The D.C. resistance limit value is provided for the purpose of keeping within the operational limit the signal current that flows between the telephone set and switching equipment, so that the telephone set and switching equipment can operate satisfactorily. The D.C. resistance limit value varies according to the type of switching equipment used at the exchange.

The switching equipment used in the Project area comprises electronic switching equipment (Type E10B) and crossbar switching equipment. On the assumpion that in the future the switching equipment will be unified to Type E10, the D.C. resistance limit value to apply in the Project is set at 1,500 ohms.

The cable loss value and the D.C. resistance value to be used in the Project are determined as under:

(at 1,500 Hz)

Cable Conducter Diameter (mm)	Cable Loss Value (dB/km)	Loop Resistance Value (ohm/km)
0.4	2.36	300
0.5	1.88	190
0.65	1.46	115

6-2 Design Principles for Subscriber Line

6-2-1 Cable and Other Materials

(1) Cable Pairs

1) Primary Cables

Primary cable pairs by conductor diameters follow:

Cable Diameter	2,400 pairs	1,800 pairs	1,500 pairs	1,200 pairs	1,000 pairs
0.4	0	0	0	0	0
0.5	-	0	0	0	0
0.65	-	-	-	0	0

Cable Diameter	800 pairs	600 pairs	400 pairs	300 pairs
0.4	0	0	0	0
0.5	0	0	0	0
0.65	0	0	0	0

When the existing duct are to be utilized, the undermentioned cable types cannot be used. (This is because the pipe in the existing duct measures about 75 mm in inner diameter.)

0.4 mm - 2,400 pairs

0.5 mm - 1,800 pairs; 0,5 mm - 1,500 pairs

0.65 mm - 1,200 pairs; 0.65 mm - 1,000 pairs

2) Secondary Cable

Cable Diameter: 0.4, 0.5, 0.65 (mm)
Cable Pairs : 400, 300, 200, 150, 100, 50, 30, 20, 10 (pairs)

(2) Cross-Connecting Cabinet Capacity

The cross-connecting cabinet capacities are twofold.

1) 1,600 Pairs

The cross-connecting cabinet capacity for 1,600 pairs will apply in case where the demand size 15 years after (i.e., as of the eyar 2002) is about 400 - 800.

2) 800 Pairs

The cross-connecting cabinet capacity for 800 pairs will apply in case where the demand size 15 years after (i.e., as of the years 2002) is about 400 or less.

Meanwhile, the existing cross-connecting cabinets include the type with capacity for 1,200 pairs.

(3) Distribution Point

The distribution point capacity is for 10 pairs, in principle.

In the case of indoor distribution points in the buildings, etc., capacities are for 200, 100, 50 30 and 10 pairs.

(4) MDF

The cable terminating capacity per vertical of MDF is 800 and 1,000 pairs.

6-2-2 Design Principles for Underground Duct

(1) In the existing duct route, if the installation of proposed cable still leaves spare pipes unused, no additional pipe will be built.

(2) When building additional pipe in the existing conduit route, the manhole span for new pipe is to be the long span. This is to reduce the cable splicing points to the possible minimum.

(3) The duct to be newly laid across the river/railway or in the curved section is to be of short span in order to ease cable installation in the pipe.

(4) For manhole location, the road intersection is to be avoided. This is to obtain convenience for maintenance and related management work and not to impede surface traffic.

(5) Type of manholes and dimensions of each type are given in Table 6-1.

For the manhole where the repeater or loading coil will be established, the separation between basement and cable rack must be 100 cm.

(6) As regards the number of cables to be accommodated in the duct route, the calculation is to be made as under:

1) Number of cables to be Accommodated

- To set the demand size 20 years after at 1.3 times the demand size as of 2002 (i.e., 15 years after).

- To calculate the unit (100 pairs) commensurate with the demand size 20 years and to assort the unit (100 pairs) by conductor diameters.

- To divide the unit (100 pairs) assorted by conductor diameters by the allotted unit by conductor diameters, and to use the quotient as the number of cables to be accommodated.

  (Note: Fractions obtaines in the division are to be rounded up.)

For the conduit route where junction and trunk cables are to be accommondated, the number of such junction and trunk cables is added to the number of cables obtained in the foregoing.

The number of cables to be accommodated corresponds to the total number of cables multiplied by the safety factor of 1.2.

(Note: Fractions obtained in the multiplication are to be rounded up.)

2) Maximum Unit by Conductor Diameter and Allotted Unit by Conductor Diameter

Conductor diameter	Maximum Unit: (100 pairs) Number of Units	Allotted Unit: (100 pairs) Number of Units
0.4 mm	24	16 (12)
0.5 mm	18	12 (8)
0.65 mm	10	7 (4)

Note: Parenthesized is the number of units in case where ø75 mm pipe is used.

Table 6-1 Manhole Size

Manhole Type	Number of Pipes	Length (cm)	Width (cm)	Height (cm)	Remarks
STB No. 6A	2	130	90	110	SLTD
STB No.11B	4	170	90	110	SLTD
STB No.11C	6	170	95	130	SLTD
STB No.12B	9	230	140	160	SLTD
S - 1	6 - 10	(270) 250	120	170	
S - 1R	6 - 10	(270) 250	120	220	*
S - 2	12 - 20	(400) 350	150	170	
S - 2R	12 - 20	(400) 350	150	220	*
S - 3	22 - 28	(400) 350	150	210	
S - 3R	22 - 28	(400) 350	150	260	*
S - 4	30 - 40	(530) 450	180	210	
S - 4R	30 - 40	(530) 450	180	260	*

Notes. 1) ( ) is for branch Manhole

2) * is for installation of PCM repeater and loading coil.

6-2-3 Other Design Principles

(1) How to Handle Existing Cables

1) Cable life is for 20 - 30 years. Cables in use for more than 20 years are to be withdrawn as ineffective facilities. For cables in use for more than 15 years but less than 20 years, decision is to be made considering the state of operation of the exchange to which they belong and how they are used at present.

2) In case a large number of small pair cables are used in the existing conduit route. Such small pair cables are to be withdrawn and replaced with multi-pair cables for the purpose of effective use of the existing conduit route.

3) In Mt. Lavenia and Boralesgamuwa exchange areas, the cable installation is by cabinet system. However, in other exchange areas, cables are installed by the direct distribution system. In the latter case, even the multi-pair cables are used as distribution cables. Thus, in the sections where multi-pair cables are used as distribution cables, they are not to be used as primary cables.

(2) Gas Pressurization

For air-core cables to remain in use, maintenance by gas pressurization will not apply, as is the case at present. For new cables, jelly filled cables are to be used, and they do not need maintenance by gas pressurization.

6-3 Basic Designs for Subscriber Cable Network

6-3-1 Exchange Area Modifications

(1) Colombo Central Exchange Area and Mattakkuliya Exchange Area

(Refer to Key Map.)

1) The area on the northern side of railway near Victoria Bridge is to be detached from Colombo Central Exchange area and to be newly included in Mattakkuliya Exchange area.

The farthermost subscriber in the area is 5.5 km distant from Colombo Central Exchange Office, but the distance from Mattakkuliya Exchange Office is 2.5 km.

Also, to clarify the demarcation between the two exchange areas and to facilitate maintenance and related management, the railway line is to be used as a boundary.

2) The area along Bloemendkal Road is to be realigned from Mattakkuliya Exchange area to Colombo Central Exchange area. The demarcation between the two exchange areas is to be clarified, using the railway line as a boundary. This is to eliminate the secondary cable extension across the railway and to ease maintenance and related management.

(2) Boralesgamuwa Area and Mt. Lavinia Exchange Area

Boralesgamuwa area, where belongs to Mt. Lavinia Exchange area, is distant from Mt. Lavinia Exchange Office so that the subscriber accommodation within the transmission performance objective (transmission loss distribution on subscriber line) of 8.0 dB at 1,500 Hz (as stand in Chapter III) is impossible.

To remedy the situation, RSU is to be newly established in Boralesgamuwa area by the Project. By this arrangement, the area is to be detached from Mt. Lavinia Exchange area and to constitute a new exchange area.

(3) Kollupitiya Exchange area is scheduled to be detached from Colombo Central Exchange area before the Project gets underway.

6-3-2 MDF and Cable Chamber

(1) MDF

At the exchanges where MDF holds no surplus capacity, the old terminal block (20 pairs/block) of MDF is to be replaced with a new terminal block (100 pairs/block). The new MDF for Boralesgamuwa Exchange is to be established by the relevant switching equipment expansion project.

(2) Cable Chamber

The existing trenches in Mattakkuliya and Mt. Lavinia exchange offices leave no space for new cable termination. Hence the need for trench capacity expansion.

6-3-3 Entrance Cables

The entrance cable conditions of seven exchanges in the Greater Colombo Area are shown below.

	Existing (pairs/ cables)	To be Removed (pairs/ cables)	Newly Proposed (pairs/ cables)	After Project (pairs/ cables)
Colombo Central	42,700/43	13,800/16	29,400/17	58,300/44
Mattakkuliya	1,800/3	-	3,600/2	5,400/5
Maradana	13,200/10	400/1	7,200/4	20,000/13
Havelock Town	15,200/12	-	7,200/4	22,400/16
Nugegoda	2,600/3	-	9,000/5	11,600/8
Mt. Lavinia	6,900/7	-	10,000/9	16,900/16
Boralesgamuwa	-	-	1,500/1	1,500/1

6-3-4 Underground Facilities

In Colombo Central and Mt. Lavinia exchange areas, the additional PVC pipe installation is scheduled before the Project gets underway. However, pipes used in other exchange areas are concrete pipes for the most part. For additional pipe installation by the Project, PVC pipes are to be used.

6-3-5 Other Matters of Reference

(1) Line concentrator (capacity: 96 subscribers) installation conditions are as under:

Havelock Town	4 L/C	Scheduled in 1983
Nugegoda	6 L/C	Installed in 1983
Mt. Lavinia	5 L/C	Existing

(2) Scheduled Works

The following list presents the scheduled works before the Project:

1) New exchange expansion for Kollupitiya

(1984 - 1984)

2) Colombo Central Exchange area:
   a) Galleface Court to Turrest Road area expansion (after the completion of Kollupitiya Exchange expansion)

   b) Proposed hotel project

   (1984 - 1984)

3) Havelock Town Exchange area rehabilitation work

(1984 - 1984)

4) Boralesgamuwa area (in Mt. Lavinia Exchange area) expansion project

(1984 - 1984)

6-4 Amount of Main Work

The amount of main work for implementation of subscriber cable network improvement and expansion project is shown in Table 6-2.

This work is to cover the section from the tip cable terminal on the subscriber side at MDF to the cable distribution point in outside.

Table 6-2 Amount of Main Work

Main Work / Exchange Name	Manhole (ea)	Duct (km)	Termination Cable (Pairs/Cables)	Cross Connect. Cabinet (ea)	Primary Cable (km)	Secondary Cable (km)
Colombo Central	78	23	29,400/17	62	38	220
Mattakkuliya	29	4	3,600/ 2	9	5	50
Maradana	51	17	7,200/ 4	31	20	140
Havelock Town	94	17	7,200/ 4	39	22	135
Nugegoda	74	10	9,000/ 5	17	11	140
Mt. Lavinia	116	23	10,000/ 9	27	49	245
Boralesgamuwa	2	2	1,500/ 1	2	2	20
Total	444	96	67,900/42	187	147	950

Note: Amount of manhole and duct is for primary cable only.

CHAPTER 7

COST ESTIMATION

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CHAPTER 7 COST ESTIMATION

7-1 Preconditions

Preconditions to the estimation of project implementation cost are as under:

(1) The project be carried out by the implementation schedule described in Chapter 10, Section 1.

(2) International tenders be held to select qualified Contractor and the implementation work be done by such Contractor under turn key base contract.

(3) Consultant be employed to ensure the satisfactory progress of all works concerned including the formulation of tender specifications, evaluation of tenders submitted, supervision of implementation work performance, and final acceptance tests.

(4) Expenses of necessary training for maintenance, design and construction personnel of SLTD who will take care of maintenance and expansion of facilities installed/constructed by the Project, be appropriated in the implementation cost.

(5) Subscriber cable network and junction network improvement/expansion by the Project be accomplished en bloc by the same Contractor.

(6) Work cost calculation be made at the prevailing price level as of April 1983. The rate of exchange be one U.S. dollar = 23 Rupees = 230 Japanese Yen.

(7) Price rises be allowed for at 6 (six) percent per annum for the foreign currency portion and at 10 (ten) percent per annum for the local currency portion.

(8) Contingency be rated at 5 (five) percent of the total cost inclusive of price rises.

7-2 Procurement of Equipments and Materials

Equipments and materials to be procured from abroad and in Sri Lanka for the purpose of project implementation are specified in 7-2-1 and 7-2-2.

7-2-1 Foreign Portion

The following items are to be Procured by the foreign currency portion of budget:

- Cable of all kinds
- Splicing materials (including cable terminating materials)
- Cross-connecting cabinets and distribution boxes
- Equipments for PCM system
- Cable chamber fitting and aerial cable fitting
- Manhole and joint box covers (including cover frames)
- Reinforcement
- Pipes (PVC and steel pipes)
- Work vehicles (including pole erecting cars, forklifts and drum carriers)
- Water pumps
- Work tools and measuring instruments of all kinds

7-2-2 Local Portion

The following items are to be procured by the local currency portion of budget:

- Manhole and joint box covers (including cover frames)
- Reinforcement
- Pipes (PVC and steel pipes)
- Concrete poles (including wooden poles)
- Cement
- Temporary work materials (such as manhole construction framework material)

7-3 Cost Estimation for Junction Network

The cost breakdown for junction network as part of work items of the Porject appeals below.

Junction Network Cost

(Foreign currency portion in million Japanese Yen)

(Local currency portion in million Rupees)

	Foreign Currency Portion	Local Currency Portion	Remarks
Work Cost	1,957.0	28.5	

7-4 Cost Estimation for Subscriber Cable Network

The table below presents the cost breakdown for subscriber cable network as part of work items of the Project.

