

## 9. PROJECT EVALUATION

### 9.1 Financial Analysis

This project is part of the Rural Development project, and so profitability forecast is expected to be low. It is planned to install PCOs at seven (7) locations particularly from the standpoint of tele-access improvement, and this is expected to be a strain on the implementation and operation of the project. The main reason why the Rural Development project has not been implemented to date is the difficulty in recovering initial investment. In other words, it was considered that project implementation would simply put a strain on operations. This is a fact. However, the Rural Development project must be implemented in order to achieve the rollout target in the license provisions submitted to ETC from ETA.

In this situation, it is considered difficult to implement long-term loans in the Rural Development project accompanying the obligation to repay the interest and original capital. A fund-raising plan was therefore drawn up considering Foreign Grant Aid from both international organizations (Multilateral Aids) and assistance between two countries (Bilateral Aid), and the profitability of this was evaluated.

#### 9.1.1 Basic Assumptions for Financial Analysis

The purpose of this analysis is to measure and assess the financial viability of the Local Network Development project in MEKELE and WUKURO area project under the following conditions and assumptions which have been discussed with ETC staff.

The financial evaluation has not dealt with nominal change of value such as inflation and currency exchange rate fluctuation to reveal essential viability of the Project.

In the sense, Net present value and Internal rate of return are typical means as the evaluation tool under the appraisal prerequisite, for the Project.

a) Fiscal Year

1, July - 30, June

b) Project Appraisal Period

2003/04 – 2020/21 (18 years)

c) Fixed Price Base

Financial Projections have been done in 2002 constant price. In this mean, All costs shall be fixed at 2002 level. This price level, which was estimated to be the standard market price in 2002 will be adopted for all costs, such as construction costs and operating costs.

d) Exchange Rate

US\$1.00 = Birr 8.56 (August 2002)

US\$1.00 = Yen 120.0 (August 2002)

e) Long Term Loan

Current Long - Term Loan Condition

Interest rate	:	4.0%
Repayment	:	20 times over 10 years
		Fixed principal payment
Grace period	:	non

f) Foreign Grant Aid

Since Ethiopia belongs to the LLDC, bilateral aids are available to conduct through foreign grant aids. The foreign grant aids should be real grants, not to be subsidiary loans.

Duty	:	No duty, No charge
Belongings	:	ETC asset

g) Revenue collecting ratio

The expected collecting ratio is set as following Table 9.1-1.

**Table 9.1-1 The Expected Collecting Ratio**

Year	Revenue Collecting Ratio
2006/07 - 2010/11	85%
2011/12 - 2015/16	85%
2016/17 - 2020/21	85%

h) Corporate Income Tax

30% of ETC's net taxable income.

i) Insurance

The cost for insurance was assumed to be approximately 0.1% of the book value of Equipment & Facilities costs in each project year based on the current ETC's insurance system.

j) Depreciation

Full value of all asset items is depreciated without remaining salvage value, over the estimated useful lives of these assets. Depreciation is provided as following Table 9.1-2.

**Table 9.1-2 Depreciation Method**

Items	Depreciation method
Buildings	2.5%
<i>Plant</i>	
Exchange & Switching Equipment	5.0%
Radio & Transmission Equipment, VoIP	7.0%
Cable & Subscriber Network	8.0%
Air-conditioning plant, office facilities	20.0%
Motor Vehicles and others	20.0%

k) Working Capital

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

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

**9.1.2 Investment Plan**

Estimate of the gross required capital funding for the project.

**(1) Total Investment Cost**

The total investment cost can be summarised in Table 9.1-3.

**Table 9.1-3 Total Investment Cost**

Unit: US\$1,000

Items	Foreign	Local	TOTAL
<b>NODE</b>	849	121	970
<b>Transmission, PCO</b>	955	206	1,161
<b>OSP</b>	937	373	1,310
<b>Engineering Service</b>	517	97	614
<b>Total</b>	3,258	797	4,055

**(2) Expenditure Schedule**

The total investment cost is disbursed in each project year of construction period as shown in Table 9.1-4.

