社会開発調査部報告書

No. 2

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 II

MASTER PLAN

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

MAP OF THE NATIONEL ZONES

CONVENTIONAL SIGN

CAPITAL AND ADMINISTRATIVE
ULAANBAATAR Capital of the MPR
ONDORKHAAN Centres region- (provinces)
Centres districts
over 30 000 inhabitants
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, Rivers
Other

Rivers, Depths in meters
Seasonal river
Dry Courses (wadi)
Lakes fresh and Lakes salt
Lakes seasonal
Wells, Spring
Swamps or Marshes, Solfatara
Sands
Heights above Sea Level in meters
Eternal Snows and Glaciers
Ancient Embankments
Caves

SCALE 1:9'000000
DEPTH AND HEIGHT SCALE IN METERS

Mountain zone
Forest and steppe zone
Gobi zone
Forests
Hatret zone
Steppe zone
Desert zone
Sands
Scale 1:12 000 000

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

This Report covers the Master Plan up to the year 2020 for Development of Rural Telecommunication System in Mongolia covering the whole Mongolian territory.

1. Development Framework and Key Development Targets

Key Development Targets up to 2020 as framework of the Master Plan are shown in Table 1.

Table 1 Key Development Targets up to 2020

Indexes	Sub-Indexes	Area	Present Status (2001 and/or 2002)	Development Targets			
				Short-Term Target		Medium-Term Target	Long-Term Target
				(2003-2005)	(2006-2008)		
Socio-Economy	Population	Whole country	2,412,818	2,561,461	2,673,259	2,879,374	3,181,944
		Whole Aimags	1,616,618	1,667,961	1,699,059	1,797,674	1,976,644
	GDP per Capita (US$ Constant in 1995)	Whole country	590.9	669.5	742.6	888.3	1,169.3
	GRDP per Capita (US$ Constant in 1995)	Whole Aimags	442.7	503.8	572.5	697.2	922.4
Demand Forecast (DELs)	Fixed Telephone Service (PSTN)	Whole country	167,587	196,637	218,424	270,212	370,489
		Whole Aimags	92,138	105,747	115,954	143,128	196,140
		Sum centre	28,795	32,801	35,806	44,318	60,780
	Mobile Telephone Service	Whole country	208,083	271,983	319,908	420,025	592,151
		Whole Aimags	110,367	142,189	166,056	218,035	307,364
		Sum centre	35,525	45,372	56,064	65,985	97,687
	Total of Fixed and Mobile Telephone Services	Whole country	375,670	468,620	538,332	690,237	962,640
		Whole Aimags	202,505	247,936	282,010	361,163	503,504
		Sum centre	64,320	78,173	91,870	110,303	158,467
DELs/100 Inhabitants	Fixed Telephone Service (PSTN)	Whole country	6.95	7.68	8.17	9.38	11.64
		Whole Aimags	5.70	6.34	6.82	7.96	9.92
	Mobile Telephone Service	Whole country	8.62	10.62	11.97	14.59	18.61
		Whole Aimags	6.83	8.52	9.77	12.13	15.55
	Total of Fixed and Mobile Telephone Services	Whole country	15.57	18.30	20.14	23.97	30.25
		Whole Aimags	12.53	14.86	16.60	20.09	25.47
Supply Volume (DELs)	Fixed Telephone Service (PSTN)	Sum centre	10,521	20,646	29,302	42,391	60,780
Switching Capacity (Line Units)	Fixed Telephone Service (PSTN)	Sum centre	19,724	37,178	47,812	58,898	62,100
Demand Forcast of IT and Data	Internet Services	Whole country	9,000	81,078	135,137	172,590	210,042
		Whole Aimags	450	23,184	40,234	57,350	74,466
		Sum centre	-	5,081	8,891	15,559	22,227
IT/Data circuits per 100 Inhabitants	Internet Density	Whole country	0.37	3.17	5.06	5.99	6.60
		Whole Aimags	0.03	1.39	2.37	3.19	3.77

2. Project Implementation Plan and Cost Estimate

The Sums are prioritised with four (4) ranks from "P-1" to "P-4". The Sums of "P-1" are planned to implement the project for the first stage of Phase-I, or the period from the year 2003 to the year 2005. Those of "P-2" are for the second stage of Phase-I, or the period from the year 2006 to the year 2008. Those of "P-3" for the Phase-II from the year 2009 to the year 2013, and those of "P-4" for the Phase-III from the year 2014 to the year 2020. Main scope of facilities plan and cost estimate are shown in Tables 2 and 3.