Subscriber Cable Network Cost

(Foreign currency portion in million Japanese Yen)

(Local currency portion in million Rupees)

	Foreign Currency Portion	Local Currency Portion	Remarks
Work Cost	4,812.0	145.4	

7-5 Miscellaneous Cost

7-5-1 Training Cost

Cost of training for construction and maintenance personnel breaks down as under. The training is to be administered for purposes of satisfactory progress of project implementation and of maintenance/ expansion of facilities installed/constructed by the Project.

(1) Training Items and Trainess

	In Sri Lanka	Overseas	Total
Cable, outside plant work	30 persons x 2 months	15 persons x 2 months	90 man-months
Subscriber's premises work	20 persons x 1 month	5 persons x 1 month	25 man-months
PCM work	10 persons x 1 month	5 persons x 1 month	15 man-months
Total	90 man-months	40 man-months	130 man-months

In Sri Lanka, training is given for field work personnel. Overseas training is for planning, design and maintenance plus related management.

(2) Training Cost

(Foreign currency portion in million Japanese Yen)

(Local currency portion in million Rupees)

	Foreign Currency Portion	Local Currency Portion
Training Cost	57.0	0.3

7-5-2 Consultant Fee

Fee for Consultant to be employed for implementation of the Project is as under:

(1) Consultant Services

a. Detailed design

b. Preparation of plan papers and tender specifications

c. Assistance in tender practices (including tenderer qualification check, evaluation of tenders, and contract document preparation)

d. Witness to factory tests of equipment and materials

e. Supervision of construction work progress by resident supervisor

f. Witness to intermediate tests and final acceptance tests

(2) Consultant Fee

(Foreign currency portion in million Japanese Yen)

(Local currency portion in million Rupees)

	Foreign Currency Portion	Local Currency Portion
Consultant Cost	409.0	5.4

7-6 Maintenance Cost, Operation and Administration Cost, and Working Capital

7-6-1 Maintenance Cost

Annual costs for maintenance of facilities to be installed/constructed by the Project appear below. They are calculated at 4 (four) percent of the total plant investment.

It may be noted that the maintenance cost of SLTD (excluding OTS) in 1981 is estimated at 4.7 percent of the net plant in operation valued at the then prevailing price level. The maintenance cost of outside-plant facilities is 3 (three) percent of investmented values in case of Japan.

(in million Rupees)

	1988 - 2007
Maintenance Cost	36.1

7-6-2 Operation and Administration Cost

Annual operation and administration cost for providing telecommunication services appears below. The cost is estimated at 30 percent of annual operating revenues.

The operation and administration cost of SLTD (excluding OTS) in 1981 is estimated at about 36 percent of operating revenue, of which about 78 percent is personnel cost. It is expected to decrease relatively since rationalization is being carried out to reduce the number of personnel per telephone. In Japan, about 30 percent of operating revenue is set aside for operation and administration cost annually.

(In million Rupees)

	1988	1989	1990	1991	1992
Operation and Administration Cost	31.8	55.3	77.8	102.4	125.9

1993 - 2007
117.6

Note: For operating revenue, refer to Chapter 8.

7-6-3 Working Capital

Annual increments of working capital to be required for providing services after service-in appear below.

Generally, the amount of working capital required is said to be around 30 percent of operating revenue. This percentage, however, is considered to decrease in accordance with service scale expansion. It is about 10 percent in case of Japan.

(In million Rupees)

	1988	1989	1990	1991	1992
Working Capital Requirements	31.8	55.3	78.8	102.4	125.9
Annual Increments	31.8	23.5	23.5	23.6	23.5

1993	1994 - 2006	2007
117.6	117.6	0.0
-8.3	0.0	-117.6

Note: For operating revenue, refer to Chapter 8.

7-7 Total Project Implementation Cost

Total project implementation cost based on the estimates in the preceding paragraphs 7-1 through 7-5 appears in Table 7-1. It should be noted that this total cost does not include operational costs and annual working captal increments described in paragraph 7-6.

Table 7-1 Total Project Implementatin Cost

	Foreign Currency Portion (million J¥)	Local Currency Portion (million Rs)
Junction network	1,957.0	28.5
Subscriber cable network	4,812.0	145.4
Training	57.0	0.3
Consultant fee	409.0	5.4
Sub-total	7,235.0	179.6
Price contingency	1,458.0	71.9
Physical contingency	435.0	12.6
Total:	9,128.0	264.1

The price contingency indicated in the above table was calculated based on the following formula:

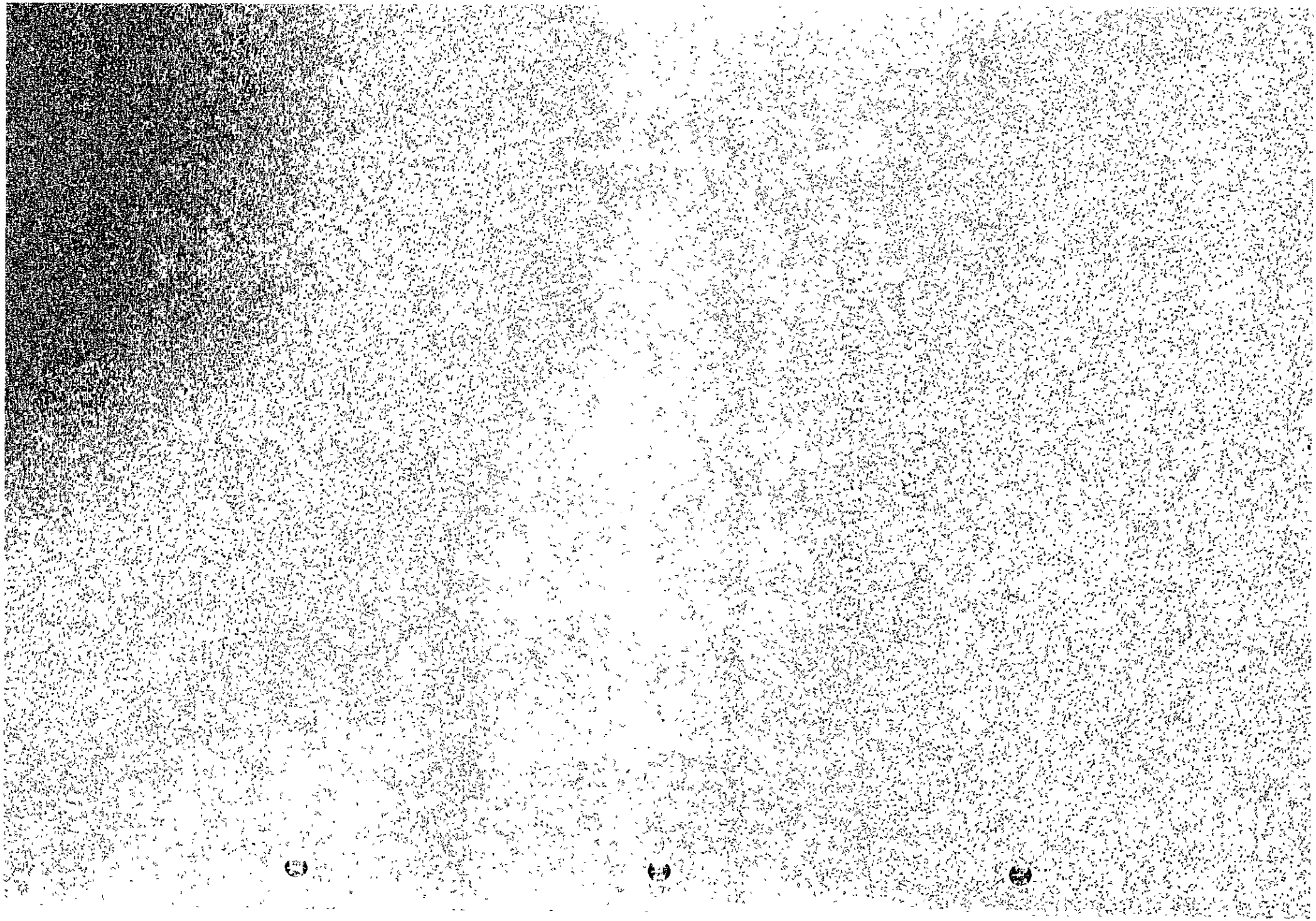
	1984	1985	1986	1987
a. Costs (Constant price at April, 1983)				
Foreign	F1	F2	F3	F4
Local	L1	L2	L3	L4
b. Price Increase (per annum)				
Foreign	6%	6%	6%	6%
Local	10%	10%	10%	10%
c. Costs (current price)				
Foreign	F1 x 1,090	F2 x 1,075 x 1,060	F3 x 1,075 x 1,060 x 1,060	F4 x 1,075 x 1,060 x 1,060 x 1,060
Local	L1 x 1,150	L2 x 1,125 x 1,100	L3 x 1,125 x 1,100 x 1,100	L4 x 1,125 x 1,100 x 1,100 x 1,100

d. Price Contingency c - a

Note: It is assumed that the costs of 1984 is to be expended at the beginning of the 4th quarter, and the costs of other years are in the middle of the year.

CHAPTER 8

REVENUE ESTIMATION



CHAPTER 8 REVENUE ESTIMATION

8-1 Preconditions

8-1-1 The Project and the Whole System of Telecommunications Network

The Project is concerned only with the junction network and subscriber cable network in the Greater Colombo Area. It is not an integrated project covering switching systems and subscribers' plants also. Therefore, revenues to accrue from the Project is intrinsically those that accrue from the whole system on condition that installation/construction of other related facilities progresses and reaches completion in parallel with the Project or such related facilities already exist in a complete form.

In order to cope with such an implication, assuming that the Project does progress in parallel with a investment plan for the whole system, revenues from the whole system are calculated as a first step. Then, the revenues thus obtained are multiplied by a ratio of the amount of investment in the Project to the amount of investment in the whole system. The result of this multiplication can be deemed as the revenues attributable to the current project.

According to the investigation by a World Bank's consultant, the ratio of the value of each category of facilities to that of whole system is as under:

Subscribers' apparatus	10%
Subscribers' local line	35%
Local exchange equipment	25%
Junctions	10%
Trunk exchanges	5%
Long distance network	15%

For allocating revenues to the Project, the ratios quoted above are used as reference. However, these ratios may vary due to conditions of a particular country or as a result of recent technological development. Therefore, in the next chapter a sensitivity analysis will be made against various revenue levels.

8-1-2 Revenues from the Whole System

The telephone demand and supply situation now in the Greater Colombo Area is very stringent. Investment can seldom reach the level to cater for the ever-increasing demand. Thus the judgment is made that, without investment in the whole system, demand increases in 1988 and after cannot be satisfied. In other words, the annual revenues for and after 1988 in the Greater Colombo Area exceeding the level of 1987 are considered as the revenues attributable to the whole system.

On the other hand, the Project alone, i.e., without additional investment, cannot meet demand increases after 1992. The same is assumed for the whole system. Hence, the revenues will reach the ceiling at the level of 1992 and will remain constant thereafter.

The foregoing assumption is graphically presented in Figure 8-1.

8-1-3 Project Life and Salvage Value of Plant and Equipment

The Project life is set at 20 years after service-in. This figure is commonly used for evaluation of telecommunications projects.

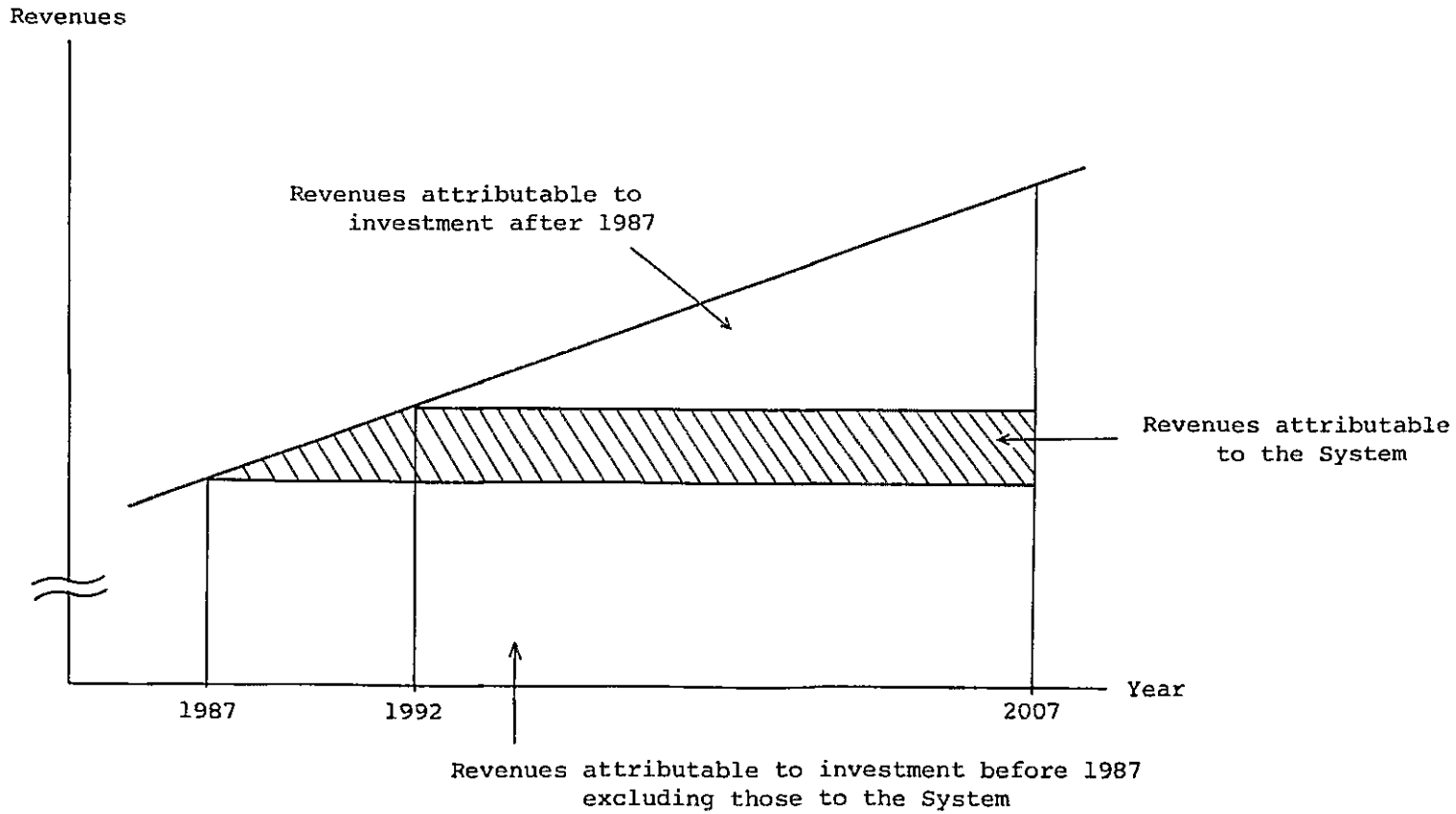


Figure 8-1 Revenues Attributable to the System

The salvage value of plant and equipment is set at zero. The reason is that when depreciation is made by 5 persent annually on a straight-line basis, the salvage value reaches zero in 20 years. Furthermore, even if the salvage value is counted to a certain extent, its present value exerts little or almost no influence on the rate of return.

