

SECTION 10 IMPLEMENTATION PLAN AND COST ESTIMATE

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10.1 Implementation Plan

10.1.1 Project Formation

The rural telecommunications network plan formulated covers 6 rural exchange areas which were selected from 51 rural exchange areas in the country.

Along with the government development policy for the rural areas, precedence was given to those 6 exchange areas by the authorities, MIPT and PTC for improvement of the telecommunications network so as to support and to enhance socio economic as well as administrative activities.

Considering limited telecommunications services being provided presently and to cope with the increase in demand in those areas, it is planned to implement the whole plan at once as one package.

In implementing the whole plan, the following priority order is to be considered to complete necessary works by PTC, such as provision of trunk circuit including circuit connecting remote line concentrator and its host exchange, construction of new station building, etc in conformity with the overall rural telecommunications network construction schedule.

- **Nkayi, Gutu, Chatsworth, Kezi, Beatrice, Murambinda**

The number of exchanges, terminal stations for MARS system as well as subscriber multiplexing system on cable PCM, radio repeater stations for trunk transmission system to be constructed in the respective areas is as under.

Items	NKI	GTU	CHS	KEZ	BTR	MRB
Exchange System	1	1	1	1	1	1
MARS System						
- Base Station	1	1	1	1	1	1
- Sub. Terminal Station	13	8	7	10	12	14
- Rep. St. with Sub. Unit	5	1	2	8	3	8
- Rep. St. without Sub. Unit	1	1	1	-	-	-
Subscriber Terminal (Cable PCM)	1	5	2	-	5	-
Trunk Transmission System						
- Terminal Station	-	-	-	1*a	-	2*b
- Repeater Station	-	-	-	3*c	-	4*d

- *a : Maphisa in Kezi area.
- *b : Mutare in Murambinda area.
- *c : Including existing repeater, Syringa on the Plumtree-Bulawayo trunk route.
- *d : Including existing repeater, Cecil Kop on the Harare-Mutare trunk route.

For implementation of the project, employment of consultant is recommended for execution of detailed design including field survey, preparation of tender specifications, assistance in evaluation of tender proposals and contract negotiation, methodical work progress management, and proper solution of problem causes in the course of implementation.

10.1.2 Implementation Time Schedule

The overall time schedule of project implementation is shown in Table 10.1 and construction schedule is shown in Table 10.2, respectively.

As shown in the time schedule, engineering services which includes detailed design and field survey is to be carried by consultant to prepare tender documents.

Taking the work volume and conditions of the project areas spreading in the wide area, the JICA Study Team proposes that the construction work be scheduled to be carried out by dividing into two groups, in principle.

Namely, based on the priority order given to respective exchange areas by PTC, implementation is to be taken in Nkayi, Gutu and Chatsworth exchange areas at first, and then in the other remaining 3 exchange areas; Kezi, Beatrice and Murambinda exchange areas.

With the above arrangements, service can be started from the area where network construction including subscriber line connection has been completed. The service-in at the first area is expected by mid 1996, and for the last area, by the beginning of 1997.

However, the services at the very beginning period in the first 3 exchange areas will start with limited number of subscribers to whom subscriber line connection is completed, as it may take time in completing subscriber connection to all applicants spread in vast outside BRA.

The following preconditions are taken into consideration in formulating the time schedule.

- (1) Equipment and materials are to be supplied by the same contractor for all areas to ease operation and maintenance, and also to reduce cost required for spare units. Therefore, the contractor selection by competitive bidding is to be made.
- (2) Construction work is to be carried out by contractor on turn-key basis. However, connection of subscriber lines in each area is to be carried out by PTC at its own cost.
- (3) Work Allotment

With a view to project implementation according to schedule and at reasonable expense, implementation work is to be allotted to 3 parties, in principle, i.e.:

- Contractor for equipment supply and its installation,
- PTC, and
- Consultant

Summary of work allotment to each party follows:

a) Scope of Work for Contractor

The Contractor of this project is to be responsible for:

- Detail design of system, equipment, cable and materials
- Manufacturing of equipment and materials
- Provision of documents, such as installation plans, as-built drawing, progress report
- Factory testing and quality control of equipment and materials
- Delivery of equipment, cables, and materials
- Training of personnel concerned in the factory and in Zimbabwe
- Installation and tests at sites and commissioning of the system completed

b) Scope of Work for PTC

PTC as the project implementing entity is to be responsible for:

- Land procurement for all new stations
- Design and construction of station building at Maphisa in Kezi area, provision of air-conditioning facilities, and commercial power lead-in
- Provision of terminal apparatus, such as telephone set, facsimile, and subscriber line connection.
- Provision of trunk circuits for 4 sections connecting terminal exchanges and their respective parent exchanges, i.e., (Beatrice-Harare), (Nkayi-Kwekwe) and (Chatsworth-Gutu-Masvingo) sections
- Assistance in custom clearance for Contractor to import the necessary equipment and materials
- Preparation of data and information necessary for the project

c) Scope of Work for Consultant

For the smooth implementation of the project, the Consultant is to assist PTC with:

- Preparation of tender documents through execution of field investigation and detail system design

- Assistance in evaluation of tender proposals and contract negotiation
- Execution of witness to factory test
- Check and review of documents submitted by the Contractor
- Supervision and control of installation and progress
- Execution of witness to acceptance test
- Preparation of final project implementation report

10.2 Project Cost Estimate

10.2.1 Initial Investment

Project cost required at the initial stage for establishing rural telecommunications network is shown in Table 10.3, and cost required by PTC for the work related to implementation of the project is shown in Table 10.4, separately.

Preconditions to the above project cost estimates are as under.

- a) Construction work in each exchange area, except subscriber line connection, is to be carried out by contractor on turn-key basis according to detail design and specifications (tender specifications and technical specifications) made by consultant.

The subscriber line connection work is to be carried out by PTC at its own cost.

- b) Equipment and materials cost is to be estimated by Free On Board (FOB) price in Japan. Therefore, Insurance and Freight cost are to be estimated based on the assumption that transportation from Japan to Durban is by sea and from Durban to Harare by land. The cost is to be figured in US Dollar equivalent. In this case, the rate of exchange to apply is to be US\$ 1 = Yen 130.
- c) Local currency portion covering land procurement, building construction, materials locally procured, inland transportation cost for equipment and materials and wages of locally employed labourers is to be figured in US Dollar equivalent. In this case, the rate of exchange to apply is to be US\$ 1 = Z\$ 5.02.

d) Cost of spares is to be figured in the amount covering 3 years stock. Cost of maintenance work vehicle is also to be figured according to the arrangement as under.

- Exchange : 1 pick-up (four-wheel drive)
(Beatrice, Gutu, Chatsworth, Kezi, Murambinda, Nkayi)

- Parent Exchange : 1 pick-up (four-wheel drive)
(Harare, Masvingo, Bulawayo, Mutare, Kwekwe)

e) Trunk route for (Maphisa-Bulawayo) and (Murambinda-Mutare) sections are to be constructed under the current plan.

New trunk route to Maphisa exchange is to be constructed between Maphisa and Syringa which is the existing repeater station on Bulawayo-Plumtree analog trunk route. And the trunk circuit is to be connected to the existing analog trunk circuit through analog-digital convertor to be provided at Syringa.

Meanwhile, 4 sections, i.e., new digital trunk route for 3 sections connecting rural exchanges and their respective parent exchanges, and circuits (*) connecting remote line concentrator and its host exchange, are to be constructed by PTC in time with the expected date of commissioning of the Rural Telecommunications Network.

(Beatrice-Harare), (Chatsworth-Gutu)*, (Gutu-Masvingo),
(Nkayi-Kwekwe)

In case fund does not become available in time for constructing those digital trunk transmission system, as an intermediate solution, an analog transmission system is constructed by PTC at its own cost by using recovered equipment.

f) Cost for man-power and materials locally procured for the installation work is estimated and is included in the local currency portion. In estimating such man-power cost, the 4-6 ratio is applied for Skilled and unskilled labourers.

g) All costs are to be estimated at price level as of 1992, and no price escalation is considered.

h) The following are to be constructed by PTC at its own cost.

- Construction of new exchange building at Maphisa.
- Acquisition of new radio station sites for both rural telecommunications system and trunk transmission system, ground levelling and provision of fence for those sites

However, cost for acquisition of new site spaces is not estimated in the estimated cost, since such may not apply in acquiring such land space in the rural area.

- Provision of subscriber apparatus (both public and ordinary telephone set and facsimile terminal) and subscriber line connection
- Construction of 4 transmission routes, (Beatrice-Harare), (Chatsworth-Gutu), (Gutu-Masvingo) and (Nkayi-Kwekwe)

Construction of building, access road and antenna masts for Nkayi-Kwekwe trunk route, and construction of cable for the section between Harare-Beatrice.

10.2.2 Reinvestment

Cost necessary for expansion of facilities to meet with the increasing demand exceeding the initial provision is to be borne by PTC. Namely, provision of additional circuits for exchange system and subscriber multiplexing system as well as subscriber lines connection is to be made by PTC at its own cost. These cost are shown in Table 10.5.

10.2.3 Expenditure Schedule

For implementation of the project in accordance with the preceding arrangement, expenditure for each year is shown in Table 10.4 for the initial stage of the project, and in Table 10.5 for addition of subscriber circuits, respectively.

Expenditure in the initial stage is divided into two portions, one is expenditure required by PTC for preparatory works related to implementation of rural telecommunications network improvement project, such as construction of building, access road, tower for the trunk routes, subscriber line connection, and the other one is for construction of rural network.

The latter one is further divided into two parts, i.e., foreign currency portion which requires for equipment/material procurement and for installation work by foreigner, and local currency portion which requires for procurement of local installation materials and labourers.

All those expenditures are shown in the above mentioned tables in equivalent US dollar.

10.3 Operating Costs

The operating cost consists of the direct and the indirect expenditure required for the operation and maintenance of the telecommunication systems as well as for administrative works related to rural telecommunication network operation.

And these expenditure are the personnel expense and general expense, such as running cost of equipment and vehicles, procurement of spare materials required for maintenance, etc.

10.3.1 Present Condition of Operations

As a system of operation for telecommunications facilities, the organization of operations and maintenances is functionally the same in PTC, and therefore it is difficult to classify costs by expenditure of operation and expenditure of maintenance, separately.

(1) Present Condition of Expenditure

According to PTC's statistics data, total direct operating cost in 1991 is itemized in the following table.

Items	Z\$'000	%
Total direct operating costs	209,065	100.0
Staff costs	112,289	53.7
Transportation	421	0.2
Accommodation	3,767	1.8
Office costs	416	0.2
General expenses	2,779	1.3
Purchases	5,741	2.7
Contract work	749	0.4
Telephone foreign handling costs	76,904	36.8
Telegraph foreign handling costs	400	0.2
Telex foreign handling costs	5,599	2.7

(2) Present Condition of Staff and Equipments

a) Staff

According to PTC's statistics data, following number of staff are in post and telecommunication sections respectively.

Staff	Post	Telecom	Total	%
Technical Staff	250	3,770	4,020	66.8
Operations	-	(3,050)	(3,050)	(54.0)
Others	-	(720)	(720)	(12.8)
Administration	3,340	1,870	5,210	33.2
Total	3,590	5,640	9,230	100.0

b) Capacity of Equipments

According to PTC's statistics data, present condition of telecommunication facilities concerning the main items are as follows,

Total number of exchanges	:	103 Ex.
Total number of equipped switch capacities:		155,000 lu.
Total number of Main lines	DEL	: 123,737 sub.
	Others	: 2,349 sub.
	Public call offices	: 1,075 plc.

10.3.2 Estimation of Operating Costs

(1) Estimation

For estimation of operating costs for the study areas, the costs stated in item 10.3.1 (1) are considered and re-calculated in proportion to the staff number and some of the costs such as "contract work", "telephone foreign handling cost", "telegraph foreign handling cost", "telex foreign handling cost", etc., are excluded.

And for simplification of estimation, total operating cost obtained above is divided into 2 portions which are personnel expense and other expenses and then, these expenses are allotted to each exchange in proportion to respective exchange's switching capacity.

As results of re-calculation stated above, total operating cost for actual operation and maintenance in 1991 become as follows,

<u>Total expenditure:</u>	<u>76,200,000 (Z\$)</u>
Staff costs:	67,400,000 (Z\$)
Other costs:	8,820,000 (Z\$)

The other costs allotted is varied in accordance with the increment of switching capacity however, personnel expense is varied by a grade of exchange, i.e., for an exchange with less than 1,000 lu. switching capacity, the technical staff may not increase until equipped with 1,000 lu.

According to PTC's manpower plan, operation and maintenance staff should be increased to 3,530 by the year 1995, and the detailed break down is given in the following table.

In addition, staff costs will be increased accordingly.

Level	Number	
	In 1991	In 1995
Manager/Engineer	40	100
Chief Technician	110	130
Telecom Technician	500	740
Telecom Mechanic	240	250
Telecom Worker	1,180	1,050
General Worker	700	700
Others	280	560
Total	3,050	3,530

(2) Results

Estimation of operating costs for each study area is stated in the Table 10.6 using a conversion rate of 1 US\$ = 5.02 Z\$ = 130 Yen.

