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JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)
MINISTRY OF INFRASTRUCTURE DEVELOPMENT (MOID)
MONGOLIAN COMMUNICATIONS ASSET COMPANY (MCAC)

THE STUDY

ON

TELECOMMUNICATIONS NETWORK

IN

ULAANBAATAR CITY

FINAL REPORT

VOLUME - II

BASIC PLAN

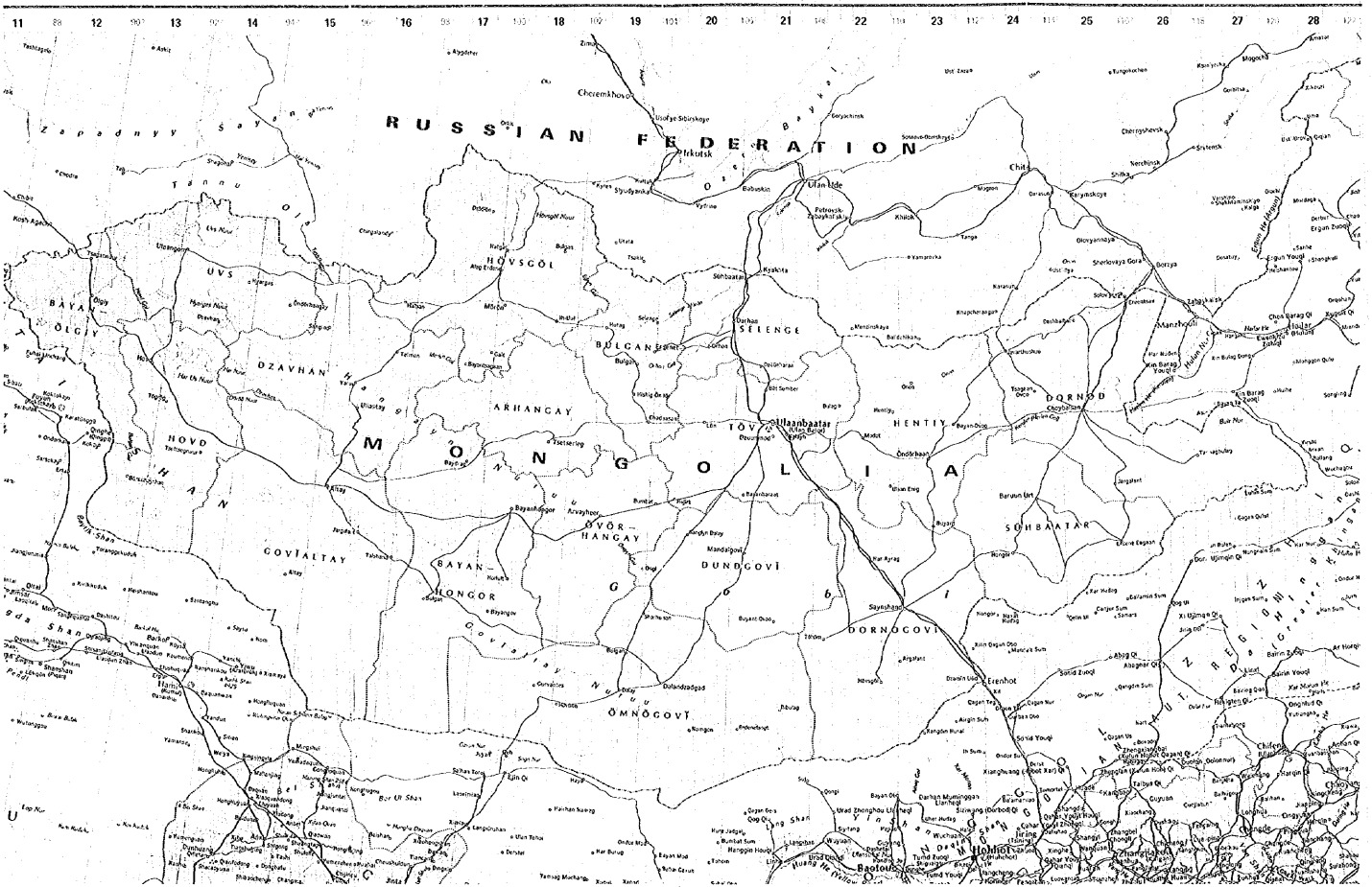
JULY 1996

JAPAN TELECOMMUNICATIONS ENGINEERING
AND CONSULTING SERVICE(JTEC)

NIPPON TELECOMMUNICATIONS CONSULTING CO., LTD(NTC)

TOKYO, JAPAN

MONGOLIA


RUSSIAN FEDERATION
MONGOLIA
Ulaanbaatar
HOVSGÖL
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BULGAN
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BAYAN-HONGOR
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Hohhot
Baotou

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All prices and costs used in this report are those prevailing in April 1996, excepting the case otherwise stated. They are also assumed to be constant during the whole project period.

Exchange Rate : US$1=Mongolian Tugrig (Tg) 490 (April 1996)

PREFACE

In response to a request from the Government of Mongolia, the Government of Japan decided to conduct a study on Telecommunications Network in Ulaanbaatar City and entrusted the study to the Japan International Cooperation Agency (JICA).

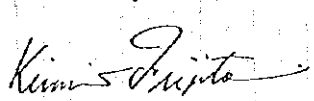
JICA sent to Mongolia a study team headed by Mr. Yasushi TAKAHASHI, Project Manager, Japan Telecommunications Engineering and Consulting Service, three times between September 1995 and July 1996.

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 the present 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.

July 1996



Kimio Fujita
President
Japan International Cooperation Agency

CONTENTS

CHAPTER 5 DEMAND FORECAST

CHAPTER 6 DEVELOPMENT FRAMEWORK AND STRATEGIES

CHAPTER 7 TELECOMMUNICATIONS NETWORK PLAN

CHAPTER 8 PROJECT IMPLEMENTATION PLAN

CHAPTER 9 ANALYSES OF FINANCIAL, ECONOMIC AND SOCIAL ASPECTS

Abbreviation

ADB	Asian Development Bank
ATC	Automatic Telephone Station
BBS	Bulletin Board System
BSC	Base Station Controller
CATV	Cable Television Service
CC	Country Code
CCITT	International Telegraph and Telephone Consultative Committee
CCP	Cross-Connection Point
CCS	Common Channel Signaling
CCT	Circuit
Ch	Channel
CMEA	Council for Mutual Economic Assistance
CPM	Critical Path Method
CT	Central Terminal
CUG	Closed User Group
CWQC	Company-Wide Quality Control
DATACOM	Datacommunications Systems Company Limited
DRCS	Digital Radio Concentration System
DTMF	Dual-Tone Multi-Frequency signaling
EAP	Economically Active Population
EC	Exchange Code
Erl	Erlang
FIRR	Financial Internal Rate of Return
FTTZ	Fiber To The Zone
FTTH	Fiber To The Home
FTTO	Fiber To The Office
GDP	Gross Domestic Product
GRDP	Gross Regional Domestic Product
GSM	Global System for Mobile communications
IC	Incoming
IDD	International Direct Dialing
IRIT	Industrial Research Institute of Telecommunication
ISC	International Switching Center
ISDN	Integrated Services Digital Network
ISUP	ISDN User Part

ITU	International Telecommunications Union
JICA	Japan International Cooperation Agency
JIS	Japan Industrial Standards
Kfw	Kreditanstale for Wiederanfbau
LE	Local Exchange
MCAC	Mongolian Communications Asset Company
MDC	Mongolian Data Company
MDF	Main Distribution Frame
MH	Manhole
MOID	Ministry of Infrastructure Development
MS	Tandem Switch
MSC	Mobile Switching Center
MTA	Mongolian Telecommunications Authority
MTC	Mongolian Telecommunications Company
MTZ	Mongolian Railway Company
N.G.O	Non Government Organization
NDB	National Development Board
NMP	Net Material Production
O & M	Operation and Maintenance
OECF	Overseas Economic Cooperation Fund
OFC	Optical Fiber Cable
OFTS	Optical Fiber Transmission System
OG	Outgoing
OPMC	Outside Plant Maintenance Center
OSP	Outside Plant
PBX	Private Branch Exchange
PDCA	Plan, Do, Check and Action
PDPC	Process Decision Program Chart
PERT	Program Evaluation and Review Technique
PHS	Personal Handyphone System
PIU	Program Implementation Unit
PSC	Primary Switching Center
PSTN	Public Switched Telephone Network
QC	Quality Control
QCS	Quality, Cost and Scheduling
QoS	Quality of Service
RBS	Radio Base Station
RSU	Remote Switching Unit

RT	Remote Terminal
SxS	Step-by-Step switch
SDCA	Standardize, Do, Check and Action
SDH	Synchronous Digital Hierarchy
SITA	International Society of Aeronautical Telecommunications
SL	Subscriber Line
SN	Subscriber Number
SSC	Secondary Switching Center
SV	Supply Volume
TC	Trunk Code
Tg	Tugrig (Mongolian Currency Unit)
TLS	Toll and Local Switch
TQC	Total Quality Control
TUP	Telephone User Part
U.B	Ulaanbaatar city
UHF	Ultra High Frequency
VSAT	Very Small Aperture Terminal
XB	Crossbar switch

CHAPTER 1

INTRODUCTION

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INTRODUCTION

1. General

This Report for the Study on Telecommunications Network in Ulaanbaatar city in Mongolia covers a Telecommunications basic plan up to the year 2010 and a feasibility study for priority projects.

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 Development (hereinafter referred to as MOID), Mongolia Communication Asset Company (hereinafter referred to as MCAC) and Japan International Co-operation Agency (hereinafter referred to as JICA). The study work has been both in Ulaanbaatar and in Japan.

2. Background of Study

Ulaanbaatar city is the political and economic center of Mongolia. The function of the telephone network is considerably deteriorated because of the shortage of the capacities, the obsoleteness of telecommunications facilities, and the disorder by the illegal use of telephone circuits, etc. This results in a great obstacle for the inhabitants' lives and the economic activities.

However, telecommunications play an important role as the national economic infrastructure of Mongolia which has recently shifted into the market economy. The Government of Mongolia has taken up the development of telecommunications as one of the most important policies. It has made, by now, a master plan of telecommunications of the whole area of Mongolia under the support of Asia Development Bank (ADB). However, the improvement of the local telecommunications network is considerably delayed. At present, the penetration ratio of telephone lines is 7 per 100 inhabitants in Ulaanbaatar, and the number of waiters has reached 20,000 in Ulaanbaatar city.

Considering the above conditions, the Government of Mongolia requested the technical assistance to the Government of Japan in September 1994, for the formation of a basic plan of the local telecommunications network in Ulaanbaatar city up to the year 2010, and for the feasibility study of the priority project(s) to be implemented by the year 1997. In response to the request, the Government of Japan dispatched JICA preparatory study team and the Scope of Work was agreed on 22nd June, 1995.

3. Objectives and Scope of Study

3.1 Objectives of Study

The objectives of the Study are as follows:

(1) To formulate a basic plan for the development of telecommunications network in Ulaanbaatar city up to the year 2010 (PHASE I Study), based on the request by the Government of Mongolia;
(2) To conduct a feasibility study for the identified project(s) based on the PHASE I Study (PHASE II Study); and
(3) To transfer technology to the Mongolian counterparts.

3.2 Scope of Study

For the objectives of the study mentioned above, the study is carried out covering the following items and sub-items:

[PHASE I Study]

3.2.1 Basic Study

(1) Collection and Review of Data / Information

a) Socio-economic conditions and statistics
b) National and regional development plans
c) Previous studies on telecommunications
d) Organization and management of telecommunications entities
e) Financial data of telecommunications entities
f) Present status of telecommunications services
g) Development plans and on-going projects for telecommunications services
h) Existing laws, regulations and technical standards related to telecommunications services

i) Present situations of operation, maintenance and management of telecommunications services
j) Present situations of telecommunications facilities and networks
k) Data necessary for the demand forecast and telephone traffic data
l) Other data / information related to the Study

2) Field Survey
a) Socio-economic conditions
b) Existing telecommunications facilities and services
c) Other surveys related to the Study

3) Analyses and Evaluation
a) Demand and traffic forecasts
b) Trend of new technologies and new telecommunications services
c) Planning framework (target year, planning area, service level)

(2) Formation of the Telecommunications Network Development Plan

1) Telecommunications network plan
2) Facilities plan
3) Operation and maintenance plan
4) Institution, and management plan
5) Human resource development plan
6) Financial review
7) Implementation plan
8) Identification of the priority project(s)

[PHASE II Study]

(3) Feasibility Study on Priority Project(s)

1) Determination of planning framework
a) Target year
b) Planning area
c) Service level

2) Facility improvement and expansion plan
   a) Transmission systems
   b) Switching systems
   c) Outside plant
   d) Cable networks
3) Operation and maintenance plan
4) Human resources development plan
5) Institution, organization and management plan
6) Cost estimation
7) Project evaluation
   a) Financial analysis
   b) Socio-economic analysis
8) Project implementation program

4. Approach to Study

4.1 Basic Concept on Basic Plan Study

This study consists of Phase-I Study and Phase-II Study. The Phase-I Study aims to formulate a basic plan for the development of telecommunications network in Ulaanbaatar city, up to the year 2010. The Phase-II Study aims to conduct a feasibility study for the identified priority project(s) based on Phase-I Study. Through the entire study, the study team reviews and studies in detail background of the problems being encountered by MOID / MCAC.

(1) Objectives of Study

The objectives of the study are broken down as follows:

a) Forecast of telecommunications demands up to the year 2010;
b) Formation of a basic plan for the development of telecommunications network in Ulaanbaatar city taking into account the existing facilities, on-going and planned projects, and trend of new technology;
c) Formation of suitable projects with the target area, the target system and the project scale;
d) Selection of priority project(s) based on the evaluation of urgency of telecommunication demand fulfilling, importance of local economy, activation service supply and financial suitability;
e) Feasibility study for the identified priority project(s) considering improvement of service quality in the network for domestic and international calls; and
f) Technology transfer to the Mongolian counterparts.

(2) Consistency with National Development Plan

The role of telecommunications development in the national development plan of Mongolia is recognized. In addition, the government policy for the telecommunications sector is reflected in the plan.

(3) Framework of Planning Target

Considering efficient management and effective investment by MCAC, an effective development framework is formulated with emphasizing, especially:

a) Improvement / expansion of the existing network;
b) Digitalization of the networks;
c) Improvement of service quality; and
d) Preparation for the future diversified telecommunications demand.

(4) Consistency with On-Going and Planned Projects

There are some on-going and planned projects financed by international organizations or some foreign resources, or by MCAC's own fund in Mongolia. The present master plan of Mongolia was prepared in 1992 by supporting of ADB. However, the time when it was projected was in the midst of economic and financial crisis (1991-1993) due to the transformation from a centrally planned to a market oriented economy. In 1994, the Mongolian economy showed a sign of recovery. The National Development Board set high the economic growth rate. This study is carried out taking into account such an economic change.

(5) Network and Facilities Plan

Network and facilities plan is formulated considering the conditions of existing facilities, and new services to be introduced. The following points are main targets of the plan:

1) Promotion of further digitalization;
2) Improvement of service quality, especially in the subscriber network; and
3) Application of radio system, to the subscriber network.

(6) Financial Analysis

The proposed plan will be reviewed from the financial perspective. The data needed for the financial analysis were collected.

(7) Organization

A short history of Mongolian organization relating to telecommunications is studied.

4.2 Specific Approach of Study Work

(1) Standard Method

Demand for the telephone was projected by three methods in this study, that is Method I called as macroscopic forecasting model, Method II called as semi-microscopic forecasting model and Method III called as microscopic forecasting model. Method I uses the regression model based on correlation between telephone density and GDP per capita in former 10 socialist countries data in 1992 to estimate the demand in whole Mongolia. Method II consists of two formula; first one is obtained by using the income level data of household demanding telephone in 1995 to estimate residential telephone demand and second one is obtained on the assumption that business telephone demand will increase in line with GDP growth rate up to 2010 in whole Ulaanbaatar city. Method III also consists of two formula; first one uses the regression model based on correlation between the number of household and residential telephone density in each district in Ulaanbaatar city in 1995 and second one is obtained on the assumption that business telephone demand will increase in line with the growth of the number of companies in each district in Ulaanbaatar city up to 2010. Finally, through the discussion with MOID and MCAC, Method II was selected in order to calculate the demand for the telephone in this study.

The result of the calculation by Model II shows telephone demand of about 163,000 at the year end of 2010.

Traffic forecast was carried out based on the existing traffic data.

(2) Data Analysis

Personal computers are used to analyze surveyed data, to forecast demand and traffic and make network plan. The specific software is used mainly in the following items:

1) Demand forecast;
2) Traffic forecast;
3) Estimation of number of trunk / junction circuits; and
4) Estimation of transmission link capacity.

3) Technology Transfer to Counterparts

Technology transfer from the Study team to the counterparts is one of the important items during study period in Mongolia. The on-the-job training method will be the most effective way for the

technology transfer. For this purpose, the Study team members are required to form close relationship with the corresponding counterpart personnel and make a joint work. For smooth joint work, the work schedule is shown to the counterparts in advance. Items of technology transfer cover not only technical issues but also economic, financial and management issues.

5. Work Schedule

5.1 Overall Time Schedule of Study

The Study period is from the end of September 1995 up to the end of July 1996. The time schedule of the basic plan study by study stage is shown in Table 1-5-1.

Table 1-5-1 Work Schedule of the Study

UB: Ulaanbaatar

Study Stages	1995	1996
First Study in UB	10W	
First Study in Japan	7W	
Second Study in UB	4W	
Second Study in Japan	6W	
Discussion of DF/R	2W	
Preparation of Final Report	4W	
Submission of Reports	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

W: Weeks

5.2 First Study in Ulaanbaatar (PHASEI Study)

During the first study in Ulaanbaatar from 27 September to 2 December 1995, the Study was conduct in the following.

(1) Discussion of Inception Report submitted from the team;
(2) Collection of data/information related to socio-economy, national development policy, telecommunications;
(3) Analyses of data / information collected;
(4) Field survey for socio-economy, demand distribution and facilities;
(5) Field survey by two technical teams
(6) Field survey by one socio-economy team
(7) Macroscopic demand forecast;
(8) Study of long-term development targets;
(9) Preparation of Progress Report

5.3 First Study in Japan (PHASEI Study)

During the first study in Japan from 4 December 1995 to 24 February 1996, the Study Team prepared the Interim Report based on the results of the first study in Mongolia. The Interim Report mainly draft basic plan consists of the following:

(1) Socio-economic study;
(2) Demand Forecasts;
(3) Telecommunications network plan;
(4) Telecommunications network facility plan;
(5) Operation and maintenance study
(6) Human resource development plan;
(7) Institution, organization and management plan;
(8) Study on finance and investment;
(9) Project formation;
(10) Evaluation of basic plan;

5.4 Second Study in Ulaanbaatar

During the second study in Ulaanbaatar from 26 February to 24 March 1996, the study team conducted the feasibility study based on the results of PHASEI Study. The results of the Study was summarized in the report at the end of this period. The Study items are as follows;

(1) Explanation and discussion on the Interim Report;
(2) Discussion on the feasibility study;
(3) Collection and analysis of available materials;
(4) Field survey;
(5) Confirmation of items for each project; and
(6) Reporting

5.5 Second Study in Japan

During the second study in Japan from 15 April to 31 May, 1996, the Study team prepared a draft final report based on the results of the second study in Ulaanbaatar

(1) Planning and designing of the priority projects;
   1) Local exchange
   2) Local junction
   3) Local cable network
   4) New service
(2) Cost estimation;
(3) Economic financial evaluation;
(4) Implementation schedule;
(5) Operation / maintenance plan;
(6) Recommendations;
(7) General evaluation on each project; and
(8) Draft final Report.

