,217,287	1,503,816	-4,270,440
11	1996	2,977,534		2,977,534			76,929	205,351	732,749	1,015,029	1,962,505	-2,307,935
12	1997	3,255,350		3,255,350		1,177,390	83,345	205,351	1,322,495	2,788,581	466,769	-1,841,166
13	1998	3,560,272		3,560,272			91,477	205,351	1,448,824	1,745,652	1,814,620	26,546
14	1999	3,891,241		3,891,241	83,800	84,000	99,291	205,351	1,484,928	1,957,370	1,933,871	1,960,417
15	2000	4,649,705		4,649,705			227,539	205,351	1,457,216	1,890,106	2,759,599	4,720,016
16	2001	5,097,863		5,097,863		339,390	134,447	205,351	1,421,961	2,101,149	2,996,714	7,716,730
17	2002	5,597,973		5,597,973			150,033	205,351	1,386,706	1,742,090	3,855,883	11,572,613
18	2003	6,146,851		6,146,851			164,663	205,351	1,351,452	1,721,466	4,425,385	15,997,998
19	2004	6,749,377		6,749,377	167,600	84,000	180,738	205,351	1,316,197	1,953,906	4,795,471	20,793,469
20	2005	7,357,667		7,357,667		1,177,390	182,487	205,351	1,280,942	2,846,170	4,511,497	25,304,966
21	2006	8,080,187		8,080,187			216,756	205,351	1,245,688	1,667,795	6,412,392	31,717,358
22	2007	8,805,376		8,805,376			217,557	205,351	1,210,433	1,633,341	7,172,035	38,889,393
23	2008	9,592,650		9,592,650			236,182	205,351	1,175,177	1,616,710	7,975,940	46,865,333
24	2009	10,450,001		10,450,001	-1,263,158	-419,000	-2,877,793	205,351	8,431,544	4,076,944	6,373,057	53,238,390
25	2010											

8-2 Economic Analysis of Project

8-2-1 Economic Analysis

Economic analysis is to examine implementation worthiness of this project from the national standpoint. For this purpose, study is made about the economic effect which this project implementation will bring to the nation and the Nusa Tenggara area.

Numerical data used in the economic analysis are based on the corresponding data used in the financial analysis. Analysis is made for Plan B only that is proven to be financially feasible.

For conversion of financial cost into economic cost, the standard conversion factor (SCF) of Indonesia is used. As it is impracticable to classify equipment investment into personnel expense and non-personnel expense, the local currency portion of project implementation budget is multipled by SCF so as to obtain the economic cost. SCF is determined, based on export and import statistics during 1978 through 1981. The value of SCF thus obtained is 0.984.

Economic benefits of telecommunication project are multifold. Besides project revenue, they comprise the rationalization of market activities centering upon commercial services and the curtailment of administrative expenses. In this study, the consumer's surplus that applies to telephone subscribers is estimated.

The consumer's surplus is estimated based on data appeared in CHAPTER 3.

The method of estimation consists of:

(1) Calculation of demand function, using inter-city traffic as of 2000, mid-year of the project period, at the three exchanges, Dompu, Maumere, Kupang, as well as the product of the number of subscribers between exchanges and the crow-flight distance between exchanges.

(2) Calculation of utility function, using the logical value of inter-city traffic obtained from demand function and inter-city calling charge.

The reason why the above three exchanges are selected for estimation is that they have the largest number of subscribers in each area, Sumbawa, Flores, Timor, respectively.

As the result of calculation, the utility function of Maumere Exchange turned out that the consumer's surplus is estimated as the value of 1.07 of the calling charge revenue in financial analysis. Thus, this value is applied to estimate the consumer's surplus of the project.

Demand function and utility function of Maumere Exchange are as follows,

(Demand Function)

$$\log T_{ij} = 2.770604 + 0.000007 \log X_{ij} + 0.004487 \log D_{ij}$$

(Multi-correlation coefficient: 0.99647)

(Utility Function)

$$P_{ij} = 1693.878 - 380.457 \overline{T_{ij}}$$

(Correlation coefficient: 0.7836)

where

T_{ij} : Traffic between exchanges i and j

X_{ij} : Product of the number of subscribers between exchanges i and j

D_{ij} : Crow-flight distance between exchanges i and j

P_{ij} : Calling charge per minute between exchanges i and j

$\overline{T_{ij}}$: Logical value of traffic

Economic IRR of this project calculated based on both SCP and consumer's surplus turns out to be 10.7%.

Moreover, when the impact of the project is evaluated extensively in social and economic aspects, it can be pointed out that immeasurable benefit of one kind or another will become available to those who utilize the telecommunication media. Hence, the judgement that this project is worth implementation from the long term, national economic point of view.

8-2-2 Economic Effects of Project

At present, in Nusa Tenggara area, telecommunication service by domestic satellite communication system is available to a limited number of cities. Availability in other cities is the extremely restricted telecommunication service by HF system.

Economic impact of telecommunication service is manifold. It comprises, among others, improvement of administrative system efficency, rationalization of industrial activities, and upgrading of welfare among local inhabitants.

In Nusa Tenggara area, the most part of telecommunication service is presently utilized by administrative organizations. As the local economy development makes progress from now forward, demand for telecommunication service from among industrial sources is bound to increase.

In Nusa Tenggara Barat, Sumbawa Island development is slower paced than Lombok Island development. Repelita IV, in its sector covering the area, places top emphasis on Sumbawa Island development. It plans transmigration from overpopulated Lombok Island to underpopulated Sumbawa Island, as well as improvement and expansion of infrastructure on Sumbawa Island for purposes of timber and coffee export promotion and tourism development.

Thus, to construct terrestrial transmission network on Sumbawa Island providing stable telecommunication media to local inhabitants is, after all, to improve efficiency of marketing activities in the area and serve better interests of visiting tourists. This certainly will contribute a great deal to the economic progress of the whole province.

Nusa Tenggara Timur is featured in its monocultural structure of economy. As a matter of fact, in coffee and marine product export alone, this province occupies an upwards of 90% share out of the province total. As long as the provincial economic structure remains as it is, internal and external trading activities will continue to expand as economic development advances.

GRDP growth rate in this province during 1975-1980 is higher than the national average for the whole of Indonesia. This fact that the growth rate in trade and service sector is remarkable, reflects the economic structure of the province.

Repelita IV places emphasis on improvement and expansion of transportation media as one of key development objectives for the province, and this is to promote commercial activities in the province. Telecommunication media hold an important role to play in the promotion of commercial activities.

Improvement and expansion of telecommunication media is all the more important in Nusa Tenggara Timur where improvement and expansion of transportation media are not easy task for geographical reason. Needless to say, such telecommunication media must be such as will ensure reliable service to the user public.

Also to be mentioned about Nusa Tenggara Timur are that due to monocultural structure of economy, inter-island or inter-city economic link is weak, and that the classification of population by religion varies conspicuously from island to island. To be sure, social movability in this province seems to be weaker than in other areas.

These unsatisfactory interrelations among islands or cities are bound to be corrected and improved as provincial economic development progresses. Repelita IV plans introduction of chemical industry in Kupang and cotton industry in Maumere, aimed at organic development of the whole province. To help realization of the plan, three sea routes are also to be planned. They are:

(1) Surabaya - Lembar - Waingapu - Tenau - Atapupu route

(2) Surabaya - Lembar - Reo - Maumere route

(3) Ujung Pandang - Bima - Waingapu - Tenau - Atapupu - Maumere - Reo - Ujung Pandang route

Also planned is to improve Reo-Maumere road and thereby promote development of middle and small size cities located along the road.

Terrestrial transmission network to be constructed by this project, co-working with transportation media to be improved as described, will go a long way toward strengthening of inter-city economic link and, through economic development of medium and small cities, for the balanced regional development.

ANNEX

ANNEX-1 Field Survey Members and Actual Survey Itinerary

1. Field Survey Members

Seven members of the field survey team were divided by their Survey objectives into four (4) groups as shown below.

(1) Collection of data/information to be mainly required for radio system engineering.

Group A : Mr. Takashi Suzuki
Mr.Yoshihide Hirata

Counterpart Officials :

Mr.Azwar Mohammad (PRANTRA. Head Office)
Mr.Yayat Supriyatna (")

Group B : Mr.Kazuo Morita
Mr.Satoru Kushida

Counterpart Officials :

Mr.Budi Wasisto (DAPRAN. Head Office)
Mr.Soemartono (KUTRA WITEL VIII)

(2) Collection of data/information to be mainly required for traffic and switching engineering and economic analysis.

Group C : Mr.Junichi Komada
Mr. Mikio Danno

Counterpart Officials :

Mr.Loeshir Arif (PRANSEN Head Office)
Miss Dewi Arumi (")

(3) Collection of data/information to be mainly required for submarine cable system engineering.

Group D : Mr.Kinya Suzuki

Counterpart Officials :

Mr.Mulia Tambunan (PRANTRA Head Office)
Mr.Ending Djukardi (KUTGP WITEL VIII)

2. Itineraries of Field Survey

Itineraries of field survey are as follows :

2.1 Step - 1 : Discussion with DITJEN POSTEL, PERUMTEL and WITEL VIII staff, and collection of Data/Information.

Date			Itinerary (All Members)
July	26 (Tue)		Tokyo to Jakarta, Meeting with Embassy of Japan.
	27 (Wed)		Meeting with POSTEL and JICA/Jakarta Office (Explanation of Inception Report).
	28 (Thu)		Jakarta to Bandung by car
	29 (Fri)		Meeting with PERUMTEL (Explanation of Inception Report).
	30 (Sat)		Meeting with PERUMTEL (Adjustment of Survey itinerary) Bandung to Jakarta by car.
	31 (Sun)		Data Arrangement
Aug	1 (Mon)		Jakarta to Denpasar by air
	2 (Tue)		Meeting with WITEL VIII (Explanation of Inception Report and adjustment of Survey itinerary).
	3 (Wed)	(1)	Team Leader, Sub Leader and Coordinator, Denpasar to Jakarta and meeting with Embassy of Japan, JICA Jakarta Office.
		(2)	Field Survey Team Map study for radio routes and preparation of field survey.
	4 (Thu)	(1)	Team Leader, Sub Leader and Coordinator, Jakarta to Tokyo
		(2)	Field Survey Team Meeting with WITEL VIII and map study for radio routes.

2.2 Step - 2 : Field Survey

Itinerary of field survey of each survey group is as follows.

(1) Group A

Aug 5 (Fri)	Denpasar to Ende by air Investigation of Ende Telephone Exchange Office and Satellite Earth Station.
6 (Sat)	T. Suzuki Map Study for radio routes. Y. Hirata Investigation of landing point for submarine cable by car.
7 (Sun)	T. Suzuki Data Arrangement Y.Hirata Investigation of landing point for submarine cable by boat.
8 (Mon)	Ende to Kupang by air

9 (Tue)	Investigation of radio route between Kupang and Kefamenanu. Investigation of Soe and Kefamenanu Telephone Exchange Office.
10 (Wed)	Investigation of radio route between Kefamenanu and Atambua. Investigation of Atambua Telephone Exchange Office and Satellite Earth Station.
11 (Thu)	Atambua to Kupang by car
12 (Fri)	Investigation of Kupang Telephone Exchange Office and Satellite Earth Station. Investigation of radio route between Kupang and Haoekoro.
13 (Sat)	Data arrangement
14 (Sun)	Data arrangement
15 (Mon)	Kupang to Baa by air
16 (Tue)	Investigation of radio route between Baa and D.Oesai. Investigation of Baa Telephone Exchange Office.
17 (Wed)	Baa to Kupang by air
18 (Thu)	Kupang to Waingapu by air. Investigation of Waingapu Telephone Exchange Office and Satellite Earth Station.
19 (Fri)	Waingapu to Waikabubak by car. Investigation of radio route between Waingapu to Waikabubak. Investigation of Waikabubak Satellite Earth Station .
20 (Sat)	Waikabubak to Tambolaka by car. Tambolaka to Bima by air. Investigation of Bima Telephone Exchange Office, Microwave Terminal Station and Doronae repeater station.
21 (Sun)	Data arrangement
22 (Mon)	Bima to Sumbawa by car. Investigation of radio route between Bima and Dompu. Investigation of Dompu Telephone Exchange Office.

23 (Tue)	Investigation of radio route between Sumbawa and Taliwang. Investigation of Alas and Taliwang Telephone Exchange Offices.
24 (Wed)	Sumbawa to Denpasar by air
25 (Thu)	Data collection and data arrangement
26 (Fri)	Data collection and data arangement
27 (Sat)	Data arrangement
28 (Sun)	Data arrangement
29 (Mon)	Meeting with WITEL VIII
30 (Tue)	Denpasar to Jakarta by air
31 (Wed)	Meeting with JICA Jakarta Office. Jakarta to Bandung by car.

(2) Group B

Aug 5 (Fri)	Denpasar to Ende by air. Investigation of Ende Telephone Exchange Office and Satellite Earth Station.
6 (Sat)	Preparation of field survey
7 (Sun)	Data arrangement
8 (Mon)	Investigation of radio route between Ende and Bajawa.
9 (Tue)	Meeting with Bajawa Bupati. Investigation of HF radio station and Telephone Exchange Office (under construction).
10 (Wed)	Investigation of radio route between Bajawa and Ruteng.
11 (Thu)	Investigation of Ruteng Telephone Exchange Office, UHF Radio Station and Poco Ranakah existing Radio Relay Station.
12 (Fri)	Ruteng to Bajawa by car
13 (Sat)	Bajawa to Ende by car
14 (Sun)	Data arrangement
15 (Mon)	Investigation of radio station site in Ende.

	16 (Tue)	Investigation of radio route between Ende and Maumere.
	17 (Wed)	Same as above.
	18 (Thu)	Investigation of Maumere Telephone Exchange Office and Satellite Earth Station. Investigation of radio route between Maumere and Larantuka.
	19 (Fri)	Investigation of radio route between Larantuka and Lewoleba. Investigation of Lewoleba HF radio Station.
	20 (Sat)	Lewoleba to Larantuka by ship.
	21 (Sun)	Investigation of Larantuka Telephone Exchange Office and Satellite Earth Station.
	22 (Mon)	Larantuka to Kupang by air
	23 (Tue)	Kupang to Kalabahi by air. Investigation of radio station site.
	24 (Wed)	Investigation of Kalabahi Telephone Exchange Office and Satellite Earth Station.
	25 (Thu)	Kalabahi to Kupang by air
	26 (Fri)	Kupang to Denpasar by air
	27 (Sat)	Same as Group A
	28 (Sun)	"
	29 (Mon)	"
	30 (Tue)	"
	31 (Wed)	"
(3)	Group C	
	Aug 5 (Fri)	Denpasar to Ende by air. Investigation of Ende telephone Exchange Office and Satellite Earth Station.
	6 (Sat)	Investigation of Ende Telephone Exchange and data collection at Bapeda.
	7 (Sun)	Data arrangement

8 (Mon)	Investigation of Ende Telephone Exchange Office and data collection at Bapeda.
9 (Tue)	Same as above
10 (Wed)	Data collection Ende to Kupang by air
11 (Thu)	Data collection at Kupang Telephone Exchange Office and Telegraph Office.
12 (Fri)	Data collection at Bapeda and Kupang Telephone Exchange Office.
13 (Sat)	Data collection at NTT (Nusa Tenggara Timur) Statistics Office, Bina Marga and Kupang Telephone Exchange Office.
14 (Sun)	Data arrangement and investigation of economic and social activities in Kupang area.
15 (Mon)	Data collection at Perdagangan, and NTT Statistic Office. Measurement of Traffic at Kupang Telephone Exchange Office.
16 (Tue)	Kupang to Denpasar by air
17 (Wed)	Data arrangement
18 (Thu)	Denpasar to Mataram by air and data arrangement.
19 (Fri)	Data collection at Mataram Telephone Exchange Office, and Telegraph Office.
20 (Sat)	Measurement of Traffic at Mataram Telephone Exchange Office. Data collection at Bina Marga and NTB (Nusa Tenggara Barat) Perdagangan.
21 (Sun)	Data arrangement
22 (Mon)	Mr. Komada Mataram to Sumbawa Besar by air and data arrangement. Mr. Danno Data collection at Mataram NTB Perdagangan.

