

**JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)  
ETHIOPIAN TELECOMMUNICATIONS CORPORATION (ETC)**

**THE STUDY  
ON  
TELECOMMUNICATIONS DEVELOPMENT PLAN  
IN  
THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA**

**Volume I**

**SUMMARY**



**FINAL REPORT**

**December 2002**

**PANTEL INTERNATIONAL CO., LTD.  
YACHIYO ENGINEERING CO., LTD.**

SSS
JR
02-172

**CURRENCY AND EQUIVALENT UNITS**

**As of August 2002**

**Currency Unit**

**US\$1.00 = Birr 8.56 (Ethiopian Birr)**

**US\$1.00 = Yen 120 (Japanese Yen)**

**JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)  
ETHIOPIAN TELECOMMUNICATIONS CORPORATION (ETC)**

**THE STUDY  
ON  
TELECOMMUNICATIONS DEVELOPMENT PLAN  
IN  
THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA**

**Volume I**

**SUMMARY**

**FINAL REPORT**

**December 2002**

**PANTEL INTERNATIONAL CO., LTD.  
YACHIYO ENGINEERING CO., LTD.**

## PREFACE

In response to a request from the Government of the Federal Democratic Republic of Ethiopia, the Government of Japan decided to conduct the Study on Telecommunications Development Plan and entrusted the study to the Japan International Cooperation Agency (JICA).

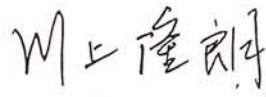
JICA selected and dispatched the study team headed by Mr. Ryoji Sasaki of Pantel International Co., Ltd. (consisting of Pantel International Co., Ltd. and Yachiyo Engineering Co., Ltd.) to Ethiopia, three times between March 2001 and November 2002. In addition, JICA set up the advisory committee headed by Mr. Takashi Miyashita, Senior Advisor, International Cooperation Division, Telecommunications Bureau, Ministry of Public Management, Home Affairs, Posts and Telecommunications between November 2001 and December 2002.

The team held discussions with the officials concerned of the Government of the Federal Democratic Republic of Ethiopia, and conducted field surveys at the study area. Upon returning to Japan, the team conducted further studies and prepared this final report.

I hope that this report will contribute to the promotion of this project and the enhancement of friendly relationship between the two countries.

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of the Federal Democratic Republic of Ethiopia for their close cooperation extended to the Study.

December 2002



---

Takao Kawakami

President

Japan International Cooperation Agency

Mr. Takao Kawakami  
President  
Japan International Cooperation Agency

December 2002

Dear Mr. Kawakami:

Letter of Transmittal

It is our great pleasure to submit to you the Final Report on the Study on Telecommunications Development in the Federal Democratic Republic of Ethiopia with cooperative efforts of Ethiopian Telecommunications Corporation and other parties concerned. The report has been prepared for the Government of the Federal Democratic Republic of Ethiopia to contribute to the telecommunication development in the country.

This report has been prepared by PANTEL INTERNATIONAL CO., LTD. and YACHIYO ENGINEERING CO., LTD, based on the contract with JICA. The study team conducted the work from November 2001 to December 2002.

The study aims at formulating the master plan for telecommunications development up to the year 2020 and feasibility study for priority projects which will be implemented by the year 2005 in the Federal Democratic Republic of Ethiopia.

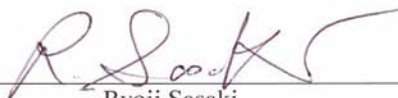
Objective areas of the study are the whole country for the master plan and several target areas for the feasibility study. Through field surveys and analyses of data/information collected, the master plan has been drawn up covering mainly development targets and strategies including sector business strategy, network development plan, implementation plan, operation/maintenance plan, organization and human resource development plan as well as cost estimate and project evaluation. The feasibility study has been carried out for three priority projects identified as the result of the master plan study.

The report consists of five volumes: the Summary, Master Plan, Feasibility Study, Supporting Report and the Data Book. The Summary presents the outline of the study results, and the Master Plan/ Feasibility Study Reports give all the Study results regarding telecommunication development. The Supporting Report describes the detailed study results, data and information referred during the study period, and detailed data for cost estimation. The Data Book presents the detailed data referred in the main report.