**Table 9.1-4 Expenditure Schedule**

Unit: US\$ 1,000

	2003/04	2004/05	2005/06	Total
Plant & Facilities	893	2,485	63	3,441
Engineering Fee	225	389	0	614
Pre Operation Cost	40	40	40	120
Initial Working Capital	0	0	32	32
Interest during construction	0	0	0	0
<b>TOTAL</b>	<b>1,158</b>	<b>2,914</b>	<b>135</b>	<b>4,207</b>
EQUITY	64	159	135	358
GRANT	1,094	2,755	0	3,849
LOAN	0	0	0	0
<b>TOTAL</b>	<b>1,158</b>	<b>2,914</b>	<b>135</b>	<b>4,207</b>

Source: Study Team

### 9.1.3 Sales Revenue Projection

This project is significant as a rural communications network construction project. The problem lies in how to predict the revenue per subscriber.

If actual past ETC data is used, the revenue structure for central Addis Ababa is heavily represented, leading to over-estimates. The data therefore cannot be used as it is.

Firstly, the subscribers covered in this project are divided into three categories.

#### (1) Subscribers installing new access systems and representing a net increase

#### (2) PCO users

For the users in category (1), the figure for general subscribers in 2004/05 is used in the Master Plan. This is US\$ 91 per subscriber. The PCO users in category (2) cannot be identified. These users have diverse characteristics, ranging from people who use the system only once a month to people who use the system every week. In this case, the number of users was determined based on existing PCO information within the same area. The figures were set at an average of 10 people per day (24,000 people p.a.) and US\$ 0.25 per person (US\$ 6,110 p.a.).

Expected revenue calculated under the aforementioned conditions is shown in Table 9.1-5. The following revenues are those obtained through the operation of the telecommunication network established under the project. The revenues are deemed as the operating income of the project. Detail figures are indicated in Table 9.1-9.

**Table 9.1-5 Total Annual Revenue for the Project**

Unit: US\$

Year	Revenue
2006/07	205,000
2010/11	191,000
2015/16	212,000
2020/21	231,000

Source: Study Team

#### 9.1.4 Operation and Maintenance Expenses

It is considered that the most of personnel required to manage this project can be covered using existing ETC staff. Necessary maintenance and staff for PCO operation are calculated at 30% of net sales revenue. The direct operation costs do not include interest payment and depreciation. The annual operation and maintenance (O&M) costs will be increased due to the increase of number of terminals. Estimated annual O&M cost has been calculated as following Table 9.1-6.

**Table 9.1-6 Total O&M Cost**

Unit : US\$

Year	O&M cost
2006/07	82,000
2010/11	72,000
2015/16	72,000
2020/21	71,000

Source: Study Team

#### 9.1.5 Financial Analysis

The purpose of the financial analysis is to measure and assess the financial viability of the priority projects under the above mentioned conditions and assumptions.

The financial soundness of the project will be assessed through the projection of the expected profit/loss and Cash flow statement, etc. The result of this financial analysis is detailed in the output sheets that are attached to the annex.

- a) Income Statement (Table 9.1-9)
- b) Cash flow Statement (Table 9.1-10)
- c) Balance Sheet (Table 9.1-11)

**Table 9.1-7 Assumption of Financing Plan**

Items	USD '000	Share %
EQUITY	347	8.26
Foreign Grant Aids	3,849	91.74
<b>TOTAL</b>	<b>4,196</b>	<b>100.00</b>

**Table 9.1-8 Basic Data for Revenue Estimation**

Year	WUKURO		MEKELE	
	New installation	Total subscriber	New Installation	Total subscriber
<b>2006/07</b>	<b>300</b>	<b>300</b>	<b>1,462</b>	<b>1,462</b>
<b>2007/08</b>	<b>175</b>	<b>475</b>	<b>103</b>	<b>1,565</b>
<b>2008/09</b>	<b>0</b>	<b>475</b>	<b>103</b>	<b>1,668</b>
<b>2009/10</b>	<b>0</b>	<b>475</b>	<b>103</b>	<b>1,771</b>
<b>2015/16</b>	<b>0</b>	<b>475</b>	<b>50</b>	<b>2,176</b>
<b>2020/21</b>	<b>0</b>	<b>475</b>	<b>49</b>	<b>2,422</b>

