

CHAPTER 12 SPECTRUM MANAGEMENT

The spectrum management and monitoring system to cope with vast increase of utilization of radio wave is not properly arranged yet in Ethiopia and it will cause disorder of radio utilization such as illegal radio station. Frequency Monitoring will contribute to the effective and efficient utilization of radio waves as an international natural source for radio communications and broadcastings.

Spectrum management, therefore, becomes an indispensable factor. Monitor stations, monitoring facilities and arrangement of the personnel concerned is needed to be newly implemented since the frequency monitoring section is already newly organized in Ethiopian Telecommunication Agency (ETA).

ETA has proclaimed the licensing and frequency management as the core objectives in PROC. No. 49/1996 and Council of Ministers Regulation on Telecommunication Services (Reg. No. 47/1999).

In this chapter, explains six elements of spectrum management that are

- a) Spectrum allocation,
- b) Rules and regulations,
- c) Data-base management,
- d) Frequency coordination,
- e) Licensing, assignment and administration and
- f) Spectrum monitoring.

Items a), c) and e) are being managed by ETA organization except item f) spectrum monitoring. Spectrum monitoring is the essential for establishment of spectrum management and describes recommendations of the spectrum monitoring plan which includes frequency bands to be monitored and necessary new facilities to be implemented. Construction plan with typical block diagram for monitoring system is followed. The general concept for installation of equipment and facilities with rough specifications concerned is introduced.

Training will be needed for operating new facilities when they are introduced to ETA. To operate efficiently the system, abilities of operators and maintenance personnel would become important factors.

Application to be dispatched for training of spectrum management to the foreign countries would be one of the solutions for the promoting operation.

CHAPTER 13 PROJECT IMPLEMENTATION PLAN

13.1 Reinforcement of Project Implementation Body

In order for several projects to be implemented on due schedule for long terms and nationwide, ETC must be equipped with proper functions and organizations. These functions and organizations are to be in charge of project management in all of the following areas, and also are responsible for trouble-shootings for each of the project on a permanent basis.

- Project planning, designing, and bidding,
- Constructions
- Systems acceptance
- Hand-over of systems to operation and maintenance division
- Subscriber connection

Implementation stage of the regional project is to be managed by the project management team established in the region.

(1) Procurement Method and Packaging

It is recommendable that a single turnkey project covers OSP, transmission, and switching facilities, and is to be implemented in parallel.

Basic design for OSP should be completed before the determination of switching capacities for taking consistency with line unit count.

(2) Outsourcing

In this Master Plan, the facility volume of year 2001 is to be increased more than double by the fiscal year of 2005/06.

Under these circumstances, in order to minimize sector risks and compress the increase of the fixed cost, the policy of outsourcing to external entities (companies) is strongly recommended.

(a) Outside Plant Construction

Outsourcing to foreign construction companies is recommended for the OSP project with large scale installation, and the rest, to local construction companies as ETC's productivity is limited.

It will be more effective for ETC not to increase the number of employees but to re-educate the current OSP staff for designing, inspection, and supervision as well as for operation and maintenance.

(b) Local Manufacturers for OSP Construction material

It is necessary to review the specifications and to upgrade the quality of materials made locally, since such quality directly affects on the maintainability of the networks under the rapid expansion.

Utilization of concrete pole and steel pole are recommendable instead of eucalyptus pole for durability strength and natural conservation.

(c) Local Suppliers for Civil Work Materials

Utilization of pre-cast type manhole is recommendable, since installation at site results in longer time, difficult construction and poor quality, and causing prolonged traffic interruption.

13.2 Project Implementation Plan for Short Term (by 2005/2006)

(1) Project List for Short Term

For further improvement of telecommunication services, telecommunication network expansion projects are to be actively implemented placing priority on the 46 priority projects selected out of various projects planned under Eighth Telecommunications Development Plan, and also on mobile-phone service expansion as well as rural telecommunications improvement in line with government policy.

A Feasibility Study was carried out by JICA Study Team for 3 telecommunication development projects selected out of 31 high priority projects including 8 projects nominated by JICA Study Team, i.e., 2 projects in Mekele and Bahir Dar regions, which include both urban and rural telecommunication network expansion, and one backbone transmission project for Addis Ababa and Nazareth route.

(a) Fixed-phone Network Expansion

Construction of local access network shall be implemented with high priority to maximize the utilization of idle exchange lines as well as providing new subscriber connections.

Local network including new/expansion of digital switch for **priority projects** shall be expanded paying attention to the capacity balance of local access network and switching unit.

Construction of local network is limited to cover 75% of the total fixed-phone demands considering the world-wise trend of the increasing mobile-phone subscribers.

Replacement of RAX exchanges is to be implemented for 40,500 lines.

Introduction of 163 new digital switches are planned under Eighth development plan, but the plan is not supported by the basic plan of local access network. Hence, the plan will be implemented employing VoIP technology in the first phase of Middle Term after completing basic design of access network.

Rehabilitation of paper insulated cables is to be implemented in this Short Term for improving services.

(b) Mobile-phone Network Expansion

Mobile-phone services shall be expanded to the 12 regional towns listed below, which is more profitable and required shorter construction period.

- Dire Dawa, Harar, Dessie, Mekele, Gondar, Bahir Dar, Nekempte, Jimma, Awassa, Shashemene, Assela, Ziway

(c) Construction of Optical Fiber Junction Ring in Addis Ababa

Optical fiber junction link with double ring configuration is to be established, connecting NSC, MSC, 6 tandem exchanges and 6 (*) local exchanges located on the junction cable route, to alleviate load of NSC/ISC transit switch owing to traffic increase in both fixed and mobile-phone services, as well as to establish the high reliability of the network.

(*): Sidis Killo, Yeka, Gergi, Bole Michael, Nefas Silk and Kolfe

The junction network configuration is shown in Figure 13-1.

(d) Establishment of IP Network

IP network is to be established connecting 8 PCs in the regions, MSC and 6 tandem exchanges not only to alleviate load on the NSC/ISC transit switch but to provide base for the introduction of VoIP to be introduced from the 1st phase of the Middle Term.

The system configuration of IP network is given in Figure 13-2.

(e) Modification of Routing Plan

Direct routing is to be applied for some local exchanges in Addis Ababa area to reduce load on tandem exchanges, i.e., Sidis Kilo, Yeka, Bole Michael, Nefas silk, Debre Zait, Akaki, Ayur tena and Kolfe.

With the same reason, direct routing is to be applied for the following exchanges in regions.

