Japan International Coooperation Agency (JICA)

Ministry of Infrastructure (MOI)
Post and Telecommunication Authority (PTA)

THE MASTER PLAN STUDY
FOR
DEVELOPMENT OF RURAL TELECOMMUNICATION SYSTEM
IN
MONGOLIA

FINAL REPORT

VOLUME III

FEASIBILITY STUDY

FEBRUARY 2003

Japan Telecommunications Engineering and Consulting Service (JTEC)
and
Pacific Consultants International (PCI)
TOKYO, JAPAN

CURRENCY AND EQUIVALENT UNITS

(As of July, 2002)

Currency Unit	=	Mongolian Tugrik (Tg)
US$ 1.00	=	Tg 1,099.47
Tg 1,000	=	US$ 0.9095

Currency Unit	=	Japanese Yen (JPY)
JPY 1,000	=	US$ 8.361
US$ 1.00	=	JPY 119.60

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PREFACE

In response to a request from the Government of Mongolia, the Government of Japan decided to conduct a master plan study for Development of Rural Telecommunication System in Mongolia and entrusted the study to the Japan International Cooperation Agency (JICA).

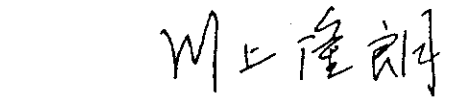
JICA sent to Mongolia a study team headed by Mr. Hideo MITSUHASHI, Japan Telecommunications Engineering and Consulting Service, three times between March 2002 and February 2003. In addition, JICA set up an advisory committee headed by Mr. Junichi Shioya, Deputy Director, International Cooperation Division, Ministry of Public Management, Home Affairs, Posts and Telecommunications of Japan, which examined the Study from specialist and technical points of view.

The team held discussions with the officials concerned of the Government of Mongolia, and conducted field surveys at the study area. After the team returned to Japan, further studies were made and this final report was prepared.

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

I wish to express my sincere appreciation to the officials concerned of the Government of Mongolia for their close cooperation extended to the team.

February 2003



Takao Kawakami
President
Japan International Cooperation Agency

Mr. Takao Kawakami
President
Japan International Cooperation Agency

February 2003

Dear Mr. Takao Kawakami

Letter of Transmittal

It is a great pleasure for us to submit to you the Master Plan Study Report for Development of Rural Telecommunication System in Mongolia.

This report has been prepared by Japan Telecommunications Engineering and Consulting Services (JTEC) and Pacific Consultants International (PCI), based on a contract with JICA. The study team conducted the works from March 2002 to February 2003.

The study aims at formulating the master plan for the development of rural telecommunication system in Mongolia up to the year 2020 and feasibility study for priority projects which will be implemented by the year 2006 in Mongolia.

Objective area of the study covered the rural areas through whole country for the master plan and several targets 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, demand forecast, network development plan, facilities plan, implementation plan, operation/maintenance/human resource plans, as well as cost estimate and project evaluation. The feasibility study has been made for priority projects in three Aimags identified as a result of the master plan study.

We wish to take this opportunity to express our deep gratitude to the officials concerned of the Japan International Cooperation Agency and other authorities concerned of the Government of Japan. We wish to offer our sincere appreciation to the officials concerned of Ministry of Infrastructure, Post and Telecommunication Authority and other authorities concerned of the Government of Mongolia for their unlimited cooperation and assistance extended to the study team in connection with the execution of their duties.

Finally, we earnestly hope that this report will contribute to future telecommunications development in Mongolia.

Very truly yours

Hideo Mitsuhashi
Team Leader
Master Plan Study for Development of
Rural Telecommunication System in Mongolia

MAP OF MONGOLIA

MAP OF ECONOMIC STRUCTURE
Scale 1:10 000 000

Industry
- Metal working
- Chemical industry
- Woodworking industry
- Industry of building materials
- Light industry
- Food industry

Extractive industry
- Coal
- Gold
- Brown coal
- Wolfram
- White tin
- Fluor spar
- Copper
- Salt

Power Station
- Thermoelectric: Diesel station

Rural agriculture
- Meat and milk farm cattle for Sainoo
- Meat and milk farm cattle for Baigan Khoroliy
- Cattle sheep farm fodder Khangay Khavtgai
- Cattle sheep farm on the Dornod pasture
- Big Lake Depression cattle farm
- Camel goat and sheep breedings Gobi
- Border zones
- Sea Routes

CONVENTIONAL SIGN

CAPITAL AND ADMINISTRATIVE
- ULAANBAATAR Capital of the MPR
- DUNDORKHAAN Centres region (provinces)
- Centres districts
- from 30 000 to 100 000 inhabitants
- from 10 000 to 30 000 inhabitants
- from 3000 to 10 000 inhabitants
- under 3000 inhabitants

BOUNDARIES
- International Boundary of the MPR
- Boundary of the provinces

COMMUNICATIONS
- Railways
- Motor Highways and Motor Roads
- Main Roads, Passes
- Other

River, Depths in meters
Subsiding river
Dry Courses (wadi)
Lakes fresh and Lakes salt
Lakes seasonal
Well, Spring
Swampes or Marshes Saltpans
Sands
Heights above Sea Level in meters
Eternal Snows and Glaciers
Ancient Embankments
Caves

SCALE 1:9 000 000
DEPTH AND HEIGHT SCALE IN METERS

MAP OF THE NATIONEL ZONES

- Mountain zone
- Forest and steppe zone
- Govi zone
- Forests
- Subtaiga zone
- Steppe zone
- Desert zone
- Sands

Scale 1:12 000 000

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

1. General

This report covers the Feasibility Study for the target projects of which were selected from the short term plan up to 2008 of the Master Plan Study.

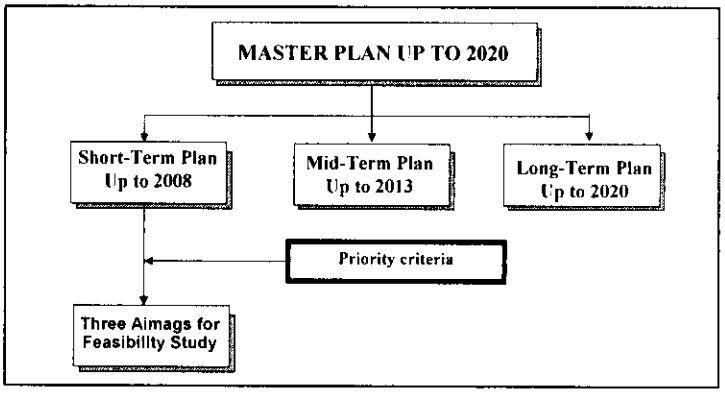
2. Selection of Priority Projects for Feasibility Study

For the selection of priority projects, Regions, Aimags and Sums were studied and analysed in consideration of national development policy. Major criteria for the prioritisation of Aimag in Region were as:

(a) Development Needs and Potentials for Rural Development.
(b) Economic Indicators of Rural Areas.
(c) Technical Factors in Sums.

Through prioritisation procedure of Aimag in Region, three Aimags were selected for the feasibility study finally, that is, Uvurkhangai, Selenge, and Darkhan-Uul. In succession to the Aimag selection, Sums were selected under the criteria as:

- Comprehensive analysis and evaluation of Sums,
- Priority evaluation of Sums by PTA.
- Planned Inter-Sum centres.
- Demand in 2020.



Sums selected for the feasibility study are:

Uvurkhangai:

Bayan-Undur, Burd, Bat-Ulzii, Bayangol, Esunzuil, ZB Ulaan, Nariinteel, Sant, Uyanga, Khujirt, and Kharkhorin. (Total 10 Sums).

Selenge and Darkhan-Uul:

Altanbulag, Eruu, Zuunburen, Tsaganuur, Shaamar, Sant, Orkhontuul, Khutul, Zuunkharaa, Bayangol (Baruunkharaa), Tunkhel, Sharingol. (Total 12 Sums).

3. Demand Forecast

All Sum centres in Uvurkhangai, Selenge, and Darkhan-Uul were the objects of the microscopic demand forecast, though Bag areas were excluded. The microscopic demand was forecast based on the data collected from sample households, public organisations, and business companies in selected Sum centres, in addition to the statistic data obtained through the study. The demand forecast counted on the number of existing subscribers, waiting applicants, unexpressed demand, and that which could shift from mobile demand.

Table 3-1 Demand Forecast

Aimag	Macro Demand Forecastr		Micro Demand Forecast	
	Demand in 2020	Density	Demand in 2020	Density
Uvurkhangai	4,444	0.18	4,931	0.19
Selenge	5,359	0.06	6,628	0.08
Darkhan Uul	1,765	0.1	1,862	0.1
Total	11,568	0.09	13,420	0.1

4. Scope of Project

The Feasibility Study is focused to design the Sum centre network and links to connect them with Uvurkhangai, Selenge, and Darkhan-Uul Aimag centre. The plan is established under the conditions that the proposed expansion and improvement be realised solely as part of MT network which is possessed by PTA.

Table 4-1 Main Scope of Project

Items		Facilities	Quantities
Switching System		Number of Exchanges	22
		Line Unit	6,580
Transmission System	Optical Fibre System	Cable Length (km)	9.4
		Multiplessor	8
	Mincrowave System	Number of Links	44
Access System	Wired System	Number of Exchanges	18
		Cable Pairs	4,450
	Wireless System	Number of Exchanges	4
		Number of Cell Stations	20
IT Services	IT Spot	Number of Spots	22

5. Project Cost

Project cost is estimated as follows.

(in US$ 1,000)

Items		Total Cost	Foreign Currency Portion	Local Currency Portion
Switchin System		2,062	2,057	5
Transmission System	Optical Fibre System	609	521	88
	Microwave System	4,927	4,285	642
Access System	Wiered System	1,764	1,273	491
	Wireless System	2,743	2,652	91
Power Plant		243	216	27
IT Services		248	0	248
Contingency		630	550	80
Consultancy Fee		1,008	1,008	0
Total		14,234	12,562	1,672

6. Financial Evaluation

The evaluation is done under the assumptions that a) project evaluation period is 2005 to 2020 (16 years), consisting of one year of "construction" and 15 years of "operations; b) all revenues and costs are expressed at the fixed prices at the end of 2001; and c) exchange rate is fixed at Tugrug 1,102 for one U.S. Dollar (at the end of 2001).

In the base case analysis, Financial Internal Rate of Return on Investment (FIRROI) is 2.197%. Dramatic improvements both in cash flow and profitability are brought about in contrast with the Master Plan. The single year cash flow would be positive every year of operations. Positive profit would be realised in the 7th year of operations. Financial self-sufficiency would be achieved in the 10th year of operations. Theses figures clearly indicate financial soundness of the project. Although the value of FIRROI is not much different from that of the Master Plan, total difference exists in substance. Subsidies would be necessary for 6 years, but the total amount would be as small as 600,000 U.S. dollars. If the subsidies are disbursed from the Universal Service Obligations Fund, a discounted front-end lump sum payment can be adopted to minimise the amount of subsidies.