	23 (Tue)	Mr. Komada Data collection at Sumbawa Besar Telephone Exchange Office.
		Mr. Danno Same as 22 August.
	24 (Wed)	Mr. Komada Data collection at Sumbawa Besar Bapeda and Statistic Office
		Mr. Danno Data collection at Mataram Statistic Office, NTB Perdagangan and Mataram Telephone Exchange Office.
	25 (Thu)	Mr. Komada Measurement of Traffic at Sumbawa Besar Telephone Exchange Office.
		Mr. Danno Mataram to Denpasar by air and data arrangement.
	26 (Fri)	Mr. Komada Data arrangement
		Mr. Danno Data arrangement
	27 (Sat)	Mr. Komada Sumbawa Besar to Denpasar by air
		Mr. Danno Data arrangement
	28 (Sun)	Data arrangement
	29 (Mon)	Meeting with WITEL VIII
	30 (Tue)	Data collection at WITEL VIII
	31 (Wed)	Data collection at WITEL VIII and PLN (Power Company).
(4)	Group D	
	Aug 5 (fri)	Same as Group A
	6 (Sat)	Investigation of landing point for submarine cable at Ende by car.
	7 (Sun)	Investigation of landing point for submarine cable at Ende by boat.

8 (Mon)	Same as Group A
9 (Tue)	Investigation of landing point for submarine cable at Kupang by car.
10 (Wed)	Investigation of landing point for submarine cable at Kupang by boat.
11 (Thu)	Investigation of entrance cable route between landing point for submarine cable and Kupang Telephone Exchange Office.
12 (Fri)	Same as above

N O T E

On and after 13 August, itinerary of Group D is same as Group A.

2.3 Step - 3 : Arrangement of Data/Information and Discussion on The Concept for Finalization of the Study.

Date	Itinerary
Sep. 1 (Thu)	Data collection and data arrangement at Perumtel Dapran Office, Bandung. Mr. Komada Denpasar to Bandung by air Mr. Danno Denpasar to Jakarta by air
2 (Fri)	Data collection and data arrangement, Bandung Mr. Danno Data collection at Biro Pusat Statistics and Bank Indonesia, Jakarta.
3 (Sat)	Same as above
4 (Sun)	Data arrangement
5 (Mon)	Data collection and data arrangement, Bandung Mr. Danno Data collection at Ministry of Finance and Meteorological Department.
6 (Tue)	Data collection and data arrangement, Bandung Mr. Danno Data collection at Bapenas and Department of Information.
7 (Wed)	Data collection and data arrangement, Bandung Mr. Danno Data arrangement

8 (Thu)	Data collection and data arrangement, Bandung Mr. Danno Jakarta to Bandung by car.
9 (Fri)	Data collection and data arrangement, Bandung
10 (Sat)	Same as above
11 (Sun)	Data arrangement
12 (Mon)	Data collection and data arrangement, Bandung Meeting with Pransen Perumtel, Bandung.
13 (Tue)	Data collection and data arrangement, Bandung Meeting with Prantra Perumtel, Bandung.
14 (Wed)	Meeting with Prantra and Pransat, Perumtel. Team Leader, Sub Team-Leader and Coordinator, Tokyo to Jakarta.
15 (Thu)	Team Leader, Sub Team-Leader and Coordinator, Jakarta to Bandung by car. Meeting with all team members.
16 (Fri)	Meeting with Perumtel, Bandung Explanation on Progress Report.
17 (Sat)	Data arrangement
18 (Sun)	Data arrangement
19 (Mon)	Meeting with Perumtel, Bandung. Discussion on Progress Report.
20 (Tue)	Meeting with Perumtel, Bandung. Bandung to Jakarta by car.
21 (Wed)	Meeting with Postel, Jakarta
22 (Thu)	Meeting with Postel, Jakarta. Meeting with Embassy of Japan and JICA Jakarta Office.
23 (Fri)	Jakarta to Tokyo

ANNEX-2 Collected Data/Information

Table AN-2-1 (1/5) Collected Data and Information

NO	NAME OF DATA	PUBLISHER
1	ORGANIZATION STRUCTURE OF WITEL VIII	WITEL VIII
2	ORGANIZATION STRUCTURE OF ENDE SECONDARY CENTRE	ENDE TELEPHONE AND TELEGRAPH OFFICE
3	ENDE ON NUMBER, 1981	ENDE STATISTIC OFFICE
4	THE PEOPLE OF KABUPATEN ENDE ON 1980	ENDE STATISTIC OFFICE
5	KABUPATEN ENDE ON NUMBER 1977 - 1978	ENDE STATISTIC OFFICE
6	KABUPATEN ENDE ON NUMBER 1979	ENDE STATISTIC OFFICE
7	ECONOMIC POTENTION DATA OF KABUPATEN ENDE	ENDE INDUSTRIAL DEPARTMENT
8	NTT REGIONAL INCOME, 1975 - 1981	ENDE STATISTIC OFFICE
9	LAND USE MAP	ENDE BAPEDA
10	BRUTO OF REGIONAL DOMESTIC PRODUCT OF ENDE	ENDE BAPEDA
11	MATERIAL PRICE LIST ON STATEMENT	ENDE BAPEDA
12	INVENTARISATION OF PELITA III PROJECT	NTT BAPEDA
13	IMPORT LIST OF SEAPORT ON 1981	NTT BAPEDA
14	THE LIST OF MATERIAL BUILDING COST AND LABOR COST	KUPANG CIVIL ENGINEERING OFFICE
15	NTT ON NUMBER, 1972	NTT STATISTIC OFFICE, KUPANG
16	NTT ON NUMBER, 1973	NTT STATISTIC OFFICE, KUPANG
17	NTT ON NUMBER, 1974	NTT STATISTIC OFFICE, KUPANG
18	NTT ON NUMBER, 1975	NTT STATISTIC OFFICE, KUPANG
19	NTT ON NUMBER, 1976	NTT STATISTIC OFFICE, KUPANG
20	NTT ON NUMBER, 1977	NTT STATISTIC OFFICE, KUPANG
21	NTT ON NUMBER, 1978	NTT STATISTIC OFFICE, KUPANG
22	NTT ON NUMBER, 1979	NTT STATISTIC OFFICE, KUPANG
23	NTT ON NUMBER, 1980	NTT STATISTIC OFFICE, KUPANG
24	NTT ON NUMBER, 1981	NTT STATISTIC OFFICE, KUPANG
25	NTT ECONOMIC SOCIAL SURVEY ON 1981	NTT STATISTIC OFFICE, KUPANG
26	NTT ECONOMIC INDICATOR ON 1982	NTT STATISTIC OFFICE, KUPANG
27	1981 REPORT	COMMERCIAL AREA OFFICE
28	NTT COMMERCIAL DATA ON 1982	COMMERCIAL DEPARTMENT
29	APPROACH, MAIN ACTIVITIES AND GENERAL DIRECTION OF DEVELOPMENT IN PELITA IV	NTT BAPEDA
30	SURVEY OF KUPANG LIVING COST, '77/'78	NTT STATISTIC OFFICE, KUPANG
31	SURVEY OF NTT LIVING COST, 1973/1974	NTT STATISTIC OFFICE, KUPANG
32	NTT PEOPLE ON 1980	NTT STATISTIC OFFICE, KUPANG
33	NTT ROAD MAP	NTT BINA MARGA OFFICE
34	THE ECONOMY OF NTT	NTT BAPEDA
35	THE ECONOMY OF NTB	PAUL R.DEUSTER - PPIDP NTB - NTT
36	NTT ON NUMBER, 1977	NTB STATISTIC OFFICE, MATARAM
37	NTT ON NUMBER, 1978	NTB STATISTIC OFFICE, MATARAM
38	NTT ON NUMBER, 1979	NTB STATISTIC OFFICE, MATARAM
39	NTT ON NUMBER, 1980	NTB STATISTIC OFFICE, MATARAM
40	NTT ON NUMBER, 1981	NTB STATISTIC OFFICE, MATARAM
41	MASTER PLAN OF NTB ON PELITA III VOLUME-I	NTB BAPEDA

Table AN-2-1 (2/5) Collected Data and Information

NO	NAME OF DATA	PUBLISHER
42	MASTER PLAN OF NTB PELITA III VOLUME II - 1	NTB BAPEDA
43	MASTER PLAN OF NTB PELITA III VOLUME II - 2	NTB BAPEDA
44	MASTER PLAN OF NTB PELITA III VOLUME III	NTB BAPEDA
45	BIMA ROAD MAP	BINA MARGA OFFICE
46	SUMBAWA ROAD MAP	BINA MARGA OFFICE
47	THE LIST OF MATERIAL BUILDING COST AND LABOR COST ON SUMBAWA AND BIMA	BINA MARGA OFFICE
48	NTB PEOPLE ON 1980	MATARAM NTB STATISTIC OFFICE
49	THE INDEX OF MATARAM CONSUMENT PRICE ON MAY 1983	MATARAM NTB STATISTIC OFFICE
50	SURVEY OF MATARAM LIVING COST '77/78	MATARAM NTB STATISTIC OFFICE
51	REGIONAL INCOME, 1975 - 1979	MATARAM NTB STATISTIC OFFICE
52	THE RESULT OF NTB POULTRY INVENTARISATION	MATARAM NTB STATISTIC OFFICE
53	EXPORT COMMERCIAL ACTIVITIES OF NTB AREA ON 1982	COMMERCIAL DEPARTMENT
54	COMMERCIAL ACTIVITIES LIST OF NTB INTER ISLAND ON 1982	COMMERCIAL DEPARTMENT
55	COMMERCIAL DATA FROM 1978 UNTIL 1983 I,II,III,IV,V,VI,VII	COMMERCIAL DEPARTMENT
56	SUMBAWA ISLAND WITH TEN YEAR DATAS ON 1971 - 1981	SUMBAWA BESAR BAPEDA
57	ROAD CONSTRUCTION COST, 1983	SUMBAWA BESAR BINA MARGA OFFICE
58	REVENUE AND EXPANDITURE FOR WITEL VIII,1982	WITEL VIII
59	WITEL VIII STATISTIC, 1979	WITEL VIII
60	WITEL VIII STATISTIC, 1980	WITEL VIII
61	WITEL VIII STATISTIC, 1981	WITEL VIII
62	ECONOMIC SOCIAL SURVEY FOR NTT PROVINCE ON 1981	PENGELUARAN RUMAH TANGGA UNTUK MAKANAN DAN BUKAN MAKANAN
63	SOLAR RADIATION. DATA NUMBER 6	METEOROLOGY AND GEOFISIC DEPT. JAKARTA
64	MEAN RAINFALL AND MEAN NUMBER OF RAIN DAYS, 1961 - 1970	METEOROLOGY AND GEOFISIC DEPT. JAKARTA
65	MONTHLY RAINFALL AND MONTHLY NUMBER OF RAIN DAYS,NUMBER 89	METEOROLOGY AND GEOFISIC DEPT. JAKARTA
66	EARTH QUICK ON NTT AREA	KUPANG GEOFISIC STATION
67	THE TABLE OF SUNRISE AND SUNSET TIMES	KUPANG GEOFISIC STATION
68	SECTORAL/NATIONAL PROJECTS AT NTT PROVINCE, 1982/1983 (NTT OR GOING PROJECT)	NTT BAPEDA
69	INVENTARISATION OF GLOBE SECTION SYSTEM (IN OPTION OF EARTH STATION)	PRAMTRA PERUMTEL
70	PLANNING OF 100 LOCATIONS OF SMALL EARTH STATION ON PELITA IV (UNDER PLANNING OF EARTH STATION)	PRAMTRA PERUMTEL
71	AVERAGE WAGES ESTATE WORKERS '78/'80	STATISTIC CENTRE BUREAU, JAKARTA
72	STATISTICAL YEARBOOK OF INDONESIA 1982	STATISTIC CENTRE BUREAU, JAKARTA

Table AN-2-1 (3/5) Collected Data and Information

NO	NAME OF DATA	PUBLISHER
73	NATIONAL INCOME OF INDONESIA,'78-'81	STATISTIC CENTRE BUREAU, JAKARTA
74	PROVINCIAL INCOME IN INDONESIA 1975 - 1979	STATISTIC CENTRE BUREAU, JAKARTA
75	ECONOMIC INDICATOR, JUNE 1983	STATISTIC CENTRE BUREAU, JAKARTA
76	THE AVERAGE OF SALARY LABOR IN HOTEL SECTOR, SALARY SURVEY ON 1981	STATISTIC CENTRE BUREAU, JAKARTA
77	BULETIN OF STATISTIC CENTRE BIRO, JULY 1983	STATISTIC CENTRE BUREAU, JAKARTA
78	NATIONAL ECONOMIC SOCIAL SURVEY OF INDONESIA ON 1980	STATISTIC CENTRE BUREAU, JAKARTA
79	NATIONAL ECONOMIC SOCIAL SURVEY OF OUTSIDE JAWA ON 1980	STATISTIC CENTRE BUREAU, JAKARTA
80	WAGES PAID OG ESTATE ON 1981	STATISTIC CENTRE BUREAU, JAKARTA
81	INTER ISLAND CARGO TRAFFIC BY COMMODITY GROUP, 1981	STATISTIC CENTRE BUREAU, JAKARTA
82	IMPORT, MARCH 1983	STATISTIC CENTRE BUREAU, JAKARTA
83	EXPORT, MARCH 1983	STATISTIC CENTRE BUREAU, JAKARTA
84	STATISTICAL POCKECTBOOK OF INDONESIA 1982	STATISTIC CENTRE BUREAU, JAKARTA
85	INDONESIA BANK, REPORT FOR THE FINANCIAL YEAR 1981/1982	INDONESIA BANK, JAKARTA
86	INDONESIA FINANCIAL STATISTIC	INDONESIA BANK, JAKARTA
87	WEEKLY REPORT NO 1268, 25 AUGUST '83	INDONESIA BANK, JAKARTA
88	CLIMATE DATA IN INDONESIA ,1971	TRANSPORTATION DEPARTMENT, JAKARTA
89	CLIMATE DATA IN INDONESIA ,1972	TRANSPORTATION DEPARTMENT, JAKARTA
90	CLIMATE DATA IN INDONESIA ,1973	TRANSPORTATION DEPARTMENT, JAKARTA
91	CLIMATE DATA IN INDONESIA ,1974	TRANSPORTATION DEPARTMENT, JAKARTA
92	CLIMATE DATA IN INDONESIA ,1975	TRANSPORTATION DEPARTMENT, JAKARTA
93	CLIMATE DATA IN INDONESIA ,1976	TRANSPORTATION DEPARTMENT, JAKARTA
94	CLIMATE DATA IN INDONESIA ,1977	TRANSPORTATION DEPARTMENT, JAKARTA
95	CLIMATE DATA IN INDONESIA ,1978	TRANSPORTATION DEPARTMENT, JAKARTA
96	CLIMATE DATA IN INDONESIA ,1979	TRANSPORTATION DEPARTMENT, JAKARTA
97	THE THIRD FIVE-YEAR DEVELOPMENT PLAN 1979 - 1984 (SUMMARY)	INFORMATION DEPARTMENT, JAKARTA
98	NTB DEVELOPMENT	INFORMATION DEPARTMENT, JAKARTA
99	EARTH QUICK IN INDONESIA, 1976	TRANSPORTATION DEPARTMENT, JAKARTA
100	EARTH QUICK IN INDONESIA, 1978	TRANSPORTATION DEPARTMENT, JAKARTA
101	TRAFFIC DATAS (HOLDING) DIL FOR ENDE TELEPHONE OFFICE, INCLUDE BRANCH OFFICE	ENDE TELEPHONE AND TELEGRAM OFFICE
102	SENTRAL CAPACITY DATAS AND NUMBER OF SUBSCRIBER ON MAY 1978 - 1983	ENDE TELEPHONE AND TELEGRAM OFFICE
103	ENDE WITH ALL BRANCH OFFICE	ENDE TELEPHONE AND TELEGRAM OFFICE
104	TIME SKEDUL OF INTERLOKAL CALL WITH HP	ENDE TELEPHONE AND TELEGRAM OFFICE
105	NUMBERS OF MESSAGES AND WORDS FOR TELEGRAM SERVICE (ENDE AREA)	ENDE TELEPHONE AND TELEGRAM OFFICE
106	MONTHLY PAID MINUTES FOR MANUAL TRUNK CALL, JAN '82 - JULY '83 (ENDE AREA)	ENDE TELEPHONE AND TELEGRAM OFFICE
107	NUMBERS OF TELEX SUBSCRIBER AND LIST	KUPANG TELEGRAM OFFICE