Source: Study Team

**Table 9.1-9 Income Statement (P/L)**

UNIT: US\$1,000

PROJECT YEAR	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	TOTAL
	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	
SALES REVENUE																
WUKURO	23	37	37	37	37	37	37	37	37	37	37	37	37	37	37	538
MEKELE	113	121	129	137	145	153	157	161	164	168	172	176	180	184	187	2,347
PCO	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	84
Sub-TOTAL(call charge)	142	163	171	179	187	195	199	203	207	211	215	218	222	226	230	2,969
Installation Charge	63	10	4	4	4	4	2	2	2	2	2	2	2	2	2	104
NET SALES	205	173	175	183	191	199	201	205	209	212	216	220	224	228	231	3,073
OPERATING COSTS																
STAFF COST	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	370
GENERAL EXP.	37	27	28	30	33	35	36	37	38	39	40	41	43	44	45	552
INSURANCE	21	19	18	17	15	14	12	11	10	8	7	6	4	3	1	165
TOTAL	82	71	70	71	72	73	73	72	72	72	72	72	71	71	71	1,087
INTEREST (ST-LOAN)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DEPRECIATION	36	36	36	36	36	12	12	12	12	12	12	12	12	12	12	298
PROFIT BEFORE TAX	87	66	69	76	83	114	116	120	124	129	133	137	141	145	149	1,688
CORPORATION TAX	26	20	21	23	25	34	35	36	37	39	40	41	42	43	45	506
PROFIT AFTER TAX	61	46	48	53	58	80	81	84	87	90	93	96	99	101	104	1,182

**Table 9.1-10 Cash Flow State Statement**

EXPECTED PROJECT RETURN (ROE) : 23.40%

UNIT: US\$1,000

PROJECT YEAR	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	TOTAL
	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	
<b>SOURCE OF FUND</b>																			
CASH FROM OPERATION	0	0	0	97	82	84	89	94	91	93	96	99	102	105	108	110	113	116	1,480
EQUITY	64	159	124	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	347
LONG-TERM LOAN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SHORT-TERM LOAN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL SOURCE OF FUND	64	159	124	97	82	84	89	94	91	93	96	99	102	105	108	110	113	116	1,826
<b>APPLICATION OF FUND</b>																			
PLANT AND FACILITIES(P/F)	24	119	63	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	206
P/F ( GRANT )	869	2,366	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3,235
ENGINEERING SERVICE(GRANT)	225	389	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	614
PRE-OPERATION COST	40	40	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	120
WORKING CAPITAL	0	0	21	-3	0	1	1	1	0	1	1	1	1	1	1	1	1	0	27
INT.DURING CONSTRUCTION	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SUB-TOTAL	64	159	124	-3	0	1	1	1	0	1	1	1	1	1	1	1	1	0	353
REPAYMENT (ST- LOAN)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL APPLICATION OF FUND	64	159	124	-3	0	1	1	1	0	1	1	1	1	1	1	1	1	0	353
CASH SURPLUS	0	0	0	100	82	83	88	93	91	93	96	98	101	104	107	110	113	116	1,473
<b>CASHFLOW</b>	<b>-64</b>	<b>-159</b>	<b>-124</b>	<b>100</b>	<b>82</b>	<b>83</b>	<b>88</b>	<b>93</b>	<b>91</b>	<b>93</b>	<b>96</b>	<b>98</b>	<b>101</b>	<b>104</b>	<b>107</b>	<b>110</b>	<b>113</b>	<b>116</b>	<b>1,127</b>