04 Area: Mekele (27,156), Adwa (4,032), Axum (3,092), Shile (4,436), Selekleka (4,020) and Adigrat (3,527)

06 Area: Shashemene (7,085) Awassa (14,349), Dilla (3,888) and Zway (3,071)

08 Area: Bahir Dar (22,894), D. Tabur (3,338), D. Marcos (6,606) and Gondar (15,718)

(f) Expansion of PDN and Internet Services

For expanding the public data network as well as Internet services nationwide, 5 PoPs are additionally established in the regional towns, i.e., Yeka, Gerji, Kotebe, Akaki and Debre Braham.

(g) Rural Telecommunications Network Construction

In accordance with the Government policy of promoting rural area development, a total of 700 PCOs is to be constructed in rural areas for providing public phone services and also for providing subscriber connections to Farmers' Association and other agencies in the neighboring areas.

Table 13-1 Number of New PCOs (Short Term)

Region	Total	Region	Total	Region	Total
Tigray	55	Somari	20	Harari	2
Affar	10	Benishagul-Gumuz	33	Dire Dawa	2
Amhara	179	SNNP	112		
Oromiya	269	Gambela	18	Total	700

For establishing rural telecommunications network, both terrestrial radio transmission system and VSAT system (Faraway system) are applied.

(PCO Operation):

For simplifying the operation of PCO services, introduction of pre-paid card system is preferable other than the operator assisted call operation.

Operation of PCO business are to be outsourcing to private sector with contract to minimize the running cost of ETC, except maintenance work of the telecommunications facilities which is to be carried out by ETC.

(h) Transmission Network Construction

In addition to the construction of backbone transmission link planned under the Eighth Telecommunications Development Plan of ETC, construction of 17 new links is to be implemented and system expansion of 15 links is also to be implemented.

Besides the above, a fiber optic transmission link with STM-16 SDH digital hierarchy is to be constructed for (NSC/TR III–Deble Zeit–Adama West M/W Rep.–Nazareth: Approx. 100 km) section.

(i)Improvement of Operation and Management

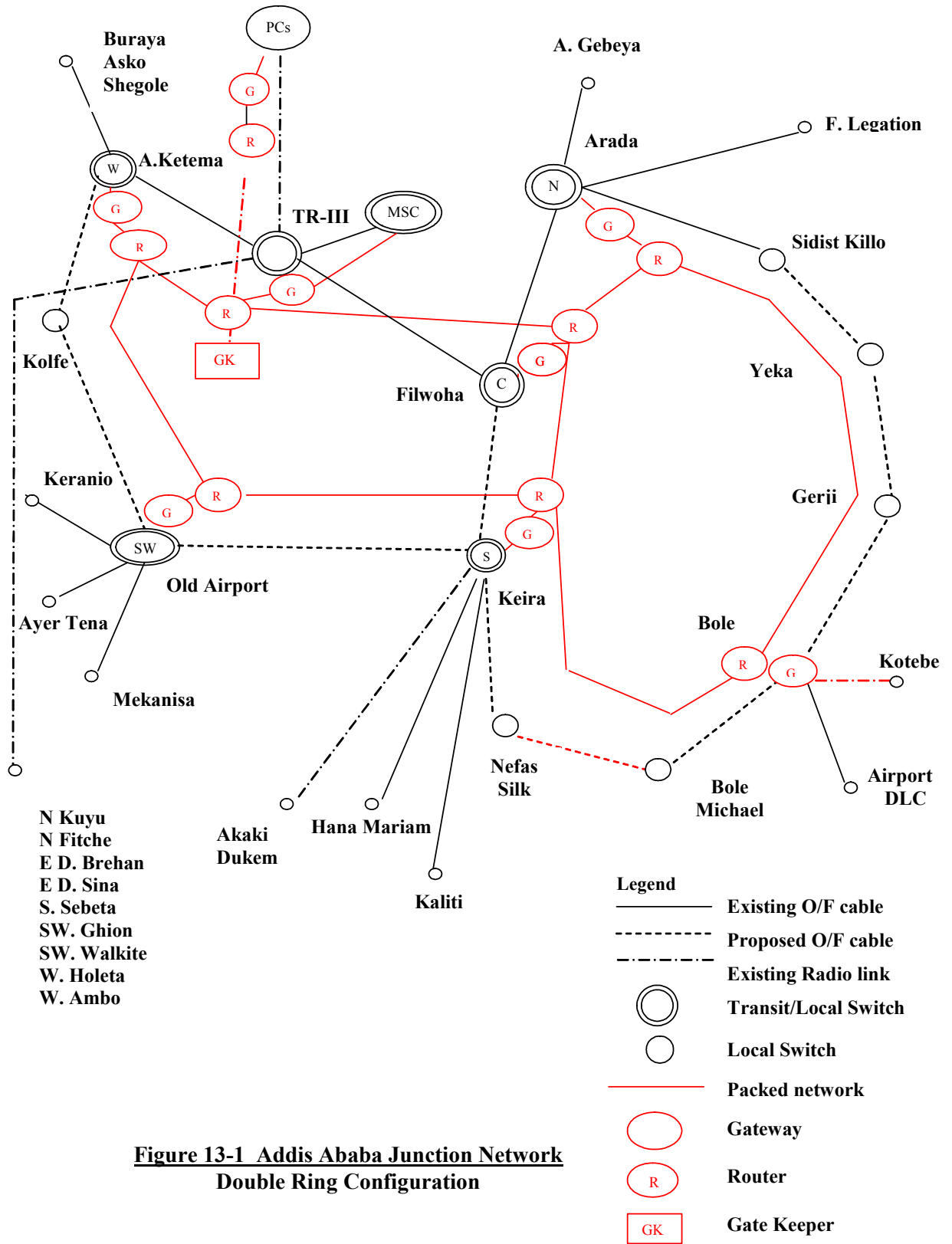
Integration of Sub-systems

Sub-systems developed for operation and maintenance, customer services, project management monitoring purposes are to be integrated to CIMIS (Corporate Integrated Management Information System) which is being implemented by ETC to modernize the management of huge resources, intensive project planning, control and monitoring, extensive capacity building, etc.

Establishment of OPMC (Outside Plant Maintenance Center)

Two (2) OPMCs are to be established in Addis Ababa to perform the new subscriber connections, fault restore and preventive maintenance of the local access network in all Addis Ababa zones.

Projects planned for Short Term are shown in Table 13-1.