Table AN-2-1 (4/5) Collected Data and Information

NO	NAME OF DATA	PUBLISHER
	CHANNEL IN KUPANG KANDAGRAP	
108	DATA FOR POWER COMSUPTION IN KUPANG SWITCHING CENTRE	KUPANG TELEPHONE OFFICE
109	REPORT OF NUMBER OF SUBSCRIBER ON KUPANG TELEPHONE OFFICE,MARCH 1983	KUPANG TELEPHONE OFFICE
110	REPORT OF KUPANG TELEGRAPH TRAFFIC ON 1981 - 1983	KUPANG TELEPHONE OFFICE
111	PULSE DATAS OF COIN BOX	KUPANG TELEPHONE OFFICE
112	WAITING LIST OF TELEX SUBSCRIBER	KUPANG TELEPHONE OFFICE
113	DATAS OF TOTAL CAPACITIES OF PRIMARY ,SECONDARY, DCL CABELS ON KUPANG TELEPHONE OFFICE	KUPANG TELEPHONE OFFICE
114	DATAS OF TDO WORD BILL, TKP AND OFFICIALS PAID ON KUPANG TELEPHONE OFFICE	KUPANG TELEPHONE OFFICE
115	DATAS OF EXCHANGE CAPACITY AND NUMBER OF SUBSCRIBER AT KUPANG TELEPHONE OFFICE	KUPANG TELEPHONE OFFICE
116	KUPANG TELEPHONE DIRECTORY, 1982	KUPANG TELEPHONE OFFICE
117	THE LIST OF TELEX/LDC/IC MUTATIONS POSITION : JULY 1983	MATARAM TELEGRAM OFFICE
118	THE WAITING LIST OF TELEX/IC POSITION : JULY 1983	MATARAM TELEGRAM OFFICE
119	NUMBER OF MASSAGES AND WORDS FOR TELEGRAM SERVICE	MATARAM TELEGRAM OFFICE
120	CURRENT DISTRIBUTION ON BUSY HOUR LOOK ON RECTIFIER	MATARAM TELEPHONE OFFICE
121	TOTAL PULSES FOR AUTOMATIC OPERATION	MATARAM TELEPHONE OFFICE
122	NUMBER OF SUBSCRIBERS AND WAITING APPLICANTS	MATARAM TELEPHONE OFFICE
123	MONTHLY PAID MINUTES FOR MANUAL CALLS BY DESTINATION BASIS	MATARAM TELEPHONE OFFICE
124	THE TABLE OF CALL BILL PAID MINUTES TKO, TDO, OFFICIALS	MATARAM TELEPHONE OFFICE
125	CAPACITY OF LOCAL NETWORK	MATARAM TELEPHONE OFFICE
126	MATARAM TELEPHONE DIRECTORY, 1982	MATARAM TELEPHONE OFFICE
127	TECHNIC DATA OF NUMBER OF SUBSCRIBER ON 1976 - 1983	BIMA TELEPHONE AND TELEGRAM OFFICE
128	THE REALISATION OF INTERLOCAL/ INTERNATIONAL CALLS ON 1982	BIMA TELEPHONE AND TELEGRAM OFFICE
129	CAPACITY OF LOCAL NETWORK	SUMBAWA BESAR TELEPHONE/TELEGRAM OFFICE
130	NO. OF SUBSCRIBER AND WAITING APPLICANTS	SUMBAWA BESAR TELEPHONE/TELEGRAM OFFICE
131	NO. PULSE AUTOMATIC OPERATION	SUMBAWA BESAR TELEPHONE/TELEGRAM OFFICE
132	NO. OF MESSAGES AND WORD FOR TELEGRAM SERVICE	SUMBAWA BESAR TELEPHONE/TELEGRAM OFFICE
133	TABLE OF CUURENT RECTIFIER DISTRIBUTION OF STO SUMBAWA BESAR	SUMBAWA BESAR TELEPHONE/TELEGRAM OFFICE
134	MONTHLY PAID MINUTES FOR MANUAL TRUNK CALLS BY DESTINATION BASIS	SUMBAWA BESAR TELEPHONE/TELEGRAM OFFICE

Table AN-2-1 (5/5) Collected Data and Information

NO	NAME OF DATA	PUBLISHER
135	TELECOMMUNICATION SERVICE TARIF BOOK	SUMBAWA BESAR TELEPHONE/TELEGRAM OFFICE
136	TELEPHONE DICTIONARY, 1982	SUMBAWA BESAR TELEPHONE/TELEGRAM OFFICE
137	MONTHLY REPORT OF INTERLOCAL CALL (KUPANG AREA : JAN - JULY, 1983)	WITEL VIII
138	MONTHLY REPORT OF INTERLOCAL CALL (BIMA AREA : JAN - JULY, 1983)	WITEL VIII
139	THE TABLE OF RATEMETER INDICATOR AND TELEX SUBSCRIBER PULSES COST (JAN, 1982 - JULY, 1983)	WITEL VIII
140	THE TABLE OF EXPRESSION NAMES-WITEL I UNTIL WITEL XII	DAPRAN PERUMTEL
141	THE TABLE OF PRECENTAGE OF FIX ASSET DEPRECIATION GROUP OF PERUMTEL	PEGTEL PERUMTEL
142	THE PRIORITY LIST OF PROJECT PROPOSE ON 1983/1984	BAPEDA KAB. NTB
143	THE DRAFT OF REPELITA IV OF NTB PROVINCE	BAPEDA KAB. NTB
144	TELECOMMUNICATION IN INDONESIA BY THE YEAR 2000 (EXTRACT)	PRANSEN PERUMTEL
145	SLDD NETWORK COMMUNITY OF INTEREST FACTORS	PRANSEN PERUMTEL
146	ESTIMATE SLDD TRAFFIC	PRANSEN PERUMTEL
147	ESTIMATE TELEPHONE DEMAND	PRANPOTEL PERUMTEL
148	THE PLAN OF 100 SMALL EARTH STATION EXPANSION ON REPELITA IV	PRANSAT PERUMTEL

ANNEX-3 Project Cost (Plan C, Stage I)

Unit: Foreign Currency (Million Yen)
Local Currency (Million Rupiah)

	(Foreign Currency)	(Local Currency)
I. Equipment		
Terrestrial Transmission System	2,810	-
Submarine Cable System	2,900	-
Total	5,710	-
II. Installation & Engineering		
Terrestrial Transmission System	770	1,285
Submarine Cable System	1,100	-
Total	1,870	1,285
III. Civil Works & Others		
Terrestrial Transmission System	-	1,159
Submarine Cable System	-	-
Total	-	1,159
IV. Sub Total (I - III)	7,580	2,444
V. Consulting Service Fee	417	171
VI. Total	7,997	2,615
VII. Contingency	800	262
VIII. Grand Total	8,797	2,878

ANNEX-4 Project Cost for Optical Fiber Submarine Cable System

Project Cost for submarine cable between Ende and Kupang is as follows:

1) Equipment

Repeater (Including one spare)	700	Million Yen
Submarine Cable of Optical Fiber System	1,500	"
Multiplexing Equipment	700	"
	2,900	"

2) Installation Cost

For landing portion	100	Million Yen
For sea portion	1,000	"
	1,100	"

3) Total 4,000 Million Yen

ANNEX-5 Organizational Structure of WITEL VIII

April, 1983

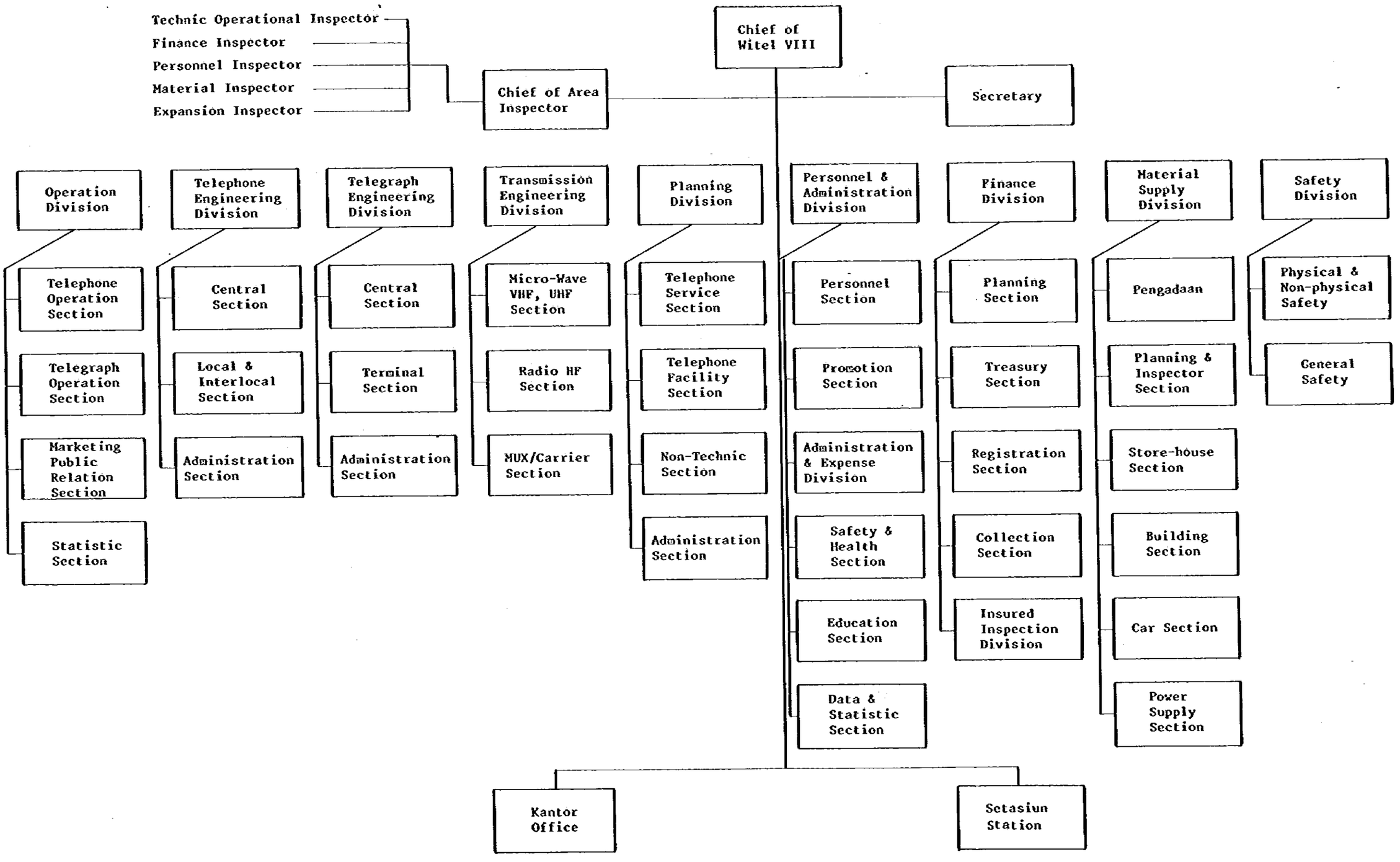


Figure AN-5-1 Organizational Structure of WITEL VIII

ANNEX-6 Regression Model for Demand Forecast

Table AN-6-1 presents up-to-date data (as of 1980) pertaining to population and GDP, as well as the number of main telephones, in 60 countries of the world. Telephone density per 100 inhabitants and GDP per capita obtained from the table are graphically plotted in Figure AN-6-1.

As seen in the illustration, GDP per capita is at an especially high level in Kuwait, United Arab Emirates and Saudi Arabia. This fact certainly reflects the advantageous position of these three countries as petroleum producing countries. Therefore, these three countries are excluded from consideration when regression analysis is made.

Regression analysis conducted, based on data of the remaining 57 countries, produces the following model formula:

$$Y = 0.000286 \cdot X^{1.27}$$

(Correlation coefficient: 0.96)

where

Y: Number of main telephones per 100 inhabitants

X: GDP per capita (in U.S. dollars)

For the purpose of applying the above regression formula to Nusa Tenggara area as of 1980, telephone density (Y = 0.109) and GRDP per capita (X = 175.68) of the area as of 1980 are substituted in the model formula. By this means, the following formula can be obtained:

$$Y = 0.000154 \cdot X^{1.27}$$

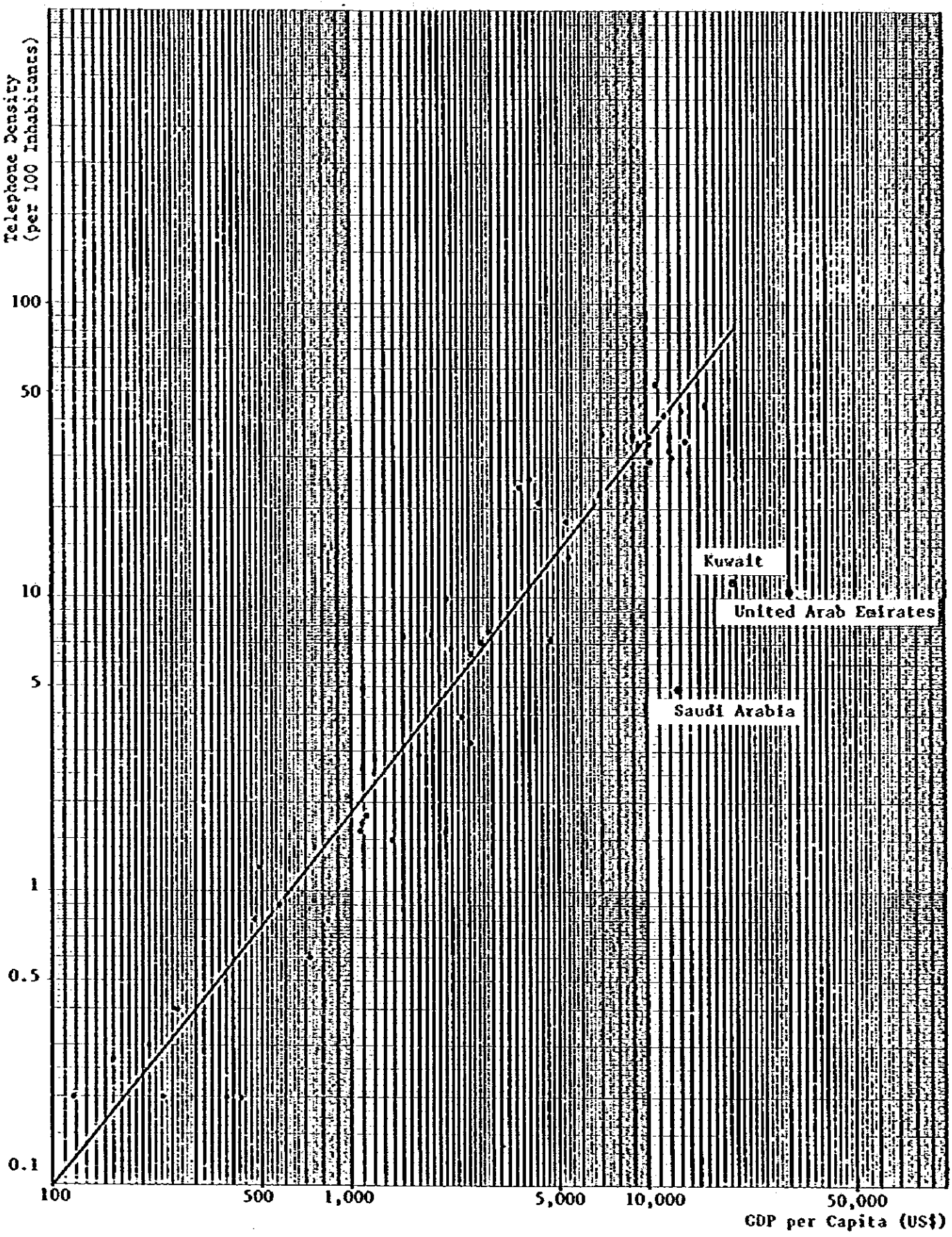


Figure AN-6-1 Telephone Density and GDP per Capita

Table AN-6-1 (1/4) Basic Data for Telephone Demand Forecast

Country	Population ($\times 10^6$)	GDP		Total Telephones		Main Telephones		Remarks
		US$ ($\times 10^9$)	per Capita		per 100 Inhabitants	%	per 100 Inhabitants	
Ethiopia	31.1	3.69	118.6	87,846	0.3	74.9	0.2	
Malawi	6.1	1.42	232.8	15,130	0.3	80.3	0.2	
India	673.2	142.01	210.9	2,785,096	0.4	75.6	0.3	
Sri Lanka	14.7	3.76	255.8	83,500	0.6	73.0	0.4	
Pakistan	82.2	21.46	261.1	367,080	0.4	93.8	0.4	
Sudan	18.7	7.19	384.5	65,038	0.3	70.1	0.2	
Togo	2.5	1.06	424.0	7,870	0.3	75.5	0.2	
Kenya	15.9	5.99	376.7	198,294	1.2	42.2	0.5	
Bolivia	5.6	6.10	1,089.3	135,100	2.6	100.0	2.6	
Egypt	39.8	22.97	577.1	534,021	1.2	74.0	0.9	
Zimbabwe	7.4	3.64	491.9	224,452	3.0	38.5	1.2	
El Salvador	4.5	3.39	753.3	75,920	1.6	86.5	1.4	
Thailand	47.0	33.45	477.7	496,558	1.1	70.3	0.8	
Philippines	49.0	35.49	724.3	537,795	1.1	58.5	0.6	

Source: World Development Report, 1982 (World Bank)
The World Telephones, 1982 (AT & T)

Table AN-6-1 (2/4) Basic Data for Telephone Demand Forecast

Country	Population ($\times 10^6$)	GDP		Total Telephones		Main Telephones		Remarks
		US$ ($\times 10^9$)	per Capita		per 100 Inhabitants	%	per 100 Inhabitants	
Papua New Guinea	3.0	2.49	830.0	49,330	1.6	51.5	0.8	
Peru	17.4	19.24	1,105.7	487,123	2.8	59.9	1.7	
Jamaica	2.2	2.66	1,209.1	119,402	6.0	46.0	2.8	
Guatemala	7.3	7.85	1,075.3	81,622	1.6	98.2	1.6	
Columbia	26.7	29.57	1,107.5	1,623,105	6.0	81.5	4.9	
Paraguay	3.2	4.45	1,390.6	58,713	1.8	84.6	1.5	
Tunisia	6.4	7.30	1,140.6	188,476	3.0	59.6	1.8	
Turkey	44.9	53.82	1,198.7	1,902,081	4.2	60.3	2.5	
Korea, Rep. of	38.2	58.25	1,524.9	3,386,800	9.0	81.6	7.3	
Malaysia	13.9	23.60	1,697.8	596,972	4.4	66.1	2.9	
Costa Rica	2.2	4.85	2,204.5	236,132	10.4	64.0	6.7	
Panama	1.8	3.39	1,883.3	191,913	9.9	75.7	7.5	
Algeria	18.9	39.87	2,109.5	484,973	2.5	64.4	1.6	
Brazil	118.7	237.93	2,004.5	7,496,000	6.3	62.7	4.0	
Mexico	69.8	166.70	2,388.3	5,082,718	7.5	52.4	3.9	
Chile	11.1	28.08	2,529.7	569,969	5.0	63.7	3.2	

Table AN-6-1 (3/4) Basic Data for Telephone Demand Forecast

Country	Population ($\times 10^6$)	GDP		Total Telephones		Main Telephones		Remarks
		US$ ($\times 10^9$)	per Capita		per 100 Inhabitants	%	per 100 Inhabitants	
South Africa	29.3	74.66	2,548.1	2,932,983	12.1	52.7	6.4	
Portugal	9.8	21.93	2,237.8	1,371,731	13.8	72.1	9.9	
Argentina	27.7	130.92	4,726.4	2,880,754	10.3	70.2	7.2	
Yugoslavia	22.3	62.15	2,787.0	2,133,225	9.6	73.0	7.0	
Uruguay	2.9	8.43	2,906.9	287,140	9.9	76.7	7.6	
Hong Kong	5.1	20.23	3,966.7	1,676,298	32.7	76.3	25.0	
Greece	9.6	35.65	3,713.5	1,796,435	28.9	81.2	23.5	
Singapore	2.4	10.48	4,366.7	702,219	29.1	71.1	20.7	
Sadi Arabia	9.0	115.43	12,825.6	442,514	5.3	92.0	4.9	
Kuwait	1.4	27.29	19,492.9	214,763	15.3	73.3	11.2	
United Arab Emirates	1.0	30.02	30,020.0	208,896	20.0	52.4	10.5	
Ireland	3.3	17.80	5,393.9	650,017	18.7	73.1	13.7	
Spain	37.4	198.32	5,302.7	11,844,623	31.0	58.0	18.0	
Italy	56.9	393.95	6,923.6	19,269,340	33.7	67.5	22.4	
New Zealand	3.3	23.30	7,060.6	1,798,802	56.8	63.2	35.9	
U.K.	55.9	522.85	9,353.3	27,784,447	49.7	66.7	33.1	

Table AN-6-1 (4/4) Basic Data for Telephone Demand Forecast

Country	Population ($\times 10^6$)	GDP		Total Telephones		Main Telephones		Remarks
		US$ ($\times 10^9$)	per Capita		per 100 Inhabitants	%	per 100 Inhabitants	
Finland	4.9	49.90	10,183.7	2,374,461	49.6	68.0	33.7	
Australia	14.5	148.06	10,211.0	7,684,336	52.6	66.0	34.7	
Japan	116.8	1,039.98	8,903.9	58,007,409	49.4	71.3	35.2	
Canada	23.9	253.35	10,600.4	16,178,158	67.1	79.0	53.0	
Austria	7.5	76.98	10,264.0	3,010,110	39.8	72.8	29.0	
U.S.A.	227.7	2,587.10	11,361.9	191,595,000	83.7	49.5	41.4	
Netherlands	14.1	167.63	11,888.7	7,230,000	50.9	69.7	35.5	
France	53.5	651.89	12,184.9	24,686,319	45.9	64.0	29.4	
Belgium	9.8	116.48	11,885.7	3,636,074	46.8	67.7	31.7	
Norway	4.1	57.29	13,973.2	1,851,683	45.3	58.6	26.5	
Denmark	5.1	66.38	13,015.7	3,316,709	63.6	67.8	43.1	
Sweden	8.3	122.75	14,789.2	6,621,000	79.6	66.5	52.9	
Germany Fed. Rep.	60.9	819.14	13,450.6	28,553,622	46.3	73.0	33.8	
Switzerland	6.5	101.47	15,610.8	4,612,382	72.5	61.6	44.7	

ANNEX-7 Population in Indonesia Estimated by Repelita IV

Table AN-7-1 Estimated Population in Indonesia

Year	Estimated Population ($\times 10^3$)	Growth Rate (%)
1971	119,893.7	2.32
1980	148,055.2	2.00
1984	160,259.7	
1985		
1986	166,734.2	1.95
1989	176,679.6	
1990	180,124.8	
1991	183,637.3	1.84
1994	193,961.7	
1995	197,530.6	
1996	201,165.2	1.70
1999	211,600.6	
2000	215,197.2	
2001	218,855.6	1.50
2005	232,285.4	
2010	250,237.3	

Source: Repelite IV (Draft)

ANNEX-8 Demand Forecast by Master Plan

Table AN-8-1 Microscopic Telephone Demand Forecast in Eastern Part of Indonesia (by Primary Areas)

(Nusa Tenggara Timur)

Primary Area		Line Capacity				
Area Code	Area Name	1984	1989	1994	1999	2005
381	ENDE	1,050	1,700	2,800	4,500	6,800
382	Maumere	550	800	1,000	1,600	2,400
383	Larantuka	100	200	400	600	900
384	Bajawa	200	400	600	800	1,200
385	Ruteng	580	900	1,500	2,400	3,600
386	Waingapu	0	200	400	600	900
387	Waikabubak	100	200	400	600	900
(Total - ENDE)		(2,580)	(4,400)	(7,100)	(11,100)	(16,700)
391	KUPANG	3,040	4,000	6,000	10,000	15,000
392	Soe	150	200	400	600	900
393	Kefamenanu	120	200	400	600	900
394	Atambua	400	600	1,000	1,600	2,400
395	Baa	50	100	200	300	500
396	Seba	0	100	100	200	300
397	Kalabahi	200	400	600	800	1,200
398	Ilwaki	0	100	100	200	300
399	Baukau	200	400	600	1,000	1,500
390	Dili	900	1,500	2,500	4,000	6,000
(Total - KUPANG)		(5,060)	(7,600)	(11,900)	(19,300)	(29,000)
Total Line Capacity - Nusa Tenggara		7,640	12,000	19,000	30,400	45,700
Forecasted Lines - Nusa Tenggara		6,500	10,200	16,200	25,800	38,800

Note: Nusa Tenggara Barat is out of study, in the case of Master Plan.

Table AN-8-2 Microscopic Demand Forecast for Non-telephone Services by Tandem Areas (Telegram)

Area \ Year	Telegram Messages (x 10^3)				
	1984	1989	1994	1999	2005
Medan Tandem Area	1,308	2,076	2,817	3,266	3,266
Jakarta Tandem Area	3,924	6,228	8,453	9,799	9,799
Surabaya Tandem Area	2,943	4,672	6,339	7,349	7,349
- Jawa Timur	1,413	2,243	3,043	3,528	3,528
- Bali and Nusa Tenggara	706	1,121	1,521	1,764	1,764
- Kalimantan	824	1,308	1,775	2,057	2,057
Ujung Pandang Tandem Area	1,982	2,652	3,305	3,831	3,831
- Sulawesi	1,169	1,564	1,983	2,298	2,298
- Maluku	466	624	760	881	881
- Irian Jaya	347	464	562	652	652
Total - Indonesia	10,157	15,628	20,914	24,245	24,245

Table AN-8-3 Microscopic Demand Forecast for Non-telephone Services by Tandem Areas (Telex)

Area \ Year	No. of Lines				
	1984	1989	1994	1999	2005
Medan Tandem Area	1,250	2,190	3,300	4,950	5,850
Jakarta Tandem Area	8,220	14,510	21,800	32,675	38,850
Surabaya Tandem Area	1,780	3,040	4,520	6,805	8,100
- Jawa Timur	1,190	2,100	3,150	4,725	5,620
- Bali and Nusa Tenggara	190	340	520	780	930
- Kalimantan	400	600	850	1,300	1,550
Ujung Pandang Tandem Area	593	1,020	1,555	2,350	2,800
- Sulawesi	393	670	1,030	1,555	1,840
- Maluku	80	150	225	350	420
- Irian Jaya	120	200	300	450	540
Total - Indonesia	11,843	20,760	31,175	46,780	55,600

Table AN-8-4 Microscopic Demand Forecast for Non-telephone Services by Tandem Areas (New Services)

Area \ Year	Estimated 1980	Data and Facsimile Terminals, etc.				
		1984	1989	1994	1999	2005
Medan Area	(20)	40	90	230	580	1,700
Jakarta Area	(140)	300	710	1,850	4,540	13,500
Surabaya Area	(30)	60	150	390	960	2,800
- Jawa Timur		40	100	250	620	1,800
- Bali and Nusa Tenggara		10	25	70	160	450
- Kalimantan		10	25	70	180	550
Ujung pandang Area	(10)	20	50	130	320	1,000
- Sulawesi		20	30	80	180	580
- Maluku			10	20	60	160
- Irian Jaya			10	30	80	260
Total - Indonesia	(200)	420	1,000	2,600	6,400	19,000

ANNEX-9 Historical Data of Number of Subscribers and Waiting Applicants in Nusa Tenggara Area

Table AN-9-1 (1/2) Number of Subscribers and Waiting Applicants

(Nusa Tenggara Barat)

Exchange	1979	1980	1981	1982	1983	Growth Rate up to 1982
Mataram	1,299	(42) 2,026	(256) 2,677	(716) 2,733	(805) 2,727	28.1%
Lembar	19	21	23	(3) 23	(13) 26	6.6%
Selong	145	190	207	(29) 227	(33) 230	16.1%
Praya	128	161	179	(81) 182	(103) 202	12.4%
Sumbawa Besar	476	444	576	(49) 596	(57) 599	7.8%
Alas	55	101	116	146	(8) 154	38.5%
Taliwang	56	64	69	79	87	12.2%
Dompu	170	184	215	242	(100) 223	12.5%
Bima	457	530	608	675	(111) 739	13.9%
Tente	25	29	30	31	47	7.4%
Sila	21	23	23	24	24	4.6%
TOTAL	2,851	3,773	4,723	(878) 4,958	(1,230) 5,058	20.3%

Note: Parenthesized figures show number of waiting applicants.

Table AN-9-1 (2/2) Number of Subscribers and Waiting Applicants

(Nusa Tenggara Timur)

Exchange	1979	1980	1981	1982	1983	Growth Rate up to 1982
Ende	262	(53) 287	(31) 314	(64) 325	(115) 367	7.4%
Wolowaru	11	11	10	10	10	-
Maumere	(36) 228	(56) 243	(26) 256	(76) 265	(170) 293	5.1%
Larantuka	-	-	-	-	(80) 0	-
Bajawa	-	-	-	-	(199) 0	-
Ruteng	(53) 181	(29) 199	(93) 239	(92) 261	(87) 296	13.0%
Reo	(16) 37	(15) 48	(11) 64	(11) 66	(12) 69	21.3%
Waingapu	-	-	-	-	(140) 245	-
Waikabubak	-	-	-	-	-	-
Kupang	817	1,094	1,317	(213) 1,373	(252) 1,367	18.9%
Camplong	6	7	7	8	10	10.1%
Soe	57	58	62	(61) 82	(66) 95	12.9%
Nikiniki	12	12	13	(8) 13	(7) 14	2.7%
Kefamenanu	52	57	60	(59) 70	(61) 94	10.4%
Ululok	4	4	4	(4) 4	(4) 4	-
Ukusi	-	-	-	-	-	-
Atambua	103	104	104	(57) 137	(40) 188	10.0%
Baa	22	22	23	(9) 24	(10) 24	2.9%
Seba	-	-	-	-	-	-
Kalabahi	53	57	73	(74) 86	(68) 98	17.5%
TOTAL	1,845	2,203	2,546	(728) 2,724	(1,311) 3,174	13.9%

ANNEX-10 Nusa Tenggara Area Traffic Analysis

1. Trunk Originating Calling Rate

Based on data obtained in this study, calculation is made for subscriber trunk calling rate at the present stage. The method of calculation is described below. This analysis is mainly about trunk exchanges in Nusa Tenggara Timur whereabout a relatively rich supply of data is available.