6. Study Team and Parties Concerned

6.1 Organization

This Study has been carried out by the following teams:

(1) Advisory Committee: To advise JICA of technical matter for smooth conduct of the Study

(2) Study Team : To carry out survey, analysis, evaluation, basic plan, and feasibility study

The relation of such teams and other organizations is shown in Figure 1-6-1.

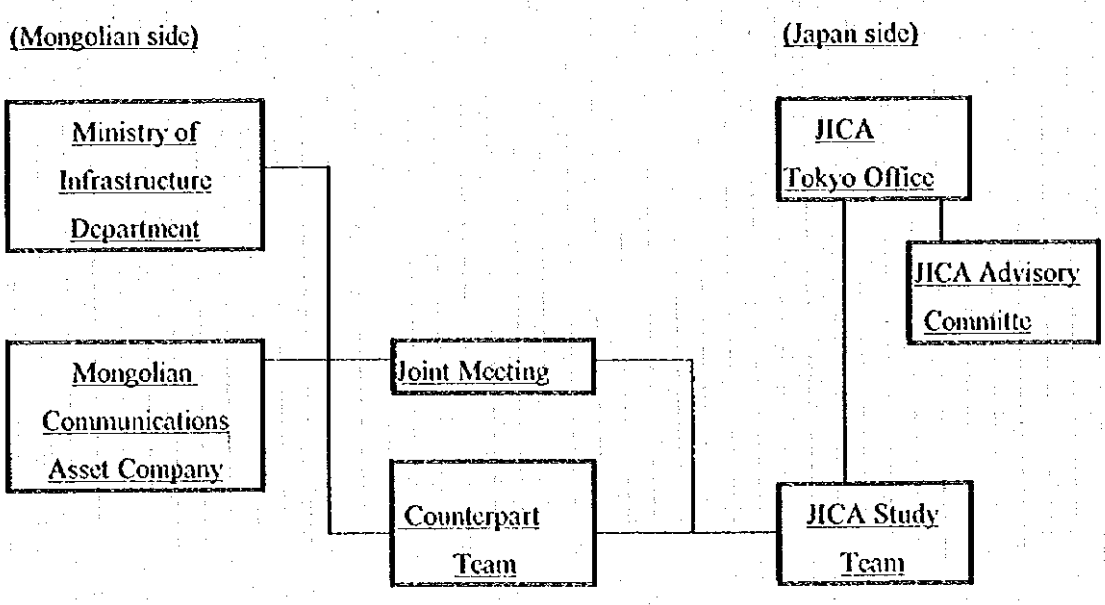


Figure 1-6-1 Organization Chart for Study

6.2 Study Team Members

Duty-in-Charge	Name
Team Leader Service plan / Operation & maintenance	Yasushi TAKAHASHI
Assistant Team Leader Network plan	Yuichi ITO
Demand forecast / Traffic forecast	Naoto MATSUDA
Transmission network plan / Transmission & radio facilities plan	Masahiro SATAKE
Switching facilities plan / Traffic forecast	Kaoru KUSHIDA
Local network plan / Outside plant facilities plan	Yuji OISHI
Organization & management plan / Human resources	Tadashi AOYAGI
Economic / financial analysis	Haruo YAMANE
Administrative support	Masayuki ITO

6.3 MOID/MCAC Counterparts

MOID/MCAC counterparts officially assigned and participated in this study are listed in Table 1-6-2. In addition, many MOID/MCAC personnel other than mentioned in the table have cooperated with the Study team.

Table 1-6-1 List of MOID/MCAC Counterparts

Name of Counterpart	Duty in Charge	Entity	Title/Division
G.Battur	Co-ordination with	MCAC	Executive Director
N.Nansaljav	JICA Study team	MCAC	Deputy Executive Director
N.Nansaljav	Network plan	MCAC	Deputy Executive Director
D.Dorjsuren		MTC	Chief Engineer of Ulaanbaatar Switching
Sh.Ganbold		MCAC	Network planning expert
G.Sharavdemberel		Government	Director of telecommunications department
M.Naranbaatar	Transmission	MCAC	Radio System Expert
T.Ochir	network plan	MTC	Senior Engineer
Sh.Batchimeg	Transmission/ radio	MCAC	Engineer
L.Banzragch	facilities	MOID	Officer
N.Baatarsuren		MCAC	Transmission systems expert
G.Demberel		MCAC	Radio systems expert
N.Enebish		MCAC	Small-size enterprises expert
B.Davaatseren	Switching facilities	MCAC	Switching Expert
B.Tumennasan	plan/ Traffic	MCAC	Data communications expert
B.Narantuya	forecast	MOID	Officer
D.Boldbaatar		MTC	Engineer
Ts.Ganbold	Local network plan/	MCAC	OSP Expert
Ts.Altantsetseg	Outside plant	MTC	Engineer
D.Dolgorsuren	facilities plan	MCAC	Rural communication expert
M.Mend-Ochir		MCAC	Radio systems expert
B.Purevsuren	Institution & management	MCAC	International Cooperation Senior officer
J.Baatarkhuu	Human resources development	MOID	General Director of Communications Department of MOID
L.Munkhbat		MTC	Director of Human resource development and Administration Dept.
B.Tunglag	Economic/Financial	MCAC	Deputy Executive Director
T.Oyunchuluun	analysis	MCAC	Finance, Economics & Planning Expert

6.4 Advisory Committee Members

Duty-in-Charge	Name	Ailiated to
Chairman	Motoyuki MUKODA	Special Advisor, International Affairs Department, Ministry of Posts & Telecommunications
Member	Osamu MAKINO	Development Specialist in Telecommunications, Institute for International Cooperation, Japan International Cooperation Agency

CHAPTER 2

SOCIO-ECONOMIC CONDITION OF MONGOLIA AND ULAANBAATAR

CHAPTER 2

SOCIO-ECONOMIC CONDITION OF MONGOLIA AND ULAANBAATAR

1. Socio-Economic Condition of Mongolia

1.1 Overall Trend

Mongolia is at present in the process of a transformation from a centrally planned to a market oriented economy. Due to a number of external shocks and internal political and economic instability, Mongolia experienced an economic and financial crisis from 1991 to 1993. The external shocks included the disintegration of the Council for Mutual Economic Assistance (CMEA), formed by former communist bloc countries, on which Mongolia depended largely in terms of external trade and economic assistance. Another external factor was the decline in world prices of Mongolia's major export commodities such as copper and cashmere. Domestically, Mongolia was going through political reforms to adopt a democratic system as well as transforming its economic system into a market economy around 1990. With this internal instability, Mongolia was not able to cope properly with the changes in the external economic condition. The economy shrank by about 30%, unemployment rose, and poverty population increased between 1990 and 1993. In 1994, however, the Mongolian economy seems to have hit the bottom and showed a sign of recovery. This upturn was due mainly to the improved macro-economic management with the assistance of international aid organizations and the progress in structural reform stimulating private sector activities.

1.2 Population and Gross Domestic Product (GDP)

Table 2-1-1 presents GDP, GDP per capita and population in Mongolia since 1980. Population of Mongolia had been growing at around 2.5 percent per year since 1980 until 1990. Reflecting economic hardship on the part of nationals, population growth rate declined down to 1.3% per year in 1994. The population in 1994 numbered 2,280 thousand. In accordance with expected economic recovery, population growth rate is likely to rise in the coming years.

The Mongolian economy was enjoying constant economic growth in the 1980's at annual average rates ranging from 3.5% to 9.4% or 6.3% on average, supported by close ties with CMEA

countries. Since 1990, however, the economy began to shrink as a result of a number of external and domestic constraints. The largest fall was experienced in 1992 reaching a 9.5% reduction of GDP.

GDP per capita also experienced continuous decline in early 1990's. GDP per capita in 1993 at 73,875 Tugrugs in 1993 price was by 28% lower than the 1989 level. GDP per capita in 1994 in current price stayed at 125,393 Tugrugs, which is equivalent to US$ 307 per capita applying the exchange rate of 408 Tugrugs / US$. Although Mongolia's per capita income level is classified as one of the lowest income countries in the world, the actual standard of living in Mongolia would probably be higher than the statistical figure indicates, assuming a relatively high proportion of non-cash incomes.

Table 2-1-2 presents a sectoral composition of Mongolia's GDP since 1985. In 1993, the industrial sector accounted for 29% of GDP, the proportion kept almost constant since 1980. The agriculture sector registered a fast growth in 1992 at 15.7%, increasing the sector's share up to 21%. This rise in the sector would be related with privatization policy enabling personal possession of properties, especially livestock. The service sector's share in 1993 was 21%, about 7% higher than 1990 level, which is a clear sign of the expansion of service activities stimulated by the market economy policy.

1.3 International Trade

In the 1990's, international trade also experienced a shrink of activities. Table 2-1-3 shows that between 1990 and 1994 export value in US$ fell by 44%, while import dropped by 72%. As a result of faster reduction of import, the trade balance turned positive at 3.6 million US$ in 1993 and rose to 109 million US$ in 1994, which is equivalent to 16% of GDP. In the coming years, an increase in trade surplus due to expanding export is expected.

Diversification of trade partners is another notable trend since 1990. As Table 2-1-4 shows, eastern bloc countries accounted for 87% and 84% of exports and imports respectively in 1990. The shares dropped to 42% and 57% in 1994. Instead western countries like USA and Switzerland and Asian countries such as Japan and South Korea increased the shares.

1.4 Unemployment, Wage and Poverty

The economic crisis since 1991 was seriously felt at the level of individual population in terms of unemployment, income level and incidence of poverty.

The economic slump and streamlining of state owned enterprises have resulted in the increase of unemployment. As Table 2-1-5 presents, the unemployment rate rose from 5.5% in 1990 to 8.7% in 1994 due to slower growth of employment opportunities than the increase in labor force. Sector-wise, employment in the agriculture and trade sectors rose in the 1990-1994 period, while those in other sectors showed a decline resulting in stagnation of the overall employment figure in 4 years. These trends are shown in Table 2-1-6.

Reduction of income level for the population was a serious outcome of the economic crisis since 1991. Table 2-1-7 summarizes the changes in average wage level in current and constant prices.

Table 2-1-7 Average Monthly Wage in Mongolia

(Unit: Tugrug)

Year	Nominal Average Monthly Wage	Price Index (1991 = 100)	Real Average Monthly Wage
1991	1,025	100	1,025
1992	1,449	422	344
1993	5,253	1,201	437

Source: a) Economic Review and Bank Operations, ADB in June 1995

b) Mongolian Economy and Society in 1994, State Statistical Office in Mongolia

As a result of higher rate of inflation than the increase in nominal wage, average wage level in real term declined by 66% in 1992 followed by a 27% increase in 1993, which is still 43% of the 1991 level.

The increase in unemployment and the reduction of income level resulted in an increase of the population living under poverty line. The poverty population rose from 15.9% in 1992 to 26.5% in 1993 and 1994.

1.5 Economic Recovery in Sight

After four successive years of economic contraction, the Mongolian economy started to recover in 1994. The main leading sectors were agriculture, construction and communications. Economic growth in 1994 with sector disaggregation can be observed in the data on net material production (NMP) prepared by the Asian Development Bank (ADB) mission in 1995 as shown in Table 2-1-8. Net material production indicates production and services of materials expressed in monetary term. This datum is considered useful to grasp sector-wise economic growth in 1994 in the absence of GDP disaggregated into sectors in constant prices.

Overall NMP grew at 2.8% in 1994. Those sectors growing faster than NMP were agriculture, construction and communications with growth rates at 7.1%, 3.9%, and 6.0% respectively. The growth in the agriculture sector was due mainly to the expansion of the livestock sub-sector which expanded at 15% with increased private operation. The rise in the world cashmere price was a favorable factor. Crop production shrank on the contrary. The growth of the construction sector was caused by growing demand from the private sector, increased imports of construction materials and the increase in public investment. In the communications sector, the transport sub-sector grew by 2%. The growth of other sub-sectors led the communications sector's growth. The industrial sector grew by 2.7% resulting from the production increase of Darhan mini-metal plant, expanded output in mineral resources such as copper, gold and nonferrous metals and the increase in output from private enterprises. Production of most state owned enterprises remained stagnant or declined due to inefficient operation.

The latest data show that the Mongolia's GDP grew at 2.3% and 6.3% in 1994 and 1995 respectively. A fast growth in 1995 is achieved by the industrial sector expanding at 20.7%, led largely by rising international copper price. The construction sector and the telecommunications sector grew at 26.5% and 24.9% respectively, while the agriculture sector's growth remained at 5.0%.

2. Socio-Economic Condition of Ulaanbaatar

2.1 Position of Ulaanbaatar

Ulaanbaatar, the capital city of Mongolia, functions as the political and economic center of the country. Table 2-2-1 summarizes the position of Ulaanbaatar by a number of indices.

Table 2-2-1 Ulaanbaatar Compared with Nation

Item	Unit	a) Ulaan baatar	b) Mongolia	a)/b) (%)
Land area	square km	3,542	1,566,500	0.2
Population	1994, thousand	610	2,280	26.8
GRDP / GDP	1994, million Tugrug	83,194	283,264	29.4
EAP*	thousand	266	861	30.9
Number of employees	thousand	194	787	24.7
Unemployment	thousand	65	75	86.8
Unemployment rate	percent	24.4	8.7	-

* EAP: economically active population

It is observed that population and economic activities are concentrated in a small area accounting only for 0.2% of the national land. Concentration of economic activities measured in terms of GRDP's (gross regional domestic product) share in GDP seems lower than an intuitive observation. Since there were no official data on GRDP, an estimate of Ulaanbaatar's GRDP was made by the following steps and as shown in Table 2-2-2.

- Estimate of sector-wise labor productivity based on the data on GDP and the number of labor force in Mongolia

- Derivation of Ulaanbaatar's sector-wise GRDP based on the available labor force data for Ulaanbaatar and national average of labor productivity figures obtained above

Table 2-2-2 Estimated GRDP of Ulaanbaatar in 1994

Sector	(a) Value Added per Labor (thousand Tg)	(b) Number of Labor Force (thousand)	(c): (a)*(b) GRDP by Sector (million Tg)	(d) GDP of Mongolia (million Tg)	(e): (c)/(d) GRDP/GDP (percentage)
Agriculture	326	8.3	2,706	98,538	2.7
Industry	607	85.6	51,959	95,365	54.5
Service	285	100.1	28,529	89,361	31.9
Total	367	194.0	83,194	283,264	29.4

Source:

(1) Mongolian Economy and Society in 1994, State Statistical Office of Mongolia

(2) Economic Review and Bank Operations, ADB in June 1995

(3) Ulaanbaatar Mayor's Office

The following two factors can be considered that would explain relatively low share of the Ulaanbaatar's economy in the national economy.

- Agriculture is still playing an important role in Mongolia's economy.
- An important characteristics of recent economic developments is the expansion of agriculture activities and contraction of the industrial sector. These factors might have led to a diminished role of Ulaanbaatar, the major concentration of industrial activities.

In the coming years, expansion of industrial and trade related activities, which are already in sight, is expected to result in the larger role played by Ulaanbaatar.

A deviation is observed between the Ulaanbaatar's share in economically active population and the number of employees, 30.9% as opposed to 24.7%, indicating limited employment opportunities in Ulaanbaatar compared with the labor force. This gap has resulted in the unemployment rate of 24% in Ulaanbaatar as opposed to 9% in the nation as a whole.

2.2 Population

Ulaanbaatar's population numbered 610 thousand in 1994 accounting for 27% of the national population as shown in Table 2-2-3. A rapid concentration of population in Ulaanbaatar proceeded in the 1950's when average annual growth rate reached 10.6%. Since then the rate of growth has declined gradually and remained between 1.5% and 1.9% since 1990. The average population growth rate between 1990 and 1995 was 1.5% per year.

As shown in Table 2-2-3, population growth in Ulaanbaatar was led by the growth in apartment area. Since 1990, the population in apartment area grew at 3.4%/year, while that in ger area decreased at 1.1%/year on average.

2.3 Income Distribution

The Ulaanbaatar Mayor's Office has been conducting a household income and expenditure survey on a sample survey basis every month. Based on the results of the September 1995 survey, the following income distribution patterns of Ulaanbaatar as a whole and ger area are derived.

Table 2-2-4 Income Distribution in Ulaanbaatar and Ger Area

(Unit: %)

Income Strata (Tg/h.h./month)	Ulaanbaatar	Ger Area
above 80,000	11.5	2.0
60,000 - 79,999	9.5	6.0
40,000 - 59,999	23.5	19.2
20,000 - 39,999	38.4	44.5
below 20,000	17.1	28.3
Total	100.0	100.0

The table indicates that the households in ger area are concentrated more in the lower income strata than the city's average. The average household incomes were 50,157 Tugrigs per month per household for the city as a whole and 32,137 Tugrigs per month per household for the ger area. The level of poverty can be measured by the proportion of the poverty population which is defined, as of October 1995, as those with monthly income of below 4,200 Tugrigs per person. Assuming an average household size of 4.5 persons, monthly income of 18,900 Tugrigs per household would be the

threshold income level. Applying this standard, the ratios of poverty population in Ulaanbaatar and ger area are 16.3% and 27.3% of the total population respectively. Table 2-2-4 shows a detailed income distribution pattern of Ulaanbaatar and ger area.

2.4 Outline of Ulaanbaatar City by District

Table 2-2-5 presents an outline of Ulaanbaatar city by district. The following trends are observed.

- The population in the main part of the city (excluding enclaves and Nalaih) accounts for 93% of all the population.

- Faster growth of population is observed in such districts as Bayanzurh (5.6%) and Bayangol (1.8%).

- Three districts with distinctively high population densities are Suhbaatar, Chingeltei, and Bayangol with 49, 23, and 39 people living in a hectare respectively.

- There are three major districts with large amount of industrial outputs: Bayangol, Songinohairhan, and Han Uul. The changes in the share of industrial outputs have been as shown in Table 2-2-6.

Table 2-2-6 Share of Industrial Output

(Unit: %)

District	1990	1994
Bayangol plus Songinohairhan	20.3	47.6
Han Uul	62.7	34.1

The Han Uul district has traditionally been the location for major state enterprises. Reflecting the recent stagnation of the industrial sector, especially that of state owned factories, the share of Han Uul district in industrial output has been declining. Bayangol and Songinohairhan districts have seen popping-up of new private factories resulting in a rise of the share.

- Summarizing the trends of population and industrial growth, population tends to be growing toward the eastern direction from Bayangol to Bayanzurh, while industry is growing toward the west from Bayangol to Songinohairhan.

- Any special pattern is not observed in the distribution of companies among districts. Relatively speaking, there are more large companies in Suhbaatar, Chingeltei, Bayanzurh, and Han Uul districts.

- In terms of the distribution of labor force, the majority of primary sector labor force is found in Han Uul (56%), followed by Bayanzurh (21%) and Suhbaatar (11%). Songinohairhan is the largest concentration of secondary sector labor force (32%) followed by other 5 districts accounting for a range of 10 to 14%. Songinohairhan and Bayangol are the two districts with high proportions of tertiary sector labor force at 25% and 23% respectively.