**Table 9.1-11 Balance Sheet**

UNIT : US\$1,000

PROJECT YEAR	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
<b>ASSETS</b>																		
CURRENT ASSETS	0	0	0	100	182	265	353	445	536	629	725	823	924	1,028	1,135	1,245	1,357	1,473
FIXED ASSETS	64	223	326	326	290	254	218	183	147	135	123	111	99	87	76	64	52	40
LESS DEPRECIATION	0	0	0	36	36	36	36	36	12	12	12	12	12	12	12	12	12	12
NET FIXED ASSET	64	223	326	290	254	218	183	147	135	123	111	99	87	76	64	52	40	28
ACCOUNT RECEIVABLE	0	0	34	29	29	31	32	33	33	34	35	35	36	37	37	38	39	39
TOTAL ASSETS	64	223	360	419	466	514	567	625	705	786	870	958	1,048	1,140	1,236	1,334	1,436	1,540
<b>LIABILITIES</b>																		
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	14	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
TOTAL LIABILITY	0	0	14	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
<b>EQUITY</b>																		
PAID-IN SHARE CAPITAL	64	223	347	347	347	347	347	347	347	347	347	347	347	347	347	347	347	347
RETAINED EARNINGS	0	0	0	61	107	156	209	267	346	428	512	599	689	782	878	976	1,077	1,182
SHORT TERM LOAN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL EQUITY	64	223	347	408	454	502	555	613	693	774	858	946	1,036	1,128	1,224	1,323	1,424	1,528
LIABILITIES & EQUITY	64	223	360	419	466	514	567	625	705	786	870	958	1,048	1,140	1,236	1,334	1,436	1,540

### 9.1.6 Major Financial Indicators

The major financial indicators in each operation year will be calculated below. Each indicator is obtained from the following formulas:

- Net Profit on Equity on Sales Revenue

$$\text{Profit before tax} / \text{Equity (Paid in share capital)}$$

- Profit Break Even Point

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

- Cash Break Even Point

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

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 9.1-12 Major Financial Index**

Items	2006/07	2010/11	2015/16	2020/21
Net profit on Equity	17.62%	16.71%	25.98%	30.05%
Profit Break Even Point	58.00	57.00	39.00	36.00
Cash Break Even Point	27.00	26.00	30.00	27.00

### 9.1.7 Sensitivity Analysis

The effects on the profitability of the projects by the charges of conditions assumed in this financial analysis have also been analysed. The changes of conditions (variable factors) and their variable ranges have been assumed as follows:

- a) Total Investment Cost

+20% and -20% of the fluctuation of the Total Investment Cost at the construction stage excluding Interest during construction and Initial Working Capital.

- b) Sales Revenue

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

- c) O&M cost

+20% and -20% of the fluctuation of the O&M cost in each project year.

- d) Grant portion

-5%, -10%, -20% of the fluctuation of the Grant portion for Initial Investment cost

The result of the sensitivity analysis is summarised in Table 9.1-13.

If the Total Investment Cost fluctuates more than  $\pm 20\%$  of the predicted value, FIRR shows fluctuations of approximately 5.0%. This will have a slight effect on the profitability of this project, but is not serious enough to affect the feasibility of implementation.

Sales revenue fluctuations will have a major effect on the profitability of the project. If the expected revenue fluctuates by  $\pm 20\%$ , FIRR will show fluctuations of 7.36%. The charge revenue for existing subscribers must be analysed to ensure suitable estimates for calculations.

If the foreign grant portion decreases and the self-financing portion increases, the FIRR calculation results will fluctuate significantly. FIRR (23.40%) will be 15.58% if the grant portion assumed decreases by 5.0%, 11.02% if it decreases by 10%, and 4.85% if it decreases by 20%. Support from the ETC main body will therefore be required in the form of cross subsidies.

**Table 9.1-13 The Result of the Sensitivity Analysis**

Variable factor	Variation	FIRROE (%)
Total Investment	+ 20%	21.12
	<b>Base</b>	<b>23.40</b>
	- 20%	26.14
Sales Revenue	+ 20%	26.88
	<b>Base</b>	<b>23.40</b>
	- 20%	19.52
O/M cost	+ 20%	21.38
	<b>Base</b>	<b>23.40</b>
	- 20%	25.33
Grant portion	<b>Base</b>	<b>23.40</b>
	-5%	15.58
	-10%	11.02
	-20%	4.85

Source: Study Team

### 9.1.8 Result of Financial Analysis

One of the main issues in Ethiopia's telecommunications sector is rural development. Development of telecommunications networks has made little progress in rural areas inhabited by approximately 85% of the country's population, and immediate improvements are needed for the situation in which only less than 10% of the population living in urban areas has access to telecommunications services. This project advocates rural development as one of its objectives and recommends the installation of PCOs as the strategic way of achieving this.