**Figure 13-1 Addis Ababa Junction Network
Double Ring Configuration**

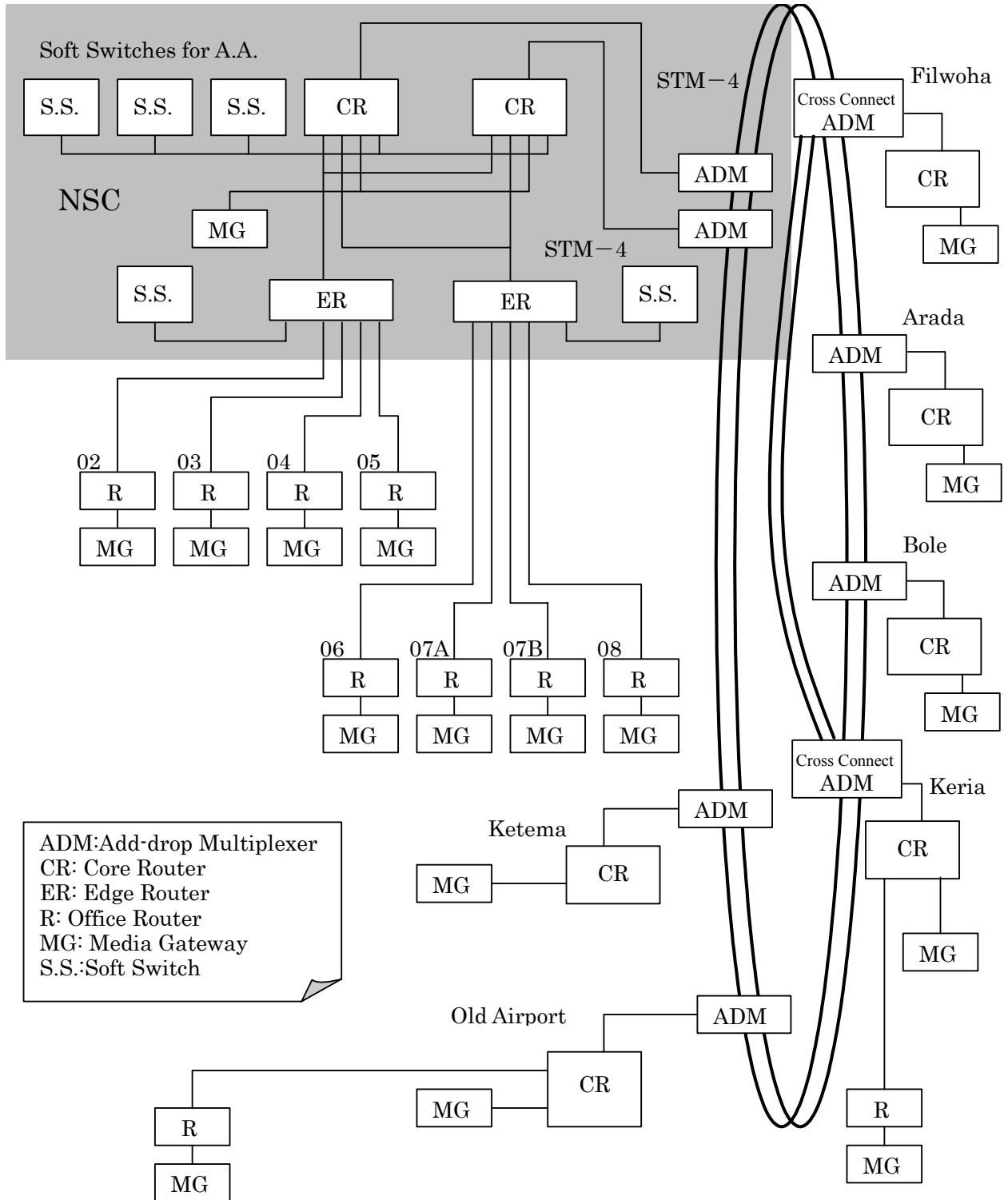


Figure 13.2 National IP Network Configuration

Table 13-2 Project List for Short Term

No.	Project Name	Description
1	Urban and Regional Town Telecom Expansion Project	A.A Zone and 8 Regions
	Access Network (OSP, WLL, FTZ) including OSP Rehabilitation (60,000 Pairs) in A.A	296,900 Pairs
	Digital Switch	124,500 LU
	Payphone	65 Units
2	Mobile Network Expansion Project	13 Regional towns including A.A (400,000 LU in Capacity)
3	Rural Telecommunications Network Project	700 Rural Communities
4	IP based Network	IP based Network Connecting 8 PCs, MSC and 6 Tandem Exchs. in A.A
5	Transmission Network Expansion - Backbone Transmission System - Optical Fiber - M/W - Super radio system - Junction Link - VSAT	- Addis Ababa – Nazareth (100 km) - 17 new links and 1 expansion link - Approx. 120 new links - Optical fiber ring in A.A (60 km) - 27 sites including 15 new PCO
6	Introduction of CIMIS - Customer Services - Operation and Maintenance - Project management	- 8 Regions and 6 Zones - Integration of sub-system to CIMIS - ETC head office/project site
7	OPMC Project	Establishment of 2 OPMCs in A.A
8	Cyber Café / POP Expansion Project	Cyber Café: 16, POP: 5

13.3 Project Implementation for Middle Term and Long Term

Middle Term Procurement is to be carried out in two phases, first of which concentrates on incomplete projects under the Eighth 5-Year Development Program.

The tentative scope(middle and long term) is given in the Table 13-3.

Table 13-3 Project List for Middle/Long Term

No.	Project Name	Scope up to 2010/11	Scope up to 2020/21
1	Fixed-phone Network Expansion		
	- VoIP	226,000 LU	667,000 LU
	- Subscriber Access Network (OSP, WLL, FTZ)	271,000 Pair	768,000 Pair
	- Payphone	600	1400
	- Introduction of 2 nd Gateway at Nazareth	1	--
2	Mobile-phone Network Capacity Expansion	150,000 LU	410,000 LU
3	Rural Telecom Network Expansion	1,527 PCOs (including 65 VSAT)	2,891 PCOs (including 96 VSAT)
4	Transmission Network Expansion		
	- Microwave - Satellite	- Backbone: 17 links - Spur Route: 200 links - 12 sites	- Backbone: 18 links - Spur Route
5	POP & Cyber-café Expansion	15 POP/48 C. Cafe	5 POP/ -
6	Rehabilitation of OSP (with OSP and FTZ)	60,500 Pairs	--
7	Construction of 2 nd International Gateway	1	--
8	Establishment of OPMC	9	--

13.4 Project Cost

Cost for Short Term and Middle/Long-Term Projects are given in Table 13-4.

Table 13-4 (1/2) Project Cost for Short-Term

Unit: US\$ mil.