1-1 Trunk Calling Rate via Manual Board

Table AN-10-1 presents the monthly paid-minutes (unit: minute) of trunk calls via manual boards at trunk exchanges in Ende and Kupang Secondary areas. The period for analysis is from January to July 1983. In this analysis, busy-hour trunk traffic via manual boards is obtained from monthly paid-minutes. The calculation formula follows:

$$Ao = PM \cdot C1 \cdot C2 \cdot \frac{60}{3,600}$$

where

Ao : Busy-hour trunk traffic via manual boards (Erl.)

PM : Monthly paid-minutes

C1 : Coefficient for conversion of monthly paid-minutes to per day equivalent. Generally, average number of working days per month (1/25) is used.

C2 : Busy-hour call concentration ratio (0.12) (This concentration ratio is calculated from rectifier discharge current curve. Refer to Figure AN-10-2.)

Busy-hour traffic thus obtained is multiplied by 1.5 in consideration of improvement effect by introduction of SLDD services. The calling rate that results is shown in Figure AN-10-1.

1-2 Calling Rate by SLDD

The number of pulses for automatic calls at Kupang Exchange presents the following trend during the period from January to June 1983:

January	February	March	April	May	June
1,274,434	1,089,190	1,210,496	(793,167)	1,212,061	1,158,752

Note: The drastic decrease of pulses for April is due to system failure by thunderbolt.

(1) Local Call Ratio in the Number of Pulses

Study result about the number of busy-hour simultaneous operations (every 3 minutes) of outgoing trunks and intra-office trunks at Kupang Exchange is as follows:

Number of trunk calls (originating)	83
Number of local calls	641

Following are the assumptions used to obtain the number of local call ratio from the above total pulses:

1) In Nusa Tenggara area, the flat rate applies to local call tariff. Therefore, each local call duration is considered to be relatively long. Hence the assumption of 180 seconds as holding time for both local and trunk calls.

2) Trunk call destinations from Kupang Exchange belong to tariff zone IV or V in almost all cases. Therefore, SLDD calls can be considered to be metered at 2.5 seconds intervals on the average.

Based on the foregoing assumptions, the number of pulses for local and SLDD calls can be calculated as under:

Local calls 641 pulses

SLDD calls $83 \times 180 \times \frac{1}{25} = 5,976$ pulses

The above calculation result allows presumption that about 10% of all pulses are for local calls.

(2) SLDD Calling Rate

Based on the previously mentioned assumptions and by the following formula, busy-hour SLDD traffic is calculated:

$$A1 = P \cdot C1 \cdot C2 \cdot C3 \cdot C4 \cdot \frac{2.5}{3,600}$$

where

A1: Busy-hour SLDD traffic (Erl.)

P : Number of pulses in several months

C1: SLDD call ratio to all pulses (0.9)

C2: Coefficient for conversion of the number of pulses in several months to monthly equivalent

C3: Coefficient for conversion of the number of pulses per month to daily equivalent (1/25)

C4: Busy-hour concentration ratio (0.12)

When the above calculation formula is used for Kupang Exchange, busy-hour SLDD traffic of 3.57 Erl. can be obtained. By dividing this traffic by the number of subscribers, SLDD calling rate of 2.6 m Erl. can be obtained.

2. Existing Traffic Distribution

Busy-hour traffic via manual boards (Ao) and SLDD traffic (Al) of all exchanges in Nusa Tenggara area are obtained by the methodology described in the preceding Section 1. Existing traffic distribution arranged by destinations appears in Table AN-10-2.

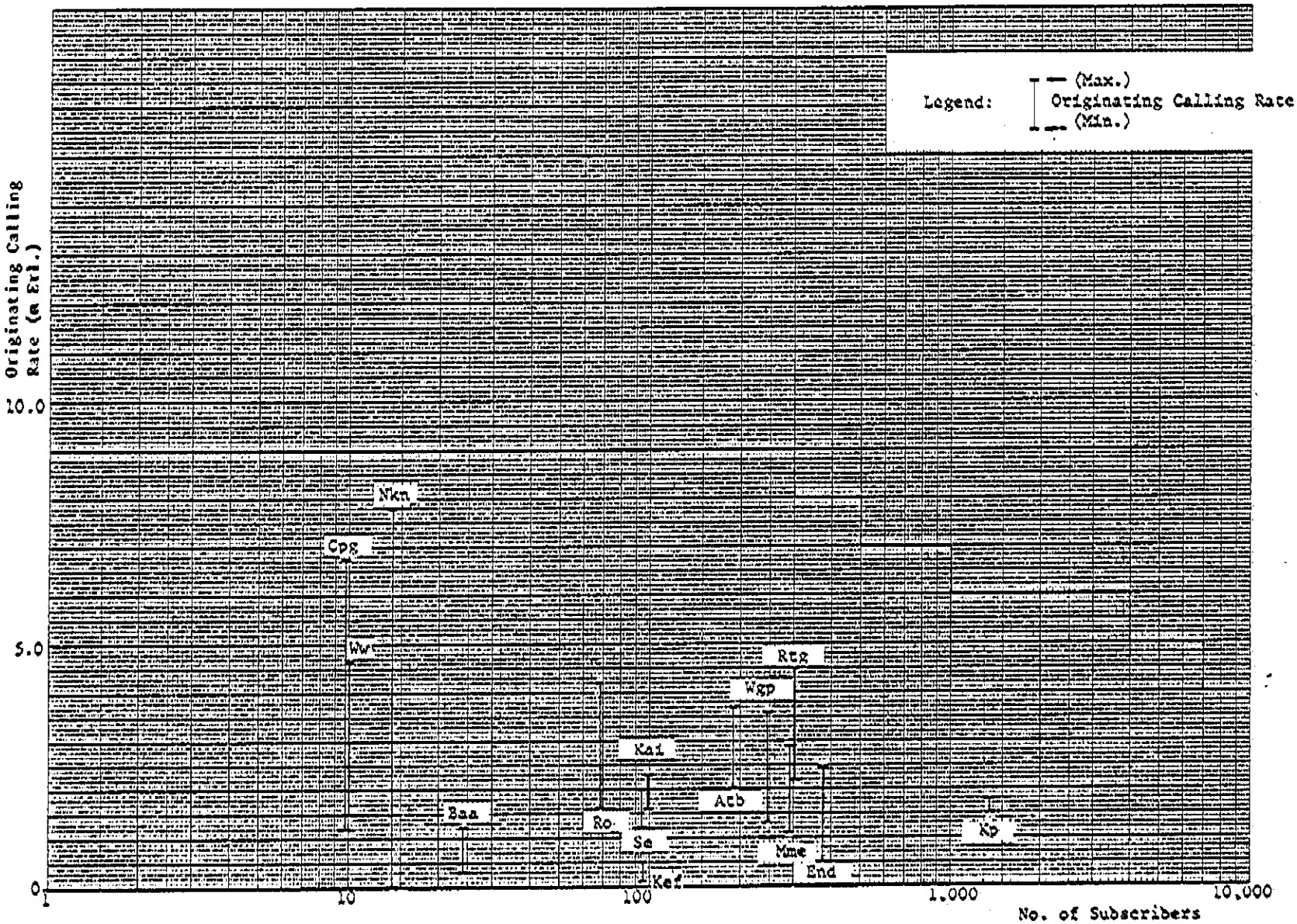


Figure AN-10-1 Originating Calling Rate Based on Manual Operation

Table AN-10-1 Monthly Paid-minutes for Manual Trunk Calls

Exchange Name	No. of Sub. (1983)	Month						
		Jan.	Feb.	Mar.	Apr.	May	June	July
Ende	367	6,660	7,451	6,362	4,501	1,591	2,456	4,263
Wolowaru	10	223	117	382	316	332	267	233
Maumere	293	5,721	7,048	2,605	3,632	4,081	2,737	3,052
Larantuka	0	3,437	3,397	2,054	751	10	0	2,442
Bajawa	0	160	145	22	122	183	128	135
Ruteng	296	11,192	9,890	7,196	5,819	6,877	5,547	6,132
Reo	69	2,414	1,955	971	895	1,581	1,292	1,527
Waingapu	245	4,748	7,302	2,726	3,452	n.r.	3,014	3,156
Waikabubak	0	1,760	1,997	1,891	n.r.	n.r.	1,804	2,035
Kupang	1,367	17,072	19,719	19,292	20,807	n.r.	18,491	18,150
Camplong	10	541	372	360	557	n.r.	309	96
Soe	95	1,348	1,618	1,452	1,223	n.r.	947	1,038
Nikiniki	14	906	425	0	510	n.r.	369	6
Kefamenanu	94	224	121	401	200	n.r.	295	378
Atambua	188	4,460	5,833	3,647	3,226	n.r.	4,129	4,321
Baa	24	247	240	53	100	n.r.	179	214
Seba	0	42	45	57	96	n.r.	66	96
Kalabahi	98	1,328	1,295	1,421	1,483	n.r.	1,866	1,742

Note: n.r.: Not reported

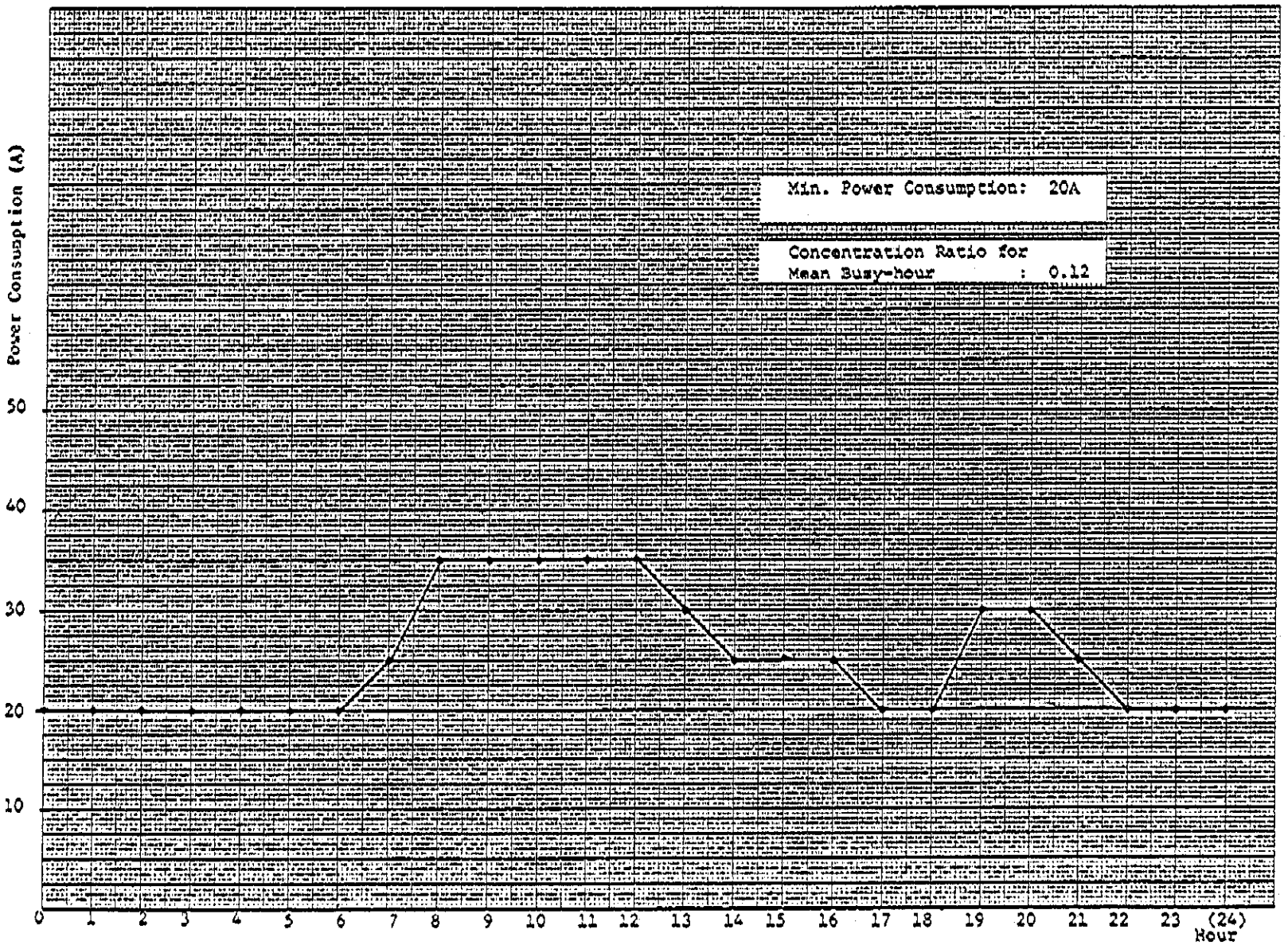


Figure AN-10-2 (1/2) Power Consumption (Sumbawa Besar Exchange)

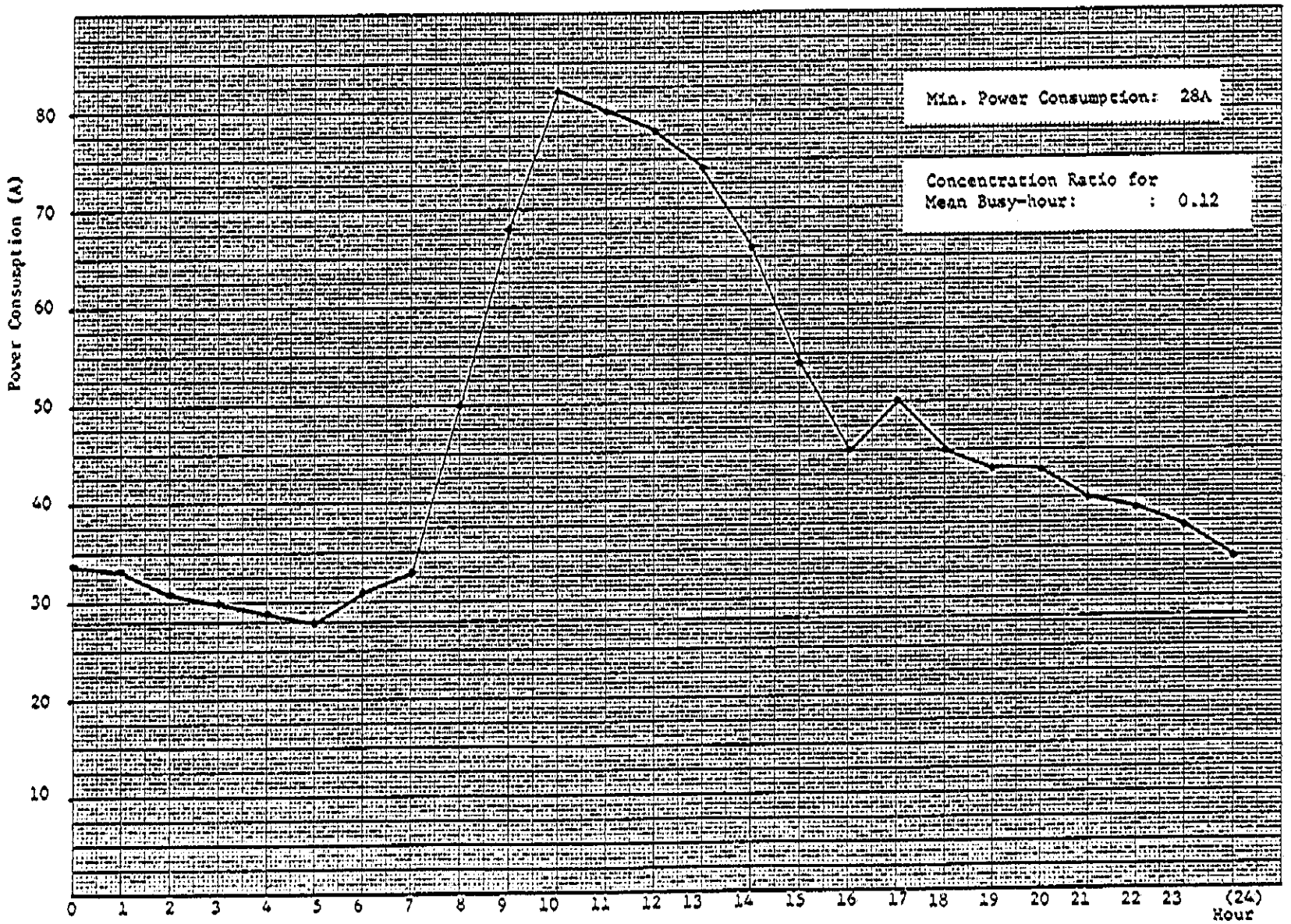


Figure AN-10-2 (2/2) Power Consumption (Kupang Exchange)

