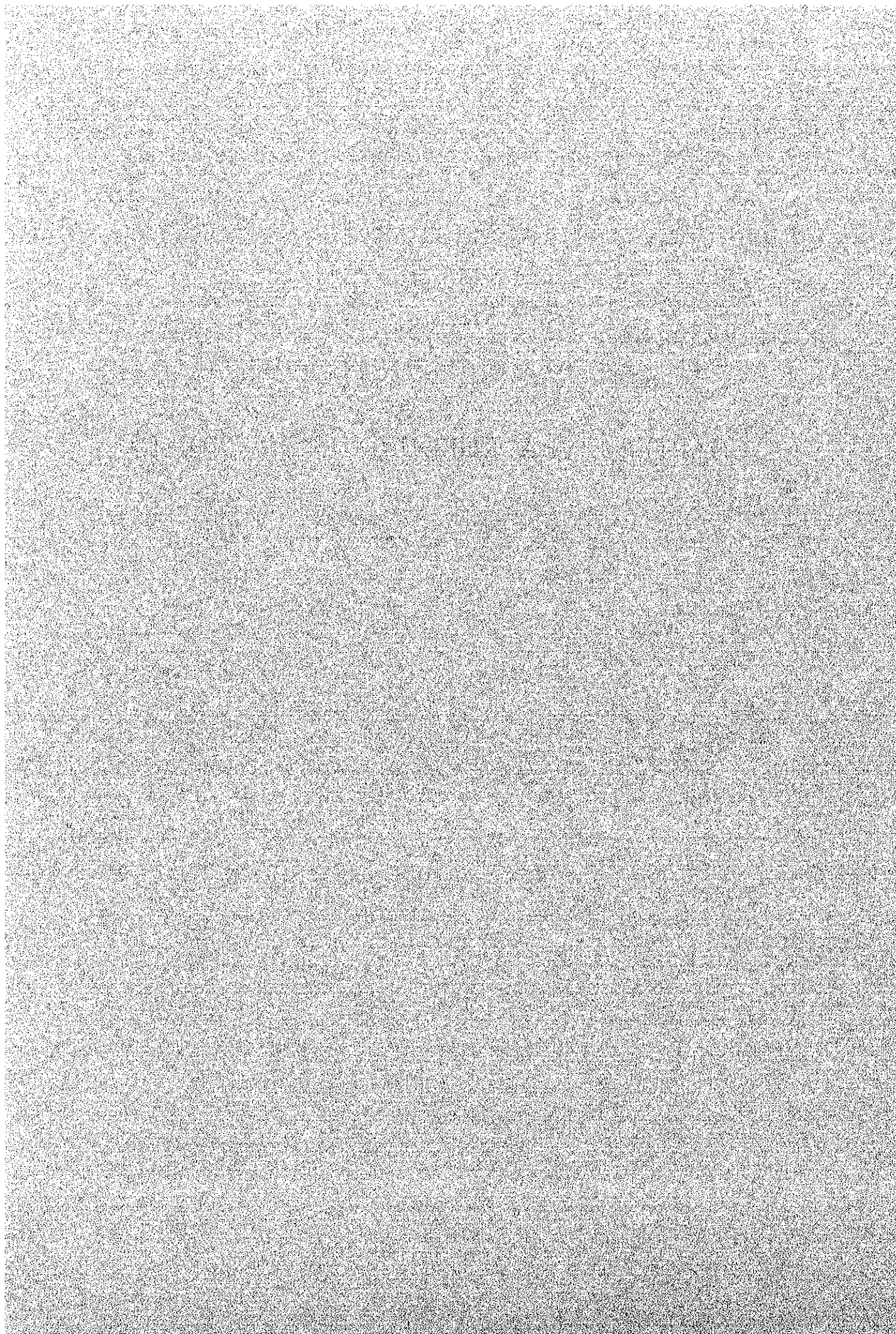


# **CHAPTER 1 BACKGROUND OF THE PROJECT**



# Chapter 1 Background of the Project

## 1-1 Background of the Project

Although the Lao People's Democratic Republic (the Lao PDR) has promoted moderate socialist programs since the revolution by the Lao People's Revolutionary Party in 1975, economic development was impeded by a deadlock in the planned economy caused by the centralization of power. To revitalize the economy, the Government of the Lao PDR in 1986 adopted a new economic policy which is called the "new economic mechanism." This program has encouraged more autonomy for national enterprises, the promotion of foreign trade and investment, and a liberalization of the nationwide distribution system.

The Government of the Lao PDR recognized the importance of telecommunications as infrastructure indispensable for social and economic activities. It made the expansion of existing telecommunications networks to promote economic development its first priority. The Government prepared a plan for the First Telecommunications Rehabilitation Project (TELECOM I) in 1986, and the 5-year Investment Program for Telecommunications Network Development in 1990. As the first step of the 5-year program, the Government commenced in 1990 the Second Telecommunications Development Project (TELECOM II) in cooperation with the World Bank (IDA). As a part of this project, the Government of Japan agreed to grant aid to build digital telephone switching facilities in the 6 principal cities countrywide including Vientiane, based on a request from the Laotian Government.

International communications connect the Lao PDR by microwave (60 lines) to neighboring Thailand, and by satellite communications (75 lines) with other countries. Since the existing earth station for satellite communications is relatively small, it will soon be unable to cope with increasing demand.

