

CHAPTER 3 CONSIDERATIONS ON GENERAL DEVELOPMENT TREND AND TELECOMMUNICATION PLANS IN OTHER COUNTRIES

3-1 General Development Trend of Telecommunications

The world's telecommunications are developing from telephony to non-telephony communications and further towards introduction of electronic and digital technologies associated with computers, yielding remarkable outcomes.

This trend, however, involves many uncertain factors which make definite demand forecast rather difficult. The Master Plan includes, therefore, only the services for which demands are expectable with considerable certainty. Accordingly, it will be necessary to make adequate additions or modifications to the Master Plan during its future implementation period while taking into account the general trend of telecommunications development. In such occasions, it would be essential for both the domestic and international telecommunication plannings to place their basis on a common ground, especially when introducing new services and/or technologies with minimum confusion and maximum effect.

The following paragraph describes the basic considerations on which the Master Plan is based and to which the implementation of the Master Plan should refer, in terms of fundamental services and technical items.

(Refer to PART VII, CHAP. 2)

3-2 Service Trend

In general, the first stage of national or international telecommunications development in a country is to establish and expand a nation-wide telephone network. When the demand for telephone service is fulfilled in a nation-wide scale, qualitative improvement for the network and introduction of new telephone services will be required as the second stage. Simulta-

neously the third stage will involve introduction of non-telephony telecommunication services (high-level telex, data and visual communications, etc.). The fourth stage will aim at more diversity, integration and sophistication in use of these various kinds of telecommunications in association with computers and supported by new technologies.

The present Master Plan is framed chiefly for the first stage. In view of the technical and global trends described just below, however, it is expected that the second and then the third stages will soon come up on the scene because of domestic customer demand, pressing administrative requirement and request from abroad, even though the demand is limited initially to a relatively small amount.

3-3 Technical Trend

In the technical aspect along with the respective service development stage, the first stage of the development will include a national-wide automatic telephone network using the EMD or crossbar switching systems and coaxial or microwave transmission lines, and an international automatic network using submarine cables or communication satellites.

The second stage will involve intelligentization of the telephone network by introducing a stored-program controlled (SPC) electronic switching system and a common channel signalling system. The third stage will see the introduction of nontelephony telecommunication terminal devices and related switching systems. And the fourth stage will proceed with digitization of telecommunication networks by utilizing digital technologies, i.e. digital switching and transmission systems as well as computers, toward the formation of an integrated services digital network (ISDN).

While the Master Plan places its major emphasis on the technologies appearing in the first state, it also includes introduction of a part of the new technologies mentioned above for the second through fourth stages (especially the digital technologies) into the capital area.

When considering both the fulfillment of the requirements for telecommunication services equally for the capital and 'interior' areas and the concordance with the state-of-the-art and manufacturing circumstances of the world, it would be essential to envisage intelligentization and digitization not only in the capital-area network but extensively in the nationwide network, and to steadily prepare necessary techniques and operating staffs to meet the introduction of new communication devices and facilities. For maximum effect, the network intelligentization and digitization will also have to involve the connection system between the domestic and international networks as well.

3-4 Intelligentization and Digitization of Telephone Network

Since the star-type circuit network, which is the simplest network configuration, is so far sufficient to fulfill the telephone service demands in Paraguay as far as the provision of the basic service is concerned, the Master Plan based on that network type will allow for the best economical effectiveness. In the economical view, it is not easy to justify the total and prompt introduction of the new advanced switching system, signalling system or transmission medium (particularly digital system for long distance) for the enhancement of the existing telephone network. To prepare for the future development of services and technologies, however, it is fundamental to confirm the necessity for and feasibility of the intelligentization and digitization of the most basic telephone network.

The intelligentization of a telephone network means a provision of the capability for versatile connection and processing (storage, and information manipulation) of communications between two terminals and/or between a terminal and a central processor.

The digitization of a telephone network means provision of economical and/or high-quality speech paths by introducing integrated digital switching and transmission systems into them,

as well as the capability for integrating non-telephony communications with telephony. The intelligentization and digitization are combined to provide for the foundation for the ISDN while offering their respective effects.

As a reference, the following items are described in the attached ANNEXES:

- * Features of digital telephone network (V1-1)
- * Features of stored-program controller network (V1-2)
- * Features of common control switching network (V1-3)
- * Transition toward digital network (V1-4)

(Refer to PART III, SEC.I, 2-2 and SEC.II, 2-3)

3-5 Mutual Relevance Between Domestic and International Telecommunications Development Trend and Its Plans in Other Countries

The preceding paragraphs 3-1 through 3-4 describes the general development trend of telecommunications. Development of domestic and international telecommunications may involve two different cases: in one case, international telecommunication will begin as an extension of the existing domestic telecommunications; in the other case, international telecommunications will precede domestic telecommunications, which will begin by utilizing the domestic part of the international telecommunication connections or facilities.

Based on those considerations, the Master Plan provides coordination between the domestic and international telecommunication fields in terms of services and facilities, as will be described later. For this purpose, note is taken of the telecommunication circumstances and its trends in each related country as far as possible. Also necessary considerations are taken on the contents of the latest plans that are the outcomes of certain binational or international agreements indicated by ANTELCO, or of the ITU World and Latin America Plan Committees. (Refer to PART III, SEC.II, CHAP. 2; 3-1-1)

CHAPTER 4 CONSIDERATIONS ON FUNDAMENTAL TELEPHONE
NETWORK PLAN

4-1 Fundamental Telephone Network Plan in General

A fundamental telephone network plan applies to the subscriber trunk dialling telephone network, and generally includes the following items which are listed in the Scope of Work of the Master Plan. A practical implementation plan is produced by putting the predicted demand into the fundamental network plan, which provides a foundation for the telecommunication plans for both long and short terms.

- (1) Network configuration (referring to exchange hierarchy, circuit network, and switching network)
- (2) Routing plan (including switching and signalling systems)
- (3) Numbering plan
- (4) Rate system
- (5) Charging system
- (6) Engineering standards (referring to traffic-engineering, transmission-engineering, and reliability-engineering standards)

In each country, whether the fundamental network plan is properly framed or not is the key factor that affect the successful construction of the subscriber trunk dialling network.

Originally, the fundamental telephone network plan aims chiefly at the domestic telecommunications. However, the inter-field coordination between the domestic and international telecommunications in the Master Plan has been carried out based on this fundamental plan because of the following reasons:

- (1) The CCITT recommendations for international operator or subscriber dialling telephone systems have been determined elaborately under total considerations on many practical domestic and international network conditions in terms of the items listed just before. So the fundamental telephone network plan cannot be framed independently for the domestic and international networks.
- (2) The plan and design for the connection system between domestic and international telephone networks is largely affected by the fundamental plan for the domestic telephone network.
- (3) When mobile or non-telephony communications services are planned by utilizing or integrating with the existing telephone network, the domestic and international networks will have even greater correlations than described in items (1) and (2).

4-2 Fundamental Telephone Network Plan in Paraguay

The current fundamental telephone network plan in Paraguay is a revision of the network plan, transmission plan, numbering scheme, and charging system specified in Volume II, Chapter 2 BASIC TECHNICAL PLAN in the 20-Year Long National Telecommunications Development Project established with cooperation by ITU. The domestic telecommunications Master Plan is framed basically after this current fundamental plan.

In general, the fundamental telephone network plan, which aims first at construction of a nation-wide subscriber trunk dialling network, is revised and/or supplemented to accommodate additional telephone services, non-telephony telecommunications, and/or new technologies (particularly for switching). For this end, it is expected that the fundamental telephone network plan in Paraguay be framed or revised prior to the practical implementation of the Master Plan. Also it is recommended that the framed or revised items of the fundamental network plan be com-

piled in an integrated document for the future reference, for the implementation planning or quotation in bid specifications and for providing a basis for revisions.

Reference materials for the implementation and study of the fundamental telephone network plan are given in the attached ANNEX VI-5.

(Refer to PART III, SEC. I, CHAP. 3 and 4)

CHAPTER 5 CONSIDERATIONS ON MUTUALLY RELEVANT TERMS IN
DOMESTIC AND INTERNATIONAL TELECOMMUNICATION
SERVICES AND FACILITIES INTRODUCTION PLANS

5-1 Services Introduction Plan

- (1) Subscriber dialling plan for international telephone network:

The international subscriber dialling (ISD) telephone service has different degree of correlation with the existing domestic network using the EMD switching system, depending on whether the charging system uses a detailed billing system or a periodic pulse metering system. Based on the agreed modifications in the preceding Feasibility Study results, the Master Plan assumes the use of the periodic pulse metering system enabling to introduce ISD service throughout the country. This charging system is put in practical use usually under consideration not only of cost and reliability (particularly due to metering pulse intervals), but also of countermeasures, e.g. operator assistance, customer claims, immediate charge information and payment requirement.

For the ISD services, the configuration of the connection system between the domestic and international telephone networks (which will be described in item 5-2(3)) is particularly important.

- (2) Introduction of new telephone services

As new international telephone services, the inauguration of international conference telephone, credit call and

some other services can be planned involving the international digital switching system. For new domestic telephone services, the Master Plan includes a list of new services as such. Selection of services from this listing is left to the hand of ANTELCO.

It seems to be adequate that a new telecommunication service be introduced into both the domestic and international fields at the same time. However, introduction timing may differ between the two because of the differences in demand for the service or facilities required or of the necessary coordination with other countries as far as the international communication is concerned.

(3) Telegram

Since the telegram service is planned as a continuation of the existing systems (GENTEX for domestic service, and operator routing for international service), it can be treated independently for the domestic and international fields.

(4) Telex etc.

Telex and other related services will be provided automatically in an integrated manner, since a digital data circuit switching equipment is to be introduced in the first five year period of the Plan as the electronic telex switching system for both domestic and international uses. The existing telex services are maintained as they are, for both domestic and international networks. New telex services can be inaugurated at any time as needed within the functional capability of that new switching system.

Although the teletex communication is not envisaged in the term of the Master Plan, it may be necessary to consider the possibility because, the demand for international teletex communications could arise between

specific customers at an unexpectedly early time and the demand might extend into the domestic field.

(5) Data communications

Based on the ANTELCO policy, data communication services will be offered as described in paragraph 2-1 (4).

Data communications service can be provided utilizing the telephone or telex network, which is the intermediate form located in between the leased line service and common-carrier switching network service. This service form is worth attention because of easy applicability to a broad area, although its transmission rate is limited by the transmission characteristics of the network due to the inherent impairments such as circuit and switching noise.

On the other hand, it seems that the leased data communication network for the customers with mass-data communication demand would have to be connected to the international data communications network in the future. Special attention is required to the packet switching network in this respect.

(6) Facsimile communication service

Using a facsimile communication, a telegram dispatch and delivery service is planned as a domestic service. For an international service, the Bureaufax (using the CCITT GIII machine) is planned, in which the terminal equipments are installed in the ANTELCO offices and the visual or text message from the customers is transmitted/received over the public switched telephone network. The latter service will be applied to the domestic area as well. The Telefax, a kind of subscriber facsimile, will also be made available via the existing public switched telephone network, as not only domestic but also international service.

(Refer to PART III, SEC. I, CHAP. 6; SEC. II, CHAP. 2 and 3)

5-2 Facilities Introduction Plan

(1) Domestic and international switching facilities

Since both the domestic and international telecommunications are operated solely by ANTELCO, it is possible to install the international switching equipment either separately from or together with the toll transit switching equipment. The separate installation has an advantage in that the facilities can be designed and operated optimally and independently for the domestic and international applications, while it has a drawback in economical respect derived from the separate and tandem configuration of the two facilities. The combined installation has advantages and drawbacks just reverse to those of the separate installation.

The consideration on selection between the separate and combined installations is also applicable to the toll and local switch installations as well. In general, separate installation is beneficial for large-scale facilities, while combined installation is more advantageous for smaller facilities.

When introducing the digital switching equipment, the international/toll combined transit switching equipment might be installed separately, for example, one in Central II and the other in Central I, respectively. Since, in this case, a group of circuits must also be divided into two groups, it would be necessary to provide connecting circuits between the two exchanges to allow for selection of the two respectively terminated groups of circuits.

(2) Improvement of transmission line network reliability

For improvement of transmission line network reliability, the toll transmission systems have spare systems for each route and, in addition, have a standby route in loop configuration. As the standby routes for international

satellite circuits, a circuit group is planned between the Central II office where the international switching equipment locates and Cd.Pte.Stroessner to make the international satellite circuits of Brazil accessible from that office. (Refer to PART III, SEC. I, 7-3-1; SEC. II, 2-2)

(3) Connection system between domestic and international telephone networks

For the connection system between the domestic and international telephone networks, it is important to make the plan in line with the expected future trend of demand and technologies while retaining customer's benefits, service quality (in switching, transmission, reliability and rate), and economical effectiveness. The CCITT Recommendations will be a useful guideline for this planning.

Some information for the implementation plan for the connection system between international and domestic telephone networks and its future studies are described in the attached ANNEX VI-6.

(Refer to PART III, SEC. I, CHAP. 3; SEC. II, CHAP. 2 and 3)

CHAPTER 6 INTER-FIELD COORDINATION FOR DOMESTIC AND
INTERNATIONAL TELECOMMUNICATIONS, RADIO
REGULATION & MONITORING AND NATIONAL
EDUCATIONAL TV BROADCASTING

This chapter describes the considerations which have been taken and are to be taken for each correlative item between the fields given in the title.

6-1 Transmission Paths for National Educational TV
broadcasting Programs

It is confirmed that programs can be transmitted as planned to any local TV stations over the dedicated transmission systems, since a long-distance microwave trunk transmission path for the domestic telecommunication services is to be constructed in advance. (Refer to PART III, SEC, I, 2-2-4; 7-8-2; SEC. IV, 3-8)

6-2 Frequency Assignments to Telecommunications and Broad-
casting, and Radio Regulation

The Master Plan takes into consideration all the items needed for the title of this paragraph. However, in executing the projects concerning radio transmission paths, mobile radio and rural telephone services, a close contact between each of the project concerned is vital, for the sake of appropriate frequency assignments and preparation for frequency management and monitoring.

In the broadcasting field, an international coordination is needed for frequency assignments. It is desired that Paraguay will joint the Broadcast Frequency Allocation Group, when the implementation of the Master Plan provides for the necessary circumstance.

The Master Plan includes the expenditure for innovating the radio regulation and monitoring needed to cope with

the future development of telecommunications, broadcasting, and the associated operating facilities including measuring equipment. (Refer to PART III, SEC. III, CHAP. 2; SEC. IV, 3-2)

CHAPTER 7 CONSIDERATIONS OF ORGANIZATION AND ITS MANAGEMENT

7-1 Basic Form of Organization and Its Management

The Scope of Work requires adequate plans concerning the organization and management structure for the telecommunications, radio regulation & monitoring, and educational TV broadcasting entities.

Considerations on the organizations and managements needed for the execution of the individual Master Plan are described in the respective chapters. This chapter provides the fundamental organizational and managerial concepts and related considerations which are common to all fields for reference for the Master Plan implementation.

The organization form may be divided into two types: "the functional division type" which is based on the five managerial functions of policy/target (objective) setting, planning, execution, evaluation and action, and "the particular division type" which is based on some handling particular items such as responsible districts, service or commodity types, specialized areas, and so forth.

The basic form of the organization and management chiefly of telecommunications entity is described in ANNEX VI-7.