Table AN-10-2 Status Quo of Traffic Distribution

From \ To	Own PA	Own SA	Other SAs	Other TAs
Mataram PA	7.35%		69.28%	23.36%
Sumbawa Besar SA		18.65%	73.86%	7.48%
Ende SA		18.82%	68.09%	13.10%
Kupang SA		14.31%	49.19%	36.50%

ANNEX-11 Supplementary Data for Terrestrial Traffic Distribution

Table AN-11-1 (1/3) Coefficient (α) Applied in Gravity Model

(from Sbw SA)

SC	Sj (1983)	d	α	d^{α}	$\frac{Sj}{d^{\alpha}}$	Ratio
Sb	54,690	530	0.5	23.02	2,376	0.209
Jr	11,300	410	0.6	36.95	306	0.027
Ml	15,940	520	0.6	42.62	374	0.033
Md	13,140	660	0.6	49.17	267	0.024
Dpr	15,430	240	0.2	2.99	5,161	0.454
Sbw	2,470	1	0.5	1.00	2,470	0.217
End	2,609	470	0.4	11.72	223	0.020
Kp	2,541	710	0.4	13.82	184	0.016
TOTAL	118,120				11,361	1.000

Table AN-11-1 (2/3) Coefficient (α) Applied in Gravity Model

(from End SA)

SC	S_j (1983)	d	α	d^{α}	$\frac{S_j}{d^{\alpha}}$	Ratio
Sb	54,690	1,000	0.45	22.39	2,443	0.288
Jr	11,300	880	0.6	58.44	193	0.023
Ml	15,940	990	0.6	62.72	254	0.030
Md	13,140	1,130	0.6	67.90	194	0.023
Dpr	15,430	710	0.4	13.82	1,116	0.132
Sbw	2,470	470	0.4	11.72	211	0.025
End	2,609	1	0.5	1.00	2,609	0.308
Kp	2,541	270	0.1	1.75	1,452	0.171
TOTAL	118,120				8,472	1.000

Table AN-11-1 (3/3) Coefficient (α) Applied in Gravity Model

(from Kp SA)

SC	Sj (1983)	d	α	d^{α}	$\frac{Sj}{d^{\alpha}}$	Ratio
Sb	54,690	1,250	0.35	12.13	4,509	0.381
Jr	11,300	1,120	0.5	33.47	338	0.029
Ml	15,940	1,230	0.5	35.07	455	0.038
Md	13,140	1,370	0.5	37.01	355	0.030
Dpr	15,430	950	0.3	7.82	1,973	0.167
Sbw	2,470	710	0.35	15.40	160	0.014
End	2,609	270	0.1	1.75	1,490	0.126
Kp	2,541	1	0.5	1.00	2,541	0.215
TOTAL	118,120				11,821	1.000

Table AN-11-2 (1/3) Calculation Result of Traffic Distribution

from Sumbawa Besar SC

Secondary Area		1990			1995			2000			2005			2010		
S.C	d^{α}	Sj	$\frac{Sj}{d^{\alpha}}$	(ratio) Traffic	Sj	$\frac{Sj}{d^{\alpha}}$	(ratio) Traffic	Sj	$\frac{Sj}{d^{\alpha}}$	(ratio) Traffic	Sj	$\frac{Sj}{d^{\alpha}}$	(ratio) Traffic	Sj	$\frac{Sj}{d^{\alpha}}$	(ratio) Traffic
Sb	23.02	107,520	4,671	(0.207) 4.17	176,800	7,680	(0.212) 7.92	264,500	11,490	(0.195) 10.75	404,900	17,589	(0.194) 14.76	619,800	26,924	(0.189) 20.84
Jr	36.95	22,060	597	(0.027) 0.55	34,880	944	(0.026) 0.97	53,400	1,445	(0.025) 1.38	81,900	2,217	(0.025) 1.91	125,600	3,399	(0.024) 2.65
Ml	42.62	46,640	1,094	(0.049) 0.99	75,040	1,761	(0.049) 1.83	221,000	4,951	(0.084) 4.63	252,600	5,927	(0.066) 5.02	405,100	9,505	(0.067) 7.39
Md	49.17	25,520	519	(0.023) 0.47	40,640	827	(0.023) 0.86	60,000	1,220	(0.021) 1.16	88,500	1,800	(0.020) 1.53	130,700	2,658	(0.019) 2.10
Dpr	2.99	30,460	10,187	(0.452) 9.09	48,680	16,281	(0.449) 16.77	76,400	25,552	(0.434) 23.91	119,900	40,100	(0.443) 33.70	188,300	62,977	(0.443) 48.84
Sbw	1.00	4,665	4,665	(0.207) 4.17	7,514	7,514	(0.207) 7.73	12,104	12,104	(0.206) 11.35	19,496	19,496	(0.216) 16.43	31,401	31,401	(0.221) 24.37
End	11.72	4,609	393	(0.017) 0.35	7,426	634	(0.017) 0.64	11,962	1,021	(0.017) 0.94	19,268	1,644	(0.018) 1.37	31,037	2,648	(0.019) 2.10
Kp	13.82	5,497	398	(0.018) 0.37	8,857	641	(0.018) 0.68	14,269	1,032	(0.018) 1.00	22,986	1,663	(0.018) 1.37	37,024	2,679	(0.019) 2.10
TOTAL	(90%)		22,524	(20.11)		36,282	(37.33)		58,815	(55.09)		90,436	(76.06)		142,191	(110.24)
Other TAs	(10%)			(2.24)			(4.15)			(6.13)			(8.46)			(12.25)

Table AN-11-2 (2/3) Calculation Result of Traffic Distribution

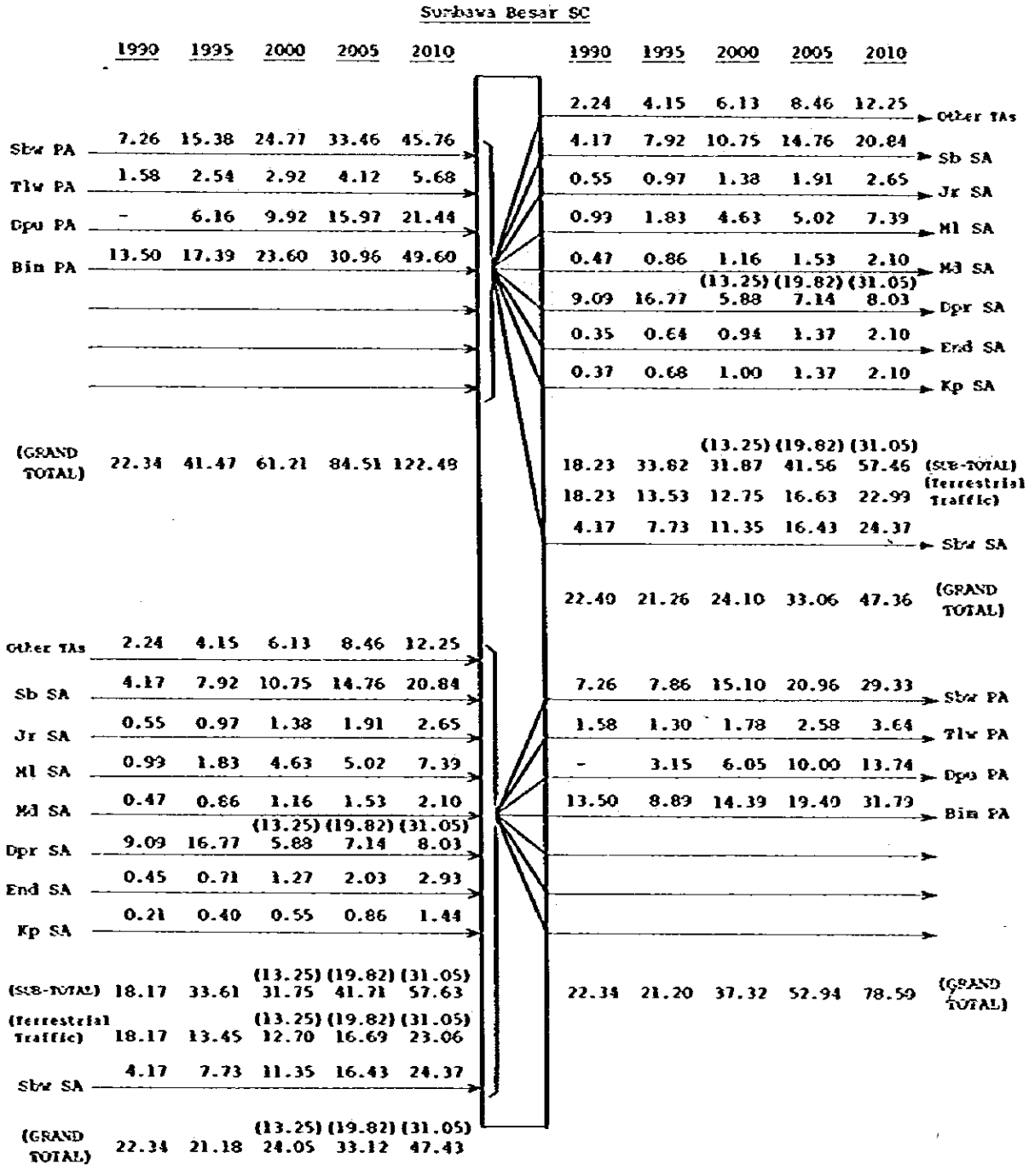
from Ende SC

Secondary Area		1990			1995			2000			2005			2010		
S.C	d^{α}	Sj	$\frac{Si}{d^{\alpha}}$	(ratio) Traffic	Sj	$\frac{Si}{d^{\alpha}}$	(ratio) Traffic	Sj	$\frac{Si}{d^{\alpha}}$	(ratio) Traffic	Sj	$\frac{Si}{d^{\alpha}}$	(ratio) Traffic	Sj	$\frac{Si}{d^{\alpha}}$	(ratio) Traffic
Sb	23.39	107,520	4,802	(0.288) 5.31	176,800	7,896	(0.293) 8.61	264,500	11,813	(0.271) 14.26	404,900	18,084	(0.268) 21.73	619,800	27,682	(0.259) 30.30
Jr	58.44	22,060	377	(0.023) 0.43	34,880	597	(0.022) 0.65	53,400	914	(0.021) 1.11	81,900	1,401	(0.021) 1.71	125,600	2,149	(0.020) 2.34
Ml	62.72	46,640	744	(0.045) 0.83	75,040	1,196	(0.044) 1.30	211,000	3,364	(0.077) 4.05	252,600	4,027	(0.060) 4.87	405,100	6,459	(0.061) 7.14
Md	67.90	25,520	376	(0.023) 0.43	40,640	599	(0.022) 0.65	60,000	884	(0.020) 1.06	88,500	1,303	(0.019) 1.54	130,700	1,925	(0.018) 2.11
Dpr	13.82	30,460	2,204	(0.132) 2.44	48,680	3,522	(0.131) 3.85	76,400	5,528	(0.127) 6.69	119,900	8,676	(0.128) 10.38	188,300	13,625	(0.128) 14.98
Stw	11.72	4,665	398	(0.024) 0.45	7,514	641	(0.024) 0.71	12,104	1,033	(0.024) 1.27	19,496	1,663	(0.025) 2.03	31,401	2,679	(0.025) 2.93
End	1.00	4,609	4,609	(0.277) 5.11	7,426	7,426	(0.276) 8.11	11,962	11,962	(0.274) 14.42	19,268	19,268	(0.285) 23.11	31,037	31,037	(0.291) 34.05
Kp	1.75	5,497	3,141	(0.189) 3.49	8,857	5,061	(0.188) 5.52	14,269	8,154	(0.187) 9.84	22,986	13,135	(0.194) 15.73	37,024	21,157	(0.198) 23.17
TOTAL	(85%)		16,651	(18.42)		26,938	(29.36)		43,652	(52.61)		67,557	(81.07)		106,713	(116.99)
Other TAs	(15%)			(3.25)			(5.19)			(9.29)			(14.31)			(20.65)

Table AN-11-2 (3/3) Calculation Result of Traffic Distribution

from Kupang SC

Secondary Area		1990			1995			2000			2005			2010		
S.C	d^{α}	Sj	$\frac{Sj}{d^{\alpha}}$	(ratio) Traffic	Sj	$\frac{Sj}{d^{\alpha}}$	(ratio) Traffic	Sj	$\frac{Sj}{d^{\alpha}}$	(ratio) Traffic	Sj	$\frac{Sj}{d^{\alpha}}$	(ratio) Traffic	Sj	$\frac{Sj}{d^{\alpha}}$	(ratio) Traffic
Sb	12.13	107,520	8,864	(0.371) 6.00	176,800	14,575	(0.377) 11.40	264,500	21,805	(0.348) 14.53	404,900	33,380	(0.348) 22.93	619,800	51,096	(0.339) 34.87
Jr	33.47	22,060	659	(0.028) 0.46	34,880	1,042	(0.027) 0.82	53,400	1,595	(0.025) 1.05	81,900	2,447	(0.025) 1.65	125,600	3.753	(0.025) 2.58
Ml	35.07	46,640	1,330	(0.056) 0.91	75,040	2,140	(0.055) 1.67	211,000	6,017	(0.099) 4.14	252,600	7,203	(0.075) 4.94	405.100	11,551	(0.077) 7.92
Md	37.01	25,520	690	(0.029) 0.47	40,640	1,098	(0.028) 0.85	60,000	1,621	(0.026) 1.09	88,500	2,391	(0.025) 1.65	130,700	3,531	(0.023) 2.37
Dpr	7.82	30,460	3,895	(0.163) 2.64	48,680	6,225	(0.161) 4.87	76,400	9,770	(0.136) 6.52	119,900	15,332	(0.160) 10.54	188,300	24,079	(0.160) 14.46
Sbw	15.40	4,665	303	(0.013) 0.21	7,514	488	(0.013) 0.40	12,104	786	(0.013) 0.55	19,496	1,266	(0.013) 0.86	31,401	2,039	(0.014) 1.44
End	1.75	4,609	2,634	(0.110) 1.78	7,426	4,243	(0.110) 3.33	11,962	6,835	(0.109) 4.55	19,268	11,010	(0.115) 7.58	31.037	17,735	(0.118) 12.14
Kp	1.00	5,497	5,497	(0.230) 3.72	8,857	8,857	(0.229) 6.92	14,269	14,269	(0.228) 9.52	22,986	22,986	(0.239) 15.75	37,024	37,024	(0.246) 25.31
TOTAL	(65%)		23,872	(16.16)		38,668	(30.22)		62,698	(41.75)		96,015	(65.87)		150,808	(102.85)
Other TAs	(35%)			(8.71)			(16.27)			(22.49)			(35.47)			(55.38)



Note: Parenthesized figures show traffic on High Usage Route.