As the existing earth station is small (standard F-3 size), high charges must be paid for satellite use which is disadvantageous for profitability in the long run. Moreover, since the existing earth station was constructed by a contract with an Australian company and most international calls are routed via Australia, transit fee payments increase costs in comparison with direct trunks. But it is rather hard to procure the capital for constructing a new earth station for international communications due to the financial status of the Lao PDR.

For this reason, the Laotian Government requested the Japanese Government for grant aid for the improvement of international telecommunications for nationals, economic development by

foreign investment promotion by improving the telecommunications infrastructure.

## 1-2 Outline of Request

Summary of the request of the Laotian Government:

### 1-2-1 Objectives of Request

#### (1) Short-Term Objectives

- Renovation of international telecommunication facilities using self-satellite communication system
- Improvement of international telecommunications services performance in the country
- Reduction of operation cost of international telecommunications services using new standard-A satellite earth station
- Acceleration of reconstruction and development of national economy supported by new high quality international telecommunications services.

#### (2) Middle and Long-Term Objectives

- To enhance development and implementation of other quality-of-life programs
- To provide efficient and reliable total telecommunications services
- To promote industry and tourism
- To enlarge employment opportunities

### 1-2-2 Executing Agency

The executing agency for this project will be the *Entreprise d'Etat des Postes et Telecommunications Lao (EPTL)* which is a state-owned but independently-organized enterprise. EPTL was separated from the governmental organization in January of 1986 and has a total of about 1,200 personnel (structure shown in Figure 1-1). The governmental organization which administers the telecommunications sector of the Lao PDR is the Ministry of Communications, Transport, Posts and Construction (MCTPC), and EPTL is under this jurisdiction. The structure of MCTPC is shown in Figure 1-2.

EPTL is a telecommunications common carrier in the Lao PDR and operates all domestic and international telecommunications business in the Lao PDR except for some value-added services.