(Refer to PART III, SEC. I, CHAP. 9; SEC. II, 2-3; SEC. III, CHAP. 3; SEC. IV, CHAP. 2; SEC. V, CHAP. 4)

7-2 Organization and Its Management for Domestic and International Telecommunications Entities

The current organization of ANTELCO is of the functional division type, and seems to have been functioning very effectively as an organization for the age of expansion and construction in telecommunications.

Since the Master Plan places its primary stress on expansion and construction during the term of the Plan, it seems to be adequate that the present functional division type organization be maintained over the term of the Master Plan and a new sub-organization be added to the present organization when introduction of new telecommunication services (such as data communication) comes up at the practical level.

In addition to the specific organization and management structures for each of the domestic and international telecommunications entities which are furnished in the Plans for each field, the following gives particular points for considerations required in common to both fields:

- (1) Market research for new communication services and survey on new technical trends.
- (2) Countermeasures to the wider spread in telephone and new communication services and to the consequent increase in subscription and facilities work.
- (3) Service index setting, service supervision and traffic and trouble control activities for the domestic and international networks.
- (4) Job execution utilizing computers.
- (5) Software management for switching equipments and computers.

These points for considerations should be realized firstly within the extent of the existing organization possibility, before a new organization is introduced for them.

(Refer to PART III, SEC. I, CHAP. 9; SEC. II, CHAP. 2)

7-3 Organizations and Managements for Radio Regulation and Monitoring and National Educational TV Broadcasting

The organization structures required for the radio regulation and monitoring and the broadcast are also detailed in the respective Master Plans. Basically, both of the organizations and their managements are of the particular division type. To support this organization type, consideration will be needed on countermeasures to be taken in order to adequately function so-called "PLAN-DO-SEE" management cycle activities as are explicitly done in the functional division type organizations. (Refer to PART III, SEC. III, CHAP. 3; SEC. IV, CHAP. 2)

PART IV. ESTIMATION OF PROJECT COST AND REVENUE

PART IV ESTIMATION OF PROJECT COST AND REVENUE

INTRODUCTION

(1) Calculation of construction cost

Main conditions commonly used for the estimation of the construction cost of each field are as follows:

- 1) The prices taken are those prevailing at the end of 1981, when the study for preparing this report was executed. Price escalation is not taken into account.
- 2) Installation cost is prepared on the basis of a turn-key base contract, unless otherwise stated.
- 3) Consultant fees are included, within the limit necessitating the consultant services, in the construction cost of the new technologies introduction projects, and the projects that necessitate the field investigation by foreign engineers at the execution.
- 4) Training and also, if necessary, maintenance assistance expenses are provided in the budget in case the project involves introduction of new technologies and new operation.
- 5) Construction costs are divided into local and foreign currencies based on the following criteria:

a) Foreign currency portion

All the cost (CIF) of the equipment and materials imported from abroad, and those other costs that are incurred and paid for overseas in foreign currencies, e.g., foreign workers' fees, training, maintenance assistance and consulting fees, and contingency, etc.

b) Local currency portion

Costs of all the goods and services procured locally, e.g., local transportation, station buildings, civil construction, and those other costs that are incurred locally for labor, training, maintenance assistance, consulting, contingency, etc.

- 6) Goods and materials cost includes measuring instruments and tools for maintenance, and spares to be provided before starting operation.
- 7) Contingencies are provided to take care of additional construction costs that might be incurred due to unexpected occurrences.
- 8) The exchange rate used is that as of the end of 1981, i.e., 1 U.S. Dollar equals 126 Guaranies or 230 Japanese Yen.

(2) Estimation of operating cost

Expenses necessary for operating and maintaining the various phases of operation included in this Master Plan are estimated.

Depreciation period for the equipment has been set at 20 years; we estimate, accordingly, the operating costs extending over 20 years after erection; these data are necessary as the yardstick of financial analysis for working out an internal rate of return for the investment in both fields of domestic and international telecommunications.

For other fields, operating expenses up to the year end of this Master Plan (Year 1997) are given without

considering the internal rate of return for investment.

The estimation method for operating expenses and the results of such estimation are given in the following sections.

(3) Estimation of revenue

The estimate for the revenue to be derived from the execution of this Master Plan is given here for both domestic and international telecommunications.

The estimation period of revenue is set at 20 years after erection similarly as and for the same reason as the preceding item (2).

For such fields as radio regulation and monitoring, national educational TV broadcasting, and manpower development, revenue estimates are not considered, in view of the very nature of those activities.

Explanation as to the method of revenue estimation and its results is given in each section.

SECTION I DOMESTIC TELECOMMUNICATIONS

CHAPTER 1 PROJECT COST ESTIMATE

1-1 Construction Cost Estimate

In making the construction cost estimate for various domestic telecommunications projects, the following conditions are taken into consideration in addition to those common conditions explained at the INTRODUCTION of PART IV:

- 1) In case of reusing the replaced equipment, necessary costs for removal and reinstallation are added in the construction cost estimate.
- 2) In the case of installing subscriber telephones, the cost for it is calculated with the assumption that the works are executed by contractors.
- 3) Installation works of subscribers' terminal equipment for rural telephone systems for the 2nd and 3rd 5-year plans are excluded from the turn-key base contracts; instead, those works are executed by ANTELCO's personnel.

Construction cost estimate for each item is shown in Table IV-I-1. The total construction cost estimate for domestic telecommunications amounts to 97,100 million Guaranes, which includes the already-committed contracts amounting to a total of 12,475 million Guaranes; the remainder of 84,625 million Guaranes include a foreign currency portion of 519.92 million U.S. Dollars and a local portion of 19,115 million Guaranes.

1-2 Operation and Maintenance Cost Estimate

The operation and maintenance costs can generally be estimated according to the following formula.

Maintenance cost = Construction cost x maintenance cost ratio.

Operation cost = Revenue x operating cost ratio.

The above-mentioned ratio in the formula have been deduced from the financial statements as follows:

Maintenance cost ratio = 0.022

Operation cost ratio = 0.29

The operation and maintenance costs calculated from the above-mentioned formula are shown in Table IV-I-2.

The estimates exclude the already-contracted projects included in the 1st 5-year plan.

CHAPTER 2 ESTIMATE OF REVENUE

The revenues from the already existing services are estimated from the current tariffs: The revenue for new services is calculated from the tentative tariff schedule described in CHAPTER 10, SECTION I, PART III. Further, the revenue estimate is only conducted on the main services, excluding minor services of small percentages in the overall revenue picture.

2-1 Number of Chargeable Facilities

The facilities to generate revenue are determined in accordance with the "DEMAND FULFILLMENT PLAN" of CHAPTER 6, SECTION I, PART III.

2-2 Revenue Unit Rate

The revenue unit rates of the existing services are based upon the revenue per facility of recent installation; the revenue unit rates of new services are based on the unit revenue rate per facility deduced from the tentative tariff schedule shown in Table III-I-44.

2-2-1 Subscriber telephones

The revenue unit rates (monthly) which add up both basic rates and message rates are as follows:

Capital		10,376 Guaranies
Interior	Automatic office	11,167 Guaranies
	Manual office	4,689 Guaranies

2-2-2 Public telephones

The average revenue (monthly) per public telephone in 1980 was 13,012 Guaranies, which is used as the basis to obtain the revenue unit rate of public telephones.

When the toll dialing service of public telephone is introduced, the unit revenue rate should be expected to increase, but for estimation purposes this time, the above-mentioned unit revenue rate is taken as the basis.

2-2-3 Rural telephones

We have assumed the revenue per rural subscriber telephone including both basic and message rates to be 5,975 Guaranies per month. The revenue per rural public telephone is calculated at 11,850 Guaranies (monthly).

2-2-4 Land mobile radio telephone

We assume the revenue per unit to be 34,731 Guaranies (monthly) including both the basic and message rates.

2-2-5 Telex service

Since the recent record of revenue per telex terminal shows a figure of 47,236 Guaranies (monthly), including both basic rate and communication rate, we are using it as the unit revenue rate for this item.

2-2-6 Ship communication

We are using the ship communication service revenue of 1981 in order to make an estimate for the Master Plan period.

Further, we have eliminated the already-contracted projects included in the 1st 5-year plan in making up this estimate.

The estimated results of revenues worked out by the above-mentioned method are given in Table IV-I-3.

Unit: Foreign currency: Million U.S. Dollars
 Local currency : Million Guaranies
 * : Million Guaranies

Table IV-I-1 Investment plan of domestic telecommunications

Item	1983		1984		1985		1986		1987		1988		1989		1990		1991		1992		1993		1994		1995		1996		1997		Total	
	Foreign	Local	Foreign	Local	Foreign	Local	Foreign	Local	Foreign	Local	Foreign	Local	Foreign	Local	Foreign	Local	Foreign	Local	Foreign	Local	Foreign	Local	Foreign	Local	Foreign	Local	Foreign	Local	Foreign	Local	Foreign	Local
Subscriber's telephone									0.74	8	0.98	33	0.79	37	1.15	40	1.54	44	1.37	48	1.54	52	1.54	55	1.10	59	0.99	62	0.25	48	11.99	486
Public telephone									0.13	0	0.17	0	0.17	0	0.17	0	0.17	0	0.17	0	0.17	0	0.17	0	0.17	0	0.17	0	0.04	0	1.70	0
Rural telephone									1.79	53	2.01	195	2.26	165	1.92	195	1.86	149	1.80	150	1.77	148	1.79	148	1.80	148	2.66	168	0.73	170	20.39	1,689
Local exchange									14.04	51	15.44	209	13.76	210	17.13	183	16.73	196	17.24	176	20.23	206	16.75	158	16.88	137	15.98	165	3.88	116	168.06	1,807
Toll exchange									1.17	2	1.09	7	0.53	4	0.10	2	1.52	3	1.33	9	0.62	5	0.12	2	2.11	3	1.64	11	0.31	5	10.54	53
Subscriber's cable									11.57	278	15.56	1,107	14.53	1,095	11.56	1,086	18.87	1,128	23.21	1,440	23.60	1,482	22.29	1,505	17.25	1,458	15.57	1,384	3.88	1,052	177.89	13,015
Junction									5.30	14	1.77	41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7.07	55
Trunk transmission line									9.42	45	11.59	185	5.48	165	2.72	50	1.95	26	2.12	18	2.71	29	1.00	25	5.15	27	1.79	69	0.04	5	43.97	644
Mobile radio communications									0	0	5.83	5	1.94	16	1.93	2	3.13	5	0.83	0	0	0	3.31	3	1.11	10	0	0	0	0	18.08	41
Telegraph, Telex and Data communication									0	0	2.25	1	2.52	12	2.78	13	2.64	14	2.35	14	3.43	14	3.33	16	2.80	14	2.51	14	0.61	10	25.22	124
Sub-total	(0.94) 0.94	0	(10.04) 10.04	(221) 221	(16.73) 16.73	(44) 44	(3.90) 3.90	(936) 936	(0.92) 45.08	451	(2.48) 59.17	1,785	41.98	1,704	39.46	1,571	48.41	1,565	50.42	1,855	54.07	1,936	50.30	1,912	48.37	1,856	41.31	1,873	9.74	1,406	(35.01) 519.92	(1,201) 19,115
Authorized plan (contracted)	*	2,335	*	3,120	*	3,120	*	3,120	*	780																					*	12,475
Total	*	2,453	*	4,606	*	5,272	*	4,547	*	6,911	*	9,240	*	6,994	*	6,543	*	7,665	*	8,208	*	8,749	*	8,250	*	7,951	*	7,078	*	2,633	*	97,100

Note: 1. The amount for Authorized plan (contracted) shows the estimated annual investment.
 2. The amount with parentheses shows the investment for authorized plan (DTS, Rural telephone introduction plan), which is included in the amount without parentheses in "Sub-total".



Table IV-I-2 Operation and maintenance cost of domestic telecommunications project

Unit: Million guaranies

Year	Operating cost	Maintenance cost	Total
1983	0	0	0
1984	0	0	0
1985	1	7	8
1986	8	21	29
1987	9	62	71
1988	356	301	657
1989	851	494	1,345
1990	1,637	633	2,270
1991	2,621	777	3,398
1992	3,743	964	4,707
1993	4,935	1,145	6,080
1994	6,180	1,341	7,521
1995	7,501	1,517	9,018
1996	8,885	1,692	10,577
1997	10,348	1,841	12,189
1998	11,099	1,841	12,940
1999	11,099	1,841	12,940
2000	11,099	1,841	12,940
2001	11,099	1,841	12,940
2002	11,099	1,841	12,940
2003	11,099	1,841	12,940
2004	11,099	1,841	12,940
2005	11,090	1,820	12,910

Year	Operating cost	Maintenance cost	Total
2006	11,090	1,820	12,910
2007	11,090	1,820	12,910
2008	9,611	1,540	11,151
2009	8,454	1,347	9,801
2010	7,567	1,208	8,775
2011	6,246	1,064	7,310
2012	4,547	877	5,424
2013	3,129	696	3,825
2014	1,808	500	2,308
2015	803	324	1,127
2016	206	149	355
Total	200,409	36,847	237,256

Note: This table does not include the operation and maintenance cost of the authorized projects (contracted) for the 1st five-year period.

Table IV-I-3 Annual revenue of domestic telecommunications project

Unit: Million guaranies

Service Year	Ordinary telephone	Public telephone	Rural telephone	Land mobile telephone	Telex	Total
1983	0	0	0	0	0	0
1984	0	0	0	0	0	0
1985	0	0	27	0	0	27
1986	0	0	77	0	0	77
1987	0	0	51	0	0	51
1988	2,886	23	115	0	0	3,024
1989	5,388	70	124	0	128	5,710
1990	8,751	117	161	67	298	9,394
1991	12,102	164	169	126	484	13,045
1992	16,144	211	188	188	680	17,411
1993	19,917	258	208	256	861	21,500
1994	24,157	304	226	331	1,087	26,105
1995	28,523	351	245	414	1,291	30,824
1996	33,192	398	265	504	1,489	35,848
1997	38,108	445	304	604	1,674	41,135
1998	36,029	468	267	559	1,707	39,030
1999	36,029	468	267	559	1,707	39,030
2000	36,029	468	267	559	1,707	39,030
2001	36,029	468	267	559	1,707	39,030
2002	36,029	468	267	559	1,707	39,030
2003	36,029	468	267	559	1,707	39,030
2004	36,029	468	267	559	1,707	39,030
2005	36,029	468	216	559	1,707	38,979

Service Year	Ordinary telephone	Public telephone	Rural telephone	Land mobile telephone	Telex	Total
2006	36,029	468	216	559	1,707	38,979
2007	36,029	468	216	559	1,707	38,979
2008	30,265	421	189	559	1,707	33,141
2009	26,497	374	170	559	1,551	29,151
2010	23,732	327	142	514	1,377	26,092
2011	19,490	280	123	457	1,189	21,539
2012	13,952	233	104	399	990	15,678
2013	9,371	187	85	334	813	10,790
2014	5,190	140	66	262	577	6,235
2015	2,065	93	47	183	380	2,768
2016	361	46	28	96	181	712
Total	680,381	9,122	5,631	11,443	33,827	740,404

Note: This table does not include the revenue of the authorized projects (contracted) for the 1st five-year period.

SECTION II INTERNATIONAL TELECOMMUNICATIONS

CHAPTER 1 PROJECT COST ESTIMATE

1-1 Construction Cost Estimate

The construction cost is estimated based upon the conditions in item (1) explained at the INTRODUCTION of PART IV.

The calculated results are shown in Table IV-II-1; the estimated construction cost amounts to 3.9 billion Guaranies, the breakdown of which includes 28 million U.S. Dollars as the foreign currency portion and 373 million Guaranies as the local currency portion.