In addition to the above expenditure, the costs of insurance for facilities to be constructed should be added and the costs have assumed approximately 0.1% of the book value of total Equipments & Facilities costs for the six study areas, based on the current PTC's insurance system.

Total additional operating costs to be increased after completing the project are stated in the Table 10.7 in each project year.

However, Nkayi (NKI) exchange is not put in-service at present. It is planned that the exchange will commence service before 1995.

Thus, the operating cost is estimated as if the exchange were operating just as other exchanges for the study purposes.

Table 10.1 Project Implementation Schedule

Item	1993				1994				1995				1996				1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Arrangements for Procurement of Funding																				
Engineering Services																				
Approval of Tender Documents																				
Tender Floating																				
Tender Evaluation & Contract Nego																				
Approval and Signing of Contract																				
Design by Contractor / Manufacturing																				
Transportation																				
Installation																				
Testing & Commissioning (PIC's Work)																				
Land Acquisition																				
Building Construction Construction of Trunk Route																				
Subscriber Connection																				

Table 10.2 Construction Schedule

Year	1993				1994				1995				1996				1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
First Group (Nyayi, Gutu, Chatsworth)																				
-Tower & Shelter (Foundation/Erection)																				
-Transmission & Switch Sys.																				
-External Plant																				
-Acceptance Test																				
(Subscriber Line Connection by PTC)																				
Second Group (Kezi, Beatrice, Murambinda)																				
-Tower & Shelter (Foundation/Erection)																				
-Transmission & Switch Sys.																				
-External Plant																				
-Acceptance Test																				
(Subscriber Line Connection by PTC)																				

Table 10.3

Summary of Project Cost

Unit: Thousand US\$

Exchange Name	SUMMARY			Nkayi			Gutu			Chatsworth			Kezi			Beatrice			Murambinda			Training Center		
	Foreign	Local	Total	Foreign	Local	Total	Foreign	Local	Total	Foreign	Local	Total	Foreign	Local	Total	Foreign	Local	Total	Foreign	Local	Total	Foreign	Local	Total
Transmission Sys.	5,467	0	5,467	613	0	613	757	0	757	655	0	655	1,118	0	1,118	838	0	838	1,486	0	1,486	0	0	0
-MARS Sys.	2,851	0	2,851	538	0	538	267	0	267	352	0	352	585	0	585	441	0	441	668	0	668	0	0	0
-Trunk Sys.	1,351	0	1,351	0	0	0	0	0	0	0	0	0	533	0	533	0	0	0	818	0	818	0	0	0
-Cable PCM Sys.	1,265	0	1,265	75	0	75	490	0	490	303	0	303	0	0	0	397	0	397	0	0	0	0	0	0
Switching Sys.	1,965	0	1,965	342	0	342	447	0	447	162	0	162	291	0	291	402	0	402	321	0	321	0	0	0
External Plant	2,579	2,538	5,117	294	384	678	665	410	1,075	388	318	706	235	375	610	707	551	1,258	290	500	790	0	0	0
Power Plant	1,972	0	1,972	311	0	311	245	0	245	211	0	211	422	0	422	330	0	330	453	0	453	0	0	0
-Solar Sys.	1,742	0	1,742	288	0	288	222	0	222	188	0	188	353	0	353	307	0	307	384	0	384	0	0	0
-E/G, Rec. Battery	230	0	230	23	0	23	23	0	23	23	0	23	69	0	69	23	0	23	69	0	69	0	0	0
Ant. Mast	1,543	0	1,543	308	0	308	97	0	97	110	0	110	392	0	392	251	0	251	385	0	385	0	0	0
Eq. Shelter	1,194	0	1,194	139	0	139	240	0	240	130	0	130	176	0	176	272	0	272	237	0	237	0	0	0
Test Eq. & Spares	798	0	798	81	0	81	81	0	81	81	0	81	81	0	81	81	0	81	81	0	81	312	0	312
Maintenance Vehicles	209	0	209	38	0	38	38	0	38	19	0	19	38	0	38	38	0	38	38	0	38	0	0	0
SUB - TOTAL	15,727	2,538	18,265	2,126	384	2,510	2,570	410	2,980	1,756	318	2,074	2,753	375	3,128	2,919	551	3,470	3,291	500	3,791	312	0	312
Transportation/Inst. Cost	8,368	2,192	10,560	1,204	368	1,572	1,352	212	1,564	954	177	1,131	1,453	515	1,968	1,622	365	1,987	1,754	517	2,271	29	38	67
SUB - TOTAL	24,095	4,730	28,825	3,330	752	4,082	3,922	622	4,544	2,710	495	3,205	4,206	890	5,096	4,541	916	5,457	5,045	1,017	6,062	341	38	379
Engineering Services	2,624	-	2,624	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL	26,719	4,730	31,449	3,330	752	4,082	3,922	622	4,544	2,710	495	3,205	4,206	890	5,096	4,541	916	5,457	5,045	1,017	6,062	341	38	379

Table 10.4 Expenditure Schedule

UNIT IN US \$

	1994						1995						1996						TOTAL
	MATERIAL		INSTALLATION				MATERIAL		INSTALLATION				MATERIAL		INSTALLATION				
	FOREIGN	LOCAL	FOREIGN	LOCAL		TOTAL	FOREIGN	LOCAL	FOREIGN	LOCAL		TOTAL	FOREIGN	LOCAL	FOREIGN	LOCAL		TOTAL	
				SKILL	UNSKILL					SKILL	UNSKILL					SKILL	UNSKILL		
1) PREOPERATION																			
NKAYI	0	3,833	0	5,667	0	9,500	0	3,333	0	4,500	0	7,833	0	0	0	12,667	0	12,667	30,000
GUTU	0	3,833	0	5,667	0	9,500	0	3,333	0	4,500	0	7,833	0	0	0	12,667	0	12,667	30,000
CHATSWORTH	0	3,833	0	5,667	0	9,500	0	3,333	0	4,500	0	7,833	0	0	0	12,667	0	12,667	30,000
KEZI	0	3,833	0	5,667	0	9,500	0	3,333	0	4,500	0	7,833	0	0	0	12,667	0	12,667	30,000
BEATRICE	0	3,833	0	5,667	0	9,500	0	3,333	0	4,500	0	7,833	0	0	0	12,667	0	12,667	30,000
MURAMBINDA	0	3,833	0	5,667	0	9,500	0	3,333	0	4,500	0	7,833	0	0	0	12,667	0	12,667	30,000
SUB. TOTAL 1)	0	23,000	0	34,000	0	57,000	0	20,000	0	27,000	0	47,000	0	0	0	76,000	0	76,000	180,000
2) PREPARATORY WORK																			
EX. BUILDING(Tr)																			
CHATSWORTH Rep.	0	0	0	0	0	0	0	30,600	0	8,200	12,300	51,100	0	0	0	0	0	0	51,100
Rep. NKY-KWEKWE	0	55,100	0	34,500	28,400	118,000	0	47,000	0	74,000	68,000	189,000	0	0	0	0	0	0	307,000
BEATRICE-HRR	0	0	0	0	0	0	0	50,000	0	180,000	270,000	500,000	0	0	0	0	0	0	500,000
MAPHISA EX.	0	0	0	0	0	0	0	44,000	0	15,500	16,400	75,900	0	0	0	0	0	0	75,900
SUB. CONNECTION	0	0	0	0	0	0	0	0	0	0	0	0	0	278,100	0	22,900	18,000	319,000	319,000
SUB. TOTAL 2)	0	55,100	0	34,500	28,400	118,000	0	171,600	0	277,700	366,700	816,000	0	278,100	0	22,900	18,000	319,000	1,253,000
3) INITIAL WORKING CAP.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	102,000	102,000
4) EQUITY TOTAL = 1)+2)+3)	0	78,100	0	68,500	28,400	175,000	0	191,600	0	304,700	366,700	863,000	0	278,100	0	98,900	18,000	497,000	1,535,000
5) EQUIPMENTS & FACILITIES																			
NKAYI	0	0	0	0	0	0	881,000	177,000	415,000	25,000	39,000	1,537,000	1,355,000	344,000	715,000	53,000	74,000	2,541,000	4,078,000
GUTU	0	0	0	0	0	0	1,068,000	184,000	461,000	27,000	40,000	1,780,000	1,635,000	366,000	792,000	54,000	76,000	2,923,000	4,703,000
CHATSWORTH	0	0	0	0	0	0	724,000	144,000	330,000	20,000	30,000	1,248,000	1,119,000	291,000	572,000	42,000	59,000	2,083,000	3,331,000
KEZI	0	0	0	0	0	0	1,134,000	195,000	504,000	33,000	50,000	1,916,000	1,739,000	387,000	863,000	66,000	93,000	3,148,000	5,064,000
BEATRICE	0	0	0	0	0	0	1,211,000	243,000	557,000	34,000	52,000	2,097,000	1,855,000	475,000	952,000	67,000	95,000	3,444,000	5,541,000
MURAMBINDA	0	0	0	0	0	0	1,356,000	252,000	611,000	40,000	60,000	2,319,000	2,069,000	493,000	1,041,000	76,000	110,000	3,789,000	6,108,000
SUB TOTAL 5)	0	0	0	0	0	0	6,374,000	1,195,000	2,878,000	179,000	271,000	10,897,000	9,772,000	2,356,000	4,935,000	358,000	507,000	17,928,000	28,825,000
6) ENGINEERING SER.	0	0	1,570,000	0	0	1,570,000	0	0	370,000	0	0	370,000	0	0	684,000	0	0	684,000	2,624,000
7) TOTAL = 5)+6)	0	0	1,570,000	0	0	1,570,000	6,374,000	1,195,000	3,248,000	179,000	271,000	11,267,000	9,772,000	2,356,000	5,619,000	358,000	507,000	18,612,000	31,449,000
8) GRAND TOTAL = 4)+7)	0	78,100	1,570,000	68,500	28,400	1,745,000	6,374,000	1,386,600	3,248,000	483,700	637,700	12,130,000	9,772,000	2,634,100	5,619,000	456,900	525,000	19,109,000	32,984,000

Table 10.5 REINVESTMENT SCHEDULE

IN US \$

YEAR	MATERIAL		TOTAL	WORK		TOTAL	GRAND TOTAL
	FOREIGN	LOCAL		SKILL	UNSKILL		
2000	443,000	18,000	461,000	8,000	7,000	15,000	476,000
2001	0	36,000	36,000	2,000	4,000	6,000	42,000
2002	0	36,000	36,000	2,000	4,000	6,000	42,000
2003	0	36,000	36,000	2,000	4,000	6,000	42,000
2004	0	36,000	36,000	2,000	4,000	6,000	42,000
2005	980,000	115,000	1,095,000	44,000	62,000	106,000	1,201,000
2006	0	194,000	194,000	2,000	4,000	6,000	200,000
2007	0	194,000	194,000	2,000	4,000	6,000	200,000
2008	0	194,000	194,000	2,000	4,000	6,000	200,000
2009	0	194,000	194,000	2,000	4,000	6,000	200,000
2010	0	194,000	194,000	2,000	4,000	6,000	200,000
2011	0	97,000	97,000	1,000	2,000	3,000	100,000
TOTAL	1,423,000	1,344,000	2,767,000	71,000	107,000	178,000	2,945,000