In the sensitivity analysis, when revenues increase by 10% including adjustment of tariffs, FIRROI would be 3.249%, bringing financial self-sufficiency in the 4th year of

operations. The total subsidies would be decreased to 100,000 U.S. dollars. When capital investment is decreased by 15%, FIRROI would become 3.665% and the project would show positive profit for the whole operation period, making subsidy unnecessary

7. Implementation Plan

The implementation plan shown below is a quick case example of JICA project. The implementation period in normal case and other than JICA needs longer than the quick case. Figure 7-1 shows an example of overall implementation schedule of quick case.

Stage	Ref. No.	Major Items	Year	2002				2003				2004				2005				2006			
			Quarter	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
I	**JICA Master Plan Study Stage**																						
	1	Master Plan Study			■	■	■	■															
	2	Feasibility Study				■	■	■															
II	**Project Preparation Stage**																						
II-1	Application for Donor					■																	
II-2	Selection of Consultant (by JICA)																						
	1	Invitation to Tender to Consultant						■															
	2	Selection of Consultant						■															
	3	Signature of Consulting Services Agreement						■															
II-3	Basic Design (by Finance of JICA)																						
	1	Basic Design								■													
	2	Budget Estimate									■												
II-4	Exchange of Notes											■											
II-5	Consulting Services Agreement with PTA												■										
II-6	Detailed Design and Selection of Contractor																						
	1	Detailed Design											■										
	2	Documents for Invitation to Tender											■										
	3	Selection of Contractor												■									
	4	Signature of Project Contract												■									
III	**Construction and Installation Stage**																						
	1	Detailed Design by Contractor												■	■								
	2	Manufacturing of Goods and Materials												■	■	■	■						
	3	Factory Inspection of Goods and Materials													■	■	■						
	4	Delivery and Shipment													■	■	■						
	5	Construction and Installation													■	■	■	■	■				
	6	Acceptance Test																■	■				
	7	Completion of Project																	■				

Figrue 7-1 An example of Overall Implementation Schedule

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Acronyms

A

AC	: Alternating Current
ADB	: Asian Development Bank
ADM	: Add-Drop Multiplexer
ADPCM	: Adaptive Differential PCM
ADS	: Active Double Star
ADSL	: Asymmetric Digital Subscriber Line
AHEC	: Agency Hygiene and Epidemiological Control
AMA	: Automatic Message Accounting
AMPS	: Advanced Mobile Phone Service
AN	: Access Node
AP	: Affordability Parity
ATC	: Automatic Telephone Station
ATIS	: Automatic Terminal Information Service
ATM	: Asynchronous Transfer Mode

B

B-ISDN	: Broad-band Integrated Services Digital Network
BOT	: Build, Operate and Transfer
BRI	: Basic Rate Interface
BRS	: Base Radio Station
BSC	: Base Station Controller
BSMS	: Base Site Management System
BTS	: Base Transceiver Station

C

CAD	: Computer Aided Design
CAGR	: Compounded Annual Grown Rate
CAP	: Carrierless Amplitude/Phase Modulation
CAPEX	: Capital Expenditure
CATV	: Cable Television Service or Cable Television System
CBR	: Constant Bit Rate
CC	: Country Code
CCP	: Cross-Connection Point
CCR	: Call Completion Rate
CCS	: Common Channel Signalling
CCT	: Circuit
CDMA	: Code Division Multiple Access

CDR	: Call Data Recording
Ch	: Channel
CIC	: Carrier Identification Code
CIF	: Cost, Insurance and Freight
CLR	: Circuit Loudness Rating
CMTS	: Cellular Mobile Telephone Service
CO_2	: Carbon Dioxide
C/P	: Counterpart
CPE	: Customer Premises Equipment
CPI	: Consumer Price Index
CPM	: Critical Path Method
CR	: Calling Rate
CRC	: Communications Regulatory Commission
CRE	: Corrected Reference Equivalent
CS	: Cell Station
CSS	: Customer Service System
CT	: Central Terminal
CTC	: Community Telephone-service Centres
CUG	: Closed User Group

D

DAMA	: Demand Assigned Multiple Access
D-AMPS	: Digital AMPS
DC	: Direct Current
DCF	: Discounted Cash Flow
DCME	: Digital Circuit Multiplex Equipment
DCN	: Data Communications Network
DDD	: Domestic Direct Dialling or Distant Direct Dialling
DDF	: Digital Distribution Frame
DEURAS	: Detect Unlicensed Radio Station
DF/R	: Draft Final Report
DG	: Diesel Generator
D/L	: Distribution Line (Power)
DLC	: Digital Loop Carrier
DMT	: Discrete Multi-Tone
DNC	: Destination Network Code
DP	: Distribution Point
DRCS	: Digital Radio Concentration System
DSMX	: Analogue-Digital Conversion system

	DSP	: Digital Signal Processing
	DTMF	: Dual-Tone Multi-Frequency Signalling
E		
	E-10B	: Type of Switch of Alcatel in France
	EA	: Energy Authority of Mongolia
	EAP	: Economically Active Population
	EC	: Electronic Commerce
	EC	: Exchange Code
	EIA	: Environmental Impact Assessment
	EIRR	: Economic Internal Rate of Return
	Erl	: Erlang
	ERMES	: European Radio Message System
	ES	: Erred Second
	ESR	: Erred Second Ratio
	EU	: European Union
	EWSD	: Type of Switch of Siemens in German
	Ex.	: Telephone Exchange
F		
	FDI	: Foreign Direct Investment
	FDMA	: Frequency Division Multiple Access
	FIFTA	: Foreign Investment and Foreign Trade Agency
	FIRR	: Financial Internal Rate of Return
	FIRROI	: Financial Internal Rate of Return on Investment
	FIRROE	: Financial Internal Rate of Return on Equity
	FM	: Facilities Management
	FOB	: Free On Board
	F/R	: Final Report
	F/S, FS	: Feasibility Study
	FTR	: File Transfer Protocol
	FTTC	: Fibre-To-The-Curve
	FTTH	: Fibre-To-The-Home
	FTTO	: Fibre-To-The-Office
	FTTZ	: Fibre-To-The-Zone
	FWA	: Fixed Wireless Access
	FY	: Fiscal Year
G		
	GDP	: Gross Domestic Product
	GMSK	: Gaussian Filtered Minimum Shift

GNI	: Gross National Income
GNP	: Gross National Product
GOJ	: Government of Japan
GOM	: Government of Mongolia
GOS	: Grade of Service
GRDE	: Gross Regional Domestic Expenditure
GRDP	: Gross Regional Domestic Product
GSM	: Global System for Mobile Communications
G/T	: Gain/Temperature
GTZ	: Gesellshaft fuer Technische Zusammen
GW	: Gateway

H

HDI	: Human Development Index
HDSL	: High-bit-rate Digital Subscriber Line
HDTV	: High Definition Tele Vision
HF	: High Frequency
HLR	: Home Location Register
HRD	: Human Resource Development
HRX	: Hypothetical Reference Configuration
HSD	: High Speed Digital Transmission Service
HSDLC	: High Speed Digital Leased Circuits Service

I

IAP	: Internet Access Provider
IBO	: Input Back Off
IC	: Incoming
ICP	: Internet Content Provider
IC/R	: Inception Report
ICT	: Information and Communication Technology
IDC	: Insulation Displacement Contact
IDD	: International Direct Dialling
IDR	: Intermediate Digital Record
IMF	: International Monetary Fund
IMT-2000	: International Mobile Telecommunications 2000
IN	: Intelligent Network
INMARSAT	: International Maritime Satellite Organisations
INTELSAT	: International Telecommunications Satellite Organisations
INTERIX	: Internet Index
INTERSPUTNIK	: International Organisation of Space Communications

INTS	: International Transit Switch
IP	: Internet Protocol
IRR	: Internal Rate of Return
ISC	: International gateway Switching Centre
ISDN	: Integrated Service Digital Network
ISMC	: International Switching Maintenance Centre
ISO	: International Standardization Organisation
ISP	: Internet Service Provider
IT	: Information Technology
ITMC	: International Transmission Maintenance Centre
IT/R	: Interim Report
ITS	: Integrated Transceiver System
ITSP	: Internet Telephony Service Provider
ITU	: International Telecommunications Union
ITU-T	: International Telecommunications Union Telecommunications Standardization Sector

J

JBIC	: Japan Bank of International Cooperation
JEC	: Standard of the Japanese Electro-technical Committee
JEM	: The Standard of Japan Electrical Manufacture Association
J/V	: Joint Venture
JICA	: Japan International Cooperation Agency
JIS	: Japanese Industrial Standard
JP, JP¥	: Japanese Yen
JTEC	: Japan Telecommunications Engineering and Consulting Service

K

KfW	: Kreditanstale for Wiederanfbau
KT	: Korean Telecom

L

LAN	: Local Area Network
LDC	: Less Developed Country
LE	: Local Exchange
LLDC	: Least among Less Developed Country
LR	: Loudness Rating
LRE	: Low Rate Encoding
LSMS	: Living Standard Measurement Survey
LTM	: Local Tandem Switch

M

MAP21	: Mongolian Action Program for the 21th Century
MC	: Maintenance Centre
MCAC	: Mongolian Communications Asset Company
MDC	: Mongolian Data Company
MDF	: Main Distribution Frame
MH	: Manhole
MIX	: Mongolia Internet Exchange
MOFA	: Ministry of Food and Agriculture
M/M	: Minutes of Meeting
MNDP	: Mongolian National Democratic Party
MOBIX	: Mobile Index
MOECS	: Ministry of Education, Culture and Science
MOFA	: Ministry of Food and Agriculture
MOFE	: Ministry of Finance and Economics
MOH	: Ministry of Health
MOI	: Ministry of Infrastructure
MOID	: Ministry of Infrastructure Development (ex-MOI)
MOIT	: Ministry of Industry and Trade
MONE	: Ministry of Nature and Environment
MOSSL	: Ministry of Social Safety and Labour
MOSTEC	: Ministry of Science, Technology, Education and Culture
MOT	: Ministry of Telecommunications (ex-MOI)
MOT	: Ministry of Telecommunications
MOTB	: Mongolian Tourism Board
MP, M/P	: Master Plan or Master Plan Study
MPHPT	: Ministry of Public management, Home Affairs, Posts and Telecommunications of Japan
MRC, MRZ	: Mongolian Railway Company
MRTC	: Ministry of Roads, Transport and Communications
MRTV	: Mongolian Radio and Television
MS	: Mobile Station
MS	: Multiplex Section
MSC	: Mobile service Switching Centre
MSDP	: Mongolian Social Democratic Party
MSU	: Main Switch Unit
MSU	: Multi Subscriber Unit
MT	: Mini Terminal