The population benefiting from seven (7) PCOs would rise to 50,155, and this would improve the tele-access in the area covered to 60%. Incidentally, the tele-access for the whole of Ethiopia is less than 10%. Tele-access improvement is advocated as one of the project goals, and so the project does not guarantee profitability.

The case in which long-term loans were used was calculated first. The conditions were the same as the assumed conditions indicated, but large losses were predicted, and it was confirmed that this would not form a calculation base. The results were the same even when the interest rate was set to 0%. In other words, the original capital could not be returned even if the budget required for operation could be covered.

**It must be concluded that, from this position, setting up this project as a base for long-term loans is difficult.**

The case was then calculated in which foreign grant aid was used to resolve the problem of profitability facing this project. It was confirmed that some form of profit would be achievable allowing independent operation if the preparatory work required for project implementation is set as the self-financing portion and 91.74% of the necessary funds are obtained through Foreign Grant Aid.

The results show that the financial position is positive over the entire period, and no financial shortages will arise.

The expected profitability and financial condition will be discussed here.

The payout period for the capital of **US\$347,000** required in the initial investment (Equity portion) is **3.92 years**. A cash flow of **US\$1,127,000** is yielded throughout the operating period, with **FIRROE at 23.40%**.

The results show that if at least the initial investment can be covered by Foreign Grant Aid, operation is somehow possible. However, it must be remembered that the self-financing ratio covering the investment costs in the FIRR figures above is only 8.26%, and only the operating costs can be covered by the predicted revenue. Fund procurement using long-term loans is definitely not advisable. It is clear that the project would simply leave a negative impact on the main ETC operations. Cross subsidies will therefore be applied between the high-profit business (mobile phone business and urban projects in Addis Ababa) and this project.

In the present development stage of the Ethiopian telecommunications sector, eliminating cross subsidies is one feat that is not possible.

## **9.2 Economic Evaluation**

Telecommunication is almost universally recognised as an avenue for raising living standards and a key element of economic development. Thus telecommunication projects have an 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 telecommunication in Ethiopia, however, is prevented to become mature mainly due to the national treasury problems for development on large scale.

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

circumstances, Government of Ethiopia has come to reconsider ways and means for the improvement of the telecommunication systems. More wider scaled services are to be provided by Ethiopian Telecommunication sector to satisfy the nation's needs. The necessity for planning new telecommunication networks is thus raised.

### **(1) Method of Economic Evaluation**

In this Economic Analysis, the economic effect expected from the performance of these projects will be assessed dealing mainly with the calculation of Economic Internal Rate 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.

### **(2) Economic Benefit**

Economic Benefit of the project will be divided into direct and indirect benefits, which will be assessed separately.

#### **1) Direct Benefit**

The direct benefit of these projects lays its importance in the economic value. Sales revenue in economic value to be generated by the Master Plan are estimated, based on investigation results concerning historical tariff level.

One problem concerns how the difference between mobile phone and fixed phone charges should be considered. In the current charge system, mobile phone charges are three times those for fixed phones. Subscribers accept the higher charges since mobile phones have the added value of allowing calls to be made on the move. However, the spread of fixed phones is not so advanced in developing countries, and in many cases, subscribers requiring a phone purchase a mobile phone. These subscribers simply require a means of communication, and would be happy with either a mobile or fixed phone. In this case, the cost of one call is the same for either. For fixed phones at least, the consumer surplus here arises as the cost difference with mobile phones.

#### **2) Indirect Benefit**

The improvement of Telecommunication networks will contribute a great deal to the improvement of the national well-being not simply in the form of economic benefit but also in term of social benefit.