Table 2-1-1 Gross Domestic Product (GDP), GDP per capita and Population of Mongolia

(Unit: GDP and GDP per capita are in 1993prices)

Year	Population		GDP		GDP per Capita	
	(thousand)	(%/year)	(million) (Tugrug)	Annual Growth (%/year)	(Tugrug)	Annual Growth (%/year)
1980	1,682.0	-	124,154.6	-	73,814	-
1985	1,900.6	2.5	172,744.6	6.8	90,890	4.2
1986	1,949.7	2.6	188,937.1	9.4	96,906	6.6
1987	1,997.0	2.4	195,469.8	3.5	97,882	1.0
1988	2,044.0	2.4	205,448.3	5.1	100,513	2.7
1989	2,095.6	2.5	214,036.8	4.2	102,136	1.6
1990	2,149.3	2.6	208,650.7	-2.5	97,078	-5.0
1991	2,187.2	1.8	189,357.2	-9.2	86,575	-10.8
1992	2,215.0	1.3	171,366.6	-9.5	77,366	-10.6
1993	2,250.0	1.6	166,219.1	-3.0	73,875	-4.5
1994	2,280.0	1.3	170,042.1	2.3	74,580	1.0

Source: Mongolian Economy and Society in 1994,
State Statistical Office of Mongolia

Table 2-1-2 GDP of Mongolia by Sector in 1986 Prices

(Unit : million Tugrugs in 1986 prices)

Sector	1980	1985	1986	1987	1988	1989	1990	1991	1992	1993
Industry	2,024.8	3,078.9	3,144.8	3,300.0	3,426.7	3,809.2	3,887.4	3,507.1	2,856.6	2,621.1
Agriculture	1,209.7	1,612.0	1,805.9	1,637.6	1,681.6	1,879.8	1,846.9	1,709.2	1,977.0	1,879.1
Construction	399.7	452.3	511.9	596.6	675.0	697.7	561.1	466.5	240.4	199.6
Transport	697.2	1,003.5	1,126.3	1,151.9	1,190.0	1,166.6	1,124.6	499.9	476.0	430.3
Communication	67.5	128.3	146.4	154.7	166.0	180.9	190.8	162.4	113.6	121.7
Trade etc. *	1,407.3	1,828.7	1,929.0	2,104.2	2,201.8	2,405.1	2,363.4	2,072.3	1,581.0	1,589.1
Services	987.7	1,249.5	1,343.1	1,442.6	1,580.3	1,602.9	1,521.6	2,131.1	2,026.9	1,890.5
Others	119.7	133.9	150.7	152.7	142.5	155.6	143.4	153.6	175.8	180.0
Total value added	6,913.6	9,487.1	10,158.1	10,540.3	11,063.9	11,897.8	11,639.2	10,702.1	9,447.3	8,911.4
Subsidies	-795.8	-975.0	-848.1	-908.4	-940.3	-1,351.0	-1,357.8	-1,371.4	-284.0	-717.8
GDP	6,117.8	8,512.1	9,310.0	9,631.9	10,123.6	10,546.8	10,281.4	9,330.7	9,163.3	8,193.6
			(Annual average growth rates, %/year)							
	(80-85)	(85-86)	(86-87)	(87-88)	(88-89)	(89-90)	(90-91)	(91-92)	(92-93)	(85-93)
Industry	8.7	2.1	4.9	3.8	11.2	2.1	-9.8	-18.5	-8.2	-2.0
Agriculture	5.9	12.0	-9.3	2.7	11.8	-1.8	-7.5	15.7	-5.0	1.9
Construction	2.5	13.2	16.5	13.1	3.4	-19.6	-16.9	-48.5	-17.0	-9.7
Transport	7.6	12.2	2.3	3.3	-2.0	-3.6	-55.5	-4.8	-9.6	-10.0
Communication	13.7	14.1	5.7	7.3	9.0	5.5	-14.9	-30.0	7.1	-0.7
Trade *	5.4	5.5	9.1	4.6	9.2	-1.7	-12.3	-23.7	0.5	-1.7
Services	4.8	7.5	7.4	9.5	1.4	-5.1	40.1	-4.9	-6.7	5.3
Others	2.3	12.5	1.3	-6.7	9.2	-7.8	7.1	14.5	2.4	3.8
Total value added	6.5	7.1	3.8	5.0	7.5	-2.2	-8.1	-11.7	-5.7	-0.8
Subsidies	4.1	-13.0	7.1	3.5	43.7	0.5	1.0	-79.3	152.7	-3.8
GDP	6.8	9.4	3.5	5.1	4.2	-2.5	-9.2	-1.8	-10.6	-0.5
				(Sector distribution in %)						
Industry	29.3	32.5	31.0	31.3	31.0	32.0	33.4	32.8	30.2	29.4
Agriculture	17.5	17.0	17.8	15.5	15.2	15.8	15.9	16.0	20.9	21.1
Construction	5.8	4.8	5.0	5.7	6.1	5.9	4.8	4.4	2.5	2.2
Transport	10.1	10.6	11.1	10.9	10.8	9.8	9.7	4.7	5.0	4.8
Communication	1.0	1.4	1.4	1.5	1.5	1.5	1.6	1.5	1.2	1.4
Trade etc. *	20.4	19.3	19.0	20.0	19.9	20.2	20.3	19.4	16.7	17.8
Services	14.3	13.2	13.2	13.7	14.3	13.5	13.1	19.9	21.5	21.2
Others	1.7	1.4	1.5	1.4	1.3	1.3	1.2	1.4	1.9	2.0
Total value added	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Mongolian Economy and Society in 1993, Statistical Office of Mongolia

Note: * Trade and material procurement

Table 2-1-3 Trade Balance of Mongolia

(Unit: million US$)

Year	Export (mln US$)	Import (mln US$)	Trade Balance (mln US$)	% to GDP (%)	Exchange Rate (Tg/US$)	Trade Balance (mln Tug)	GDP (mln Tug)
1980	402.8	547.8	-145.0	-6.4	3	-435.0	6,755.1
1985	689.1	1,095.5	-406.4	-13.0	3	-1,219.2	9,371.9
1986	716.1	1,139.7	-423.6	-13.6	3	-1,270.8	9,310.0
1987	717.9	1,104.6	-386.7	-11.9	3	-1,160.1	9,709.6
1988	739.1	1,113.6	-374.5	-18.4	3/7.1	-1,891.2	10,301.0
1989	721.5	963.0	-241.5	-16.0	7.1	-1,714.7	10,730.9
1990	660.7	924.0	-263.3	-17.9	7.1	-1,869.4	10,465.0
1991	348.0	360.9	-12.9	-1.6	7.1/40	-303.8	18,909.0
1992	388.4	418.3	-29.9	-2.5	40	-1,196.0	47,298.0
1993	382.6	379.0	3.6	0.6	150/400	990.0	166,219.1
1994	367.5	258.4	109.1	15.7	402/414	44,512.8	283,263.0

Note: Exchange rates are shown in ranges for 1988, 1991, 1993 and 1994 in which years either the official exchange rates were changed or fluctuated after 1993. The averages are used to derive trade balances in Tugrig.

Source: a) Monthly Bulletin of Statistics (October 1995)

b) Mongolian Economy and Society in 1994,

State Statistical Office of Mongolia

Table 2-1-4 Trade Partners of Mongolia

(Unit: million US$)

1990				1994			
Export Top 5 Countries	Amount	Import Top 5 Countries	Amount	Export Top 5 Countries	Amount	Import Top 5 Countries	Amount
USSR	517.5	USSR	716.2	Russia	103.8	Russia	148.8
Czechoslovakia	29.9	Germany	37.4	China	73.2	China	23.9
Bulgaria	16.7	Czechoslovakia	34.0	Kazakstan	52.1	Japan	16.7
Hungary	13.7	China	22.3	Switzerland	22.4	South Korea	14.9
Germany	13.7	Hungary	20.5	South Korea	19.1	USA	11.4
Others	69.2	Others	93.6	Others	96.9	Others	42.7
Total	660.7	Total	924.0	Total	367.5	Total	258.4
			(Percentage share %)				
USSR	78.3	USSR	77.5	Russia	28.2	Russia	57.6
Czechoslovakia	4.5	Germany	4.0	China	19.9	China	9.2
Bulgaria	2.5	Czechoslovakia	3.7	Kazakstan	14.2	Japan	6.5
Hungary	2.1	China	2.4	Switzerland	6.1	South Korea	5.8
Germany	2.1	Hungary	2.2	South Korea	5.2	USA	4.4
Others	10.5	Others	10.1	Others	26.4	Others	16.5
Total	100.0	Total	100.0	Total	100.0	Total	100.0

Source: Mongolian Economy and Society in 1994,
State Statistical Office of Mongolia

Table 2-1-5 Unemployment in Mongolia

(Unit: thousand)

Year	Economically Active Population	Employed	Unemployed	Unemployment rate (%)
1987	686.3	665.4	21.4	3.1
1988	772.2	743.3	28.9	3.7
1989	794.1	764.1	30.9	3.9
1990	829.3	783.6	45.7	5.5
1991	851.1	795.7	55.4	6.5
1992	860.0	806.0	54.0	6.3
1993	844.7	772.8	71.9	8.5
1994	861.4	786.5	74.9	8.7
		(Rate of change in %)		
87-88	12.5	11.7	35.0	-
88-89	2.8	2.8	6.9	-
89-90	4.4	2.6	47.9	-
90-91	2.6	1.5	21.2	-
91-92	1.0	1.3	-2.5	-
92-93	-1.8	-4.1	33.1	-
93-94	2.0	1.8	4.2	-
90-94 *	1.0	0.1	13.1	-

Note*: Annual average for the period

Source: Mongolian Economy and Society in 1992 and the same in 1994,
State Statistical Office of Mongolia

Table 2-1-6 Number of Employment by Sector in Mongolia

(Unit : thousand)

Year	Total	Industry	Agriculture	Construction	Transport, Communication	Trade, Technical Provision
1990	783.6	131.6	258.8	66.0	57.7	54.6
1991	795.7	132.2	274.9	49.4	52.2	51.9
1992	806.0	133.9	294.2	41.4	50.2	53.8
1993	772.8	124.1	302.2	33.0	46.0	50.5
1994	786.5	100.9	336.6	27.3	31.5	67.4
		(Rate of change, % / year)				
90-91	1.5	0.5	6.2	-25.2	-9.5	-4.9
91-92	1.3	1.3	7.0	-16.2	-3.8	3.7
92-93	-4.1	-7.3	2.7	-20.3	-8.4	-6.1
93-94	1.8	-18.7	11.4	-17.3	-31.5	33.5
90-94*	0.1	-6.4	6.8	-19.8	-14.0	5.4

Note*: Average annual for the period

Source: Mongolian Economy and Society in 1994,
State Statistical Office of Mongolia

Table 2-1-8 Net Material Product of Mongolia *

Item	1993	1994	Rate of Change (%)
Net Material Product	5,864	6,028	2.8
Agriculture	1,293	1,385	7.1
Industry	2,168	2,227	2.7
Construction	180	187	3.9
Transport	319	325	1.9
Communications	83	88	6.0
Trade	1,619	1,659	2.5
Others	202	157	-22.3

Note: * Derived by the ADB team by subtracting non-material services, depreciation of fixed assets and subsidies and other items from GDP.

Source: Economic Review and Bank Operations, ADB (June 1995)

Table 2-2-3 Population of Mongolia and Ulaanbaatar by Ger and Apartment Areas

(Unit: thousand)

Year	Ulaanbaatar			Mongolia	(UB/Mongolia, %)
	Total	Ger	Apartment		
1950	55.5	42.5	13.0	772.4	7.2
1960	152.2	88.9	63.3	968.1	15.7
1970	294.4	182.7	111.7	1265.4	23.3
1980	435.4	226.8	208.6	1682.0	25.9
1990	574.9	257.7	317.2	2149.3	26.7
1991	578.9	248.8	330.1	2187.2	26.5
1992	589.0	245.1	343.9	2215.0	26.6
1993	598.6	238.7	359.9	2250.0	26.6
1994	609.9	246.8	363.1	2280.0	26.8
1995 *	619.3	-	-	-	-
	(Annual average growth rate , %/year)				
1950-60 **	10.6	7.7	17.2	2.3	-
1960-70 **	6.8	7.5	5.8	2.7	-
1970-80 **	4.0	2.2	6.4	2.9	-
1980-90 **	2.8	1.3	4.3	2.5	-
1990-91	0.7	-3.5	4.1	1.8	-
1991-92	1.7	-1.5	4.2	1.3	-
1992-93	1.6	-2.6	4.7	1.6	-
1993-94	1.9	3.4	0.9	1.3	-
1994-95	1.5	-	-	-	-
90-94/95 ***	1.5	-1.1	3.4	1.5	-

Note* 1) Figures are those at the end of each year.

2) * Annual average figures of the periods.

3) ** As of October 1995

4) *** 90-95 for Ulaanbaatar total only, others for 90-94.

Source: 1) Mongolian Economy and Society in 1994, State Statistical Office of Mongolia

2) Ulaanbaatar Mayor's Office

3) World Bank team for Mongolian Urban Services Project

Table 2-2-4 Income Distribution in Ulaanbaatar

(as of September 1995)

Monthly Household Income Strata (Tug/month)	Income	
	City * (%)	Ger Area (%)
above 100,000	7.2	1.0
90,000-99,999	1.2	0.0
80,000-89,000	3.1	1.0
70,000-79,000	3.3	3.0
60,000-69,999	6.2	3.0
50,000-59,999	9.7	11.1
40,000-49,999	13.8	8.1
30,000-39,999	19.2	19.2
20,000-29,999	19.2	25.3
10,000-19,999	11.1	16.2
below 10,000	6.0	12.1
Total	100.0	100.0
Average Income	50,157	32,137
Poverty population (%)	16.3	27.3

Note: 1) * Including ger area

2) Poverty population is defined as per capita income of below 4,200 Tugrugs per person per month and the assumed household size of 4.5 persons per household.

Source: Ulaanbaatar Mayor's Office

Table 2-2-5 Outline of Ulaanbaatar City Disaggregated into Districts

Distrct	Population (95', 000)	Population growth, 92-95 (%/year)	Population density (person/ha)	Industrial output, 94' price (million Tg)	Number of Companies (95') *			Number of Laborforce (94') **			
					Total	Large	Small	Total	Primary	Secondary	Tertiary
Suhbaatar	80.2	1.3	49.3	3,201	3,132	626	2,506	15,704	558	5,515	9,631
Chingeltei	90.4	1.4	22.9	624	3,250	676	2,574	13,305	0	6,810	6,495
Bayangol	111.7	1.8	38.7	19,650	4,586	787	3,799	22,232	0	7,300	14,932
Songinohairhan	124.3	0.7	1.1	11,404	3,112	254	2,858	31,420	74	17,097	14,249
Bayansur	105.3	5.6	0.7	168	3,976	784	3,192	17,074	1,120	6,173	9,781
Khan-Uul	60.9	0.7	1.4	22,255	2,059	472	1,587	14,420	2,960	7,556	3,904
Nalaih	23.4	-3.3	5.2	165	414	79	335	3,122	6	955	2,161
Baganuur	16.9	1.0	0.8	7,765	392	76	316	4,731	486	2,509	1,736
Bagahangai	6.2	1.7	0.4	6	212	7	205	470	40	150	280
Ulaanbaatar	619.3	1.7	1.7	65,238	21,133	3,761	17,372	122,478	5,244	54,065	63,169
				(Percentage Composition, %)							
Suhbaatar	13.0	-	-	4.9	14.8	16.6	14.4	12.8	10.6	10.2	15.2
Chingeltei	14.6	-	-	1.0	15.4	18.0	14.8	10.9	0.0	12.6	10.3
Bayangol	18.0	-	-	30.1	21.7	20.9	21.9	18.2	0.0	13.5	23.6
Songinohairhan	20.1	-	-	17.5	14.7	6.8	16.5	25.7	1.4	31.6	22.6
Bayansur	17.0	-	-	0.3	18.8	20.8	18.4	13.9	21.4	11.4	15.5
Khan-Uul	9.8	-	-	34.1	9.7	12.5	9.1	11.8	56.4	14.0	6.2
Nalaih	3.8	-	-	0.3	2.0	2.1	1.9	2.5	0.1	1.8	3.4
Baganuur	2.7	-	-	11.9	1.9	2.0	1.8	3.9	9.3	4.6	2.7
Bagahangai	1.0	-	-	0.0	1.0	0.2	1.2	0.4	0.8	0.3	0.4
Ulaanbaatar	100.0	-	-	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Note : 1) * large companies : those with more 5 million togrog of capital, small ; others

2) ** Reason for discrepancy between the total figure of Ulaanbaatar and that in the text is not known. It would probably be due to the difference in the definitions

Source : Ulaanbaatar Mayor's Office

CHAPTER 3

SOCIO-ECONOMIC FRAMEWORK

CHAPTER 3

SOCIO-ECONOMIC FRAMEWORK

1. National Development Policies and Telecommunications

1.1 Overall Policy

Mongolia's economy is going through a transition process toward a market oriented economy. There still lie a number of challenges ahead. To guide the transition process in a coherent and efficient manner, the National Development Board (NDB) is preparing following mid-term and long-term plans.

- Mid-term Economic development Program up to 2000
- Concept of Economic Development up to 2020

The mid-term plan has already been prepared and submitted to the government for review and is scheduled to be finalized and approved in the beginning of 1996.

General directions of the present economic development policies are stipulated in "Mongolia, Annual Economic Development Report" prepared in May 1995 by the National Development Board. The present economic development policies are summarized as follows.

a) Macro-economic Policy:

- a coherent package of monetary and fiscal policies to halt inflation and stabilize the foreign exchange rate
- the improvement of balance of payments position and increase international reserves
- activation of national production, the development of production infrastructure and the solution of problems in social infrastructure
- the intensification of privatization process

b) Promotion of National Production

An economic growth of 3.0% at minimum is the target for 1995 through the following measures.

- a flexible interest rate policy for bank loan
- improvement in the management and structure of agriculture production
- establishment of differential customs duties on imports of machinery and equipment
- purchase of products worth 3 billion Tugrigs by announcing government tenders among producers
- intensification of oil exploration work
- improvement of the utilization of production capacities of mines
- connection of Ulaangom, Ulgii, and Hovd cities to the Russian energy system
- continuation of technical renovation in the energy, road, transport and, communications sectors

c) Science and Technology Policy:

- a consistent science and technology policy with an appropriate distribution among basic and applied technological studies
- formation of a legal basis for the restructuring of the science sector matching market economy conditions
- introduction of new technologies for the assembly of small size machinery and equipment

d) Social Policy:

The main goal of social sector policy is to create a social security system in order to protect the population, especially vulnerable groups, from the averse impact of the transition to a market economy through the following measures:

- creation of 40 thousand jobs annually to limit the unemployment rate at 5%
- utilization of up to 30 percent of privatization fund revenues as a resource dedicated to employment generation
- establishment of poverty alleviation funds with public representative management
- expansion of social care for disabled persons, orphans, disabled and handicapped children and enhancement of social care centers
- intensification of the restructuring process in the education, culture, and health care sectors
- improvement of the service quality and availability of health care institutions

1.2 Public Investment Program

The Public Investment Program (PIP) is an important instrument of government policy. It aims at contributing to the establishment of conditions for economic growth, hand in hand with improved social facilities, and poverty reduction. The highest priority is placed on the energy, transport, and telecommunications sectors. The following shows a distribution of planned investment amount by sector between 1995 and 1998.

- Energy : 31 %
- Telecommunication : 12 %
- Transport : 35 %
- Industry : 7 %
- Agriculture : 10 %
- Social sector : 5 %

The following Table 3-1-1 summarizes needs for international financial cooperation for the implementation of the Public Investment Program for 1995 - 1998.

Table 3-1-1 Need for International Financial Cooperation between 1996 and 1998

(Unit: million US$)

Sector	Project Cost	Percentage
Energy	202.0	54.6
Telecommunication	28.7	7.8
Road transport	83.0	22.5
Education	20.0	5.4
Health sector	6.0	1.6
Support to private sector	30.0	8.1
Total	369.7	100.0

Source: Mongolia, Annual Economic Development Report, NDB (May, 1995)

1.3 Role of Telecommunications

The national development policies mentioned so far indicate two essential implications for telecommunications development. The roles of the telecommunications sector can be conceived as the following.