Table 10.6 Operation and Maintenance Costs

UNIT IN US\$

	1991	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
EXCHANGE: BEATRICE																	
S/W CAP.	200	200	650	650	650	650	700	700	700	700	700	700	700	700	700	700	1000
PERSONNEL	18,800	20,700	20,700	20,700	20,700	20,700	20,700	20,700	20,700	20,700	20,700	20,700	20,700	20,700	20,700	20,700	20,700
GENERAL	2,400	2,400	9,500	9,600	9,700	9,800	9,900	9,900	9,900	9,900	9,900	9,900	10,700	11,500	12,100	12,800	13,500
EXPENDITURE	21,200	23,100	30,200	30,300	30,400	30,500	30,600	30,600	30,600	30,600	30,600	30,600	31,400	32,200	32,800	33,500	34,200
EXCHANGE: MURAMBINDA																	
S/W CAP.	200	200	300	300	300	300	500	500	500	500	500	650	650	650	650	650	850
PERSONNEL	18,800	20,700	20,700	20,700	20,700	20,700	20,700	20,700	20,700	20,700	20,700	20,700	20,700	20,700	20,700	20,700	20,700
GENERAL	2,400	2,400	5,700	6,200	6,600	7,000	7,600	7,900	8,300	8,500	9,000	9,400	9,800	10,400	10,800	11,200	11,700
EXPENDITURE	21,200	23,100	26,400	26,900	27,300	27,700	28,300	28,600	29,000	29,200	29,700	30,100	30,500	31,100	31,500	31,900	32,400
EXCHANGE: NKAYI																	
S/W CAP.	200	200	250	250	250	250	400	400	400	400	400	500	500	500	500	500	600
PERSONNEL	18,800	20,700	20,700	20,700	20,700	20,700	20,700	20,700	20,700	20,700	20,700	20,700	20,700	20,700	20,700	20,700	20,700
GENERAL	2,400	2,400	5,000	5,300	5,700	6,000	6,400	6,600	6,900	7,100	7,300	7,600	7,800	8,200	8,300	8,500	8,800
EXPENDITURE	21,200	23,100	25,700	26,000	26,400	26,700	27,100	27,300	27,600	27,800	28,000	28,300	28,500	28,900	29,000	29,200	29,500
EXCHANGE: KEZI																	
S/W CAP.	200	200	350	350	350	350	400	400	400	400	400	600	600	600	600	600	700
PERSONNEL	18,800	20,700	20,700	20,700	20,700	20,700	20,700	20,700	20,700	20,700	20,700	20,700	20,700	20,700	20,700	20,700	20,700
GENERAL	2,400	2,400	5,900	6,000	6,200	6,300	6,400	6,900	7,300	7,800	8,300	8,800	9,000	9,300	9,500	9,700	9,900
EXPENDITURE	21,200	23,100	26,600	26,700	26,900	27,000	27,100	27,600	28,000	28,500	29,000	29,500	29,700	30,000	30,200	30,400	30,600
EXCHANGE: CHATSWORTH																	
S/W CAP.	200	200	300	300	300	300	400	400	400	400	400	450	450	450	450	450	600
PERSONNEL	18,800	20,700	20,700	20,700	20,700	20,700	20,700	20,700	20,700	20,700	20,700	20,700	20,700	20,700	20,700	20,700	20,700
GENERAL	2,400	2,400	5,400	5,700	5,900	6,200	6,400	6,500	6,600	6,700	6,900	7,000	7,400	7,900	8,000	8,400	8,800
EXPENDITURE	21,200	23,100	26,100	26,400	26,600	26,900	27,100	27,200	27,300	27,400	27,600	27,700	28,100	28,600	28,700	29,100	29,500
EXCHANGE: GUTU																	
S/W CAP.	400	400	600	600	600	600	950	950	950	950	950	1050	1050	1050	1050	1050	1250
PERSONNEL	18,800	20,700	20,700	20,700	20,700	20,700	20,700	20,700	20,700	20,700	20,700	24,100	24,100	24,100	24,100	24,100	29,300
GENERAL	4,700	4,700	9,700	10,500	11,300	12,000	13,000	13,200	13,500	13,700	14,000	14,200	14,700	15,200	15,600	16,000	16,600
EXPENDITURE	23,500	25,400	30,400	31,200	32,000	32,700	33,700	33,900	34,200	34,400	34,700	38,300	38,800	39,300	39,700	40,100	45,900
PERSONNEL	112,800	124,200	124,200	124,200	124,200	124,200	124,200	124,200	124,200	124,200	124,200	127,600	127,600	127,600	127,600	127,600	132,800
GENERAL	16,700	16,700	41,200	43,300	45,400	47,300	49,700	51,000	52,500	53,700	55,400	56,900	59,400	62,500	64,300	66,600	69,300
INSURANCE	0	0	31,000	29,000	27,000	25,000	23,000	21,000	19,000	17,000	16,000	14,000	12,000	10,000	9,000	7,000	5,000
TOTAL	129,500	140,900	196,400	196,500	196,600	196,500	196,900	196,200	195,700	194,900	195,600	198,500	199,000	200,100	200,900	201,200	207,100

Table 10.7 ADDITIONAL OPERATING COSTS

UNIT IN US\$

	PERSONNEL	GENERAL	INSURANCE	TOTAL
1991				0
1996	11,000	0	0	11,000
1997	11,000	25,000	31,000	67,000
1998	11,000	27,000	29,000	67,000
1999	11,000	29,000	27,000	67,000
2000	11,000	30,000	26,000	67,000
2001	11,000	33,000	23,000	67,000
2002	11,000	35,000	21,000	67,000
2003	11,000	36,000	19,000	66,000
2004	11,000	37,000	17,000	65,000
2005	11,000	39,000	16,000	66,000
2006	15,000	40,000	14,000	69,000
2007	15,000	43,000	12,000	70,000
2008	15,000	46,000	10,000	71,000
2009	15,000	47,000	9,000	71,000
2010	15,000	50,000	7,000	72,000
2011	20,000	53,000	5,000	78,000

SECTION 11 FINANCIAL ANALYSIS

SECTION 11 FINANCIAL ANALYSIS

11.1 General

The project will be financially analyzed in this section. That is, the expected revenue and expenditure in the project will be analyzed and the financial soundness of the project is to be assessed. In this financial analysis, it is defined that the project would start the telecommunications service in January 1997, and its economic life span is 15 years.

11.1.1 Method of Financial Analysis

The method contrasts the total amount of the costs of construction, operation, etc., with the revenues obtained by the Call charge, Installation fees and Rental fees to calculate the profit and make the various financial statements, etc.

This section deals mainly with the calculation of Financial Internal Rates of Return (FIRR) which, by definition, is the discount rate which achieves a net present value of zero, when discounting sets of financial cash flows are expected in the project.

The cost information for the project, i.e., capital cost estimates, operating cost estimates, etc., is assumed with their schedule as shown in Section 10 and is put into a systematic and consistent framework to permit projections of cost streams which will be used in the FIRR analysis.

Similarly, the demand forecasts of the telecommunications services stated in Section 5 are used to develop projections of the sales revenues of the Project. The annual cash flow in each project year is thus, projected to calculate the FIRR.

11.1.2 Main Assumptions for Financial Analysis

(1) Project Life

Referring the Project Schedule in Section 10, the project life for the Financial Analysis is set as follows.

- a) Planning stage : Feb. 1994 - Dec. 1994
- b) Construction period : Jan. 1995 - Dec. 1996
- c) Operation period : Jan. 1997 - Dec 2011 (15 years)

(2) Analyzed Cases

The Rural telecommunication network project will be implemented in remote and rural areas that area in a depopulated situation and which have experienced a difficult economy.

From this point of view, the project financing scheme sustained by the Grant-aid of lateral country basis is set as the case to be analyzed (Case 2), in addition to the conventional financing case (Case 1).

Case 1 : Equity (owned capital) / Long-Term Loan

Equity (Owned Capital) : covers 30% of "Project Costs"
Long-Term Loan : covers 70% of "Project Costs"
(Refer to Section 10, Table 10.3)

Case 2 : Grant / Equity

Grant portion :
Equipment & Facilities including Engineering Service fee in "Project Costs" (Refer to Section 10, Table 10.3).

Equity (Owned Capital) portion :
Preparatory works by PTC, pre-operation costs and Initial Working Capital in "Project Cost" (Refer to Section 10. Table 10.3).

(3) Financial Condition

The total capital required for the Case 1 will be raised as shown in Section 10, "Implementation Plan".

a) Condition of Long-Term Loan

Interest : 11.5% p.a.

Debt Repayment : Equal Semi-Annual payment for 15 years
including Grace Period of 5 years

b) Subsidiary

In case of shortage of funds during the operation period, the Government of Zimbabwe will provide the subsidiary to fulfill the cash deficits, if any.

(4) Taxes, Insurance

a) Sales Tax

Sales tax equivalent to 10% of the tariff imposed is included in sales revenues in the telecommunications service in Zimbabwe.

b) Corporation Income Tax

Corporation Income Tax has not been applied, because PTC is operated under the organization of M.I.P.T. (Ministry of Information, Posts and Telecommunications).

c) Insurance

The cost for insurance has assumed approximately 0.1% of the book value of Equipment & facilities costs in each project year based on the current insurance system.

(5) Depreciation

The depreciation condition was settled as follows. Full value of all the asset items is depreciated without remaining salvage value.

<u>Item</u>	<u>Depreciation method</u>
Equipment & Facilities	15 years straight line
Engineering Services	5 years straight line
Pre-operation Costs	5 years straight line
Interest during Construction	5 years straight line

(6) Working Capital

a) Working Capital during the Operation

The amount of Working capital is assumed the following for each year of operation.

Account Receivable : Sales Revenue for 2 months
Accounts Payable : Operating costs for 2 months

b) Initial Working Capital (I.W.C)

The equivalent amount to the working capital required in the first operation year is reserved prior to the service-in of the new communication network.

11.2 Sales Projection

Sales revenue in each project year is estimated incorporating the following.

- Demand Forecast presented in Section 10
- Present Tariff System considering the distances between the assumed usages and BRA (Basic Rental Area)

11.2.1 Revenue Items

Revenue from Telecommunications service consists of following three categories.

(1) Call Charges

- a) Local Calls: Call charges within each Telecommunication Exchange Areas
- b) STD Calls : Call charges on the calls exchanged with other Telecommunication Exchange Areas

(2) Installation Fee

This represents the charges imposed to a subscriber when the telephone is newly installed.

(3) Rental Fee

This represents the Monthly Rental Tariff paid by a subscriber in a fixed amount for his usage of the end terminal.

11.2.2 Present Tariff System

Present PTC's tariff system for telephone subscribers is summarized in following Table 11.1. Zimbabwean telephone tariff system is characterized by accelerative charges for the distances. Call charges within the telecommunication exchange area is constant (Local calls), but the charge to other exchange area (STD calls) depends on distance and duration. Installation fee and Rental fee referring to in terms of "within BRA" and "outside BRA" and a premium charges shall be borne by a subscriber according to distance from BRA.

Table 11.1 Present Tariff System

(Z\$)

Item	Description	Tariff
Call Charge	Local calls	ZC 16.65 per 3 minutes
	STD calls	Depend on distance and duration
Installation Fee	Within BRA	Z\$ 87.2 per month
	Outside BRA	Basic charge Z\$ 87.2 Plus a premium chargee by distance(km) from BRA <= 16km Z\$ +199.20 per km 16 - 32km Z\$ 1282.4+99.60 per km >= 32km Z\$ 2876.0+49.80 per km
Monthly Rental Fee	Within BRA	Z\$ 8.75 per month
	Outside BRA	Basic charge Z\$ 8.75 per month Plus a premium charge by distance(km) from BRA Z\$ 3.10 per 0.5km

11.2.3 Sales Revenue Projection

Demands of the revenue elements, i.e., Call charges, Installation and Monthly rental fee are forecasted for every 5 year span of the Project as shown in Table 10.3 in Section 10. The sales revenues of the entire project period have been projected based on the above Demand Forecast and the present PTC's Tariff System.

(1) Call Charge

STD calls (Trunk calls) are the major source of incomes in total revenues obtained by the calls interexchanged. As for the estimation of the revenues of STD calls the following calculation method is applied.

a) Revenue Distribution Rate

Revenue distribution method, the share % of incomes obtained by STD calls are estimated as 40% with the standard construction costs distribution ratio given in Table 11.2 is taken into account.

$$[100 - (\text{Toll trunk} + \text{Toll transmission})] \times 1/2 (\text{Division with other telephone exchanges}) = 40(\%)$$

Table 11.2 Construction Cost Distribution Ratio

<u>Item</u>	<u>Ratio</u>
Subscriber's premise equipment	10%
Local subscriber's line	40%
Local switching	30%
Toll trunking	5%
Toll transmission	15%

b) Revenue Estimation

- Annual Revenue of STD calls is calculated by the following formula;

$$AR = BT/BCR/MT \times CR \times RC \times WD \times S \times DR$$

Where,

AR : Annual Revenue

BT : Busy hour originating and terminating traffic

BCR : Busy hour concentration ratio (14.3%)

MT : Mean holding time of complete calls

Local calls : 3 minutes

STD calls : 4 minutes

CR : Call completion ratio

Local calls : 60%

STD calls : 50% (Note 1)

RC : Revenue per completed call

Local calls : Z\$0.1665

STD calls : Z\$1.536 (Note 2)

WD : Annual average of working days (300 days)

S : Number of telephone subscribers

DR : Annual Revenue-Distribution Ratio

Note 1: It is assumed that call completion ratio of STD call is improved from the present ratio of 26% to 50% along with the implementation of National Digitalization Program.

Note 2: It is assumed that most of the STD calls will terminate in the parent exchange. However, a 20% increment on the nominal charge for a unit to the

parent exchange is made to allow for those calls to destinations beyond the parent exchange.

(2) Installation Fee

Annual installation fee is obtained by distance of new subscribers and the number of new installations in Project.

(3) Rental Fee

The incremental sales revenue of rental obtained from new subscribers after 1997 is calculated based on the average fees by the distance and their number estimated in Section 5.

Total annual revenue of Call charge, Installation fee and Rental fee are shown in Table 11.3.

The Sales revenue for the 6 exchange areas is also summarized in Table 11.4.