Such indirect benefits conceivable are:

For Nations:

- Greater ease in emergency access to medical institutions
- Improved emergency 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 Ethiopia's Telecommunication Sector:

- Nation-wide expansion of telecommunications service.
- Improvement of telecommunications service.
- Rapid innovation in telecommunications.
- Simplification of network management.
- Creating new services.

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

Implementing the Master Plan involves no factors that will negatively affect Ethiopian society. The transfer of control from benefits to costs is therefore not considered.

### **(3) Economic Cost**

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

#### **1) Initial Investment Costs for Implementation of the Projects**

The Equipment and Facilities costs, Engineering services costs, Pre-operation costs and Initial working capital will be necessary as the initial cost for the economic value.

#### **2) Operating and Maintenance Costs**

As the operating and maintenance costs, the staff costs, general expenses and insurance charges are required. These expenses must be analysed economically considering their economic values.

#### **3) Items of Transfer**

The tax imposed on ETC is an actual expenditure for ETC. However, looking at the tax from a social perspective, it is only a transfer of cash from ETC to the government. Since it does not require resources, it will not be considered a cost.

For the same reason, the insurance to be paid to domestic companies is a transfer item and therefore is excluded from the cost.

### **(4) 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 (FEP)**

The foreign exchange premium used was that obtained by canvassing the black market dollar rate in Addis Ababa. Under normal circumstances, the standard conversion factor is calculated from the figure for imports and exports, the FEP being the inverse of the resulting

figure, however where a black market dollar rate exists, this is used for the FEP because it is deemed to reflect market prices more accurately.

## 2) Premium of Economic Factor

The financial values of costs items presented in 'Financial Evaluation' will be divided into local and foreign currencies. Although the value of national parameter is not announced by the Government of Ethiopia, the value is set up for the project with the assumption that socio-economic environment in the country will reach the average level of the African region. Then the economic values will be calculated using the value of national parameters (premium of economic value) as shown below:

- Construction**	0.73
- Unskilled Labor**	0.50
- Working Capital*	1.00
- Foreign Exchange Premium*	1.03

\* : Estimated by study team

\*\* : These shadow price ratios were obtained in Uganda

The factor for construction is applied to all locally source equipment and services and the factor for unskilled labour is applied to all local labour.

## (5) Economic Analysis

Economic evaluation is more conceptual approach than the financial evaluation with the assumption that economic evaluation employs perspective of society while financial evaluation is based on business entity's perspective. Therefore, Economic benefit and cost are not directly related to actual monetary flow.

### 1) Determination of Economic Direct Benefit

As clear from the example of neighbouring Uganda, the recent rapid growth in mobile phone use is transforming subscriber values with regard to telephones. In many countries the number of mobile phones already exceeds that of fixed phones, and what was once one phone per household is now becoming one per person.

In Bangladesh, under similar socio-economic conditions to those Ethiopia will be experiencing in 2020/21, the number of mobile phones had outstripped that of fixed phones by 2002. Despite mobile calling charges three times those of fixed phones, subscriber numbers are growing. Seen in terms of a social phenomenon, this means that Bangladeshis wanted a means of communication so much they were willing to pay triple the phone charges to obtain one.

In Addis Ababa, public payphones are limited, and so there are cases of subscriber phones being lent out illegally in front of stores. The charge for these is Brr0.75 for 6 minutes.

Considering these two situations, **Economic Benefit Streams 1** is calculated with charges that Ethiopians are willing to pay being the same as for mobile phones, i.e. three times that for fixed phones.

Cost fluctuations due to changes in the exchange rate were next considered. The charge system for fixed phones has remained the same since charges were revised in 1993. However, comparing the exchange rates for 2001/02 with 1996/97 shows a change of approximately 30%. An **Economic Benefit Stream 2** is calculated with this as the consumer surplus latent within the charge system.

The total economic benefits are summarised as shown in Table 9.2-1.