Table 2 Main Scopes of Facilities Plan

Items		Facilities	Short-Term		Medium-Term	Long-Term	Total
			(2003-2005)	(2006-2008)	(2009-2013)	(2014-2020)	
Switchin System		Line Unit	27,460	15,020	14,580	5,040	62,100
Transmission System	Optical Fibre Cable	Length (Km)	37	26	69	74	206
		SDH Section	9	4	7	9	29
	Microwave	Terminal Sation	84	46	76	42	248
	VSAT	Earth Sation	19	12	22	2	55
Access System	Wired	Cable Pair	33,440	19,133	12,712	3,377	68,662
	Wireless	Cell Sation	30	3	4	5	42
Power Plant			-	-	-	-	-
IT Services	IT Spots	Sites	122	60	103	54	339

Table 3 Cost Estimate of Facility Plan

(US$ 1,000)

Item		Short-Term		Medium-Term	Long-Term	Total
		(2003-2005)	(2006-2008)	(2009-2013)	(2014-2020)	
Switchin System		6,535	7,457	7,135	3,245	24,372
Transmission System	Optical Fibre Cable	1,421	787	1,547	1,492	5,247
	Microwave and VSAT	18,479	8,888	17,742	8,783	53,892
	Sub-total	19,900	9,675	19,289	10,275	59,139
Access System	Wired	9,035	5,169	3,434	913	18,551
	Wireless	3,519	567	567	567	5,220
	Sub-total	12,554	5,736	4,001	1,480	23,771
Power Plant		7,272	6,094	10,690	4,802	28,858
IT Services	IT Spots	1,245	615	1,035	540	3,435
Total		47,506	29,577	42,150	20,342	139,575

3. Analysis of Financial and Economic Aspect

(1) Financial Evaluation

As for the financial analysis of the Master Plan, there can be two basic cases (Case A: including Duty and VAT, Case B: excluding Duty and VAT) regarding its income and cash flow projection. However, in order to eliminate the burden of taxes, Case B and its sensitivity are analysed.

Financial Internal Rate of Return on Investment (FIRROI) of Case B, which indicates viability of investment, is 1.871%. In a case among the sensitivity analyses, FIRROI would improve up to 2.926 % when a multiplier effect of the following occurs: increase in revenues (+5 %), decrease in capital investment (-10 %), and decrease in operation and maintenance costs (-10 %). In that case, the positive profit for a single year would be realised in the 12th year and the total amount of the required subsidies would be reduced to 4.8 million US dollars.

(2) Economic Evaluation

Economic Internal Rate of Return (EIRR), which is a useful tool to clarify the magnitude of economic contribution of the Master Plan, is calculated at 7.66%, by applying the " Travel Cost" method based on the field survey results.

4. Recommendations

Recommendations are made for a smooth and effective implementation of the Master Plan towards the year 2020 on institution, organisation, management, human resource development, technical affairs, financing, etc. Especially, the following on the institution and rural telecommunications development policy are emphasized:

(1) Universal Service Obligations Fund

The rural telecommunications network, part of the national telecommunications network, has special features such as small sized facilities deployed at many little Sum centres or settlements scattered in the vast territory requiring a massive capital investment and less revenues compared to those in the urban areas. The Universal Service Obligations Fund (USOF), which is collected from the revenues of telecom operators from the urban subscribers, aims to subsidise the initial investment costs, and operation and maintenance

costs for the rural telecommunications services. MT has subsidised the rural operation and maintenance cost internally. The Government promulgated a regulation on USOF in September 2002 in order to involve the other mobile telephone operators, in addition to the amendment of the Telecommunications Act in 2001. It is an urgent task for the Government to modify the shortcomings of the present laws and regulations.

(2) Digitisation of Trunk Transmission System

Among the trunk transmission systems that connect the telecommunications facilities in the capital city and the rural major cities, 40 % are digitised, though the remaining 60% are still in an analogue type. For the effective and smooth implementation of the rural telecommunications system construction, the digitisation of such analogue type trunk transmission systems is essential for the development of the rural telecommunication system, including the common use of the trunk transmission systems, though such trunk transmission systems are not the objectives of this Master Plan. Therefore it is recommended that the digitisation of such analogue transmission systems should be performed before the completion of the rural telecommunications facilities in order to utilise such completed facilities most.