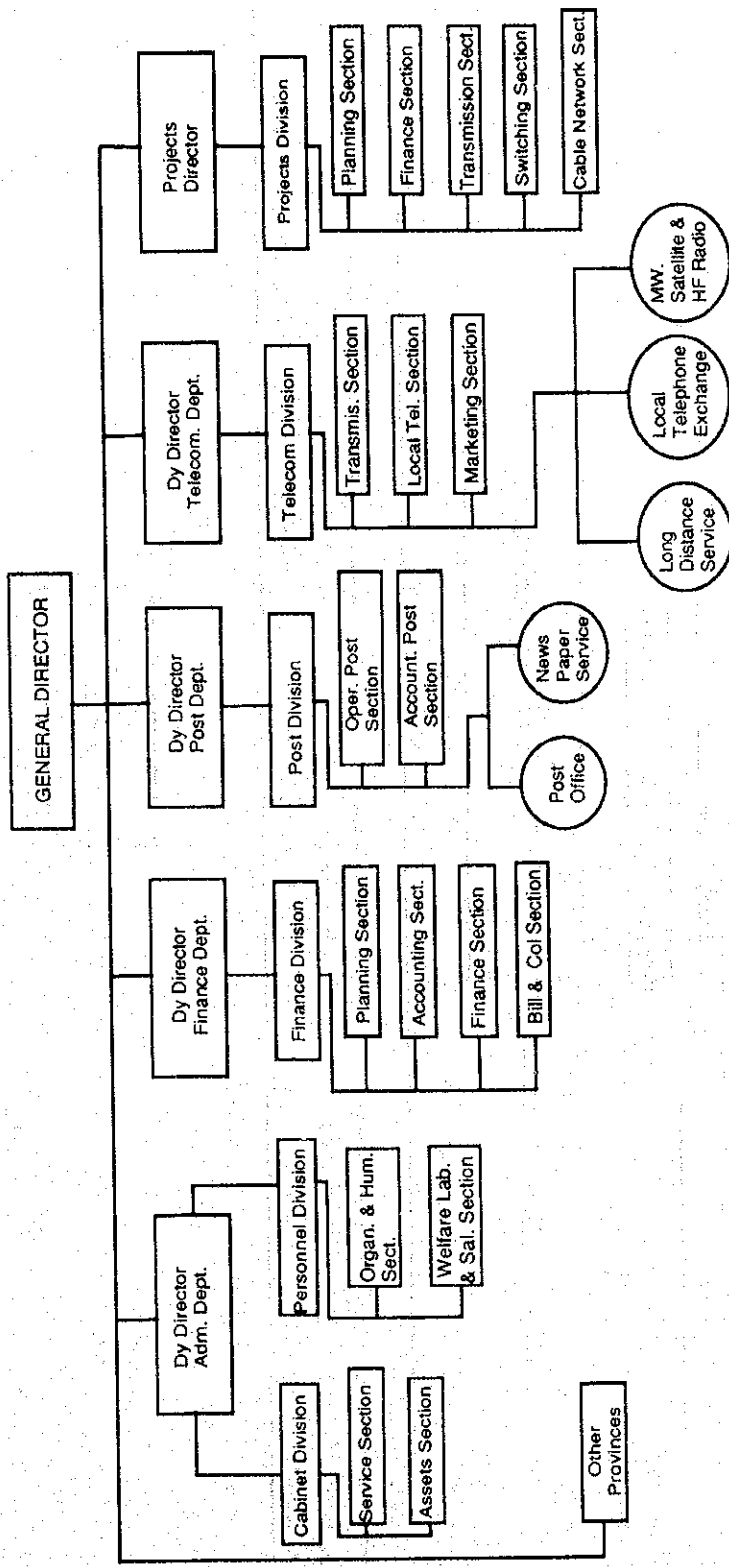


Figure 1-1 Organization Chart of EPTL

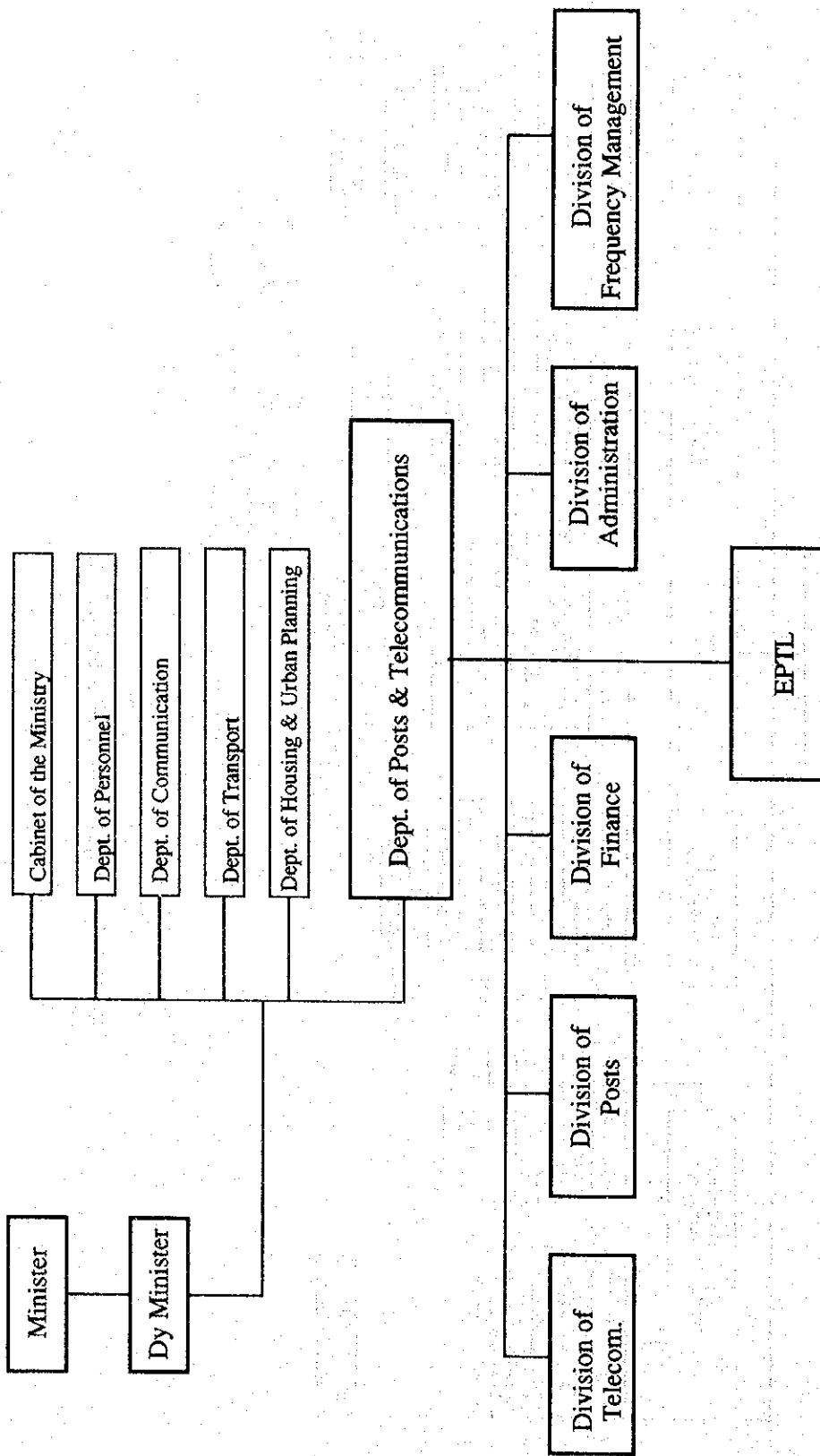


Figure 1-2 Organization Chart of MCTPC

EPTL provides telecommunications services including telephone, telex, telegram, facsimile, leased line, and mobile telephone. About 77% of total operating revenue was obtained from telephone service in 1992, and the ratio of international telephone service to overall telephone business amounted to the high rate of 82% in that year.

### 1-2-3 Outline of Requested Facilities and Equipment

Summary of facilities and equipment that were requested by the Lao PDR:

#### (1) Building

Satellite communication earth station buildings.

#### (2) Equipment

(a) Satellite communication facility (Standard-A earth station, 70 lines : including one TV channel).

Antenna system, power supply system, amplifier system, control system, etc.

(b) Microwave transmission system (Earth station to Numphou station and Earth station to Broadcasting station).

### 1-3 Projects and Programs of Other Donors

Status of recent financial and technical cooperation in the field of telecommunications from other donors is shown in Table 1-1.

There is no particular plan or program of donors or international organizations relating directly to this project, including financial and technical cooperation.