**Table 9.2-1 Economic Benefit Streams**

Unit: US\$ 1,000

<i>Year</i>	<i>Financial Benefit Stream</i>	<i>Economic Benefit Streams 1</i>	<i>Economic Benefit Streams 2</i>
2006/07	345.67	599.70	371.08
2007/08	335.90	629.19	365.23
2008/09	345.77	653.62	376.55
2009/10	361.94	684.34	394.18
2010/11	378.11	715.07	411.80
2015/16	423.61	803.25	461.58
2020/21	462.20	876.59	503.64

Source: Study Team

## 2) Economic Cost Streams

The total investment and O&M costs in each project year described in Table 9.2-2 for Economic Analysis. The costs are converted into the economic cost using value of national parameter (Shadow premium)

**Table 9.2-2 Economic Cost Streams**

Unit: USD1,000

<i>Year</i>	<i>Staff Cost</i>	<i>General Expense</i>	<i>Insurance</i>	<i>Economic Cost</i>	<i>Financial Cost</i>
2006/07	22	37	-	59	82
2007/08	22	30	-	52	71
2008/09	22	30	-	53	70
2009/10	22	33	-	55	71
2010/11	22	35	-	57	72
2015/16	22	42	-	64	72
2020/21	22	47	-	69	71

Source: Study Team

## (3) Assessment of Result of Economic Analysis

EIRR during the economic life span for the Base cases are calculated using the economic benefit and costs. EIRR, the measures to assess the economic viability, are summarised as shown in Table 9.2-3 and Table 9.2-4.



**Table 9.2-3 Economic Analysis**

Unit: US\$1,000

	INVESTMENT (EQUITY)	O&M Cost	TOTAL COST	Benefit Stream 1	Cash Flow 1	Benefit Stream 2	Cash Flow 2
2003/04	47		47		(47)		(47)
2004/05	116		116		(116)		(116)
2005/06	93		93		(93)		(93)
2006/07		59	59	333	274	218	159
2007/08		52	52	321	269	188	136
2008/09		53	53	329	276	191	138
2009/10		55	55	345	290	199	144
2010/11		57	57	360	303	208	151
2011/12		60	60	375	315	217	157
2012/13		60	60	380	320	219	159
2013/14		61	61	388	327	223	162
2014/15		63	63	395	332	227	164
2015/16		64	64	402	338	231	167
2016/17		65	65	409	344	236	171
2017/18		66	66	417	351	240	174
2018/19		67	67	424	357	244	177
2019/20		68	68	431	363	248	180
2020/21		69	69	438	369	252	183
	256	919	1,175	5,747	4,572	3,341	2,166

**Table 9.2-4 Net Present Value (Discount rate 12%)**

	Benefit Stream 1	Benefit Stream 2
Cost (C)	487,000	487,000
Benefit (B)	2,491,000	1,462,000
B – C	2,004,000	975,000
B / C	5.11	3.00
EIRROE	67%	42%

Source: Study team

The EIRROE is 67.0% or 42.0% indicates the existence of economic effects. As may be seen from the figures used to calculate this EIRROE, the EIRROE figure itself provides no any absolute yardstick. It is not a major element in decision-making in the sense that "if the EIRROE is above 20% this should be done", and is closer to a relative value. In other words, it must be remembered that this figure does entail some risk. The self-financing ratio covering the investment costs is only 8.26%, and only the operating costs can be covered by the predicted economic revenue.

The results of the economic evaluation also show that while the project is necessary for economic growth, it is a BHN type project for which profit cannot be expected. It is therefore problematic to calculate fund procurement using the long-term loan base, and it must be implemented using Foreign Grant Aid or self-financing. Implementation using self-financing would not be impossible in the present ETC operating environment, but this would definitely become a burden. It is ideally hoped to obtain a strategic partner and at least lay down some form of operating environment in preparation for the period of competition.

However, the rollout target cannot be achieved unless rural development is also carried out. This represents a major conflict. As far as can be seen from the external and internal situations

surrounding ETC, the most effective solution for implementing this project is the injection of foreign grant aid.