No	Project Name	Description	Foreign	Local	Total Cost
1	Urban and Regional Town Telecom Expansion Project	A.A Zone and 8 Regions - Local Access, Switch, payphone	121.1	42.2	163.3
2	Mobile Network Expansion Project	13 Regional Towns	134.2	1.5	135.6
3	Rural Telecommunications Network Project	700 Rural Communities	44.2	10.6	54.7
4	IP based Network Project	Connecting PCs, MSC & 6 Tandem Exchanges in A.A	11.0	1.2	12.3
5	Backbone Transmission	A.A - Nazareth	4.5	1.8	6.2
6	Junction Link	Addis Ababa	5.3	8.0	13.3
7	Transmission Network Expansion Project	Microwave, Fiber, DRCS, Satellite	96.0	18.4	114.4
8	CIMIC Project	Customer Services, O&M, Project Monitoring	14.0	3.5	17.5
9	OPMC Project	Establishment of OPMC in A.A	2.0	0.3	2.3
10	Cyber Café / POP Expansion Project	Cyber Café: 16, POP: 5	1.2	0.0	1.2
11	Technical Support by Civil Engineer	Standardization of station building, duct system	0.4	0	0.4
	Total		433.8	87.3	521.2

A total cost of US\$ 521,200,000 is required to implement projects planned for the short term period of the Master Plan.

Table 13-4 (2/2) Project Cost for Middle Term and Long Term

Unit: US\$ mil.

Target Year	2010/11			2020/21		
Unit	Foreign	Local	Total	Foreign	Local	Total
Fixed Telephone	114.8	34.8	149.6	266.2	93.7	359.9
Mobile-phone	59.9	0.6	60.6	163.1	1.8	164.9
Rural Telecom	89.1	22.8	111.9	175.7	44.0	219.7
Transmission Expansion	72.6	26.6	99.2	31.8	8.3	40.1
IP Network	0	0	0	1.7	0.2	1.9
POP & C. Café Expansion	4.3	0.0	4.4	0	0	0
OPMC Expansion	9.0	1.5	10.5			
Building Construction	0.0	1.0	1.0	0	0.9	0.9
CIMIS	5.0	3.5	8.5	10.0	7.0	17.0
Spectrum Management	9.7	2.0	11.7			
Total Cost	364.4	92.8	457.3	648.6	155.8	804.4

A total of US\$ 1,261,700,000 is required to implement projects planned for the middle and long term period of the Master Plan.

CHAPTER 14 EVALUATION OF MASTER PLAN

The Master Plan has been formulated with the objectives of (1) Improving tele-access and (2) Eliminating the digital divide, and it must be reiterated that the aim is not necessarily to boost the financial status of ETC. This being the case, the Plan takes the view that active efforts should also be made to roll out uneconomical rural services to the extent that funds permit.

At the time the Master Plan was being formulated, the Ethiopian telecommunication sector faced the following problems: (1) Low levels of tele-access and tele-density, (2) Delayed take-up of mobile-phones, (3) Declining income from international telecommunications, (4) Stalled rural development projects, (5) Delay in deregulating the telecommunication sector and lack of private sector activity.

The Master Plan proposed the following strategies for solving these six problems.

- 1) Concentrating on promoting growth in the highly profitable mobile-phone business
- 2) Adopting a pre-paid formula for 80% or more of mobile-phones
- 3) Rolling out 5000 PCOs nationwide to improve tele-access
- 4) Splitting ETC to ease the way for introduction of private operators (Scenario 2)

Although long-term plans have been put forward for the training of personnel for the telecommunication sector and for business strategies, so far the Master Plan has only been assessed and motives assigned in terms of the financial indicators. Now, in addition to this financial assessment, the Master Plan has been evaluated from the technical and customer perspective.

14.1 Technical Perspective

(1) Efficiency of the Investment

(a) Balancing of the Facility Schedule

The current idle capacity of the switching equipment (260,000 l.u.) is scheduled to have new subscriber connections (245,000 subscribers) by year 2005.

(b) Weighting on Facility Investment Among Fixed-phone, Mobile-phone and ICT.

The priority of the investment is given on

1st : mobile-phone and internet network

2nd :Rural PCO network

3rd: Fixed-phone expansion of the areas with the long waiting applicant supported by the basic design of the subscriber access network.

(2) Reliability/stability/security

(a) Transit Node Capacity

The relief to the transit nodes is to be carried out in the short term plan

- NSC/ISC : by the over-lay of IP network for 8 PCs and 6 Tandems
- 6 Tandems: by applying the direct routes among local exchanges
- PCs: by applying the direct routes among LEs in PC area

(b) Addis Ababa O/F Junction Rings

100% redundancy is to be given to the transmission capacity by the double O/F rings with STM-16.

(c) Addis Ababa – Nazareth Backbone Transmission System

O/F trunk transmission between TR-III and Nazareth. In order to divert the south and east microwave routes from Mt.Furi repeater station, the captioned O/F cable is to be installed within the short term plan.

(d) Other Actons Taken for Improvement of Reliability

- Ring configuration for the radio trunk routes (Long Term Plan)
- Second International Gateway switch (First phase of middle Term plan)
- Interface points at each PC of Mobile-phone to Fixed-phone network.

(3) Flexibility

- High capacity of AA junction ring
- Over-lay of packet network on trunk transmission routes
- 30% margin for originating calling rate

(4) Serviceability

- 1) Replacement of analog switches by digital switches
 - Relief of the spare parts problem of analog switch
 - Connection establishment time becomes short by CCS No.7 instead of R2 signal.
- 2) Rehabilitation of absolute OSP cables and Drop-wire
 - High fault rate is to be reduced.
- 3) Marketing effort to increase the hunting system
 - “Called-party busy “will be decreased.

(5) Productivity

- 1) Out-sourcing

The out-sourcing is recommended for the implementation of OSP project, new subscriber connections and for the part of OSP fault recovery works.

- 2) Stream-lining of O/M works
The responsibility / Authority of O/M work is decentralized and is to be addressed to the Regions and sites.
- 3) Introduction of OPMC
Outside plant O/M works are to be stream-lined including staff training
- 4) Centralized and Integrated Management Information System(CIMIS)

(6) Conformity with the Current Technical Trend

- 1) Introduction of VoIP
- 2) Application of FTZ for the subscriber access network considering the wide-band services
- 3) CIT contents development

(7) Universal Services

The proposed target of “Tele-access” for year 2020 is 86.4%

(8) Maintainability

- 1) Spare parts problem
In order to avoid the spare parts problem of the circuit switching system, MP proposes the network expansion by VoIP.
- 2) Improvement of O/M efficiency by;
 - Decentralization
 - CIMIS
 - OPMC
- 3) Re-organization of technical staff

14.2 Customer Perspective

The customer perspective ranks most highly among the strategic objectives of the Master Plan.