Table 11.3 Sales Revenue Projection by Distance

Project Year	Items	Number of Call		Number of Installation					Number of Total Subscribers					TOTAL SALES REV. (1000 US\$)
		Case 1	Case 2	BRA	5-25Km	25-45Km	45-65Km	65-85Km	BRA	5-25Km	25-45Km	45-65Km	65-85Km	
		Z\$	(ZC)	87.2	2079.2	4668.8	5764.4	6760.4	105.6	849.6	2337.6	3825.6	5313.6	
1('97)	No.	1,819,665	1,167,264	690	625	84	14	13	690.2	625.2	83.4	14	13	751
2('98)	No.	1,957,230	1,311,408	144	70	11	1	1	834.4	695.4	93.8	15	14	456
3('99)	No.	2,094,795	1,455,552	145	70	10	0	0	979.6	765.6	104.2	15	14	494
4(2000)	No.	2,232,360	1,599,696	146	73	10	0	0	1,125.8	838.8	114.6	15	14	537
5('01)	No.	2,369,925	1,743,840	148	75	12	0	0	1,273.0	913.0	127.0	15	14	583
6('02)	No.	2,449,710	1,848,672	65	66	13	1	1	1,338.4	979.8	140.2	16	15	615
7('03)	No.	2,529,495	1,953,504	66	68	14	1	1	1,404.8	1,047.6	154.4	17	16	651
8('04)	No.	2,609,280	2,058,336	66	69	14	0	0	1,471.2	1,116.4	168.6	17	16	682
9('05)	No.	2,689,065	2,163,168	67	69	15	0	0	1,537.6	1,185.2	183.8	17	16	716
10('06)	No.	2,768,850	2,268,000	68	71	19	0	0	1,605.0	1,256.0	202.0	17	16	756
11('07)	No.	2,843,505	2,519,496	55	122	29	1	1	1,659.4	1,376.2	229.6	18	17	842
12('08)	No.	2,918,160	2,770,992	56	122	30	1	1	1,714.8	1,496.4	258.2	19	18	897
13('09)	No.	2,992,815	3,022,488	57	122	31	0	1	1,770.2	1,616.6	287.8	19	19	951
14('10)	No.	3,067,470	3,273,984	55	125	34	0	0	1,823.6	1,739.8	319.4	19	19	1,008
15('11)	No.	3,142,125	3,525,480	71	152	58	0	0	1,877.0	1,863.0	351.0	19	19	1,096
TOTAL	No.	38,484,450	32,681,880	1,899	1,899	384	19	19	21,105.0	17,515.0	2,818.0	252	240	11,035

Table 11.4 Sales Revenue Projection for each exchange area

Project Year	Sales Revenue Projection (1000 US\$)							
	NKAYI	GUTU	CHATSWORTH	KEZI	BETRICE	MURAMBINDA	TOTAL	
1('97)	107	97	117	163	179	88	751	
2('98)	69	76	69	90	88	64	456	
3('99)	76	86	75	90	93	73	493	
4(2000)	83	97	81	94	99	83	537	
5('01)	91	109	87	97	106	92	582	
6('02)	91	114	92	108	110	100	615	
7('03)	94	121	98	115	115	108	651	
8('04)	97	127	104	119	120	115	682	
9('05)	100	135	110	125	124	123	717	
10('06)	103	142	115	133	130	132	755	
11('07)	116	153	128	147	152	147	843	
12('08)	122	161	138	155	165	157	898	
13('09)	129	168	147	161	178	168	951	
14('10)	136	176	157	168	192	179	1,008	
15('11)	177	183	166	175	205	190	1,096	
TOTAL	1,591	1,945	1,684	1,940	2,056	1,819	11,035	
Average Annual	106	130	112	129	137	121	736	

11.3 Total Investment Cost

11.3.1 Total Investment Cost

The total investment cost detailed in Section 10 can be summarized in Table 11.5 for the financial Analysis.

Table 11.5 Total Investment Cost

(US\$'000)

Item	Cost	Depreciation Method
Equipment & Facilities	28,825	15 years straight line
Engineering Service	2,624	5 years straight line
Preparatory Works	1,253	15 years straight line
Pre-operation Costs	180	5 years straight line
Interest During Construction (Case 1 Only)	(3,787)	5 years straight line
Initial Working Capital	102	Non-depreciation
Total Investment Cost (Case 1)	36,771	-
Total Investment Cost (Case 2)	32,984	-

11.3.2 Expenditure Schedule of Total Investment Cost

The total investment cost is disbursed in each year of construction period as shown in Table 11.6.

Table 11.6 Expenditure Schedule

(US\$'000)

Item	Project Year			Total
	-3('94)	-2('95)	-1('96)	
Equipment & Facilities	0	10,897	17,928	28,825
Engineering Service	1,570	370	684	2,624
Preparatory Works	118	816	319	1,253
Pre-operation Costs	57	47	76	180
Interest during Construction (Case-1 only)	(109)	(950)	(2,728)	(3,787)
Initial Working Capital	0	0	102	102
Total (Case-1)	1,854	13,080	21,837	36,771
Total (Case-2)	1,755	12,130	19,109	32,984

11.3.3 Reinvestment

The additional investment for the telecommunication system becomes necessary as the demand of the subscribers increases. The costs for such reinvestment shown below is assumed to be applied by PTC's owned equity.

Table 11.7 Reinvestment Schedule

Project Year	Reinvestment (US\$'000)
4(2000)	443
5('01)	42
6('02)	42
7('03)	42
8('04)	42
9('05)	1,201
10('06)	200
11('07)	200
12('08)	200
13('09)	200
14('10)	200
15('11)	100
Total	2,912

11.4 Operating Costs

Table 11.8 is the summary of the direct operating costs not including interest payment and depreciation. The operating costs in the representative years are listed in this table since the operating costs in every year increase due to the increase of number of terminals. For operating the network established under the current plan, the following expenditure required compare to the present expenditure. The cost is deemed as the operating costs in this study.

Table 11.8 Operating Costs

(US\$'000)

Items	Project year		
	1('97)	10(2000)	15('11)
Staff Costs	11	15	20
General Expenses	24	40	53
Insurance	31	14	5
Total	67	69	78

11.5 Financial Analysis

The purpose of the financial analysis is to measure and assess the financial viability of the project under the above mentioned condition and assumptions. The financial analysis will be performed for the selected base cases set by different financing scheme, namely (1) Case 1 : Long-term Loan/Equity case, and (2) Case 2 : Grant/Equity case.

11.5.1 Summary of Financial Statements

(1) Financial Statements

The result of this financial analysis is detailed in the output sheets that are attached to the end of this Section.

- Income Statements (Table 11.9, 11.12)
- Cash Flow Statements (Table 11.10, 11.13)
- Balance Sheets (Table 11.11, 11.14)

(2) Summary of Financial Analysis for Base Cases

The summary of the result of the above financial analysis is shown in Table 11.15.

Table 11.15 Summary of Financial Analysis

(US\$'000)

Item	Case 1	Case 2
Total Investment	36,771	32,984
Project Funding		
Equity (Own Capital)	11,031	1,535
Debt (Long-term Loan)	25,740	-
Grant	-	31,449
Total	36,771	32,984
Sales Revenue		
Project Total	9,932	9,932
(Average Annual)	(662)	(662)
Operating Costs, Interest, Depreciation		
Project Total	68,229	4,133
(Average Annual)	(4,547)	(275)
Income Tax		
Project Total	0	0
(Average Annual)	(0)	(0)
Net Profit		
Project Total	-58,298	5,799
(Average Annual)	(-3,887)	(387)
Cash Flow during operation		
Project Total	-45,750	8,850
(Average Annual)	(-3,050)	(590)
Equity for reinvestment (Total project)	-2,945	-2,945
Expected Project Return (IRROE)	N.A.	19.51%
Payout period from the Initial Equity	N.A.	3.42 Years

11.5.2 Major Financial Indicators

The major financial indicators in each operation year are shown in Table 11.16. Each indicator is obtained from the following formula:

(1) Net Profit on Equity on Sales Revenue

$(\text{Net Profit after tax}) / \text{Equity (Paid-in share capital)}$

(2) Debt Service Coverage Ratio

$(\text{Net Profit after tax} + \text{Depreciation} + \text{Interest}) / (\text{Repayment} + \text{Interest})$

(3) Break Even Points (B.E.P.)

i) Profit B.E.P. - Sales Revenue

$(\text{OPC} + \text{D} + \text{I}) \times 1 / r \times 100$

ii) Cash B.E.P - Sales Revenue

$((\text{OPC} + \text{D} + \text{I}) + (\text{R} - \text{D}) / (1 - g) + \text{WCI}) \times 1 / r \times 100$

where, OPC : Operating Costs

r : Sales revenue at each project year

R : Repayment of Long-term Loan

D : Depreciation

I : Interest on Long-term Loan

g : Tax rate

WCI : Working Capital increase

Table 11.16 Major Financial Indicators

Project Year	Net Profit on Equity (%)		Debt Service Coverage Ratio	Profit Break Even Point (%)		Cash Break Even Point (%)	
	Case 1	Case 2		Case 1	Case 2	Case 1	Case 2
1 ('97)	(-)51.4	31.9	0.21	935	28	441	30
2 ('98)	(-)53.8	14.6	0.12	1,548	45	739	18
3 ('99)	(-)53.5	16.8	0.13	1,429	42	683	17
4 (2000)	(-)51.1	14.0	0.14	1,317	42	628	15
5 ('01)	(-)51.0	13.2	0.11	1,223	48	824	14
6 ('02)	(-)37.3	15.9	0.09	1,882	40	973	13
7 ('03)	(-)34.4	17.0	0.10	783	38	868	12
8 ('04)	(-)31.5	17.9	0.12	699	36	781	12
9 ('05)	(-)26.6	10.0	0.13	632	47	697	11
10 ('06)	(-)23.9	10.0	0.15	558	48	619	12
11 ('07)	(-)20.8	11.1	0.18	464	45	516	10
12 ('08)	(-)18.0	11.5	0.21	400	44	448	10
13 ('09)	(-)15.3	11.7	0.24	345	43	388	9
14 ('10)	(-)12.7	12.0	0.28	295	42	334	9
15 ('11)	(-)10.0	13.6	0.67	242	39	146	8

11.5.3 Sensitivity Analysis

The effects on the profitability of the Project by the changes of conditions assumed in this financial analysis have been analyzed.

The following changes of conditions (variable factors) and their variable ranges are determined.

(1) Total Investment Cost

+10% and -10% of the fluctuation of the Total Investment Cost of construction stage excluding Interest during construction, and Initial Working Capital and Reinvestment required during operation.

(2) Sales Revenue

+20% and -20% of the fluctuation of the sales revenue in each project Year.

(3) Interest on Long-term Loan (Case 1 only)

Decrease of 4.0 and 8.0 Points shows the base value of 11.5% p.a.

(4) Grant Portion Rate (Case 2 only)

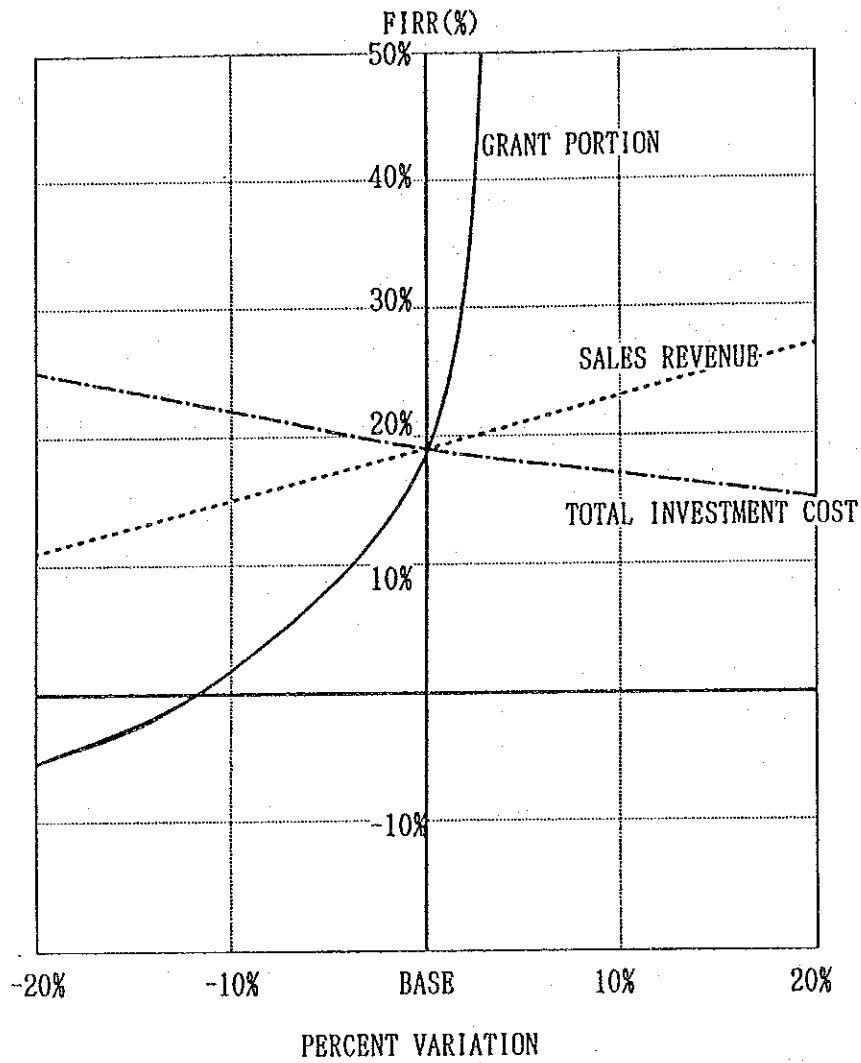
-10% and -20% decrease against the required investment costs for Equipment & Facilities and Design & Tendering which are assumed in Case 2 as the Grant element items.