8-1-4 Revenue Items

Revenue items of the Project are indicated below:

Telephone service:

Installation fees
Annual rentals
Call charges
- local calls
- trunk calls
- international calls

Circuits to be established by the Project may be used also for public telephones, telexes and leased circuits. However, at present, they still belong to the minority group when compared with subscribers' telephones. Thus, in the revenue estimation here, the assumption is that all the circuits will be used for subscribers' telephones.

In case where the use of those circuits for other than subscribers' telephone services increases relatively, the gross revenue would be greater. As for telegraph-service revenue, since increase or decrease as the result of the Project is considered to be negligibly small, it is not taken up for revenue estimation.

8-1-5 Calculation Procedures

Calculation procedures for revenue estimation are as under:

First, each revenue item is calculated for the whole system. Then, each amount of revenues thus obtained is multiplied by the "ratio of revenue distribution to the Project" shown in Table 8-2, which is determined based on the component ratio of cost of each category of facilities described in paragraph 8-1-1. Here, clear demarcation is made between the revenues from local subscribers' cable network and those from inter-exchange junction network. The reason is that the ratio of revenue distribution differs between the two network categories.

8-2 Revenue Estimation

8-2-1 Installation Fees

The number of new telephone subscribers in 1988 and after that can be covered by the whole system is as under. From 1993 forward, the corresponding number is zero because new demands cannot be catered for.

Annual Increase of Subscribers

	Installation Fee	1988	1989	1990	1991	1992	1993 - 2007
Local Network	Rs10,000	4,431	4,431	4,431	4,431	4,431	0
	Rs 7,000	1,689	1,689	1,689	1,689	1,689	0
Junction Network	Rs10,000	4,431	4,431	4,431	4,431	4,431	0
	Rs 7,000	5,163	5,163	5,163	5,163	5,163	0

Each entry appearing above is multiplied by Rs. 10,000 in the case of subscribers of Colombo Central, Mattakkuliya, Maradana and Havelock Town exchanges and by Rs. 7,000 in the case of other exchanges. The result is further multiplied by the ratio of revenue distribution presented in Table 8-2 to obtain the installation-fee revenue by the Project. The amount of revenues by years appears below.

Installation-Fee Revenue

(million Rs)

	1988	1989	1990	1991	1992	1993 - 2007
Local Network	19.6	19.6	19.6	19.6	19.6	0.0
Junction Network	8.0	8.0	8.0	8.0	8.0	0.0
Total	27.6	27.6	27.6	27.6	27.6	0.0

8-2-2 Annual Rentals

Although the installation-fee revenues are counted only for the year of installation, the annual-rental revenue is continuous from year to year. When the cumulative total of subscribers in 1988 and after as tabulated below is multiplied by a unit rate of annual rentals, or, more precisely, by Rs. 600 each in the case of business telephones and by Rs. 250 each in the case of residence, the annual-rental revenues of te whole system are obtained. Further, by multiplying the revenues of the whole system by the ratio of revenue distribution the annual-rental revenues by the Project are obtained.

Cumulative Total of Subscribers

		1988	1989	1990	1991	1993 - 2007
Local Network	Business	3,042	6,084	9,126	12,168	15,210
	Residence	3,078	6,156	9,234	12,312	15,390
Junction Network	Business	3,701	7,402	11,103	14,504	18,505
	Residence	5,893	11,786	17,679	23,572	29,465

Annual-Rental Revenue

(million Rs)

	1988	1989	1990	1991	1993 - 2007
Local Network	0.9	1.8	2.7	3.6	4.5
Junction Network	0.4	0.8	1.2	1.6	2.0
Total	1.3	2.6	3.9	5.2	6.5

8-2-3 Call Charges

(1) Local Call Charges

For the local-call-charge revenue estimation, the traffic volume per day is firstly obtained by dividing the busy-hour originating traffic shown in Table 5-2 by the busy-hour concentration ratio. Further, this traffic volume per day is divided by the mean holding time of completed and incompleted calls to obtain all-day calls. Furthermore, all-day calls are multiplied by the completed-call ratio to obtain the number of completed calls, and this number is multiplied by the call charge corresponding to the mean holding time of completed calls. By this means the revenue per day can be obtained. Lastly, the revenue per day is multiplied by the number of working days in the year to obtain the revenue per annum.

The foregoing calculation procedures can be formularized as under:

$$YR = \frac{\frac{BT}{BCR}}{MT} \times CR \times RC \times WD$$

Where: YR = revenne per annum
BT = busy-hour originating traffic
BCR= busy-hour concentration ratio
MT = mean holding time (completed and incompleted calls)
CR = completed call ratio
RC = revenue per completed call
WD = working days in the year

Out of the revenues obtained as per above, the portions that can be summed up as revenue from the whole system are those that exceed the level of 1987, according to the principle set forth in the preceding paragraph, and that amount becomes constant after 1992. When the amount is multiplied by the ratio of revenue distribution the local-call- charge revenue can be obtained as under:

Local-Call-Charge Revenue

(million Rs)

	1988	1989	1990	1991	1992 - 2007
Local Network	11.0	22.0	33.0	44.0	55.0
Junction Network	4.1	8.2	12.3	16.4	20.5
Total	15.1	30.2	45.3	60.4	70.5

For computing the above, it is assumed that the completed-call rate, set at 50 percent for 1987, will be improved to 65 percent in 1992. Therefore, it is safe to consider that benefits resulting from the completed-call rate improvement are incorporated in the above revenues.

(2) Trunk Call Charges

For trunk-call-charge revenue estimation, the calculation is made following the same principle as in the case of local-call-charges. To be noted, however, is that tariff differences due to night discount and call distance as well as necessity or no necessity of operator assistance are taken into account. Also it should be mentioned that, in addition to the number of originating calls, the same number of terminating calls is counted since they also generate revenues in the hands of SLTD.

Shown below is the trunk-call-charge revenue by the Project obtained by the above calculation.

Trunk-Call Charge Revenue

(million Rs)

	1988	1989	1990	1991	1992 - 2007
Local Network	15.9	31.8	47.7	63.6	79.5
Junction Network	5.9	11.8	17.7	23.6	29.5
Total	21.8	43.6	65.4	87.2	109.0

(3) International Call Charges

The same principle as in the foregoing applies to the estimation of international-call-charge revenue. However, the terminating versus originating call ratio used here is 1.5 : 1, which was estimated based on the record in 1982.

For international-call-charge revenue, the distribution ratios shown in 8-1-1 are not valid since they do not comprise facilities investment required for international communication services.

According to the data of 1982, the average revenue per minute amounts to approximately Rs. 46 whereas the payment required by foreign administrations including international circuit rental fees is worth Rs. 29 per call. Thus, by subtracting such payments from the revenue per call, the problem relating to facilities for international calls located outside Sri Lanka can be settled.

International call facilities owned by SLTD estimated from the value of fixed assets as of 1979 account for about 10 percent of the total. This fact indicates that the component ratio mentioned in paragraph 8-1-1 has to be multiplied by 0.9.

The international-call-charge revenue by the Project obtained as per above is as under:

International-Call-Charge Revenue

(million Rs)

	1988	1989	1990	1991	1992 - 2007
Local Network	30.6	61.2	91.8	122.4	153.0
Junction Network	9.6	19.2	28.8	38.4	48.0
Total	40.2	80.4	120.6	160.8	201.0

The yearly revenues estimated in the foregoing are summarized in Table 9-1. Various kinds of values assumed and used in the calculations are given in Table 8-1.

Table 8-1 Summary of Assumed Values for Computing Revenues

A. Installation Fees: Rs 10,000 for Metro-Colombo; Rs. 7,000 for others

B. Annual Rentals: Rs 600 for business; Rs 250 for residence

C. Call Charges:		Local	Trunk	International	Unit
1. Mean holding time					
- completed		135	250	440 + 30*	seconds
- incompleted		10	15	30	seconds
2. Completed call ratio					
No. of completed calls / No. of total call attempts	(1987)	50	50	60	%
	(1992)	65	65	75	%
3. Concentration ratio		10	10	10	%
Traffic of busy-hour / All-day traffic					
4. No. of calls during discount-hours divided by total		-	10	-	%
5. No. of working days in a year		300	300	300	days
6. Charges per call		1.25	10.70	340.00	Rs
7. Revenues per call		1.25	8.00	130.00	Rs
8. No. of terminating calls divided by originating		-	100	150	%

Note: * Only 440 seconds are charged for revenue calculation since 30 seconds are needed for operator assistance and waiting time for answering.

Table 8-2 Ratios of Revenue Distribution to the Project

(Unit: percent)

	Local Network	Junction Network
Installation Fees	35.0	10.0
Annual Rentals	35.0	10.0
Local Calls	35.0	10.0
Trunk Calls	35.0	10.0
International Calls	31.5	9.0

CHAPTER 9

FINANCIAL AND ECONOMIC ANALYSIS

ЧАСТИНА 8

ФІЗИЧНІ ТА ЕКОНОМІЧНІ ОЗНАКИ ЗАЛЕЖНОСТІ

CHAPTER 9 FINANCIAL AND ECONOMIC ANALYSIS

9-1 Financial Analysis

9-1-1 Financial Internal Rate of Return

Table 9-1 presents year by year breakdowns of the project implementation costs estimated in Chapter 7 and of the revenues (i.e., benefits) calculated in Chapter 8.

Some working capital is to be recovered in 1993, when the revenue decreases compared with the year before, and all of the balance at end of the project life. They are entered as debits to expenditures. The entries as initial investment are exclusive of contingencies. The project life is set at 20 years after service-in as stated in the preceding chapter.

The financial internal rate of return (FIRR) of the Project computed based on Table 9-1, i.e., the discount rate that equalizes the present value as of 1984 of the cost and benefit streams estimated at the price level of 1983, is 15.2 percent.

The real opportunity cost of capital for the economy of Sri Lanka is around 5-8 percent, which was estimated considering the nominal interest rates and price increases indicated in the below table. Therefore, it is concluded that the FIRR of the Project exceeds the opportunity cost of capital. It follows that the implementation of the Project is feasible from the view point of the financial aspect.

The Opportunity Cost of Capital

(Unit: Percent)

Country	Type of Interest Rate	(1) Nominal Interest Rate	(2) Rate of Price Increase	(3) Real Interest Rate [(1)-(2)]
Sri Lanka	a. Treasury bill (short-term)	13.00*1	10.80*2	2.20
	b. Difference between short and long term interest rate of bank deposits	4.50 - 5.50*2	—	—
	c. Estimated long term interest rate (a+b)	17.50 - 18.50*1	10.80*2	6.70 - 7.70
	d. Long term lending rate - Development Finance Corporation	13.00 - 17.00*1	10.80*2	2.20 - 6.80
Japan	e. Long term prime rate	8.40*4	2.40*5	6.00
U.S.A.	f. Treasury bill (long-term)	10.92*4	6.07*6	4.85

Note: *1 : As at Dec. 1982.

*2 : Increase of Colombo Consumers' Price Index during 1982.

*3 : Difference of interest rates between 3 month and 12 month bank deposits as at Dec. 1982.

*4 : As at June, 1983.

*5 : Increase of Nation-Wise Consumers' Price Index during 1982.

*6 : Increase of Consumers' Price Index during 1982.

Table 9-1 Cashflow Table for Computing FIRR

(Unit: Million Rs.)