I wish to take this opportunity, on behalf of the Study Team, to express our deep gratitude to the officials concerned of the Japan International Cooperation Agency and other authorities concerned of the Government of Japan for providing valuable comments and suggestions. The Study Team wishes to offer our sincere appreciation to the officials concerned of Ministry of Finance and Economic Development, Ethiopian Telecommunications Corporation, and other authorities concerned of the Government of Ethiopia for their unlimited cooperation and assistance extended to the study team.

Finally, The Study Team earnestly hopes that this report will contribute to future telecommunications development in the Federal Democratic Republic of Ethiopia.

Sincerely yours,



Ryoji Sasaki  
Team Leader

Study on Telecommunications Development Plan  
in the Federal Democratic Republic of Ethiopia

THE STUDY ON TELECOMMUNICATIONS DEVELOPMENT PLAN  
IN  
THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA

COMPOSITION OF THE REPORTS

<b>VOLUME I</b>	<b>SUMMARY</b>
<b>VOLUME II</b>	<b>MASTER PLAN</b>
<b>VOLUME III</b>	<b>FEASIBILITY STUDY</b>
<b>VOLUME IV</b>	<b>SUPPORTING DOCUMENTS FOR MASTER PLAN</b>
<b>VOLUME V</b>	<b>DATA FILE FOR MASTER PLAN</b>



**THE STUDY  
ON  
TELECOMMUNICATIONS DEVELOPMENT PLAN  
IN  
THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA**

**(Part 1)**

**SUMMARY OF MASTER PLAN**



**Final Report**

The Study on Telecommunications Development Plan  
in the Federal Democratic Republic of Ethiopia

**VOLUME I (Part 1) Summary of Master Plan**

**Table of Contents**

<b>CHAPTER 1 INTRODUCTION.....</b>	<b>1 - 1</b>
1.1 Background .....	1 - 1
1.2 Objectives and Scope of Study .....	1 - 1
1.3 Policy of the Study .....	1 - 2
1.4 Work Schedule .....	1 - 2
<b>CHAPTER 2 NATURAL AND SOCIO-ECONOMIC CONDITIONS .....</b>	<b>1 - 3</b>
2.1 Population .....	1 - 3
2.2 Social Indicators .....	1 - 3
2.3 Gross Domestic Products and Gross Regional Domestic Product .....	1 - 4
2.4 National Development Plan .....	1 - 4
2.5 Regional Development Plan .....	1 - 5
<b>CHAPTER 3 PRESENT STATUS OF TELECOMMUNICATIONS SECTOR ...</b>	<b>1 - 6</b>
3.1 Present Telecommunications Services .....	1 - 6
3.2 Problems .....	1 - 6
3.3 Project Management .....	1 - 7
3.4 Customer Service .....	1 - 8
3.5 Organization and Human Resource Development .....	1 - 9
3.6 Current Financial Status of ETC .....	1 - 10
<b>CHAPTER 4 REVIEW OF TELECOMMUNICATIONS</b>	
<b>DEVELOPMENT PLAN.....</b>	<b>1 - 13</b>
4.1 Overview of the Network Situation in January 2002 .....	1 - 13
4.2 Review of the Priority Projects (45 Projects for Regions and Addis Ababa) .....	1 - 13
4.3 Revision of Eighth 5-year Development Plan Including Priority Projects.....	1 - 14
<b>CHAPTER 5 DEMAND FORECAST .....</b>	<b>1 - 16</b>
5.1 Population Growth Rate .....	1 - 16
5.2 Economic Growth Rate .....	1 - 16
5.3 Fixed-phone Demand .....	1 - 16
5.4 Mobile-phone Demand .....	1 - 17
5.5 Demand Forecast for Internet/Data Services .....	1 - 18