This strategy involves restoring customer faith in Ethiopian telecommunication services by improving both tele-access and tele-density. The plan is to raise tele-access from its current 5% (2002) to 87% by 2020, and tele-density from 0.5 (2002) to 2.16 (2020). The plan also aims to meet customer needs by working actively to provide mobile-phone and Internet services. Target subscriber numbers are shown in following Table.

Table 14-1 Main Target of the Master Plan

	2005	2010	2020
Fixed-phone	616,000	841,000	1,341,000
Mobile-phone	317,000	510,000	946,000
Internet	109,000	192,000	405,000
Tele-density %	1.27	1.62	2.16
Tele-access %	13	41	87

Source: Study Team

14.3 Financial Perspective

The financial goal of the Master Plan is to secure the minimum level of profitability required to make the improvements to tele-access and tele-density needed to restore customer faith in Ethiopian telecommunications. The aim will be to reduce borrowings as much as possible and to fund projects internally.

The Master Plan indicates a FIRROE of 21.19%. The Plan provides for a dividend of 30% of the net profit for the shareholders i.e. the strategic equity partner and the Ethiopian government, and as such may be considered an appropriate plan in financial terms. In the Master Plan profit by year would be expected from the first year, with dividends paid to the shareholders from this first year. A look at cash flow for each year indicates cash flows would be negative for the first three years of operation. This is due to strategic front-loading of investment in mobile-phones, meaning that cumulative cash flows would move into the black in 2012/13, ten years after launch of operations. Cash flow of US\$ 373 million would be generated throughout the period of operation, with a financial internal rate of return on equity (FIRROE) of 21.19%. Even the FIRR figures alone indicate that the business would provide more than adequate returns for an operation with a high degree of public benefit.

Table 14-2 Total Project Cost by Facilities

Items	Total amount (US\$1,000)	Share %
Mobile	368,063	20.6
PCO	386,337	21.7
OSP/FTZ/WLL	425,240	23.9
VoIP	180,398	10.1
Transmission/VSAT	261,274	14.7
Switch	41,950	2.3
Payphone	2,655	0.2
Others	116,969	6.5
Total	1,782,886	100.0

Source: Study Team

Table 14-3 Total Project Cost in each Project Year

Unit: US\$ 1,000

Year	Total Investment	Year	Total Investment
2003/04	173,726	2012/13	80,439
2004/05	173,726	2013/14	80,439
2005/06	173,726	2014/15	80,439
2006/07	91,463	2015/16	80,439
2007/08	91,463	2016/17	80,439
2008/09	91,463	2017/18	80,439
2009/10	91,463	2018/19	80,439
2010/11	91,463	2019/20	80,439
2011/12	80,439	2020/21	80,439
		Total	1,782,886

Table 14-4 Total Number of Additional Subscriber by Service

Year	Fixed-phone	Mobile	Internet
Existing (Sep. 2002)	310,230	60,000	10,000
2003/04	76,843	85,433	22,000
2005/06	230,528	256,300	66,000
2010/11	453,528	450,000	161,998
2015/16	723,978	668,025	258,499
2020/21	994,428	886,050	355,000

Source: JICA study team 2000

Table 14-5 Revenue Distribution by Service (Billed Amount)

Year	Fixed-phone	Mobile	Internet	Installation	TTL
2003/04	13,316	17,808	8,800	10,348	50,272
2005/06	36,110	42,033	26,400	10,348	114,890
2010/11	66,223	67,205	48,599	5,398	187,426
2015/16	105,718	98,181	77,550	6,124	287,573
2020/21	143,703	128,414	106,500	6,124	384,741

Source : JICA study team 2002

Note: other : Installation fee, etc.

The results of this evaluation indicate that if this were a business run by the government as part of the country's social infrastructure, it would offer more than sufficient returns. However, the strategic equity partner will be a private investor. Some doubt remains as to whether private investors would show any interest in implementing the Master Plan in a country with a national discount rate of 10.0-12.0%. The Master Plan proposed here would deliver a comprehensive and balanced network. Naturally the character of some of the projects involved would require cross subsidies, and if these projects were not carried out because it was uneconomical to do so, this would mean failure to achieve the objectives of the Master Plan. Efficient means should be chosen to bring the Master Plan to fruition, taking into account the need to achieve its objectives, and seeking the understanding of the strategic equity partner regarding this need.

Table 14-6 Cash Flow

FIRR (2003/04-2035/36) has been calculated at 21.19% (FIRROE)

NPV (Discount rate at 12%) has been calculated at US\$142,008,000 (2003/04-2035/36)

DIVIDEND Policy: 30% of net profit p.a.

UNIT : USD 1000

YEAR	INVESTMENT			REVENUE	O&M COST	DEPRE.	INTEREST	C.TAX (30%)	P/L A.TAX	REPAYMENT	DIVIDEND Levy	CASH FLOW
	LOAN	GRANT	Own Fund									
2003/04	86,863	17,373	69,490	44,453	13,938	9,692	1,737	5,726	13,360	2,895	4,676	-54,010
2004/05	121,608	17,373	34,745	73,592	14,878	19,384	5,733	10,079	23,518	9,844	8,231	-9,919
2005/06	121,608	17,373	34,745	101,025	16,143	29,076	10,122	13,705	31,979	17,952	11,193	-2,835
2006/07	64,024	0	27,439	113,414	16,909	34,160	13,036	14,793	34,516	24,139	12,081	5,017
2007/08	64,024	0	27,439	122,922	18,326	39,245	14,589	15,229	35,534	28,408	12,437	6,495
2008/09	64,024	0	27,439	131,095	20,371	43,135	15,971	15,485	36,132	32,676	12,646	6,507
2009/10	54,878	0	36,585	145,604	21,306	47,026	16,999	18,082	42,191	36,639	14,767	1,226
2010/11	54,878	0	36,585	157,659	21,987	50,917	17,692	20,119	46,944	40,298	16,431	4,548
2011/12	48,264	0	32,176	174,941	23,316	55,061	18,106	23,537	54,920	43,736	19,222	14,847
2012/13	48,264	0	32,176	191,746	23,957	59,205	18,255	27,099	63,230	46,953	22,131	21,176
2013/14	48,264	0	32,176	208,717	25,385	63,307	18,275	30,525	71,224	50,171	24,928	27,256
2014/15	48,264	0	32,176	225,875	26,703	67,409	18,167	34,079	79,517	53,389	27,831	33,531
2015/16	48,264	0	32,176	241,801	28,309	71,511	17,930	37,215	86,836	56,606	30,392	39,172
2016/17	48,264	0	32,176	257,718	29,982	75,272	17,564	40,470	94,430	59,824	33,051	44,652
2017/18	48,264	0	32,176	257,533	31,078	79,032	17,069	39,106	91,247	63,041	31,937	43,126
2018/19	48,264	0	32,176	272,499	32,091	82,341	16,446	42,486	99,135	63,363	34,697	51,239
2019/20	48,264	0	32,176	288,379	33,212	85,649	15,868	46,095	107,555	59,632	37,644	63,752
2020/21	48,264	0	32,176	304,385	34,106	88,957	15,462	49,758	116,102	54,742	40,636	77,505
TOTAL	1,114,543	52,118	616,225	3,313,356	431,996	1,000,380	269,020	483,588	1,128,371	744,310	394,930	373,286