Year	0 1984	1 1985	2 1986	3 1987	4 1988	5 1989	6 1990	7 1991	8 1992	9 1993	10-22 1994-2006	21 2007
A. Cash Inflows												
1. Installation Fees					27.6	27.6	27.6	27.6	27.6			
2. Annual Rentals					1.3	2.6	3.9	5.2	6.5	6.5	6.5	6.5
3. Local Calls					15.1	30.2	45.3	60.4	75.5	75.5	75.5	75.5
4. STD Calls					21.8	43.6	65.4	87.2	109.0	109.0	109.0	109.0
5. International Calls					40.2	80.4	120.6	160.8	201.0	201.0	201.0	201.0
Total Inflows					106.0	184.4	262.8	341.2	419.6	392.0	392.0	392.0
B. Cash Outflows												
1. Initial Investment	10.7	150.3	594.8	147.3								
2. Working Capital					31.8	23.5	23.5	23.6	23.5	-8.3		-117.6
3. Maintenance					36.1	36.1	36.1	36.1	36.1	36.1	36.1	36.1
4. Operation & Administration					31.8	55.3	78.8	102.4	125.9	117.6	117.6	117.6
Total Outflows	10.7	150.3	594.8	147.3	99.7	114.9	138.4	162.1	185.5	145.4	153.7	36.1
C. Surplus/Deficit (A - B)	-10.7	-150.3	-594.8	-147.3	6.3	69.5	124.4	179.1	234.1	246.6	238.3	356.3

NPV at 15% discount rate = 10.4 ; at 16% = -42.9 ; IRR = 15.2%

9-1-2 Sensitivity Analysis

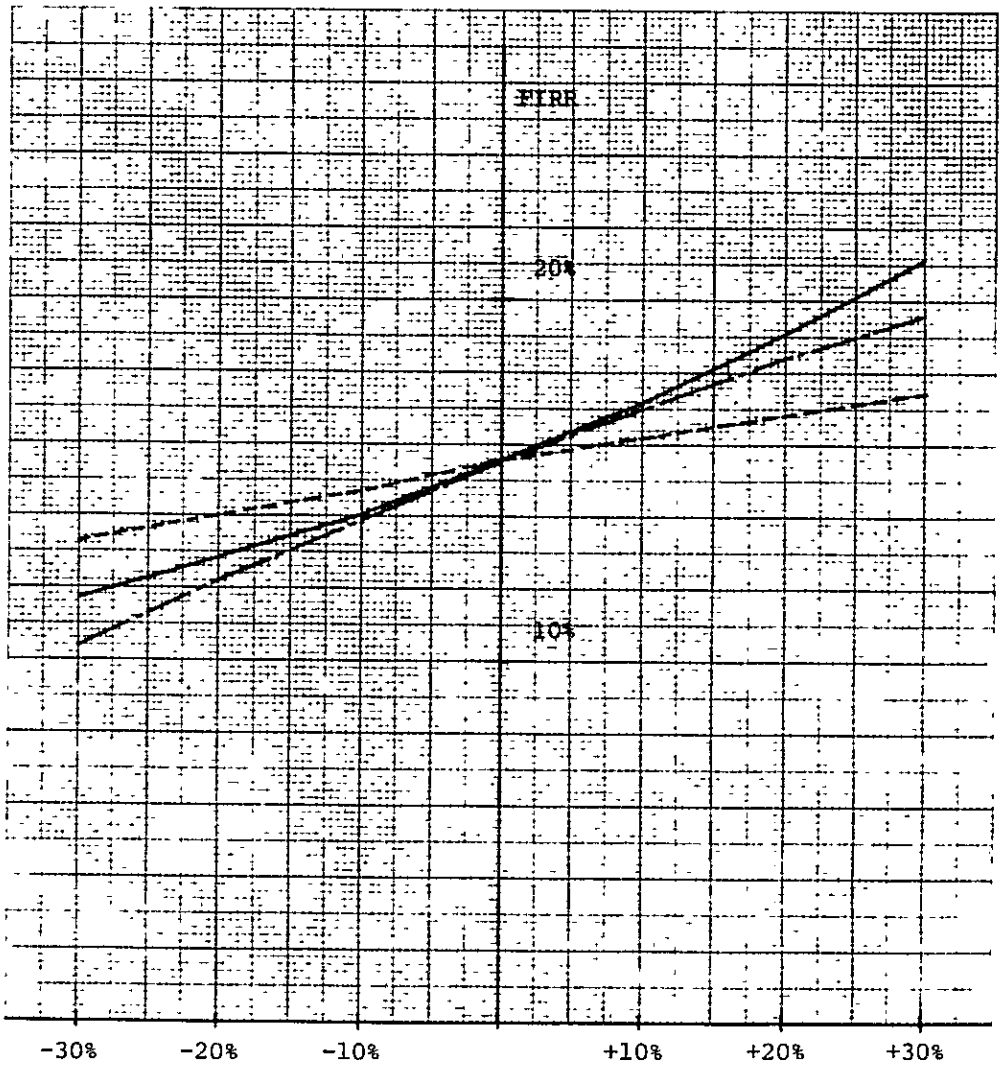
The Sensitivity analysis is to see how much will the FIRR obtained in the preceding paragraph vary depending upon increases or decreases of costs and benefits. The results of the analysis are as follows:

(Unit: percent)

	+30%	+20%	+10%	0%	-10%	-20%	-30%
Decrease of revenues	10.2	12.0	13.6	15.2	16.7	18.1	19.4
Increase of initial investment	11.5	12.6	13.8	15.2	16.7	18.7	20.8
increase of operation & administration costs	13.1	13.8	14.5	15.2	15.9	16.6	17.2

The above results are graphically presented in Figure 9-1.

As seen in Figure 9-1, the effects of operation/ administration costs variations on FIRR are not necessarily significant; however, to variations in the amount of revenues and initial investment, FIRR is relatively sensitive. Nevertheless, even in the event that the initial investment increases by more than 30 percent and revenue decreases by 30 percent, FIRR still remains well above the opportunity cost of capital (8%) mentioned before.



decrease ←—— Revenue ——→ increase

increase ←—— Initial Investment ——→ decrease

increase ←- - - Operation and Administration - - -→ decrease

Figure 9-1 Sensitivity Analysis

9-1-3 Funds Flow Analysis

As stated in Chapter 2, SLTD is deriving sound and reasonable profits from its entire operation as far as its notional financial statements are concerned. In reality, however, SLTD cannot reserve and/or reinvest its profits since they must be credited to the Treasury's account. On the other hand, any funds needed for investment activities are to be provided by the Treasury.

This kind of financial system makes it extreamly difficult to assess the impact of the Project on SLTD's financial status. Therefore, as a second best approach, a funds flow analysis is conducted only concerning the Project.

The Major assumptions employed for the analysis are as follows:

(1) All the required funds are to be financed by borrowings.

- The foreign portion of the initial investment is to be financed by a concessional loan of a foreign government or an international aid agency. The terms of the loan are: i) interest rate - 4 percent per annum (payable every year); ii) repayment - equal installment of 20 years with 10 year grace period.

- The local portion of the initial investment is to be borrowed from a domestic financial institution. The terms of the loan are: i) interest rate - 8 percent per annum (payable every year); ii) repayment - payable in 10 years.

- Other necessary funds are to be borrowed from a domestic financial institution on a short-term basis. The terms of the loan are: i) interest rate - 5 percent per annum; ii) repayment - as soon as surplus funds are accumulated.

(2) The assumptions regarding depreciation, operation and administration costs, maintenance costs, and working capital are as same as those made in Chapter 7. All the analysis here is made on a real term basis and, accordingly, inflation is not taken into account.

Table 9-2, 9-3, and 9-4 are a pro-forma income statement, a balance sheet, and a funds flow statement, respectively. The "Cash in Hand" in the balance sheet is cumulative sum of the "Change in Cash" in the funds flow statement. Although the cash-in-hand should be included in the category of working capital according to the standard accounting principles, a clear distinction is made here between the account receivables, which is necessary for the operation, and the cash-in-hand in order to show how much surplus funds (cash-in-hand) will be left in the hands of SLTD as the result of the Project.

The analysis based on these statements reveals that both the operating and net income become surplus in the second year after service-in. The operating ratio comes down to a sound value of 60 percent in the third year and shifts at the level of around 50 percent afterwards. As a result, the rate of return on the initial investment exceeds 10 percent in the forth year. It should be noted that the rate of return on the total assets is somewhat low because of the fact that no interest earning is counted for the cash-in-hand.

Table 9-2 Pro-forma Income Statement of the Project

(Unit: million Rs)

Year	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
A. Operating Revenues																	
Installation fees					27.6	27.6	27.6	27.6	27.6								
Annual rentals					1.3	2.6	3.9	5.2	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
Local calls					15.1	30.2	45.3	60.4	75.5	75.5	75.5	75.5	75.5	75.5	75.5	75.5	75.5
Trunk calls					21.8	43.6	65.4	87.2	109.0	109.0	109.0	109.0	109.0	109.0	109.0	109.0	109.0
International calls					40.2	80.4	120.6	160.8	201.0	201.0	201.0	201.0	201.0	201.0	201.0	201.0	201.0
Total					106.0	184.4	262.8	341.2	419.6	392.0	392.0	392.0	392.0	392.0	392.0	392.0	392.0
B. Operating Expenses																	
Operation & Administration					31.8	55.3	78.8	102.4	125.9	117.6	112.6	117.6	117.6	117.6	112.6	117.6	117.6
Maintenance					36.1	36.1	36.1	36.1	36.1	36.1	36.1	36.1	36.1	36.1	36.1	36.1	36.1
Depreciation					45.2	45.2	45.2	45.2	45.2	45.2	45.2	45.2	45.2	45.2	45.2	45.2	45.2
Total					113.1	136.6	160.1	183.7	207.2	198.9	198.9	198.9	198.9	198.9	198.9	198.9	198.9
C. Operating Income (A-B)					-7.1	47.8	102.7	157.5	212.4	193.1	193.1	193.1	193.1	193.1	193.1	193.1	193.1
Less: Interests																	
Foreign		0.4	6.1	25.3	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.6	27.3	25.9	24.4	23.0
Local-long term		0.1	0.6	9.7	14.3	14.3	14.3	14.3	14.3	14.3	14.3	14.3	13.8	4.6			
-Short term			0.1	0.4	2.1	4.1	3.0										
D. Net Income		-0.5	-6.8	-35.4	-52.4	0.5	56.5	114.3	169.2	149.9	149.9	149.9	150.7	161.2	167.2	168.7	170.1
Operating Ratio (%)						74.1	60.9	53.8	49.4	50.7	50.7	50.7	50.7	50.7	50.7	50.7	50.7
Rate of Return on: Initial investment (%)						0.1	6.3	12.7	18.7	16.6	16.6	16.6	16.7	17.8	18.5	18.7	18.8
Net plan in operation (%)						0.1	7.4	15.8	25.0	23.7	25.5	27.7	30.4	35.7	41.2	46.8	53.9
Total Assets (%)						0.1	0.5	11.7	14.7	11.5	10.4	9.5	9.5	9.7	9.4	8.8	8.3

Table 9-3 Pro-forma Balance Sheet of the Project

(Unit: million Rs)

Year	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
A. Assets																	
Plant in Operation					903.1	903.1	903.1	903.1	903.1	903.1	903.1	903.1	903.1	903.1	903.1	903.1	903.1
Less: Accumulated Depreciation					45.2	90.4	135.6	180.8	226.0	271.2	316.4	361.6	406.8	452.0	497.2	542.4	587.6
Net Plant in Operation					857.9	812.7	767.5	722.3	677.1	631.9	586.7	541.5	496.3	451.1	405.9	360.7	315.5
Work in Progress	10.7	161.0	755.8	903.1													
Total Fixed Assets	10.7	161.0	755.8	903.1	857.9	812.7	767.5	722.3	677.1	631.9	586.7	541.5	496.3	451.1	405.9	360.7	315.5
Account Receivables					31.8	55.3	78.8	102.4	125.9	117.6	117.6	117.6	117.6	117.6	117.6	117.6	117.6
Cash in hand							18.7	154.6	345.5	548.9	742.8	923.6	973.6	1,085.7	1,261.9	1,439.6	1,618.7
Total Current Assets					31.8	55.3	97.5	257.0	471.4	666.5	860.4	1,041.2	1,091.2	1,203.3	1,379.5	1,557.2	1,736.3
Total Assets	10.7	161.0	755.8	903.1	889.7	868.0	865.0	979.3	1,148.5	1,298.4	1,447.1	1,582.7	1,587.5	1,654.4	1,785.4	1,917.9	2,051.8
B. Liabilities																	
Equity: Accumulated Profits		-0.5	-7.3	-42.7	-95.1	-94.6	-38.1	76.2	245.4	395.3	545.2	695.1	845.8	1,007.0	1,174.2	1,342.9	1,513.0
Long-term Borrowings: Foreign	10.0	153.7	634.3	723.5	723.5	723.5	723.5	723.5	723.5	723.5	723.0	715.3	683.6	647.4	611.2	575.0	538.8
Local	0.7	7.3	121.5	179.6	179.6	179.6	179.6	179.6	179.6	179.6	178.9	172.3	58.1				
Short-term Borrowings: Local		0.5	7.3	42.7	81.7	59.5											
Total Borrowings	10.7	161.5	763.1	945.8	984.8	962.6	903.1	903.1	903.1	903.1	901.9	887.6	741.7	647.4	611.2	575.0	538.8
Total Liabilities	10.7	161.0	755.8	903.1	889.7	868.0	865.0	979.3	1,148.5	1,298.4	1,447.1	1,582.7	1,587.5	1,654.4	1,785.4	1,917.9	2,051.8
Debt-Equity Ratio (%)								1185	368	228	165	128	88	64	52	43	36

Table 9-4 Pro-forma Funds Flow Statement of the Project

(Unit: million Rs)

Year	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
A. Sources																	
Operating Income					-7.1	47.8	102.7	157.5	212.4	193.1	193.1	193.1	193.1	193.1	193.1	193.1	193.1
Depreciation					45.2	45.2	45.2	45.2	45.2	45.2	45.2	45.2	45.2	45.2	45.2	45.2	45.2
Internal Cash Generation					38.1	93.0	147.9	202.7	257.6	238.3	238.3	238.3	238.3	238.3	238.3	238.3	238.3
Long-term Borrowings: Foreign	10.0	143.7	480.6	89.2													
Local	0.7	6.6	114.2	58.1													
Short-term Borrowings: Local		0.5	6.8	35.4	39.0												
Total Borrowings	10.7	150.8	601.6	182.7	39.0												
Total Sources	10.7	150.8	601.6	182.7	77.1	93.0	147.9	202.7	257.6	238.3	238.3	238.3	238.3	238.3	238.3	238.3	238.3
B. Requirements																	
Initial Ingestment	10.7	150.3	594.8	147.3													
Change in Working Capital					31.8	23.5	23.5	23.6	23.5	-8.3							
Foreign Loan: Interest		0.4	6.1	25.3	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.6	27.3	25.9	24.4	23.0
Amortization											0.5	7.7	31.7	36.2	36.2	36.2	36.2
Local Loan: Interest-Long-term		0.1	0.6	9.7	14.3	14.3	14.3	14.3	14.3	14.3	14.3	14.3	13.8				
-Short-term			0.1	0.4	2.1	4.1	3.0										
Amortization-Long-term											0.7	6.6	114.2	58.1			
-Short-term						22.2	59.5										
Total Debt-Service		0.5	6.8	35.4	45.3	69.5	105.7	43.2	43.2	43.2	44.4	57.5	188.3	126.2	62.1	60.6	59.2
Total Requirements	10.7	150.8	601.6	182.7	77.1	93.0	129.2	66.8	66.7	34.9	44.4	57.5	188.3	126.2	62.1	60.6	59.2
C. Change in Cash (A-B)							18.7	135.9	190.9	203.4	193.9	180.8	50.0	112.1	176.2	177.7	179.1
Debt-Service Ratio (times)						0.75	1.40	4.69	5.96	5.51	5.36	4.14	1.26	1.89	3.83	3.93	4.02

The balance of borrowings, which reaches a peak in the year of service-in, declines soon due to the repayment of the short-term loan. The largest amount of repayment comes in 1996; however, there is no need to use accumulated cash for repayments owing to sufficient internal cash generation. After that year, the amount of repayment decreases and, accordingly, the debt-service-ratio (internal cash geration/debt service payments) moves up to a sound level of about 4.0.