1-2 Operation and Maintenance Cost Estimate

The operation and maintenance cost estimate is worked out based on the following formula:

$$\text{Maintenance cost} = \text{Construction cost} \times \text{maintenance cost ratio}$$

$$\text{Operation cost} = \text{Revenue} \times \text{operation cost ratio}$$

The maintenance cost and operation cost for the international telecommunications is worked out based upon the following values:

$$\text{Maintenance cost ratio} = 0.018$$

$$\text{Operation cost ratio} = 0.18$$

The operation and maintenance costs obtained from the above-mentioned method are shown in Table IV-II-2.

CHAPTER 2 REVENUE ESTIMATE

The revenue estimates for respective services are shown in Table IV-II-3. This estimate is worked out based upon the forecast traffic increase and the unit revenue rates for respective services described below:

- (1) International telephone charge per minute

$$\frac{1,382,669,089 \text{ (Sales amount)}}{3,283,318 \text{ (Minutes originated)}} = 421 \text{ Guaranies}$$

- (2) International telex charge per minute

$$\frac{368,540,270 \text{ (Sales amount)}}{808,557 \text{ (Minutes originated)}} = 456 \text{ Guaranies}$$

- (3) International facsimile charge per a facsimile message

$$\text{US\$6.45*} = 813 \text{ Guaranies}$$

* Refer to the item under the title of "Public Facsimile" in the "BASIC POLICIES OF THE MASTER PLAN" in CHAPTER 2 of PART III, SECTION II.

Further, the revenue expected of the leased lines has been omitted from this estimate due to their negligibly small estimated demand.

Table IV-II-1 Investment plan of international telecommunications

Unit: Foreign currency: Million U.S. Dollars
Local currency : Million Guaranies

Item	1983		1984		1985		1986		1987		1988		1989		1990		1991		1992		1993		1994		1995		1996		1997		Total	
	Foreign	Local	Foreign	Local	Foreign	Local	Foreign	Local	Foreign	Local	Foreign	Local	Foreign	Local	Foreign	Local	Foreign	Local	Foreign	Local	Foreign	Local	Foreign	Local	Foreign	Local	Foreign	Local	Foreign	Local		
Increment of circuits	0	0	0	0	0.87	6	0	0	0	0	0	0	0	0	0.61	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.52	20
Grade up of Areguá E/S	0	0	0	0	0	0	0	0	0	0	0.35	5	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.53	45
Introduction of I.S.D.	1.06	3	3.39	11	0.76	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5.21	16
BUREAU FAX introduction	0.17	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.17	5
2nd earth station	0	0	0	0	0	0	0	0	0	0	0	0	2.18	35	0	0	6.52	100	3.90	62	0	0	0	0	0	0	0	0	0	0	12.60	197
Grade up of I.N.T.S.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	
I.N.T.S. replacement	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.30	20	0	40	1.90	19	0.44	10	5.64	89
Total	1.23	8	3.39	11	1.63	8	0	0	0	0	0.35	5	2.18	40	0.61	8	6.52	100	3.90	63	0.01	1	2.16	39	1.35	61	3.90	19	0.44	10	27.67	373



Table IV-II-2 Operation and maintenance cost of international telecommunications project

Unit: Million guaranies

Year	Operating cost	Maintenance cost	Total
1983	0	0	0
1984	0	11	11
1985	33	15	48
1986	67	15	82
1987	76	15	91
1988	84	16	100
1989	93	21	114
1990	106	23	129
1991	111	39	150
1992	429	49	478
1993	469	49	518
1994	506	55	561
1995	1,076	59	1,135
1996	1,545	68	1,613
1997	1,639	69	1,708
1998	1,734	69	1,803
1999	1,832	69	1,901
2000	1,933	69	2,002
2001	2,035	69	2,104
2002	2,141	69	2,210
2003	2,249	69	2,318
2004	2,359	55	2,414
2005	2,472	55	2,527

Year	Operating cost	Maintenance cost	Total
2006	2,588	55	2,643
2007	2,147	54	2,201
2008	2,235	54	2,289
2009	2,325	52	2,377
2010	2,416	52	2,468
2011	2,509	20	2,529
2012	1,016	20	1,036
2013	1,058	20	1,078
2014	1,102	15	1,117
2015	1,147	15	1,162
2016	1,194	15	1,209
Total	42,726	1,400	44,126

Table IV-II-3 Annual revenue of international telecommunications project

Unit: Million guaranies

Service Year	Telephone	Telex	Fax	Total
1983	0	0	0	0
1984	0	0	2	2
1985	181	0	5	186
1986	363	0	8	371
1987	409	0	11	420
1988	452	0	15	467
1989	500	0	18	518
1990	567	0	22	589
1991	592	0	27	619
1992	647	1,709	28	2,384
1993	700	1,878	30	2,608
1994	756	2,057	0	2,813
1995	3,734	2,245	0	5,979
1996	6,144	2,442	0	8,586
1997	6,457	2,648	0	9,105
1998	6,772	2,862	0	9,634
1999	7,094	3,085	0	10,179
2000	7,421	3,316	0	10,737
2001	7,753	3,555	0	11,308
2002	8,091	3,804	0	11,895
2003	8,434	4,060	0	12,494
2004	8,782	4,326	0	13,108

Service Year	Telephone	Telex	Fax	Total
2005	9,136	4,598	0	13,734
2006	9,495	4,882	0	14,377
2007	9,859	2,069	0	11,928
2008	10,229	2,189	0	12,418
2009	10,604	2,312	0	12,916
2010	10,984	2,439	0	13,423
2011	11,370	2,569	0	13,939
2012	2,941	2,703	0	5,644
2013	3,040	2,839	0	5,879
2014	3,140	2,981	0	6,121
2015	3,242	3,130	0	6,372
2016	3,347	3,286	0	6,633
Total	163,236	73,984	166	237,386

SECTION III RADIO REGULATION AND MONITORING

CHAPTER 1 PROJECT COST ESTIMATE

1-1 Facilities Construction and Maintenance Cost Estimate

As the facilities construction cost for radio regulation and monitoring, the following facilities construction and maintenance cost estimate shall apply:

- (1) Equipment & facilities installation and maintenance costs for radio regulation

Equipment cost such as measuring instruments, etc., necessary for the inspection of radio stations, are estimated.

Further, the costs for the calibrating equipment necessary for maintaining the specified performances of various equipments are included in the estimate.

- (2) Equipment & facilities installation and maintenance costs for radio monitoring

Equipment & facilities installation and maintenance costs necessary for radio monitoring are included in the estimate. Further, facilities for maintaining the equipment & facilities for radio regulation and monitoring have been included in the estimate.

- (3) Other equipment & facilities

A contingent account is provided to purchase contingent items of equipment which might become necessary in addition to existing facilities.

In the project cost is included the equipment for training. The total construction cost for these items amounts to

810 million Guaranies, which include a foreign currency portion of 4.88 million U.S. Dollars and a local portion of 193 million Guaranies. Table IV-III-1 shows the investment plan for radio regulation and monitoring.

1-2 Operation Cost Estimate

Included in the operation cost are maintenance costs for the facilities and operational consumables. The former includes the expenses for maintenance, repair, and installation work. These costs are roughly equivalent to 10% of the investment cost of this category.

Table IV-III-2 shows the operating cost estimate. As additional reference, we have included the sum of the investment cost and operating cost in Table IV-III-3.

Table IV-III-1 Investment plan of radio regulation and monitoring

Unit: Foreign currency: Million U.S. Dollars
Local currency : Million Guaranies

Item Year	Radio monitoring facilities		Other facilities		Inspection equipment	Calibration equipment	Maintenance equipment	Training facilities		Total	
	Foreign currency	Local currency	Foreign currency	Local currency				Equipment	Maintenance	Foreign currency	Local currency
1983	0.15	8	0.02	3	0.11	0	0	0.12	5	0.40	16
1984	0.85	0	0.02	3	0	0	0	0	5	0.87	8
1985	0.43	19	0.02	3	0	0	0.03	0	5	0.48	27
1986	0.43	22	0.02	3	0	0	0	0	5	0.45	30
1987	0.09	2	0.02	3	0	0.08	0	0	5	0.19	10
1988	0.09	1	0.02	3	0	0	0	0	5	0.11	9
1989	0.08	1	0.02	3	0	0	0	0	5	0.10	9
1990	0	0	0.02	3	0	0	0	0	5	0.02	8
1991	0	0	0.02	3	0	0	0	0	5	0.02	8
1992	0	0	0.02	3	0	0	0	0	5	0.02	8
1993	0.11	0	0.02	3	0.11	0	0	0.12	5	0.36	8
1994	0.84	0	0.02	3	0	0	0	0	5	0.86	8
1995	0.40	0	0.02	3	0	0	0.03	0	5	0.45	8
1996	0.43	20	0.02	3	0	0	0	0	5	0.45	28
1997	0.08	0	0.02	3	0	0	0	0	5	0.10	8
Total	3.98	73	0.30	45	0.22	0.08	0.06	0.24	75	4.88	193

Table IV-III-2 Operation cost of radio regulation and monitoring

Unit: Foreign currency: Million U.S. Dollars
Local currency : Million Guaranies

Year \ Item	Facilities maintenance		Articles of consumption		Total	
	Foreign currency	Local currency	Foreign currency	Local currency	Foreign currency	Local currency
1983	0	0	0.02	3	0.02	3
1984	0.01	1	0.02	3	0.03	4
1985	0.10	1	0.02	3	0.12	4
1986	0.14	3	0.02	3	0.16	6
1987	0.19	5	0.02	3	0.21	8
1988	0.19	5	0.02	3	0.21	8
1989	0.20	5	0.02	3	0.22	8
1990	0.21	5	0.02	3	0.23	8
1991	0.21	5	0.02	3	0.23	8
1992	0.21	5	0.02	3	0.23	8
1993	0.21	5	0.02	3	0.23	8
1994	0.22	5	0.02	3	0.24	8
1995	0.31	5	0.02	3	0.33	8
1996	0.35	5	0.02	3	0.37	8
1997	0.39	5	0.02	3	0.41	8
Total	2.94	60	0.30	45	3.24	105

Table IV-III-3 Total expense of radio regulation and monitoring

Unit: Foreign currency: Million U.S. Dollars
Local currency : Million Guaranes

Year	Investment		Operation cost		Total	
	Foreign currency	Local currency	Foreign currency	Local currency	Foreign currency	Local currency
1983	0.40	16	0.02	3	0.42	19
1984	0.87	8	0.03	4	0.90	12
1985	0.48	27	0.12	4	0.60	31
1986	0.45	30	0.16	6	0.61	36
1987	0.19	10	0.21	8	0.40	18
1988	0.11	9	0.21	8	0.32	17
1989	0.10	9	0.22	8	0.32	17
1990	0.02	8	0.23	8	0.25	16
1991	0.02	8	0.23	8	0.25	16
1992	0.02	8	0.23	8	0.25	16
1993	0.36	8	0.23	8	0.59	16
1994	0.86	8	0.24	8	1.10	16
1995	0.45	8	0.33	8	0.78	16
1996	0.45	28	0.37	8	0.82	36
1997	0.10	8	0.41	8	0.51	16
Total	4.88	193	3.24	105	8.12	298

SECTION IV NATIONAL EDUCATIONAL TV BROADCASTING

CHAPTER 1 PROJECT COST ESTIMATE

1-1 Construction Cost Estimate

(1) Construction cost

The costs are calculated in accordance with the common conditions in Item (1) explained at the INTRODUCTION of PART IV. The costs of the infrastructure for this project will be treated in a separate project; therefore they are excluded from this estimate.

The construction costs break-down is as shown below (including both foreign and local currency portions):

- 1) Studio and transmitting facilities
3,618 million Guaranies
- 2) Station buildings and TV towers
2,083 million Guaranies
- 3) Allocation of TV receiving facilities
383 million Guaranies
- 4) Consultant fees for broadcasting equipment and
architecture
421 million Guaranies

(2) Expenses particularly needed for the training of personnel

The facilities particularly needed for the training of the program and technical personnel to be engaged for the national educational television are estimated. (For details of the facilities, refer to Item 3-4-1, SECTION V, PART III.) Miscellaneous other operational expenses to run these facilities are excluded from this estimate.

(3) Total construction cost

The results of calculation based on (1) and (2) above are shown in Table IV-IV-1.

The total construction cost estimate amounts to 6,618 million Guaranies, of which the foreign currency portion amounts to 46.8 million U.S. Dollars, and the local portion 722 million Guaranies.

1-2 Operation and Maintenance Cost Estimate

1-2-1 Operational expenses estimate

Operational expenses of technical facilities include expenses for supplying articles of consumption, daily maintenance work of facilities, repair of failed equipment as well as power supply, fuel, etc. Operational expenses of office work and management include expenses for the repair of broadcasting buildings and their attached facilities, supply of general office articles and so on. Operational expenses for program production means the expenses for purchasing VTR tapes for production, reference and preservation of broadcasting programs, general expenses to produce programs, and others.

Recent broadcasting equipment uses mostly solid-state devices of very low failure rate, and main articles of consumption are VTR heads, pickup tubes for color cameras, color picture tubes, transmitting tubes for final stages and bulbs for studio lighting.

It is expected that in the early stage of the development of the national educational television, total operating hours will be comparatively long because of the use of equipment for training purposes, although broadcasting hours will be rather short. Assuming that the daily broadcasting hours will be three hours, the renewal of parts due to wear will be limited to those

related studio facilities, except for accidental failures. The renewal of transmitting tubes of the TV transmitters will not be necessary for quite a long period of time; probably every five years after the start of operation.

Besides those expenses, it is also necessary to take into account the expenses for maintenance of the buildings and other structures, like antennas and TV masts which have to be overhauled and painted to prevent rusts.

A considerable time may be needful for the supply of the spare parts and repairing the failed equipment by the manufacturers. In view of this, it is desirable that enough spare parts to cover about two years should be included in the plan of operation and maintenance cost.

As for the VTR tapes, it is necessary to supply them successively and systematically, according to a purchase plan based on tape operation plans including those for broadcasting and for other use.

The approximate life of each of the broadcasting buildings, structures like antennas and masts and electronic equipment like transmitters and studio equipment is as follows, provided that preventive maintenance is perfectly assured by specialists or manufacturers:

60 years	Broadcasting building
40 years	TV masts
20 years	Transmitters, transmitting antennas, electric power generators, OB vans
8 years	VTR, ENG cameras

An outline of intervals of periodical maintenance by specialists or manufacturers is as follows. Expenses for them must be taken into account.

* Checking and repairing of the broadcasting building should

be made every 10 years, and the attached equipment, such as air conditioners, should be renewed every 5 years.

- * Although it depends on the environmental conditions, TV masts should be repainted every 7 to 10 years.
- * Cavities for transmitting tubes should be overhauled every 5 years.
- * Transmitting antennas should be checked every 3 years, and should be thoroughly overhauled every 10 years.
- * Electric power generators should be given an overhaul every 4 years.
- * As for cameras, lenses should be checked every 3 years, which condensers in the equipment should be replaced every 8 years.
- * OB vans should be overhauled at every running distance of about 20,000 km.

Following are the estimated expenses by items during the planned period, calculated under the above-mentioned conditions as well as on the basis of the broadcasting hours and the number of programs, which are stated in "3 - 1 Program Compilation Plan" and "3 - 7 Program Production Plans" of PART III, SECTION IV.