14.4 Aspect of Organization and Human Resource Development

The master plan is planned to meet increasing and varying demands for telecommunication service. Taking present organization and human resources capacity into consideration as fixed, the implementation of infrastructure development and subsequent operation and maintenance proposed in the master plan might be almost impossible. To fulfill the gap between present capacity and required one for the implementation of infrastructure development, operation and maintenance, organization and human resource development plan has been formulated.

During the formulation of the master plan, feedbacks were carried among the members of the Study Team. In the feedback, temporary evaluations were made and excessive loads on the organization or on parts of organization were avoided or organization strengthening and human resources development plans were reviewed. The proposed master plan is the results of these feedback processes.

It may appear to someone that the master plan or organization and human resource development plan are still too challenging. ETC has already started, however, some of the plans and programs for organization and human resource development. Most of the plans and programs recommended in the organization and human resource development plan are further improvement of their activities for organization strengthening and human resource development. ETC has a base to carry out the recommended plans and programs for organization and human resource development which will render possibility of implementation of telecommunication network development and proper operation and maintenance of the network proposed in the master plan.

14.5 Following of the Implementation of the Master Plan

The proper implementation of the Master Plan shall be monitored by Quality of services and Performance indicators as well as the achievement of the strategic objectives of Master Plan as given in Table 14-7 “Strategic Objectives and Management”.

14.6. Conclusion

The rational and proper implementation of the Master Plan will result:

- 1) Generation of financial profit in the form of local currency.
- 2) Capital investments for management and network expansion will be recovered from the revenue.
- 3) Cross subsidization will be inevitable between Mobile-phone/Internet and fixed-phone/rural PCO.

The government is required to monitor the new ETC (with the strategic equity partner) to invest in the unprofitable areas and the rural PCOs.

Table 14-7 Strategic Objective and Measurement

Strategic Objectives	Strategic Measurement	
	Core Outcomes	Performance Driver
1)Customer perspective Restoring customer faith in service Enhancing customer satisfaction	Eliminating subscriber waiting lists Improving Tele-access Improving Tele-density Attracting and retaining subscriber (in each segment) Identifying Key subscribers	Number of subscriber per region Increase in number of mobile-phone subscribers Increase in number of Internet subscribers Number of Key subscribers
2)Financial perspective Securing stable sources of revenue Diversifying sources of revenue Investment strategy Meet Shareholder Expectation	Sales profit ratio Boosting revenues Efficiency of Investment Payment of dividends	Mobile-phone sales Internet sales Revenue collection period Dividend rate
3)Internal-Business process perspective Understanding the market Changing the business model Providing services in a responsible manner Improving productivity	Share of customer segments Identifying future customer needs Revenue from mobile-phone and Internet Share of Pre-paid Mobile-phone market Time taken to recover from faults Call completion rate Expense ratio Precision, Frequency, and stringency of billing	Surveys of customer satisfaction Changes to revenue structure Identifying causes of faults Expense management, moving staff Outsourcing Quality of billing Communicating with customers Work of Key customer service unit
4)Learning and Growth perspective Setting individual goals for employees Improving information system capabilities Boosting staff capabilities	Revenue per staff member Proposals per staff member Staff satisfaction Staff retention Number of employees per PC Staff productivity	Improving motivation Developing staff skills

CHAPTER 15 RECOMMENDATIONS

The upgrading of economic infrastructure such as communications, power generation and transportation is vital as a fundamental condition for promoting development of continuous economic growth in Ethiopia. There is therefore an urgent need for upgrading the communications infrastructure in Ethiopia, and it is predicted that the investment demand will grow extremely large in the future coupled with the implementation of the Master Plan. However, it will be no easy matter to procure the huge amount of the total investment of US\$1,782 million from the market in which telecommunications are involved. The use of public funding may not be government policy, and so it is expected that the Ethiopian government will reduce the burden on public responsibility by utilizing private funds in the form of a strategic partner, and improve the efficiency of business management with cost-cutting by adopting market forces. In the current development stage, it is believed that considering revenue (e.g. dividend profits) from the telecommunications sector other than tax revenue by the government will result in delaying progress with rural development.

There are many risks that may affect the involvement of private investors, including the level of involvement of the government in regional and charge policies, the undeveloped legal system, and the lack of guarantee with charge revenues. Unless the situation regarding these issues can be clarified, it will not be possible to attract the interest of private investors. Prompt action by the Ethiopian government is therefore awaited.

15.1 Recommendations on Technical Matters

(1) Follow-up of Master Plan

As the master plan is made based on the many assumption and unclear data of ETC, the plan shall be carefully reviewed and rectified timely, especially prior to the middle term plan. Major objectives of Master Plan are placed on;

- Solution to the imbalanced facility
- Enhancement of Mobile-phone and Internet services
- Extension of “Tele-access”
- Improvement of O/M and Customer service efficiency.

(2) Network Capacity Expansion

- 1) Priority given to the subscriber access network as the solution to the idle capacity of switching system.
- 2) Integrated management of capital investment. The return of the investment shall be taken immediately upon the completion of the project.
- 3) Reinforcement of planning /design function
- 4) Network expansion policy
 - 75% level of demands for fixed-phone expansion
 - Enhancement of the capacity expansion for mobile-phone and internet services

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(3) Capacity Building for Operation and Maintenance

- 1) Separation of O/M body for 3 services of fixed-phone, mobile-phone and internet / data services.
- 2) Improvement of Day-to-day maintenance and operation.
 - reporting system with the help of CIMIS
 - Trouble shooting / recovery system
- 3) Improvement of QoS
 - Fault rate (OSP)
 - Fault recovery time (OSP)
 - Call completion rate
- 4) Improvement of the productivity
- 5) Reinforcement of Training Center Function
- 6) Administration of Plant record

(4) Capacity Building for Local Telecommunication Industry

- Out-sourcing for new connection, OSP repair work and small size expansion
- Encouragement of Local industry

(5) Reinforcement of Marketing Activities

- Cultivation of the demand for new services
- Provision of wide-band services to the key customers
- Management /up-dating of waiting applicant lists

(6) Reinforcement of Management Capacity

- Stream-line of the organization
- Establishment of CIMIS

15.2 Recommendation on Organization Management and Human Resource Development

Among various plans and programs recommended in Chapter 11, the followings might be most important or essential for the development of the telecommunication sector.