- to support economic development
- to contribute to improving socio-economic condition of the poorest and vulnerable portion of the population

Ulaanbaatar would play a crucial role in the transition process. The improved telecommunications system of the city would help Ulaanbaatar to play an even greater role as the center and hub of the secondary and tertiary sector economic activities. In the economic development aspect, the following contributions are expected from the upgrading and expansion of telecommunications services in Ulaanbaatar.

- The government is keen to encourage the growth of small to medium scale enterprises, specially export-oriented types. This type of activities are heavily information-dependent, requiring high quality telecommunications services.
- The agricultural and agro-processing sectors are expected to lead the country's economic growth. The improved telecommunications services between cities and rural areas would enhance smoother flows of information leading to increased efficiency in production and better marketing activities.
- Foreign direct investment would increase as a result of the improvement in the telecommunications services.
- Various economic costs incurred under the present condition would be reduced (e.g. reduced transportation cost).
- Privatization policy would lead to further expansion of trade activities which is information intensive.

An analysis on the socio-economic condition in Ulaanbaatar in Section 2.1 revealed that in the ger area the average income level is about 36% lower than the city's average and higher concentration in lower income strata is observed. Consideration for the vulnerable group at the national policy level can be translated into the need for particular attention on ger area population in telecommunications planning. According to a household survey conducted in July to August 1995 as a part of the Mongolian Urban Services Project funded by the World Bank, the lack of telephone was cited by the

respondents as the second problem facing them. The following are the percentages of the respondents citing the following items as problems.

- Bathhouse : 83.0 %
- Telephone : 68.0 %
- Electricity : 53.0 %
- Solid waste collection: 51.0 %
- Road, streets and paths : 45.0 %

Increased access to the telephone network, either through private telephone or public phone, would contribute to upgrading the living standard of the ger area population in a number of aspects such as follows.

- Emergency cases
- Business opportunities
- Increased opportunities for communication in the daily life
- Improvement in various social services such as education, culture, and health care

2. Socio-Economic Framework

A socio-economic framework was established based on the data regarding the existing socio-economic targets collected through interview surveys. The socio-economic framework would serve as a basis for telephone demand forecast. Table 3-2-1 shows the prepared socio-economic framework.

Table 3-2-1 Socio-Economic Framework

Item	Unit	Mongolia	Ulaanbaatar
Population			
growth rate			
1995-2000 (average)	%/year	1.8	1.5
after 2000	%/year	2.0	1.5
population in 2000	thousand	2,508	668
2010	thousand	3,058	778
Economic growth rate			
1995-2000	%/year	5.6	5.6
after 2000	%/ year	6.0	6.0

The population growth targets for Mongolia were collected from the NDB. The rate at 2.0% per year after 2000 is higher than the recent trend (1.5% / year between 1990 and 1994). The assumption is that Mongolia will need a faster population growth to support economic growth. The population growth rates for Ulaanbaatar are based on the data collected from the Ulaanbaatar City Mayor's Office. The growth rate at 1.5% per year is set based on the past trend since 1990. As a result of higher population growth rate assumed for Mongolia, the share of Ulaanbaatar in the national population is assumed to decline from the present 27% to 25% in 2010. The explanation for this is that higher rate of natural increase in the rural areas will surpass the social increase caused by immigration into Ulaanbaatar.

The economic growth rate of Mongolia is assumed to rise from the minimum 3.0% in 1995 to 5.3% in 1996, 5.5% in 1997 and 1998, 5.8% in 1999 and 6.0% in 2000 and thereafter. These rates are set based on the discussion with the NDB. The growth rate at 6.0% after 2000 is regarded as the minimum target. In the absence of existing data and future projection for Ulaanbaatar's GRDP, the growth rates of the nation are assumed to be applied to Ulaanbaatar. Considering the leading role to be played by Ulaanbaatar in Mongolia's economic development, these rates are considered to be on the conservative side.

CHAPTER 4

EXISTING TELECOMMUNICATIONS DEVELOPMENT PLAN AND PRESENT TELECOMMUNICATIONS SERVICES

CHAPTER 4

EXISTING TELECOMMUNICATIONS DEVELOPMENT PLAN AND PRESENT TELECOMMUNICATIONS SERVICES

1. Existing Telecommunications Development Plan

1.1 Demand Fulfillment and Network Development Targets

In line with the Mongolian Sector Policy Statement which was approved by the MOID Minister's Council on 19th April, 1994, MOID has driven forward its plans to meet the requirements pointed out in the new telecommunication policy.

The MOID intended to take the following activities:

- introduction of digital technology into the integrated telecommunication network;
- utilization of satellite system for telephony, telegraphy and data communications;
- installation of new microwave systems in some aimags;
- use of fiber optic cables in urban and populated areas;
- introduction of mobile communication services.

It was estimated by the Master Plan prepared with the assistance of ADB, in keeping with the aspirations of the people and the demand arising from economic growth, that the requirement for telephones in Ulaanbaatar would be in the following order of magnitude:

Year	1995	-	30,000 lines
	2000	-	45,000 lines
	2005	-	58,000 lines
	2010	-	68,000 lines

In response to the requirements, MOID launched a four-year development plan in line with the Master Plan. In Ulaanbaatar city, the on-going programs by means of financing by ADB funds for "44,000 subscriber lines" and by KfW funds for "host exchange with 8,500 lines" were expected to meet the requirement.

These programs are being carried out by introducing new digital exchanges, providing subscriber cable networks and expanding transmission networks by linking exchanges countrywide.

On the other hand, the actual demand in Ulaanbaatar city reached 60,000 lines 1995. This is twice the demand forecast by the Master Plan. Even after these projects are completed in 1997, the number of remaining applicants will reach more than 30,000 in Ulaanbaatar city. Therefore, the Mongolian Government decided to make the new basic plan of Ulaanbaatar city up to the year 2010 in order to fulfill the growing demand.

1.2 Increase of Telephone Subscribers and Waiters

Telephone subscribers and waiters in Ulaanbaatar city in recent years are shown in the Table 4-1-1.

Table 4-1-1 Number of Subscribers and Waiters for Past Years

(Unit: No. of subscribers / waiters)

	1989	1990	1991	1992	1993	1994	1995
No. of Subscribers	29,404	31,890	31,968	30,860	37,349	37,861	44,082
No. of Waiters	-	-	-	-	-	19,500	24,174

Telecommunications network development up to now has been aimed at catching up with demand growth in the Ulaanbaatar city area but it has not been sufficient. The number of subscribers in Ulaanbaatar city in 1995 was about 44,000 and there are about 24,000 waiters mainly because of the shortage of capacities and deterioration of local exchanges and cable networks. The service falls far short of the inhabitants' need and so many complaints come from subscribers.

1.3 Exchange Capacity, Its Usage and Waiting Applicants

MCAC had 52,984 lines of exchange capacity and 40,813 connected lines as of Sept. 1995. This indicates that MCAC made use of around 76 % of the installed exchange capacity on average in Sept. 1995. It is understood that the exchange resources could not be used to the utmost, in spite of a large number of waiters, because outside plant installations have not been enough for the increased exchange resources. It was learnt through interviews with officials on site that there are many waiting applicants out of the normal service area of exchange, who have been waiting for several years, and the MCAC network cannot cover all populated areas. This may be another factor hampering a high usage rate of the exchange resources. Table 4-1-2 shows the installed exchange capacity and connected lines of each switching unit area.

Table 4-1-2 Installed Exchange Capacity, Connected Lines and Waiting Applicants

	District	Area Name	Switching Unit	Switching Capacity	Subscriber Lines	Waiting Applicants
1	Han-Uul	120 Myangat	ATC-34	3,328	3,278	1,191
		Airport	ATC-37A	1,024	660	518
		Yarmag	ATC-37Y			
2	Songio Hairhan	Tolgoit	ATC-33	4,864	2,249	965
		1-R Horoolol	ATC-38	4,608	3,970	2,314
3	Bayangol	3,4-R Horoolol	ATC-36	11,000	8,671	6,961
4	Suhbaatar	Tuv Shuudan	ATC-3	14,336	12,307	7,144
			ATC-2	4,800	1,586	
5	Chingeltei	5 Buudal	ATC-73	0	0	
6	Bayansurh	14-R Horoolol	ATC-35	1,024	857	3,855
			ATC-5	8,000	7,235	
Total				52,984	40,813	22,948

1.4 Local Call Traffic in Ulaanbaatar city

Table 4-1-3 shows the local call traffic in Ulaanbaatar city (E10-B only) from July through September 1995. And Table 4-1-4 shows the Direct distance calls from Ulaanbaatar.

Table 4-1-3 Local Call Traffic in Ulaanbaatar city (E-10B only)

Site	Switching capacity	Subscribers 28. Sept. 1995		Local Traffic (minutes)		
		Main	Branch	July	August	September
ATC-32(H)	14,336	11,769	508	8,782,134	8,379,419	9,170,528
ATC-35(RSU)	1,024	876	-	488,704	485,777	540,002
ATC-33(RSU)	4,864	2,187	254	1,372,427	1,229,815	1,569,648
ATC-38(RSU)	4,608	3,981	-	2,448,317	2,493,375	2,845,717
ATC-36(RSU)	11,000	8,685	89	5,754,427	5,588,526	6,339,399
ATC-37(RSU)	1,024	830	21	592,227	609,989	632,094
ATC-34(RSU)	3,328	2,746	-	1,933,806	1,876,772	2,080,166
Group lines	-	240	378	38,825	53,669	49,584
Total	40,184	31,314	1,250	21,410,867	20,677,412	23,227,138

Subscribers in service for each month.
(exclude fault lines, cutlines)

July : 31,084
August : 31,316
September : 31,314

The number of branch lines is included in the number of main lines.

Table 4-1-4 Direct Distance Calls from Ulaanbaatar

E-10B subscribers only

To Aimag / City	Direct Distance Calls Ulaanbaatar (from / minutes)			
	Jan-Jun 1995	July	August	September
Number of Subs.	31,659	31,084	31,316	31,314
1.CECERLEG		111/217	209/490	
2.ULGII		1,120/2,586	1,775/4,272	
3.BULGAN		1,971/4,205	2,360/4,545	
4.BAYANHONGOR		2,134/5,254	2,032/5,367	
5.ALTAI		2,960/8,609	3,120/8,195	
6.SAINSHAND		1,697/4,916	2,192/6,140	
7.CHOIBALSAN		2,518/7,896	2,761/7,532	
8.MANDALGOBI		1,643/4,572	1,652/4,862	
9.ULIASTAI		219/497	180/410	
10.ARVAIHEER		2,416/6,572	2,653/6,882	
11.DALANZADGAD		2,036/6,075	2,062/6,185	
12.BARUUN URT	N.A.	124/333	136/274	N.A.
13.SUKHBAATAR		2,558/5,249	2,541/5,831	
14.ZUUN MOD		1,730/3,711	1,575/3,767	
15.ULAAN GOM		316/765	251/524	
16.HOVD		2,994/8,173	3,310/9,087	
17.MUREN		N.A.	N.A.	
18.UNDER KHAAN		1,585/4,692	1,954/5,166	
19.DARKHAN		7,376/18,021	8,102/19,784	
20.ERDENET		7,434/16,536	7,545/18,620	
21.NALAIH		1,151/2,926	1,082/2,595	
22.BAGANUUR		2,552/7,188	3,035/8,573	
23.CHOIR		12/12	2/1	
TOTAL		46,657/118,776	50,529/129,002	
		2.55 min/Ave	2.55 min/Ave	

2. Telecommunication Service Quality

2.1 Low Call Completion Rate

The call completion rate* is one of the most important indicators of telephone service quality. The call completion rate means the percentage of call attempts that receive an answer. Busy, no-answer and incomplete dialing are not considered successful calls. In good networks, a call completion rate of above 60% can be achieved.

Call completion ratio*: The ratio of the number of completed call attempts to the total number of call attempts, at a point of a network (ITU-T Rec. E.600).

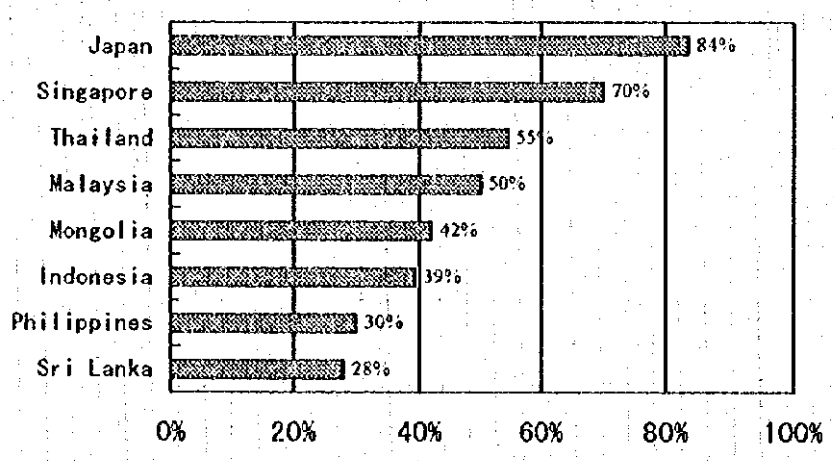


Figure 4-2-1 Telephone Call Completion Rates in Asia (1990-1994)

The call completion rate in Mongolia is low compared with other countries in Asia. This situation incurs low customer satisfaction and decrease in revenue. This matter must be improved by referring to the analysis of causes. This Mongolian data was referred to Annex 2 "Figures of the MTC's Quality of Service" from 1A-5011-MTC's O&M and Customer Service review by NTC & SOFRECOM (June 1995).

2.2 Frequent Faults in Operation

The fault rate is also an important indicator of service quality. This rate generally indicates the number of faults per month per 100 main lines. As shown in Figure 4-2-2, the results vary from

country to country. In general, customers will not be satisfied with a rate higher than rate over 8 which means one fault per year.

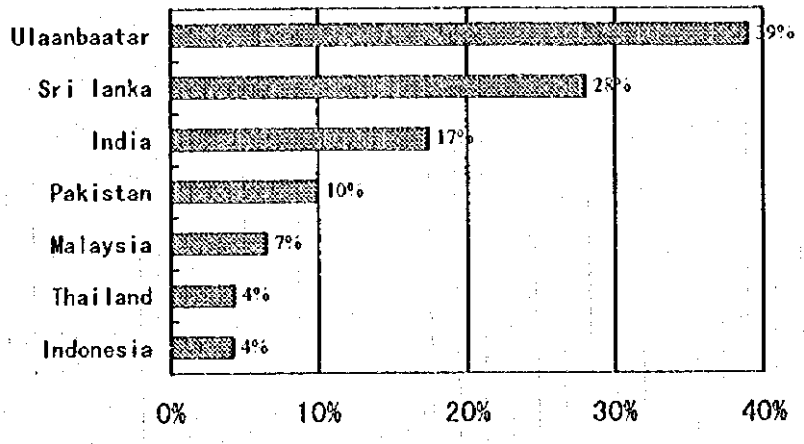


Figure 4-2-2 Telephone Line Fault Rates in Asia (1991-1994)

The fault rate of Ulaanbaatar city is very high (bad) compared with other countries in Asia. The value, 39%, means that every telephone line has faults 4.6 times per year. This problem occurs mainly on primary cables to subscribers. To solve such problems, the rehabilitation of subscriber lines must be implemented in addition to the skill up-grading of maintenance staff. This figure (Ulaanbaatar, 39%) was taken from "Local loop QoS in Ulaanbaatar, per ATC for August 1995" contained in Vol.V Chapter 3,3, Outside Plant.

2.3 Delay of Fault Clearance Work

The clearance time is one of the major quality indicators concerning maintenance efficiency. In general, customers cannot wait more than one day to have a telephone line fault cleared. Therefore, this item indicates the percentage of faults cleared within 24 hours (actually, within one day). Figure 4-2-3 shows the result of clearance in various countries in Asia.

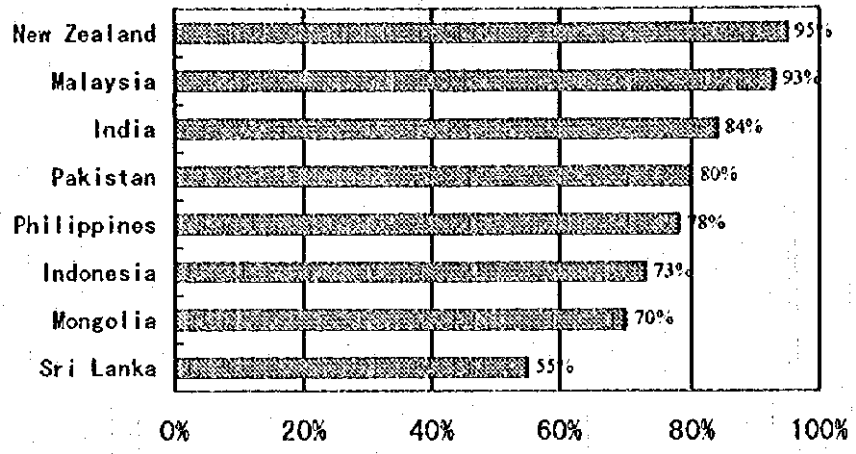


Figure 4-2-3 Fault Clearance Rate Within 24Hours (1991-1994)

The clearance rate for Mongolia is very low compared with other countries in Asia. The main reason for this problem is due to the great number of faults. It seems that the clearance rate can be improved easily when the number of faults is reduced through the rehabilitation of existing cable networks. The data in Mongolia are shown in Annex 2 "Figures of the MTC's Quality of Services" from 1A-5011-MTC's O&M and Customer Service review by NTC & SOFRECOM (June 1995).

3. Problems in Telecommunications Development and Future Trends

Telecommunications facilities have basically been positioned as part of the social infrastructure. In addition, as a monopolistic public enterprise in the telecommunications sector of Mongolia, MCAC is destined to provide telecommunications services for the entire country, including areas where it is quite difficult to make a profit. Without any guarantee in sight for securing sufficient charges in the future, however, MCAC will certainly find it extremely difficult to universally satisfy demand in telephone services throughout the country given the limited financial resources.

It will therefore be necessary to introduce external resources. Wherever the necessary funds are obtained, it will be necessary at the very least, to secure sufficient profits for repayment. To this end, the concept of cross subsidies, in which the returns from high-profit projects support low return projects, must be strongly promoted. In more concrete terms, it is necessary to study through the Basic Plan the possibility of diverting profits from the Ulaanbaatar city area to regional areas, and to achieve universal expansion of the network.

The basic plan will result in a great increase of residential subscribers. As most residential subscribers pay only about US$ 12 monthly, appropriate measures should be taken to deal with this situation.

4. Present Status of the Telecommunications Sector

Telecommunications services in Mongolia had been operated by the Ministry of Telecommunications as a government administrative organization until 1989. In 1990, the Mongolian Telecommunications Authority (MTA) was established to provide telecommunication services under the political reform of Mongolia.

Afterward, Mongolian Telecommunications Corporation (MTC) was formed in 1992 and provided all the basic telecommunications services under MOID's control. In connection with the introduction of a market-oriented policy and sector privatization, MTC was divided into two (2) companies as of September1, 1995. One of them is MCAC, a governmental organization wish is responsible for managing communication assets.

The other is MTC, a privatized company which is responsible for operating services under a lease agreement with MCAC.

MTC provides all the basic telecommunication services and is prohibited from providing value-added services.

5. Present Status of Telecommunication Services and Operators

5.1 General

Most of the telecommunication facilities, using analog technology, were made by the former Soviet Union during the 1960s and 1970s. These facilities are well maintained, but have become obsolete and inadequate at present for providing comprehensive domestic and international telecommunication services.