<b>CHAPTER 6 TRAFFIC FORECAST AND CIRCUIT CALCULATION .....</b>	<b>1 - 19</b>
6.1 Assumption for Originating Calling Rate .....	1 - 19
6.2 Assumption for Call Distribution .....	1 - 19
6.3 Circuit Calculation .....	1 - 20
<b>CHAPTER 7 FRAMEWORK OF THE MASTER PLAN .....</b>	<b>1 - 21</b>
7.1 Objectives and Policies for Telecommunications in Ethiopia .....	1 - 21
7.2 Planning Period and Target Years of the Master Plan .....	1 - 21
7.3 Framework of the Master Plan .....	1 - 21
<b>CHAPTER 8 SECTOR BUSINESS STRATEGY .....</b>	<b>1 - 27</b>
<b>CHAPTER 9 TELECOMMUNICATIONS NETWORK PLAN .....</b>	<b>1 - 30</b>
9.1 Basic Concept of Network Plan .....	1 - 30
9.2 Fundamental Technical Plan .....	1 - 30
9.3 Public Switched Telephone Network .....	1 - 30
9.4 IP-based Network .....	1 - 30
9.5 Universal Service .....	1 - 31
9.6 Mobile Telephone Network .....	1 - 31
9.7 Public Data Network .....	1 - 31
9.8 Transmission Network .....	1 - 32
9.9 Subscriber Access Network .....	1 - 33
9.10 Supporting Facility .....	1 - 33
9.11 Information Communication Technology .....	1 - 33
<b>CHAPTER 10 OPERATION AND MAINTENANCE IMPROVEMENT PLAN.</b>	<b>1 - 37</b>
10.1 Urgent Plan .....	1 - 37
10.2 Preventive Maintenance .....	1 - 37
10.3 Decentralization of the O/M Function .....	1 - 37
10.4 Culture Change through Management by Objective .....	1 - 38
10.5 Introduction of OPMC (Outside Plant Maintenance and Training Center) .....	1 - 38
10.6 Customer Service .....	1 - 38
<b>CHAPTER 11 ORGANIZATION AND HUMAN RESOURCE DEVELOPMENT PLAN .....</b>	<b>1 - 39</b>
11.1 The Regulator (ETA) .....	1 - 39
11.2 The Operator .....	1 - 40

<b>CHAPTER 12 SPECTRUM MANAGEMENT.....</b>	<b>1 – 42</b>
<b>CHAPTER 13 PROJECT IMPLEMENTATION PLAN .....</b>	<b>1 - 43</b>
13.1 Reinforcement of Project Implementation Body .....	1 - 43
13.2 Project Implementation Plan for Short Term (by 2005/2006) .....	1 - 44
13.3 Project Implementation for Middle Term and Long Term .....	1 - 49
13.4 Project Cost .....	1 - 50
<b>CHAPTER 14 EVALUATION OF MASTER PLAN.....</b>	<b>1 - 52</b>
14.1 Technical Perspective .....	1 - 52
14.2 Customer Perspective .....	1 - 54
14.3 Financial Perspective .....	1 - 55
14.4 Aspect of Organization and Human Resource Development .....	1 - 57
14.5 Following of the Implementation of the Master Plan .....	1 - 58
14.6 Conclusion.....	1 - 58
<b>CHAPTER 15 RECOMMENDATIONS.....</b>	<b>1 - 60</b>
15.1 Recommendations on Technical Matters. ....	1 - 60
15.2 Recommendation on Organization Management and Human Resource Development .....	1 - 61
15.3 Recommendation on Financial Matter .....	1 - 63
15.4 Recommendation on Environment of Telecom Sector .....	1 - 66

## Index for Tables

### CHAPTER 1 INTRODUCTION

### CHAPTER 2 NATURAL AND SOCIO-ECONOMIC CONDITIONS

Table 2.1	Population (2001) and Land area by Region.....	1 - 3
Table 2.2	Productive System of Ethiopia .....	1 - 4
Table 2.3	GRDP/cap.(FY2000) by Region.....	1 - 4

### CHAPTER 3 PRESENT STATUS OF TELECOMMUNICATION SECTOR

Table 3.1	Current Status of Telecommunications Services.....	1 - 12
-----------	--	--------

### CHAPTER 4 REVIEW OF THE TELECOMMUNICATIONS DEVELOPMENT PLAN

### CHAPTER 5 DEMAND FORECAST

Table 5.1	Future Population.....	1 - 16
Table 5.2	Future Economic Growth for GDP .....	1 - 16
Table 5.3	Future Economic Growth for GDP/cap .....	1 - 16
Table 5.4	Micro Demand.....	1 - 17
Table 5.5	Mobile-phone Demand .....	1 - 17
Table 5.6	Internet Demand .....	1 - 18