Based on these analyses on a constant price basis concerning the Project's funds flow, it is safe to conclude that there will be no critical problem for repayments even if all the necessary funds for project implementation are financed by borrowings.

9-2 Economic Analysis

9-2-1 Economic Internal Rate of Return

The rate of return presented in 9-1-1 is what we call financial internal rate of return, which is computed based on the prevailing market prices and the present level of telecommunications charges. In order to evaluate the true impact of the Project to Sri Lanka's ecomony, this FIRR must be converted to Economic Internal Rate of Return (EIRR) using shadow prices instead of market prices. This is because the market prices and the telecommunications charges, which are determined by a monopolistic supplier, do not necessarily represent the true value of economic resources.

The fundamental procesures taken and the major assumptions employed for computing EIRR are as follows:

(1) The prices used in the financial analysis were converted to "the border price" by multiplying by the standard conversion factor (SCF). The foreign portion of the initial investment, however, was untouched since they are expressed in terms of CIF price which is considered as the border price.

It should be noted that the SCF estimated for the Project is 1.00. Eventually, the border prices obtained following the above procedures happen to be as same as the domestic market prices.

(2) In view of the large number of unemployment, the wage rate of unskilled labor can be deemed to be higher than their marginal productivity. The estimated shadow wage rate is 77 percent of the actual payment.

(3) As for economic benefits, consumers' surplus was counted in addition to the operating revenues calculated in the financial analysis. The estimation of the demand curve necessary for deriving the consumers' surplus was made analysing the changes in demand in response to the tariff increases during 1979-80 period.

The EIRR computed following the above procedures is 29.7 percent, which is well above the FIRR. This means that the Project will bring about not only a great deal of financial benefits to SLTD but also a large mount of economic benefits to the entire economy of Sri Lanka, and that the magnitude of the latter is relatively greater than that of the former.

9-2-2 Unquantitative Economic Benefits

The economic benefits of the Project are not limited to the quantitative SLTD's revenues and the consumers' surplus which are counted as benefits for calculating EIRR in 9-2-2.

The economy of Sri Lanka is now in the process of transition from predominant dependence on such traditional primary products as tea, coconuts, and rubber to non-traditional goods, especially those of light industry. In order to ensure such development, the government has been placing an emphasis on promoting exports and encouraging investment of foreign capital. However, the present state of infrastructure, typically represented by telecommunications is not good enough to sustain the growth of modern industries. Insufficient investment, maintenance, and improper administration in the past had worked as constraints on socio-economic development. It follows that investment in industrial infrastructure is prerequisite and/or urgent need for re-organization of the economy.

The study of the Research Institute of Telecommunications and Economics (The Role of Telecommunications Services in Developing Countries: March 1979, Tokyo) showed that there is a general tendency among developing countries that telecommunications services so often become a critical constraint on economic development. Putting it in another way, the benefits of the investment in a bottle-necked sector will be great. In fact, the study estimated that the effects of enlarging production by a unit investment in the telecommunications sector of Indonesia was three times as large as that of Japan.

Judging from per capita GDP, Indonesia's level of economic development can be regarded as same as that of Sri Lanka although the per capita GDP of the former is slightly higher than that of the latter. It may follow that the effects of investments in telecommunications sector in Sri Lanka are as great as those estimated for Indonesia. These positive impacts for increasing production, however, cannot be quantified since most of them are realized through so-called external economy. Hence, they were not captured in the course of calculating EIRR in 9-2-1.

On the other hand, significant external diseconomy such as polution problems is not identified for the Project. There are some possibilities to cause, say, traffic jams during construction; however, such adverse effects are of the nature of once-for-all and will disappear after completion.

With these considerations, it is safe to conclude that the unquantitative economic benefits of the Project exceed the unquantitative economic costs.

9-3 Social Analysis

The improvement of telecommunications network contributes a great deal to betterment of national well-being not simply in the form of economic benefits but also in terms of social benefits. More precisely, the greater ease of emergency access to medical institutions is conducive to protection and rescue of human lives; the functioning of communication media at higher efficiency leads to upgrading and diversification of government services including improvement of security; increased supply of information has intimately to do with everyday life of the people.

The Project is to be implemented in the area where the income level is relatively high. Therefore, when considered from the viewpoint of income distribution, the Project does not necessarily bring a great deal of benefits directly to the needy class. However, the construction work creates a great number of employment opportunities: the civil works alone provide jobs of about 260,000 man-days. Furthermore, the coming into service of the telecommunications system as infrastrcture to promote industrial production enables economic activities to pull up momentum. The aggregate employment opportunities to follow for the poor are great indeed.

9-4 Overall Evaluation

After the introduction of the liberalized economic policies in 1977, the economy of Sri Lanka showed a remarkable growth rate of 4.4 percent in terms of per capita real GDP. For further development of the economy, however, there is a large possibility that the telecommunications sector will be a constraint. In fact, this possibility was confirmed by a cross-sectional study of many developing countries. Also the study team experienced the stringent state of telecommunications services. Attempts to make a call during the day time so often resulted in incompleted calls due to the heavy traffic congestion. Even if connected, it was hard to hear the words of the other party. On the other hand, the demand for new installation has been increasing rapidly and the number of waiting applicants has continued to accumulate although the installation fees have been raised to a demand-curbing level of Rs.7,000 - 10,000. Thus, the existing facilities of SLTD in the Greater Colombo Area can meet neither demand increases nor maintain a satisfactory service level without expansion of facilities and replacement of old equipment.

With this recognition, the Government has been placing an emphasis on investments in the telecommunications sector as one of the major issues to be tackled in the Public Investment Program. SLTD also has been executing CADS I - III projects for the Greater Colombo Area, and is now preparing CADS IV. Nevertheless, the target of these projects is mainly exchange equipment. As for the trouble-some work of improving outside-plant facilities, only patch-up works have been made, and no drastic measures has been taken. Eventually, the failure rate per 100 subscribers per month is as high as 38.9. Out of these failures, almost 70 percent is attributable to the defects of outside-plant facilities. It should be recalled that the performance of the telecommunications system is seriously damaged by a minor defect in a part of the entire system. Accordingly, the benefits of investments on exchange equipment will be largely reduced in case the present state of the cable systems were left alone. It follows that the importance of investments in the telecommunications sector and especially in the outside plant facilities cannot be over emphasized.

Feasibility of the Project as new investments in the outside plant facilities is proven by the FIRR of 15.2 percent. The funds flow analysis showed that the profitability of the Project assures repayments of loans even if all the necessary funds were provided by borrowings. In addition, the economic analysis found that EIRR is 29.7 percent and is greater than FIRR. In the eyes of the social impacts, the Project is to provide employment opportunities for large number of unskilled labour. The new system, once completed and put into service, will bring large benefits in the form of easier emergency access to medical institutions and authorities of security as well as disaster relief/prevention.

Benefits to accrue by increased supply of information is indeed immeasurable. Futhermore, the Profits of the Project, if appropriately reserved in the hands of SLTD or the Government, will be a significant source of finance for further improvement and expansion of telecommunications network.

On the other hand, it is clear that telecommunications system itself seldom becomes a source of either public pollutions or adverse social effects. Therefore, it can be concluded that the implementation of the Project is not only feasible but also desirable.

This conclusion, however, is subject to two conditions. One is related to inflation. The financial IRR is calculated in terms of the constant price as of 1983 in order to prove into the real rate of return of the Project. Actually, however, due to price rises, the nominal costs of investment and of operation and administration will increase annually. Therefore, without proper revision of tariff rates to compensate for such cost increment, the earning power of the Project is sure to deteriorate.

The other is to carry out, as occasion requires, the investment in facilities associated with the Project. Without such investment, the benefits of the Project are bound to be reduced and the IRR to be realized will also follow suit.

CHAPTER 10

PROJECT IMPLEMANTATION PLAN

CHAPTER 10 PROJECT IMPLEMENTATION PLAN

10-1 Implementation Time Schedule

The Project is to be implemented as part of SLTD's 1984-1987 Telecommunication Facilities Improvement and Expansion Plan.

At some of exchanges whose subscriber cable network is to be improved and expanded, the service to new subscribers will begin in the first half of 1987. In some sections among junction network, the service can be initiated in the latter half of 1986.

The implementation time schedule for the Project appears in Table 10-1.

10-2 Implementation Method

(1) Turn key Base

In the Project implementation, the associated works including civil construcution works, cable work and transmission equipment installation work will be carried out in parallel to a certain extent. Subscriber works are to be followed by subsucriber premise work by SLTD.

For the purpose of effective execution of all work series whereby to complete the subscriber cable network and junction network satisfactorily within a reasonable period, the entire project is to be carried out on the lump work base and the turn key base.

(2) Employment of Consultant

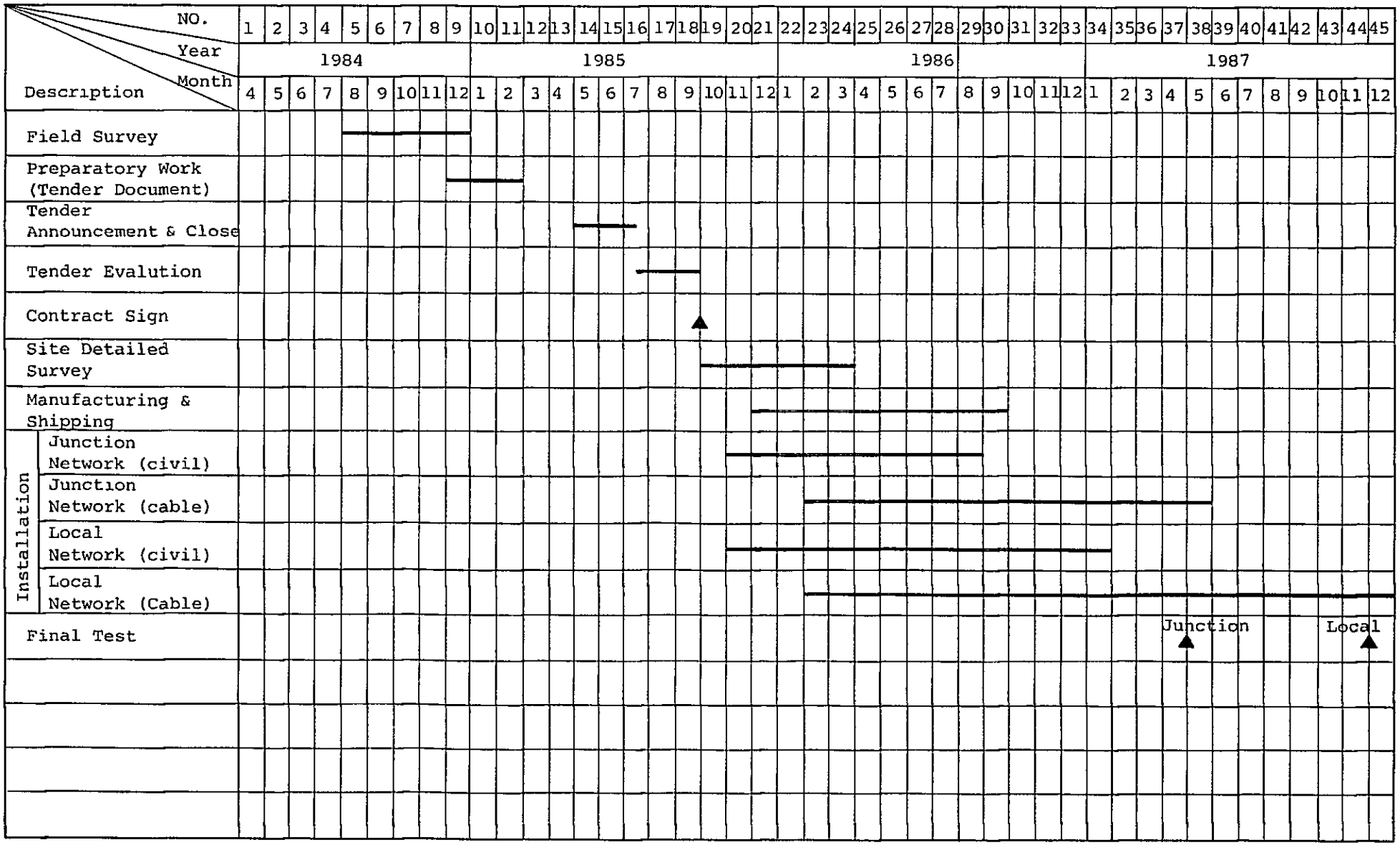
The Project is a large scale project whose implementation cost amounts to 1,177 million rupees and whose implementation period including the preliminary work period extends for four years.