With the introduction of the French E10B telephone exchange in ATC3 in 1993, the quality of telecommunication services in Ulaanbaatar improved and switching capacities doubled by the end of the year. Meanwhile the old subscriber cables are still in use and the obsolete cables cause deterioration of network quality.

The national trunk network consists of the analog microwave system and the open-wire system. Although the backbone microwave system has been operated without major problems, the open-wire system has not been so reliable. It was observed that the number of trunk circuits is not sufficient nationwide. Considering the equipment lifetime and other circumstances, those facilities and systems should be replaced with the latest digital system immediately in order to maintain the national backbone route in good condition and continue to provide stable communication services.

At present, MCAC/MTC monopolize the following nation wide basic telecommunication services:

a) Domestic telephone service (local and trunk calls);
b) International telephone service (IDD and operator-assisted service);
c) Facsimile service;
d) Telex service (international);
e) Telegram service (domestic and international);
f) Leased circuits;
g) Broadcasting program service.

5.2 Telecommunications Operated by MTC

5.2.1 Telephone Services

In order to meet telephone demand, improvement of telephone services in Ulaanbaatar city is a pressing matter the telecommunications sector. MCAC/MTC have been making efforts to improve them in recent years. The telephone density was 3.2 per 100 inhabitants in Mongolia, and 6.7 per 100 inhabitants in Ulaanbaatar with 23,000 waiting applicants as of the end of 1995.

The historical data regarding telephone services during 1989 - 1994 are shown in Table 4-5-1.

Table 4-5-1 Telephone Services in Ulaanbaatar and Mongolia

	Year	1989	1990	1991	1992	1993	1994	1995
Mongolia	No. of Subscribers	62,404	66,357	68,480	64,126	66,399	67,700	76,000
	Telephone Density	2.98	3.09	3.19	2.90	2.96	2.94	3.28
Ulaanbaatar	No. of Subscribers	29,404	31,890	31,968	30,860	37,349	37,861	44,082
	Telephone Density	5.24	5.55	5.55	5.24	5.23	5.21	7,12

At present, MTC provides telephone and non-voice services as its main business, although the latter is not mature yet.

Subscriber telephone cables have been extended to cover Ulaanbaatar city. However, in the outskirts of the city, in the "ger" area, there is are very few telephone services. The location and size of the ger areas are shown in Vol. III, Figure 3-2-2. Special attention should be paid to the installation of adequate telephone services for people living in the ger areas as the basic infrastructure.

5.2.2 Telex Service

Telex service is available to customers in Ulaanbaatar and Darhan. They have the choice of connection to Russia or direct access to Hong Kong by satellite, 40-line telex step-by-step exchange is operating to connect 10 trunk lines to Moscow via terrestrial microwave links, and three 46-channel telex circuits are operating to connect the pivotal exchange in Hong Kong via AsiaSat.
Telex service is not generally available domestically in Mongolia.

5.2.3 Leased Circuit Service

Leased circuits provide both voice and low-speed data services with 84 subscribers, which are mainly Government and banks is about 300. The total number of national and international circuits.

5.2.4 Other Services

A facsimile service is also provided by 900 terminals, using the telephone network, and the terminal equipment belongs to MCAC. Telegraph services are available through teleprinters in post and telecommunication offices.

6. Present Status of Telecommunications Network Managed by MCAC/MTC

6.1 General

The domestic national telecommunications network in Mongolia consists of about 3,970 km of analog microwave network, 30,000 km of open-wire lines with a small capacity of 3-12 channels, and about 350 telephone exchanges with a total capacity of 97,000 lines, 41% of which are digital.

Most of the network equipment uses analog technology, and was manufactured during the 1960s and 1970s in the former USSR. These facilities are now inadequate for providing stable national and international telecommunication services due to the age of the equipment lifetime.

An overview of the present status of the telecommunication system operated by MCAC/MTC is described in the following paragraphs.

6.2 Switching Network

The switching network in Ulaanbaatar mainly consists of domestic and international telephone switching and telex switching networks.

6.2.1 Domestic Telephone Switching Network

The national telephone switching network comprises one (1) Secondary Switching Center (SSC) as a gateway to/from the International Switching Center (ISC), twenty three (23) Primary Switching Centers (PSCs) as a gateway to/from SSC, two (2) Local Exchanges (LEs) and six (6) RSUs in Ulaanbaatar, three hundred and fifty (350) LEs in aimags, somons, special cities (Darhan and Erdenet), and the detached territories (Nalaih and Baganuur) in Mongolia. MCAC has about one hundred thousand (100,000) switching capacity and seventy six thousand (76,000) subscribers as of November 1995. Figure 4-6-1 shows the national telephone network configuration. Now, three switches replacement and improvement project funded by KfW (Kreditanstalt fur Wiederaufbau) are being implemented. After completion of these projects, the total switch capacity will reach approximately one hundred and ten thousand (110,000) in 1997.

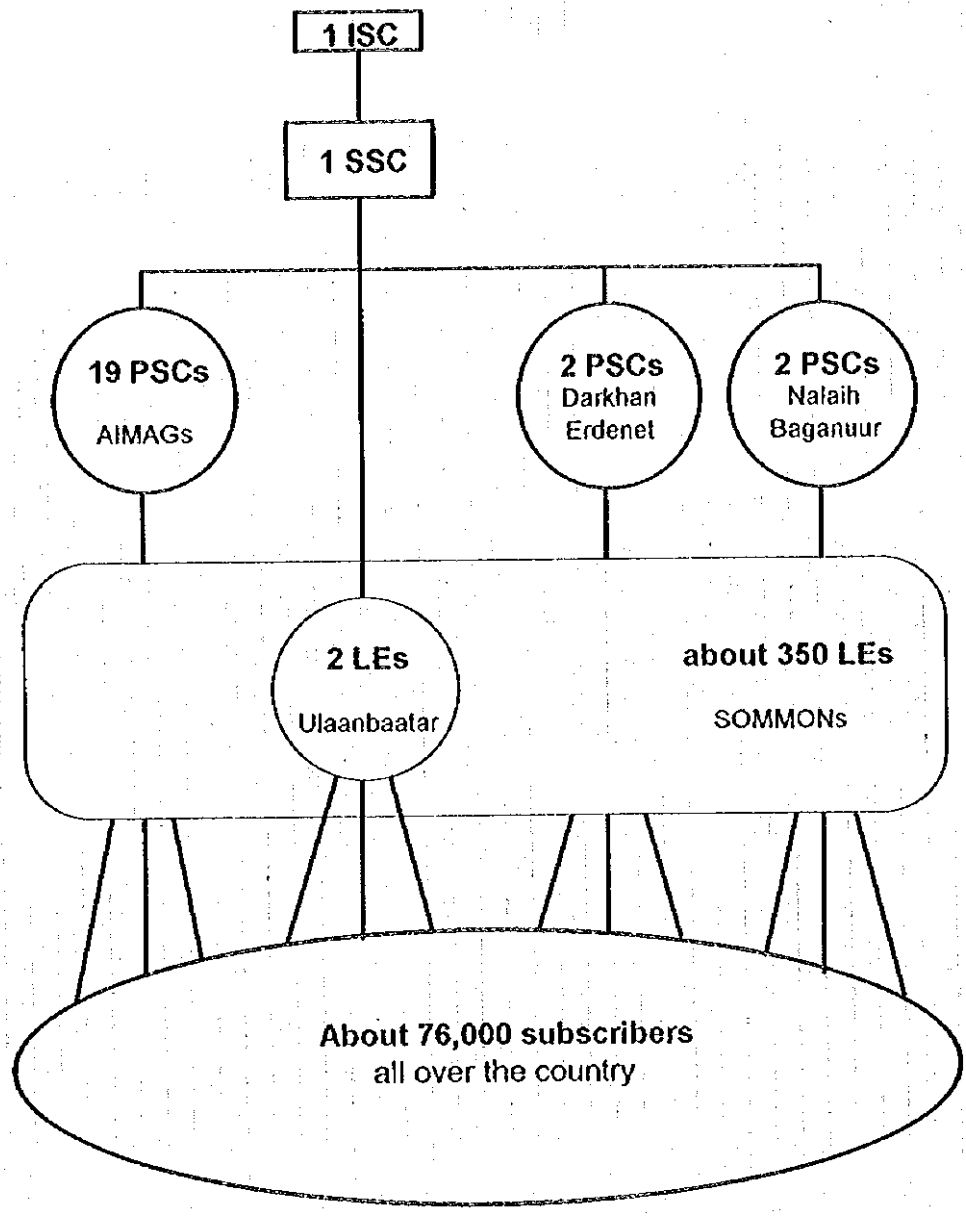


Figure 4-6-1 The National Telephone Network Configuration

6.2.2 Exchange Capacity

There are 353 Local Exchanges (LEs) in the MCAC network. And MCAC has a total of 256 automatic exchanges (ATCs) in its network. The exchange capacity is about 110,000 lines, with and 76,000 lines in use. Table 4-6-1 shows the exchange capacity and working lines by aimag area, and Table 4-6-2, the exchange capacity and working lines in the Ulaanbaatar area.

Table 4-6-1 Exchange Capacity and Working Lines by Aimag Area

(December 1994)

	Aimag/City	Switching Capacity			Subscriber Lines		
		Aimag	Somon	Total	Aimag	Somon	Total
1	TSETSERLEG	1,000	524	1,524	939	120	1,059
2	ULGII	1,000	392	1,392	1,145	203	1,348
3	BULGAN	1,000	1,042	2,042	1,013	479	1,492
4	BAYANHONGOR	1,000	482	1,482	990	164	1,154
5	ALTAI	1,000	834	1,834	1,100	259	1,359
6	SAINSHAND	900	1,225	2,125	958	280	1,238
7	CHOIBALSAN	1,800	844	2,644	1,560	174	1,734
8	MANDALGOBI	1,000	528	1,528	1,042	338	1,380
9	ULIASTAI	1,000	666	1,666	879	391	1,270
10	ARVAIHEER	1,000	1,418	2,418	1,160	977	2,137
11	DALANZADGAD	2,000	294	2,294	873	129	1,002
12	BARUUN URT	800	660	1,460	674	135	809
13	SUHBAATAR	1,000	1,546	2,546	1,039	307	1,346
14	ZUUNMOD	1,000	1,612	2,612	960	716	1,676
15	ULAANGOM	2,000	890	2,890	1,000	265	1,265
16	HOVD	1,200	680	1,880	1,090	196	1,286
17	MUREN	2,700	784	3,484	968	310	1,278
18	UNDER-HAAN	1,000	1,146	2,146	1,014	521	1,535
19	DARHAN	2,800	1,600	4,400	2,712	1,134	3,846
20	ERDENET	2,000	500	2,500	2,335	300	2,635
21	CHOIR	200	250	450	138	25	163
	TOTAL	27,400	17,917	45,317	23,589	7,423	31,012

Table 4-6-2 Exchange Capacity and Working Lines in Ulaanbaatar area

(November 1995)

	District	Area Name	Exchange	Type	Capacity	Subscriber Lines
1	Han-Uul	120 Myangat	ATC34	RSU	3,328	2,919
		Airport	ATC37 A	RSU	1,024	651
		Yarmag	ATC37 Y	RSU		
		Biokombinat	ATC76	XB	200	144
		Shuvuun Fabric	ATC	PBX	100	60
2	Songio Hairhan	Tolgoit	ATC33	RSU	4,864	2,094
		1-R Horoolol	ATC38	RSU	4,608	4,035
		Jargalant	ATC	XB	200	25
		Nairamdal	ATC	PBX	32	30
3	Bayangol	3,4-R Horoolol	ATC36	RSU	11,000	8,782
4	Suhbaatar	Tuv Shuudan	ATC3	E10B(H)	14,336	12,329
			ATC2	SxS	4,800	1,439
5	Chingeltei	5 Buudal	MDF73	No Switch	0	0
6	Bayansurh	14-R Horoolol	ATC35	RSU	1,024	893
			ATC5	SxS	8,000	7,292
		Gachuurt	ATC	XB	50	29
		Honhor	ATC	XB	50	50
7	Nalaih	Nalaih	ATC	SxS	1,200	940
			ATC	PBX	48	48
8	Baganuur	Baganuur	ATC	XB	3,000	1,927
			ATC	PBX	32	32
			ATC	PBX	48	32
9	Bagahangai	Bagahangai	ATC	XB	200	63
Total					58,144	43,814

6.2.2 International Telephone Switching Network

For the International Switching Center (ISC), only one (1) international switch (NEAX-61E) is operating in Ulaanbaatar. The international connections to/from foreign destinations are made via Intelsat, InterSputnik and microwave. Figure 4-6-2 shows the international telephone network as of November 1995.

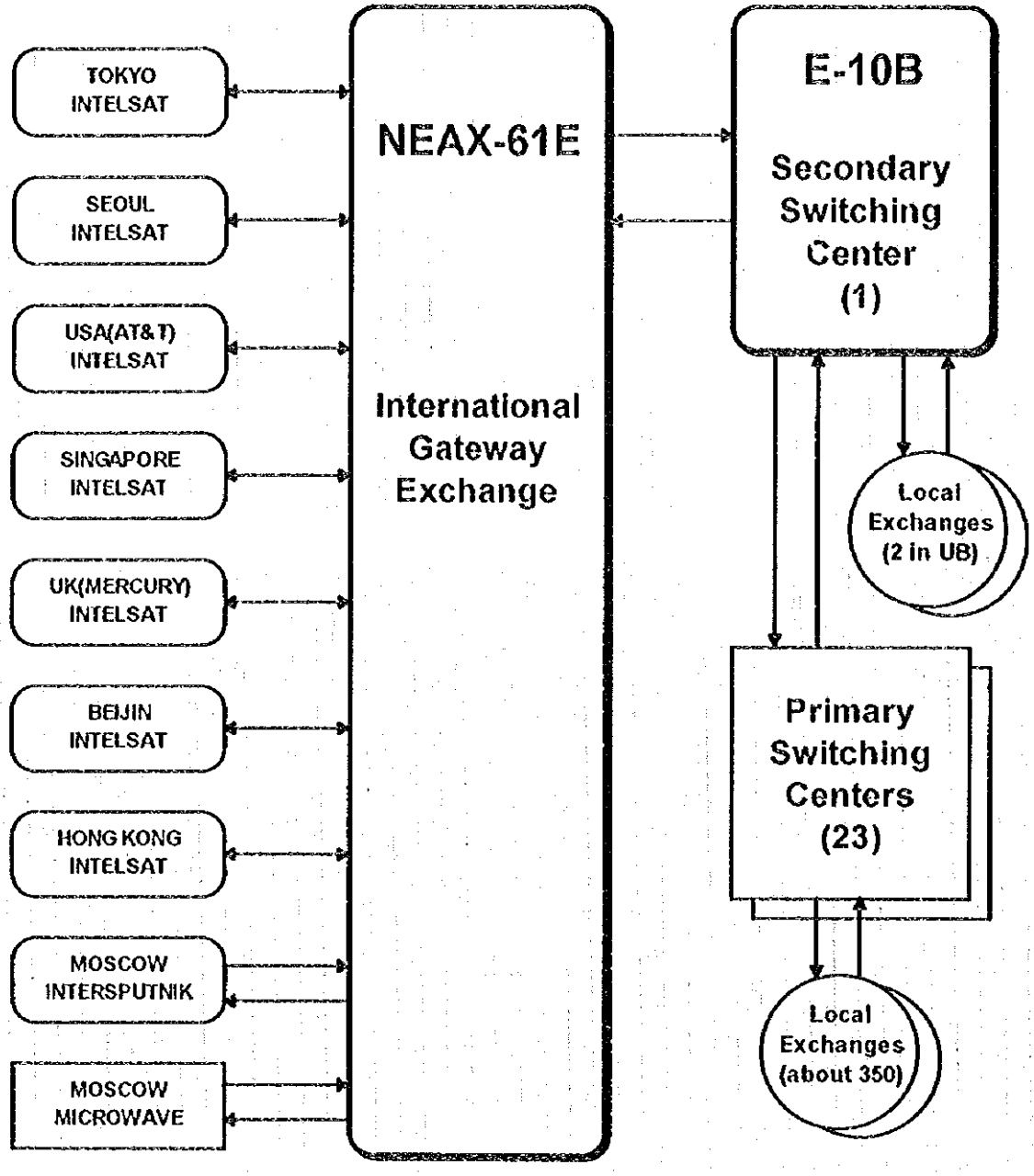


Figure 4-6-2 International Telephone Network Configuration

6.2.3 Telex Switching Network

As for the telex service, there is no exclusive exchange in Mongolia. This country uses telex exchanges situated in Hong Kong and Moscow. There are only one hundred (100) subscribers (Government, banks, etc.) and telex needs are currently decreasing.

6.3 Transmission Network

Considering the territory and population of Mongolia, radio telecommunication systems offer advantage in terms of cost and flexibility, particularly in low density areas. A digital microwave system has already been installed between the ATC-32 and the Naran earth station via the MTV station as a repeater, but the majority of remaining routes are still using analog systems and most of the equipment is nearing the end of its lifetime.

Therefore, in order to avoid serious interruption of the services, renewal of the existing analog network is inevitable.

6.3.1 International Transmission Network

Until 1992, the international transmission network had only two (2) direct links to Russia and China via terrestrial microwave and open-wire systems, respectively. In this sense, the international telecommunications network requires to be effective and flexible in terms of finance and politics.

After the completion of the satellite earth station at Naran in 1993, it has become possible to communicate with more than 110 countries by using Intelsat, InterSputnik and AsianSat systems.

6.3.2 National Transmission Network

The national transmission network consists of terrestrial microwave and open-wire systems. Attention should be focused on rehabilitation and digitalization of the obsolete facilities. Digitalization of the national network has already been started in the satellite approach links and the link between Ulaanbaatar and Erdenet / Darhan under the ADB project.

According to the Master Plan by ADB program, existing backbone routes are to be digitized by the year 2002.

The present national transmission route configuration is shown in Figure 4-6-3.
The figure shows that the analog microwave system connects all aimags except four which are connected by open-wire links.

6.3.3 Junction Transmission Network in Ulaanbaatar City

The junction transmission network in Ulaanbaatar city consists of optical fiber cable links connecting all the ATC exchanges except ATC-73. ATC-73 where only MDF is installed is connected by metallic cable to ATC-32.

Details of the present junction network are described in Figure 4-6-4.