MT	: Mongolia Telecom
MTB	: Mongolian Tourism Board
MTC	: Mongolian Telecommunications Company
MTBF	: Mean Time Between Failure
MTSPS	: Mongolian Telecommunications Sector Policy Statement
MTP	: Message Transfer Part
MW	: Microwave System

N

NCC	: New Common Carrier
NCSM	: national Centre for Standardisation and Meteorology
NDC	: National Destination Code
NDF	: Nordic Development Fund
NE	: Network Element
NEAX-61	: Type of Switch of NEC in Japan
N-ISDN	: Narrow-band Integrated Services Digital Network
NMS	: Network Management System
NMC	: National management Centre
NORAD	: Norwegian Agency for Development Co-operation
NOx	: Nitrogen Oxide
NP	: Network Performance
NPV	: Net Present Value
NSO	: National Statistical Office of Mongolia
NTC	: National Transit Centre
NTT	: Nippon Telegraph and Telephone Corporation

O

OAM	: Operation, Administration and Maintenance
OAN	: Optical Access Network
OBO	: Output Back Off
ODA	: Official Development Assistance
ODF	: Optical Distribution Frame
OECD	: Organisation of Economic Cooperation Development
OECF	: Overseas Economic Cooperation Fund
OFC	: Optical Fibre Cable
OFTS	: Optical Fibre Transmission System
OG	: Outgoing
OJT	: On-the-Job Training
OLR	: Overall Loudness Rating

OLT	: Optical Line Termination
OM, O&M	: Operation and Maintenance
OMC	: Operation and Maintenance Centre
ONT	: Optical Network Termination
ONU	: Optical Network Unit
OPEX	: Operating Expenditure
OPMC	: Outside Plant Maintenance Centre
OPS	: Optical Power Splitter
OQPSK	: Offset Quadrature Phase Shift Keying
OS	: Operation System
OSI	: Open System Interconnection
OSP	: Outside Plant

P

PABX, PBX	: Private Automatic Brach Exchange or Private Branch Exchange
PAP	: Poverty Alleviation Program
PC	: Personal Computer
PC	: Primary Centre
PCI	: Pacific Consultants International
PCM	: Pulse Code Modulation
PCM	: Project Cycle Management
PDC	: Personal Digital Cellular
PDH	: Plesiochronous Digital Hierarchy
PDS	: Passive Double Star
PHS	: Personal Handy-phone System
PMP, P-MP	: Point-to-Multi Point
POI	: Point Of Interface
PON	: Passive Optical Network
POTS	: Plain Old Telephone Service
PTP	: Point-to-Point
PPP	: Purchasing Power Parity
P/R	: Progress Report
PRC	: Primary Reference Clock
PRI	: Primary Rate Interface
PSC	: Provisional Switching Centre
PSTN	: Public Switched Telephone Network
PTA	: Post and Telecommunication Authority of Mongolia

	PV	: Photovoltaic
	PVC	: Permanent Virtual Circuit
Q		
	QA	: Q Adapter
	QOS	: Quality of Service
	QPSK	: Quadrature Phase Shift Keying
R		
	RE	: Reference Equivalent
	RLR	: Receive Loudness Rating
	RMC	: Regional Management Centre
	RR	: Radio Regulation
	RSU	: Remote Subscriber Unit
	RT	: Remote Terminal
	RU	: Repeater Unit
S		
	SASE	: Stand Alone Synchronization Equipment
	SCF	: Standard Conversion Factor
	SCPC	: Single Channel Per Carrier
	SCR	: Successful Call Rate
	SCR	: Subscriber Radio System
	SDH	: Synchronous Digital Hierarchy
	SDM	: Space Division Multiplexing
	SDSL	: Symmetric Digital Subscriber Line
	SDX-RB	: Type of Switch in Korea
	SE	: Secondary Centre
	SES	: Severely Erred Second
	SESR	: Severely Erred Second Ratio
	SFD	: Saturation Flux Density
	SIM	: Subscriber Identity Module
	SINPO	: SINPO (Signal Interference Noise atmospheric Propagation disturbance Overall readability) Code
	SL	: Subscriber Line
	SLA	: Service Level Agreement
	SLIC	: Subscriber Line Interface Circuits
	SLR	: Send Loudness Rating
	SME	: Small and Medium Enterprise
	SN	: Subscriber Number
	SO	: Service Order

SOHO	: Small Office/Home Office
SOx	: Sulphuric Oxide
SS	: Single Star
SSC	: Secondary Switching Centre
SS7	: Signalling System No7
SSU	: Single Subscriber Unit
SSU	: Synchronization Supply Unit
STD	: Subscriber Trunk Dialling
STM	: Synchronous Transfer Mode
STP	: Signal Transfer Point
STP	: Switched Transit Plan
STS	: Site Transmission System
SU	: Subscriber Unit
SUS	: Site Utility System
SV	: Supply Volume
SW	: Switch or Switching
S/W	: Scope of Work
SWOT	: Strength, Weakness, Opportunity and Threat (Analysis)

T

TC	: Trunk Code
TCU	: TDM Control Unit
TDD	: Time Division Duplex
TDM	: Tandem
TDMA	: Time Division Multiple Access
Tg.	: Tugirg (Mongolian Currency Unit)
TLS	: Toll and Local Switch
TMN	: Telecommunications Management Network
TQC	: Total Quality Control
T/R	: Terms of Reference

U

UHF	: Ultra High Frequency
UNDP	: United Nations Development Program
UNESCO	: United Nations Educational , Scientific, and Cultural Organisation
UR	: Unavailability Ratio
USD, US$, US¢	: United States Dollar, United States Cent
UB	: Ulaanbaatar

V

	VAT	: Value Added Tax
	VBR	: Variable Bit Rate
	VDSL	: Very high-bit-rate Digital Subscriber Line
	VDU	: Visual Display Unit
	VHF	: Very High Frequency
	VGT	: Voice Grade Transmission Service
	VLR	: Visitors' Location Register
	VOD	: Video On Demand
	VoIP	: Voice-over-IP
	VPN	: Virtual Private Network
	VSAT	: Very Small Aperture Terminals
W		
	WAC	: WLL Access Controller
	WAN	: Wide Area Network
	WAP	: Wireless Application Protocol
	W-CDMA	: Wide-band Code Division Multiple Access
	WCS	: WLL Cell Station
	WDM	: Wavelength Division Multiplexing
	WLL	: Wireless Local Loop
	WP	: Working Paper
	WRC	: World Radio communication Conference
	WS	: Work Station
	WSU	: WLL Subscriber Unit
	WTO	: World Trade Organisation
	WTX	: Wireless Telephone Exchange
	WWF	: World Wide Fund for Nature Conservation
	WWW	: World Wide Web
X		
	XB	: Crossbar Switch
	xDSL	: Digital Subscriber Line
Y		
Z		
	ZUD	: Natural Disaster

CHAPTER 1

INTRODUCTION

CHAPTER 1

INTRODUCTION

1.1 Background of the Priority Projects

1.1.1 General

Recognising that the rural telecommunications network development is essential to improve such basic needs of life as education, medical care, etc., and in consideration of the gap found between the urban and rural areas, the Government of Mongolia intends to establish a telecommunications network which could contribute to life level improvement in the rural areas and the local economic development. The rural telecommunications network development is an important theme of the country to be placed under the international assistance.

The network in the rural areas, especially those of the level lower than the capital Ulaanbaatar and Aimag centres, remains intact. The telecommunications facilities are composed of aged analogue switches, microwave radio links, and open wires transmission links introduced by Russia in 1980's. The poor quality of communication of such telecommunications facilities could be a reason bringing about isolation from modern society. The telephone line density in the rural areas was only 2.27 lines per 100 inhabitants as of December 2001 (except for the capital Ulaanbaatar and major cities of Darhan Uul, Orhon, Baganuur and Nalaikh) and the mobile telephone was not available there at all.

Mongolia is a vast country with sparse population. Commercial investment to the rural areas is very difficult, even latest technologies are applied, for such conditions. It is essential for the Government of Mongolia, where it wishes to realise the development of the telecommunications network in such rural areas as a long term target, counts on the possibility of various funding schemes including state expenditure, international loan, and/or contribution of monopolised operator.

In such context, the Government of Mongolia requested the Government of Japan to conduct a master plan study for development of rural telecommunications network which covers the whole rural areas of the country, and contributes to the development in the rural areas. In reply to the request, JICA dispatched a preliminary study team in September 2001 and concluded Scope of Work and Minutes of Meeting.

1.1.2 Objectives of the Study

The objectives of this Master Plan Study are categorised into Phase-I and Phase-II Studies as follows:

- **Phase-I Study**
  To formulate a long-term plan up to the year 2020 for the development of the rural telecommunication system covering the whole Mongolian territory.

- **Phase-II Study**
  To conduct a feasibility study on the priority project(s) identified in consequence of the Phase-I Study.

This Volume-III of the Study Report covers a Feasibility Study for priority projects in three (3) Aimags selected from an urgent development program in the Master Plan for the development of telecommunications networks in Mongolia up to the year 2020. The priority projects aim to be completed by the year 2008. The feasibility study as Phase-II Study has been carried out in accordance with the work plan and schedule of the study which were discussed and agreed upon between MOI/PTA and JICA. The study work has been done both in Mongolia and in Japan. The major items of the feasibility study are referred to in the following:

<u>The Feasibility Study in Mongolia (1 September - 30 October 2002)</u>

(a) Explanation and discussion of the Interim Report;
(b) Decision of objective priority projects for feasibility study;
(c) Collection of data and information regarding priority projects from a view of both technical and socio-economic points;
(d) Field survey for objective priority projects;
(e) Preparation of scope of work for objective priority projects;
(f) Preparation of a working paper of basic conditions and basic facilities design for feasibility study;
(g) Explanation and discussion of scope of work for objective priority projects; and
(h) Technology transfer through field survey and project basic design.

<u>The Feasibility Study in Japan (15 November - 28 November 2002)</u>

(a) Technical specifications for projects;

(b) Operation and maintenance plan required for facilities after completion of feasibility study projects;
(c) Manning plan required for facilities after completion of feasibility study projects;
(d) Organization plan required after completion of feasibility study projects;
(e) Financial plan for feasibility study projects;
(f) Evaluation of feasibility study projects;
(g) Implementation programme of urgent need projects;
(h) Preparation of human resources development plan;
(i) Recommendations; and
(j) Preparation of the Draft Final Report consisting of master plan and feasibility study.