Hence, the top requirement economically is to save the cost as much as possibly by controlling the uptrend of financial spendings on equipment procurement to the permissible minimum.

Technically, the implementation management capability of high level is required. For, the project includes, for the subcriber cable network improvement, a complete replacement of existing facilities and, for junction network renovation, the introduction of such advanced technologies as digitalization via PCM systems and optical fiber cable tansmission.

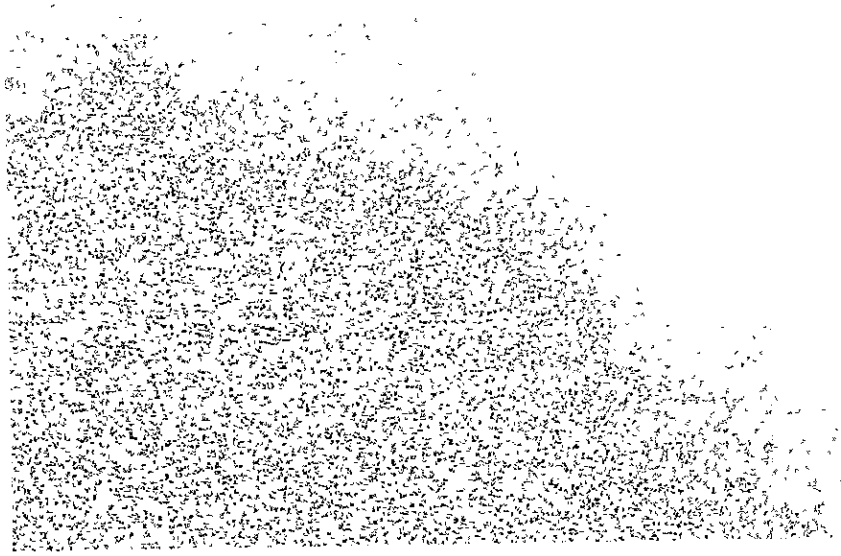
Thus, for the formulation of project specifications, as well as the evaluation of tenders accepted, the supervision of construction work and the carrying out of tests including acceptance tests, a fully capable and experienced Consultant is to be employed.

Table 10-1 Implementation Schedule



CHAPTER 11

COSIDERATIONS REQUIRED IN PROJECT IMPLEMENTATION



CHAPTER 11 CONSIDERATIONS REQUIRED IN PROJECT IMPLEMENTATION

11-1 Relationships with Other Projects

The Project is aimed at subscriber cable network and junction network improvement and expansion. To raise the project implementation effect to the maximum, SLTD should establish and promote an integrated plan fully coordinated to all associated plans including the local switching equipment augmentation plan.

11-2 Well Organized Implementation System

As stated in the preceding section 10-1, the Project is of large scale and its implementation extends over a long period. Hence the possibility of many kinds of difficulties to take place in the course of implementation.

For the purpose of prompt solution to such difficulties whereby to ensure the progress of implementation work according to the schedule, SLTD should organize an efficient and effective implementation system. In other words, SLTD should establish the project implementation headquarters founded on the pertinently organized framework, and assign capable personnel to all aspects of implementation duty.

The effective use of the Consultant will help SLTD a great deal in answering that purpose.

11-3 Familiarization and Safety Measures

The project implementation, this time, will be carried out in the urban districts. That is to say, the implementation work, i.e., the construction/installation of facilities of many kinds (such as manholes, cables and poles) will be made in close contact with the social life of the people at large. Therefore, it is important to familiarize the public in advance about this project and obtain their full understanding.

No less important is the well managed work execution to reduce to the minimum the public hazards that may occur during the work. Such public hazards include personal injuries, noise and disturbance to surface traffic.

Tenders should be so managed as to select fully experienced and capable Contractor who can act properly in due consideration of all the facts mentioned above.

11-4 No-Interruption of Service

In the project implementation, ineffective cables and other facilities will be replaced at many places. Therefore, the work execution must be duly managed in order not to deteriorate the service due to the work. For this purpose, the correct plant records (covering cables and other outside plants) should be formulated prior to the detail design of the project by SLTD.

11-5 Work in Subscriber Premises

In the latter half stage of project implementation and after the completion of implementation work, service-in is scheduled for a large number of subsribers on the waiting list. In this connection, the undermentioned preparations are necessary:

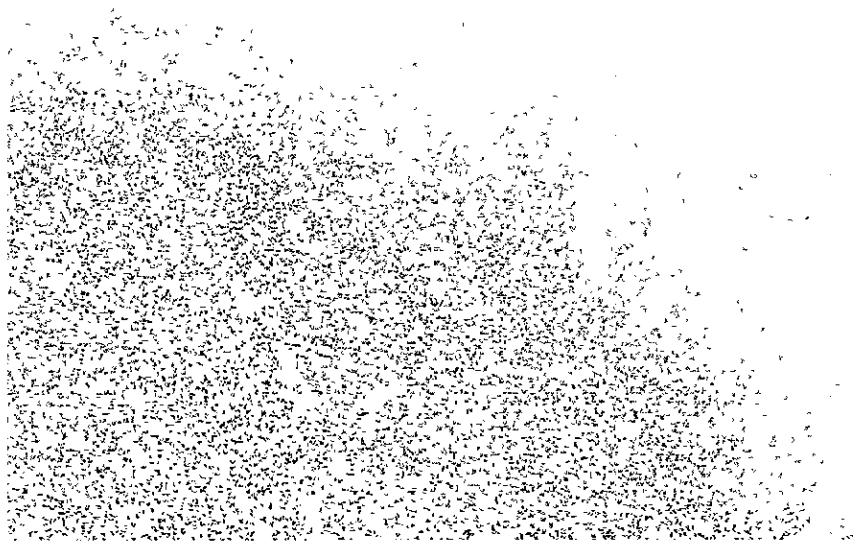
(1) To establish subscriber premises work practice standard.

(2) To procure necessary work personnel and administer training for them.

(3) To procure work vehicles and tools.

(4) To obtain sufficient stock of work materials.

REFERENCE



Reference: Wire Dropping to Subscribers' Premises

1. Summary

Wire dropping to subscribers' premises is not included in the Scope of Work as defined in the Feasibility Study Report. Nevertheless, for the purpose of effective operation of the system to be realized by this Project, the whole system down to the subscriber terminals must be in the completely workable condition when the Project implementation comes to a conclusion.

From such viewpoint, plan and cost to be estimated for the work of wire dropping to all subscribers' premises is appended herein as reference, according to SLTD requirement. The wire dropping work mentioned comprises wire dropping to the existing subscribers' premises in connection with the cutover to the newly installed cables, and wire dropping to new subscribers' premises at the time of service-in of the newly completed system.

2. Contents of Wire Dropping Work

2.1 Cutover of Existing Subscribers

This is to cut over the existing subscriber lines to the new subscriber line network to be completed by this Project. Smooth progress of this cut over work assumes vital importance for the satisfactory implementation of this Project and for the full raising of Project effect.

2.1.1 Number of Subscribers Concerned

The approximate number of existing subscribers to be involved in the cut over work follows:

	No. of Existing Subscribers (End of 1982)	Estimated No. of Subscribers to be Cut Over
Colombo Central	13,077	4,500
Mattakkuliya	625	400
Havelock Town	6,548	4,600
Nugegoda	1,896	1,400
Mt. Lavinia, Boralesgamura	4,486	3,300
Total	34,442	20,000

2.1.2 Scope of Cut over Work

a) New drop wire installation from terminal box to subscriber's premise

b) Withdrawal of existing drop wire after the cut over

c) New jumper wire installation and withdrawal of existing jumper wire for cut over at main distribution frame

d) Connection test at the time of cutover

2.2 Service-through for New Subscribers

Service-through work for new subscribers scheduled for the initial year is essential for having the Project effect take shape without delay after the implementation of this Project.

2.2.1 Number of Subscribers Concerned

The approximate number of new subscribers to be served by the new subscriber line network follows:

	No. of Subscribers 1987	No. of Subscribers 1992	No. of Subscribers for Service-through in Initial Year
Colombo Central	21,040	34,250	2,600
Mattakkuliya	1,980	3,790	350
Maradana	9,590	13,680	800
Havelock Town	10,240	14,860	900
Nugegoda	4,870	8,030	600
Mt.Lavinia	7,830	13,070	1,000
Boralesgamuwa	840	1,140	50
Total			6,300

2.2.2 Work Item and Work Materials

Service-through work for new subscribers consists of drop wire installation from terminal box to telephone set in subscriber's premise. Materials required for this work are:

1) Telephone set

2) Protector

3) Drop wire (PE insulated)

4) Fixing metal and Miscellaneous Hardware

3. Expenses Required

Expenses required for the aforementioned wire dropping work break down as under.

1) Cut over of Existing Subscribers

Foreign currency: 250 million Japanese yen

Local currency: 3 million Rupees

2) Service-through for New Subscribers

Foreign currency: 100 million Japanese yen

Local currency: 3 million Rupees

3) Total

Foreign currency: 350 million Japanese yen

Local currency: 6 million Rupees

When wire dropping work is included in this Project, cost of this Project becomes as under.

Foreign currency: 9,478 million Japanese yen

Local currency: 270.1 million Rupees

APPENDIX

APPENDIX 1

SCOPE OF WORK

MINUTES OF DISCUSSIONS

ON

THE FEASIBILITY STUDY

ON

TELECOMMUNICATIONS NETWORK IMPROVEMENT PROJECT

FOR

GREATER COLOMBO IN THE DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA

In response to the request made by the Government of Sri Lanka for technical cooperation in conducting the feasibility study on Telecommunications Network Improvement Project for Greater Colombo area, the Government of Japan, through Japan International Cooperation Agency (JICA), sent a preliminary study team (hereinafter referred as to Study Team) to identify and confirm the intention of Sri Lanka authorities concerned.

During its stay in Sri Lanka, Study Team observed the project sites, had a series of discussions and exchanged views with Sri Lanka authorities concerned. As the result, Study Team has identified and confirmed the following:

1. In Greater Colombo area which is the center of telecommunication Network in Sri Lanka, the exchange system and transmission system are relatively better-improved.
2. But, from the standpoint of the total telecommunication network system, since the outside plant facilities are left undeveloped, the expected function as a total telecommunication network system is not effectively utilized.

Based on the above-mentioned findings, Sri Lanka authorities concerne and Study Team have agreed that the captioned study is to be conducted focusing on the outside plant improvement.

The results of Discussions were incorporated into Scope of Work as attachment 1, and to confirm the aforementioned, the minutes of discussions are signed by the representatives of

Sri Lanka Telecommunications Department (SLTD)

and

Japan International Cooperation Agency (JICA)

For Japan International Cooperation Agency (JICA)

Mr. Katsumi Hirakawa
Team Leader of
Japanese Preliminary
Study Team.
Dated: Dec. 17, 1982

For Sri Lanka Telecommunications Department (SLTD)

Mr. Ambalavanar Shanmugarajah
Director of Telec ommunications.

Issued at Telecommunications Department Headquarters, Colombo-1.

SCOPE OF WORK

FOR

THE FEASIBILITY STUDY

ON

TELECOMMUNICATION NETWORK IMPROVEMENT PROJECT

FOR

GREATER COLOMBO IN THE DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA

I. The objectives of the study

The objectives of the study are to conduct a feasibility study on Telecommunication Network Improvement Project for Greater Colombo area, and to formulate a feasibility study report.

II. Study Area

The Study Areas are following exchange or remote switching unit service areas in Greater Colombo Area.

1. Ja-ela
2. Ragama
3. Kadawata
4. Wattala
5. Mattakkuliya
6. Malwana
7. Colombo Central (cf. Annex I)
8. Wellampitiya
9. Angoda
10. Kaduwela
11. Maradana
12. Kotte
13. Hokandara
14. Havelock Town
15. Nugegoda
16. Maharagama
17. Homagama
18. Padukka
19. Moratuwa
20. Piliyandala
21. Mt.Lavinia (including Boralesgamuwa)
22. Kelaniya (cf. Annex II)

III. Scope of the Study

1. Socio-economic situations in Greater Colombo and Sri Lanka
2. Development plans by each sector in Greater Colombo
3. Present situations of telecommunications in Greater Colombo and Sri Lanka
4. Macroscopic demand forecast by exchange

5. Originating traffic estimation by exchange

6. Traffic flow estimation among exchanges

7. Junction cable system design for following exchanges:

1. Ja-ela
2. Ragama
3. Kadawata
4. Wattala
5. Mattakkuliya
6. Malwana
7. Colombo Central (c.f. Annex I)
8. Wellampitiya
9. Angoda
10. Kaduwela
11. Maradana
12. Kotte
13. Hokandara
14. Havelock Town
15. Nugegoda
16. Maharagama
17. Homagama
18. Padukka
19. Moratuwa
20. Piliyandala
21. Mt. Lavinia (Including Boralesgamuw
22. Kelaniya (c.f. Annex II)

8. Basic design of Junction Cables

9. Basic design of primary subscriber cables for following exchanges -

1. Colombo Central (Excluding areas on Annex I)
2. Mattakkuliya
3. Maradana
4. Havelock Town
5. Nugegoda
6. Mt. Lavinia (including Boralesgamuwa)

10. Cost estimation (up to the end of Secondary Subscriber Cables)

11. Benefit estimation

12. Financial analysis

13. Economic analysis

14. Social appraisal

15. Implementation schedule

16. Guideline for maintenance & operation concerning outside plants.

IV. Report

1. Interim Report

Twenty (20) copies of Interim Report in English will be prepared at the end of the field survey in Sri Lanka. The Report will contain all the findings at this stage such as:

(1) The results of demand forcast and traffic estimation

(2) Basic design drawings for junction cables and primary subscriber cables

(3) Implementation schedule

(4) Cost estimation

(5) Benefit estimation

(6) Other necessary items

Remarks At this stage, Sri Lanka authorities concerned and Study Team should come to agreements on basic points on the contents of the Report (especially above-mentioned item (1), (2)& (3)) by concluding the minutes of discussions.