The result of the sensitivity analysis is summarized in Table 11.17 and Figure 11.1.

Table 11.17 Summary of Sensitivity Analysis

Variable Factor	Variation	Expected Project Return (IRROE)	
		Case 1	Case 2
Total Investment	-10%	N.A.	21.83%
	Base	N.A.	19.51%
	+10%	N.A.	17.55%
Sales Revenue	-20%	N.A.	12.52%
	Base	N.A.	19.51%
	+20%	N.A.	25.33%
Interest on L.T Loan (Case 1 only)	-4 point(7.5% p.a.)	N.A.	N.A.
	Base(11.5% p.a.)	N.A.	N.A.
	-8 point(3.5% p.a.)	N.A.	N.A.
Grant portion Rate (Case 2 only)	Base	N.A.	19.51%
	-10%	N.A.	2.52%
	-20%	N.A.	-2.92%

NOTE) IRROE (Internal Rates of Return on Equity) figures in all the sensitivity analysis of case 1 are not applicable (N.A.) due to the financial difficulty to payback the initial investment as detailed in 11.6 "Assessment of result of financial analysis".



Total Investment Cost / Sales Revenue / Grant Portion Rate

Figure 11.1 Summary of Sensitivity Analysis for Case 2

IRROE % to variation of Financial Parameter

11.6 Assessment of Result of Financial Analysis

The expected profitability and financial condition will be discussed here. Following is an assessment of the forecast profitability and financial state of the project.

While a nation's economy is developing, the spread of telephones in that nation generally grows at a faster pace than the economy. This project targets rural areas, where further development is expected. Telecommunications is one of the prerequisites for growth in these areas, and this project targets to serve Basic Human Needs (BHN) and provides principal infrastructure in the form of a public enterprises.

The point at issue when discussing the project's financial state is the scale of sales revenue. Because the project targets developing areas, growth in demand is expected to be slight, coupled with low income growth. This poses difficulties in carrying out a project requiring a large investment and is the most distinctive feature of rural projects. In other words, although a telecommunications network is needed in order to expedite economic growth, the funds required to provide and administer such a network are often in short supply.

The profitability of a project planned under these circumstances is very low, which makes it difficult to carry out this kind of project using conventional fund raising methods. Two cases were assessed, case 1 being the loan/equity method and case 2 the grant/equity method.

(1) Case 1 (Loan/Equity)

The financial analysis of this case 1 was conducted with the following conditions: Interest rate -- 11.5% p.a.; repayment period -- 15 years including the grace of 5 years.

In this case, a loss of US\$5,675,000 is recorded, with a total loss of US\$58,298,000 for the 15 year period of the project. This puts pressure on the funds, resulting in a fund shortage for each operating year of the project. It will also lead to the government of Zimbabwe having to provide a subsidy, which will amount to US\$45,750,000 (an annual average of US\$3,050) -- twice the amount of initial investment.

A further study of the financial status, based on leading financial indicators and the results of sensitivity analysis indicates the following:

- a) The Debt Service Coverage Ratios show 0.09 to 0.67 throughout the repayment period, meaning that the funds raised through operations will not be able to cover the majority of the funds required for repayment throughout the period of the project. This indicates, therefore, the necessity for the government of Zimbabwe to provide a large subsidy. Even if the rate of interest on borrowing is 0.0%, a government subsidy will still be needed to make up for the shortage of funds.
- b) The Cash Break-Even Point indicates that 3 to 15 times anticipated revenues will be required each year from the first year of operation until the completion of the project. This supports the above prediction of a fund shortage. Given these conditions, it is not possible to calculate the Financial Internal Rate of Return (FIRR). The scale of cash flow is so insignificant as to be not worth the reckoning if the project is to be based on borrowing.
- c) Even lower interest rates for the long-term borrowing, which constitute 70% of the total investment, will only slightly reduce the formidable fund shortage. For example, even if the interest rate of 11.5% given in the base case is lowered by 8 % to 3.5%, it is still not possible to calculate the FIRR.
Furthermore, a case where the entire portion of the funds required are covered by equity capital with no long-term loans taken out will still only slightly alleviate the situation. Even in this case, it still remains impossible to calculate the FIRR.
- d) As the results of the sensitivity analysis indicate, cases where sales revenues can be increased while the total investment can be decreased do not even present a financial state of affairs which affirms the feasibility of the project.

The above points show that it is difficult to justify making the investment for the project. The project requires an investment too great for the small revenue anticipated, thus placing great pressure on funds.

(2) Case 2 (Grant/Equity)

Case 2 introduces a grant in order to overcome the problem of the project's profitability. The cost for preparatory works -- such as the cost of installing transmission links -- needed to allow the facilities for the project to be brought in, Pre-operation costs and Initial Working Capital are covered by the equity portion, on the understanding of the need for a grant.

The costs of Equipment and facilities constituting the telecommunications network are covered by the grant portion. This reduces the amount of funds which the Government of Zimbabwe need to supply, and guarantees profitability and enables operation.

There will be a fund surplus throughout the life of the project, except for those years in which a large amount of Reinvestment is required. There is thus no need for a government subsidy, which is necessary during periods where there is a fund shortage. No cash flow problems will arise.

The payout period for the equity capital of US\$1,535,000 required in the initial investment is 3 to 4 years. All of the additional funds needed for facility expansion can be paid out. A cash flow of US\$8,850,000 is yielded throughout the operating period, with FIRR at 19.51%. The profit ratio reflects the soundness of financial state.

This FIRR is attained because the equity accounts for only 4% of Total Investment Costs and anticipated sales revenues are sufficient to maintain the stable operation. Note should be made of the fact that FIRR values are largely affected by changes in the percentage of equity in the total cost of investment.

A further study of the financial status based on major financial indicators and the results of a sensitivity analysis shows the following;

- a) The Profit Break Even Point for each year of the project is 50% or lower. The Cash Break Even Point is 20% or lower. These levels point to a sound situation in terms of profits and funds.

b) The results of sensitivity analysis are as follows;

i) Total Costs of Investment

If the Total Investment Costs varies by plus or minus 10% from the base value, the FIRR value also fluctuates by about 10%. Although the total costs of investment do affect the project's profitability to some extent, they do not have a life or death influence over the project.

ii) Sales Revenue

Fluctuations of sales revenues affect the project's profitability to a relatively large extent. If sales revenues vary from the estimates by plus or minus 20%, FIRR values fluctuate by about 30%. Because the areas targeted by the project largely comprise communal farming areas which are subject to natural misfortunes, there is a strong possibility that sales revenues may decline. But even where sales revenues drop 20%, the FIRR of 12.52% remains above 10%. It therefore seems that the profitability of the project, as one which serves to meet basic human needs, is secure.

iii) Grant Portion of Total Costs of Investment

With a small equity portion in the total costs of investment, the results of financial analysis point to preferable profitability. But it should be noted that a decrease in the grant portion attributing to an increased portion of equity in the Total Investment Cost affects the project viability greatly. For example, as noted in the sensitivity analysis, should the grant portion set based on the equity portion decrease 10% and this decrease is covered using equity, the FIRR will experience a major fall from 19.51% to 2.52%. Similarly, if the grant portion should fall 20%, the FIRR will decline to -2.92%. This would mean it would be impossible to secure funds, making it very difficult to complete the project. The above points indicate that the case which uses the grant/equity methods allows the project to operate with solid profitability, provided the assumed grant can be introduced.

(3) General Assessment

This project aims to set an example for projects of its type which are needed for economic development but which do not yield an immediate revenue. With such small sales revenues anticipated, a project requiring a large investment poses too great a burden. If the common financial scheme (Case 1) using the Loan/Equity method is employed, the distinctive feature of rural projects mentioned at the beginning of this assessment is evident, making it difficult to carry out the project from a financial perspective.

But if the bulk of the funds needed for the project can be covered by a grant provided through bilateral aid, financially sound operations are promised and the project is justified. The distinctive feature of these kinds of projects must be recognized and the benefits accruing from the project as shown in the economic analysis in the next section needs to be taken into account. In this case, undertaking the project with the help of a grant seems likely to contribute to the economic development and provision of infrastructure in Zimbabwe.

The Rural Telecommunications Network Project in the Republic of Zimbabwe

(CASE 1)

***** TABLE 11.9 INCOME STATEMENT *****

UNIT: 1000 US\$

PROJECT YEAR	1 '97	2 '98	3 '99	4 2000	5 '01	6 '02	7 '03	8 '04	9 '05	10 '06	11 '07	12 '08	13 '09	14 '10	15 '11	TOTAL
SALES REVENUE																
CALL CHARGES	185	206	228	250	271	285	298	311	324	338	355	372	390	407	425	4,645
INSTALLATION FEES	383	44	41	42	45	43	45	43	44	48	81	82	82	84	118	1,224
RENTAL FEES	184	205	225	245	267	287	309	328	348	370	406	443	479	516	553	5,167
TOTAL	751	456	494	537	583	615	651	682	716	756	842	897	951	1,008	1,096	11,035
SALES TAX	75	46	49	54	58	61	65	68	72	76	84	90	95	101	110	1,104
NET SALES	676	410	444	483	525	553	586	614	645	680	758	808	856	907	986	9,932
OPERATING COSTS																
STAFF COST	11	11	11	11	11	11	11	11	11	15	15	15	15	15	20	194
GENERAL EXP.	25	27	29	30	33	35	36	37	39	40	43	46	47	50	53	570
INSURANCE	31	29	27	26	23	21	18	17	16	14	12	10	9	7	5	268
TOTAL	67	67	67	67	67	67	66	65	66	69	70	71	71	72	78	1,032
INTEREST (LT-LOAN)	2,960	2,960	2,960	2,960	2,960	2,738	2,442	2,146	1,850	1,554	1,258	962	666	370	74	28,860
DEPRECIATION	3,323	3,323	3,323	3,339	3,390	2,074	2,077	2,080	2,160	2,176	2,189	2,203	2,216	2,229	2,233	38,337
PROFIT BEFORE TAX	-5,675	-5,940	-5,906	-5,883	-5,893	-4,326	-3,999	-3,677	-3,431	-3,119	-2,760	-2,429	-2,097	-1,764	-1,398	-58,298
INCOME TAX	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PROFIT AFTER TAX	-5,675	-5,940	-5,906	-5,883	-5,893	-4,326	-3,999	-3,677	-3,431	-3,119	-2,760	-2,429	-2,097	-1,764	-1,398	-58,298

The Rural Telecommunications Network Project in the Republic of Zimbabwe

(CASE 1)

EXPECTED PROJECT RETURN : N.A.

***** TABLE 11.10 CASH FLOW STATEMENT *****

UNIT: 1000 US\$

PROJECT YEAR	-3 '94	-2 '95	-1 '96	1 '97	2 '98	3 '99	4 2000	5 '01	6 '02	7 '03	8 '04	9 '05	10 '06	11 '07	12 '08	13 '09	14 '10	15 '11	TOTAL	
SOURCE OF FUND																				
CASH FROM OPERATION	0	0	0	-2,351	-2,617	-2,583	-2,543	-2,503	-2,252	-1,922	-1,598	-1,272	-943	-570	-226	119	465	835	-19,961	
EQUITY	556	3,924	6,551	0	0	0	476	42	42	42	42	1,201	200	200	200	200	200	100	13,976	
LONG-TERM LOAN	1,298	9,156	15,286	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25,739	
SUBSIDIARY	0	0	0	2,307	2,623	2,589	2,550	3,795	4,832	4,501	4,176	3,851	3,530	3,152	2,808	2,463	2,121	452	45,750	
TOTAL SOURCE OF FUND	1,854	13,080	21,837	-44	6	7	483	1,334	2,622	2,621	2,621	3,780	2,787	2,782	2,782	2,782	2,786	1,387	65,505	
APPLICATION OF FUND																				
PLANT AND FACILITIES(P/F)	118	11,713	18,247	0	0	0	476	42	42	42	42	1,201	200	200	200	200	200	100	33,023	
P/F (GRANT PORTION)	(0)	(0)	(0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
P/O COST,ENGINEER.SERVICE	1,627	417	760	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,804	
WORKING CAPITAL	0	0	101	-44	6	7	7	5	6	5	5	5	13	8	8	8	12	0	151	
INT.DURING CONSTRUCTION	109	950	2,728	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3,787	
SUB-TOTAL	1,854	13,080	21,837	-44	6	7	483	47	48	47	47	1,206	213	208	208	208	212	100	39,766	
REPAYMENT (LT- LOAN)	0	0	0	0	0	0	0	1,287	2,574	2,574	2,574	2,574	2,574	2,574	2,574	2,574	2,574	1,287	25,739	
TOTAL APPLICATION OF FUND	1,854	13,080	21,837	-44	6	7	483	1,334	2,622	2,621	2,621	3,780	2,787	2,782	2,782	2,782	2,786	1,387	65,505	
CASH SURPLUS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CASHFLOW	-556	-3,924	-6,551	0	0	0	-476	-42	-42	-42	-42	-1,201	-200	-200	-200	-200	-200	-100	-13,976	