1.2 Selection of Priority Projects for Feasibility Study

1.2.1 Selection of Priority Projects

In the Phase-I Study for preparing a Master Plan, a project implementation plan up to the year 2020 was prepared. The project implementation plan consists of short-term, medium-term and long-term plans. The priority projects for the feasibility study were selected from the short-term plan as an urgent programme consisting of projects in 21 Aimags, which aims to meet rapidly growing telephone demand and to catch up 100% fulfilment to the waiting demand in the top priority Sums by the year 2008. The details of the project formation and selection of the priority projects for the feasibility study are referred to in Chapter 16 of Volume-II. The following figures 1.2-1 shows a flow of project formation:

1.2.2 Priority Projects and Projects Site Selected for Feasibility Study

Through the discussion between MOI/PTA and JICA Study Team in the beginning of September 2002, it was agreed that the feasibility study for the rehabilitation and expansion of the rural telecommunications system was conducted in the following Aimags during the Second Study in Mongolia:

(a) Uvurkhangai;
(b) Selenge; and
(c) Darkhan-Uul

Selection of Uvurkhangai Aimag was the top Aimag as the result of the rural development priority in Chapter 16 of Volume-III. Selection of Selenge and Darkhan-Uul Aimags was the top Aimags as the urgent rural development needs such as the mergence of two Aimags, the establishment of free trade zone, the biggest granary area in Mongolia, the utilisation of the existing digital microwave and optical fibre cable system.

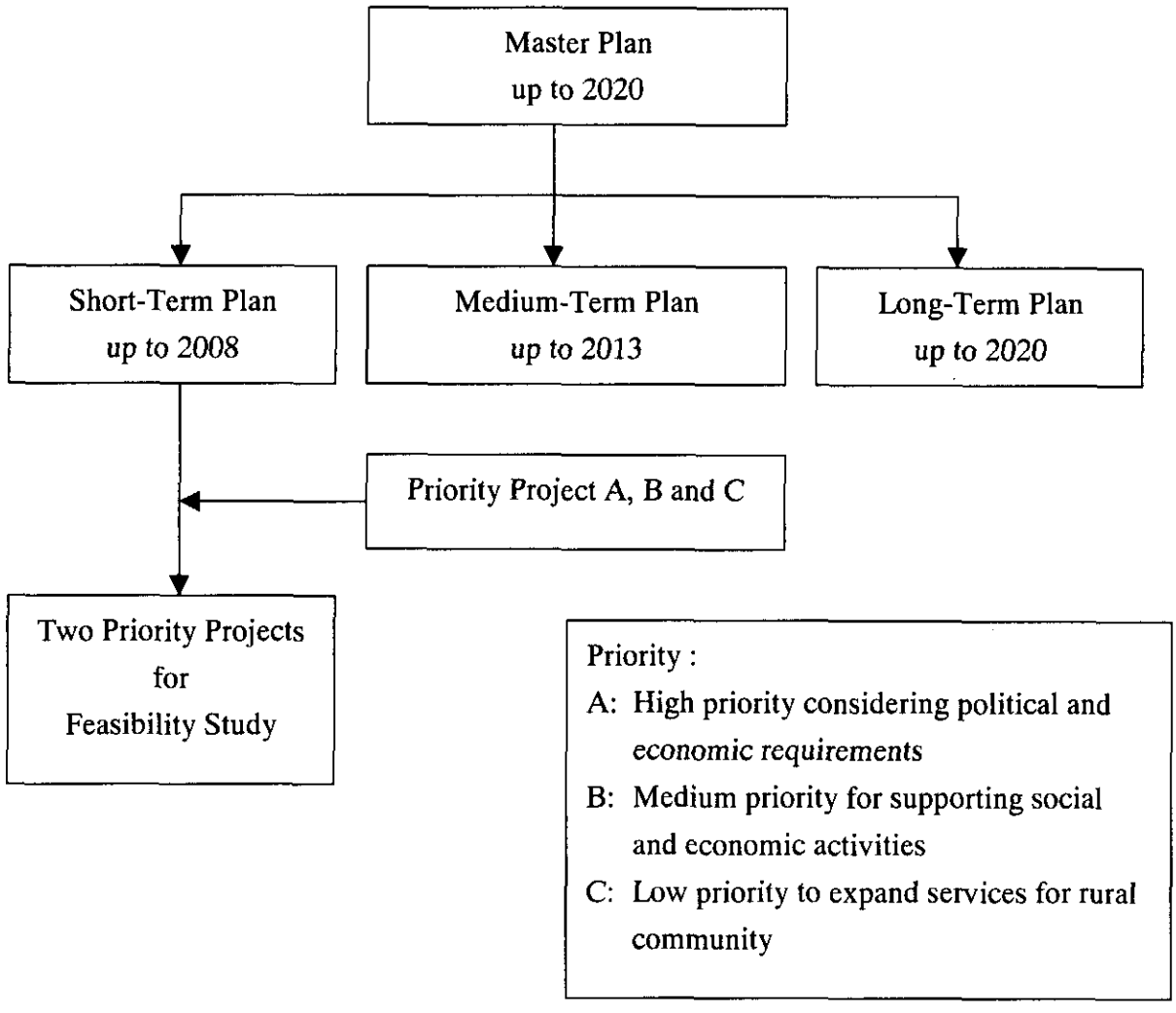

Figure 1.2-1 A Flow of Project Formation

1.3 Precondition of the Feasibility Project

1.3.1 General

Up the present, private participation in the telecommunications services has been promoted in Mongolia. In addition, the fixed telephone services, the mobile telephone services and the international telecommunications services are opened to private operators under the telecommunications policy in Mongolia. In those circumstances, there will be

difficulty to make detailed planning and design in the feasibility study without any precondition, because the network configuration and supply volume, etc., will be unforeseeable depending on business strategies of respective private operators. Accordingly this feasibility study is carried out in consideration of the following:

- Participation of Fixed, WLL (Wireless Local Loop), Mobile, International Telecommunications and Internet Services Private Operators
- Microscopic Demand Forecast for Feasibility Study

1.3.2 Impacts by Participation of Private Operators

By participation of fixed, WLL, mobile, international telecommunications, Internet services private operators, the feasibility study is carried out taking into account:

(a) Quicker network expansion by both PTA/MT and private operators will bring higher telephone DEL supply speed.
(b) The higher supply speed will bring more expressed demand by activating suppressed demand.
(c) By sound competition among PTA/MT and private operators, including mobile telephone operators, international telecommunications operators, and Internet services providers, various qualities service will be much improved.
(d) Corporate efficiency of PTA/MT will be much improved by the competition.
(e) A burden for the Government in the telecommunications sector will be reduced.

Considering the above, this feasibility study is carried out on condition that the future telephone demand consists of satisfied demand (DEL) + registered waiters + suppressed demand.

1.3.3 Microscopic Demand Forecast for Feasibility Study

By participation of fixed, WLL, mobile, international telecommunications, Internet services private operators, the feasibility study is carried out on condition that:

(a) Telephone demand forecast obtained from the microscopic demand forecast approach, which basic data collection was carried out by individual enquiries and answers through site survey, was used for the facilities planning under the feasibility study.

(b) The mobile telephone demand in Sum centres during un-available mobile telephone services period was shifted into the fixed telephone demand.

(c) WLL demand in Sum centre was considered as a part of the fixed demand forecast, because WLL services is limited in the capital city only.

(d) The demand forecast in some Sum centres, in which MT withdrew, was not considered in the facilities planning under the feasibility study.

1.4 Work Schedule for the Feasibility Study

1.4.1 Overall Time Schedule

The Study period consisting of Phase-I and Phase-II Study is from the end of March 2002 up to the middle of February 2003. The time schedule of this Study is shown in Table 1.4-1. The feasibility study was carried out in the period of the Second Study in Mongolia and the Second Work in Japan.

Table 1.4-1 Work Schedule of the Study

Study Stages	2002					2003
First Study in Mongolia	3.5M					
First Work in Japan		2M				
Second Study in Mongolia			2M			
Second Work in Japan				1.5M		
Discussion of Draft Final Report					2W	
Preparation of Final Report						1.5M
Submission of Report	IC/R P/R		IT/R W/P		DF/R	F/R

IC/R: Inception report
P/R: Progress Report
IT/R: Interim Report
DF/R: Draft Final Report
F/R: Final Report

M: Months
W: Weeks

1.4.2 Progress in the Second Study in Mongolia

During the Second Study in Mongolia from September 1 to October 30, 2002, the Study Team carried out the following work together with counterparts:

(a) Explanation and discussion of Interim Report submitted from the study team;

(b) Selection of priority projects for feasibility study

(c) Collection of data and information for feasibility study;

(d) Field survey for priority projects selected for feasibility study;

(e) Preparation of a working paper of basic conditions and basic facilities design for feasibility study and outline of project scope;
(f) Technology transfer through field survey and project basic design;
(g) Explanation and discussion of basic conditions of feasibility study and outlines of project scope.

1.4.3 Progress in the Second Work in Japan

During the Second Work in Japan from November 15 to November 28, 2002, the Study Team prepared a draft final report consisting of a master plan and feasibility study. The Study Team carried out the following work:

(a) Modification of the master plan submitted as Interim Report;
(b) Basic design and cost estimate for the priority project selected for the feasibility study;
(c) Evaluation of the objective priority projects selected for the feasibility study;
(d) Preparation of a draft final report consisting of a master plan study and feasibility study.

1.5 The Study Team and the Parties Concerned

1.5.1 JICA Study Team

JICA Study Team members participated in the Second Study in Mongolia are listed in the following Table 1.5-1.

1.5.2 Counterpart from Mongolian Side

Counterparts from Mongolian side officially assigned and participated in this Study are listed in the following Table 1.5-2. In addition, many officers other than mentioned in the table below have co-operated to the study team through the study period.

1.5.3 JICA Advisory Committee

Member of JICA advisory committee and project officers of JICA Headquarters are listed in the following Table 1.5-3 and 1.5-4, respectively.