2. Draft Final Report

Twenty (20) copies of Draft Final Report in English will be prepared in Japan about 40 days after the field survey in Sri Lanka. The Report,in addition to the items in Interim Report, will contain the following:

(1) Precise cost estimation

(2) Precise benefit estimation

(3) Financial analysis

(4) Economic analysis

(5) Social appraisal

(6) Other necessary items

Remarks (1) At this stage, Study Team will come to Sri Lanka with the Report for the review meeting of the Report.

(2) And, Sri Lanka authorities concerned should give the final approval on the Report except minor points by concluding minutes of discussions.

(3) Findings in Interim Report especially items (4) & (5) will be reviewed, modified and incorporated into Draft Final Report as necessary.

3. Final Report

Twenty (20) copies of Final Report in English will be prepared and sent to Sri Lanka after about 2 months of review meeting.

V. Undertakings of the Government of Sri Lanka

The Government of Sri Lanka, through SLTD for the conduct of the study, will undertake the following.:

1. SLTD shall take following necessary measures in cooperation with proper agencies concerned.

(1) To be responsible for dealing with claims which may be brought by third parties against the members of Study Team and to keep them secured from the claims in the course of the study, except when such claims arise from gross negligence or purposeful misconducts of the members of Study Team.

(2) To ensure the safety of Study Team.

(3) To exempt Study Team from taxes, duties, fees and other charges on equipments and other materials brought into Sri Lanka for the conduct of the study.

(4) To secure the entry permission into private properties and other areas necessary for the conduct of the field survey.

(5) To allow to take all data and documents related to the stud including photographs and maps out of Sri Lanka to Japan.

2. SLTD shall make the following necessary arrangements.

(1) To recommend proper tracers to Study Team.

(2) To help Study Team collect necessary data, documents and information which are not under the authority of SLTD

(3) To recommend proper local labour assistants (especially for ground measurement for the site surveys) to Study Team.

3. SLTD shall, at its own expense, provide Study Team with the following. :

(1) Available data, documents and information which are under the authority of SLTD.

(2) Counterpart personnels (Project manager, Officials, Engineers, Economist).

(3) Suitable office space with necessary furniture.

(4) Suitable space and equipments for drawings.

(5) Typists.

VI. Undertakings of the Government of Japan

The Government of Japan, through JICA, for the conduct of of the study, will undertake the following. :

1. JICA, at its own expense, will dispatch Japanese consultants as the Study Team.

2. JICA, at its own expense, through the Study Team, will perform the transfer of technology concerning the formulation of feasibility study both in Sri Lanka and in Japan.

VII. Tentative Study Schedule

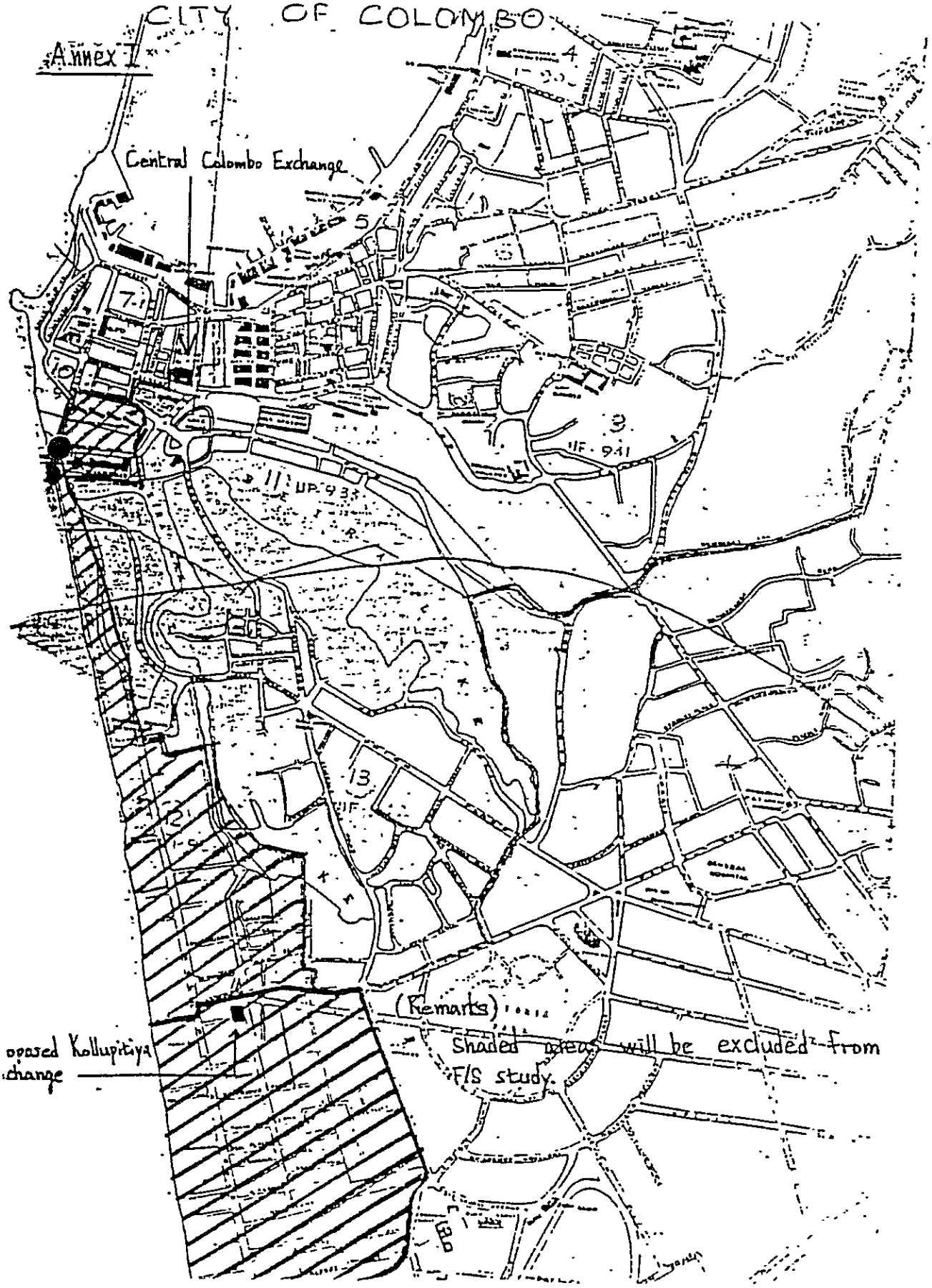
The Study, in principle, will be carried out in accordance with the table below.

Tentative Study Schedule

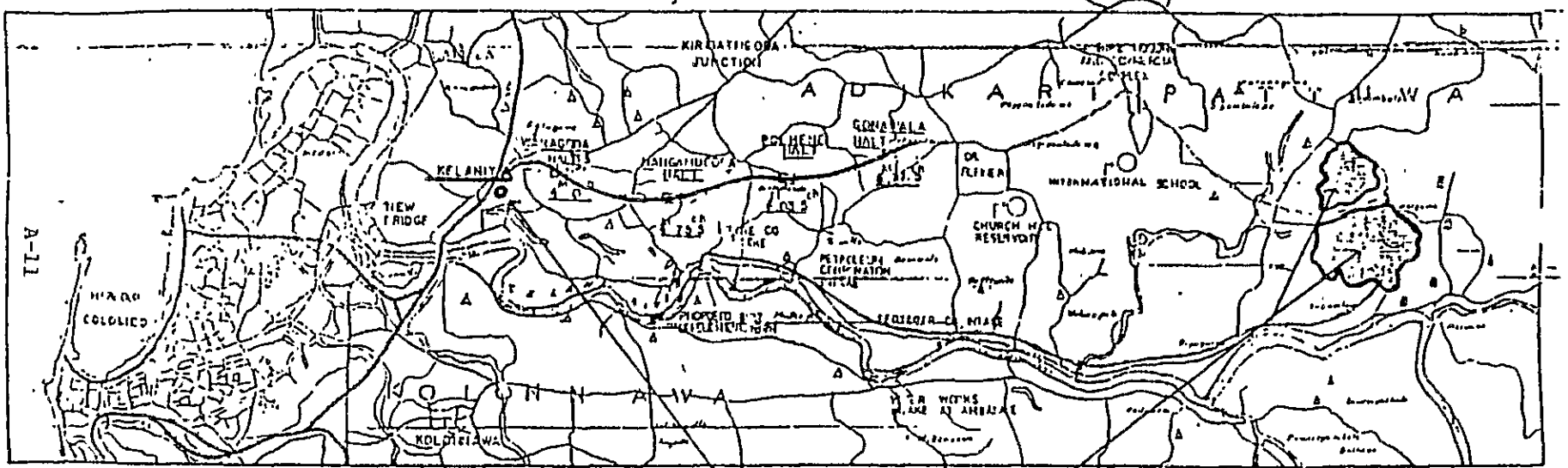
Month / Study Items	1	2	3	4	5	6	7	8	9	10
1. Field Survey in Sri Lanka	▨	▨	▨	▨	▨					
2. Study in Japan							▨			
3. Review Meeting in Sri Lanka							▨			
4. Study in Japan										
Report & others	1. ▲				2. ▲	3. ▲			4. ▲	
Minutes of Discussions					X		X			

Remarks

1 --- Plan of Operations
2 --- Interim Report
3 --- Draft Final Report
4 --- Final Report


CITY OF COLOMBO
Annex I
Central Colombo Exchange
(Remarks)
Shaded area will be excluded from F/S study.
oposed Kollupitiya change

Annex II


KIRIBATHGODA JUNCTION
KELANIYA
NEW BRIDGE
KOLONNAWA
GONAVALA HALT
INTERNATIONAL SCHOOL
CHURCH HILL RESERVOIR
existing exchange
Biyagama Free Trade Zone
(to be excluded from F/S study)
LEGEND
PRINCIPAL ROADS
RIVER / CANAL
PROPOSED RAILWAY LINE
PROPOSED BIYAGAMA BIPZ AREA
ACCESS ROAD (TO BE IMPROVED)

A-11

APPENDIX 2

MINUTES OF THE MEETING

FOR FEASIBILITY STUDY

Meeting convened on 16.02.83 to discuss the Planning of

Local Network of the Metropolitan Area

Present: M/s	K.K.Gunawardena	S.L.T.D.
	N. Yoshida	J.I.C.A.
	H. Imaizumi	J.I.C.A.
	S. Shimizu	J.I.C.A.
	R.C.R.Dissanayake	S.L.T.D.
	C.Gnanaindiran	S.L.T.D.
	K. Beneragama	S.L.T.D.

1. Limiting Circuit

It was agreed to implement the recommendation made by the JICA team to limit the loss of local network to 8 dB at 800 Hz T.T.

2. Subscriber Data

The macro forecast has been completed. With regard to detailed forecast it was agreed to compile the data proper to the elements of the grid of the Metropolitan Network.

Next Meeting on 23.02.1983.

for Director of Telecommunications
S.L.T.D.

(K.K.Gunawardena)
Deputy Director Planning
S.L.T.D.

for Japan International
Cooperation Agency

(Nobuo Yoshida)
Leader of the Feasibility Study Team

Meeting convened on 23.02.83 to discuss Basic Design

Standards for Outside Plant in Colombo area

Present:	M/s K.K.Gunawardena	- Deputy Director(Planning)	S. L.T.D.
	D.K.W.Beneragama	- C.E(Cables) CADS	-do -
	R.B.Kumarapathirana	- STE/Traffic Engineering	-dO -
	R.C.R.Dissanayake	- Engineer/Cables	-do -
	N.Yoshida	- J.I.C.A.	
	H.Imaisumi	- J.I.C.A.	
	S.Shimuzu	- J.I.C.A.	

****

Agreement was reached on the following items:

1. Subscribers Cables -

1. Provisioning Period

a) Primary Cable 5 years

b) Secondary Cable 15 years

c) Civil facilities 20 years (minimum)

2. Transmission Limit

Where a network is to be replaced by a new network the loss should be restricted to 8dB at 1500 Hz(i.e, 6dB at 800 Hz). Where this is not readily feasible, loss to he restricted to 8 dB at 800 Hz.

3. Structure of Subscribers Network

Direct distribution system to serve subscribers within 300-500 metres around exchange site. Cabinet system to serve subscribers over 500 metres from exchange.

4. Cable Line formation

Primary cables to be laid in ducts. Secondary cables to be directly buried armoured cable or Aerial cable.

contd.....

5. Type of Cables and Materials -

5.1 Primary Cable

Primary Cables to be Cellular Polyethenene insulated, Polyethelene sheathed, Jelly filled Cable. A decision whether cables should be of unit twin type or quad type to be taken after comparison of costs. The conductor diameters to be 0.4 mm and 0.5 mm. The necessity to use 0.65 mm conductors will be decided after consideration of the report regarding the optimisation of exchange boundaries. The capacities of cables to be 300,400,600,800,1000,1200,1500,1800 and 2400 pairs.

5.2 Secondary Cables

a) Directly buried cable to be Polyethylene insulated, Polyethyelene sheathed, armoured, unit twin type jelly filled cable, preferably formed in units of ten to facilitate distribution to terminal boxes.

b) Aerial Cable to ~~be~~ Polyethelene insulated, Polyethelene sheathed twin type Self Supporting Cable. Plain(not self supporting cable)aerial cable to be used only in special circumstances. The conductor diameters to be 0.4 mm,0.5 mm, 0.65mm and 0.9mm. The capacities of cables to be 10,20,30,50,100,150,200, 300 and 400 pair.

5.3 Cross Connecting Cabinets

The cabinets to be 800 pair and 1600 pair.

5.4 Distirbution Points

a) Pole and Wall Mounting type to be generally of capacity 10 pairs and in special circumstances 20 pairs.

b) Indoor type to be of capacity 10,50,100 and 200 pairs.