***** TABLE 11.11 BLANCE SHEET *****

UNIT : 1000 US\$

PROJECT YEAR	-3 '94	-2 '95	-1 '96	1 '97	2 '98	3 '99	4 '2000	5 '01	6 '02	7 '03	8 '04	9 '05	10 '06	11 '07	12 '08	13 '09	14 '10	15 '11		
ASSETS																				
CURRENT ASSETS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FIXED ASSETS	1,854	14,934	36,669	36,669	33,346	30,022	27,175	23,878	20,530	18,498	16,463	15,584	13,624	11,648	9,658	7,656	5,639	3,510		
LESS DEPRECIATION	0	0	0	3,323	3,323	3,323	3,339	3,390	2,074	2,077	2,080	2,160	2,176	2,189	2,203	2,216	2,229	2,233		
NET FIXED ASSET	1,854	14,934	36,669	33,346	30,022	26,699	23,836	20,488	18,456	16,421	14,383	13,424	11,448	9,458	7,456	5,439	3,410	1,277		
ACCOUNT RECEIVABLE	0	0	113	68	74	81	87	92	98	102	107	113	126	135	143	151	164	164		
TOTAL ASSETS	1,854	14,934	36,782	33,414	30,096	26,779	23,923	20,580	18,553	16,523	14,490	13,537	11,574	9,593	7,598	5,591	3,574	1,442		
LIABILITIES																				
CURRENT LIABILITIES	0	0	0	0	0	0	1,287	2,574	2,574	2,574	2,574	2,574	2,574	2,574	2,574	2,574	1,287	0		
FIXED LIABILITY	1,298	10,454	25,739	25,739	25,739	25,739	24,452	21,879	19,305	16,731	14,157	11,583	8,009	6,435	3,861	1,287	0	0		
ACCOUNT PAYABLE	0	0	11	11	11	11	11	11	11	11	11	12	12	12	12	12	13	13		
TOTAL LIABILITY	1,298	10,454	25,751	25,751	25,751	25,751	25,751	24,464	21,890	19,315	16,742	14,168	11,594	9,021	6,447	3,873	1,300	13		
EQUITY																				
PAID-IN SHARE CAPITAL	556	4,480	11,031	11,031	11,031	11,031	11,507	11,549	11,591	11,633	11,675	12,876	13,076	13,276	13,476	13,676	13,876	13,976		
RETAINED EARNINGS	0	0	0	-5,675	-11,615	-17,522	-23,404	-29,297	-33,623	-37,623	-41,300	-44,731	-47,850	-50,610	-53,039	-55,135	-56,899	-58,298		
(SUBSIDIARY)	0	0	0	2,307	4,930	7,519	10,069	13,864	18,696	23,187	27,373	31,224	34,754	37,906	40,714	43,177	45,298	45,750		
TOTAL EQUITY	556	4,480	11,031	7,663	4,346	1,029	-1,828	-3,884	-3,336	-2,793	-2,252	-631	-20	572	1,152	1,718	2,275	1,429		
LIABILITIES & EQUITY	1,854	14,934	36,782	33,414	30,096	26,779	23,923	20,580	18,553	16,523	14,490	13,537	11,574	9,593	7,598	5,591	3,574	1,442		

The Rural Telecommunications Network Project in the Republic of Zimbabwe

(CASE 2)

***** TABLE 11.12 INCOME STATEMENTS *****

UNIT: 1000 US\$

PROJECT YEAR	1 '97	2 '98	3 '99	4 2000	5 '01	6 '02	7 '03	8 '04	9 '05	10 '06	11 '07	12 '08	13 '09	14 '10	15 '11	TOTAL
SALES REVENUE																
CALL CHARGES	185	206	228	250	271	285	298	311	324	338	355	372	390	407	425	4,645
INSTALLATION FEES	383	44	41	42	45	43	45	43	44	48	81	82	82	84	118	1,224
RENTAL FEES	184	205	225	245	267	287	309	328	348	370	406	443	479	516	553	5,167
TOTAL	751	456	494	537	583	615	651	682	716	756	842	897	951	1,008	1,096	11,035
SALES TAX	75	46	49	54	58	61	65	68	72	76	84	90	95	101	110	1,104
NET SALES	676	410	444	483	525	553	586	614	645	680	758	808	856	907	986	9,932
OPERATING COSTS																
STAFF COST	11	11	11	11	11	11	11	11	11	15	15	15	15	15	20	194
GENERAL EXP.	25	27	29	30	33	35	36	37	39	40	43	46	47	50	53	570
INSURANCE	31	29	27	26	23	21	19	17	16	14	12	10	9	7	5	268
TOTAL	67	67	67	67	67	67	66	65	66	69	70	71	71	72	78	1,032
INTEREST (LT-LOAN)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DEPRECIATION	120	120	120	135	186	153	155	158	238	254	268	281	294	308	311	3,101
PROFIT BEFORE TAX	489	223	258	281	271	333	364	390	340	357	420	455	491	528	597	5,799
INCOME TAX	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PROFIT AFTER TAX	489	223	258	281	271	333	364	390	340	357	420	455	491	528	597	5,799

The Rural Telecommunications Network Project in the Republic of Zimbabwe

(CASE 2)

EXPECTED PROJECT RETURN (ROE) : 19.51%

***** TABLE 11.13 CASH FLOW STATEMENT *****

UNIT: 1000 US\$

PROJECT YEAR	-3 '94	-2 '95	-1 '96	1 '97	2 '98	3 '99	4 2000	5 '01	6 '02	7 '03	8 '04	9 '05	10 '06	11 '07	12 '08	13 '09	14 '10	15 '11	TOTAL
SOURCE OF FUND																			
CASH FROM OPERATION	0	0	0	609	343	377	417	457	486	520	549	578	611	688	736	785	835	909	8,900
EQUITY	175	863	496	0	0	0	476	42	42	42	42	1,201	200	200	200	200	200	100	4,479
LONG-TERM LOAN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SUBSIDIARY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL SOURCE OF FUND	175	863	496	609	343	377	893	499	528	562	591	1,779	811	888	936	985	1,035	1,009	13,379
APPLICATION OF FUND																			
PLANT AND FACILITIES(P/F)	118	816	319	0	0	0	476	42	42	42	42	1,201	200	200	200	200	200	100	4,198
P/F (GRANT)	(0)	(10,897)	(17,928)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	28,825
ENGINEERING SERVICE(GRANT)	(1,570)	(370)	(684)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,624
PRE-OPERATION COSTS	57	47	76	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	180
WORKING CAPITAL	0	0	101	-44	6	7	7	5	6	5	5	5	13	8	8	8	12	0	151
INT.DURING CONSTRUCTION	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SUB-TOTAL	175	863	496	-44	6	7	483	47	48	47	47	1,206	213	208	208	208	212	100	4,529
REPAYMENT (LT- LOAN)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL APPLICATION OF FUND	175	863	496	-44	6	7	483	47	48	47	47	1,206	213	208	208	208	212	100	4,529
CASH SURPLUS	0	0	0	653	337	371	410	452	480	515	544	573	598	680	728	777	823	909	8,850
CASHFLOW	-175	-863	-496	653	337	371	-66	410	438	473	502	-628	398	480	528	577	623	809	4,370

***** TABLE 11.14 BALANCE SHEET (CASE2) *****

UNIT : 1000US\$

PROJECT YEAR	-3 '94	-2 '95	-1 '96	1 '97	2 '98	3 '99	4 2000	5 '01	6 '02	7 '03	8 '04	9 '05	10 '06	11 '07	12 '08	13 '09	14 '10	15 '11	TOTAL
ASSETS																			
CURRENT ASSETS	0	0	0	653	990	1,361	1,771	2,223	2,704	3,218	3,762	4,335	4,933	5,613	6,341	7,118	7,941	8,850	
FIXED ASSETS	175	1,038	1,433	1,433	1,313	1,194	1,550	1,457	1,313	1,203	1,089	2,132	2,094	2,039	1,972	1,891	1,796	1,588	
LESS DEPRECIATION	0	0	0	120	120	120	135	186	153	155	158	238	254	268	281	294	308	311	
NET FIXED ASSET	175	1,038	1,433	1,313	1,194	1,074	1,415	1,271	1,161	1,047	931	1,894	1,839	1,772	1,691	1,596	1,488	1,277	
ACCOUNT RECEIVABLE	0	0	113	68	74	81	87	92	98	102	107	113	126	135	143	151	164	164	
TOTAL ASSETS	175	1,038	1,546	2,035	2,258	2,516	3,273	3,587	3,962	4,368	4,800	6,342	6,899	7,519	8,174	8,865	9,594	10,291	
LIABILITIES																			
CURRENT LIABILITIES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
FIXED LIABILITY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ACCOUNT PAYABLE	0	0	11	11	11	11	11	11	11	11	11	12	12	12	12	12	13	13	
TOTAL LIABILITY	0	0	11	11	11	11	11	11	11	11	11	12	12	12	12	12	13	13	
EQUITY																			
PAID-IN SHARE CAPITAL	175	1,038	1,534	1,534	1,534	1,534	2,010	2,052	2,094	2,136	2,178	3,379	3,579	3,779	3,979	4,179	4,379	4,479	
RETAINED EARNINGS	0	0	0	489	712	970	1,252	1,523	1,856	2,221	2,611	2,951	3,308	3,728	4,183	4,674	5,201	5,799	
(SUBSIDIARY)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TOTAL EQUITY	175	1,038	1,534	2,023	2,247	2,505	3,262	3,575	3,951	4,357	4,789	6,331	6,887	7,507	8,162	8,853	9,581	10,278	
LIABILITIES & EQUITY	175	1,038	1,546	2,035	2,258	2,516	3,273	3,587	3,962	4,368	4,800	6,342	6,899	7,519	8,174	8,865	9,594	10,291	

SECTION 12 ECONOMIC ANALYSIS

SECTION 12 ECONOMIC ANALYSIS

12.1 General

Telecommunication is almost universally recognized as an avenue for raising living standards and a key element of economic development. Thus telecommunication projects have an important impact on individual and social welfare.

As economic activity should be expanded on a national scale, telecommunications is acquiring strategic importance for growth and development.

The early emphasis in public investment projects was on infrastructure such as buildings, in keeping with the belief that this was the basis for economic growth. Subsequently, greater emphasis was given to human basic needs, particularly in telecommunication, consistent with the belief that Telecommunication development-led growth was the route to Rural Area Development.

It is clear that there will be adequate demand for the telecommunication service in Zimbabwe as the empirical evidence indicates that people place value on using telecommunications.

The communications in Zimbabwe, however, is prevented to become mature mainly due to the relatively high communication charge imposed to the people.

In these circumstances, PTC has come to reconsider ways and means for the improvement of the telecommunication systems.

More wider scaled services are to be provided by PTC to satisfy the people's basic needs. The necessity for planning new telecommunication networks is thus raised.

This section covers the Economic Analysis for the project in rural communications.

The economic appraisal is undertaken to ascertain the overall impact of the project on the country's economy. The Financial Analysis prepared

in Section 11, was made from the view point of a project sponsor, whereas the Economic Analysis is made from that of a government decision concerned with broader economic development objectives of the country.

12.2 Method of Economic Analysis

In this Economic Analysis, the economic effect expected from the performance of this project for the rural telecommunication network will be assessed dealing mainly with the calculation of Economic Internal Rates of Return (EIRR) when discounting sets of economic cost and benefit streams for the project. Through elimination of the value of transfer items and application of appropriate shadow prices to the financial cost and benefit streams, the financial cash flows are transferred into economic cost and benefit streams to calculate the EIRR.

12.2.1 Economic Benefit of the Project

Economic Benefit of this project will be divided into the direct benefit and the indirect one, and each benefit will be assessed separately.

(1) Direct Benefit

The direct benefit of this project lays its importance in the economic value of the Rural telecommunication network.

Sales revenue in economic value to be generated by this project is estimated on investigation result with user's willingness to pay.

(2) Indirect Benefit

The improvement of a Rural telecommunication network will contribute a great deal to the improvement of the national well-being not simply in the form of economic benefit but also in terms of social benefit. Such indirect benefits conceivable are :

For rural residents;

- Greater ease in emergency access to medical institutions
- Improved emergency communication serving for protection and rescue of human lives
- Improved efficiency in communication, leading to upgrading and diversification of government and private services
- Economic effects to enhance business activities
- Increase in employment opportunities, improvement in security, etc.

For PTC;

- Nationwide expansion of telecommunications service
- Improvement of telecommunications service
- Rapid innovation in rural telecommunications
- Simplification of rural network management
- Creating new services

With a combination of above effects, national economic growth is promoted.

12.2.2 Economic Costs

For the economic costs, the following items must be considered.

(1) Initial Investment Cost for Implementation of the Project

The Equipment and Facilities costs, Engineering services costs, pre-operation cost and Initial working capital will be necessary as the initial cost for the implementation of this Project.

The economic value of these costs will be calculated by separating the local and foreign currency portions, considering the premiums for the economic value.

(2) Operating Costs

As the operating costs of this project, staff cost, general expenses and insurance charge are required. These expenses must be analyzed economically considering their economic value.