- (1) Operational expenses necessary for power supply and fuel 353 million Guaranies
- (2) Operational expenses necessary for program production 1,618 million Guaranies
- (3) Operational expenses necessary for general management 1,083 million Guaranies
- (4) Operational expenses for maintenance of the buildings, equipment and facilities
 - 19 million Guaranies
 - in local currency
 - 1.39 million U.S. Dollars
 - in foreign currency
 - (175 million Guaranies)

1-2-2 Personnel cost estimate

The estimate is made on the basis of the required number of personnel as described in CHAPTER 4 of PART III, SECTION IV and the budget which will be granted by the Republic of Paraguay to the personnel engaged in the national educational television service.

1-2-3 Result of operation and maintenance cost estimate

The estimated cost (operational expenses and personnel cost) is shown in Table IV-IV-2.

The estimating conditions are similar to those applied to the construction cost estimate for both the operational expenses and personnel cost estimates.

Table IV-IV-1 Investment plan of national educational TV broadcasting

Unit: Foreign currency: Million U.S. Dollars
Local currency : Million Guaranies

Year	Construction cost		Personnel training facilities	Total	
	Foreign currency	Local currency		Foreign currency	Local currency
1983	0	0	0	0	0
1984	0	0	0.91	0.91	0
1985	2.66	234	0	2.66	234
1986	5.59	0	0	5.59	0
1987	5.98	86	0	5.98	86
1988	2.88	42	0	2.88	42
1989	2.88	42	0	2.88	42
1990	5.27	57	0	5.27	57
1991	3.46	51	0	3.46	51
1992	3.15	42	0	3.15	42
1993	3.21	42	0	3.21	42
1994	5.46	42	0	5.46	42
1995	2.90	42	0	2.90	42
1996	2.45	42	0	2.45	42
1997	0	0	0	0	0
Ttoal	45.89	722	0.91	46.80	722

Table IV-IV-2 Operation and maintenance cost of national educational TV broadcasting

Unit: Foreign currency: Million U.S. Dollars
Local currency : Million Guaranies

Year	Operational expenses		Personnel expenses	Total	
	Foreign currency	Local currency	Local currency	Foreign currency	Local currency
1983	0	0	0	0	0
1984	0	1	6	0	7
1985	0	1	24	0	25
1986	0	4	65	0	69
1987	0.02	80	104	0.02	184
1988	0.03	83	125	0.03	208
1989	0.06	89	144	0.06	233
1990	0.08	95	192	0.08	287
1991	0.08	103	217	0.08	320
1992	0.12	277	236	0.12	513
1993	0.18	354	255	0.18	609
1994	0.18	419	289	0.18	708
1995	0.18	502	310	0.18	812
1996	0.20	524	328	0.20	852
1997	0.26	541	331	0.26	872
Total	1.39	3,073	2,626	1.39	5,699

SECTION V MANPOWER DEVELOPMENT

CHAPTER I PROJECT COST ESTIMATE

1-1 Construction Cost Estimate

In making the construction cost estimate for the manpower development project, the following conditions are taken into consideration in addition to those common conditions in Item (1) explained at the INTRODUCTION of PART IV:

- (1) Basic structures to be included as part of the overall educational facilities, such as major common buildings, university electronics engineering faculty building, technical high school building, associated service facilities (libraries, documents preparation room, store houses, etc.) etc., are included in the foreign currency portion; also included in this portion are practice room, training equipment and its associated service equipment and apparatuses including measuring instruments.

General facilities such as students dormitory, buffet, recreation room, tower, swimming pools, etc. are included in the local currency portion.

- (2) We do not count the school site procurement costs, because ANTELCO's land is intended to be utilized for it, but some local currency expenditure is earmarked for readjusting the site. The construction cost estimate prepared in accordance with IPT's long-term extension program is shown in Table IV-V-1, the total estimated expenditure amounting to 5.95 billion Guaranies, comprising of 31.23 million U.S. Dollars of foreign currency portion and 2017 million Guaranies of local currency.

1-2 Operation Cost Estimate

The working budget for the operation of IPT for fiscal 1982 amounts to 83 million Guaranies in total, including an operating fund of 64 million Guaranies for personnel expenses and 19 million Guaranies for operating costs.

In Central and South Americas, the allocation of working expenses for training institute (e.g., paper, printing and other necessaries and consumables) is generally kept at a low level as a percentage of the total expenditure, but in IPT, they are relatively given a bigger share, so as to enable a greater scope of utilization of the available facilities and materials. The operating cost estimate planned in consideration of the past records and the long-term extension program of IPT is shown in Table IV-V-2.

Table IV-V-1 Investment plan of manpower development

Unit: Foreign currency: Million U.S. Dollars
Local currency : Million Guaranies

Year	Building & facilities		Equipment		Total	
	Foreign currency	Local currency	Foreign currency	Local currency	Foreign currency	Local currency
1983	0	20	0	0	0	20
1984	6.33	450	3.24	0	9.57	450
1985	0	142	0	15	0	157
1986	0	0	0	0	0	0
1987	0	0	0	0	0	0
1988	0	50	0	0	0	50
1989	6.52	450	4.05	0	10.57	450
1990	0	150	0	20	0	170
1991	0	0	0	0	0	0
1992	0	0	0	0	0	0
1993	0	0	0	0	0	0
1994	0	80	0	0	0	80
1995	6.96	500	4.13	0	11.09	500
1996	0	120	0	20	0	140
1997	0	0	0	0	0	0
Total	19.81	1,962	11.42	55	31.23	2,017

Note: This table shows only the investment in IPT expansion, and excludes the investment for the training equipment etc. included in the other projects.

Table IV-V-2 Operation cost of manpower development

Unit: Foreign currency: Million U.S. Dollars
 Local currency : Million Guaranies

Year \ Item	Foreign currency	Local currency
1983	0.33	90
1984	0.41	110
1985	0.41	120
1986	0.65	130
1987	0.65	140
1988	0.71	160
1989	0.80	180
1990	0.80	185
1991	0.80	190
1992	0.83	200
1993	0.83	205
1994	0.83	215
1995	0.83	230
1996	0.83	230
1997	0.83	230
Total	10.54	2,615

Note: This table shows only the operation cost for IPT.

SECTION VI TOTAL COST AND REVENUE

The construction cost, operation and maintenance cost, and the revenues (on domestic and international telecommunications services only) for respective fields comprising -- Domestic telecommunications, International telecommunications, Radio regulation and monitoring, National educational TV broadcasting and Manpower development -- are shown in Table IV-VI-1, Fig. IV-VI-1, Table IV-VI-2, and Table IV-VI-3.

The grand total of construction cost estimates covering all fields amounts to 114,339 million Guaranies, comprising 12,475 million Guaranies which are already contracted (a part of the 1st 5-year plan) and the remaining allotment of 101,864 million Guaranies: This latter allotment consists of 630.50 million U.S. Dollars of foreign currency portion and 22,420 million Guaranies of local currency.

Table IV-VI-1 Investment of Master Plan

Field	Currency	Unit	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	Total
Domestic telecommunications	Foreign currency	Million U.S. Dollars	0.94	10.04	16.73	3.90	45.08	59.17	41.98	39.46	48.41	50.42	54.07	50.30	48.37	41.31	9.74	519.92
	Local currency	Million Guaranies	0	221	44	936	451	1,785	1,704	1,571	1,565	1,855	1,936	1,912	1,856	1,873	1,406	19,115
	Total	Million Guaranies	118	1,486	2,152	1,427	6,131	9,240	6,994	6,543	7,665	8,208	8,749	8,250	7,951	7,078	2,633	84,625
International telecommunications	Foreign currency	Million U.S. Dollars	1.23	3.39	1.63	0	0	0.35	2.18	0.61	6.52	3.90	0.01	2.16	1.35	3.90	0.44	27.67
	Local currency	Million Guaranies	8	11	8	0	0	5	40	8	100	63	1	39	61	19	10	373
	Total	Million Guaranies	163	438	213	0	0	49	315	85	921	555	2	311	231	511	66	3,860
Radio regulation and radio monitoring	Foreign currency	Million U.S. Dollars	0.40	0.87	0.48	0.45	0.19	0.11	0.10	0.02	0.02	0.02	0.36	0.86	0.45	0.45	0.10	4.88
	Local currency	Million Guaranies	16	8	27	30	10	9	9	8	8	8	8	8	8	28	8	193
	Total	Million Guaranies	66	118	87	87	34	23	22	11	11	11	53	116	65	85	21	810
National educational television	Foreign currency	Million U.S. Dollars	0	0.91	2.66	5.59	5.98	2.88	2.88	5.27	3.46	3.15	3.21	5.46	2.90	2.45	0	46.80
	Local currency	Million Guaranies	0	0	234	0	86	42	42	57	51	42	42	42	42	42	0	722
	Total	Million Guaranies	0	115	569	704	839	405	405	721	487	439	446	730	407	351	0	6,618
Manpower development	Foreign currency	Million U.S. Dollars	0	9.57	0	0	0	0	10.57	0	0	0	0	0	11.09	0	0	31.23
	Local currency	Million Guaranies	20	450	157	0	0	50	450	170	0	0	0	80	500	140	0	2,017
	Total	Million Guaranies	20	1,655	157	0	0	50	1,782	170	0	0	0	80	1,897	140	0	5,951
Sub-total	Foreign currency	Million U.S. Dollars	2.57	24.78	21.50	9.94	51.25	62.51	57.71	45.36	58.41	57.49	57.65	58.78	64.16	48.11	10.28	630.50
	Local currency	Million Guaranies	44	690	470	966	547	1,891	2,245	1,814	1,724	1,968	1,987	2,081	2,467	2,102	1,424	22,420
	Total	Million Guaranies	367	3,812	3,178	2,218	7,004	9,767	9,518	7,530	9,084	9,213	9,250	9,487	10,551	8,165	2,720	101,864
Authorized plan (contracted)		Million Guaranies	*	*	*	*	*											12,475
Total		Million Guaranies	2,702	6,932	6,298	5,338	7,784	9,767	9,518	7,530	9,084	9,213	9,250	9,487	10,551	8,165	2,720	114,339
Authorized plan (ISD, DTS, Rural telephone) Note 2	Foreign currency	Million U.S. Dollars	2.00	13.43	17.49	3.90	0.92	2.48	0	0	0	0	0	0	0	0	0	40.22
	Local currency	Million Guaranies	3	232	46	936	0	0	0	0	0	0	0	0	0	0	0	1,217
	Total	Million Guaranies	255	1,924	2,250	1,427	116	312	0	0	0	0	0	0	0	0	0	6,284

Note 1: The amount marked with * shows the estimated annual investment.
 2: The amount described here is included in the above items.



9.8 Total amount of investment

- Manpower development
- National educational television broadcasting
- Radio regulation & monitoring
- International telecommunications
- Domestic telecommunications
- Contracted project

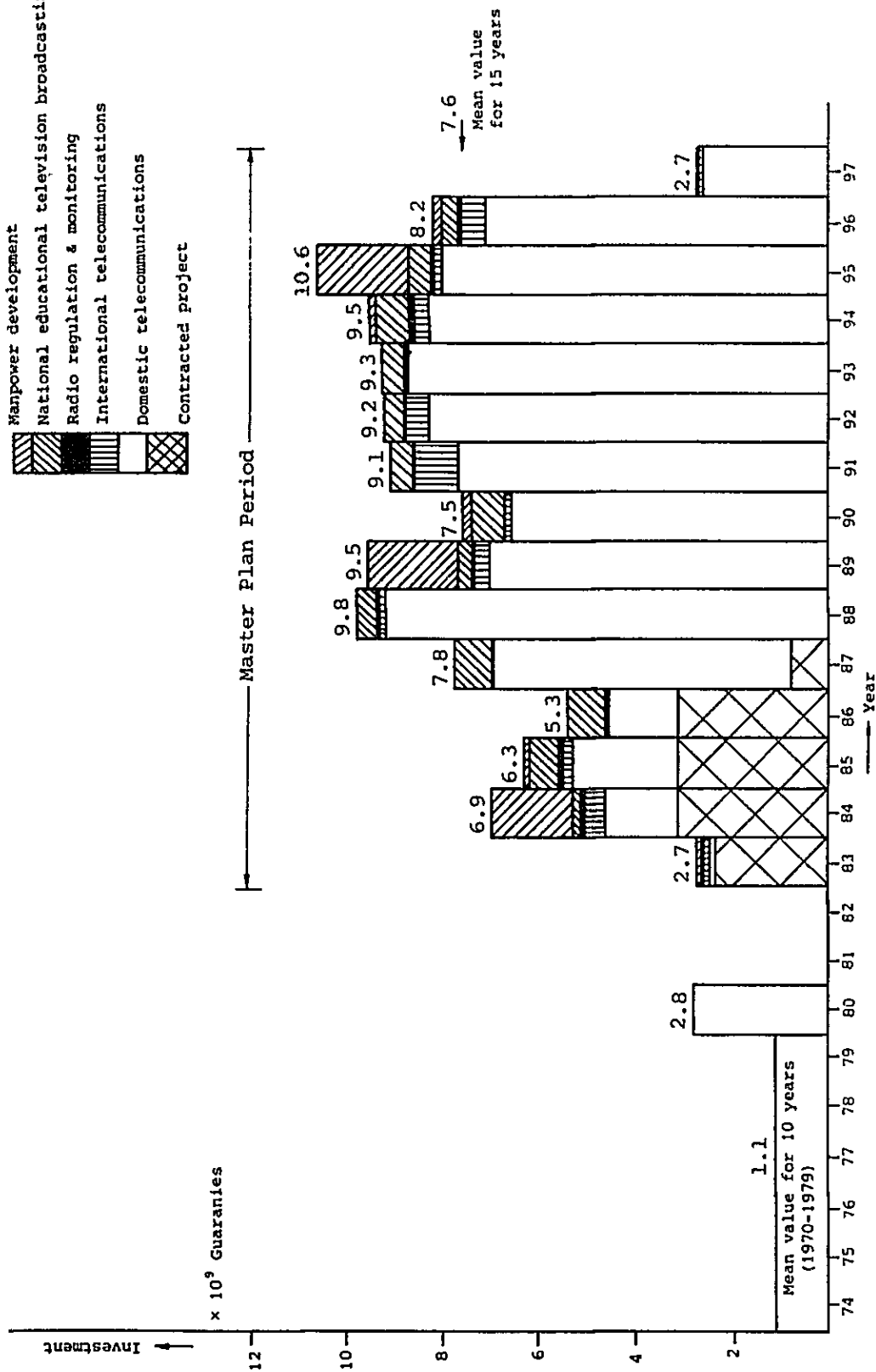


Fig. IV-VI-1 Investment of Master Plan

Table IV-VI-2 Operation and maintenance cost of Master Plan

Unit: Million Guaranies

Year	Domestic telecommunications	International telecommunications	Radio regulation & monitoring	National educational TV broadcasting	Manpower development	Total
1983	0	0	6	0	132	138
1984	0	11	8	7	162	188
1985	8	48	19	25	172	272
1986	29	82	26	69	212	418
1987	71	91	34	187	222	605
1988	657	100	34	212	249	1,252
1989	1,345	114	36	241	281	2,017
1990	2,270	129	37	297	286	3,019
1991	3,398	150	37	330	291	4,206
1992	4,707	478	37	528	305	6,055
1993	6,080	518	37	632	310	7,577
1994	7,521	561	38	731	320	9,171
1995	9,018	1,135	50	835	335	11,373
1996	10,577	1,613	55	877	335	13,457
1997	12,189	1,708	60	905	335	15,197
Total	57,870	6,738	514	5,876	3,947	74,945

Note: Operation and maintenance cost of domestic telecommunications does not include that of the authorized projects (contracted) for the 1st five-year period.