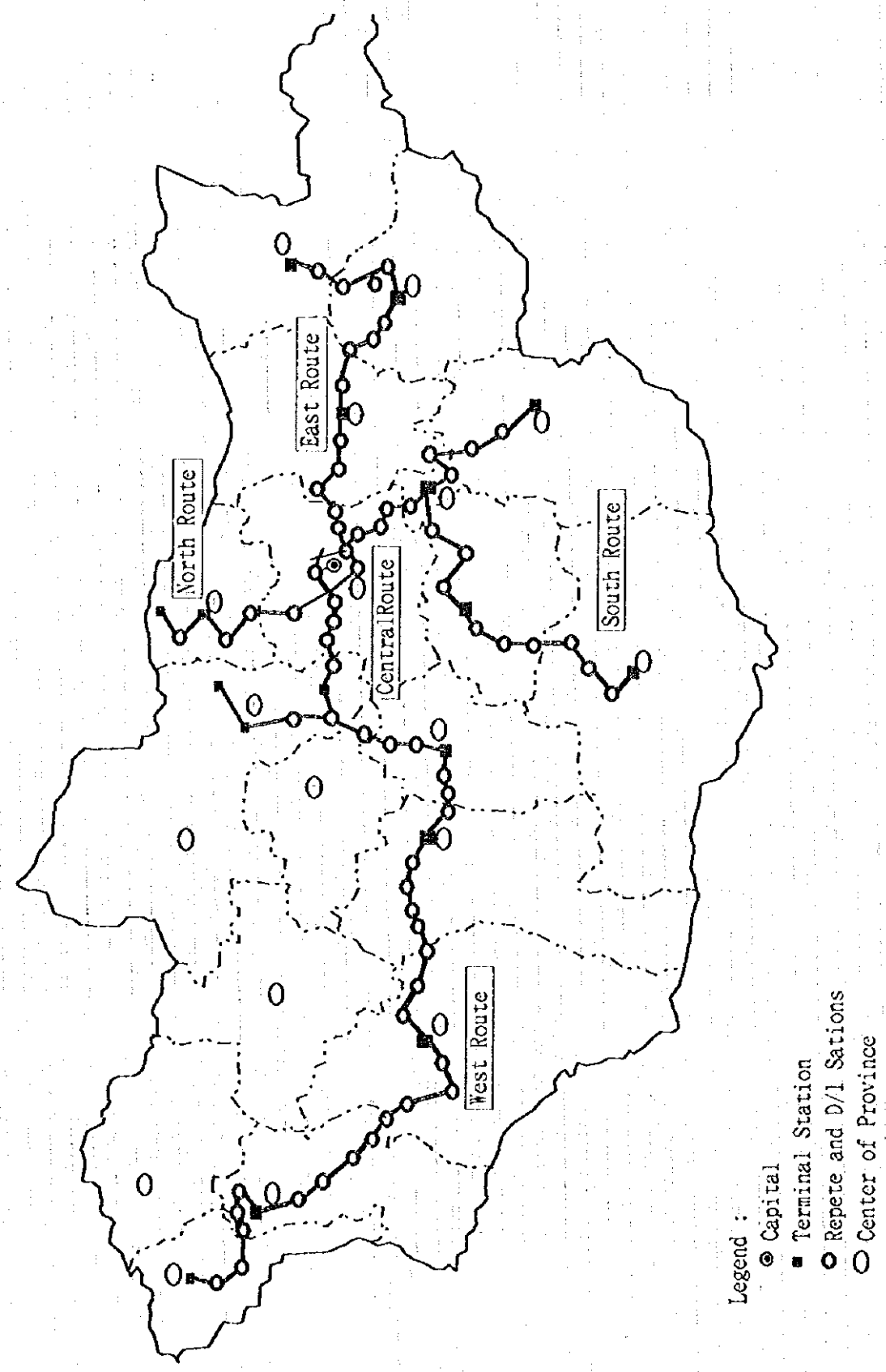


Figure 4-6-3 National Microwave Route Configration

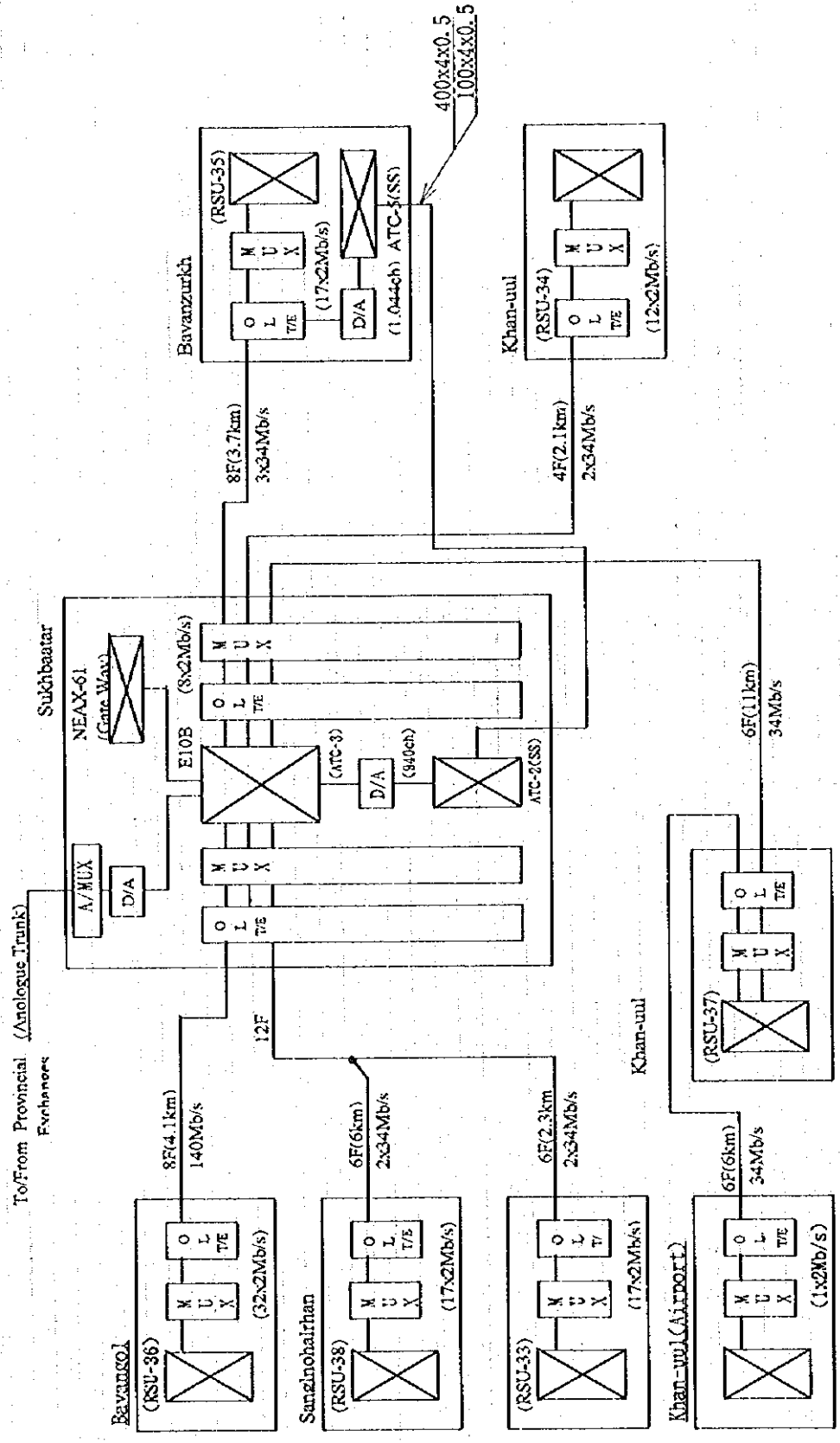


Figure 4-6-4 Junction Network in Ulaanbaatar Area

6.4 Subscriber Cable Network

The subscriber cable network in Ulaanbaatar consists of metallic cables. The base of the subscriber cable network as well as the other equipment technology originated from the former Soviet Union. Around 55% of the cables in service were installed before 1975, and more than 80% were installed before 1980. The oldest cables are dated 1958. The majority, possibly 95%, of the network consists of air spaced, paper core, and lead sheathed copper cables. The remainder are air spaced, polyethylene insulated, and sheathed, copper cables. Open wires are still used as a distribution system in the remote districts in Ulaanbaatar. The network is, as a whole, in a bad state due to deterioration and lack of maintenance.

Optical fiber cables have been used to link RSUs to ATC3 (Host) only in Ulaanbaatar city, but outside the city there are no optical fiber links, although several remote districts exist.

Table 4-6-3 shows the present status of subscriber cable facilities as of June 1995 in Ulaanbaatar city.

Table 4-6-3 Present status

Category	As of June1995
Switch Capacity	52,984 lines
Primary Cable Pair	61,260 lines
Cable Pair/Switch Capacity	1.16

6.4.1 Distribution System and Transmission Requirements

The current subscriber cable distribution system employs a flexible distribution system using cross-connection cabinets at the cross-connection points (CCP). Figure 4-6-5 shows a typical schematic diagram of the flexible distribution system.

Pairs to a CCP are provided on an instalment basis to meet growth in demand over planned of 5-year period.

The single-gauge of 0.5 mm had been used since the establishment under the influence of the former Soviet Union, but since 1990, 0.4mm gauge has been introduced from China.

The cables are installed either in ducts or directly laid in the ground. Duct occupancy is planned based on a maximum of 1,200 x 0.5mm pairs per bore. These cables were originally pressurized to prevent the ingress of water, but the gas systems were not working at all due to lack of compressor parts and associated equipment spares.

The major portion of the cable network is installed in duct, and armored cables are scarcely used for directly buried or aerial cables suspended from support wires by small clips, and saddles are scarcely used in aerial cables . Figure 4-6-6 shows the configuration of underground / aerial junctions.

Within large blocks of apartment buildings, the external cable terminates at a distribution block, which is generally in the stairway or corridor and set into the wall of the building. Figure 4-6-7 shows the configuration of distribution in an apartment.

The attenuation loss is presently limited to 10.5dB at 1,500 Hz and the loop resistance is 1,200 Ohms. Although international standards provide for the use of copper cables with a caliber of 0.5mm, most telecommunication companies choose twin calibers like 0.4mm and 0.6mm which are used for far longer distances. Accordingly, the ADB master plan recommends the use of this cheaper manner, citing that as switching is cheaper and modularized, use of the 0.4mm caliber is easier in most cases.

Under the ADB project, 0.4mm caliber will be used up to 3,500 meters. As for the loss, it will be 9.5 dB and the electric resistance loop will remain as mentioned above.

6.4.2 Primary Cable

There are more than 313 km of primary cables in Ulaanbaatar city, about 95% of which are estimated to be lead sheathed cables, although no data is available.

The types and sizes of existing primary cables are shown in the Table 4-6-4.

Table 4-6-4 Existing Primary Cable

Conductor gauge	Pair	Capacity
	Lead sheath	Plastic sheath
0.5mm	50,100,200,300,400,500,600, and 1,200 pairs	50,100,200,300,400, and 500 pairs
0.9 mm	52 pairs	—

In the ADB project, conductors having diameters of 0.4, 0.5 and 0.6mm are specified in the tender, but actually, according to the Bill of Lading obtained, the following jelly filled cables in ducts are listed:

0.4mm : 100, 200, 300, 400, 500, 600, 800, 1,000, 1,200, 1,600, 1,800, 2,000 and 2,400 pairs.
0.6mm : 100, 200, 300, 400, 500, 600, 800, 1,000 and 1,200 pairs.

6.4.3 Secondary Cable

There are less than 390 km of secondary cables existing in Ulaanbaatar city, about 70% of which seem to be lead sheathed cables, and the remaining 30% are plastic sheathed cables, although no data is available.

The conductor gauge of existing secondary cables is 0.5mm, and the pair sizes are 10, 20, 30, 50, 100 and 200 pairs.

Under the ADB project, as in the case of primary cable, conductors having diameters of 0.4, 0.5 and 0.6mm are specified in the tender, but actually, the following jelly filled cables in ducts and self-supporting aerial cables are listed:

For jelly filled cables in ducts:

0.4mm : 10, 20, 30, 50, 100, 150, 200, 300 and 400 pairs.
0.6mm : 10, 20, 30, 50, 150 and 200 pairs.

For self-supporting aerial cables:

0.4mm : 10, 20, 30, 50 and 100 pairs.
0.6mm : 10, 20, 30 and 50 pairs.

6.4.4 Cross-Connection Cabinet

There are about 225 cross-connection cabinets scattered around Ulaanbaatar city having three types of capacities, 300, 600, and 1200 pairs.

The cross-connection cabinets are made of sheet metal and are adequate for the function. The terminations (cable heads) are fully sealed with the lead cable plumbed to the entry sleeve. The jumper wire is terminated on screw connections. Some screws from spare positions are missing having been cannibalized for use on working pairs.

Problems with running wires and cables internally and a shortage of spares have lead to the practice of running temporary overhead wires and cables out of door openings. A practice that will use it in deterioration of network quality.

Generally the jumper fields are run neatly, but there are signs of material shortages. In some cabinets the shortest distance between the two terminations has been used instead of following the jumper field.

Under the ADB project, a new cabinet having a 2,000 pair capacity will be added to the existing ones.

6.4.5 Distribution Point

There are less than 7,000 distribution points scattered around in Ulaanbaatar city, about 94% of which are installed in buildings.

There are four types of distribution blocks 10-pair, 20-pair, 30-pair and 50-pair.
The 20-pair distribution block is reported to be mostly used.

6.4.6 Overhead Construction

Wooden poles are used extensively, these are generally fastened to non-rotting concrete stumps. This practice is ideal for the Mongolian conditions.

On the open wire routes, there is little evidence of transverse or in-line stays, that are normally fitted on routes subject to adverse weather conditions, such as strong winds and icing, are expected.

The twisted, plastic-coated, single-pair type of wire is used for aerial distribution or drop wires.

After two years, the insulation is likely to start bubbling or splitting, resulting water penetration and hence low insulation.

Under the ADB project, in addition to wooden pole, 7m, 8m and 10m long galvanized steel poles are planned to be used.

6.4.7 Duct

A network of ducts about 184 km long exists in Ulaanbaatar city. The duct formation varies from 1 to 48 multi-way depending on the route.

The network is constructed using asbestos cement duct laid in single and multi-way formations. The duct is a single uniform size through out its length without sockets. The inner diameter of the duct is 100 mm. Duct lengths are joined by aligning the butts and taping the joints. The duct is then laid directly on the earth bed and the trench backfield.

Under the ADB project, PVC pipes with inner diameters 57 mm and 99 mm (3 mm and 5.5 mm thick, respectively, and 6m long) are planned to be used instead of asbestos cement duct, and PVC pipes are specified to be joined with a sockets. Steel pipes are planned when crossing rivers as well.

6.4.8 Manholes

There are about 4,550 manholes in Ulaanbaatar city. Although there are three sizes, the smallest seen in Ulaanbaatar is not large enough to house cable joints.

In general, the manholes are built of reinforced concrete, and the round manhole covers are made of cast iron. The covers measure 60 cm in diameter and have a uniform, thickness of 2.5 cm.

The types and sizes of existing manholes are shown in Table 4-6-5.

Table 4-6-5 Existing manholes

MH Type	Height	Width	Length
M1	80	40	60
M2	120	80	120
M3	140	140	160

Unit: cm

Under the ADB project, the manhole types will be modified in terms of size, and M4 size will be added.

New manhole types envisaged in ADB project are shown in Table 2-3-15 of Volume III, Chapter 2.

6.4.9 Main Distribution Frame

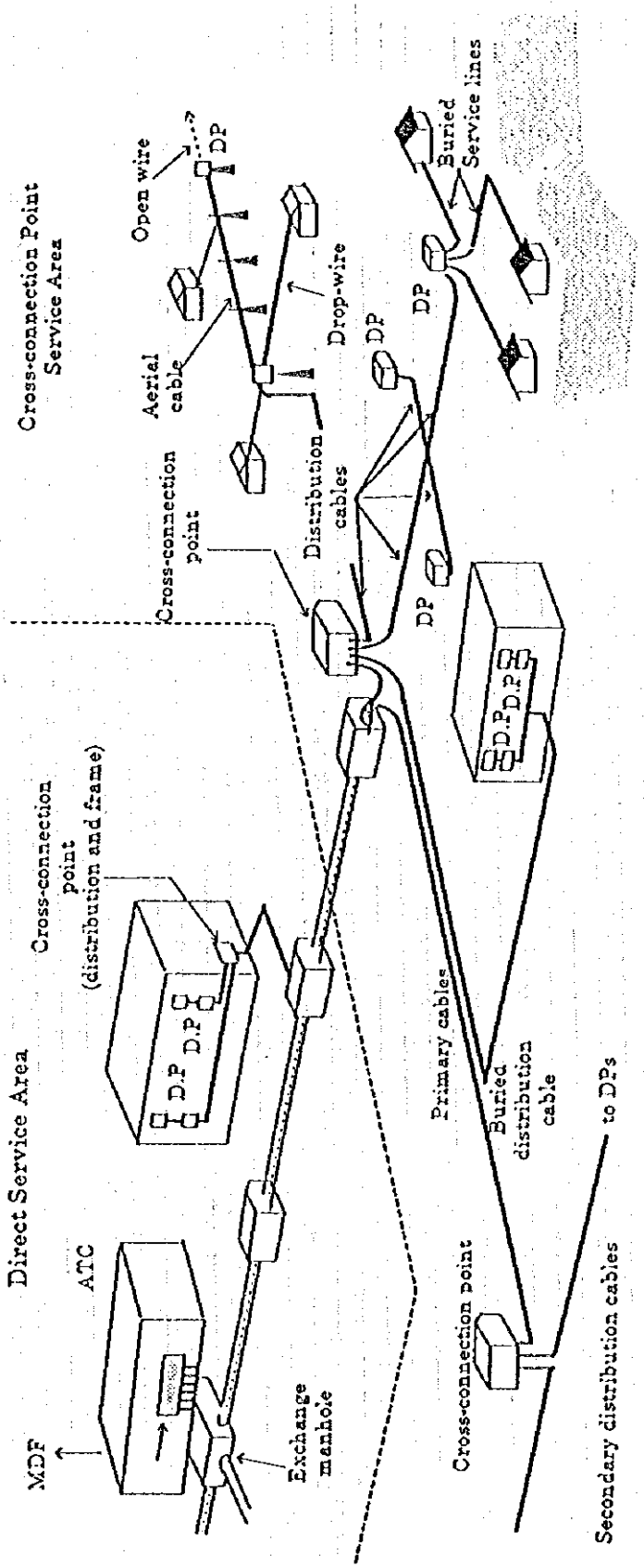
With the exception of the newly installed E10B frame, the termination block is 20-pair incorporating a heat coil, and has carbon black protection. The wires are terminated on solder tags.

6.4.10 Joint Closure

Lead cable joints are plumbed. Polyethylene cable joints are closed using a plastic sleeve which is taped to the cable sheath. Lead to polyethylene joints are closed using a combination of both.

Under the ADB project, heat-shrinkable and mechanical sleeves are planned to be used.

As for the jointing materials, it is specified that the jointing of multi-pair cables will be compulsory effected by means of Insulation Displacement Contact (IDC) connectors, grease filled and operated by machine or hand tool.