Table 1 - 1 Assistance from Abroad

Item No.	Item	Amount	Commission Date	Donor
1	Telex Exchange	FF 9.1M	1991	France (Grant)
2	Digital Switching System	J¥ 1,736M	1993	Japan (Grant)
3	Microwave System (VTE-PXN)	FF 4.8M	1991	France (Grant)
4	Consultancy, Training, Study Visit	US\$ 2.89M	1991-1993	UNDP (Grant)
5	Microwave System (VTE-NKI)	US\$ 0.4M	1993	Fujitsu (Grant)
6	Outside Plant	US\$ 10.8M	1994	IDA (Loan)
7	Transmission	US\$ 6.8M	1994	IDA (Loan)
8	Microwave System (LPB-XAI)	FF 11.1M	1995	France (Grant)
9	Rural Telecom phase I	DM 4M	1995	Germany (Grant)
10	Rural Telecom phase II	DM 10M	1996	Germany (Grant)

#### 1-4 Telecommunications Business of Other Private Company

The Lao PDR concluded a master agreement regarding a joint venture for telecommunications and broadcasting in Laos with Shinawatra Computer and Communications Public Co. Ltd., a Thai company, in 1993. According to the agreement, business to be undertaken in Laos consists of (1) cellular mobile telephone service, (2) public telephone service, (3) public switched telephone networks, (4) paging service, (5) broadcasting service, and (6) international telecommunications service.

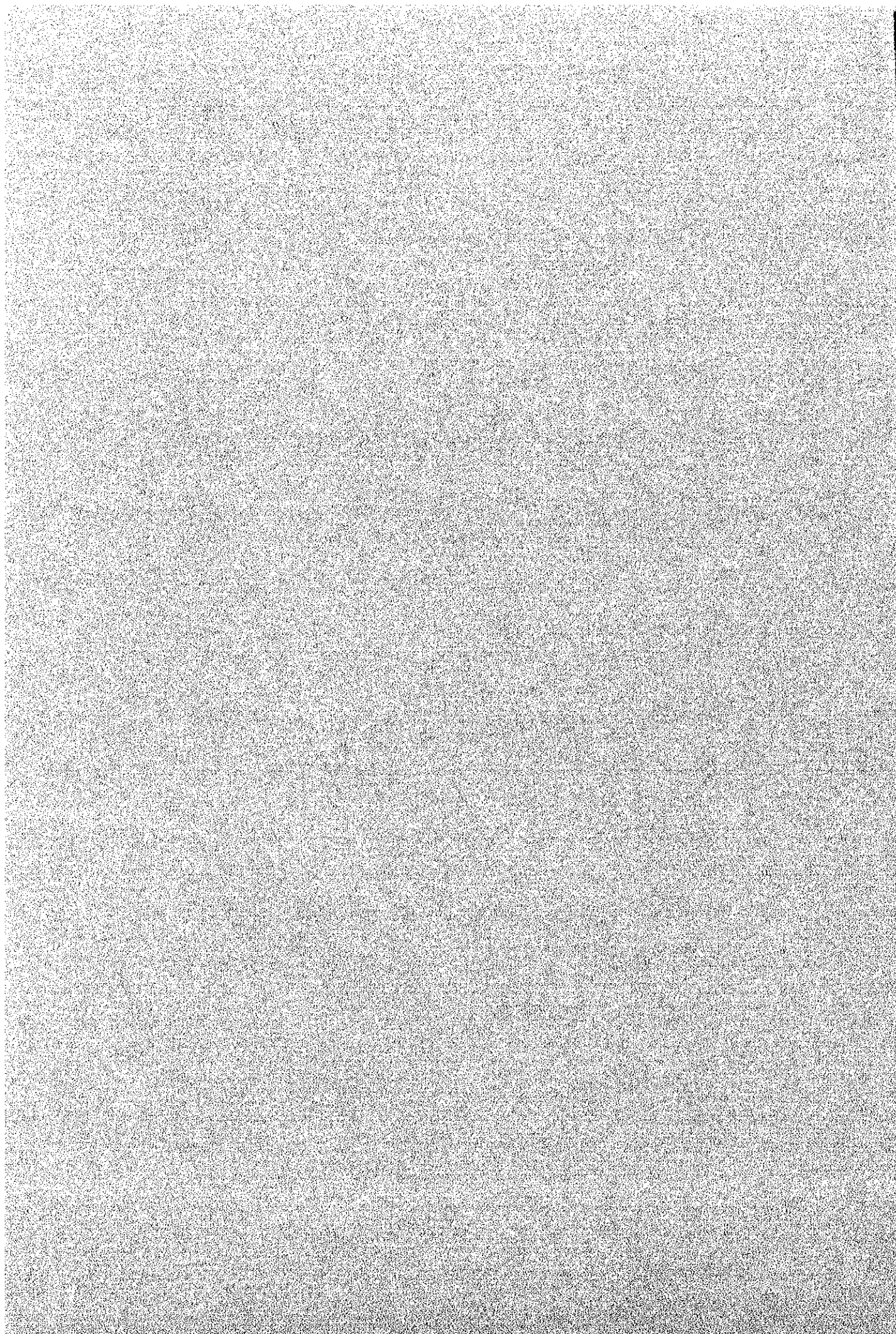
Based on the agreement, a joint venture called "Lao Shinawatra Telecom Co., Ltd." has been established and it has commenced cellular mobile telephone and broadcasting services. However, the international telecommunications service of this joint venture is required to use the existing facilities of EPTL.