Table 1.5-1 List of JICA Study Team Members

Name of Member	Duty-in-charge	Belonging to
Mr. MITSUHASHI Hideo	Team Leader, Telecommunication Services	JTEC
Mr. KUBO Katsuhei	Socio-Economic and Financial Analysis	JTEC
Mr. KUSANO Makine	Rural Development	PCI
Mr. UCHIYAMA Suzuo	Demand Forecast	JTEC
Mr. ISHIHARA Yasuo	Network Planning, Traffic Forecast, Switching System	JTEC
Mr. ISHIGAKI Hideaki	Radio System, International Facility Plan, Radio Frequency Management	JTEC
Mr. OKAMOTO Masazumi	Outside Plant Plan (Cable Work, Civil Work and Subscriber Terminal)	JTEC
Mr. HOSODA Tomio	Transmission Network Plan, Transmission Facility Plan	JTEC
Mr. KASAI Takashi	Power Plant Facility Plan	PCI
Mr. MIHARA Noboru	IT Network Plan, IT Demand Forecast	PCI
Mr. MARUYAMA Iwao	Operation and Maintenance Plan	JTEC
Mr. TANAKA Makoto	Organisation and Management Plan, Human Resource Development Plan, Institute Issue	JTEC
Mr. NEGISHI Yukio	Administrative Support	JTEC
Ms. ABIKO Sanae	Interpreter	JTEC

Note: JTEC: Japan Telecommunications Engineering and Consulting Services
PCI: Pacific Consultants International

Table 1.5-2 List of JICA Advisory Committee Members

Name	Duty-in-charge	Affiliated to
SHIOYA Junichi	Chairman Telecommunication Policy	Deputy Director, International Cooperation Division, Telecommunications Bureau, Ministry of Public Management, Home Affairs, Posts and Telecommunications
ISHIZUKA Hiroshi	Member Rural Communication Plan	Assistant Director, Technology Policy Division, Information and Communications Policy Bureau, Ministry of Public Management, Home Affairs, Posts and Telecommunications

Table 1.5-3 List of Project Officers of JICA Headquarters

Name	Duty-in-charge	Affiliated to
ENDO Hiroaki	Project Officer	Second Development Study Division Social Development Study Department, Japan International Co-operation Agency
OKUDA Hisakatsu	Project Officer	Second Development Study Division Social Development Study Department, Japan International Co-operation Agency

Table 1.5-4 List of Counterparts

Duty-in-charge	Name	Affiliated to
Chairman (Leader)	Mr. N. Nansaljav	PTA
Socio-Economic and Financial Analysis	Mr. T. Ganbat Mr. N. Norovjav	PTA PTA
Rural Development	Mr. D. Naranbayar Ms. N. Bolormaa	MT PTA
Demand Forecast	Mr. Ts. Usukhbayar	PTA
Network Planning, Traffic Forecast, Switching System	Mr. N. Bilgee Mr. B. Davaatseren	PTA PTA
Radio System, International Facility Plan, Radio Frequency Management	Mr. M. Naranbaatar	CRC
Outside Plant Plan (Cable Work, Civil Work and Subscriber Terminal)	Ms. Uugantsetseg Mr. S.Tugsbileg	PTA PTA
Transmission Network Plan, Transmission Facility Plan	Mr. N. Baatarsuren Mr. Ch. Davaajav	PTA PTA
Power Plant Facility Plan	Mr. D. Agchbayar	PTA
IT Network Plan, IT Demand Forecast	Mr. Ch. Zolbayar Mr. G. Enkhbayar	PTA PTA
Operation and Maintenance Plan	Mr. T. Ochir Mr. D. Tserenchimed	PTA PTA
Organisation and Management Plan, Human Resource Development Plan, Institute Issue	Mr. Ts. Bold Mr. B. Amgalanbat	PTA MOI

Table 1.5-5 List of Attendees Who Made Comments

Name	Affiliated to	Duty in Charge
Mr. G. Basanjav	MOI	Director, Policy and Coordination Department of Road, Transport, Information, Communication and Tourism (PCDRTICT)
Mr. N. Naranmandakh	MOI	Senior Officer, PCDRTICT
Mr. G. Battur	PTA	General Director
Mr. B. Davaastseren	PTA	Deputy Director General
Mr. O. Battogtokh	CRC	Deputy Director General
Mr. B. Baatar	CRC	Director
Ms. U. Tamir	CRC	Director
Mr. M. Mend-Ochir	CRC	Director
Mr. N. Bolor	MT	Technical Director

Table 1.5-6 List of Members of Scientific and Technical Council of Communication Sector (Non-executive) /STCCS/

Name	Degrees	Duty in Charge
Mr. B. Sukhbaatar	Sc. D., Prof, CEng.	Director of STCCS
Mr. Ts. Bold	Ph. D., Assist. Prof.	Secretary of STCCS
Mr. N. Nansaljav	Ph. D., Asisst. Prof., CEng.	Member of STCCS
Mr. G. Tsogbadrakh	Ph. D. Prof., CEng.	Member of STCCS
Mr. B. Damdinsuren	Ph. D., Prof., CEng.	Member of STCCS
Mr. L. Batkhisig	Ph. D., CEng.	Member of STCCS
Ms. G. Bayarsuren	Ph. D.	Member of STCCS
Mr. I. Norovjav	M. Sc.	Member of STCCS

CHAPTER 2

PRESENT STATUS OF TELECOMMUNICATIONS

CHAPTER 2

PRESENT STATUS OF TELECOMMUNICATIONS

2.1 General

The telecommunications network in target area is exploited by MT, MRC, Mobicom, and Skytel. MT provides fixed line telephone service in Aimag centres, Sum centres, and some Bags. MRC provides fixed line telephone service in the settlements along the railway. Mobicom and Skytel provide mobile phone service in the Aimag centres and a few Sum centres. Internet service is available through dial-up connection in Aimag centres and in some Sum exchanges connected through digital inter-exchange link.

All of the Sum centres are provided with telephony service. The number of MT subscriber lines is 3,000 in Uvurkhangai, 3,329 in Selenge, and 5,871 in Darkhan-Uul as of Augutst 2002. Fourty-six (46) MT exchanges were counted in the target three (3) Aimags. Most of them have only several dozen subscriber lines, but Kharkhorin, Zuunkharaa, and Khutul exchanges have several hundred subscriber lines.

The physical transmission network is made up with digital microwave transmission system, optical fibre transmission system, open-wire transmission system, and metallic cables of subscriber access network. The MT switching systems in Aimag centres are digital, and those in Sum centres are mostly analogue and others are digital PBXs.

2.2 Socio-economic Status of the Project Area

(1) General

The project Area, consisting of 10 selected Sums in Uvurkhangai Aimag and 12 selected Sums in Selenge/Darkhan-Uul Aimags area, currently has a total of 3,242 rural telephone subscribers (1,274 in Uvurkhangai and 1,968 in Selenge/Darkhan-Uul) that corresponds to 2.5% of the national base fixed telephone subscribers. This composition ratio, according to the feasibility study plan, would once reach some 3.3% in 2006 taking in those transferred from mobile telephone and would become stabilised at 2.8% in the long-range. The number of telephone subscribers in the project Area would reach 10,410 in 2020, the target year for both of the Feasibility Study and the Master Plan.

Upon reviewing the main issues and development directions of regional and rural development activities being elaborated, formulated or implemented in the country under the policy as approved by the parliament in June 2001 (See Chapter 2 of the Master Plan), the Study Team made a comparative evaluation among the five economic regions and the comprising Aimags in each region on the grounds of rural development potential and key economic factors to support its selection of the candidate sites of the feasibility study having high telecommunications development priority.

As a result, Khangai region, followed by Central region, was selected as the top priority region and Uvurkhangai was ranked at the top priority Aimag concurrently with Arkhangai Aimag, and Selenge Aimag was among the four second ranking Aimags in the Central region.

Socio-economic profiles of the project Area is shown in Table 2.2

(2) Socio-economic profiles

Table 2.2 Socio-economic Profiles of the project Area

	Population 2001			GRDP 2001 Current Price	Household 2001 Sum Centre
	Total Sum	Sum Centre	Other Than S.C.		
	(persons)	(persons)	(persons)	(Tg.mln)	(households)
Uvurkhangai					
Burd	3,896	607	3,289	0	0
Bat-Ulzii	5,750	1,837	3,913	0	649
Bayangol	4,747	896	3,853	98.3	173
Esunzuil	3,820	1,003	2,817	898.4	244
ZB Ulaan	5,106	669	4,437	0	253
Nariinteel	4,279	1,386	2,893	6.1	339
Sant	3,878	730	3,148	8.9	170
Uyanga	7,824	1,343	6,481	679.2	394
Khuzirt	0	0	0	151.7	2,193
Kharkhorin	13,444	8,523	4,921	69.9	3,453
Total	55,645	15,757	39,888		8,025
	100%	28.3%	71.7%		
Selenge/Darkhan-Uul					
khutul	8,755	6,596	2,159	0	2,068
Zuunkharaa	22,304	15,461	6,843	14,036	3,597
Bayangol	5,261	3,580	1,681	2,440	1,182
Tunkhel	3,526	3,526	0	0	710
Shariin gol	8,619	7,722	897	9,778	2,131
Altanbulag	3,812	3,206	606	327.8	710
Eruu	3,130	2,745	655	1,200	681
Zuunburen	2,245	1,998	247	161.3	396
Sant	2,053	1,601	452	62.5	532
Tsuganuur	4,326	3,073	1,253	110.6	976
Orkhontuul	4,002	3,500	502	385.6	878
Shaamar	4,409	3,426	983	144.2	1,030
Total	72,442	56,164	16,278		33,595
	100%	77.5%	22.5%		

2.3 Existing Facilities and Services

2.3.1 Switching System

(1) Uvurkhangai Aimag

The Sum centres are all furnished with telephony service. There are 11 analogue switch units and 7 digital switch units in Uvurkhangai Aimag for the telephony service. Out of the 19 Sum centres, Bayan-Undur is not furnished with switching unit but the telephone service is provided through a distant subscriber line from the Aimag centre. The Bayan-Undur had formerly an analogue switching unit, but it was removed as power was not supplied for a long time and not working.

Total switch capacity is 4,008 lines, including 1,760 lines of Aimag centre, as of September 2002.

Table 2.3.1-1 Switch Capaicty and Line in Use of Uvurkhangai

Aimag/Sum	Switch Capacity	Lines in use
Aimag centre	1,760	1,644
Sum centres	2,248	1,356
Total	4,008	3,000

(2) Selenge and Darkhan-Uul Aimags

The Administrative limit does not coincide completely with the service area of MT Telecomm Centres. Some Sum/Bag centres of Selenge Aimag fall into Darkhan-Uul Telecom Centre service area.

Total number of Sum/Bag centres in Selenge and Darkhan Uul Aimag where the exchange is installed is 22 in total. Telephony service of Tunkhel (Selenge) and Salkhit (Darkhan-Uul) are not provided with MT exchanges, but with MRC exchanges.

The existing Sum switching systems are analogue and digital, that is, 17 analogue units and 5 digital units. Total switch capacity is 11,980 lines, including 8,272 lines of Aimag centre, as of September 2002.

Table 2.3.1-2 Switch Capacity and Line in Use of Selenge/Darkhan-Uul

Aimag/Sum	Switch Capacity	Lines in use
Aimag centre	8,272	7,020
Sum centres	3,709	2,647
Total	11,980	9,427

(3) Aimag Centre Switch

Arvaikheer (Uvurkhangai) Aimag centre switching unit is a digital, which is a product of Germany. It is "SDE", a family of EWSD digital switching system of Siemens. It was installed in 1997 and its capacity is 1,760 subscriber lines. A total of 1,644 subscriber lines are in use and the spare is only 116 lines. The SDE has two (2) 2Mbps links with Ulaanbaatar, one is connected to EWSD and another to E-10B. The SDE is running satisfactorily.