Figue 4-6-5 Typical schematic diagram of flexible distribution system

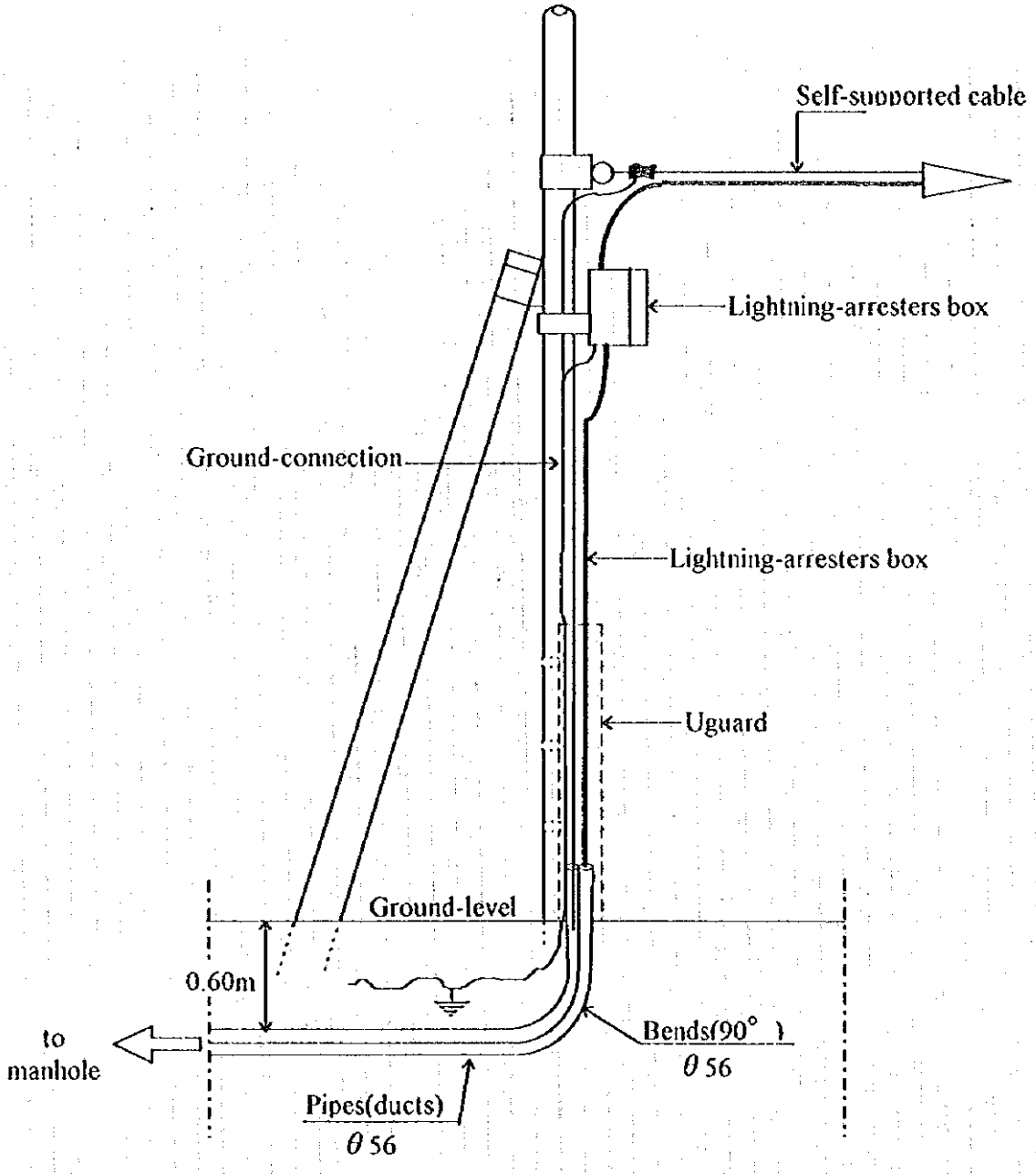


Figure 4-6-6 Configuration of Underground/Aerial Junction

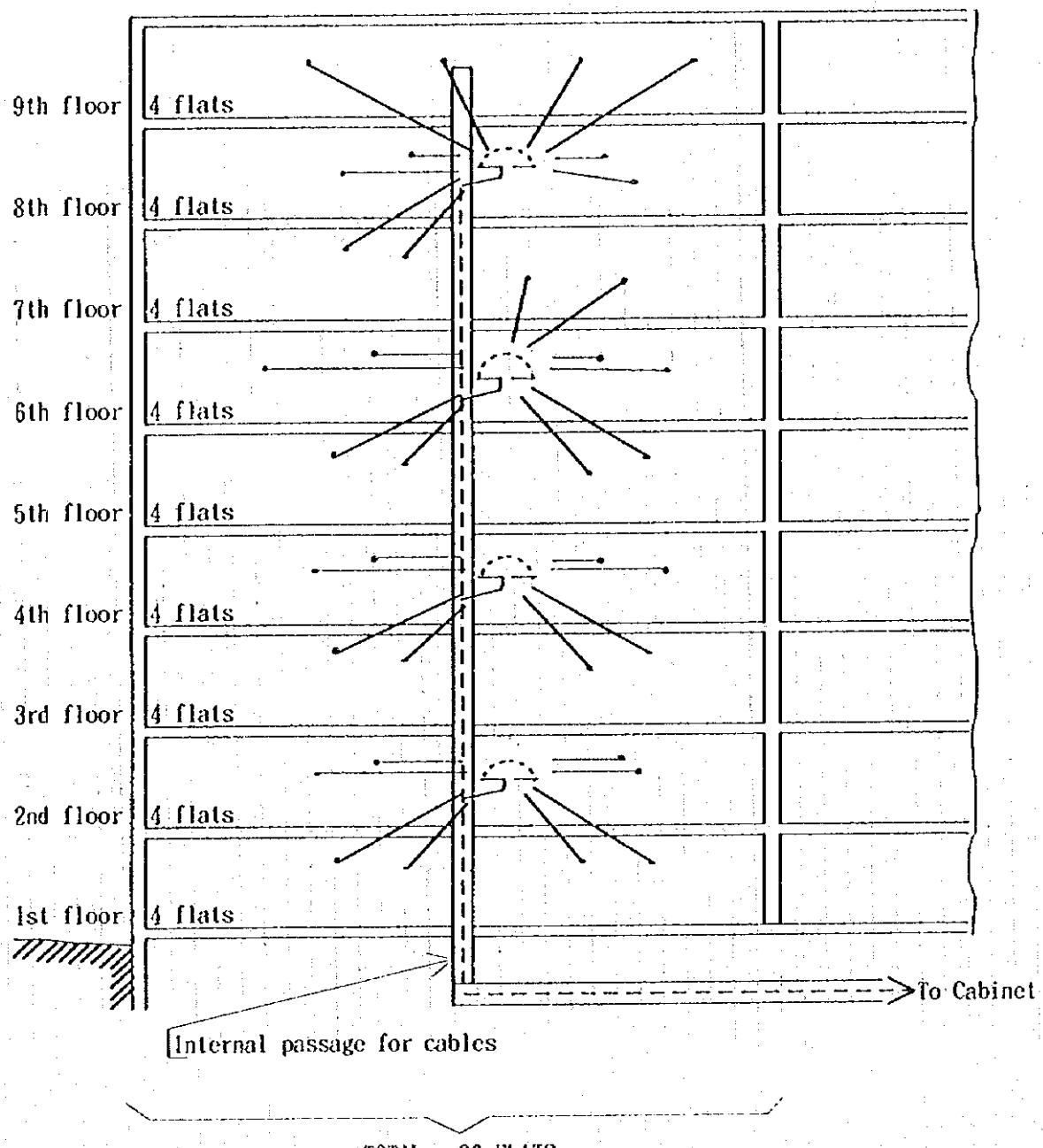


Figure 4-6-7 Configuration of Distribution in Flats

7. TELECOMMUNICATIONS SERVICES OTHER THAN MCAC/MTC NETWORKS

In Mongolia, the number of operators, other than MCAC/MTC, which provide telecommunication services, are increasing. An outline of major operators' activities are mentioned below.

7.1. Data Communications (DATACOM Co., Ltd.)

7.1.1 General

In Mongolia, data communication services are provided by the Datacommunications Systems Company Limited (DATACOM) which was established in February 1994. Previously, DATACOM was the National Informatics Center which ran the mainframe computers for the National Development Board. Number of staff is 34.

DATACOM provides four services and has about 500 users. Users are composed of banks, government organizations and other companies. DATACOM offers services to users 24 hours a day. Host computers are installed in the head office and in the Ministry of Environment office. No trouble has occurred with them so far. The data traffic volume is increasing by about 10~20% a month. Presently, DATACOM is steadily expanding its service areas to cover the entire, country in compliance with user needs.

DATACOM uses its own private 128 kbps satellite link to the Sprint Link (USA) network and the SITA network for some international communications.

7.1.2 Provided services

DATACOM provides the following services:

1) Domestic PC-Mail Service:
   This service includes public and corporate e-mail, file transfer and BBS (information distributing service). The PC-Mail network covers Ulaanbaatar city, Darhan, Erdenet and 18 provincial centers. DATACOM is expanding its service area to include all aimags (21provincial centers).
2) International PC-Fax (fax forwarding) Service:

This service provides international transmission of computer generated facsimile messages via Internet and SITA networks.

3) Full Internet Access Service:

4) Packet Switching Service:
This service is provided in 10 aimags.

7.1.3 Tariff

1) PC-Mail service
One time service - US$ 75
Monthly charge - US$ 15 (no traffic or usage charge)

2) International PC-Fax service
One time service - no charge for PC-Mail/Internet users
US$ 75 for users with conventional fax machines
Usage charge - depends on destination country, for example, 1- minute fax transmission:

USA	US$ 0.1
Germany	US$ 0.35
Japan	US$ 0.37
Singapore	US$ 0.35

3) Full Internet access service
Shell account
One time charge US$ 75
Monthly charge US$ 15
Usage charge US$ 0.1 per outgoing message
US$ 0.1 per outgoing 1-minute online (Telnet,...)

SLIP/PPP-account
One time charge 1-month charge
Monthly charge
US$ 90 for 15 hours per month
US$ 145 for 30 hours per month
US$ 495 for 240 hours per month (up to 10 accessors can share as corporate users)
US$ 995 for 24-hour dedicated connection.

7.1.4 Network Configuration

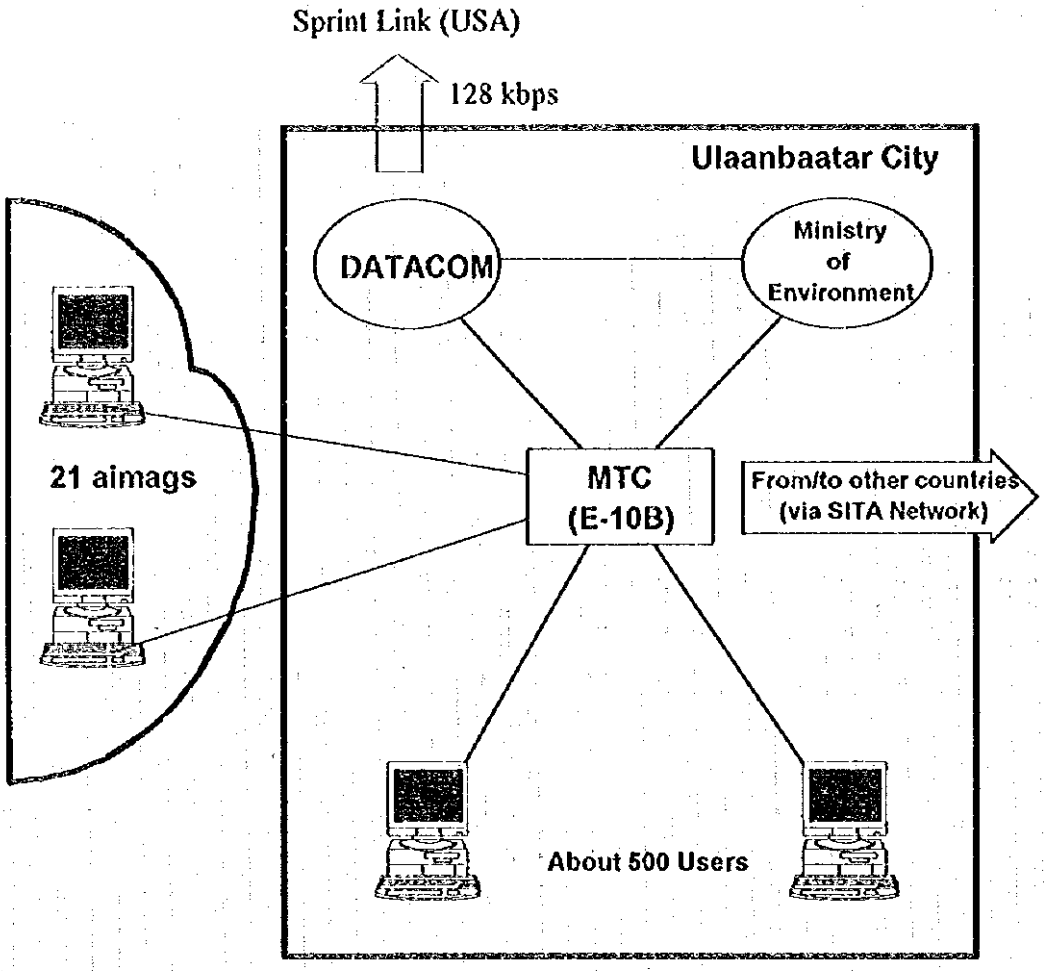


Figure 4-7-1 Network Configuration of DATACOM

7.1.5 Future Plan

DATACOM has currently no special plan.

7.2. Governmental Network (Communication Office of the Government)

7.2.1 General

7.2.1.1 Present Status

Inter communications, between buildings of the Mongolian government and those of ministries and other public organizations are using a cross-bar exchange (ATC65) produced in the former German Democratic Republic. This exchange, installed in 1973, has a 1,600-subscriber capacity. Since it has been used for over 20 years, there are no spare parts and no possibility of supplying them. Further use of this exchange will not possible when the MCAC networks are digitalized. Subscriber cable networks also have a lot of problems, because most of the cables are the old lead type with paper insulated cores.

7.2.1.2 Network of Ih Tenger Guest House

Subscribers of the special services at the Ih Tenger Guest House, include:

1. President of Mongolia
2. Chairman of Mongolian Parliament
3. Prime Minister of Mongolia
4. Foreign high level guests of the state and government
5. Officials escorting high level guests
6. Campus service and security personnel

The Ih Tenger telecommunications system uses a UP ATSK 100/400 exchange (capacity: 300), made in the former Soviet Union. Since the MCAC telephone exchange has been changed to a digital system, this exchange cannot provide new services or meet connection demand any more.

7.2.1.3 Aimag Links

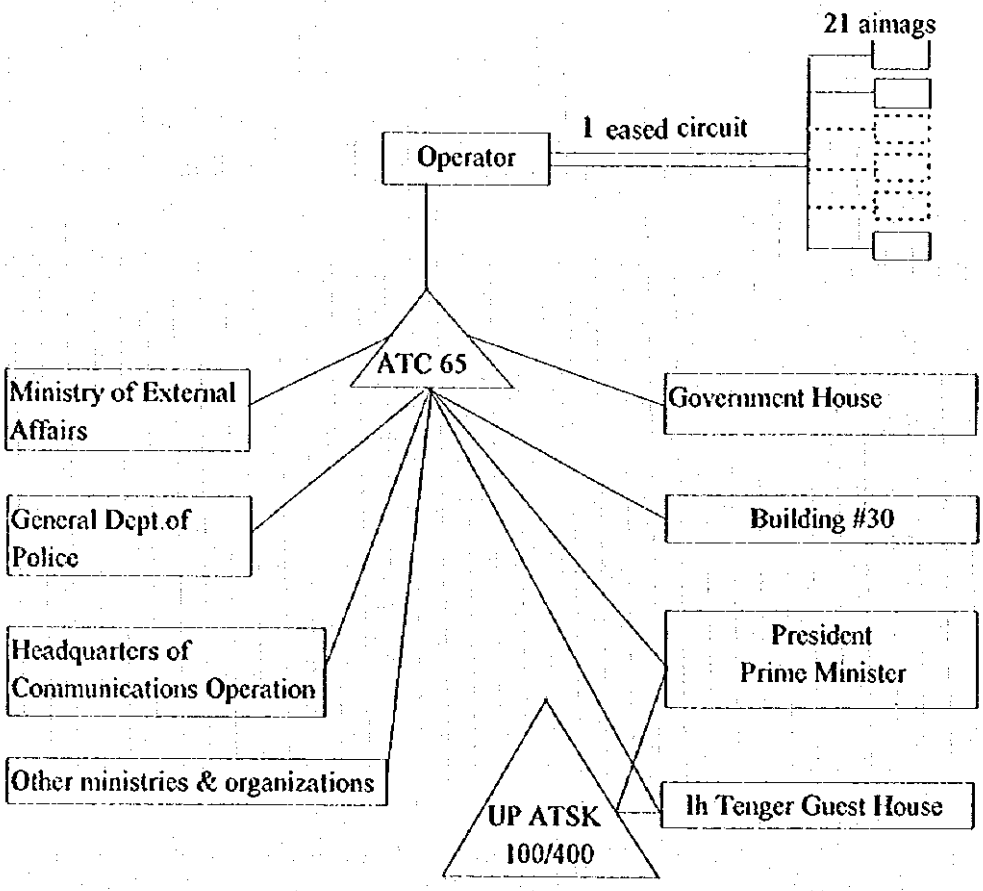
For 21 aimags, ATC65 operators connect telephone lines to/from aimags.

7.2.2 Services Provided

At present, these networks transmit only telephone calls and facsimile messages.

7.2.3 Network Configuration

Figure 4-7-2 shows present network configuration.



There are 455 telephones in Government House; 428 telephones in 46 ministries, general departments, committees and offices; and 157 telephones in the Ih Tenger Guest House (1,140 in all).

Figure 4-7-2 Configuration of Governmental Network

7.2.4 Future Plans

It will become necessary to connect the governmental network with the MCAC network for transmit telephone facsimiles and data.

New central equipment will unite the networks and be connected to mobile HF and UHF radio and satellite communications equipment. The use of this equipment as a basic connecting system will create a basic network with special purposes designed to unite all categories of state and government communications.

In future, this system will form an optical local fiber area network in order to transmit high speed information.

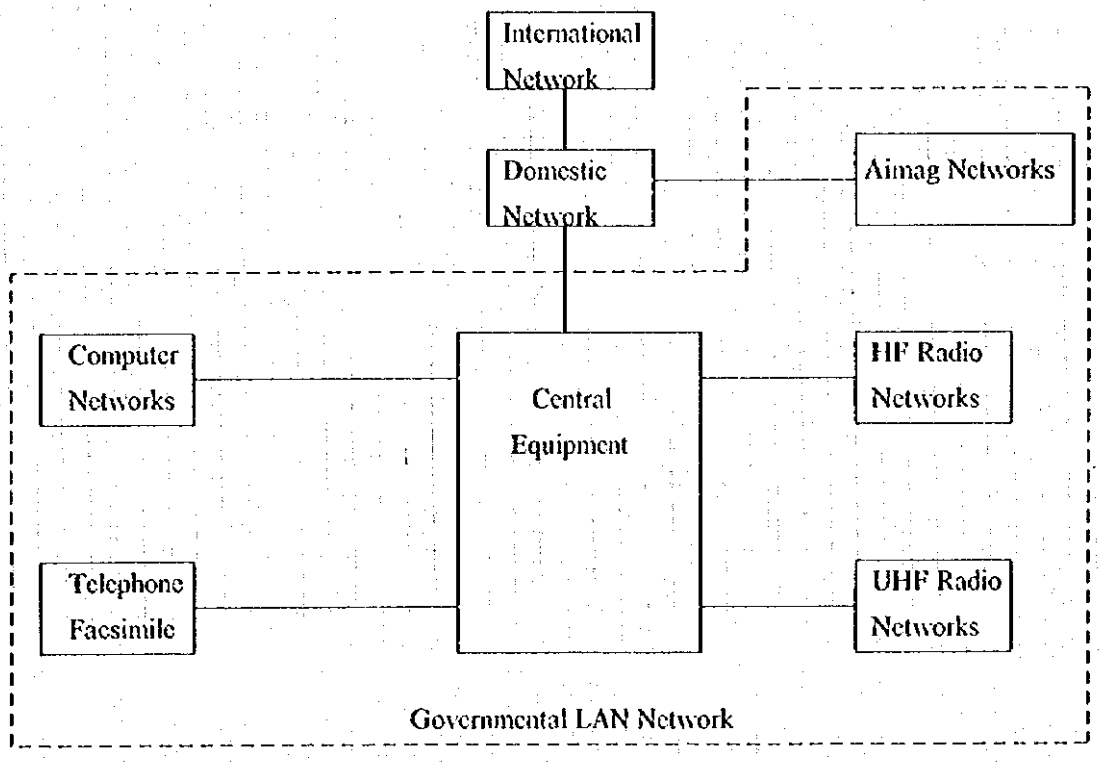


Figure 4-7-3 Future Plan of Governmental Network

In conclusion, by connecting the Government, Ministries and General Administration office to one data network, information exchange speed and reliability will be much improved.