(3) Joint Owning and Leasing Company of Trunk Transmission Systems

The existing trunk transmission network systems that cover the country are owned by PTA, and the other telecommunications operators, such as Mongolian Railway Company (MRC) and Mobicom. In the case of the telecommunications operators intending to expand their services in the rural areas, they have two options; i.e. use of a part of such exiting trunk transmission systems by lease, or construction of a new trunk transmission system by themselves.

It is highly recommended that the unused transmission capacity of the newly installed trunk transmission system with huge investment costs and advanced technology should be leased to other operators with a fair rate of lease rental, in order to recover the investment cost earlier. The establishment of a joint venture company that leases trunk transmission systems is also recommended in order to utilise the trunk transmission systems most, as a national policy.

5. Comprehensive Assessment of the Master Plan

In order to assure and realize the Master Plan, the results of the Master Plan have been analysed and assessed comprehensively about its appropriateness from social, technical, economic, financial, management and organisational, and environmental protection aspects.

Under this Master Plan, the present densities of both fixed telephone and Internet services in the whole territory of Mongolia will be increased remarkably by the year 2020, and those in the rural areas will also be improved by the year 2020, and the digital divide between the urban and rural areas will be reduced.

The development of the rural telecommunications system has special features such as small sized facilities deployed at many little Sum centres or settlements scattered in the vast territory and less revenue compared to those in the urban areas. In order to implement the project as originally planned, USOF is required for the construction, operation and maintenance cost of such rural telecommunications facilities.

The Master Plan as a whole is evaluated as appropriate, although its implementation requires solution of the expected financial difficulties. The implementation will produce ripple effect on the whole rural society, meeting broader social needs, such as rural economy invigoration, rural industry development, prevention of natural disaster, and administrative service improvement, including educational, medical and health care services, although the quantification of the benefits is difficult.

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CHAPTER 4 PRESENT TELECOMMUNICATIONS NETWORK FACILITIES

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

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CHAPTER 1

INTRODUCTION

CHAPTER 1

INTRODUCTION

1.1 General

This Report covers a telecommunications master plan up to the year 2020 and a feasibility study for priority projects which will be implemented by the year 2006, for the Master Plan Study for Development of Rural Telecommunication System in Mongolia.

The report consist of :

- **Volume-I Summary**
- **Volume-II Master Plan**
- **Volume-III Feasibility Study for the Priority Projects**
- **Volume-IV Supporting Data**
- **Volume-V Data Book**

The study has been carried out in accordance with the work plan and schedule of the study which were discussed and agreed upon between Ministry of Infrastructure/Post and Telecommunication Authority (hereinafter referred to as MOI/PTA) and Japan International Cooperation Agency (hereinafter referred to as JICA). The study work has been done both in Mongolia and in Japan. The major items of the study are referred to in the following:

The First Study in Mongolia (27th March – 5th July 2002)

(a) Explanation and discussion of the Interim Report;
(b) Collection of data/information and analyses;
(c) Field survey of the selected target Aimags and Sums;
(d) Socio-economic and rural development study;
(e) Telecommunication demand forecast;
(f) Telecommunication traffic forecast;
(g) Study on key development targets in the telecommunications sector;
(h) Study on management, structure, operation, maintenance, and human resources;
(i) Financial conditions study;
(j) Study on laws, regulations, radio frequency management, and standards;
(k) Preparation, discussion and finalisation of the Progress Report; and

(l) Technology transfer through the field survey and preparation of development framework.

The First Work in Japan (18th July – 7th August 2002)

(a) Preparation of telecommunications networks plan;
(b) Preparation of numbering plan of Sums;
(c) Preparation of telecommunications network facilities plan;
(d) Preparation of project implementation and cost estimate;
(e) Preparation of financial plan;
(f) Preparation of operation and maintenance plan;
(g) Preparation of institution, organisation and management plan;
(h) Preparation of human resources development plan;
(i) Project evaluation (financial evaluation, organisational and institutional evaluation, technical evaluation, socio-economic evaluation);
(j) Implementation plan;
(k) Identification of priority project(s) and selection of feasibility project(s), and
(l) Summary and recommendation.