Table IV-VI-3 Annual revenue of Master Plan

Unit: Million Guaranies

Year	Domestic tele-communications	International telecommunications	Total
1983	0	0	
1984	0	2	2
1985	27	186	213
1986	77	371	448
1987	51	420	471
1988	3,024	467	3,491
1989	5,710	518	6,228
1990	9,394	589	9,983
1991	13,045	619	13,664
1992	17,411	2,384	19,795
1993	21,500	2,608	24,108
1994	26,105	2,813	28,918
1995	30,824	5,979	36,803
1996	35,848	8,586	44,434
1997	41,135	9,105	50,240
Total	204,151	34,647	238,798

Note: The revenue of domestic telecommunications does not include the revenue of the authorized projects (contracted) for the 1st five-year period.

PART V. EVALUATION

PART V. EVALUATION

CHAPTER 1. FUNDAMENTAL APPROACHES TO EVALUATION

The present Master Plan was worked out with Japan's technical cooperation offered at the request of the Paraguayan Government, but it is agreed that the Paraguayan Government would assume full and whole responsibilities for its formulation. Accordingly, its justifiability and legitimacy should be evaluated along the following judgement criteria, with specific consideration to the government's administrative functions — Paraguay's political and socio-economic development and managerial viewpoints of pertinent undertakings.

1. Judgement criteria based on the nation's political and socio-economic development
 - 1) Degree of contribution to the improvement of the people's daily lives and welfare, promotion of industries, performance of government functions including politics, administration and national security, and promotion of the national land development scheme.
 - 2) Adequacy of national demand prospects.
 - 3) Adequacy of service improvements and expansion for the people.
 - 4) Size of economic benefit as compared with cost.
2. Judgement criteria based on managerial viewpoints of pertinent undertakings (e.g., ANTELCO)
 - 1) Payability and profitability.
 - 2) Feasibility of fund raising and refunding.

- 3) Degree of equalization of equipment investment (construction investment).
 - 4) Excess/shortage of equipment investment.
 - 5) Coordination between the long-term Master Plan, annual development plans, and management (planning, operation, and data feedback to planning stage).
3. Judgement criteria based on the world's technological level or trends.
- 1) Efforts to catch up with the world's technological level or trends.
 - 2) Introduction of new technologies and services.
 - 3) Inter-field coordination and adjustment.

Evaluation along the above judgement criteria is given in Table V-1 for each field-wise development plan. A conclusive overall evaluation of the Master Plan is given in the following chapters, followed by a detailed elucidation of its profitability (financial analysis) and socio-economic impacts (economic analysis) given under separate headings.

Table V-1 Summary of Master Plan evaluation

Development field Judgement criteria	Domestic telecommunications	International telecommunications	Radio regulation and monitoring	National educational TV broadcasting	Manpower development
<p>1. Judgement criteria based on Paraguay's political and socio-economic development</p> <p>1) Degree of contribution to the improvement of the people's lives and national land development scheme.</p> <p>2) Adequacy of national demand prospects.</p> <p>3) Justifiability of service improvements and expansions.</p> <p>4) Economic benefit (economic analysis)</p>	<p>1) Optimized plan at present, formulated by discussing all prevailing problems to the root to with Paraguayan policy-making authorities.</p> <p>2) Presupposes certain conditions (e.g., economic growth rate).</p> <p>3) Well balanced.</p> <p>4) IRR set at 36.7% surpasses that of capital opportunity cost in Paraguay. (Total of domestic and international: 38.1%)</p>	<p>1) Same as left.</p> <p>2) Presupposes certain conditions (e.g., traffic estimate).</p> <p>3) Same as left.</p> <p>4) IRR set at 47.1% surpasses that of capital opportunity cost in Paraguay.</p>	<p>1) Same as left.</p> <p>2) No specific problems involved.</p> <p>3) An integrated modified plan.</p> <p>4) Not determined yet.</p>	<p>1) Same as left, but institutional scheme to attain a higher viewing rate is necessary to obtain the expected result.</p> <p>2) Same as left.</p> <p>3) A well-balanced plan.</p> <p>4) Not determined yet.</p>	<p>1) An optimum plan.</p> <p>2) Same as left.</p> <p>3) Same as left.</p> <p>4) No specific problems involved.</p>
<p>2. Judgement criteria based on managerial viewpoints of relevant undertakings</p> <p>1) Payability and profitability.</p> <p>2) Feasibility of fund raising and refunding.</p> <p>3) Equalization of equipment investment.</p> <p>4) Excess/shortage of equipment investment.</p> <p>5) Linkage between Master Plan and management policies.</p>	<p>1) FIRR set at 24.6% (Total of domestic and international telecommunications: 27.4%).</p> <p>2) Net profit exceeds repayment requirement, and fund raising capacity is large enough.</p> <p>3) All problems discussed to the root for investment equalization.</p> <p>4) Balanced and optimized.</p> <p>5) Reexamination of Master Plan and feedback of relevant data to the management level are important.</p>	<p>1) FIRR set at 45.4%.</p> <p>2) Same as left.</p> <p>3) Same as left.</p> <p>4) Same as left.</p> <p>5) Same as left.</p>	<p>1) Not determined yet (Revenue estimate including commission required).</p> <p>2) Not determined yet (revenue estimate including commission required).</p> <p>3) Same as left.</p> <p>4) Same as left.</p> <p>5) Same as left.</p>	<p>1) Not determined yet (Legislation necessary).</p> <p>2) Not determined yet (legislation necessary).</p> <p>3) Same as left.</p> <p>4) Same as left.</p> <p>5) Same as left.</p>	<p>1) No problems involved in ANTELCO's internal organization.</p> <p>2) Examination from a public point of view necessary.</p> <p>3) Same as left.</p> <p>4) Same as left.</p> <p>5) Same as left.</p>



Development field: Judgement criteria	Domestic telecommunications	International telecommunications	Radio regulation and monitoring	National educational TV broadcasting	Manpower development
<p>3. Judgement criteria based on world's technological level or trends</p> <p>1) Efforts to catch up with world level or trends.</p> <p>2) Adequacy of new technology introduction.</p> <p>3) Inter-field coordination.</p>	<p>1) A well-balanced plan formulated with consideration to the trends in the worlds.</p> <p>2) Balanced according to the national needs and economic efficiency.</p> <p>3) Satisfactory at the present stage.</p>	<p>1) Same as left.</p> <p>2) Same as left.</p> <p>3) Same as left.</p>	<p>1) Same as left.</p> <p>2) Same as left.</p> <p>3) Same as left.</p>	<p>1) Same as left.</p> <p>2) Same as left.</p> <p>3) Same as left.</p>	<p>1) Same as left.</p> <p>2) Same as left.</p> <p>3) Same as left.</p>

CHAPTER 2. EVALUATION FROM POLITICAL AND SOCIO-ECONOMIC VIEWPOINTS

1. Overall Evaluation from National Socio- Economic Development

The Master Plan can be evaluated as an optimized plan that can be produced at present because each field-wise development plan was formulated by discussing with the Paraguayan policy-making authorities on all problems pertaining to the 1) degree of contribution to the people's livelihood improvement and the national land development schema, 2) national demand prospects, 3) service improvement, and 4) economic benefit, and by giving precedence to the Paraguayan authorities' policies and judgement.

2. Cautions

Attention must be given to the following two points.

- 1) To attain the desired level of contribution to the people's livelihood and the national land development scheme, the national educational TV broadcasting will be required to cover the drawbacks of the current educational system or play a substitutive and supplementary role in school education. This presupposes the maintenance of a certain viewing rate and consequently calls for institutional scheme for attaining it.
- 2) The national demand prospects are based on certain preconditions such as the growth rate of economy and population. It is necessary to watch the future changes in these preconditions and the resultant influence on the national demand.

CHAPTER 3. EVALUATION FROM MANAGERIAL VIEWPOINTS

1. Evaluation along Financial Aspect including Profitability

Along two judgement criteria of 1) payability and profitability and 2) fund raising and refunding feasibility, the domestic and international telecommunications development plans can be evaluated as having an ample fund raising capacity and producing a net profit surpassing the repayment requirement and an internal rate of return of 27.4% (FIRR) and 38.1% (IRR), as described in additional Chapters 1. and 2. As for the radio regulation and monitoring plan and the national educational TV broadcasting plan, however, it is necessary to formulate measures for securing the income (or subsidy) in a quantitative basis required for their normal operation.

2. Evaluation along Equipment Investment Equalization

Seen along the equipment (construction) investment aspect, it can be said that efforts for its equalization were made in formulating all field-wise development plans. Along the excess/shortage of equipment investment, it can be said that the investment was optimized with due consideration to customer service, fault prevention and other important matters.

3. Evaluation along Coordination between Master Plan, Individual Annual Plan, and Management (planning, operation, data feedback to planning level)

As described in Item 8 of Summary (Remarks), the Master Plan needs to be reexamined and modified according to the changes in management environment, in order to be able to establish adequate annual plans and management targets and to ensure a data flow in a cycle of planning, operation and re-examination.

CHAPTER 4. EVALUATION FROM WORLD TECHNOLOGICAL LEVEL AND TREND VIEWPOINTS

1. Evaluation along Efforts to catch up with World Level and Trends and Introduction of New Technologies

It can be said that the Master Plan was formulated for balanced introduction of new technologies by discussing all relevant problems to the root with the Paraguayan policy-making authorities, with careful consideration to the economic efficiency and national need of high technologies such as introduction of digital communication networks, optical fiber communication, satellite communication, and data communications.

As for the judgement criterion 3-3) inter-field technical coordination, the Master Plan is formulated to ensure unified, integrated implementation of all field-wise plans, as described in the section dealing with inter-field coordination in PART III, SECTION VI. When the Master Plan is put in operation, the inter-field coordination efforts should be redoubled for smooth introduction of new technologies and services and for efficient operation of relevant organizations.

CHAPTER 5. OVERALL EVALUATION

Evaluation along the degree of contribution to Paraguay's national development and from the viewpoint of world's technological level/trend is rather difficult because of the multiplicity of judgement standards that can be established for such evaluation. It may nevertheless be said that even along these two criteria, the Master Plan can be evaluated as a most well-balanced plan formulated to satisfy given conditions by boiling down all prevailing problems with the Paraguayan policy-making authorities. Judging from the managerial viewpoint of ANTELCO, the Master Plan can also be evaluated as satisfying financial conditions.

In this sense, the Master Plan can be fully justified as of today, but it is naturally necessary to keep a watchful eye over any future changes in its preconditions and problems.

ADDITIONAL CHAPTER 1. PROFITABILITY OF MASTER PLAN
(FINANCIAL ANALYSIS)

Revenue and Expenditure Plan
and Internal Rate of Return

The following financial analysis is made for two of the five field-wise development plans covered by the Master Plan, the domestic telecommunications development plan and the international telecommunications development plans. The radio regulation and monitoring plan and the national educational TV broadcasting plan are excluded because no clear-cut picture in terms of quantity has yet been obtained as to the scheme for securing the necessary amount of revenue (or subsidy). The manpower development plan was also excluded because it is to be carried out by the ANTELCO's internal organization.

1. Revenue and Expenditure Plan

Tables V-2 ~ V-5 show the revenue and expenditure estimations for the domestic and international telecommunications development plans based on the preconditions given in Reference No. 1. These tables, showing the results of trial calculations, indicate the following facts which are described in detail in References No. 2. and 3.

- a) Revenue will surpass expenditure by a large margin throughout the 15-year period, indicating that the revenue and expenditure plan is highly satisfactory.
- b) Net profit will also surpass repayment requirement by a large margin, indicating that sufficient fund raising capacity can be guaranteed.

Note: The revenue and expenditure plan is a trial profit and loss statement of the Master Plan, and the term

"net profit" used therein differs from the revenue/ expenditure balance, or the cash flow, referred to Item 2 (Internal Rate of Return).

Reference No. 1 Preconditions for Revenue and Expenditure Calculation

1. Revenue, Operation Cost, and Maintenance Cost

Values obtained from the financial analysis of the domestic and international telecommunications plans presented in this report are used.

2. Capital Cost

- (1) Loan agreement is assumed to be concluded for every 3 years' fund requirement, with a deferment term of 3 years.
- (2) Nothing is determined yet as to the sources of fund supply, but the interest was calculated with the opportunity cost of capital in Paraguay taken at 12%.
- (3) Repayment period is assumed to be 10 years.

3. Depreciation Expenses

- (1) Durable period is taken at 20 years.
- (2) Residual value is assumed to be zero.

Reference No. 2 Revenue and Expenditure Characteristics
of Master Plan

Table V-2 (Revenue & expenditure and repayment plan) is a trial profit and loss statement prepared on the assumption that the domestic and international telecommunications development plans will be carried out on certain preconditions by a single enterprise. The table indicates the following characteristics.

1. The expenditure/revenue ratio is expected to maintain a high level of 44% throughout the 15-year period, with the revenue amounting to \$977.8 billion, surpassing the expenditure of \$427.6 billion.
2. A deficit will be recorded for some years after 1983, but this will turn to a black-ink balance as from around 1989. Net profit will amount to \$33.7 billion at peak, but will range from \$10 billion to \$30 billion in normal years.
3. In the capital account, the annual total of repayment and interest will amount to \$11 billion ~ \$13.1 billion at peak, as shown in Table V-4 (Cost of capital & repayment). It is considered that this fund requirement can be covered amply by the net profit.
4. Expenditure will consist of operation cost of 57%, depreciation of 21%, and capital cost of 13%, and maintenance cost of 9%. Thus, the operation cost is expected to be far higher than the depreciation expense cost (these two expenditures are just nearly the same in ordinary process industries). This is because the calculations were worked out on

the basis of the present cost structure of ANTELCO,
and indicates the need for improving the efficiency
of the operation sector.