The Lao PDR has decided to execute the project by accepting Japanese grant aid. Therefore, there is no overlap between this project and Shinawatra's project.

On the other hand, EPTL recently received a small size earth station, as an emergency relief, from Hong Kong Telecommunications Limited, a telecommunications carrier in Hong Kong, on a business cooperation basis. It has been put into service since January connecting with Hong Kong by a 384 kbit/s IDR path (12 voice channels with low rate encoding) via an Asiasat satellite.



## **CHAPTER 2    OUTLINE OF THE PROJECT**



## Chapter 2 Outline of the Project

### 2-1 Objectives of the Project

In the current situation of magnified demand for international telecommunications on the completion of Telecom II, the existing channels for international services cannot satisfy demand. It is supposed that the situation will be worse from now on.

Since direct trunks are scarce and the ratio of third country transit to total traffic is very big, transit charges are extremely high. Space segment charges are also high because the existing earth station is small.

One of the objectives of this project is to solve the problems mentioned above. Others are to provide the channel capacity which is lacking to assist the socio-economic activities of Laos by stimulating foreign investment, and to improve socio-economic activities and quality of life of the Laotian nation.

### 2-2 Examination of the Request

#### (1) Necessary Number of Lines

Though a total of 70 international lines including a television channel was initially requested, the number of lines must be studied carefully, because it influences the scale of facilities and the number of operation and maintenance personnel. The necessary number of lines should be derived from an appropriate demand forecast.

As for satellite television transmission, Laotian authorities feel that such functions will be necessary in the future but are not necessary at the moment.

Lao National Television is planning to expand programs and to improve the nationwide television transmission network. It is considered that a demand for exchanging programs with foreign countries will grow in accordance with the progress of these developments.

Therefore, proper consideration should be taken with the configuration and floor space of the earth station so that TV transmission equipment can be installed there in the future.

#### (2) Earth Station Standard

The type of earth station requested was "Standard-A". There are several kinds of INTELSAT earth stations for international telecommunications (refer to Table 3-7).

It is pointed out in the request that, even near future traffic demand may exceed the existing capacity and the charge for satellite use per channel is expensive due to the small size of the existing earth station.

Though these problems can be settled by using a larger earth station, doing so is meaningless if the earth station is too expensive. The final decision on the type of earth station has to be done only after considering trade-offs.

### (3) Communication Building at Earth Station

As station buildings are generally used for more than 30 years, future utilization of the buildings should be also considered in designing them.

### (4) Approach Link

Though a microwave system was requested to link the international exchange (Numphou station) with the earth station, it was recognized in the field survey that there were other possibilities to be studied.

The system and configuration of the approach link need to be decided with due consideration of the various elements.

### (5) Switching System and Billing System

Because the existing switching system and billing system were designed to deal with international traffic via a satellite only by way of Australia, they do not have any functions like producing international account records for each destination or distributing return traffic, inconveniencing international settlements.

Moreover, traffic statistical data gathering is not sufficient for international telecommunications.

The finance of EPTL will be stable if EPTL assures foreign currency income from international telecommunications operations by performing international account settlements properly. This can also contribute to state finances. Since direct lines to Japan and Singapore, in addition to Australia, have been established, these systems must be improved as soon as possible.

## (6) Executability

The financial status of EPTL seems sound and it is considered that additional maintenance expenses in operating an international telecommunications business using these project facilities pose no difficulties for EPTL.

Moreover, EPTL already has the least-necessary personnel for operation and maintenance of satellite communications, because they have already been operating an earth station for international purposes, even though it is small in size. So it is considered that there will not be any difficulties with the new earth station after the completion of this project.

## (7) Achievement of Objectives and Beneficial Effects

In order to realize the objectives of the Laotian Government, it is considered appropriate to carry this project into effect. It is also anticipated that the completion of this project will bring many benefits to the Lao PDR. Such benefits are as follows: (The details are discussed in Chapter 4.)

- Fulfillment of international telecommunications demand
- Reduction of transit charges
- Reduction of space segment charges for satellite use
- Stabilization of finances
- Improvement of quality of international telecommunications services
- Development of state economy
- Contribution to development of domestic telecommunications networks

Execution of this project using Japan's grant aid has been judged appropriate, as the effect of the project and ability of recipient country have been confirmed, and because the effect of the project satisfies the requirements of the system of Japan's grant aid. Therefore, it has been decided to carry out a basic design of this project on the assumption that Japan's grant aid is to be extended.

## 2-3 Project Description

### 2-3-1 Executing Agency

The executing agency for this project is the Entreprise d'Etat des Postes et Telecommunications Lao (EPTL). The supervising organization is the Ministry of Communications, Transport, Posts and Construction (MCTPC).

The structure within EPTL executing this project is as follows:

- Planning, procurement and construction: Project Department
- Operation and maintenance: Telecommunications Department

### 2-3-2 Location and Condition of Project Site

The project sites are Vientiane and Nathom, about 13km north from the center of Vientiane (refer to the location map in the first part of this report).

The place where the new earth station will be constructed is located in Nathom within the same premises as the existing standard F-3 earth station.

The site belongs to EPTL and has an area of about 33,000 square meters with enough free space for another earth station.