### CHAPTER 6 TRAFFIC FORECAST AND CIRCUIT CALCULATION

### CHAPTER 7 FRAMEWORK OF THE MASTER PLAN

Table 7.1	Target of the Master Plan (1/2).....	1 - 25
Table 7.1	Target of the Master Plan (2/2).....	1 - 26

### CHAPTER 8 SECTOR BUSINESS STRATEGY

### CHAPTER 9 TELECOMMUNICATIONS NETWORK PLAN

Table 9.1	Candidate Location of POPs.....	1 - 32
-----------	---------------------------------	--------

### CHAPTER 10 OPERATION AND MAINTENANCE IMPROVEMENT PLAN

### CHAPTER 11 ORGANIZATION AND HUMAN RESOURCE DEVELOPMENT PLAN

Table 11.1-1	Program/Action Proposed in Organization and Human Resource Development Plan for the Regulator .....	1 - 39
Table 11.2-1	Organization and Human Resource Development Plan of the Operator .....	1 - 41

### CHAPTER 12 SPECTRUM MANAGEMENT

**CHAPTER 13 PROJECT IMPLEMENTATION PLAN**

Table 13.1	Number of New PCOs (Short Term) .....	1 - 46
Table 13.2	Project List for Short Term .....	1 - 49
Table 13.3	Project List for Middle/Long Term .....	1 - 49
Table 13.4	(1/2) Project Cost for Short-Term.....	1 - 50
Table 13.4	(2/2) Project Cost for Middle Term and Long Term .....	1 - 51

**CHAPTER 14 EVALUATION**

Table 14.1	Main target of the Master Plan .....	1 - 54
Table 14.2	Total Project Cost by Facilities .....	1 - 55
Table 14.3	Total Project Cost in each Project Year.....	1 - 55
Table 14.4	Total Number of Additional Subscriber by Service .....	1 - 56
Table 14.5	Revenue Distribution by Service (Billed Amount).....	1 - 56
Table 14.6	Cash Flow .....	1 - 57
Table 14.7	Strategic Objective and Measurement .....	1 - 59

**CHAPTER 15 RECOMMENDATIONS**

## Index for Figures

<b>CHAPTER 1</b>	<b>INTRODUCTION</b>	
<b>CHAPTER 2</b>	<b>NATURAL AND SOCIO-ECONOMIC CONDITIONS</b>	
<b>CHAPTER 3</b>	<b>PRESENT STATUS OF TELECOMMUNICATION SECTOR</b>	
<b>CHAPTER 4</b>	<b>REVIEW OF THE TELECOMMUNICATIONS DEVELOPMENT PLAN</b>	
<b>CHAPTER 5</b>	<b>DEMAND FORECAST</b>	
<b>CHAPTER 6</b>	<b>TRAFFIC FORECAST AND CIRCUIT CALCULATION</b>	
<b>CHAPTER 7</b>	<b>FRAMEWORK OF THE MASTER PLAN</b>	
<b>CHAPTER 8</b>	<b>SECTOR BUSINESS STRATEGY</b>	
Figure 8.1	Business Model (Scenario 1: 2008/09) .....	1 - 28
Figure 8.2	Business Model (Scenario 2: 2008/09) .....	1 - 29
<b>CHAPTER 9</b>	<b>TELECOMMUNICATIONS NETWORK PLAN</b>	
Figure 9.1	Outline of Backbone Network (incl. On-going Project) .....	1 - 32
Figure 9.2	Existing Link Service Coverage in Addis Ababa City .....	1 - 34
Figure 9.3	Service Coverage Plan for 12 Major Cities at Phase 2 Stage (Reference). .....	1 - 34
Figure 9.4	Service Coverage Plan for Phase 3 Stage (Reference).....	1 - 34
Figure 9.5	Present Routing for PSTN.....	1 - 35
Figure 9.6	Routing Plan for IP Network (2005) .....	1 - 35
Figure 9.7	Routing Plan for IP Network (2010-20).....	1 - 36
Figure 9.8	Expectation to IP Network .....	1 - 36
<b>CHAPTER 10</b>	<b>OPERATION AND MAINTENANCE IMPROVEMENT PLAN</b>	
<b>CHAPTER 11</b>	<b>ORGANIZATION AND HUMAN RESOURCE DEVELOPMENT PLAN</b>	
<b>CHAPTER 12</b>	<b>SPECTRUM MANAGEMENT</b>	
<b>CHAPTER 13</b>	<b>PROJECT IMPLEMENTATION PLAN</b>	
Figure 13.1	Addis Ababa Junction Network Double Ring Configuration.....	1 - 47
Figure 13.2	National IP Network Configuration .....	1 - 48
<b>CHAPTER 14</b>	<b>EVALUATION</b>	
<b>CHAPTER 15</b>	<b>RECOMMENDATIONS</b>	