The Arvaikheer Aimag centre switching system capacity shall be expanded synchronising with accommodation of new Sum centre switching units. The existing Aimag centre switching system is almost fully used. It shall be expanded in capacity of inter-exchange circuits, as well as traffic capacity of call handling.

Sukhbaatar (Selenge) Aimag centre switching unit is a digital, which is a product of Germany. It is "SDE", a family of EWSD digital switching system of Siemens. It was installed in 1997 and its capacity is 1,888 subscriber lines. A total of 1,376 subscriber lines are in use and the spare is only 504 lines. The SDE has three (3) 2Mbps links with Ulaanbaatar, that is, to EWSD, E10-B and MRC switch, and one (1) 2Mbps link with Darkhan. The SDE is running satisfactorily.

The Sukhbaatar Aimag centre switching system capacity shall be expanded synchronising with accommodation of new Sum centre switching units. The existing Aimag centre switching system will not be enough to accommodate new switches in Sum centres. It shall be expanded in capacity of inter-exchange circuits, as well as traffic capacity of call handling.

Darkhan-Uul Aimag centre switching unit is a digital, which is a product of Germany. It is "EWSD" digital switching system of Siemens installed in New Darkhan, which has a Remote Switch Unit (RSU) in Old Darkhan. The host and RSU were installed in 1997. The host switch capacity is 4,384 subscriber lines and that of RSU is 2,000 subscriber lines. A total of 5,644 (3,917 of Host switch + 1,727 of RSU) subscriber lines are in use and the spare is only 740 lines. The SDE host switch has ten (10) 2Mbps links in total. The EWSD is running satisfactory.

The Darkhan-Uul Aimag centre switching system capacity shall be expanded synchronising with accommodation of new Sum centre switching units. The existing Aimag centre switching system will not be enough to accommodate new switches in Sum centres. It shall be expanded in capacity of inter-exchange circuits, as well as traffic capacity of call handling.

(4) Sum/Bag Centre Switch

In Uvurkhangai Aimag, Sum centres have respectively a switching system, except Bayan-Undur where a switching system was removed in 2001 as power supply was suspended for a long time. The switching systems are C12/48, ATCK50/200, KXTD, EM-48, and others. Sum centre exchanges have difficulties in maintenance due to out-moded product, faulty hardware, spare parts purchase delay, etc. Some exchanges are running only winter seasons due to insufficient power supply in summer.

In Selenge Aimag and Darkhan-Uul, Sum centres have respectively a switching system. The switching systems are HICOM, C12/48, ATCK50/200, KXTD, and others. Sum centre exchanges have difficulties in maintenance due to out-moded product, faulty hardware, spare parts purchase delay, etc. MT has withdrawn from telecommunication service in Salkhit Bag centre since June 2001 and Tunkhel since March 2002. The Dulaankhaan Bag centre switch is of a capacity of 100 subscriber line and has only five (5) subscribers.

Most of Sum centre switches are PBXs which are not connected directly with Aimag centre switch, but connected by means of distant subscriber line which is terminated by a telephone apparatus at the Sum centre. Accordingly, the trunk call services are realised through operator assistance. Figure 2.3.1-1 shows a connection pattern between PBX in Sum centre and local switch in Aimag centre.

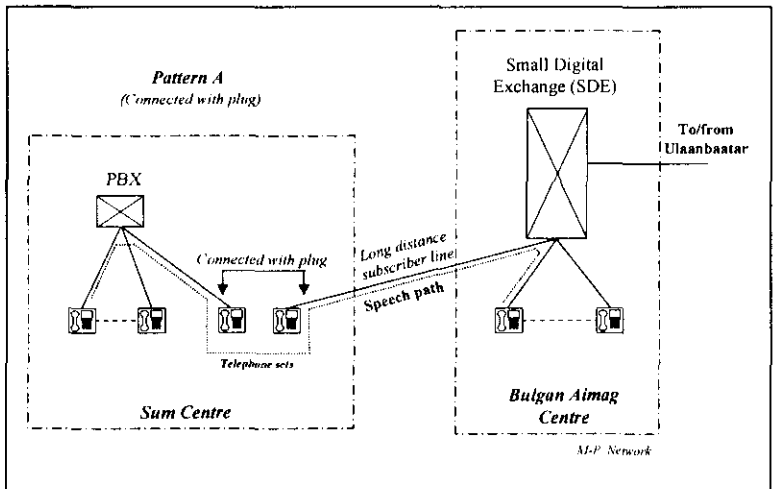

Figure 2.3.1-1 Path between Sum and Aimag Centre

Table 2.3.1-3 and Table 2.3.1-4 show the switching facilities including trunk call service mode in Uvurkhangai Aimag and Selenge/Darkhan Uul Aimag, repectively.

Table 2.3.1-3 Sum Switch Facilities in Uvurkhangai

No.	Aimag/Sum	Switching Facilities			Working Conditions		Trunk Call Service	
		Model	Type	Capacity	Status	Power	O/G	I/C
1	Aimag center	SDE	D	1,760	Working	Central Grid	Yes	Yes
2	Bayan-Undur	Not exist	---	0	No Hardware	---	Thru operator	Thru operator
3	Burd	C-12/48	D	48	Working	Central Grid	Thru operator	Thru operator
4	Bat-Ulzii	C-12/48	D	48	Working	Central Grid	Thru operator	Thru operator
5	BB-Ulaan	ATC-50/200	A	50	Seasonal	Sum Diesel	Thru operator	Thru operator
6	Bayangol	C-12/48	D	48	Working	Central Grid	Thru operator	Thru operator
7	Guchin-Us	KXTD-500	D	100	Working	Solar	Dialling "9"	Thru operator
8	Esonzuun-Zyil	ATC-50	A	100	Working	Central Grid	Thru operator	Thru operator
9	Ulziit	ATC-40/80	A	40	Working	Central Grid	Thru operator	Thru operator
10	ZB Ulaan	ATC-50	A	50	Working	Central Grid	Thru operator	Thru operator
11	Bogd	C-12/48	D	48	Working	Solar	Thru operator	Thru operator
12	Nariinteel	ATC-50/200	A	50	Seasonal	Sum Diesel	Thru operator	Thru operator
13	Sant	ATC-50/200	A	50	Working	Central Grid	Thru operator	Thru operator
14	Taragt	ATC-50/200	A	50	Working	Central Grid	Thru operator	Thru operator
15	Tugrug	EM-48	D	48	Working	Central Grid	Thru operator	Thru operator
16	Uyanga	ATC-50/202	A	200	Working	Central Grid	Thru operator	Thru operator
17	Kharkhandulaan	ATC-50/203	A	50	Seasonal	Sum Diesel	Thru operator	Thru operator
18	Khujirt	KXT-336	D	262	Working	Central Grid	Dialling "9"	Thru operator
19	Kharkhorin	ATC-100/2000	A	1,000	Working	Central Grid	Thru operator	Thru operator
20	Uurkhai in Baynteeg	National Product	A	6	Paused	Solar	Thru operator	Thru operator
	Total	---	---	**4,008**	---	---	---	---

Field Survey-2

Table 2.3.1-4 Sum Switch Facilities in Selenge and Darkhan Uul

No.	Aimag/Sum	Switching Facilities			Working Conditions		Trunk Call Service	
		Model	Type	Capacity	Status	Power	O/G	I/C
11	Selenge Aimag	SDE	D	1,888	Working	Central Grid	Yes	Yes
12	Altanbulag	HICOM	D	200	Working	Central Grid	Thru operator	Thru operator
13	Eruu	ATCK-100/2000	A	100	Working	Central Grid	Thru operator	Thru operator
14	Zuunburen	Panasonic	D	32	Working	Central Grid	Thru operator	Thru operator
15	Khushaat	ATCK-50/200	A	50	Working	Central Grid	Thru operator	Thru operator
16	Orkhon	C-12/48	D	48	Working	Central Grid	Thru operator	Thru operator
17	Sant	ATCK-50/200	A	50	Working	Central Grid	Thru operator	Thru operator
18	Khuder	ATCK-50/200	A	50	Working	Central Grid	Thru operator	Thru operator
19	Tsagaannuur	ATCK-50/200	A	100	Working	Central Grid	Thru operator	Thru operator
20	Bugant	ATCK-50/200	A	100	Working	Central Grid	Thru operator	Thru operator
21	Orkhontuul	ATCK-50/200	A	50	Working	Central Grid	Thru operator	Thru operator
22	Baruunburen (Bayangol)	ATCK-50/200	A	100	Working	Central Grid	Thru operator	Thru operator
23	Dulaankhaan	ATCK-50/200	A	100	Working	Central Grid	Thru operator	Thru operator
24	Javkhlant	ATCK-50/200	A	50	Working	Central Grid	Thru operator	Thru operator
25	Shaamar	ATCK-50/200	A	100	Working	Central Grid	Thru operator	Thru operator
26	Tushig	ATCK-50/200	A	50	Working	Central Grid	Thru operator	Thru operator
Homing To Darkhan-Uul EWSD								
27	Saikhan (Nomgon)	ATCK-50/200	A	100	Working	Central Grid	Thru operator	Thru operator
28	Khutul	ATCK-100/2000	A	600	Working	Central Grid	Thru operator	Thru operator
29	Zuunkharaa	HICOM	D	700	Working	Central Grid	STD with "9"	DID
30	Bayangol	Panasonic-330	D	228	Working	Central Grid	Thru operator	Thru operator
31	Tunkhel	ATCK-50/200	A	---	MT has withdrawn in 2002		Via MRC	Via MRC
	Sub-total	---	---	**4,696**	---	---	---	---
51	**Darkhan-Uul**	EWSD	D	6,384	Working	Central Grid		
52	Shariin gol	ATCK-100/200	A	500	Working	Central Grid	Thru operator	Thru operator
53	Khongor	ATCK-50/200	A	150	Working	Central Grid	Thru operator	Thru operator
54	Orkhon	ATCK-50/200	A	150	Working	Sum Engine	Thru operator	Thru operator
55	Salkhit (R/D of Khongor)	---	---	---	MT has withdrawn in 2001		Via MRC	Via MRC
	Sub-total	---	---	**7,184**	---	---	---	---

Field Survey-2

2.3.2 Transmission System

2.3.2.1 Existing Transmission Network

(1) Uvurkhangai Aimag

The Aimag centre of Uvurkhangai (Arvaikheer) is connected with microwave radio relay station (MW 111), which is a terminal station of western route digital microwave trunk transmission network (NERA digital radio relay SDH-STM-1 system constructed in 1997).