The Second Study in Mongolia (1st September – 30th October 2002)

(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.

The Second Work in Japan (15th November – 28th November 2002)

(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) Organisation 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;
(j) Preparation of the Draft Final Report; and
(k) Preparation of technology transfer seminar.

1.2 Background of the Study

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.

For the telecommunications network development, a national telecommunications development master plan was worked out in co-operation of Asian Development Bank (ADB) in 1993, which aimed at constructing a network to connect Aimag centres through the digital circuits with the national capital. Another study, the Study on Telecommunications Network in Ulaanbaatar City was worked out in co-operation of JICA in 1996.

The telephone density remained still low even after the studies. It could reach to 15.05 lines per 100 inhabitants as the national average in December 2001, counting a total of 358,000 lines of fixed and mobile telephone lines. However it was only 2.27 lines per 100 inhabitants in the rural areas where the capital city Ulaanbaatar and major cities, such as Darkhan Uul, Orkhon, Baganuur and Naraikh, are excluded. The total (358,000 lines) comprises 130,000 fixed telephone lines and 228,000 mobile terminals. The mobile phone service was available in only a few Aimag centres and Sum centres.

As the national average, the fixed telephone line marked a density of 5.46 lines per 100 inhabitants in December 2001 with a total of 130,000 lines in operation. Among the total 130,000 lines, Mongolia Telecom shared 120,000 lines and Mongolian Railway Company the rest or 10,000 lines. The mobile telephone density was 9.58 lines per 100 inhabitants as of December 2001 with 228,000 mobile terminals in the whole country. Mobicom had 190,000 subscriptions and Skytel 38,000 subscriptions.

MT is a sole telecommunications operator to provide basic telecommunications services such as telephone, facsimile, and telex services. MT offers the services with the facilities leased from the Post and Telecommunication Authority (PTA). With the adoption of the Telecommunications Law in 1995, followed by basic institutional reforms, major advancements were made in bringing telecommunications services' quality closer to the international standards. The nucleus of the urban telecommunications networks is rather well.

In spite of major improvement of the situation in the capital city, the rural population's telecommunication service needs were not met. The network in rural areas, especially that of the level lower than 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.

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 (S/W) and Minutes of Meetings (M/M).

1.3 Objectives and Scope of the Study

1.3.1 Objectives of the Study

The objectives of this Master Plan Study are as follows:

- To formulate a Master Plan (M/P) up to the year 2020 for the development of the rural telecommunication system covering the whole Mongolian territory.

- To conduct the feasibility study(s) on the priority projects identified urgent through the Master Plan Study.
- To pursue the technology transfer to the counterparts of Mongolian side (the implementing agencies are MOI/PTA) in the course of the Study.

1.3.2 Scope of the Study

In order to achieve the objectives of the study mentioned above, the Study is carried out covering the following items and sub-items:

〖Phase-I Study〗

(1) Basic Study

(a) Collection and Review of Data/Information
- (i) Social and economic conditions and statistics,
- (ii) National development plans,
- (iii) Previous studies on telecommunications,
- (iv) Present status of telecommunications services,
- (v) Development plans and on-going projects for telecommunications services,
- (vi) Existing laws, regulations and technical standards related to telecommunications services,
- (vii) Present situations of operation and management of telecommunications services entities,
- (viii) Present situations of telecommunications facilities and networks, and
- (ix) Other data and information related the study.

(b) Field Survey
- (i) Social and economic conditions,
- (ii) Existing telecommunications facilities and services, and
- (iii) Other surveys related to the study.

(c) Analysis and Evaluation
- (i) Analysis of socio-economic conditions for telecommunications demand forecast,
- (ii) Demand and traffic forecast,
- (iii) Trend of new technologies and new telecommunications services, and

(iv) Planning framework (target year, planning area, service level).

(2) Formulation of the Master Plan Study for Development of Rural Telecommunication System

(a) Telecommunications networks plan,
(b) Numbering plan of Sums,
(c) Facilities plans,
(d) Cost estimation,
(e) Financial plan,
(f) Operation and maintenance plan,
(g) Institution, organisation and management plan,
(h) Human resources development plan,
(i) Project evaluation (financial evaluation, organisational and institutional evaluation, technical evaluation, socio-economic evaluation),
(j) Implementation plan, and
(k) Identification of priority project(s).