Table V-2 Revenue & expenditure and repayment plan (General)

Unit: Million Guaranties

Year	Revenue	Expenditure	Net profit	Repayment	Year	Revenue	Expenditure	Net profit	Repayment
1983	0	48	Δ 48	34	2001	50,338	21,202	29,136	6,189
1984	2	386	Δ 384	265	2002	50,925	20,774	30,151	5,655
1985	213	778	Δ 565	951	2003	51,524	20,333	31,191	5,210
1986	448	1,020	Δ 572	1,067	2004	52,138	20,111	32,027	2,290
1987	471	2,059	Δ 1,588	1,748	2005	52,713	19,855	32,858	2,069
1988	3,491	3,977	Δ 486	4,290	2006	53,356	19,678	33,678	1,847
1989	6,228	5,664	564	4,909	2007	50,907	18,929	31,978	0
1990	9,983	7,473	2,510	5,447	2008	45,559	16,793	28,766	0
1991	13,664	9,556	4,108	8,205	2009	42,067	15,165	26,902	0
1992	19,795	12,155	7,640	8,729	2010	39,515	13,899	25,616	0
1993	24,108	14,529	9,579	9,252	2011	35,478	12,067	23,411	0
1994	28,918	16,628	12,290	12,046	2012	21,322	8,250	13,072	0
1995	36,803	19,304	17,499	11,785	2013	16,669	6,255	10,414	0
1996	44,434	21,845	22,589-	11,910	2014	12,356	4,349	8,007	0
1997	50,240	23,005	27,235	13,075	2015	9,140	2,804	6,336	0
1998	48,664	23,046	25,618	10,586	2016	7,345	1,699	5,646	0
1999	49,209	22,338	26,871	9,781					
2000	49,767	21,635	28,132	8,977	Total	977,790	427,609	550,181	146,227

Table V-3 Profit and loss statement of the Master Plan (Trial sheet)

Unit: Million Guaranies

Year	Revenue	Expenditure				Net profit	Ratio: Cost/Revenue x 100	
		Cost of capital	Deprecia- tion	Operation cost	Maintenance cost			Total cost
1983	0	34	14	0	0	48	Δ 48	
1984	2	265	110	0	11	386	Δ 384	19,300
1985	213	494	228	34	22	778	Δ 565	365
1986	448	610	299	75	36	1,020	Δ 572	228
1987	471	1,291	606	85	77	2,059	Δ 1,588	437
1988	3,491	2,149	1,071	440	317	3,977	Δ 486	114
1989	6,228	2,768	1,437	944	515	5,664	564	91
1990	9,983	3,306	1,768	1,743	656	7,473	2,510	75
1991	13,664	3,811	2,197	2,732	816	9,556	4,108	70
1992	19,795	4,335	2,635	4,172	1,013	12,155	7,640	61
1993	24,108	4,858	3,073	5,404	1,194	14,529	9,579	60
1994	28,918	5,045	3,501	6,686	1,396	16,628	12,290	56
1995	36,803	5,241	3,910	8,577	1,576	19,304	17,499	52
1996	44,434	5,366	4,289	10,430	1,760	21,845	22,589	49
1997	50,240	4,684	4,424	11,987	1,910	23,005	27,235	46
1998	48,664	3,879	4,424	12,833	1,910	23,046	25,618	47
1999	49,209	3,073	4,424	12,931	1,910	22,338	26,871	45
2000	49,767	2,269	4,424	13,032	1,910	21,635	28,132	43
2001	50,338	1,734	4,424	13,134	1,910	21,202	29,136	42
2002	50,925	12,00	4,424	13,240	1,910	20,774	30,151	41
2003	51,524	665	4,410	13,348	1,910	20,333	31,191	39
2004	52,138	443	4,314	13,458	1,896	20,111	32,027	39
2005	52,713	222	4,196	13,562	1,875	19,855	32,858	38
2006	53,356	0	4,125	13,678	1,875	19,678	33,678	37
2007	50,907	0	3,818	13,237	1,874	18,929	31,978	37
2008	45,559	0	3,353	11,846	1,594	16,793	28,766	37
2009	42,067	0	2,987	10,779	1,399	15,165	26,902	36
2010	39,515	0	2,656	9,983	1,260	13,899	25,616	35
2011	35,478	0	2,228	8,755	1,084	12,067	23,411	34
2012	21,322	0	1,790	5,563	897	8,250	13,072	39
2013	16,669	0	1,352	4,187	716	6,255	10,414	38
2014	12,356	0	924	2,910	515	4,349	8,007	35
2015	9,140	0	515	1,950	339	2,804	6,336	31
2016	7,345	0	135	1,400	164	1,699	5,646	23
Total	977,790	57,742	88,485	243,135	38,247	427,609	550,181	44
(Component ratio of cost)		(13)	(21)	(57)	(9)	(100)		

Table v-4 Cost of capital & repayment

Unit: Million Guaranties

Interest rate : 12%
Repayment period: 10 years

Year	Invest- ment ①	Repayment ②	Interest ③ : ① × 0,12	Invest- ment ④	Repayment ⑤	Interest ⑥ : ④ × 0,12	Invest- ment ⑦	Repayment ⑧	Interest ⑨ : ⑦ × 0,12	Invest- ment ⑩	Repayment ⑪	Interest ⑫ : ⑩ × 0,12	Invest- ment ⑬	Repayment ⑭	Interest ⑮ : ⑬ × 0,12	Yearly total			Year	
																⑯ Repayment	⑰ Interest	⑱ Total		
1983	281		34															34	34	1983
1984	1,924		265															265	265	1984
1985	2,365	457	494														457	494	951	1985
	Total 4,570																			
1986		457	439	1,427		171											457	610	1,067	1986
1987		457	384	6,131		907											457	1,291	1,748	1987
1988		457	329	9,289	1,684	1,820											2,141	2,149	4,290	1988
				Total 16,847																
1989		457	274		1,684	1,617	7,309		877								2,141	2,768	4,909	1989
1990		457	219		1,684	1,415	6,628		1,672								2,141	3,306	5,447	1990
1991		457	165		1,685	1,213	8,586	2,252	2,433								4,394	3,811	8,205	1991
							Total 22,523													
1992		457	110		1,685	1,011		2,252	2,162	8,763		1,052					4,394	4,335	8,729	1992
1993		457	55		1,685	809		2,252	1,892	8,751		2,102					4,394	4,858	9,252	1993
1994		457	0		1,685	607		2,252	1,622	8,561	2,607	2,816					7,001	5,045	12,046	1994
										Total 26,075										
1995					1,685	404		2,252	1,352		2,607	2,503	8,182		982		6,544	5,241	11,785	1995
1996					1,685	202		2,252	1,081		2,607	2,190	7,589		1,893		6,544	5,366	11,910	1996
1997					1,685	0		2,252	811		2,607	1,878	2,699	1,847	1,995		8,391	4,684	13,075	1997
													Total 18,470							
1998								2,253	541		2,607	1,565		1,847	1,773		6,707	3,879	10,586	1998
1999								2,253	270		2,608	1,252		1,847	1,551		6,708	3,073	9,781	1999
2000								2,253	0		2,608	939		1,847	1,330		6,708	2,269	8,977	2000
2001											2,608	626		1,847	1,108		4,455	1,734	6,189	2001
2002											2,608	313		1,847	887		4,455	1,200	5,655	2002
2003											2,608	0		1,874	665		4,455	665	5,120	2003
2004														1,847	443		1,847	443	2,290	2004
2005														1,847	222		1,847	222	2,069	2005
2006														1,847	0		1,847	0	1,847	2006
2007															0		0	0	0	2007
Total	4,570	4,570	2,768	16,847	16,847	10,176	22,523	22,523	14,713	26,075	26,075	17,236	18,470	18,470	12,849	88,485	57,742	146,227	Total	



Table V-5 Depreciation estimation

Unit: Million Guaranies

Item Year	Yearly generation		Yearly total
	Investment ①	① : 20 years	Depreciation
1983	281	14	14
1984	1,924	96	110
1985	2,365	118	228
1986	1,427	71	299
1987	6,131	307	606
1988	9,289	465	1,071
1989	7,309	366	1,437
1990	6,628	331	1,768
1991	8,586	429	2,197
1992	8,763	438	2,635
1993	8,751	438	3,073
1994	8,561	428	3,501
1995	8,182	409	3,910
1996	7,589	379	4,289
1997	2,699	135	4,424
1998	0	0	4,424
1999	0	0	4,424
2000	0	0	4,424
2001	0	0	4,424
2002	0	0	4,424
2003	0	0	4,410
2004	0	0	4,314

Item Year	Year generation		Yearly total
	Investment ①	① ÷ 20 years	Depreciation
2005	0	0	4,196
2006	0	0	4,125
2007	0	0	3,818
2008	0	0	3,353
2009	0	0	2,987
2010	0	0	2,656
2011	0	0	2,228
2012	0	0	1,790
2013	0	0	1,352
2014	0	0	924
2015	0	0	515
2016	0	0	135
2017	0	0	0
Total	88,485	4,424	88,485

2. Internal Rate of Return

Internal rate of return of domestic and international telecommunications is as shown below (See Tables V-6 ~ V-8 for preconditions of calculations)

Domestic telecommunications	24.6%
International telecommunications	45.4%
Average of both plans	27.4%

The above figures indicate that the two plans are sufficiently profitable and capable of repaying loans.

The following conditions were assumed in the calculation of internal rate of return.

Reference No. 3 Preconditions of Internal Rate of Return (Financial Analysis)

1. Each plan is assumed to have a life span of 20 years after starting customer service.
2. Residual value upon termination of the life span is assumed to be zero.
3. Working capital is taken at 30% of the revenue increase from each preceding year.

Table V-6 Financial analysis of domestic telecommunications
(Incl. plans based on advance feasibility study)

Year	Benefit	Expenditure				Benefit- expenditure	
		Equipment investment	Working capital	Operating cost	Maintenance cost		Total expenditure
1983	0	118	0	0	0	118	Δ 118
1984	0	1,486	0	0	0	1,486	Δ 1,486
1985	27	2,152	8	1	7	2,168	Δ 2,141
1986	77	1,427	15	8	21	1,471	Δ 1,394
1987	51	6,131	0	9	62	6,202	Δ 6,151
1988	3,024	9,240	892	356	301	10,789	Δ 7,765
1989	5,710	6,994	806	851	494	9,145	Δ 3,435
1990	9,394	6,543	1,105	1,637	633	9,918	Δ 524
1991	13,045	7,665	1,095	2,621	777	12,158	887
1992	17,411	8,208	1,310	3,743	964	14,225	3,186
1993	21,500	8,749	1,227	4,935	1,145	16,056	5,444
1994	26,105	8,250	1,382	6,180	1,341	17,153	8,952
1995	30,824	7,951	1,416	7,501	1,517	18,385	12,439
1996	35,848	7,078	1,507	8,885	1,692	19,162	16,686
1997	41,135	2,633	1,586	10,348	1,841	16,408	24,727
1998	39,030	0	0	11,099	1,841	12,940	26,090
1999	39,030	0	0	11,099	1,841	12,940	26,090
2000	39,050	0	0	11,099	1,841	12,940	26,090
2001	39,030	0	0	11,099	1,841	12,940	26,090
2002	39,030	0	0	11,099	1,841	12,940	26,090
2003	39,030	0	0	11,099	1,841	12,940	26,090
2004	39,030	0	0	11,099	1,841	12,940	26,090
2005	38,979	0	0	11,090	1,820	12,910	26,069
2006	38,979	0	0	11,090	1,820	12,910	26,069
2007	38,979	0	0	11,090	1,820	12,910	26,069
2008	33,141	0	0	9,611	1,540	11,151	21,990
2009	29,151	0	0	8,454	1,347	9,801	19,350
2010	26,092	0	0	7,567	1,208	8,775	17,317
2011	21,539	0	0	6,246	1,064	7,310	14,229
2012	15,678	0	0	4,547	877	5,424	10,254
2013	10,790	0	0	3,129	696	3,825	6,965
2014	6,235	0	0	1,808	500	2,308	3,927
2015	2,768	0	0	803	324	1,127	1,641
2016	712	0	Δ 12,349	206	149	Δ 11,994	12,706
Total	740,404	84,625	0	200,409	36,847	321,881	418,523

Unit: Million Guaranies

Internal rate of return: 24.6%

Table V-7 Financial analysis of international telecommunications

Unit: Million Guaranies

Year	Benefit	Expenditure					Benefit-expenditure
		Equipment investment	Working capital	Operating cost	Maintenance cost	Total expenditure	
1983	0	163	0	0	0	0	Δ 163
1984	2	438	1	0	0	11	Δ 448
1985	186	213	55	33	15	15	Δ 130
1986	371	0	56	67	15	138	233
1987	420	0	15	76	15	106	314
1988	467	49	14	84	16	163	304
1989	518	315	15	93	21	444	74
1990	589	85	21	106	23	235	354
1991	619	921	9	111	39	1,080	Δ 461
1992	2,384	555	530	429	49	1,563	821
1993	2,608	2	67	469	49	587	2,021
1994	2,813	311	62	506	55	934	1,879
1995	5,979	231	950	1,076	59	2,316	3,663
1996	8,586	511	782	1,545	68	2,906	5,680
1997	9,105	66	156	1,639	69	1,930	7,175
1998	9,634	0	159	1,734	69	1,962	7,672
1999	10,179	0	164	1,832	69	2,065	8,114
2000	10,737	0	167	1,933	69	2,169	8,568
2001	11,308	0	171	2,035	69	2,275	9,033
2002	11,895	0	176	2,141	69	2,386	9,509
2003	12,494	0	180	2,249	69	2,498	9,996
2004	13,108	0	184	2,359	55	2,598	10,510
2005	13,734	0	188	2,472	55	2,715	11,019
2006	14,377	0	193	2,588	55	2,836	11,541
2007	11,928	0	0	2,147	54	2,201	9,727
2008	12,418	0	147	2,235	54	2,436	9,982
2009	12,916	0	149	2,325	52	2,526	10,390
2010	13,423	0	152	2,416	52	2,620	10,803
2011	13,939	0	155	2,509	20	2,684	11,255
2012	5,644	0	0	1,016	20	1,036	4,608
2013	5,879	0	71	1,058	20	1,149	4,730
2014	6,121	0	73	1,102	15	1,190	4,931
2015	6,372	0	75	1,147	15	1,237	5,135
2016	6,633	0	Δ 5,137	1,194	15	Δ 3,928	10,561
Total	237,386	3,860	0	42,726	1,400	47,986	189,400

Internal rate of return: 45.4%

Table V-8 Financial analysis of domestic and international telecommunications

Unit: Million Guaranies

Year	Benefit	Expenditure					Benefit-expenditure
		Equipment investment	Working capital	Operating cost	Maintenance cost	Total expenditure	
1983	0	281	0	0	0	281	Δ 281
1984	2	1,924	1	0	11	1,936	Δ 1,934
1985	213	2,365	63	34	22	2,484	Δ 2,271
1986	448	1,427	71	75	36	1,609	Δ 1,161
1987	471	6,131	15	85	77	6,308	Δ 5,837
1988	3,491	9,289	906	440	317	10,952	Δ 7,461
1989	6,228	7,309	821	944	515	9,589	Δ 3,361
1990	9,983	6,628	1,126	1,743	656	10,153	Δ 170
1991	13,664	8,586	1,104	2,732	816	13,238	426
1992	19,795	8,763	1,840	4,172	1,013	15,788	4,007
1993	24,108	8,751	1,294	5,404	1,194	16,643	7,465
1994	28,918	8,561	1,444	6,686	1,396	18,087	10,831
1995	36,803	8,182	2,366	8,577	1,576	20,701	16,102
1996	44,434	7,589	2,289	10,430	1,760	22,068	22,366
1997	50,240	2,699	1,742	11,987	1,910	18,338	31,902
1998	48,664	0	159	12,833	1,910	14,902	33,762
1999	49,209	0	164	12,931	1,910	15,005	34,204
2000	49,767	0	167	13,032	1,910	15,109	34,658
2001	50,338	0	171	13,134	1,910	15,215	35,123
2002	50,925	0	176	13,240	1,910	15,326	35,599
2003	51,524	0	180	13,348	1,910	15,438	36,086
2004	52,138	0	184	13,458	1,896	15,538	36,600
2005	52,713	0	188	13,562	1,875	15,625	37,088
2006	53,356	0	193	13,678	1,875	15,746	37,610
2007	50,907	0	0	13,237	1,874	15,111	35,796
2008	45,559	0	147	11,846	1,594	13,587	31,972
2009	42,067	0	149	10,779	1,399	12,327	29,740
2010	39,515	0	152	9,983	1,260	11,395	28,120
2011	35,478	0	155	8,755	1,084	9,994	25,484
2012	21,322	0	0	5,563	897	6,460	14,862
2013	16,669	0	71	4,187	716	4,974	11,695
2014	12,356	0	73	2,910	515	3,498	8,858
2015	9,140	0	75	1,950	339	2,364	6,776
2016	7,345	0	Δ 17,486	1,400	164	Δ 15,922	23,267
Total	977,790	88,485	0	243,135	38,247	369,867	607,923

Internal rate of return: 27.4%



ADDITIONAL CHAPTER 2. SOCIO-ECONOMIC IMPACT (ECONOMIC ANALYSIS) OF MASTER PLAN

Preconditions and Calculation of Internal
Rate of Return and Minimum Cost Method

The following approaches were made in the analysis of socio-economic impact (economic analysis) of the field-wise development plans covered by the Master Plan.