In addition, though a HF receiving antenna is already installed at the site of the earth station of the project, it is possible to remove the HF antenna because its operation will cease soon.

As for climate at the site, the rainy season is from May to September with high temperatures, and the dry season from October to April with relatively low temperatures. Rainfall usually exceeds 1,600 millimeters in a year. Both temperature and humidity are relatively high through the whole year. The annual average temperature is 25 to 27 degrees centigrade and the average annual humidity exceeds 70 per cent. The maximum wind velocity recorded is 37m/s (observed at a height of 18 meters above the ground) in 1983, during an observation period from 1960 to 1994. In addition, there is much lightning in the rainy season, often causing damage.

Earthquakes are very rare and small, when they occur, in the Vientiane region, though earthquakes have been observed only in the northern part of the country.

The premises of the earth station face a 4-meter-wide road (unpaved), and this road is now used for access to the premises.

City water and drainage services are not available at the site of the earth station. A well in the premises of the earth station is utilized for water supply. Sanitary sewage is collected, and gray water and rainwater are disposed of by natural filtration within the premises.

Commercial electric power of 22 kV is supplied to the existing earth station. The distribution line from the nearest substation is one route only and is not a dedicated line. Voltage and phase

of commercial power were relatively stable when the field survey took place, but the rate of occurrence of power cuts and voltage drops is high. During the period between January and October of 1994, power cuts occurred at an average rate of 2.2 times per month, with an average duration of 3.9 hours.

### 2-3-3 Outline of Facilities and Equipment

The facilities and equipment of this project are as follows:

#### (1) Standard-A Earth Station

It is composed of the following principal components.

- Satellite communication facility including a Cassegrain-type antenna with a diameter of about 16 meters
- Power supply facility which supplies power to the satellite communication facility
- Buildings which accommodate the satellite communication facility, the power supply facility, and operation and maintenance personnel working for 24 hours a day.

#### (2) Approach Link

The approach link, a transmission system which connects international lines between the earth station and the central office, is composed of the following principal components:

- Microwave transmission system which links the earth station with the repeater station (including antenna towers at both stations)
- Fiber-optic cable system which connects the repeater station to the central office (duplicated underground routes for reliability)

#### (3) Enhancement of International Capabilities of the Switching System and Billing System

This includes the following which are to cope with the increase of direct destinations via newly established satellite circuits:

- International account processing
- Traffic statistics retrieval
- Return traffic distribution
- Signaling system enhancement
- Expansion of international trunks, etc.

This enhancement should be implemented very urgently because the existing earth station

already has several direct destinations.

Outline of the facilities and equipment of this project is illustrated on Figure 2-1

## 2-3-4 Operation and Maintenance Plan

### (1) Organization

Maintenance of facilities and operation of services are carried out by the operation and maintenance staff in the earth station and Numphou station.

It is advised that EPTL establishes a division in the head office responsible for line planning and negotiation with foreign administrations so that international communication services operate smoothly. Technical staff with appropriate ability need to be deployed continuously to maintain facilities. As regards technical personnel, a suitable deployment and training plan should be implemented.

EPTL should consider more active utilization of the Posts and Telecommunications Training Center, and participation in training courses by foreign governments and organizations.

### (2) Personnel Plan

With the completion of this project, the following personnel will be necessary.

- Personnel of the earth station: 2 persons in addition to existing 16 persons

#### 1) Daytime work

Item	Number of Personnel
Station master	1
Satellite communication equipment	3
Microwave equipment	2
Power equipment	2
General affairs	1
Total	9