**List of Abbreviations**

Abbreviations		Abbreviations	
A:	AA Addis Ababa	L:	LAN Local Area Network
	AC Area Code		LE Local Exchange
	ADLI Agricultural Development Led Industrialization		LRE Low Rate Encoder
B:	BSC Base Station Controller	M:	MEA Multi Exchange Area
	BTS Base Transceiver Station		MoFED Ministry of Finance and Economic Development
C:	CC Country Code		MSC Mobile Switching Center
	CCS Common Channel Signaling		MSSP Multiplex Section Shared Protection
	CDMA Code Division Multiple Access	N:	NGO Non-Governmental Organization
	CIMIS Corporate Integrated Management Information System		NMS Network Management system
	CMR Children Mortality rate	O:	O&M Operation and Maintenance
	CPU Central Process Unit		OC Office Code
	CRT Cathode Ray Tube		OPGW Optical Fiber Composite Overhead Ground Wire
	CSA Central Statistical Authority		OPMC Outside Plant Maintenance Center
D:	DAMA Demand Assignment Multiple Access		OPS Operator Service
	DCME Digital Circuit Multiplication Equipment	P:	PC Primary Center
	DECT Digital Enhanced Cordless Telecommunications		PCO Public Call Office
	DF Direction Finder		PDC Personal Digital Cellular Telecommunication System
	DRCS Digital Radio Concentrator System		PDCA Plan, Do, Check, Action.
	DRMASS Digital Radio Multi-Access Subscriber System		PDH Plesiochronous Digital Hierarchy
E:	EEPSCO Ethiopian Electric Power Corporation		PHS Personal Handy-phone System
	EIRR Economic Internal Rate of Return		POP Point of presence
	ERL Erlang		PRSP Poverty Reduction Strategic Programme
	ETA Ethiopian Telecommunications Agency		PSDP Power Sector Development Programme
	ETC Ethiopian Telecommunication Corporation		PSTN Public Switched Telephone Network
	ETSI European Telecommunication Standards Institute	Q:	QoS Quality of Service
F:	FIRR Financial Internal Rate of Return	R:	RAX Remote Area Exchange
	FIRROE Financial Internal Rate of Return on Equity		RSDP Road Sector Development Programme
	FIRROI Financial Internal Rate of Return on Investment		RSS Remote Switching System
	FOT Fiber Optic Transmission System	S:	SC Secondary Center
G:	GC Gregorian Calendar		SCF Standard conversion Factor
	GDP Gross Domestic Product		SCPC Single Channel per Carrier
	GK Gate Keeper		SDH Synchronous Digital Hierarchy
	GMT Greenwich Mean Time		SIM Subscriber Identity Module
	GoE Government of Ethiopia		SIP Standard Installation Practice
	GOS Grade of Service		SMS Short Message System
	GPRS General Packet Radio Service		SN Subscriber Number
	GRDP Gross Regional Domestic Product		SOP Standard Operation/Maintenance practice
	GSM Global System for Mobile communications		STM Synchronous Transfer Mode
	GW Gateway switch	T:	TDM Tandem
H:	HF High Frequency		TDMA Time Division Multiple Access
	HQ Headquarters		TQC Total Quality Control
	HSDP Health Sector Development Program		TVRO TV Receiving Only
I:	ICB International Competitive Bid	U:	UHF Ultra High Frequency
	ICT Information And Communication Technology		UMTS Universal Mobile Telecommunication System
	IMT International Mobile Telecommunication system		UNEP United Nations Environment Programme
	IP Internet Protocol		USD United State Dollar
	IT Information Technology	V:	VHF Very High Frequency
	ITU International Telecommunication Union		VoIP Voice over Internet Protocol
	ITU International Telecommunication Union		VSAT Very Small Aperture Terminal
J:	JICA Japan International Cooperation Agency	W:	WLL Wireless Local Loop