(3) Reinvestment (plowing-back)

As the demand increases, revamp of line circuits and line connections for subscribers become necessary and the cost for such revamps will be increased on and after 2000. The economic value of these costs will be calculated by separating the local and foreign currency portions, considering the premium for the economic value.

12.2.3 Economic Parameters

The financial value projected in the Financial Analysis will be converted to the economic value using the following factors.

(1) Foreign Exchange Premium

The Foreign exchange premium utilized in converting the market value into economic value is derived from the following Standard Conversion Factor(SCF) formula.

$$SCF = (M+X) / \{(M+T_m)+(X-T_x)\}$$

Where ; SCF: Standard Conversion Factor

M: CIF value of imports

X: FOB value of exports

T_m: All taxes on imports

T_x: All taxes on exports

Each value of the above parameters to obtain SCF and the result of calculation are summarized in Table 12.1.

Table 12.1 Trends of Trade and SCF

Year	Exports(FOB) (M. US\$)	Imports(GIF) (M. US\$)	Tax(Exp) (M. US\$)	Tax(Imp) (M. US\$)	SCF
1984	289.2	275.1	Nil	82.5	0.872
1985	308.4	331.5	Nil	99.4	0.865
1986	350.0	375.9	Nil	112.8	0.866
1987	472.3	400.0	Nil	120.0	0.879
1988	570.3	428.3	Nil	128.5	0.886
1989	665.5	562.0	Nil	168.6	0.879
Average SCF					0.875
Foreign Exchange premium(1/SCF)					1.14

Source: IMF International Financial Statistics

(2) The financial value of costs items presented in Section 11, "Financial Analysis" will be divided into local and foreign currency, and the local currency portion will be further divided into skilled labour, unskilled labour and local Material, then the economic values will be calculated using the value of national parameters (Premium of economic value) as shown below:

- Local Material	1.0
- Skilled Labour	1.0
- Unskilled Labour	0.8
- Working Capital	1.0
- Foreign Exchange Rate	1.14

12.3 Economic Analysis

12.3.1 Base Cases

Referring to the two bases settled in the financial analysis the following two cases will be analyzed and EIRR on total investment (case 1) and EIRR on equity (case 2) will be calculated.

Case 1 : Corresponding to the case 1 (Loan/Equity case)

EIRR on total investment (100% Equity with elimination of loan borrowing)

Case 2 : Corresponding to the case 2 (Grant/Equity case)
 EIRR on Equity any, in other words, on total
 investment paid by PTC

12.3.2 Direct Benefit

(1) Willingness To Pay

The direct benefit of this project is calculated by adding the value of Willingness To Pay of beneficiaries to the financial value of sales revenue. In order to judge the value of Willingness To Pay(WTP), Interview survey was carried out for 120 households and commercial offices in various areas. The outcome is summarized as follows;

Table 12.2 Willingness To Pay

Items	Average Value	Maximum Value
Call Charge	+Z\$ 1/call	+Z\$ 5/call
Installation Fee	+Z\$ 150/line	+Z\$ 2000/line
Rental Fee	+Z\$ 20/month	+Z\$ 150/month

Note) The detailed result of Interview survey is shown in DATA FILE, "Result of questionnaire."

(2) Consumer's Surplus

In consideration of the outcome of interview survey, the total consumer's surplus is estimated in following manner.

In Figure 12.1, the present telephone supply is OQ1 and Installation Charge is OP1. Demand relationship is represented by DD' wherein waiting subscribers BC exist. For OQ, as the number of Installations, up to a maximum P2 of applicant subscribers are "Willingness To Pay" for subscription. In other words, the maximum premium is represented by AB and as OQ increases the premium decreases. Thus, the balance AB presents premium, causing the current project benefit from social viewpoint to be equal to the triangle ABC. The AB present premium is assumed as the "Willingness To Pay" of beneficiaries described in Table 12.2.

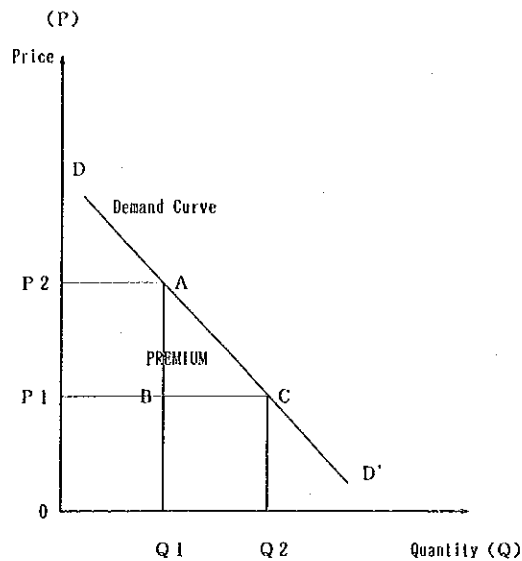


Figure 12.1 Consumer's Surplus

In this concept, using demand curve, of consumer's surplus which is indicated in Figure 12.1, the amount of consumer's surplus is inversely proportional to expansion percentage of telecommunication facilities invested in the Study area.

Current Telephone tariff system in Zimbabwe is characterized by the accelerative charges by the distances. The Willingness To Pay is presumed to reduce this amount with distance. This means that under the current tariff system, subscribers outside a BRA have been paying the Premium already. Figure 12.2 presents a schematic diagram to indicate a correlative concept of Premium and current tariff policy.

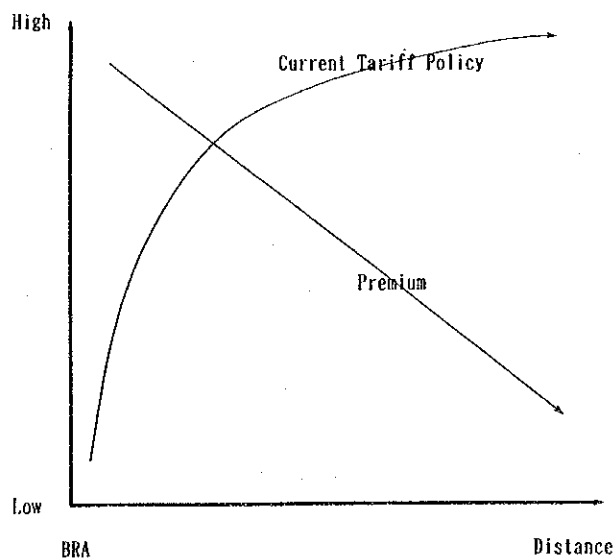


Figure 12.2 A correlative concept of Premium and Current Tariff Policy

(3) Economic Value of the Benefit

The above mentioned consumer's surplus is to be used as the base value of the economic benefit expected by the project

- Economic Benefit Case 1 (E.B.1)

E.B.1 : The premium is calculated by outcome of interview survey.

Premium of Call charges/call : Z\$ 1
 Installation fee/line : Z\$ 150
 Rental fee/month : Z\$ 20

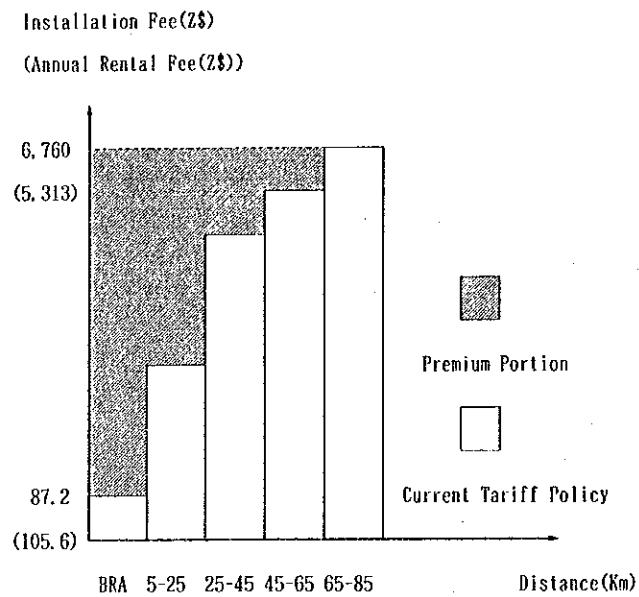


Figure 12.3 Current Installation and Annual Rental Fee by Distance

Hereupon, another proposition of measuring method of consumer's surplus is described in Figure 12.3.

Subscriber situated within a BRA, pays Z\$87.2 for installation and Z\$105.6/annum for rental charge. Another subscriber, however, whose premises is placed at over 65km from BRA must pay Z\$ 6,760.4 for installation and Z\$5,313.3/annum for rental charge. In this case, a difference of the two reached the total of Z\$ 11,880.9. This difference is evaluated as a premium in this proposition. A portion of oblique line in Figure 12.3 describes total economic premium.

Considering the above characteristics, coupled with the rather conservative premium figures obtained by the interview survey, another two cases for economic value of benefit are introduced.

- Economic Benefit Case 2 (E.B.2)

E.B.2 : The economic value of benefit assumed by the highest tariff payment of the furthest subscriber in each exchange area.

Table 12.3 shows premium figures for this case in each exchange area.

Table 12.3 Assumed Premium for Each Exchange

(Unit : Z\$)

Items	NKI	GTU	GHS	KEZ	BTR	MRB
Call charge per call	5.0	5.0	5.0	5.0	5.0	5.0
Installation fee	4668.8	4668.8	4668.8	6760.4	5764.4	4668.8
Annual Rental fee	2337.6	2337.6	2337.6	5313.6	3825.6	2337.6

- Economic Benefit Case 3 (E.B.3)

E.B.3 : The economic value of benefit derived from the highest tariff payment in all exchange areas where the project covers telecommunications service.

Call charges/call : Z\$ 5

Installation fee/line : Z\$ 6,760.4

Rental fee/annum : Z\$ 5,313.6

The total economic benefits by each Economic Benefit cases assumed for E.B.1 - E.B.3 are summarized as shown in Table 12.4.

Table 12.4 The Economic Benefit for Each Case

Project Year	Economic Benefit (US\$'000)		
	E.B.1	E.B.2	E.B.3
1('97)	1,564	5,687	6,740
2('98)	1,301	4,860	5,679
3('99)	1,407	5,292	6,228
4('2000)	1,518	5,734	6,791
5('01)	1,632	6,180	7,360
6('02)	1,704	6,410	7,600
7('03)	1,784	6,720	7,968
8('04)	1,858	7,022	8,328
9('05)	1,935	7,328	8,694
10('06)	2,018	7,644	9,073
11('07)	2,172	8,164	9,705
12('08)	2,293	8,641	10,274
13('09)	2,413	9,116	10,842
14('10)	2,538	9,594	11,415
15('11)	2,692	10,132	12,074

Note; E.B.1 : Economic Benefit Case 1
 E.B.2 : Economic Benefit Case 2
 E.B.3 : Economic Benefit Case 3

12.3.3 Economic Cost

(1) Initial Investment Cost for Performance of the Project

The total investment and costs in each construction year described in Section 10, are resummarized in Table 12.5 for Economic Analysis. The cost is divided into local and foreign currency, and the local currency costs are divided into the cost of the skilled labour, unskilled labour and local material. Each cost item is converted into the economic cost using value of national Parameter.

The Economic costs stream is shown in Table 12.5.

Table 12.5 Economic Value of Initial Investment Cost

Case 1 (Loan/Equity case)

(Unit : US\$'000)

Items (Case 1)	Market Value			Economic Value		
	-3	-2	-1	-3	-2	-1
Project Year						
Foreign Currency Equipment & Facilities	1,570	9,406	15,743	1,790	10,722	17,947
Local Currency						
Local Material	92	1,620	2,407	92	1,620	2,407
Skilled Labour	56	468	381	56	468	381
Unskilled Labour	28	637	476	22	510	381
Working Capital	-	-	102	-	-	102
Total	1,746	12,131	19,109	1,960	13,320	21,218

Case 2 (Grant/Equity case)

(Unit : US\$'000)

Items (Case 2)	Market Value			Economic Value		
	-3	-2	-1	-3	-2	-1
Project Year						
Local Currency						
Local Material	92	222	311	92	222	311
Skilled Labour	56	359	12	56	359	12
Unskilled Labour	28	282	72	22	226	58
Working Capital	-	-	102	-	-	102
Total	176	863	497	170	807	483

(2) Operating Cost

The economic value of the cost of the labour and general expenses will be calculated as the cost for operating. The transfer items (insurance on the property) are excluded from the financial value estimated, and the rest of the costs are converted into Economic value using value of national parameter as shown in Table 12.6.