#### 2) Shift work



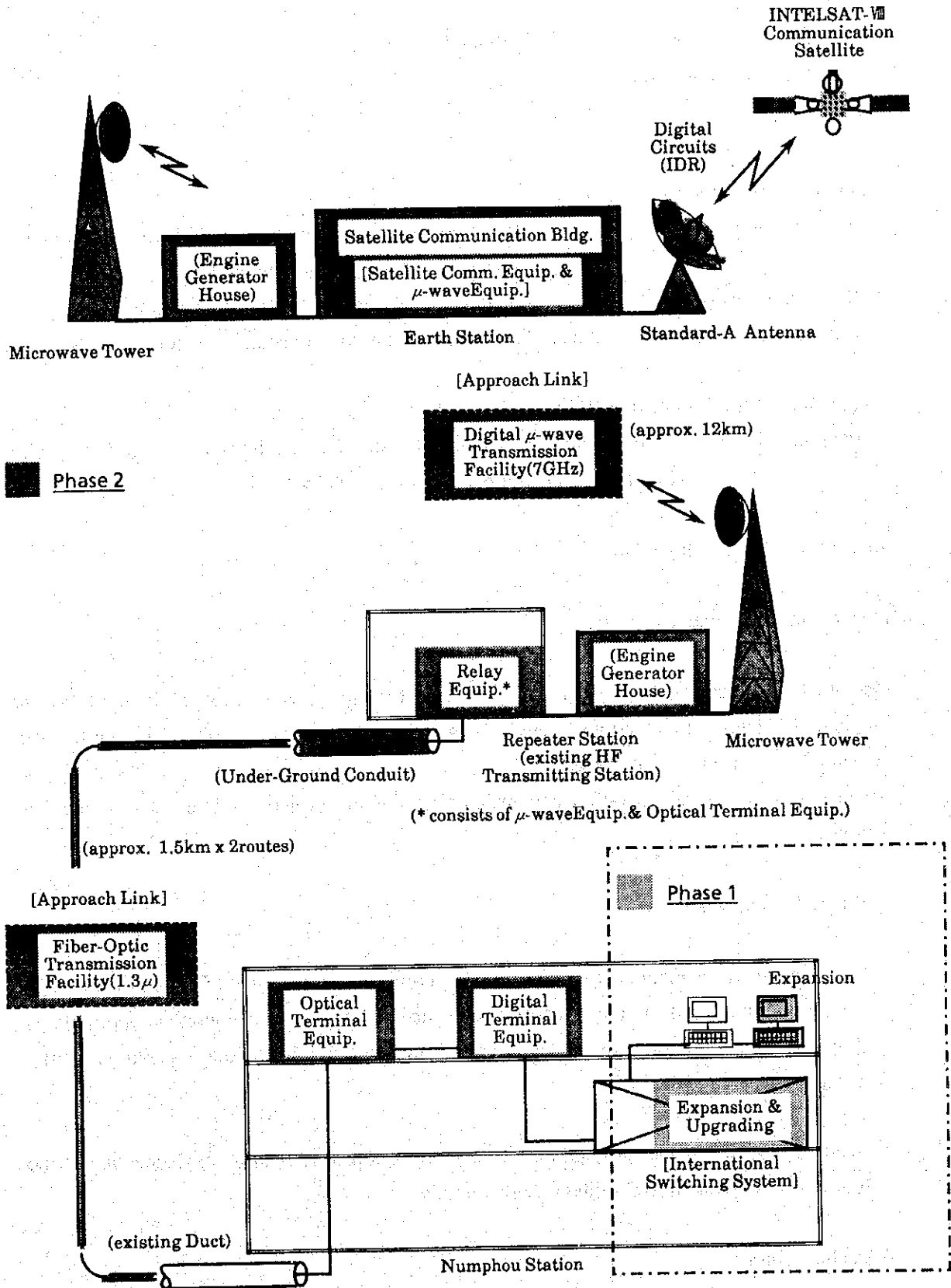


Figure 2-1 Outline of Facilities and Equipment

Item	Number of Personnel
Operation & Maintenance	3 x 3 shifts
Total	9

- Personnel of Numphou station:

- Transmission division : No additional personnel needed (existing 23 persons moved from old building to new building)
- Switching division : 4 persons in addition to existing 11 persons
- International telephone operator : 6 persons in addition to existing 8 persons

- Personnel of head office of EPTL:

- Planning division : a new division responsible for planning lines and negotiating with foreign administrations. 2 persons are needed.

In total, 14 people will be added.

(3) Operation and Maintenance Costs

Operation and maintenance costs for the project include wages for staff engaged in international telecommunications, satellite use charges, expenses for spare parts and consumables, and electricity charges.

Average annual cost of operation and maintenance of the project facilities is estimated as follows:

1) Wages for Personnel

The number of personnel for international communications, including engineers and technicians of the earth station and Numphou office and international telephone operators, is estimated to be 52 people. Annual total salary is 38,944,500 Kips (about 5.4 million Yen).

2) Electricity Charge

Electricity charge for the earth station, the repeater station and Numphou Exchange will be 49,406,400 Kip (about 6.9 million Yen) annually.

3) Satellite Charge

Space segment charge for 154 channels is 445,737,600 Kips (about 62 million Yen) annually.

#### 4) Spare Parts and Consumables

Cost for spare parts and consumables for equipment at all the sites of this project is estimated to be 50,400,000 Kips (about 7 million Yen) annually.

Total cost for one year will be 584,488,500 Kips (about 80 million Yen).

Estimated revenue of international telephone service in 1996 is 3,759,200,000 Kips (about 520 million Yen), on the condition that the existing tariff is applied. This implies that the operation and maintenance cost can be covered by the revenue.

The revenue of about 3.7 billion Kips is derived as follows:

(charge for out-going calls) = (chargeable minutes) x (average charge/minute)

where, chargeable minutes in 1996 is estimated as 2.3 million minutes,

average charge is estimated as 1,623 Kips/minute.