(1) Objective Oriented Management of ETC

ETC has expanded to a large corporation with more than 7 thousand employees and will grow further to a corporation of huge scale. Coordination among departments and divisions has become and will become more and more important to achieve the objectives of the corporation, or corporate plan of every year. Objective oriented management is proposed to achieve the coordination. The coordination has to be attained explicitly with documentation whose example is given in the chapter 11.

All divisions of ETC are organized, as a part of the corporation with respective functions, like all kinds of organizations must be. No single division alone cannot produce services of the corporation, and responsibility allocation is necessary every year to attain the objectives of the corporation of each year. Objectives of each division can be attained only with supports or attainment of objectives of other divisions. These relations should be clearly identified at the time of planning and well documented. Substantial coordinating activities are to be carried out by the planning division or department managers at the time of annual planning.

Coordination in objective oriented management is different from a system of central plan-order-control-report. Interactive processes of objective distribution and self- planning are necessary between the upper and lower organs. The planning division and upper organs have to allocate broken down objectives to assure the achievement of the corporation and to attain efficient achievement, considering optimal human and financial resource allocation in cooperation with the human resource development department and the financial department. Self-planning does not mean setting easy objectives. Divisions or lower organs should formulate implementation plans to assure the attainment of the assigned objectives and of allotted profit.

(2) Human Resource Development

Career development program (CDP) is the base for human resource development. CDP can be formulated after assessing present and future requirement of human resource for the corporation and for each department/region and division. For this assessment, classifications of employees are to be reviewed and revised and each employee has to be re-evaluated according to the revised classification. After defining CDP of corporation and department/region-divisions, CDP for each employee has to be developed. Training needs can be identified according to the CDP. CDP of the corporation and department/region-divisions and methods and forms for development of individual CDP should be documented and circulated. The document has to be reviewed and revised according to the change in business environment.

On-the-job training (OJT) has to be the main part for human resources development since self-development is the key for human resource development, especially for employees of higher level. Supports and encouragement by the superiors is necessary to attain effective and efficient OJT, using schemes and formats recommended in the chapter.

Off-JTs offered by the training institute are also important to achieve the CDP since courses suitable for the sector are quite limited outside of ETC. Out of Off-JT management training should be enhanced further. For the management training, Off-JT can only be supplemental to OJT or self-development. Follow-up courses are important to support application of methods learned in Off-JT courses.

Off-JT for specialists of information and communication technology (ICT) and for up-grading technicians to assistant engineers or engineers is inevitable corresponding to changes in business environment. For training of ICT specialists, substantial permanent courses have to be prepared. Development of curriculum and teaching materials as well as training of trainers, including participation to foreign training courses, should start immediately. For immediate needs, technical transfer from consultants and contractors during the implementation of projects which involves new technology have to be encouraged as recommended in the feasibility study report.

(3) Strengthening of Regulatory Functions

With expansion of private participation to the sector, roles of the regulator will become more important for the sound development of the sector, while the private sector or companies, in principal, pursue profits. There may increase evading activities of laws and regulations, whether intentional or unintentional. Regulations to avoid technical problems in public switched network as well as to protect customers will become more important. The regulator should fully take the vital roles with enhanced capability for collection and analysis of information.

The role of the regulator has two aspects. The one is to achieve government policy for the sector by regulating the operators and related entities. The other is to draft the sector policy and propose to the Ministry or the government according to socio-economic development policy of the federal government and regional governments. Since the regulator, as a public sector, has and should have the most volume of information of the sector, drafting practical and feasible policy has to be done by the regulator. Strengthening Planning and Research Service will be imperative.

15.3 Recommendation on Financial Matter

It would be no exaggeration to say that ETC profitability has to date been sustained by international telecommunications. However, the proportion of total ETC revenue accounted for by international telecommunications has fallen, from 60% in 1996 to 40% in 2000, suggesting changes in the ETC operating environment. ETC itself is already aware of the reasons for this falling share: a decline in international traffic and a lower international settlement rate.

First of all, Study team would like to present a review of the ETC revenue structure to date. Although it is impossible to draw any definite conclusions as ETC operating expenses do not tally with the items listed under revenue, it does appear that ETC profitability is not sustained by domestic services alone and that the company has been relying on its income from international telecommunications to cross-subsidize its domestic services. This has allowed ETC to set low domestic charges. The effect of cross-subsidizing is not confined to keeping down charges; in particular it is certain that without cross subsidies, rural development would not be possible.

However, there is no guarantee whatsoever that ETC can continue running its operations with this excessive reliance on international telecommunications. The international settlement rate is likely to drop further, while the introduction of Internet telephony and the consequent shift of

international voice traffic to data traffic will also have a major impact on ETC operations.

In light of these developments, what form should any management strategy for ETC take?

ETC is charged with providing a universal service within Ethiopia. A management strategy without cross subsidies is out of the question if the company is to carry out rural development and improve tele-access.

How, then, can these cross subsidies be maintained?

If no further growth can be expected in international telecommunications, which until now have formed the basis of cross subsidies, earnings from mobile-phone and Internet must become the financial foundation for ETC operations, with cross-subsidizing between mobile + Internet and fixed-phone + rural development. This makes mobile subscribers and Internet users key customers for ETC and makes capturing these customers' business a key corporate strategy for ETC. The same applies to the private operators who will be entering the Ethiopian market in the near future once the telecom sector is opened up to them—there will be keen competition for these customers.

What measures then does ETC need to take?

(1) Establishment of Key Subscriber Unit

First of all, ETC must pinpoint its key subscribers. No strategy can be devised without a defined target. In order to do this, a key subscriber unit needs to be set up as quickly as possible.

The role of this key subscriber unit would encompass the following:

- 1) Retaining potential key subscribers currently on the waiting list (people waiting for telephone installation). This means identifying subscriber attributes and giving priority to processing key subscriber applications for service.
- 2) Providing value-added services to key subscribers
- 3) Analyzing information about key subscribers
This will involve obtaining information about key subscribers, analyzing this information, and working with the marketing section to improve customer service.

Next, ETC needs to start marketing its services to these target key customers at the earliest practical stage. If possible ETC examines options such as giving these customers priority when assigning lines and offering value-added services for those who subscribe early. Providing mobile-phone terminals at low cost is also an effective way to capture these key customers.