7.3. Mobile Communications (MobiCom Corporation)

7.3.1 General

MobiCom Corporation was established and approved to provide cellular mobile telecommunication services in Mongolia on September 18, 1995 as a consortium of three companies. The shareholders of the consortium are Kokusai Denshin Denwa Co., Ltd. (KDD: 44.4%), Sumitomo Corporation (44.4%), and NewCom Co., Ltd. (11.2%). Initial investment is US$ 6 million for equipment and US$ 1.7 million for the license. Commencement of service was on March 18, 1996. MobiCom Corporation has adopted the GSM standard for roaming in the future with an operation frequency in the 900 MHz band. The corporation will have a monopoly on services until 1998. Figure 4-7-4 shows the organization chart of MobiCom Corporation.

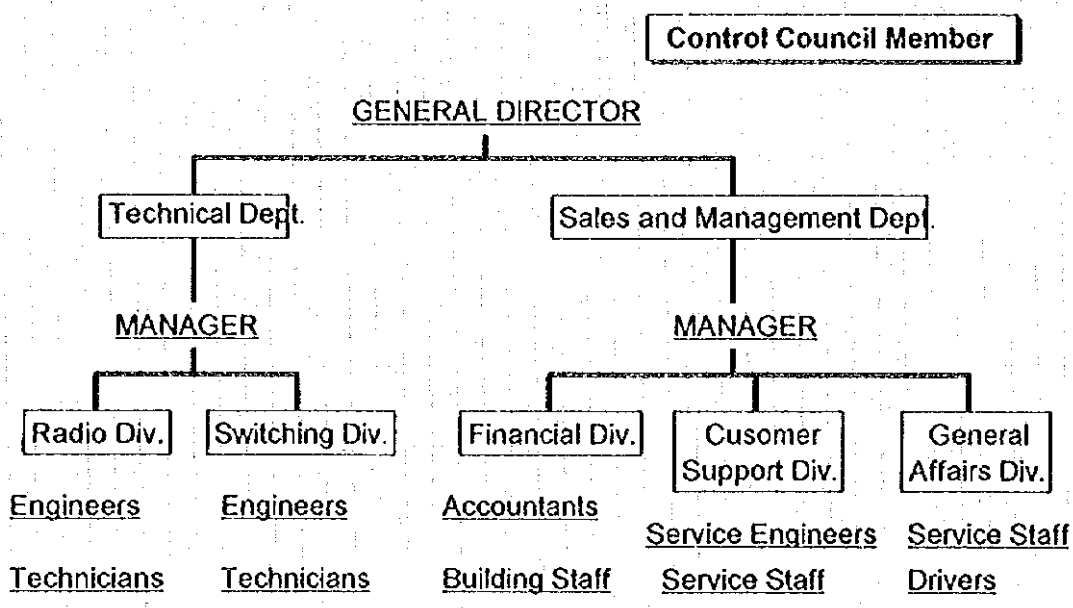


Figure 4-7-4 Organization Chart of MobiCom Corporation.

7.3.2 Services Provided

From March 1996, the central part of Ulaanbaatar city, including Buyantt-Uhaa airport and its connecting road, will be covered by the cellular service. Table 4-7-1 shows the service area in the initial stage and in the future.

Table 4-7-1 Service area in the initial stage and in the future

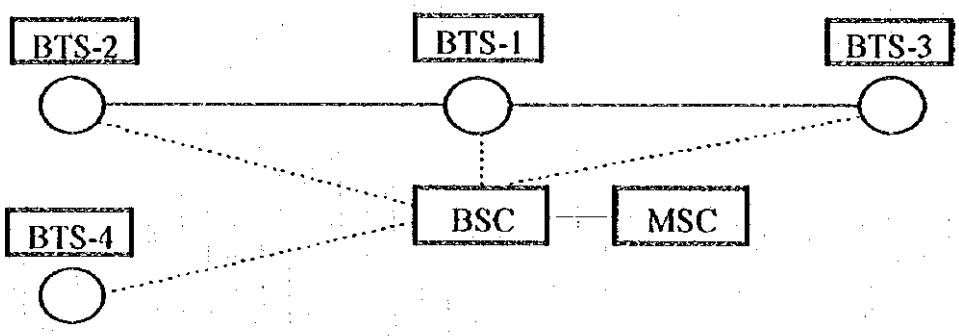
Stages	Expansion of the Service Area	Timing
1st Stage	Central part of Ulaanbaatar city, Buyant-Uhaa airport and the connecting road	March of 1996
2nd Stage	Darhan, and Erdenet	End of 1996
3rd Stage	Nalaih, and Zuunmod	Within 3 years
4th Stage	All major cities and aimag centers	
Satellite	Rural areas by satellite based service	

The system will be capable of providing local (cellular to cellular, cellular to/from PSTN), long distance, international telephone services, fax and data transmission services to/from hand-held, portable, mobile and fixed terminals. The GSM system will allow for the introduction of many other additional services like voice mail, short messaging, etc.

Telephone services for isolated communities can be provided using fixed type cellular terminals with high gain antennas, which work with standard DTMF telephone sets, Group 3 fax machine, or data modems. However, all costs necessary equipment should be paid by the customer.

7.3.3 Network Configuration

All cellular service will be provided by a mobile switching center (MSC), a base transceiver station (BTS) and 4 base transceiver stations (BTS s) installed in the central part of the city and near the Buyant-Uhaa airport. Figure 4-7-5 shows the network configuration of MobiCom corporation.



MSC = mobile switching center
BSC = base station controller
BTS = base transceiver station

Figure 4-7-5 Network Configuration of MobiCom Corporation

(1) The mobile cellular network is interconnected with Transit Switch E10B via access trunks.

(2) The base transceiver stations installed at the initial stage and those in Nalaih and Zuunmod in the future are to be connected to the Mobile Switching Center by their own digital microwave links.

(3) The base transceiver stations installed in Darhan, Erdenet and other remote areas are controlled by the Base Station Controller located in Ulaanbaatar city and connected via the digital transmission system of MCAC/MTC.

(4) BTS-1,-2, and -3 are on the sector system. The number of sectors is 3. BTS-4 is on the wide beam antenna system. Transmission power of the wave is 30 watts for 5 - 10 km radius.

(5) Heights and locations of BTS antennas: BTS-1.33m (top of MTC building), BTS-270 m and BTS 3.23m (top of available buildings), and BTS-4.18m (own tower to be built at the airport).

7.3.4 Number of Subscribers, Tariffs and Traffic

(1) Number of Subscribers

In the first year of operation, 300 subscribers are estimated in the initially covered area, Ulaanbaatar city.

(2) Tariff

Subscriber fee	US$ 200
Terminal fee	(Depends on type of terminal)
Monthly basic charge	US$ 50
Call charge	US$ 0.35/minute (in Ulaanbaatar)
	+ MTC's international charge (for international calls)
	c.f. US$ 4.35/minute (for Japan)

(3) Traffic

The traffic between the Transit Switch of MTC and the Base Station Controller at the initial stage is estimated by NewCom to be as follows:

Total Traffic (2000 subscribers x calling rate 0.07 Erlang)	140.0 Erl.
Originating Traffic (140.0 Erl. x outgoing ratio 47.4 %)	66.4 Erl.
Terminating Traffic (140.0 Erl. x incoming ratio 47.5 %)	66.5 Erl.
Mobile to Mobile Traffic (140.0 Erl. x 5 %)	7.0 Erl.

Blocking rate 1 %. Traffic load in busy hour 0.07 Erlang.

7.3.4 Future Plan

The consortium plans to make an additional investment of about US$ 700,000 for base transceiver stations in Darhan and Erdenet at the end of 1996, when the digital microwave links between Ulaanbaatar and the two cities are expected to be introduced.

In preparation for expansion of the service area to include two more cities, Naraih and Zuunmod, two base transceiver stations will be connected with the Ulaanbaatar cellular network.

Table 4-7-2 shows MobiCom's future plan.

Table 4-7-2 Future Plan of Mobicom

Year	1996	1997	1998	1999	2000
Number of subscribers (annual increase)	300	90	160	165	215
Number of subscribers (accumulation)	300	390	550	715	930
Service Area	Ulaanbaatar	Ulaanbaatar	Darhan and Erdenet added	Naraih and Zuunmod added	Baganuur, Suhbaatar, Choir, Sainshand, Arvaiheer, etc. added

7.4. Paging (MonCom Co., Ltd,)

7.4.1 General

(1) MonCom Co., Ltd. belongs to the Monsonic group. It began offering a paging service in 1994. At present, it provides a paging service in Ulaanbaatar city, using paging equipment made by Motorola with a capacity of 10,000. It now has about 1,500 subscribers. In the first stage, each subscriber receives only numeric information displayed on his receiver. From February 1996, Cyrillic and Roman alphabets can also be displayed at an additional cost of US$ 5 per month.

(2) A subscriber buys a receiver from MonCom for US$ 105, 120, 145 or 170, depending on each receiver's functions (e.g. with watch function).

(3) Charge is free for the first 3 months. After that, the charge will be US$ 5 / month (US$ 10 per month in the case of rental).

7.4.2 Service Provided

At present, the paging service is provided only in Ulaanbaatar city. Paging information is displayed in numeric characters.

7.4.3 Network Configuration

Figure 4-7-6 shows the network configuration.

The connection procedure is as follows:

(1) A subscriber dials 35-8282.

(2) When an operator answers, the subscriber gives the desired number.

(3) Radio waves are transmitted according to the desired number.

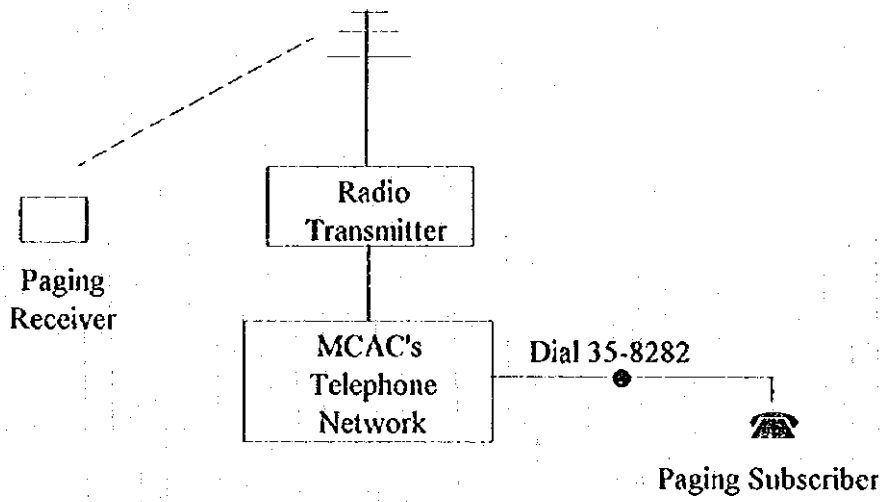


Figure 4-7-6 Network Configuration

7.4.4 Future Plan

MonCom has already obtained a license in Darhan and Erdenet from MOID, and the service was scheduled to begin in early of 1996. However, as preparations for market research were delayed, the schedule has yet to be decided.

7.5. Railway Communication (Mongolian Railway Communication Department)

7.5.1 General

The Mongolian railway has been connected with Russia since 1949. The same applies for the telecommunications network. All telecommunications equipment was made in Russia. Open wire lines extend 1,111 km from Suhbaatar in the north to Zamyn Uud in the south. At present, all equipment belongs to MCAC except in Ulaanbaatar city. Digital telephone switches were installed for subscribers from Suhbaatar to Zamyn Uud in November 1995.

7.5.2 Services Provided

The facilities are used mainly for telephone communication for controlling of trains traffic. They are also used for telephone between people working on the Mongolian railway. Subscribers were about 3,000 in 1995.

7.5.3 Network Configuration

See Figure 4-7-7.

7.5.4 Future Plan

Installation of optical fiber cables from Suhbaatar to Zamyn Uud is planned using a loan from the Overseas Economic Cooperation Fund (OECF) of Japan in the amount of US$ 71 million. Railways, vehicles and optical fiber cables are included in the amount.

See Figure 4-7-8.

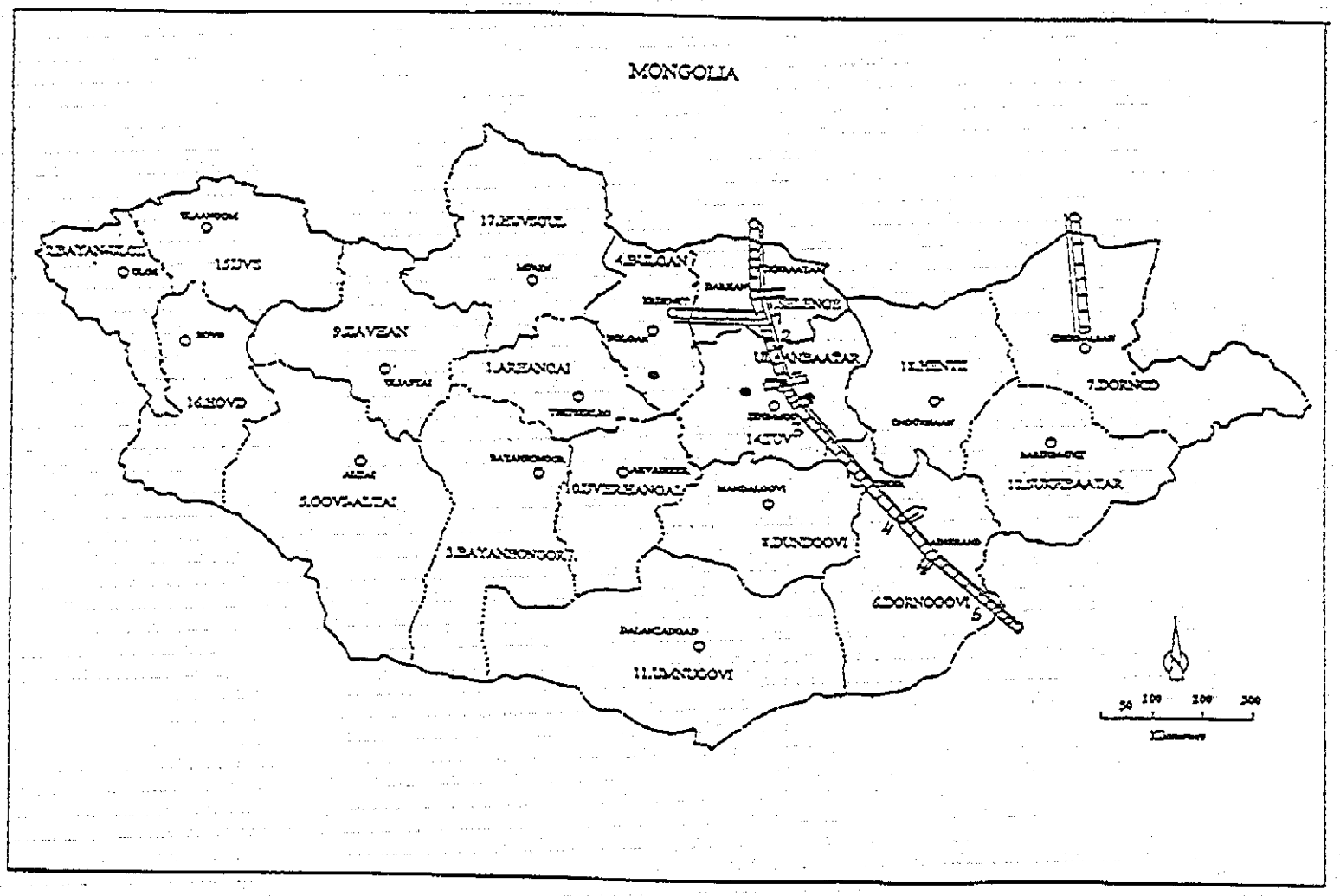


Figure 4-7-7 Network Configuration of Mongolian Railway

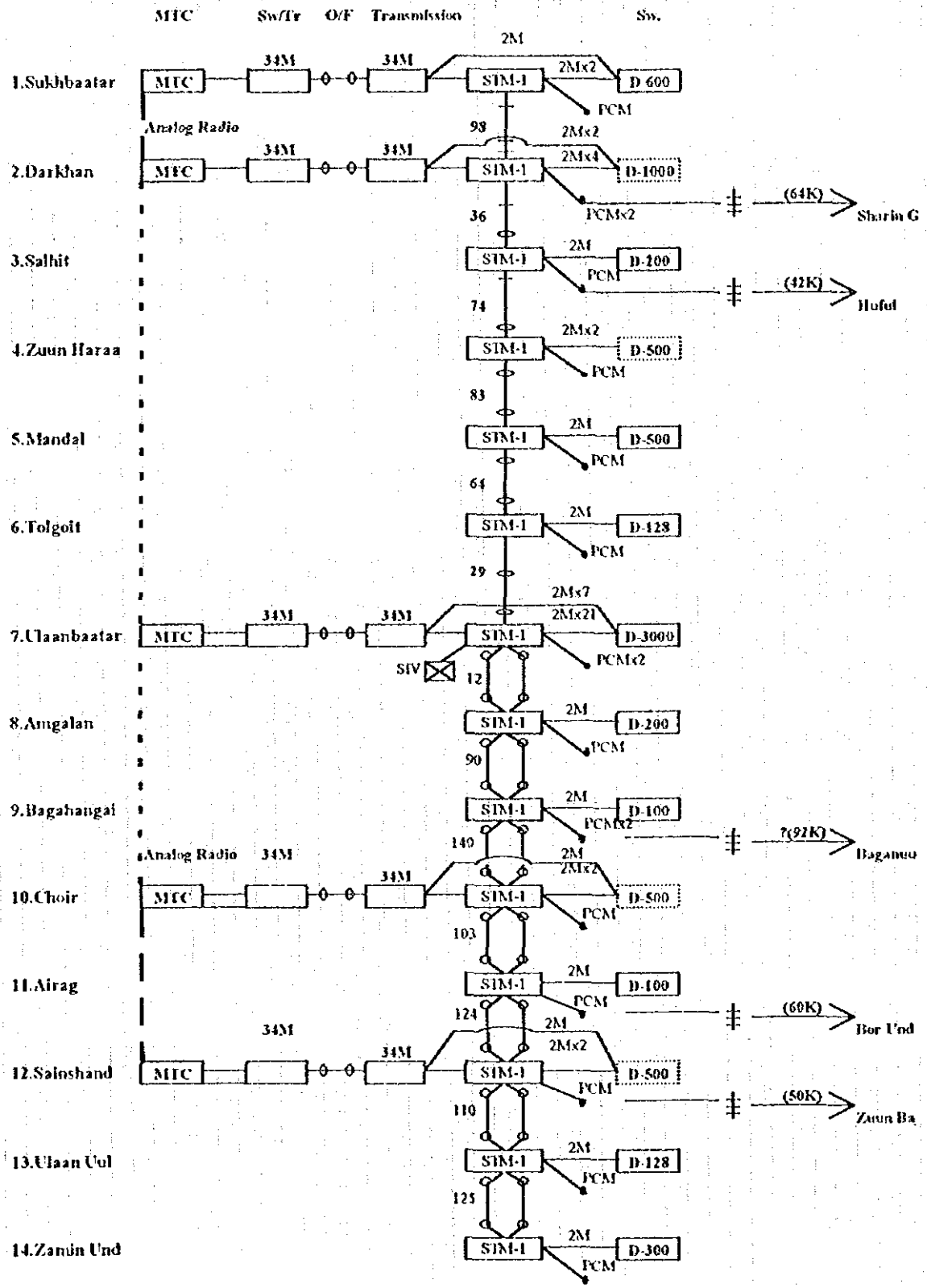


Figure 4-7-8 Mongolian Railway O/F Transmission analog main route