Figure AN-11-1 (1/3) Traffic Distribution to/from Nusa Tenggara Area

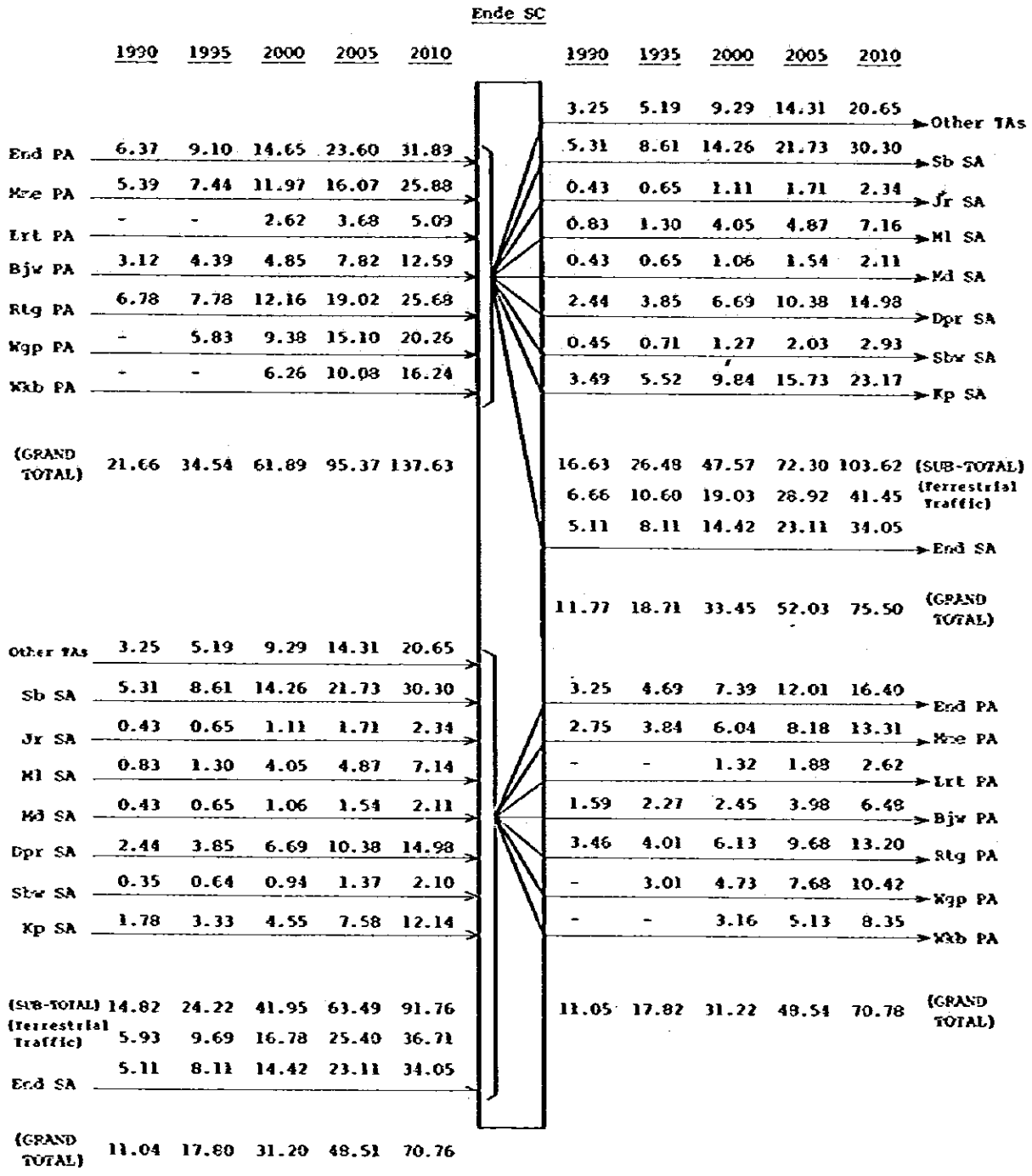
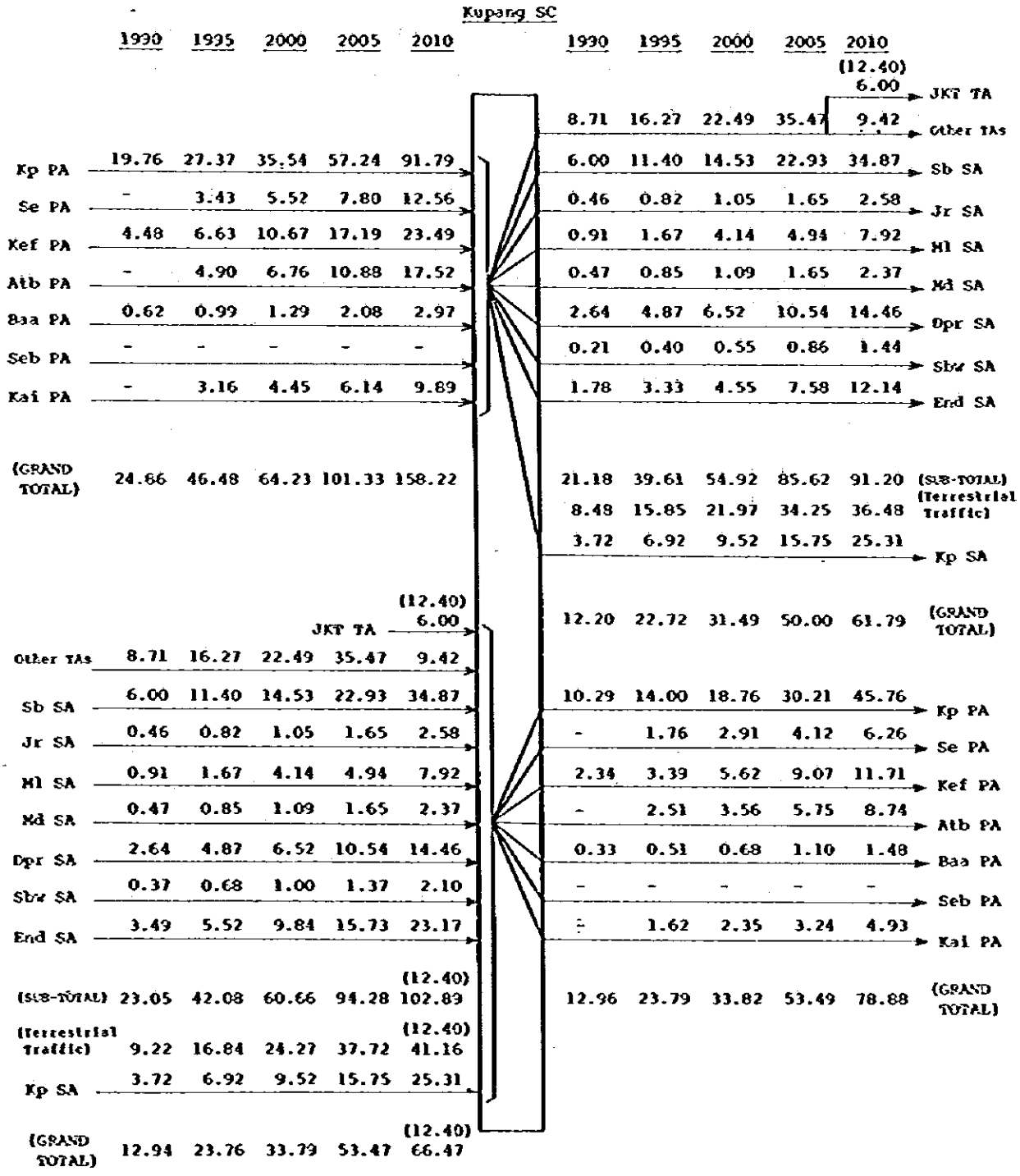


Figure AN-11-1 (2/3) Traffic Distribution to/from Nusa Tenggara Area



Note: Parenthesized figures show traffic on High Usage Route.

Figure AN-11-1 (3/3) Traffic Distribution to/from Nusa Tenggara Area

ANNEX-12 Calculation of Number of Gentex Terminals

Based on exchange by exchange number of telegram messages (outgoing) handled per year given in Table 3-7-1, busy-hour number of telegram messages handled is to be calculated. Calculation formula is

$$N_m = M \cdot C_1 \cdot C_2 \cdot C_3$$

where

N_m: Busy-hour number of telegram messages handled (Outgoing)

M : Number of telegram messages handled per year (Outgoing)

C_1: Conversion coefficient (1/300) whereby to convert the number of telegram messages handled per year into per day equivalent

C_2: Busy hour concentration ratio (0.12)

C_3: Coefficient with monthly fluctuations considered (1.5)
(Refer to Figure AN-12-1.)

In the Master Plan, time required for handling one telegram message in Indonesia is presumed to be 125 seconds. When operator's working efficiency is set at 90%, the number of telegram messages (outgoing) that can be handled per busy-hour is approximately 25. This number is the result of calculation by the following formula:

$$3,600 \times 0.9 \times \frac{1}{125} = 25$$

Handling of incoming telegram messages does not require as much time as required for handling of outgoing messages. Assume that the number of gentex terminals required in consideration of the number of incoming messages also is 1.5 times the number of terminals required in the case of outgoing messages only. Then, by the following formula, calculation is made for the number of terminals required at each exchange:

$$M_t = N_m \cdot 1.5 \cdot \frac{1}{25}$$

where

N_t : Number of gentex terminals required

N_m : Busy-hour number of telegram messages handled (Outgoing)

Minimum number of gentex terminals at each exchange, however, is set at 2 terminals, considering terminal trouble.

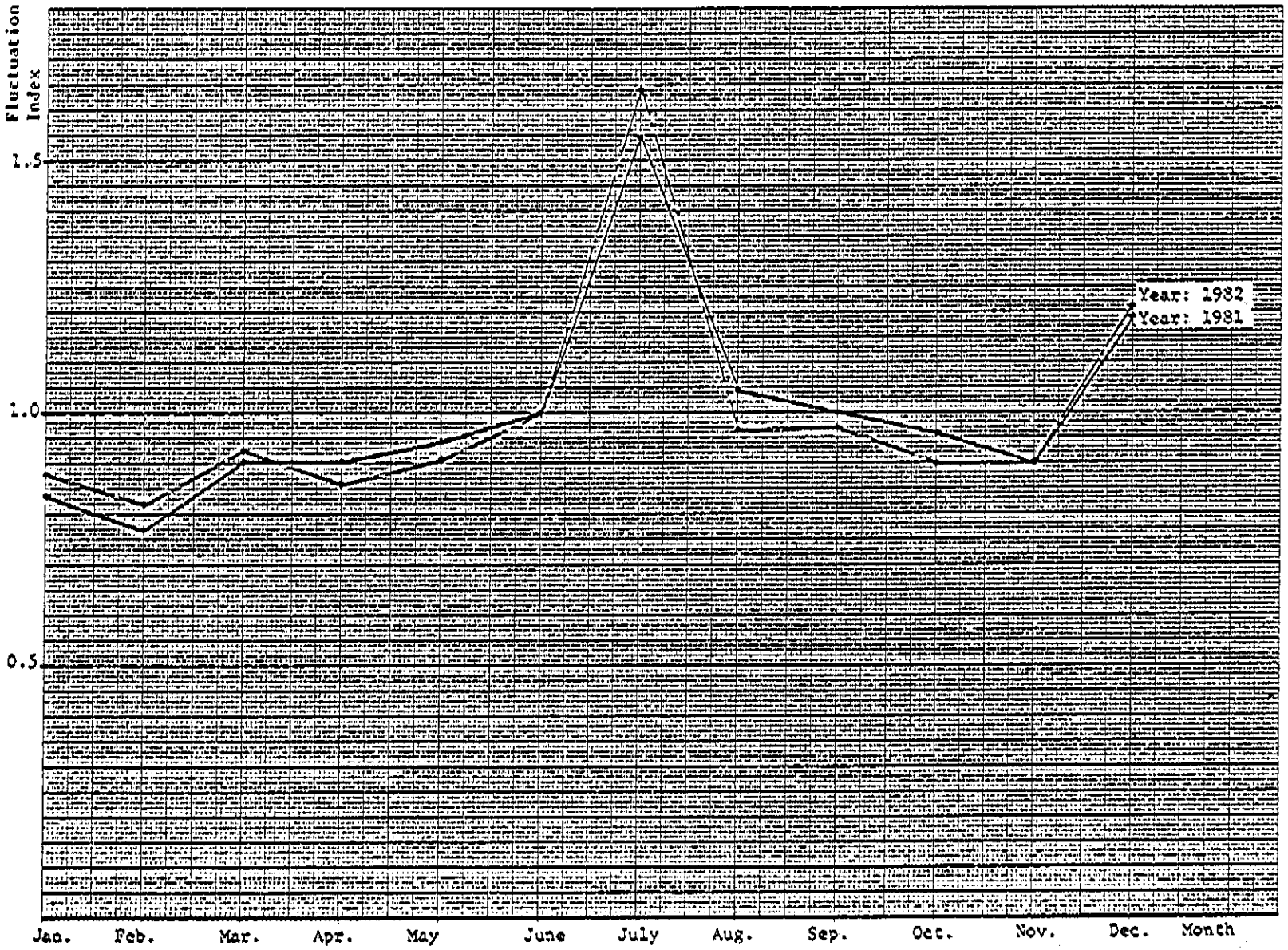


Figure AN-12-1 Monthly Fluctuation in Telegram Messages

ANNEX-13 Selection of Submarine Cable Landing Points

1. Ende

1-1 Port Area Status Quo

Ende is divided into two port areas with a promontory in between. One is Ipi Port; the other is Ende Port. The officially registered coordinates are, for the former, 8° 50' 20" South Latitude and 121° 38' 00" East Longitude and, for the latter, 8° 51' 00" South Latitude and 121° 39' 50" East Longitude.

Ipi Port is equipped with quay but Ende Port is not. Therefore, at Ende Port, ships cast anchor offshore and people aboard use ferry to go ashore.

Ipi Port is open to marine traffic from November to April; however, from April to November, strong southeasterly wind makes the port not available to ships. Contrary is the case with Ende Port: from April to November, ships can make port freely but, November to April, only when the sea condition allows.

In both port areas, the maximum wind velocity throughout the year is 20 km/h and the maximum wave crest is 2 m. In the morning, the sea is relatively calm; in the afternoon, wind grows and makes a rough sea.

Up to 75% of cargo discharge is at Ende Port and 25% at Ipi Port. Large cargoes are landed at Ipi Port quay. At Ipi Port, the quay consists of 75 m long, 13 m wide wharf that spreads parallel to the coast line at the extreme end of 175 m long jetty.

Adjoining the wharf is PERUTAMINA's moorage dolphin. The sea in this area is 20 m deep so that even a 20,000 tons class ship can moor at the dolphin.

At Ende Port also, 10,000 tons class ships cast anchor. A large ship makes port about once every 10 days.

The anchorage area is, at Ende Port, 3 miles wide, up to 30 m deep sea area and, at Ipi Port, 1.5 miles wide sea area.

According to 1982 statistics, ship entries into Ende Port number 367 times/year with 1,920 persons involved. (For further details, see Table AN-13-1.)

Fishing boats operating in the nearby sea total 50 or thereabouts. All are 10-15 m long small boats, each with a crew of 6-10 persons. A small jetty for fishing boats exists near the end of Ende Port toward the promontory.