II. Junction Cable System -

1. Provision~~A~~ING Period

a) Cable - 10 years

b) P.C.M. Repeater Housing - 10 years

c) P.C.N. Terminal Equipment and Repeater - 5 years.

contd.....

2. Cable Laying

a) In ducts

b) Direct Burial

c) Aerial

3. Type of Cable

Cellular Polyethylene insulated, polyethylene sheathed, twin type and screened cable (for P.C.M. use).

4. P.C.M.System

30 channel P.C.M. Systems to be used.

III. Civil Facilities

1. Manholes

Decision to be taken after studying drawings of various types to be furnished by J.I.C.A.

2. Conduits

2.1 Specifications to be furnished by J.I.C.A. Team at next meeting.

for Director of Telecommunications
Sri Lanka Telecommunications Department
(SLTD)

(K.K. Gunawardena)
Deputy Director of Telecommunications
S.L.T.D.

for Japan International
Cooperation Agency
(JICA)

(Nobuo Yoshida)
Leader of the Feasibility
Study Team.

Meeting held on 14.03.83 to discuss macro demand forecast for Each exchange area in Greater Colombo

Present: M/s.	K.K.Gunawardena	- Deputy Director(Planning) - S.L.T.D.
	N. Yoshida	- J.I.C.A.
	H. Imaizumi	- J.I.C.A.
	S. Shimizu	- J.I.C.A.
	D.K.W.Beneragama	- Chief Engineer(Cables)CADS-S.L.T.D.
	N.S. Mohamed	- Engineer(Planning)- S.L.T.D.
	C.Ganendiran	- Engineer(Planning)- do -
	S. Maheswaran	- Engineer(Planning)- do -
	R.C.R.Dissanayake	- Engineer(Cables) - do -

Minutes of previous meeting were tabled and accepted.

The forecast figures submitted by J.I.C.A were considered and it was observed that these figures were low compared to those compiled by S.L.T.D. It was agreed that J.I.C.A.would rescrutinize their forecast. JICA requested that the acceptance of the demand forecast be confirmed early in order that they may base their proposals on it.

for Director of Telecommunications
S.L.T.D.

(K.K.Gunawardena)
Deputy Director, Planning
S.L.T.D.

for Japan International Cooperation Agency (J.I.C.A)

(Nobuo Yoshida)
Leader of the Feasibility Study Team.

Minutes of Meeting held on 21.3.83.

Present:	M/s. A. Shanmugarajah	- Director Telecommunications
	N. Yoshida	- J.I.C.A.
	H. Imaizumi	- "
	S. Shimizu	- "
	K.K.Gunawardena	- Deputy Director(Planning)
	D.K.W.Beneragama	- Chief Engineer(Cables)CADS
	S. Thirunavukarasu	- S.T.E(EPP)
	N.S.Mohamed	- Engineer(Planning)
	G. Gnanendiran	- Engineer(Planning)
	M.A. Wijesuriya	- S.T.E((TR)
	R.C.R.Dissanayake	- Engineer(Cables)
	A.A.Fernando	- Engineer(Buildings)
	S. Maheswaran	- Engineer(Planning)

The J.I.C.A. team submitted a revised demand forecast in view of the observation at the previous meeting that the figures submitted earlier were low in the opinion of the S.L.T.D.. The figures computed by S.L.T.D. are given below:

	1986	1991
Low	-	147,000
Medium	81,000	169,000
High	-	226,000

(The above figures include the Gampaha and Veliweriya areas)

The revised figures submitted by J.I.C.A are as follows :

Year	1987	1992	1997	2002
Total Demand in Sri Lanka	141,000	219,000	327,300	486,600
Total Demand in Greater Colombo	88,800	138,000	206,200	306,500

The above figures were accepted by S.L.TD.

contd.....

A request was made at the meeting held on 14.03.83 that J.I.C.A. submits a report on the economic parameters of using 0.6 mm and 0.9 mm P.C.M. Cable. J.I.C.A agreed to submit this early.

A traffic matrix for the Greater Colombo Area was given to J.I.C.A.

Director of Telecommunications
S.L.T.D.

(A. Shanmugarajah)
Director of Telecommunications
S.L.T.D.

for Japan International Cooperation Agency.

(Nobuo Yoshida)
Leader of the Feasibility Study Team

Minutes of the Meeting held on 30.3.83

Present:	M/s K.K.Gunawardena	- SLTD
	N. Yoshida	- JICA
	H. Imaizumi	- JICA
	S. Shimizu	- JICA
	S. Fujinami	- JICA
	D.K.W.Beneragama	- SLTD
	S. Maheswaran	- SLTD
	C. Gnanendiran	- SLTD
	R.C.R.Dissanayake	- SLTD
	N.S. Mohamed	- SLTD

Minutes of the previous meeting held on 21.3.83 were tabled and accepted.

Local Network Design of Mt.Lavinia Exchange Area

It was decided not to alter the existing boundary separating Mt. Lavinia and Moratuwa exchange areas. The telephones within the De Soyzapura Housing Scheme are to be provided from Mt. Lavinia subject to the demand in 1992 being less than 200 and the copper cost falling within economic limits. The proposal by J.I.C.A for an R.S.U as indicated in the diagram supplied them was agreed to in principle.

Establishment Plan for Exchanges in Greater Colombo Area

J.I.C.A was referred to Drg.No.M773 titled "CADS Area proposed boundaries without Exchange 'A' at Kollupitiya" showing optimised boundaries of the different exchanges. The team was informed that it could make its proposals independently but was requested to take these boundaries into consideration wherever possible. The "Exchange Establishment Plans" as at 1987 and after 1992 were submitted by J.I.C.A. It was agreed that CE(I&M) and Dy Director(R) would be requested to comment on these plans and a decision taken after consulting D.T.

J.I.C.A requested S.L.T.D. to furnish the plans and proposals for CADS Stage 4. They also said that the readings for traffic from each exchange to the trunk exchange had not been supplied to them. S.L.T.D. agreed to look into this.

contd.....

Design for Civil Facilities

It was agreed that the J.I.C.A team would discuss this subject with C.E (External Plant) CTS.

for Director of Telecommunications

(K.K.Gunawardena)
Deputy Director Planning
S.L.T.D.

for Japan International Cooperation Agency.

(Nobuo Yoshida)
Leader of the Feasibility Study Team

Meeting held on 6.4.83

Present:	M/s D.K.W.Beneragama	- S.L.T.D.
	N.Yoshida	- J.I.C.A
	H.Imaizumi	- J.I.C.A
	S.Shimizu	- J.I.C.A
	S.Fujinami	- J.I.C.A
	T.Tanabe	- J.I.C.A
	S. Maheswaran	- S.L.T.D
	C.Gnanendiran	- S.L.T.D.
	N.S. Mohamed	- S.L.T.D.
	R.C.R.Dissanayake	- S.L.T.D.

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Minutes of the previous meeting held on 30.3.83 were tabled and accepted subject to the deletion of the following appearing under the capation"Local Network Design of Mt.Lavinia Exchange Area":- subject to the demand in 1992 being less than 200 and the copper cost falling within economic limits".

Design for Civil Work

J.I.C.A submitted the method of calculation of the number of ducts required to meet the projected demand in 20 years, and drawing showing the arrangements of ducts and the laying of ducts. S.L.T.D. agreed to study these designs and inform J.I.C.A.

Traffic Estimation in Greater Colombo.

J.I.C.A. submitted the Exchange Allocation Plans for 1987,1992 and 1997 and the traffic estimates. S.L.T.D. agreed to study the above documents and convey their views to J.I.C.A.

Mr.Beneragama tabled a minute of a meeting concerning the cable proposals to cater for an estimated demand in 1992 of 48,000 subscribers (excluding R.S.U subscribers) within the Central Exchange area without considering the proposed exchange at Kollupitiya. The corresponding figure if the Kollupitiya exchange is considered as a separate entity was given as 38,000. J.I.C.A was requested to take these figures into consideration in formulating its proposals.

for Director of Telecommunications
S.L.T.D.

(D.K.W.Beneragama)
C.E EP CARS

for Japan International Cooperation
Agency.

(Nobuo Yoshida)
Leader of the Feasibility Study Team

My No: FPU/GEN.

Notes of Meeting re-Proposals submitted by JICA Team-Convened on 15th April'83

Present: M/s A. Shanmugarajah ... Director of Telecommunications
K.K.Gunawardena ... Dy.Director (Planning)
A. Sanganithy ... Dy.Director (Regions)
A. Maniccavasagar ... Dy.Director (Finance and Personnel)
M/s N. Yoshida ... JICA
H. Imaizumi ... JICA

The proposals of JICA team dated 30th March'83 were tabled for discussions and the decisions taken are summaried below:

1. Exchange Allocation Plan for 1987

1.1 Proposed Master Exchange at Kelaniya

It was suggested that the JICA team may base their network plan on the above proposals but in view of current traffic flow(vide traffic matrix) the actual implementation will be considered only after 1989, after the study of pattern of flow of traffic.

1.2 Connection of RSU to Maradana

The RSU proposed for connections to the Master Exchange at Maradana is not fully in conformity with the ITU Network plan. It was decided to consider the common factors of both JICA and ITU network proposals.

2. Junction Network Plan

The design of the junction network plan should cater to the needs of the subscriber forecast of 1992 for implementation in 1987. The network configuration should match with the needs of the common factors of both JICA team and the proposals of the optimised network.(These proposals have already been available to the JICA Team.) It is noted that although the initial optimal solution requires replacement, Mt.Lavinia Exchange will be retained as the capacity is adequate up to 1992.

The plan should allow for the use of the existing routes with provision for diversion of foute at the junction of the low level route and Baseline Road.

Director of Telecommunications
S.L.T.D.

for Japan International Cooperation Agency

(A. Shanmugarajah)
Director of Telecommunications
S.L.T.D.

(Nobuo Yoshida)
Leader of the Feasibility Study Team

Meeting held on 21.04.83

Present:	M/s D.K.W. Beneragama	S.L.T.D.
	N. Yoshida	J.I.C.A.
	S. Shimizu	J.I.C.A.
	S. Fuzinami	J.I.C.A.
	A.A.Fernando	S.L.T.D.
	C.Gananendiran	S.L.T.D.
	R.C.R.Dissanayake	S.L.T.D.

Civil Works

The use of 100 mm diameter P.V.C. pipes of 3 mm thickness encased with conrete was agreed upon. It was also decided to use G.I. Pipes or reinforced concrete protection at road crossings.

The dimensions of the standard manholes and the arrangement of ducts as furnished by J.I.C.A were approved.

for Director of Telecommunications

(D.K.W.Beneragama)
Chief Engineer External Plant
C A D S

for Japan International Cooperation Agency

(Nobuo Yoshida)
Leader of the Feasibility Study Team

Notice of Meeting held on 26.4.83

Present:	M/s A. Shanmugarajah	- D.T.
	N. Yoshida	- J.I.C.A.
	H. Imaizumi	- "
	S. Shimizu	- "
	T. Inomata	- "
	D.K.W. Beneragama	- S.L.T.D.
	P. Alagaratnam	- "
	C. Gnandiran	- "
	S. Maheswaran	- "
	A.A. Fernando	- "
	M.A. Wijesuriya	- "
	R.C.R.Dissanayake	- "

The J.I.C.A. team submitted their proposals for the junction network in the Greater Colombo Areas based on the traffic forecasts for the years 1987, 1992, 1997 and 2002. The forecasts of the number of P.C.M. Systems required in the above mentioned years between each Master Exchange and between Master Exchanges and Remote Switching Units toegther with the Junction Cable Route Plan were tabled.

for Director of Telecommunications
Sri Lanka Telecommunications Department
(SLTD)

(A. Shanmugarajah)
Director of Telecommunications
S.L.T.D.

for Japan International
Cooperation Agency
(JICA)

(Nobuo Yoshida)
Leader of the Feasibility
Study Team

MINUTES OF MEETING HELD ON 21st MAY 1983.

Present:	M/s.	K.K. Gunawardena	SLTD
		N. Yoshida	JICA
		S. Shimizu	JICA
		S. Fujinami	JICA
		T. Inomata	JICA
		T. Tanabe	JICA
		D.K.W. Benaragama	SLTD
		P. Alagaratnam	SLTD
		N.S. Mohamed	SLTD
		S. Maheswaran	SLTD
		R.C.R. Dissanayake	SLTD

1. Implementation Schedule

JICA submitted the implementation schedule of its proposals. This schedule commencing in 1984 and ending in 1987, was accepted at the meeting subject to JICA exploring the possibilities of advancing the date of implementation of the proposals relating to the local network of the Colombo Central Exchange area in view of the acute congestion envisaged in this area.

2. Priority of Work

The following order of priority was accepted.

a) Local Network

1. Colombo Central
2. Mattakkuliya
3. Havelock Town
4. Maradana
5. Nugegoda
6. Mt. Lavinia
7. Boralesgamuwa

b) Master-Master

Master-RSU

3. Adoption of Optical Fibre Cable System

The proposal by JICA to introduce an Optical Fibre Cable transmission system between Colombo Exchange and Mt. Lavinia Exchange was accepted especially in view of its high reliability and the envisaged reduction in cost of such a system in the future. Further it was noted

the introduction of optical fibre would only increase the initial investment cost by 0.8% according to the figures given by JICA.

4. Amount of Work and Project Cost

JICA submitted estimates of the quantities of work involved in implementing their proposals in respect of the junction and local networks. The foreign component of the total cost of the project was estimated at 7530 million Japanese Yen and the local compenent at 320 million Sri Lanka Rupees.

5. Project Evaluation

JICA stated that the financial internal rate of return of the project, was on a conservative estimate computed at 14.8%. The team considered such a rate of return sufficient to justify the feasibility of the project.

6. JICA was informed that the acceptance of items 1,2, and 3 was subject to approval by Director of Telecommunications

K.K. GUNAWARDENA,
Dy Director (Planning)
SLTD

Nobuo Yoshida
Leader of the Feasibility
Study Team.

25th May, 1983