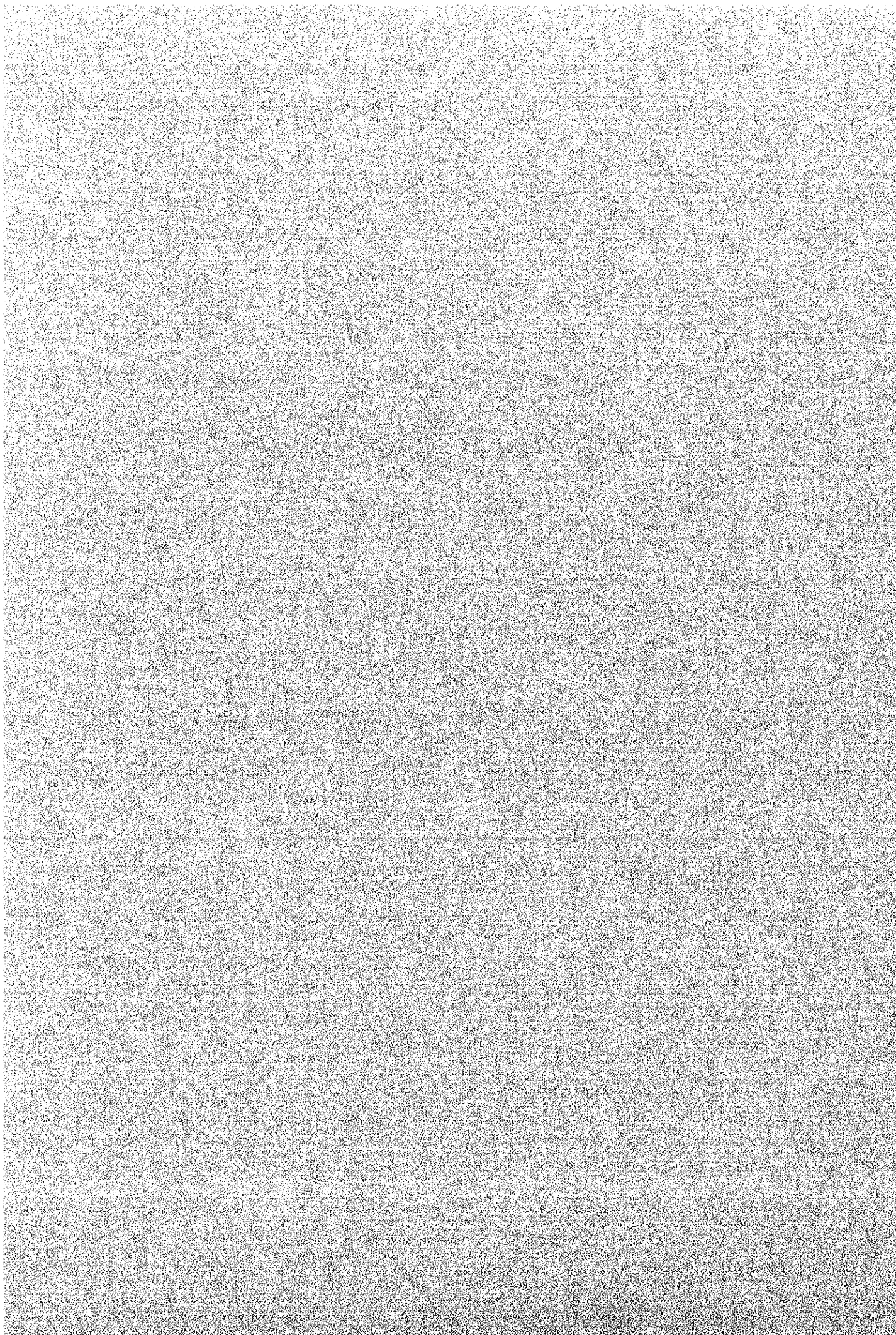
Therefore, collected charge is calculated as 3.7 billion Kips.

#### 2-4 Technical Cooperation

MCTPC and EPTL require experts and training in the fields of international communications planning, and operation and maintenance of an earth station.



## **CHAPTER 3 BASIC DESIGN**



## Chapter 3 Basic Design

### 3-1 Design Policy

The procedure for designing the project facilities is as follows:

- (1) Forecast demand for international communications in 2001, 5 years after construction
- (2) Determine direct destinations and calculate number of lines per destination
- (3) Determine scale and grade of facilities
- (4) Estimated necessary a number of staff for operation and maintenance
- (5) Design buildings to accommodate the equipment and staff

For station buildings for equipment of communications and power, necessary floor size for 15 years should be secured including an expansion of communications equipment to be performed by EPTL by itself.

The following points are considered when designing telecommunications systems.

- Kind of services
- Quality of services
- Traffic estimate
- Reliability
- Life of system
- Future expandability
- System operability and maintainability
- Cost

### 3-2 Examination of Design Criteria

In order to determine system size, an estimate of international traffic volume is necessary. Since in the Lao PDR, telephone service is predominantly in international telecommunications, an estimate of only international telephone traffic should be sufficient. The international lines, and transmission and switching equipment, are designed to bear the traffic volume in 2001, 5 years after construction.

#### 3-2-1 Estimate of International Traffic

- (1) Background of Traffic Estimate

## 1) National Economy, Present and Future

The Lao PDR has promoted economic measures, called the "new economic mechanism", since 1986. Especially after the collapse of the Soviet Union, the Lao PDR has been promoting an increased quality of life for citizens and economic interchange with western countries. Growth of Gross Domestic Product (GDP) and population are shown in Table 3-1.

Expanding foreign enterprise and trade are expected from now on. Information and human interchange are increasing steadily. However, considering the population size and geographical situation of this landlocked country, the socialist economy should change moderately.

## 2) Telecommunications Network, Present and Future

Most international telephone service is provided through the existing small size earth station and a transit switch in Australia, except for with Thailand. International telephone services with Thailand are provided via the terrestrial microwave network. However, except for several countries, most international telephone calls are only available by transit. This brings poor service quality due to low line availability and causes increased transit charges.

The deterioration of the domestic telephone network is a cause of the slow international telephone demand, and poor quality of service. But after the completion of the rehabilitation of the domestic telecommunication network, Telecom II, for metropolitan and principal vicinity cities, international telephone service will be much improved.

In spite of a limited telecommunication network, international telephone demand is growing favorably as shown in Table 3-2. It is expected to grow favorably in conjunction with economic progress and improvement of the domestic telecommunication network. Demand for international telex communications is already saturated, and gradually telex traffic will be transferred to facsimile communication.