The approach link from MW 111 to aimag center is established by NERA PDH digital radio relay (34 Mbps) and it is terminated by PCM Ericsson 60 channel Multiplexer. The path length is 13 Km and it uses radio frequency bands at 7 GHz.

Total five microwave repeater stations (MW 108, 109, 110, 112 and 113) and one terminal station (MW 111) in Uvurkhangai consist of the national trunk transmission network

in western route. The location, altitude and tower height of existing microwave radio relay stations is shown in Annex 3 Table 2.3.2.1-1. In order to expand digital cellular mobile telephone service to western and southern rural areas MobiCom Corporation is now under construction of digital microwave radio links at 34 Mbps on the existing MT microwave national trunk transmission routes. It is expected to complete by end of October in 2002. The frequency allocations of NERA SDH-STM-1 system and MobiCom PDH Paso Link system are shown in Annex 3 Figure 2.3.2.1-1. Uvurkhangai aimag existing microwave radio-relay link configuration is also shown in Annex 3 Figure 2.3.2.1-1.

The approach transmission line from existing microwave radio-relay station 108 to Kharkhorin Sum centre telecom office is established by digital microwave radio-relay used at 7 GHz band. The NEC DRM770 microwave equipment is installed at the terminal stations (MW 108 and Kharkhorin telecom office).

The 50 Pair metallic cable line is now used for the approach link between existing microwave radio-relay station 109 and Khujirt Sum centre telecom office. Excepting for Kharkhorin and Khujirt sum centres the analogue network of open wire lines (OB 3-3, OB 12-3 system) are used to connect sum centre subscribers to aimag centre switching system. Each open wire line is carrying 1 to 6 traffic channels.

Total length of open wire carrier transmission system in Uvurkhangai is about 1700 Km. Uvurkhangai aimag communication office is now controlling 20-branch office, 19 of them is located in rural areas (in 18 Sums). In the AC communication office it is available for telephone service to put 100 % automatic telephone connection into inter-aimag and long distance telephone calls. A digital microwave transmission system and PCM transmission equipment is installed at Kharkhorin and Hujirt telecom office. Switching system is now installed in 15 sum telecom offices. In Bayan-Undur, Baruunbayan-Ulaan and Khairkhandulaan sums the auto switching system is still not introduced. In Uvurkhangai aimag the auto-switching system was introduced in 3 sums for the past 3 years and in 5 sums its operation was changed from manual switching connection to auto switching connection.

The survey was implemented in the following sites:

- Microwave radio relay station: MW 111, MW 110, MW 109 and MW 108
- Aimag center: Arvaikheer
- Sum centres: Uyanga, Zuunbayan-Ulaan, Bat Ulzy, Guching-US, Khujirt, Sant, Bayangol, Toglog, Kharkhorin

Data book Table.2.3.2.1-1 shows the summary records about current telecommunications service and the facilities implemented in Field Survey.

Microwave radio relay repeater station is now manned and maintained by 24 hours shift staff members. Analogue microwave radio transmission link has been replaced by digital microwave transmission system but the KURS-4 Russian made radio equipment and 4 GHz frequency used antenna is still remained in the existing microwave relay station.

In Uyanga sum, new sum center is now being build it is about 1 km far from existing sum center. It is, therefore, required to make the service improvement to both new and old sum centres.

Concerning the Line Of Sight visibility from MW 110 to Zuunbayan-Ulaan it was found that there is no problem in building a digital microwave radio link by one hop path design.

MobiCom and Skytel corporations in Arvaikheer, Hujirt and Kharkhorin have provided digital cellular mobile communications service.

In case of introduction of WLL in Kharkhorin, it is requested to cover a Tourist Camp village it is 9 Km far from Sum center.

Regarding the construction of new digital microwave path link it is requested to extend the path link to mining village Bayanteeg that is 23 Km far from MW 113 station. Annex 3 Table 2.3.2.1-1 shows the quantity of HF IC-78 radio station in Uvurkhangai Sum center and Bag provided by ODA of Japan in 2001. Total 133 sets of HF transceiver equipment has been distributed and effectively used for emergency communication purpose.

(2) Selenge and Darkhan-Uul Aimag

National inter-province toll transmission lines from Ulaanbaatar is terminated at Darkhan-Uul Aimag Telecom Office through PDH 34 Mbps Optical Fibre Cable system that approach transmission line is connected with MW 306 digital microwave radio-relay terminal station and MW 306 station is located at 4.5 Km far from Darkhan.

In the northern toll transmission route passing through Selenge Aimag and Darkhan-Uul Aimag there are two terminal stations (Darkhan MW 306 and Sukhbaatar MW 308) and three repeater stations (Zuun Baruun Haraa MW 304, Nomgon MW 305 and Orkhon S.A.A

MW 307). NERA PDH 34 Mbps Digital Microwave Radio-Relay System now establishes it in Mongolia northern route. The northern route is terminated at Darkhan MW 306 station and is terminated at Sukhbaatar MW 308.

The Optical Fiber Cable (OFC, 8C) with 34 Mbps (16 x E1) is extended from MW 308 radio-relay station to Selenge Aimag Telecom Office. The distance of OFC is about 25 Km. The existing microwave radio-relay link configurations and the frequency allocation used is shown in Annex 3 Figure 2.3.2.1-2.

The STM-1 FOTS equipment (SMS-600V, NEC) is installed at Darkhan Telecom Office. The MRC Optical Fiber Cable Network with SDH system is laid along the Railway Road in Selenge Aimag and Darkhan-Uul Aimag. The OFC network configuration is also shown in Figure 2.2-1. The installation of 1402 Km long Optical Fibre Cable Network (OFCN) with SDH-STM-1 system (12 Cores) alongside the Mongolian Railway Road from North to South in Mongolia was completed in year of 2000. In Selenge and Darkhan-Uul it is possible to make OFCN branching by inserting ADM equipment (STM-1) from the following stations: Zuunkharaa, Salkhit, Darkhan, Sukhbaatar, Khutul and Orkhontuul.

All of MT toll transmission line between Aimag center and Sum center has been established by analogue Open Wire carrier transmission system (OB 3-3, OB 12-3) in Selenge and Darkhan-Uul Aimag. The total length of Open Wire carrier transmission lines reaches about 1380 Km.

Selenge Aimag communication office is now controlling 16 branch offices, 15 of them is located in rural areas (13 Sums). In the communication office it is available for telephone service to put 76.9 % automatic telephone connection into inter-province and long distance telephone calls. Switching system is now working in 13 sum telecom offices. In Khuder, Tushing and Khushaat sums the auto switching system is still not introduced. In Selenge aimag auto-switching system has been introduced in 4 sums during 3 years period and in 5 sums its operation was changed from manual switching connection to auto switching connection.

Darkhan-Uul aimag communication office is now managing operation and maintenance matters concerned with 10 branch offices including the following five Sum centres that belongs to Selenge Aimag administratively: Dzuunhaaraa, Saikhan (Hutul + Nomgon bag), Bayangol (Baruunharaa), Sumber and Tunkhel.

In Sumber and Tunkhel sums the auto switching system is still not introduced. MT Telecom branch office in Tunkhel Sum centre was made withdrawal and service provided by only MRC telecom office.

The survey was implemented in the following sites:

- Microwave radio relay station: MW304, MW305, MW306, MW307 and MW308
- Aimag centres: Darkhan, Sukhbaatar
- Sum centres: Altanbulag, Tsaganuur, Zuunburen, Sharin-gol, Eruu, Shamar, Hutul, Sant, Baruunburen, Orkhon-tuur, Dzuunharaa

Data book Table 2.2-1 shows the survey record of Darkhan-Uul Aimag centre and Sum centres.

Concerning installation of new digital microwave radio-relay system it is possible to utilize the existing microwave building facilities (Antenna tower, building, power supply etc.) , and also, possible to branch out from the existing microwave radio-relay stations (MW 304, MW 305, MW 307 and MW 308 radio-relay stations) to extend the Sum centres, however, present NERA PDH microwave transmission capacity is almost fully occupied, therefore, it is requested to make an additional establishment of microwave transmission route along the route from MW 304 to MW 308 for the purpose of rural telecommunication development between Aimag centre and Sum centres.

Concerning digitisation of transmission path from Darkhan to Orkhontuul it is requested to provide approach digital microwave link from nearest MRC Orkhontuul Railroad station to MT Orkhontuul Sum center Telecom Office by way of one radio-relay stations and the link distance is 18 Km.

Concerning digitization of transmission path from Darkhan to Dzuunharaa it is requested to replace existing old type 2 Mbps microwave radio-relay equipment by new digital microwave radio-relay equipment in the link between MW 304 microwave radio-relay station and MT Dzuunharaa Telecom Office.

MobiCom and Skytel corporations in Darkhan, Sukhbaatar, Altanbulag, Khutul and Zuunkharaa have provided digital cellular mobile communications service at present time.

The feasibility study of introduction of WLL (Wireless Local Loop) system was made in Sharin-Gol, Khutul and Zuunkharaa Sum centres and it is required to install the WLL system to overlay on the existing Metallic Cable system for future demand increase.

Annex 3 Table 2.3.2.1-2 shows the quantity of HF IC-78 radio station in Selenge and Darkhan-Uul Sum centres and Bags provided by ODA of Japan in 2001. Total 71 sets of HF transceiver equipment has been distributed and used effectively for emergency purpose in Selenge Aimag. Total 37 sets of HF transceiver equipment has been distributed in Darkhan Uul, however, those HF transceiver equipment are not used effectively because of popularity of mobile telecommunication services.

2.3.2.2 Existing Optical Fibre Transmission Network

Analogue Open wire systems are mainly used as transmission system from the Aimag Cebtre and Sum Centres, and there is no FOTS (Fibre Optic Transmission System) in Uvurkhangai Aimags, while the FOTS owned by MRC (Mongolian Railway Company) run from Ulaanbaatar to Sukhbaatar in Selenge Aimag (and to Russia) with a branch route from Salkhit in Dalkhaan-Uul Aimag to Orkhontuul in Selenge Aimag. The MRC facilities will be used in the Project. The detail of FOTS of MRC is shown in Figure 2.3.2-1.