Table 12.6 Economic Value of Operating Cost

(Unit : US\$'000)

Year	Financial Value				Economic Value			
	L/M	S/L	US/L	Total	L/M	S/L	US/L	Total
1('97)	24.0	4.4	6.6	35.0	24.0	4.4	5.28	33.68
2('98)	26.0	4.4	6.6	37.0	26.0	4.4	5.28	35.68
3('99)	29.0	4.4	6.6	40.0	29.0	4.4	5.28	38.68
4(2000)	31.0	4.4	6.6	42.0	31.0	4.4	5.28	40.68
5('01)	33.0	4.4	6.6	44.0	33.0	4.4	5.28	42.68
6('02)	34.0	4.4	6.6	45.0	34.0	4.4	5.28	43.68
7('03)	36.0	4.4	6.6	47.0	36.0	4.4	5.28	45.68
8('04)	37.0	4.4	6.6	48.0	37.0	4.4	5.28	46.68
9('05)	39.0	4.4	6.6	50.0	39.0	4.4	5.28	48.68
10('06)	40.0	6.0	9.0	55.0	40.0	6.0	7.20	53.20
11('07)	43.0	6.0	9.0	58.0	43.0	6.0	7.20	56.20
12('08)	45.0	6.0	9.0	60.0	45.0	6.0	7.20	58.20
13('09)	48.0	6.0	9.0	63.0	48.0	6.0	7.20	61.20
14('10)	50.0	6.0	9.0	65.0	50.0	6.0	7.20	63.20
15('11)	53.0	6.0	9.0	68.0	53.0	6.0	7.20	66.20

(Note) L/M : Local Materials, S/L : Skilled Labours
US/L : Unskilled Labours

(3) Reinvestment Cost

Required revamp of subscriber line connection and subscriber line circuit to meet the demand increase are as shown in Table 12.7. The cost is divided into local and foreign currency, and the local currency costs are divided into the cost of the skilled labours, unskilled labours and local material. Each cost item is converted into the economic cost using value of national Parameter. The Economic costs stream is indicated in Table 12.7.

Table 12.7 Economic Value of Reinvestment Cost

(Unit : US\$'000)

Items	Market Value					
	2000	2001	2002	2003	2004	2005
Project Year	2000	2001	2002	2003	2004	2005
Foreign Currency Equipment & Facilities	443	0	0	0	0	980
Local Currency Local Material	18	36	36	36	36	115
Skilled Labour	8	2	2	2	2	44
Unskilled Labour	7	4	4	4	4	62
Total	476	42	42	42	42	1201
Items	Economic Value					
	2000	2001	2002	2003	2004	2005
Project Year	2000	2001	2002	2003	2004	2005
Foreign Currency Equipment & Facilities	505.02	0	0	0	0	1117.2
Local Currency Local Material	18	36	36	36	36	115
Skilled Labour	8	2	2	2	2	44
Unskilled Labour	5.6	3.2	3.2	3.2	3.2	49.6
Total	536.62	41.2	41.2	41.2	41.2	1325.8

Items	Market Value					
	2006	2007	2008	2009	2010	2011
Project Year	2006	2007	2008	2009	2010	2011
Foreign Currency Equipment & Facilities	0	0	0	0	0	0
Local Currency Local Material	194	194	194	194	194	97
Skilled Labour	2	2	2	2	2	1
Unskilled Labour	4	4	4	4	4	2
Total	200	200	200	200	200	100
Items	Economic Value					
	2006	2007	2008	2009	2010	2011
Project Year	2006	2007	2008	2009	2010	2011
Foreign Currency Equipment & Facilities	0	0	0	0	0	0
Local Currency Local Material	194	194	194	194	194	97
Skilled Labour	2	2	2	2	2	1
Unskilled Labour	3.2	3.2	3.2	3.2	3.2	1.6
Total	199.2	199.2	199.2	199.2	199.2	99.6

12.4 Assessment of Result of Economic Analysis

EIRR during the economic life span for the Base Cases are calculated using the economic benefit and costs, and shown in Table 12.8 and 12.9. In these tables, the economic cash flows by the variation of economic benefit are calculated, in other words the cash flows and EIRR in relation to the economic values of E.B-1 - E.B-3 are presented. EIRRs, the measures to assess the economic viability are summarized as shown in Table 12.10 and Figure 12.4.

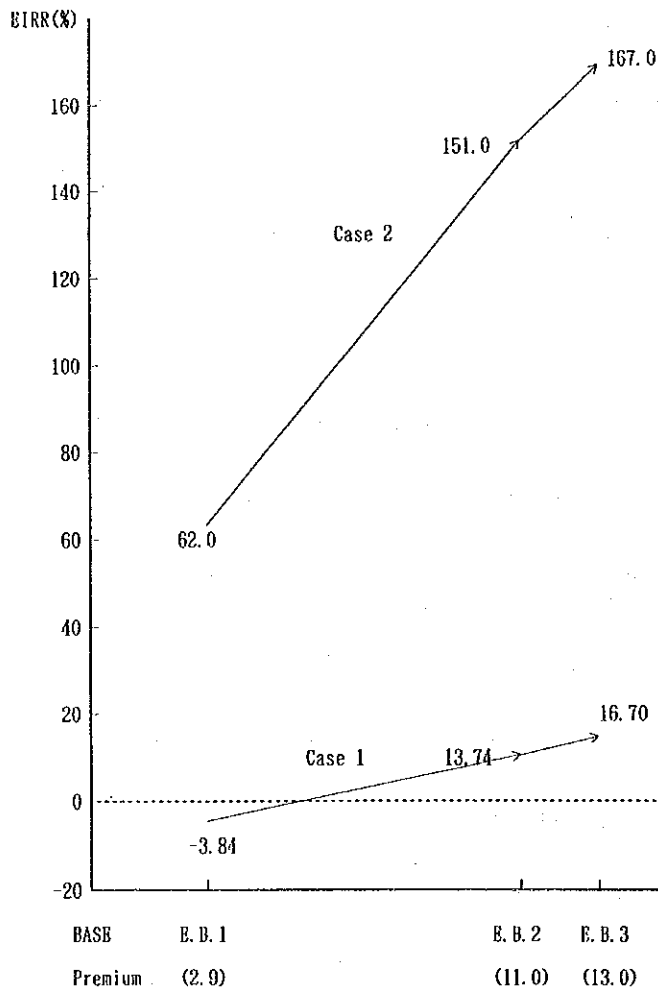


Figure 12.4 Result of Economic Analysis

(Sensitivity of EIRR to variation of Social Economic Benefit)

Table 12.8 Economic Cashflow (Case 1)

(Unit : 1,000 US\$)

Project Year	Economic Benefit (A)			Economic Cost			Economic Cashflow (A) - (B)		
	E. B. 1	E. B. 2	E. B. 3	Investment	Operating Costs	Total (B)	E. B. 1	E. B. 2	E. B. 3
	-1 ('94)	-	-	-	1,960	-	1,960	-1,960	-1,960
-2 ('95)	-	-	-	13,320	-	13,320	-13,320	-13,320	-13,320
-3 ('96)	-	-	-	21,218	-	21,218	-21,218	-21,218	-21,218
1 ('97)	1,564	5,687	6,740	0	34	34	1,530	5,653	6,706
2 ('98)	1,301	4,860	5,679	0	36	36	1,265	4,824	5,643
3 ('99)	1,407	5,292	6,228	0	39	39	1,368	5,253	6,189
4 (2000)	1,518	5,734	6,791	537	41	577	1,941	5,157	6,214
5 ('01)	1,632	6,180	7,360	41	43	84	1,548	6,096	7,276
6 ('02)	1,704	6,410	7,600	41	44	85	1,619	6,325	7,515
7 ('03)	1,784	6,720	7,968	41	46	87	1,697	6,633	7,881
8 ('04)	1,858	7,022	8,328	41	47	88	1,770	6,934	8,240
9 ('05)	1,935	7,328	8,694	1,326	49	1,374	561	5,954	7,320
10 ('06)	2,018	7,644	9,073	1,999	53	1,252	1,766	7,392	8,821
11 ('07)	2,172	8,164	9,705	1,999	56	255	1,917	7,909	9,450
12 ('08)	2,293	8,641	10,274	1,999	58	257	2,036	8,384	10,017
13 ('09)	2,413	9,116	10,842	1,999	61	260	2,153	8,856	10,582
14 ('10)	2,536	9,594	11,415	1,999	63	262	2,274	9,332	11,153
15 ('11)	2,692	10,132	12,074	100	66	166	2,526	9,966	11,908

Table 12.9 Economic Cashflow (Case 2)

(Unit : 1,000 US\$)

Project Year	Economic Benefit (A)			Economic Cost			Economic Cashflow (A) - (B)		
	E. B. 1	E. B. 2	E. B. 3	Investment	Operating Costs	Total (B)	E. B. 1	E. B. 2	E. B. 3
	-1 ('94)	-	-	-	170	-	170	-170	-170
-2 ('95)	-	-	-	807	-	807	-807	-807	-807
-3 ('96)	-	-	-	483	-	483	-483	-483	-483
1 ('97)	1,564	5,687	6,740	0	34	34	1,530	5,653	6,706
2 ('98)	1,301	4,860	5,679	0	36	36	1,265	4,824	5,643
3 ('99)	1,407	5,292	6,228	0	39	39	1,368	5,253	6,189
4 (2000)	1,518	5,734	6,791	537	41	577	1,941	5,157	6,214
5 ('01)	1,632	6,180	7,360	41	43	84	1,548	6,096	7,276
6 ('02)	1,704	6,410	7,600	41	44	85	1,619	6,325	7,515
7 ('03)	1,784	6,720	7,968	41	46	87	1,697	6,633	7,881
8 ('04)	1,858	7,022	8,328	41	47	88	1,770	6,934	8,240
9 ('05)	1,935	7,328	8,694	41	49	88	1,843	7,235	8,595
10 ('06)	2,018	7,644	9,073	1,326	53	1,374	561	7,766	9,127
11 ('07)	2,172	8,164	9,705	1,199	56	2,52	1,766	8,321	9,547
12 ('08)	2,293	8,641	10,274	1,199	58	2,55	1,917	8,909	10,017
13 ('09)	2,413	9,116	10,842	1,199	61	2,60	2,036	9,525	10,582
14 ('10)	2,536	9,594	11,415	1,199	63	2,62	2,153	10,158	11,153
15 ('11)	2,692	10,132	12,074	1,100	66	1,66	2,274	10,856	11,908

Table 12.10 Summary of Economic Analysis
(EIRR for base case)

Economic Benefit Value	Premium to Financial Value	EIRR	
		Case 1	Case 2
E.B.1	2.9	-3.84 %	62.00 %
E.B.2	11.0	13.74 %	151.00 %
E.B.3	13.0	16.70 %	167.00 %
FIRR	(1.0)	N.A.	19.51 %

The result obtained in this Economic Analysis is discussed here.

- The result of Economic Analysis clearly states that EIRR (Economic Internal Rate of Return) is much higher than the FIRR (Financial Internal Rate of Return) in both base cases. This implies that the economic benefit is very high due to the greatness of people's demand for telecommunication services even though the present tariff in market price is controlled under a relatively low charge.
- The EIRRs in Case 1 suggest that the project will stand to be economically feasible coupled with the high economic benefit assumed even though the project is wholly implemented on an equity basis. It can be also pointed out that the project can be operated without financial difficulty if the present tariff is increased by about 10 times.
- The EIRRs in Case 2 are very high. This is due to the very small investment on PTC side in the total investment cost of which major portions are supplied by a great grant aid.
- Launching of this project is considered promising, especially if the project is undertaken with the help of a grant aid. Implementation is likely to contribute to enhancement of economic development and improvement of social welfare of Zimbabwean people.

SECTION 13 RECOMMENDATIONS

SECTION 13 RECOMMENDATIONS

1. Location of Waiting Applicants

To confirm location of subscribers including waiting applicants in all exchange areas involved prior to the execution of detailed field survey to reduce the period required for system and network designing and to enable PTC to make preparatory arrangement for subscriber line connection.

2. Site Confirmation and Land Acquisition

To confirm by field survey the Maphisa new exchange site and new radio stations selected by the feasibility study, and this time to make necessary prior arrangements for building construction, land acquisition, ground levelling, and land formation. Also, to select substitute sites to be used in case the land acquisition and construction is difficult at the primarily selected sites or those sites prove to be disqualified.

The field survey of sites is indispensable for smooth progress of construction work and its completion without delay.

3. Construction of Building and Provision of Transmission System

To construct a new building at Maphisa (Kezi Area) and transmission system for the following 4 sections

- (Nkayi-Kwekwe), (Chatsworth-Gutu-Masvingo) and (Beatrice-Harare)

In addition to the above, provision of analog multiplexing equipment is to be made at Bulawayo and Syringa stations to interface with digital radio link established for (Syringa-Maphisa) section.

4. Launching this project is considered of promising. The project undertaken with the help of a grant aid seems likely to contribute to enhancement of economic development and improvement of social welfare of Zimbabwean people.

5. General Assessment

This project aims to set an example for projects of its type which are needed for economic development but which do not yield an immediate revenue. With such small sales revenues anticipated, a project requiring a large investment poses too great a burden. If the common financial scheme (Case 1) using the Loan/Equity method is employed, the distinctive feature of rural projects mentioned in item 11.6, "Assesment of Result of Financial Analysis" is evident, making it difficult to carry out the project from a financial perspective.

But if the bulk of the funds needed for the project can be covered by a grant provided through bilateral aid, financially sound operations are promised and the project is justified. The distinctive feature of these kinds of projects must be recognized and the benefits accruing from the project as shown in the economic analysis needs to be taken into account. In this case, undertaking the project with the help of a grant seems likely to contribute to the economic development and provision of infrastructure in Zimbabwe.

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