Phase-II Study

(3) Feasibility Study on the Priority Projects

(a) Confirmation of the Planning Framework
  (i) Project title and contents
  (ii) Target year,
  (iii) Planning area,
  (iv) Services level and types, and
  (v) System components.
(b) Supplemental Data Collection and Analysis
(c) Supplemental Field Survey
(d) Facility Improvement and Expansion Plan
  (i) Transmission system,
  (ii) Switching system,
  (iii) Subscriber access system, and
  (iv) Other equipment as required.
(e) Operation and Maintenance Plan
(f) Institution, Organisation and Management Plan
(g) Cost Estimate

(h) Project Implementation Programme
  (i) Programme schedule, and
  (ii) Programme elements including specifications.

(i) Project Evaluation
  (i) Financial analysis, and
  (ii) Social and economic analysis.

1.4 Work Schedule

1.4.1 Overall Time Schedule of the Study

The Study period is from the end of March 2002 up to the middle of February 2003. The time schedule of the Master Plan Study by study stage is shown in the following Table 1.4-1.

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		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 First Study in Mongolia

During the First Study in Mongolia from March 27 to July 5, 2002, the Study Team carried out the following work together with PTA counterparts:

(a) Explanation and discussion of the Inception Report submitted from the team;
(b) Collection of data and information (regional development, socio-economy, national development policy, telecommunications);
(c) Analyses of data and information collected;
(d) Field survey of the selected Aimags and Sums (rural development, socio-economy, demand distribution, facilities, household, etc.);
  - First field survey by one team: 15 April - 18 April 2002
  - Second field survey by three teams: 22 April - 28 April 2002

- Third field survey by one team: 13 May - 17 May 2002
- Fourth field survey by one team: 4 June - 6 June 2002

(e) Socio-economic and rural development study;
(f) Telecommunication demand forecast;
(g) Telecommunication traffic forecast;
(h) Study of long-term development targets and strategies;
(i) Preparation, discussion and finalization of Progress Report; and
(j) Technological transfer through the field survey and preparation of development framework.

1.4.3 First Work in Japan

During the First Work in Japan from July 18 to August 7, 2002, the Study Team prepared a draft master plan based on the results of the First Study in Mongolia. The draft master plan consists mainly of the following:

(a) Telecommunications networks plan;
(b) Numbering plan of Sums;
(c) Telecommunications network facilities plan;
(d) Project implementation and cost estimate;
(e) Financial plan;
(f) Operation and maintenance plan;
(g) Institution, organisation and management plan;
(h) Human resources development plan;
(i) Spectrum management plan;
(j) Project evaluation (financial evaluation, organisational and institutional evaluation, technical evaluation, socio-economic evaluation);
(k) Implementation plan;
(l) Identification of priority project(s), and
(m) Conclusion and recommendation.

1.4.4 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.

1.4.5 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 for three (3) Aimags. The Study Team carried out the following works:

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

1.4.6 Third Study in Mongolia

During the third study in Mongolia from December 9 to December 23, 2002, the Study Team carried out explanation and discussion of a draft final report with MT/PTA personnel, counterparts and other officials from organisations concerned. Content of the draft final report has been basically accepted. Technical transfer seminar was also carried out.

1.4.7 Third Work in Japan

During the third work in Japan from January 27 to February 14, 2003, the Study Team prepared a final report consisting of a master plan and feasibility study for three (3) Aimags, based on the result of explanation and discussion on the draft final report.

1.5 Approach to the Study

1.5.1 Basic Concept on This Study

This Study consists of the Phase-I Study and Phase-II Study. The Phase-I Study aims to formulate a short-term development plan, a medium-term development plan and a long-term development plan for the rural telecommunications networks in the whole Mongolia, up to the respective target years 2008, 2013 and 2020. The Phase-II Study aims to conduct a feasibility study for the priority project(s) identified through the Phase-I Study. Through the entire study, the Study Team reviews and studies in detail background of the problems being encountered by MOI/PTA and reflects the results on a new master plan and feasibility study.