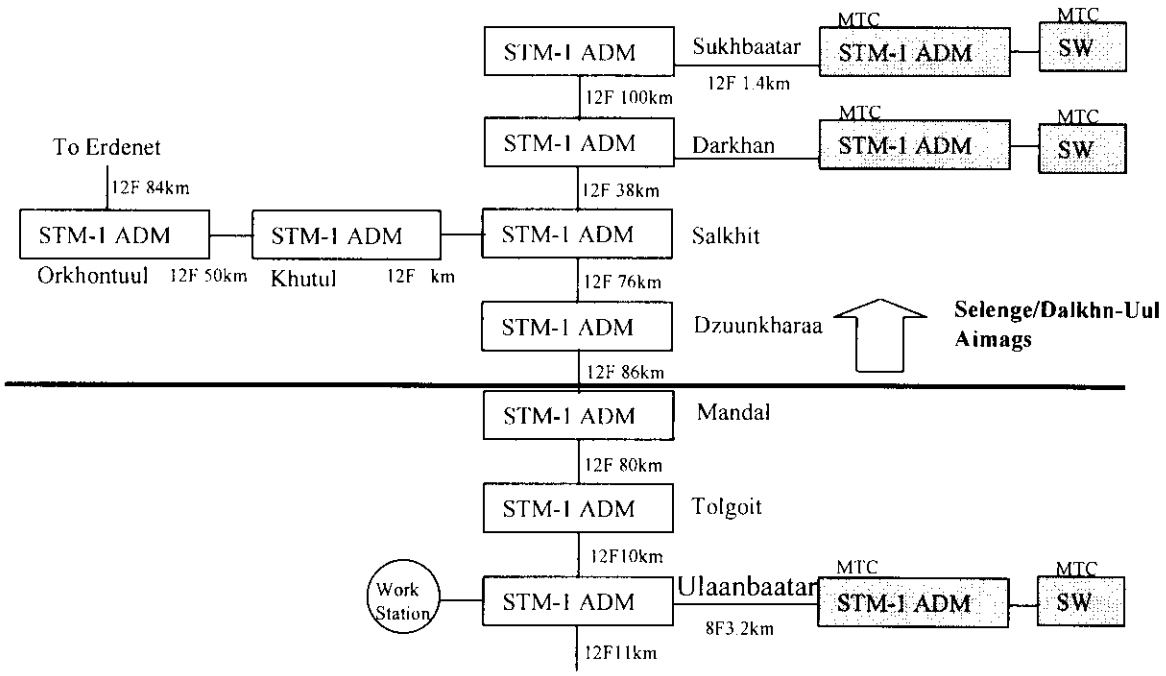

Figure 2.3.2.2-1 Mongolian Railway Company Fibre Optic Transmission Systems

2.3.3 Access Network System

(1) Wired Access Network

a) The Present Status of Existing Facilities of Sum Centres

i) Number of cable routes from a telecommunication office

Though the number of cable routes from a telecommunication office is determined based on the scale and form of Sum centre, it is three directions in many cases. The branch route is prepared in Ger areas that are distributed outside the central area of Sum centres.

ii) Cable system

Aerial cable system has been adopted in almost all Sum centres. Direct buried cable was laid in 1968 as a part existing route in Khujirt telecommunication office. Zuunkharaa telecommunication office that is the biggest Sum centre, has an underground duct system of about 1.4km.

iii) The construction fiscal year of outside plant

Outside plant of almost all Sum centres were built in the 1980s has been remarkably deteriorated. Shortage of cable capacity is also caused at present.

iv) Detailed information related to outside plant in site survey Sum centres

The detailed information collected from site survey is shown in 2.3.3-1.

Appropriate plant records with cable drawings were not holed and not up-dated in Sum centres. The plant records attached in Vol. V were prepared based on present status of outside plant of sampled Sum centres that were studied by our site survey.

Table 2.3.3-1 Sample Site Data by Field Survey

As of Sep., 2002

Items		Uvurkhngai			Selenge			Darhan
		ZB Ulaan	Burd	Hujirt	Zuunburen	Shaamar	Sant	Zuunharaa
Scale of Sum Centre	Scale of Town	Middle	Small	Big	Small	Big	(M.)-Big	Biggest
Diameter of the Sum Centre	Long (km)	5.0	3.5	4.0	3.0	4.0	3.0	7.0
	Short (km)	3.7	3.0	3.0	3.0	3.5	2.0	5.0
Population	2002	1,025	927	4,000	1,726	2,400	2,063	22,300
Household	2002	209	165	(889)	396	600	374	5,108
Percentage of Residential Class	High			20%		5%	5%	50%
	Middle	10%	10%	50%	5%	15%	5%	30%
	Low	90%	90%	30%	95%	80%	90%	20%
Public institution	Government office	1	1	1	1	1	1	1
	School	1	1	1	1	1	1	3
	Hospital	1	1	1	1	1	1	2
	Kindergarten	1	1	2	1	1	1	3
	Bank	1	1	1	1	1	1	2
	Telecom office	1	1	1	1	1	1	2
	Others			2 Police Sanatorium (Hot spring)		1 College	2 Police College	4 Police Court Factory Fire station
	Total	6	6	9	6	7	8	17
Existing main line		50	48	225	7	72	33	700
Waiting list		26	32	30	2	16	18	88
No. of exchange entrance cable	pcs	3	1	3	1	5	3	12
Total cable sheath length	km	1.3	1.0	13.5	0.015	3.0	0.4	31
Pole	ea	72	73		12	13	50	220
DP	ea	3	5	27	1	5	3	93
Furthest DP from Exchange	km	0.5	0.6	2.9	0.15	1.3	0.2	4
Open wire (from AC)	km	54	(35)		45	21.7	62	32
Open wire (intra SC)	circuit					2	3	
Open wire (to Bag)	km							54

b) The feature of Sum centre

All Sum centres have been constructed by a unification concept based on the local city development master plan. The notable feature of Sum centres is as follows:

i) The public institutions and the apartments are arranged in the central area of the Sum centre.

ii) There are 6 public institutions of a government office such as a telecommunication office, a bank, a hospital, and a school, a kindergarten in small size Sum centres. In large-scale Sum centre, there are a college, a court, a fire department, a factory, etc. adding to the organization stated in the small size Sum centres and total of 8-9 public institutions.

iii) The telecommunication office is generally located in the central part of a Sum centre.

iv) Clear roads only exist in the central are of a Sum centre.

v) There is no clear road to Ger areas. However, the future road plan are decided in Sum centre city master plan and cable route planning should follow the road plan

vi) The Sum centre city master plan is still under progress and there are many vacant spaces in the central area of Sum centre.

vii) There are some blocks of Ger area outside central area of Sum centre.

viii) The access network service area covers up to the outskirts of those Ger areas

ix) The form of the service area looks like an ellipse form and the length of major axes is 3.0-5.0km, and minor axes id 2.0-3.5km that is not affected by area size and population of Sum centres.

c) Issues on the outside plant

i) Improvement of the entrance cables to the telecommunication office

The standard of the entrance cable in PTA, Mongolia is underground cable system with manhole in front of telecommunication office and inside trench of a telecommunication office. However, actual lead-in cables are installed through the hole on the wall of telecommunication office with improper angle of cable curvature and in adequate protection in the majority of Sum centres other than large size Sum centres is entrance cable

Lead-in point of cable at the telecommunication office is the most important portion in access cable network.

Aerial lead-in method should be applied for telephone office in majority of Sum centres other than large size Sum centres. It is necessary to prepare the leading- in pole in front of a telecommunication office in the optimal position and to secure proper angular of cable curvature and the cable protection at the lead-in portion.

ii) Cable network area

The standard of cable network area in PTA, Mongolia limits the area within central area of Sum centre and the cables installed in Ger area are very few.

However, the following concepts are recommendable in the universal service and marketing strategy point of view.

- The cable section should be extended to the permanent residence Ger area to reduce the subscriber's installation cost for new subscriber connection.

- The cable section should be extended to the seasonal Ger areas even if it is a specific period.

- Public telephone should be installed in the seasonal Ger areas for the people who cannot install a telephone.

iii) Existing facility

Existing cables were installed in 2 periods during in 1984 - 1989, and in 1997 - 2001.

Since existing facilities were installed with poor construction manner and present quality of the cable network have been lower, almost all existing facilities should be renewed.

Even if some cables have enough quality, it is still necessary to rearrange the capacity of cables and/or the position of the distribution points.

Therefore, the existing facility should be replaced with new one in the project in principle.

2.3.4 Power System

(1) General

Power supply situations at the Sums selected for the Feasibility Study are as indicated in Annex 5-1, while various power supply types at the Sums are exhibited in Annex 5-2. Codes in the "Current Power Supply Types" column in Annex 5-1 correspond with those indicated in Annex 5-2. In addition, typical power supply system diagrams for MW repeater stations are provided, for reference, as indicated in Annex 5-3.

Power supply facilities at the target Sums are summarized as follows:

(2) Darkhan-uul Aimag

All of the telecom offices at the Sums in the Darkhan-uul Aimag are supplied with electricity from Central Energy System. Power supply to the telecom systems is comparatively reliable and stable.

The telecom office at the Aimag centre is provided with a stand-alone diesel generator with rated capacity of 100kW that, in combination with two battery banks, supports switching system during power failure.

(3) Selenge Aimag

All of the telecom offices at the Sums in the Selenge Aimag are supplied with electricity from Central Energy System. Power supply to the telecom systems in the Aimag is comparatively reliable and stable.

The telecom office at the Aimag centre is provided with a stand-alone diesel generator with rated capacity of 60kW that, in combination with a battery bank, supports switching system during power failure.

(4) Uvurkhangai Aimag

Telecom offices at the majority of the Sums in the Uvurkhangai Aimag are supplied with electricity from Central Energy System. Back-up diesel generators are installed at a few telecom offices that receive electricity from Central Energy System.

Sums that are not connected with Central Energy System are supplied with electricity from diesel generating stations located at the Sum centres. Almost all of the diesel generators were provided under grant aid of Japan for the last three years. Power supply capabilities by the diesel generators appear to be high.

Some of such Sum centres are provided with stand-alone PV systems of small capacity ranging from 0.4kW to 0.8kW to feed power to small power consuming equipment.

2.3.5 IT System

There are eight (8) ISP in Mongolia at present. And more than 30,000 people use Internet and 9,000 peoples have their own account as of 2001. But around 95 % of total users are inhabitants of Ulaanbaatar. ISP's service area is not restricted within Ulaanbaatar, but their routers (connection nodes) are only located Ulaanbaatar and Erdenet.

In rural area, Internet connection from Aimag centre and some Sum centres is possible basically through dial-up connection. However as stated in Annex 6.1, actual users are very limited. Only each one 10-years junior high school in Bayangol Sum (Uvurkhangai Aimag) or Zuunkharaa Sum (Selenge Aimag) is the subscriber of Internet among the surveyed 200 organizations. One person who lives in Eruu Sum (Selenge Aimag) has Internet account among the surveyed 300 persons.

That low penetration rate at Aimag and Sum areas are mainly due to high charge of long distance communication (in addition to provider's fee, 20 Tg long distance charge per minute are required), low speed connection depending on the old telecommunication facilities, lack of consumable money of the peoples and less opportunity of PC buying or using. These situations should be cleared one-by-one but as early as possible for rapid improvement of rural ICT environment.

Internet café is open at MT offices in Darkhan-Uul Aimag centre and Selenge Sum centre. RailNet has announced that he opened Internet café at Zuunkharaa railway station recently.