1. Radio Regulation and Monitoring, National Education TV Broadcasting, and Manpower Development

As for the benefit to socio-economic development of these three projects, the qualitative evaluation of the national significance of the Project applies. Cost of each plan is obtained by converting the equipment investment to the present value by the minimum cost method.

These basic approaches to cost and benefit analysis are presented below in concrete figures and words.

	Cost	Benefit
Radio regulation & monitoring	404 million Guaranies	<ol style="list-style-type: none"> 1. Efficient utilization of radio frequencies as precious resources. 2. Assurance of better administrative service, improvement of national security, and more adequate protection of human lives and properties. 3. Increase of corporate income and improvement of capital efficiency. 4. Improvement of living standards.

	Cost	Benefit
National educational TV broadcasting	2,898 million Guaranies	Improvement of school attendance rate and adult literacy rate to provide the basis for Paraguay's national development.
Manpower development	2,832 million Guaranies	Help the ANTELCO carry out the Master Plan successfully and secure the services of telecommunication and electronic engineers, and further prevent the brain outflow from Paraguay.

Note: The cost of each plan was obtained by converting the predicted equipment investment to the 1983 value.

2. Domestic and International Telecommunications

The following values of internal rate of return were obtained from the financial analysis by applying the specified conversion factor. (See Tables V-9 ~ V-11 for the basis of calculation)

Domestic telecommunications	36.7%
International telecommunications	47.1%
Average of domestic and international telecommunications	38.1%

The profitability of these two telecommunication development plans surpasses the 12% opportunity cost of capital in Paraguay. In addition, the social benefit resulting from the investment in the two plans exceeds the social expenditure by a sufficiently large margin and further serves to promote Paraguay's domestic industries and create more employment opportunities.

5. Consumers' surplus

- a) Telephone premium price was taken at \$200,000 from the field survey, and new services were calculated without regard to premium.
- b) Revenue from incoming toll calls was obtained by the following formula.

Toll rate revenue x 0.7 x 1/2



Table V-9 Economic analysis of domestic telecommunications
(Incl. plans based on advance feasibility study)

Unit: Million Guaranies

Year	Benefit	Expenditure				Benefit-expenditure	
		Equipment investment	Working capital	Operating cost	Maintenance cost		Total expenditure
1983	0	76	0	0	0	76	Δ 76
1984	0	856	0	0	0	856	Δ 856
1985	26	850	8	1	6	865	Δ 839
1986	75	3,029	15	6	18	3,068	Δ 2,993
1987	50	6,174	0	7	53	6,234	Δ 6,184
1988	4,536	8,685	853	271	249	10,058	Δ 5,522
1989	8,427	6,479	754	673	406	8,312	115
1990	13,231	6,069	1,033	1,313	519	8,934	4,297
1991	17,300	7,185	1,018	2,119	637	10,959	6,341
1992	22,345	7,638	1,218	3,041	789	12,686	9,659
1993	26,737	8,155	1,141	4,022	936	14,254	12,483
1994	31,841	7,662	1,285	5,046	1,097	15,090	16,751
1995	36,966	7,382	1,317	6,132	1,241	16,072	20,894
1996	42,452	6,501	1,401	7,271	1,384	16,557	25,895
1997	48,193	2,207	1,475	8,474	1,505	13,661	34,532
1998	45,766	0	0	9,092	1,505	10,597	35,169
1999	45,766	0	0	9,092	1,505	10,597	35,169
2000	45,766	0	0	9,092	1,505	10,597	35,169
2001	45,766	0	0	9,092	1,505	10,597	35,169
2002	45,766	0	0	9,092	1,505	10,597	35,169
2003	45,766	0	0	9,092	1,505	10,597	35,169
2004	45,766	0	0	9,092	1,505	10,597	35,169
2005	45,716	0	0	9,086	1,487	10,573	35,143
2006	45,716	0	0	9,086	1,487	10,573	35,143
2007	45,716	0	0	9,086	1,487	10,573	35,143
2008	38,961	0	0	7,904	1,257	9,161	29,800
2009	34,237	0	0	6,953	1,099	8,052	26,185
2010	30,650	0	0	6,223	986	7,209	23,441
2011	25,274	0	0	5,136	868	6,004	19,270
2012	18,330	0	0	3,740	715	4,455	13,875
2013	12,549	0	0	2,574	567	3,141	9,408
2014	7,185	0	0	1,486	408	1,894	5,291
2015	3,117	0	0	661	265	926	2,191
2016	751	0	Δ11,518	170	122	Δ11,226	11,977
Total:	880,743	78,948	0	164,125	30,123	273,196	607,547

Internatl rate of return: 36.7%

Table V-10 Economic analysis of international telecommunications

Unit: Million Guaranies

Year	Benefit	Expenditure				Benefit-expenditure	
		Equipment investment	Working capital	Operating Cost	Maintenance Cost		Total expenditure
1983	0	160	0	0	0	160	Δ 160
1984	2	434	1	0	9	444	Δ 442
1985	182	210	40	27	13	290	Δ 108
1986	364	0	41	55	13	109	255
1987	412	0	11	62	13	86	326
1988	458	47	10	69	13	139	319
1989	508	301	11	77	17	406	102
1990	577	82	15	87	19	203	374
1991	607	885	7	91	32	1,015	Δ 408
1992	2,336	533	387	353	40	1,313	1,023
1993	2,556	2	49	386	40	477	2,079
1994	2,757	297	45	417	45	804	1,953
1995	5,859	210	694	885	48	1,837	4,022
1996	8,414	504	571	1,271	56	2,402	6,012
1997	8,923	62	114	1,349	57	1,582	7,341
1998	9,441	0	116	1,427	57	1,600	7,841
1999	9,975	0	120	1,507	57	1,684	8,291
2000	10,522	0	122	1,591	57	1,770	8,752
2001	11,082	0	125	1,674	57	1,856	9,226
2002	11,657	0	128	1,762	57	1,947	9,710
2003	12,244	0	131	1,851	57	2,039	10,205
2004	12,846	0	134	1,941	45	2,120	10,726
2005	13,459	0	137	2,034	45	2,216	11,243
2006	14,089	0	141	2,129	45	2,315	11,774
2007	11,689	0	0	1,776	44	1,820	9,869
2008	12,170	0	107	1,839	44	1,990	10,180
2009	12,658	0	109	1,913	42	2,064	10,594
2010	13,155	0	111	1,988	42	2,141	11,014
2011	13,660	0	113	2,065	16	2,194	11,466
2012	5,531	0	0	836	16	852	4,679
2013	5,761	0	52	871	16	939	4,822
2014	5,999	0	53	907	13	973	5,026
2015	6,245	0	55	944	13	1,012	5,233
2016	6,500	0	Δ 3,750	982	13	Δ 2,755	9,255
Total	232,638	3,727	0	35,166	1,151	40,044	192,594

Internal rate of return: 47.1%

Table V-11 Economic analysis of domestic and international telecommunications

Unit: Million Guaranies

Year	Benefit	Expenditure						Benefit-expenditure
		Equipment investment	Working capital	Operating cost	Maintenance cost	Total expenditure		
1983	0	236	0	0	0	0	236	Δ 236
1984	2	1,290	1	0	9	1,300	1,300	Δ 1,298
1985	208	1,060	48	28	19	1,155	1,155	Δ 947
1986	439	3,029	56	61	31	3,177	3,177	Δ 2,738
1987	462	6,174	11	69	66	6,320	6,320	Δ 5,858
1988	4,994	8,732	863	340	262	10,197	10,197	Δ 5,203
1989	8,935	6,780	765	750	423	8,718	8,718	217
1990	13,808	6,151	1,048	1,400	538	9,137	9,137	4,671
1991	17,907	8,070	1,025	2,210	669	11,974	11,974	5,933
1992	24,681	8,171	1,605	3,394	829	13,999	13,999	10,682
1993	29,293	8,157	1,190	4,408	976	14,731	14,731	14,562
1994	34,598	7,959	1,330	5,463	1,142	15,894	15,894	18,704
1995	42,825	7,592	2,011	7,017	1,289	17,909	17,909	24,916
1996	50,866	7,005	1,972	8,542	1,440	18,959	18,959	31,907
1997	57,116	2,269	1,589	9,823	1,562	15,243	15,243	41,873
1998	55,207	0	116	10,519	1,562	12,197	12,197	43,010
1999	55,741	0	120	10,599	1,562	12,281	12,281	43,460
2000	56,288	0	122	10,683	1,562	12,367	12,367	43,921
2001	56,848	0	125	10,766	1,562	12,453	12,453	44,395
2002	57,423	0	128	10,854	1,562	12,544	12,544	44,879
2003	58,010	0	131	10,943	1,562	12,636	12,636	45,374
2004	58,612	0	134	11,033	1,550	12,717	12,717	45,895
2005	59,175	0	137	11,120	1,532	12,789	12,789	46,386
2006	59,805	0	141	11,215	1,532	12,888	12,888	46,917
2007	57,405	0	0	10,862	1,531	12,393	12,393	45,012
2008	51,131	0	107	9,743	1,301	11,151	11,151	39,980
2009	46,895	0	109	8,866	1,141	10,116	10,116	36,779
2010	43,805	0	111	8,211	1,028	9,350	9,350	34,455
2011	38,934	0	113	7,201	884	8,198	8,198	30,736
2012	23,861	0	0	4,576	731	5,307	5,307	18,554
2013	18,310	0	52	3,445	583	4,080	4,080	14,230
2014	13,184	0	53	2,393	421	2,867	2,867	10,317
2015	9,362	0	55	1,605	278	1,938	1,938	7,424
2016	7,251	0	Δ 15,268	1,152	135	Δ 13,981	Δ 13,981	21,232
Total	1,113,381	82,675	0	199,291	31,274	313,240	313,240	800,141

Internal rate of return: 38.1%



PART VI. IMPLEMENTATION SCHEDULE

PART VI IMPLEMENTATION SCHEDULE

1. Domestic Telecommunications

Facilities plan for each item of domestic telecommunications is detailed in PART III PLANNING BY AREA. Table VI-1 shows the year-by-year implementation schedule for the main items.

2. International Telecommunications

Facilities plan for each item of international telecommunications is detailed in PART III PLANNING BY AREA. Table VI-2 shows the year-by-year implementation schedule for the main items.

3. Radio Regulation and Monitoring

The monitoring system should be built up in four years from 1983 to 1986 considering its great exigency.

It is particularly desired to reinforce the monitoring facilities for VHF and higher frequencies ahead of those for HF band.

An annual equipment buildup plan is shown in Fig. VI-3. The following is its overview.

(1) 1st phase

- 1) In the first year, the monitoring antennas and monitoring rooms for the fixed monitoring stations should be installed to make ready the existing facilities for monitoring use.
- 2) In the next year, the monitoring equipment at the fixed monitoring stations should be built up, and

at the same time the VHF/UHF mobile direction finding station should be on hand to establish a system for monitoring VHF band and higher frequencies.

- 3) In the third and the fourth year, a system for monitoring HF band should be established.

- (2) 2nd phase

The remote control monitoring system should be introduced according to the Second Five-Year Plan in order to rationalize the monitoring services.

- (3) 3rd phase

The superannuated equipment should be replaced with new, high-technology equipment in order to build up, amplify and upgrade the monitoring system.

- (4) The plan will be reviewed for aggiornamento if the existing facilities have become obsolete because of the advent of novel systems in radio application technologies or if the new technologies dictate the modification of the existing facilities or installation of new facilities. The costs and expenses required for aggiornamento will also be allowed for.

4. National Educational TV Broadcasting

1) Basic ideas for implementation schedule

In deciding on the implementation schedule of the construction plan for the national educational television, the following points will be taken into consideration:

- Construction of broadcasting stations in 12 designated regions during the basic period of the plan which is 15 years.
- Necessity to organize a new operational body to run the national educational television.
- Expenses for the construction should be allotted evenly throughout the whole project period.
- Ensuring proper coordination with training of necessary number of personnel in running the broadcasting, such as, those for program production, technical operation and maintenance of equipment.
- Necessity of avoiding extreme change in the volume of construction during the implementation period in order to keep the workforce needed for the construction to the minimum, and to ensure equalization in the volume of construction.

2) Implementation schedule of construction plan

Table VI-4 shows the implementation schedule of construction under this plan. The summary of the implementation schedule is as follows:

- * Stage I : Construction of Asunción Broadcasting Station and that of two local broadcasting stations. (Pto. Pte. Stroessner and Encarnación)

- * Stage II : Construction of five local broadcasting stations (Pedro Juan Caballero, etc.) and construction of one studio as well as partial increase of production equipment in Asunción Broadcasting Station.
- * Stage III: Construction of four local broadcasting stations (Pilar, etc.) and partial renewal of equipment like VTR that were installed at the construction of Asunción Broadcasting Station in the first stage.

The period of time required for construction is roughly estimated as follows:

For the construction of Asunción Broadcasting Station	: 1.5 years
For the construction of local broadcasting stations	: 1 years

In considering the implementation schedule, however, a period necessary for obtaining a site and finish grading as well as for providing electricity, water-supplying and drainage facilities are not included.

5. Manpower Development

Table VI-5 shows the implementation plan based on the IPT's long-term expansion program described in PART PART III PLANNING BY FIELD.

Table VI-1 Main items of domestic telecommunications expansion schedule

Item	Unit etc.		1983-1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	Total
	1,000 sub-subscribers	Asunción Interior Total												
Public telephone	No. of telephone		399	300	300	300	300	300	300	300	300	300	295	3,394
	No. of area		14	1	1	1	1	1	1	1	1	1	2	25
	No. of subscriber		735	295	205	295	205	205	205	205	205	205	300	3,060
Local telephone switching	Digitalization		2	1	1	2	1	0	1	1	0	1	1	11
	Capacity		32,800	32,000	22,600	19,200	10,200	0	9,600	11,000	0	17,400	15,000	169,800
DTS capacity expansion	No. of exchange		0	0	0	0	1	2	2	3	2	2	3	15
	Capacity		0	0	0	0	23,000	29,000	15,000	25,800	28,000	8,000	14,000	142,800
Capacity expansion in Interior	No. of exchange		73	32	16	21	24	32	13	20	19	43	25	318
	Capacity		15,200	15,400	13,000	10,350	8,900	15,000	13,100	11,700	10,700	14,500	11,100	138,950
Toll exchange	No. of exchange		*1 (3)	1	1	1	0	1	1	1	0	1	1	8
	No. of line		*1 (3,050)	1,000	600	250	0	1,300	700	300	0	1,500	800	5,550
Junction	Optical fiber		*1 2	14	0	0	0	0	0	0	0	0	0	14
	Cable PCH		0	493	0	0	0	0	0	0	0	0	0	493
Trunk line (Microwave)	No. of new route		7	1	1	0	0	0	0	0	0	1	0	10
	No. of route		0	0	0	0	2	2	1	2	0	0	0	7
Land mobile telephone	No. of subscriber		0	0	0	258	297	333	371	410	454	496	548	3,167
	No. of radio station		0	0	0	0	6	0	0	0	0	0	0	6
Telex exchange	No. of line		1,888	1,806						1,806				5,500

Note: *1 Total number at the end of 1987, and not included in the "Total".