Traditional cast-net fishing is practiced. No drag-net fishing is done.

In Ipi Port neighborhood, sharks live. In the craggy sectors of the promontory, lobsters are among catches.

The promontory and its environs are composed of volcanic rocks (lava streams). However, in both port areas, the sea bottom is sandy. Ipi Port sea deepens steeply.

Ende Port sea also is without shallows. Therefore, even big ships can draw close to 50 m or thereabouts from the coast line.

Table AN-13-1 Ship Entries at Ende Port (based on 1982 statistics)

Ship Classification	Times of Entries/ Year	Number of Persons Involved/Year
NUSANTARA (Cargo-passenger ships 2,000 tons class)	46	238
LOCAL (Small cargo-passenger ships)	34	10
PEL RAKYAT (Sailing ships)	239	475
PRERINTIS (Ships of 500-1,000 tons class)	38	1,179
KUHUSUS (Tankers of 20,000 tons class)	10	-
Total	367	1,920

1-2 Selection of Cable Landing Point

Based on the foregoing information about Ende Port and Ipi Port, field surveys - overland and from the sea - were carried out. The promontory and its environs, where volcanic lava streams exist, were excluded from the area for cable landing.

The proposed sites for cable landing are six points marked as A, B, C, D, E and F in Figure AN-13-1. For these six points, field explorations were carried out. Results follow:

- Between Points A and B

  Point A is 5 km west of Port Office. Point B is 3 km west of Port Office. In the area between Points A and B, the mountain overhangs the road; besides, the sea bottom is rocky. Hence unfit for cable landing.

- Point C

  Point C is 2.4-2.6 km west of Port Office.
  This site is about 2.7 km from Telephone Exchange and about 900 m from the road branching point. A short distance outside Ende Port area, the coast consists of the sands. Hence fittest for cable landing.

- Between Points D and E

  The coast, though the sands, faces the sea area where big ships cast anchor. Hence unfit for cable landing.

- Point F

  The coast consists of the sands and, near the proposed site, the gravel pit exists. The site is about 6 km distant from Telephone Exchange and is located across a river. Hence unfit for cable landing.

In view of the foregoing field exploration results, decision is made for Point C as being the optimum site for cable landing. The site sketch as seen from the sea is given in Figure AN-13-2.

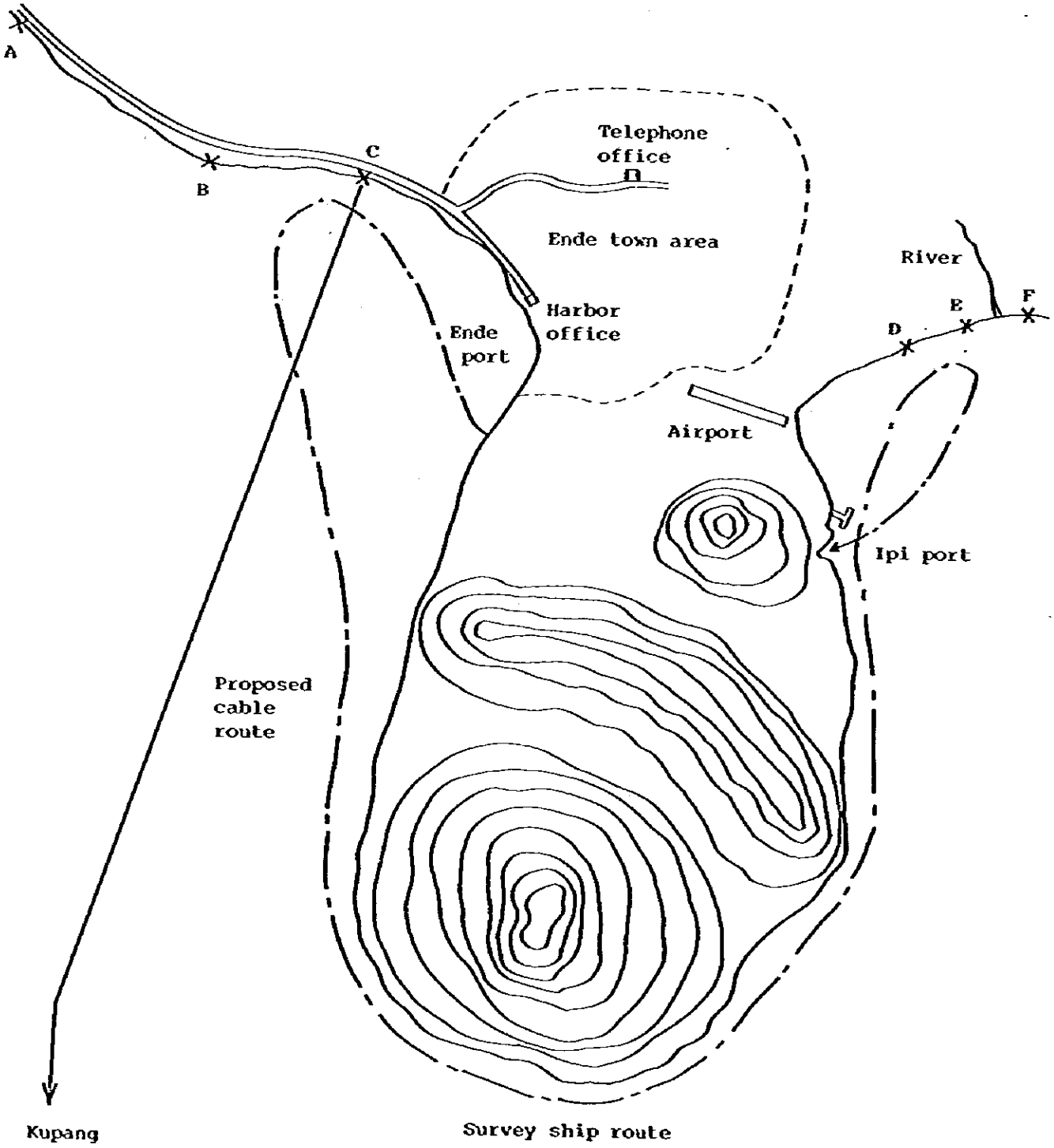


Figure AN-13-1 Guide Map for Cable Landing Area (Ende)

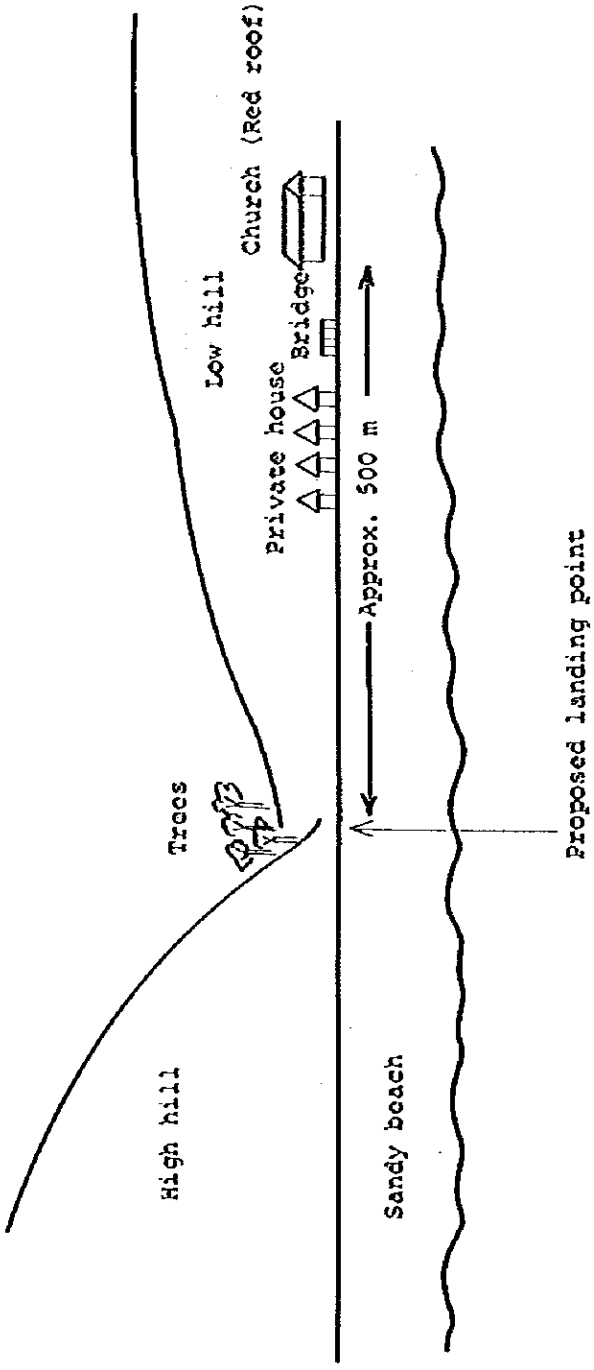


Figure AN-13-2 Distant View of Proposed Landing Point (Ende)

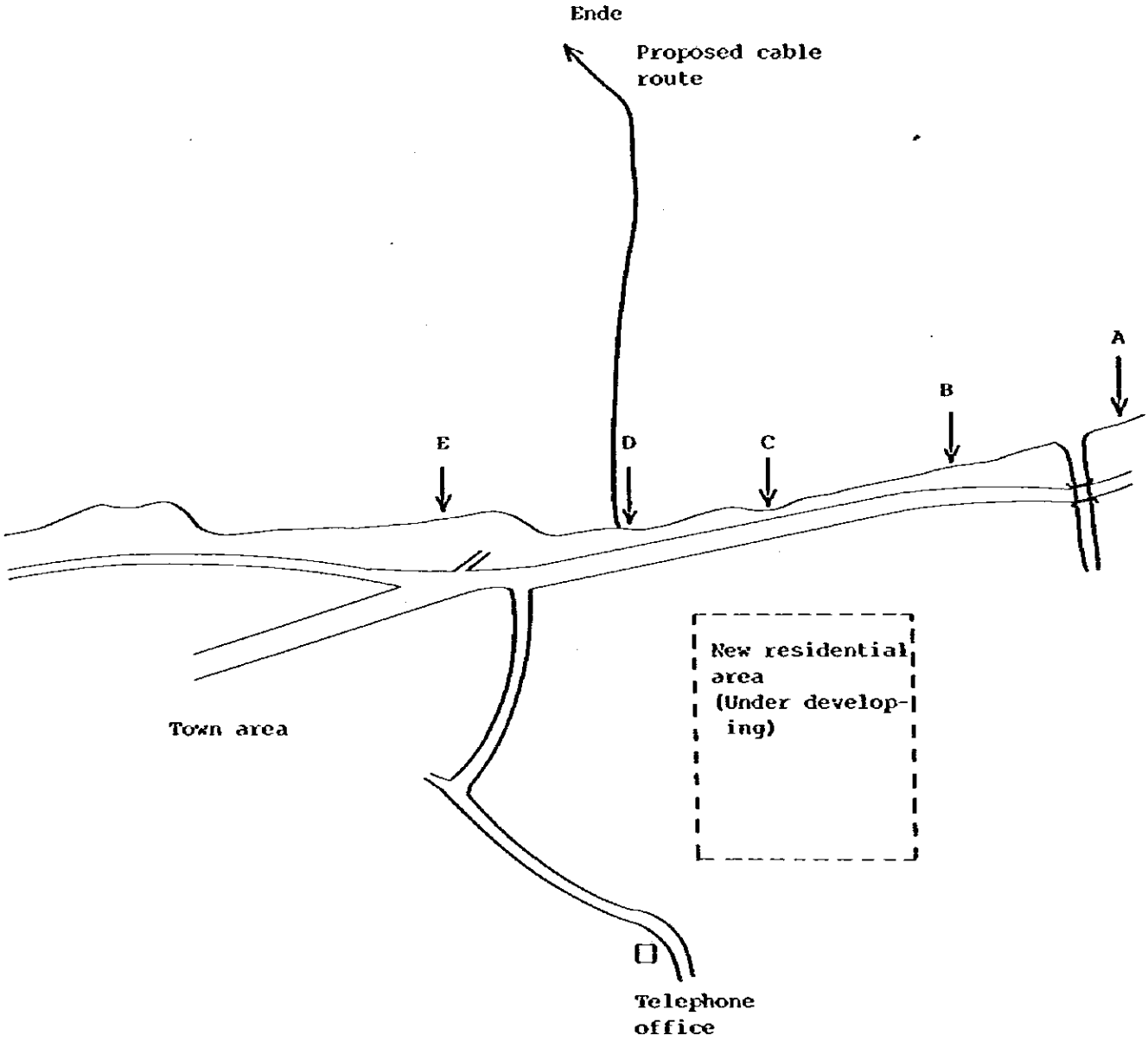


Figure AN-13-3 Guide Map for Cable Landing Area (Kupang)

2. Kupang

2-1 Port Area Status Quo

At Kupang, New Port and Old Port exist. New Port is equipped with quay. Incoming and outgoing cargo ships number 60-70 per month. They mainly comprise beef cattle carriers from Timor Island to Surabaya, etc., and PERUTAMINA tankers. Most are 5,000-10,000 tonners. The biggest belongs to the 15,000 tons class.

There also is quay for fishing boats. About 100 boats, engaged in deep-sea or inshore fishing, use the quay, every year.

Old Port is without quay. Kupang town district spreads out to the coast. Old Port is traditionally used by small fishing boats only, the biggest being the 200-300 tons class.

Thus, big ships usually visit New Port. Only occasionally they cast anchor in Old Port.

In Kupang area, during December through February, the rainy season prevails. In this season, westerly wind is strong. From May to October continues the dry season in which easterly wind blows. Generally, in the dry season, the sea is calmer than in the rainy season. Maximum wave crest throughout the year measures 1.5 m high. The difference between the rise and fall of the tide is 2 m at a maximum.

In the eastern part of Old Port lie 10 odd fishing establishments made of remodelled fishing boats. Some 10 m square, they form a fish farm. This fish farm can be easily moved to another place if necessary so that it may not especially impede submarine cable installation.

2-2 Selection of Cable Landing Point

Based on the foregoing information about Kupang Port, field surveys - overland and from the sea - were carried out. New Port and its environs, where big ships usually cast anchor, were excluded from the area for cable landing.

The proposed sites for cable landing are five points marked as A, B, C, d and E in Figure AN-13-3. For these five points, field explorations were carried out. Results follow:

- Point A

  This site is on the east side of river and is more than 7 km distant from Telephone Exchange. The road enters into a grove before reaching the coast. The coast itself consists of the sands. A long distance from Telephone Exchange and necessity of river crossing make this site unfit for cable landing.

- Between Points B and C

  Point B is about 5.7 km and Point C 4.5 km distant from Telephone Exchange though both are on hither side of river. On the coast line, the rocky bed and the sands are mixed.

- Point D

  This site is about 3.7 km from Telephone Exchange. The coast consists of the sands and is spotted with private houses. The coast is 100-150 m from the road. PERUMTEL's aerial cable crosses the road diagonally. On the poles, terminal boxes are mounted. This site is optimum for cable landing.

- Point E

This site is about 3.1 km from Telephone Exchange. Primary school is located nearby. The sea area in front is full of fishing boats lying at anchor. The coast consists of the sands; however, the location is contiguous to Old Port. Hence unfit for cable landing.

In view of the foregoing field exploration results, decision is made for Point D as being the optimum site for cable landing. Although the fishing farm enclosures lie in the sea ahead, the component units are widely separated from one another so that cable installation avoiding those units is considered to be easy.

At a point five nautical miles offshore from the cable landing site lies an uninhabited island called Kera (which is used as a fishing base). On the west side of this island, the sea is deep; therefore, cable installation on this side is preferable.

The sea bottom near the cable landing site is not smooth so that, for about 2 km from the landing site, double armored cable may have to be used.