**For the Ethiopian telecommunications sector, it is of primary importance that the minimum necessary telecommunications network for the country is built by actively gaining support from overseas while the government still holds a majority of the ETC capital structure, and that PCOs are expanded using foreign grant aid where possible for rural development.**

### **9.3 Technical Evaluation**

#### **(1) Rural PCO**

Master plan recommends new DRCS with wide band IP network solution for PCO network in rural area. Internet and mail services are now widely deployed through the world, in which require higher speeds of transmission. World-wide tendency will certainly be to rush at developing higher speed of transmission like a Gb/s and Tb/s basis. The higher the speed in transmission, the better would be, but the investment would be limited. It is, therefore, recommended constructing a practical and feasible network and the infrastructure to telecommunication network meet the local and social needs. The new telecommunication network to be constructed must comply with the requirement of IP system, which will be applied for all telecommunication network in future.

ETC's intention is to expand transmission lines with wide band and high-speed solutions for multimedia applications for socio-economic infrastructure of rural areas, such as remote education, remote medicine, remote medical service etc. As shown in the table below,

- 1) wide band solution is given only by the DRCS proposed,
- 2) the DRCS complies with the future IP network requirement and
- 3) installation cost and annual operation and maintenance cost will be cheaper than that of VSAT,

The terrestrial transmission system will be better solution taking a long-range view.

<b>Item</b>	<b>Proposed DRCS (Wide Band IP)</b>
Network	Wide Band IP Data Speed: 64 kb/s~256 kb/s
Telephone	VoIP (Voice over IP) Variable Voice Coding: 5,6k / 8k / 64 kb/s
Internet (e-mail, web etc.)	Wide Band IP Variable Data Speed: upto 256 kb/s
Comments	1) Voice CODEC can be selected according to the services of line. (Four (4) times as many as channels can be obtained at 8 kb/s CODEC in stead of 64 kb/s.) 2) Valuable speeds of lines such as high speed data, Internet, telephones etc. are automatically assigned. 3) High speed internet is available due to being composed of IP network.

## (2) Urban Areas

Introduction of FTZ will make possible to provide quality telecommunication services to the areas located for from the stations.

In the near future, switching equipment will be replaced to VoIP equipment around the world. Introduction of VoIP as pilot projects hiring a foreign consultant will contribute to training of engineers and technicians for future nation-wide development of the system.

## **10. RECOMMENDATIONS**

### **(1) PCO**

- a) Wide-band communication is applied for PCOs for use of IP in the future. Effective use of the communication system for distant medi-care and distant learning can be and should be encouraged in consultation with relevant authorities and related organisations to enhance these social services.
- b) For the expansion of PCOs over the country, rural electrification has to be encouraged. Co-ordination with EEPCO will be required.
- c) Since up to 15 PCOs can be established for one base station, continuous efforts to increase the coverage or beneficiaries will required.

### **(2) OSP**

#### **(a) Optical Fiber**

Numbers of fiber cores are designed to correspond to future demands. When actual demands arise, ETC may satisfy the demands by efficiently utilising the installed fibers. In case ETC obtains additional information on future demands during the detailed design, the number should be reviewed.

#### **(b) New Subscriber Connection (In-house Cabling)**

At present, arrestors are not installed at the entrance point to the customer premises. Considering release of services for installation and maintenance of customer premises equipment to the private sector, and increasing connections with computers, arrestors are to be installed to avoid current fusion from power lines and to protect from lightning. Installation of arrestors should be assured in accordance with construction manuals.

### **(3) Financial Management**

The results of financial evaluation show that if at least the initial investment can be covered by Foreign Grant Aid, operation is somehow possible. However, it must be remembered that the self-financing ratio covering the investment costs in the FIRR figures above is only 8.26%, and only the operating costs can be covered by the predicted revenue.

Fund procurement using long-term loans is definitely not advisable. It is clear that the project would simply leave a negative impact on the main ETC operations.

Cross subsidies will therefore be applied from the high-profit mobile phone business and urban projects in Addis Ababa. In the present development stage of the Ethiopian telecommunications sector, eliminating cross subsidies is one feat that is not possible.