(1) Objective of the Study

The objectives of the study are subdivided into the following items:

(a) Forecast of telecommunications demand up to the year 2020;
(b) Formulation of a master plan in consideration of the existing facilities, on-going and planned projects, and trend of new telecommunications technology;
(c) Formulation of projects being composed of objective area, applicable system and project scale;
(d) Selection of priority project(s) from a view of the rural development needs, social services need, preparedness factors and economic indicators, urgency of demand fulfilment and imbalance of service supply;
(e) Feasibility study of the priority projects; and
(f) Technology transfer to the counterparts through the study.

(2) Consistency with National Development Plan

Role of the rural telecommunications development in the national development plan is recognised. In addition, the national policy for the telecommunications sector is reflected to the master plan.

(3) Development Framework

In consideration of efficient management and effective investment by MOI/PTA and other operators, an adequate development framework is formulated with emphasising especially:

(a) Improvement and expansion of the existing rural telecommunications network;
(b) Digitalisation of the existing telecommunications network and system;
(c) Improvement of the service quality;

(d) Introduction of the new technology and system for new service provision; and
(e) Introduction of IT services.

(4) Consistency with On-Going and Planned Projects

For the telecommunications network development, a present national telecommunications development master plan was worked out in co-operation of Asian Development Bank (ADB) in 1993, which aimed at constructing a network to connect Aimag centres through the digital circuits with the national capital. The digitalisation project of the trunk transmission system and switching system in Aimag centres were implemented, following this Study. Another study, the Study on Telecommunications Network in Ulaanbaatar City was worked out in co-operation of JICA in 1996. Major part of the rehabilitation and expansion projects in Ulaanbaatar City implemented by this Study was over. Therefore, the implementation of the rural telecommunications system development projects from Aimag centres to Sum centres are expected under this Master Plan Study.

(5) Network Facilities Plan

Network facilities plan is formulated paying attention to the following points:

(a) Digitalisation of the network and system;
(b) Introduction of SDH system and CCS No. 7 system for various new services;
(c) Introduction of WLL (Wireless Local Loop) system in addition to the existing wired subscriber access system;
(d) Realisation of the automatic dialling from Sum centres; and
(e) Introduction of the IP-network (including Internet) in Sum centres.

(6) Telecommunications Development in Rural Areas

Rural telecommunications development is one of the most important issues in Mongolia. The study methods and procedures applied under this Study, including the feasibility study, will contribute to the development in the whole country.

(7) Institutional Issue for Telecommunications Sector

Recently institutional reform of the telecommunications entities including privatisation is an international trend. The privatisation of the telecommunications sectors in Mongolia is under the way. The study covers not only the institutional issue but also

organisational and operational issues of PTA/MT. As a result of the study, institution, organisation and management plan is proposed.

(8) Human Resources Development

Digitalisation of telecommunications facilities is to be progressed in the trunk transmission system by being replaced with old analogue facilities aiming at improvement of services quality and efficient operation and maintenance. In order to meet such a situation, human resource development of operation and maintenance staff as well as technical management staff who have knowledge of digital technologies is indispensable issue. Based on the analyses of the present situation and future conditions expected, a human resource development plan including manpower forecast is proposed.

1.5.2 Technology Transfer

Technology transfer from the study team to counterparts is one of important items during the study period in Mongolia. On-the-job training and joint work with counterparts are the most effective way for smooth technology transfer not only on the master plan study consisting mainly data collection/analyses, establishment of development targets, strategy making, network planning, facility planning, operation and maintenance plan, manpower planning and evaluation, but also on the feasibility study. Items of technology transferred covers not only technical issues but also economic and financial issues. A special training programme was carried out during the first study in Japan. JICA invited one (1) counterpart for about three (3) weeks from November 6, 2002 to November 29, 2002.

1.6 Organisation of the Study Team and Parties Concerned

1.6.1 Organisation

The Study has been carried out by the Study Team dispatched by JICA in close cooperation with counterparts of PTA and MT. The Study has been guided and supervised by the Steering Committee organized by the Government of Mongolia. The organisation for the Study has been established as the conceptual composition shown in Figure 1.6-1.

1.6.2 JICA Study Team

The JICA Study Team members participated in this study are listed in Table 1.6-1.

1.6.3 JICA Advisory Committee

The JICA Advisory Committee provides the Study Team with advice for implementing the Study. The members of the committee are shown in Table 1.6-2. The project officers of JICA Headquarters are listed in Tables 1-6-3.