*2 Including the number of existing stations.

Fig. VI-3 Annual equipment buildup plan of radio regulation and monitoring project

Item	'83	'84	'85	'86	'87	'88	'89	'90	'91	'92	'93	'94	'95	'96	'97
HF stations	Construction of antenna towers, etc.	↑↑													
	Construction of VLP antenna			↑↑											
HF fixed monitoring stations	Construction of antenna for field strength measurement	↑↑			↑↑										
	Construction of monitoring room	↑↑													
	Buildup of monitoring equipment	↑↑													
VHF/UHF fixed monitoring stations	Construction of radio communication equipment	↑↑													
	Construction of antenna towers, etc.	↑↑													
	Construction of VLP antenna	↑↑													
	Construction of antenna duplexer	↑↑													
	Construction of monitoring room	↑↑													
	Buildup of monitoring equipment	↑↑													
	Construction of radio communication equipment	↑↑													
	HF fixed direction finding station				↑↑										
	HF mobile direction finding station, No.1			↑↑											
	HF mobile direction finding station, No.2			↑↑											
VHF/UHF mobile direction finding station	HF remote control monitoring system					↑↑									
	VHF/UHF remote control monitoring system						↑↑								
Buildup of inspection facilities	Buildup of inspection facilities	↑↑													
	Buildup of calibration facilities														
Buildup of maintenance facilities	Buildup of maintenance facilities														
	Buildup of training facilities	↑↑													

↑↑ New installation
 ↑↑↑ Renewal

Table VI-4 Construction schedule of national educational TV broadcasting project

	I					II					III				
	'83	'84	'85	'86	'87	'88	'89	'90	'91	'92	'93	'94	'95	'96	'97
Designing		Basic and de-tailed designing													
Asunción													partial renewal		
Studio 1															
Studio 2								additions							
Pto. Pte. Stroessner															
Encarnación															
Pedro Juan Caballero															
Salto del Guairá															
San Pedro															
Mariscal Estigarribia															
Villarrica															
Pilar															
Concepción															
San Juan Bautista															
Paraguari															

TABLE VI-5 IPT EXPANSION SCHEDULE

YEAR ITEM	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97
BUILDING & FACILITIES	DESIGN	CONSTRUCTION	CONSTRUCTION			DESIGN	CONSTRUCTION	CONSTRUCTION				DESIGN	CONSTRUCTION		
EQUIPMENT		INSTALLATION	INSTALLATION				INSTALLATION	INSTALLATION					INSTALLATION	INSTALLATION	

PART VII. ADAPTATIONS TO CHANGES IN FUTURE

PART VII. ADAPTATIONS TO CHANGES IN FUTURE

CHAPTER 1. ANTICIPATED FUTURE CHANGES

In future, the telecommunication fields will experience the following changes. (Note)

- (1) Change in demand and traffic.
- (2) Advent of new telecommunication services.
- (3) Advent of new technologies.
- (4) Growing demand for higher quality of telecommunication services (traffic, transmission and stability).
- (5) Changes in balance-of-payments position and financial conditions.
- (6) Changes in manufacture and supply of materials and equipment.
- (7) Changes in manpower requirements.
- (8) Changes in the circumstances surrounding ANTELCO and the government authorities concerned, their policies and strategies.
- (9) Changes in socio-economic conditions and national policies in Paraguay.
- (10) Changes in the situation of the neighboring countries and of the world as a whole.

What counts most among them will be the changes (1), (2), (3) and (5).

While some may be controlled by ANTELCO itself, most of these changes are exogenous and beyond the control of ANTELCO.

Note: "Telecommunication" stated here is understood in wider sense including radio frequency administration and broadcasting.

CHAPTER 2. MASTER PLAN ADAPTATION TO ANTICIPATED FUTURE CHANGES

2-1. Basic Concepts

There are basically four ways an enterprise can adapt itself to the future changes.

Way-1 To act to remove or modify the change.

Way-2 To leave the change as it is without taking any countermeasures.

Way-3 To follow the change as it occurs.

Way-4 To provide for the change in advance.

The Way-1 is limited in the recourse generally. For example, notice to users would be at best in case of emergency to avoid traffic upheaval.

The way-2 can be taken only at the sacrifice of service level, but within acceptable level.

The way-3 offers slow but steady a posteriori measures. However, this often leads to being forestalled.

The way-4 offers anticipative measures. It can be effective and economical if taken in good time.

The way-3 is feedback control based on what has actually happened, while the way-4 is feedforward control based on forecast. These two ways are most basic and practical.

2-2. Master Plan, and Its Adaptations for Future Changes

A master plan on telecommunication systems is regarded to have the following natures:

- (1) The master plan is a long-term, basic one, and is the mother of mid-term plans or project formations. According to the mid-term plans, feasibility studies of short-term projects are carried out, and based on the study results detailed designs are carried out to formulate the implementation work process. (A general description about planning in telecommunication enterprise is presented in ANNEX VI-8.)
- (2) The master plan puts up the long-term aims and goals of an enterprise, which will extend ten to twenty years, and at the same time serves as a foundation of the socio-economic plans of a country.
- (3) The master plan offers guiding principles around which to integrate all the functions and activities of the enterprise organization, and at the same time is an instrument to enlist the help and understanding of the others.
- (4) The master plan is full of uncertainties because it looks far into the future.

Then, what should the master plan adaptations be in relation to future environmental changes? During the long period of a project which is pushed forward according to the master plan, environmental changes may happen sometimes to nullify the original forecast or assumptions or to disclose discrepancies between what was planned and what has been achieved or to forewarn such consequences. In such an even, the mast plan must always be valid and ready to help offer viable measures; namely, be adaptable enough to offer viable mid-term plans then and there.

As discussed in para. 2-1, the viable mid-term plans may be formulated according to the four ways:

In the way-1 efforts are made in hopes that the future changes may fall in with the master plan to dispense with its modification. According to the way-4, the future changes are forecast in order to conform the master plan to meet them in advance. The way-2 which gives no consideration to future changes is sometimes a self-complacent way, and cannot necessarily be accepted in master plan implementation as a normal way. In any case, the way-3, in which the practicality of the master plan and necessary actions and measures are studied based on the track records, is considered as a fundamental method of evolving the master plan through the "PLAN-DO-SEE" control cycles, whichever way may be taken. For this reason, the adaptations for future changes are often simply called the "review".

2-3. Adaptation of Master Plan in General

The methods of adapting the master plan to meet the future changes are classified as follows, according to whether the master plan is maintained or changed and how it is operated.

- A The master plan is maintained intact.
- A-1 The master plan is applied as it is.
- A-2 The master plan is applied by translating it along the time axis (year axis).
- A-3 With the master plan retained as a reference, new conditions are introduced to set upper and lower limits (or optimistic and pessimistic cases), and the master plan is applied as guided by these limits.

B The master plan itself is changed.

B-1 The master plan is pieced together with new additions as required.

B-2 The master plan is altered in part as required.

B-3 The master plan is entirely revised.

The measures taken in the way-1 are based on the method A-1, and applied more flexibly in conjunction with the method A-2, A-3, B-1 or B-2.

The measures taken in the way-2 are predicated upon the method A-1.

The measures taken in the way-3 are in accordance with all the method but A-1, and B-1 and B-2 are the major methods.

The measures taken in the way-4 are also in accordance with all the methods but A-1.

In any case, however, the method B-3 can usually be dispensed with and should be last choice.

2-4. Master Plan Adaptation Measures

As touched upon in CHAP. 1, this Master Plan will be affected by the changes in, among others, the demand (1), new services (2), new technologies (3), and the financial conditions (5). Outlined here are the Master Plan measures to be taken against these changes.

(1) Against change in demand

To provide against the demand change, the methods A-2 and A-3 will be effective, and will best be applied at the time of feasibility studies. Usually, facilities are planned to have a margin of several years, and will be enough to cover demand changes for some time after their installation. But, it should be borne in mind that the service level margin will tend downward as the demand fulfillment goes on.

To what degree the forecast and the actual records shows an agreement with the Master Plan and what measures should be taken are judged according to the service indices such as the demand fulfillment ratio, switching loss probability, waiting time, and failure rates, etc. and the installation statistical data as seen in ANTELCO's yearbook, "Memoria y Balance General".

(2) Regarding new services

As regards the new services, it is indeed a reliable way to wait until the demand comes real and then to provide measures to fulfill it. But, from the viewpoint of national interests, it will also be important to cultivate the demand. By applying the method B-1 and, if suitable, the method B-2, measures can be provided to meet the changes without modifying the Master Plan. In any case, the measures are closely related to the introduction of new technologies explained below, and it is advisable to keep on marketing survey and technical study in a forward-looking attitude.

As for the soon-to-be new services, the telephone and telegraph networks will answer the needs for some time now. While the demand will be not so large at first as to constitute a problem, the transmission quality of the networks should need to be studied and confirmed especially for data transmission.

(3) Regarding new technologies

If the new services are to be extended uniformly throughout the country, the uniform introduction of new technologies is a must. As discussed in Part III, Section VI, it will be necessary to make the nationwide telecommunication networks digitized and intelligent. The introduction of new technologies should be promoted steadily and strategically in line with the new service promotion policies and in a manner not to cause economic losses or strain the financial resources. Just as with the new services, the methods B-1 and B-2 are applicable.

(4) Against change in financial conditions

The formulation and implementation of measures against the changes in financial conditions are quite difficult, critically important though they are. Objective studies of the changes in financial aspect similar to the prospective income and expenditure and financial analyses in the Master Plan will provide viable measures for financial changes. The funds are limited, and the formulation and implementation of financial measures should, needless to say, be the highest priority of consideration together with the problems of timing and distribution of funds.

(5) Review of Master Plan

Practically, the Master Plan should be reviewed on the occasion of formulating the mid-term plan (project formation) and short-term plan (feasibility study). The difference between the Plan and the fact will become larger, the closer the time of Master Plan review is to the end of the Master Plan period. Ideally, therefore, the Master Plan should be reviewed every time the mid-term plan is formulated, and should be replaced with a new Master Plan starting from that time of review. To do this perfectly, the method B-3 would be employed. But this will take time and resources terribly from ANTELCO.

In every field of telecommunications, the Master Plan has been formulated as a cumulative compendium of every fiscal year plans, being divided into three five-year stages according to the Scope of Work. As a result, the Master Plan can be used for systematic review of mid-term and short-term plans and at the same time as a basis for annual implementation programming especially in the fields of radio regulation and monitoring, national educational TV broadcasting and manpower development. It is therefore hoped for ANTELCO to find most in this respect of the Master Plan.

For the review of the Master Plan, there should be prepared the targets and goals, presumed conditions, forecasting and planning methods, and the related basic data (statistics, prerequisite parameters, etc.). However, the particulars of these items require a lot of spaces to describe in and some of them are not necessarily of prime importance to the Master Plan, and prone to obsolescence. For these reasons, not all of these are incorporated in the Master Plan. However, the essential information necessary to review the forecast data is presented in the ANNEX to this Plan, in terms of the demand, traffic and relevant quantity of facilities in each field of the telecommunications of the Master Plan. It is expected that the review of the the Master Plan would be conducted throughgoingly according to the newly arisen requirements of respective fields and by making use of the latest data.

CHAPTER 3. NECESSARY CONSIDERATIONS FOR MASTER PLAN IN EACH
FIELD

The particular matters to be taken into account in the adaptation of the Master Plans for the future changes are described in the respective field reports and reproduced below in a summarized form.

3-1 Domestic Telecommunications

- (1) Systematic and regular review of the telecommunication service demands, and verification and correction of the demand forecast when census data and other new, significant data, become available. (Refer to PART III, SEC. I, CHAP. 5)
- (2) Marketing survey to predict real and potential demands for new telephone service, data communication service, facsimile service, visual communication service, and other new services. (Refer to DITTO, CHAP. 2 and 5)
- (3) Planning and promotion of the telecommunication networks digitalization in keeping with the introduction of new services and the economic trends of the technologies concerned. (Refer to DITTO, CHAP. 2)
- (4) Taking a long range view of introducing various radio systems for the purpose of administrating available frequencies and avoiding interference. (Refer to DITTO, CHAP. 12 (4))
- (5) Partial modification with reference to the Master Plan of the projects for which the Feasibility Studies have been completed and which are scheduled for implementation in the first five-year period. (Refer to DITTO, CHAP. 12, (1) through (3))

3-2 International Telecommunications

- (1) Study and formulation of the methods for the exchanges concerned to obtain data required for administrating ISD communication, with respect to counterpart countries, traffic, etc. (Refer to PART III, SEC. II, 2-3; 3-1-2)
- (2) Digitization of the connection system between the international exchange and the local digital exchanges for the purpose of eliciting the maximum of digital technologies. (Refer to DITTO, 3-1-2)
- (3) Build-up of organizations for traffic forecast and control, and review of demand forecast. (Refer to DITTO, 2-3)
- (4) Study of a rate system (such as time zone rates) for the purpose of encouraging the use of non telephony communication (like facsimile) during a period of time when the telephone circuits are operated on a light load. (Refer to DITTO, 2-3; 2-4)
- (5) Preparation of counter measures in prospect of the data transmission service being led by packet switching in the near future. (Refer to DITTO, 2-4)

3-3 Radio Regulation and Monitoring

- (1) Formulation of new frequency assignment policies, new radio equipment technical standards and radio station accrediting and licensing policies in anticipation of the expansion of the frequency uses and bands to be used. (Refer to PART III, SEC. III, 2-2; 5-1)
- (2) Deployment of policing functions and the relevant facilities and staffs to cope with communication hazards and illegal stations resulting from the amplification of radio wave use, and rationalization of functions through the employment of a remote supervisory control system. (Refer to DITTO, 3-2; 5-2)

- (3) Upbringing of the required human resources which should be amplified, meeting the increase in number of radio stations and related administrative work. (Refer to DITTO, 4-1)
- (4) Legislative measures to protect the monitoring facilities from deterioration of radio monitoring conditions due to regional developments, etc. (Refer to DITTO, 5-2)
- (5) Innovation of the facilities and equipments in accordance with the advent of new radio technology applications and new telecommunications.

3-4 National Educational TV Broadcasting

- (1) Study for complementary installation of TV stations to meet the demand for expansion of service area.
(Refer to PART III, SEC. IV, 2-1; 3-2)
- (2) Measures for encouraging the purchase of TV sets and eliminating non-power areas, particularly those for development and expansion of power grids to feed electricity to every corner of the country. (Refer to DITTO, 3-10-2)
- (3) Procurement of broadcasting station staff. (Refer to DITTO, 3)
- (4) Formulation of measures to meet the international developments (international arrangements for frequency assignment, demand, new technologies, etc.).

3-5 Manpower Development

- (1) Formulation of the implementation schedule for the 2nd and 3rd expansion plan, by reviewing the demand forecast of electronics engineers and technicians as the planning basis, taking the movements in technologies and the progress of the implementations in each field of the Master Plan into consideration. (Refer to PART III, SEC. V, CHAP. 4 and 5)

- (2) Establishing an organization directly pertaining to the top management bodies concerned and conducting the studies and recommendations-making of the fundamental policies for the manpower development through it. (Refer to DITTO, CHAP. 5)

- (3) Ensuring adequate work and good treatment for the staffs educated at IPT. (Refer to DITTO, CHAP. 5)

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ANNEX

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