(2) Re-balancing of the Tariff System

The ETC tariff system is structured such that a monopoly is continued where international calls those are substantially in the black compensate for deficit local services that make up the infrastructure.

One means of improving this situation is to have another look at a tariff system with a balanced cost structure where the tariffs for international calls are lowered and the tariffs for services that are in the deficit are raised. It should be noted here that the Ethiopian telecommunications sector is still in the development stage.

In Ethiopia where the communications infrastructure is underdeveloped, there is the stance that earnings made in urban areas are moved around for the development of other areas (cross subsidies). This structure cannot be changed until the foundations of a communications infrastructure are in place. However, it is necessary to rebalance the tariff system while balancing customer tendencies with the internal compensation structure.

(3) Reevaluation of International Calls Tariffs.

Key customers that often make expensive international calls may use VoIP services. It can therefore be considered likely that the total amount of international call traffic will be drastically reduced as a result.

Therefore it is heeded that the current situation where key customer traffic is relied upon is an era that is coming to an end. It is difficult to envision the total number of key customers increasing from now. The only way to increase the international traffic is to encourage general subscribers to make international calls. It is therefore necessary to lower the international call tariffs to bring about an environment that makes it easier for general subscribers to make international calls.

(4) Conducting Customer Analysis and Strengthening Marketing

Customer analysis pertaining to key subscribers (mainly business users) is also lagging behind.

This is one business activity and includes the implications of market research. Assuming that competition will occur for each type of service, it will be necessary in the future to reconsider the tariff system in line with movements in the market. This will require the establishment of key subscriber units.

(5) Maintaining Cash Flow Analysis for Each Service

In order to maintain appropriate tariff levels, it is necessary to carry out analysis of each type of service, and fundamental data analysis is required in order to review the lowering of tariff levels for International call that are in the black and the raising of tariff levels for local and Interurban calls that are in the deficit. In the future, ETC will be spun off, and the opportunity to give consideration to a business strategy cannot be missed for the occasion when the communications sector is open to competition. Regarding the government, when preparing information relating to this analysis, this is divided into fields where market theory is taken into account, and fields where profitability cannot be achieved merely by taking market theory into account. The latter is either carried out by the government or private sector that provide incentives that support stimulation of the private sector are necessary providing that they advance stimulation of the private sector.

(6) Adopting the Principles of Competition

Adopting the principles of competition is considered to be extremely effective in stimulating the currently stagnating telecommunications sector, and the government also hopes for this. Active involvement by foreign investors is predicted in the future with the adoption of principles of fair competition.

It must however be remembered that implementing rural development and creating a competitive environment creates conflicts, and so it hoped that a stance will be taken considering development of the Ethiopian telecommunications sector by looking at the overall picture. Depending on changes in the sector environment, it is possible that ETC may have to shift towards an urban-oriented business strategy offering short-term profitable projects rather than long-term strategic projects described in the Master Plan. The Ethiopian government and ETA must take responsibility for creating an investment environment and legal system that forms a fair competitive environment in which ETC alone is not left with the responsibility for rural development.

Likewise, ETC must also set up a business environment capable of coping with competition. It is especially important to ensure an understanding of projects' profitability and attributes. A valid business plan cannot be created without this information. The adoption of a high-reliability information management system (CIMIS) is therefore desirable.

15.4 Recommendation on Environment of Telecom Sector

(1) Strategic Equity Partner

The management partner, who will be chosen in year 2003, will lead to the reform of ETC into an efficient customer-oriented business.

- Semi-autonomy divisions for fixed-phone, mobile-phone and internet/data services.
- Performance-based salary system
- Encouragement of competitions among divisions
- Target broken down to each division

(2) Monopolistic Environment Created by ETC

ETC will retain as monopoly until 2007/2008 and the competitors will enter into mobile-phone and Internet business after 2007/2008.

(3) Heavy Rollout Target

The rollout target for Eighth 5-year plan given by ETA as the conditions of the license will be too heavy.

- 22,000 lines PCO
- 470,000 l.u. of additional switch
- additional 500,000 subscribers

The ETA should review the rollout target.

(4) Lack of a Clear Division of Responsibilities between the Public and Private Sector.

The master plan recommends that from 2008/09 onward private operators should assume the leadership in providing such telecommunications services as mobile-phones and ISP that are expected to be profitable and can attract investors. The plan also suggests that ETC as a public corporation should take the initiative in providing rural development and fixed-phone services, which are not expected to be profitable. In principle, only a market expected to be profitable provide a place where private investors can play an active role.

Possessing the national backbone and international gateway, ETC has the potential to create a new business model in which interconnection charges form the main source of its revenue, conduct business operations as a public corporation, and maintain national security.

(5) Existence of Digital Divide

The people who can enjoy the telecommunications services are in a minority of less than 5%.

The development of the rural area is one of the major schemes of the National plan. MP places the higher priority in the rural area network development.

(6) Interconnectivity between New and Existing Telecom Operator

In the case of a private operator applying for interconnectivity to the ETA, it will be the responsibility of the ETA to ensure that ETC complies.

(7) Legalization of VoIP

Taking into account the fact that the private ISPs have already entered the VoIP market, and that the service band will become wider; the legalization of VoIP is not so far.

(8) Presence of Private ISPs

The ISP sector is ideal for local industries making use of local capital and the multiple ISPs will have the effect to contributing to the stimulation of the Ethiopian economy.

(9) Segregation of Telecommunications and ICT Sectors.

The telecommunications now exists as a sector within ICT industry.

In Ethiopia, the regulatory Ministry is different for telecommunication (by Ministry of Infrastructure) and for ICT (by Science and Technology Commission). Which ministry will be responsible for licensing the private telecommunication operator using VoIP?

The terms must be clearly defined by the relevant organization.

(10) Use of ODA Funding

Whether or not ETC qualifies for ODA funding depends on the policies of the individual contributing countries. It is planned to inject 30% of private capital into ETC from 2003. The majority of the capital structure will still be held by the Ethiopian government and responsibility for rural development will also lie with ETC.

New investment required to achieve the rollout target has poor profitability and some of the benefits that should be generated by the existing network are being diverted into new investment projects.

The Ethiopian government intends to operate the sector with private resources, but the many projects proposed in the Master Plan are with low profitability. This is because improving tele-access is ranked as an important goal in the Master Plan.

If the use of ODA funding is possible for this portion with support from the Ethiopian government, the feasibility of achieving the Master Plan targets increases. In conclusion, it is shown that if ETC is willing to carry out rural development and is working towards achieving the rollout target, ODA funding used for ETC will be widely benefiting the Ethiopian population.

The study team comes to the conclusion that ODA funding for ETC is appropriate from the standpoint of achieving the Master Plan.