1.6.4 Counterparts from Mongolian Side

Counterparts from Mongolian side officially assigned and officials participated in this study are listed in Table 1.6-4 to Table 1.6-6. In addition, many officials other than mentioned in the tables below have co-operated to the Study Team through the Study period.

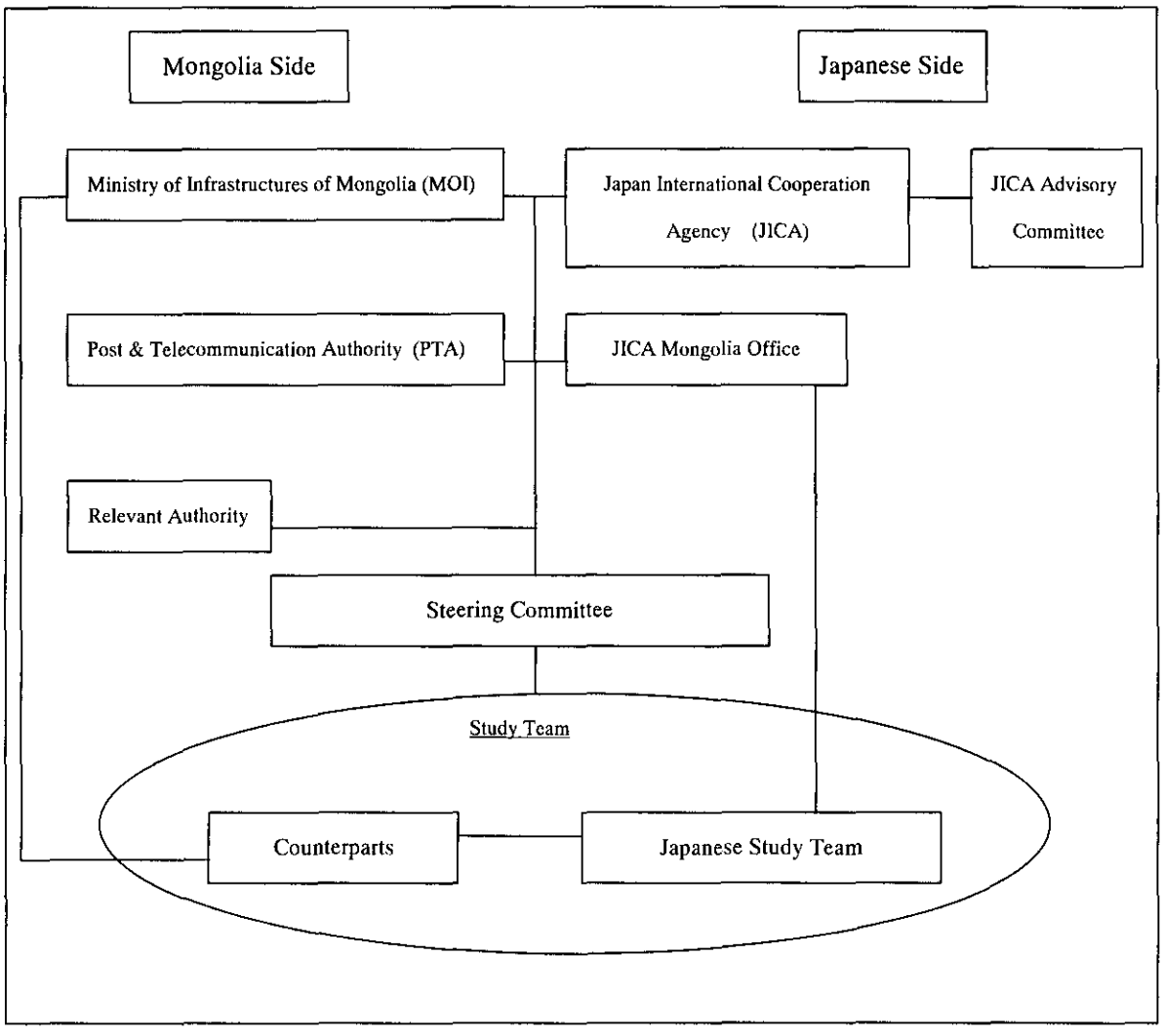

Figure 1.6-1 Organisation for the Study

Table 1.6-1 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 1.6-2 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 1.6-3 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 1.6-4 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 Mrs. 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)	Mrs. 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 1.6-5 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 1.6-6 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