

(4) Telecommunications Operators

Revision of the Telecommunication Act of Mongolia was placed on the Parliament in March 2001 and the revision of the Telecommunication Act was passed Parliament on October 18, 2001. The corresponding Telecommunications Sector Policy Statement was promulgated on December 28, 2001 as the order of the Minister for Infrastructure of Mongolia.

The current licensed communication service providers are 140 as shown in Table 14.1-1 and the main telecommunications operator's situation are as follows:

Table 14.1-1 Licensees for Communications Services in Mongolia (as of 2002)

	Service category	No. of licensees
1	Basic telephone service	4
2	Cellular service	2
3	Telecommunication equipment manufacturer & maintenance	16
4	Post and delivery service	7
5	Cable TV	11
6	Radio service	22
7	TV service	11
8	Cable installation service	33
9	Internet service	13
10	Premises communication service	5
11	Satellite communication service	1
12	Pay-phone service by pre-paid card	3
13	Information service	3
14	Others	5
15	Non-fixed telephone(WLL) service	1
16	Wireless TV service	3
	Total	140

(a) Basic telephone service

4 companies provides basic telephone services as follows:

- MT (Mongolian Telecom Co. Ltd.)

The company provides basic telephone service (local, domestic and international call services) in whole country, borrowing state-owned network facilities controlled by PTA.

The main works of MT are operation and maintenance of basic telephone services and there are no works of network planning, designing, project implementation.

Also MT provides internet service through a subsidiary company Micom, CATV service in 13 Aimag areas and WLL(Wireless Local Loop: 1.9GHz) service under the licenses from MOI.

Share holders of MT are Government (54.67%), Korean Telecom(40%) and employees of telecommunication sector(5.33%).

The organisation chart is in Figure 14.1-5

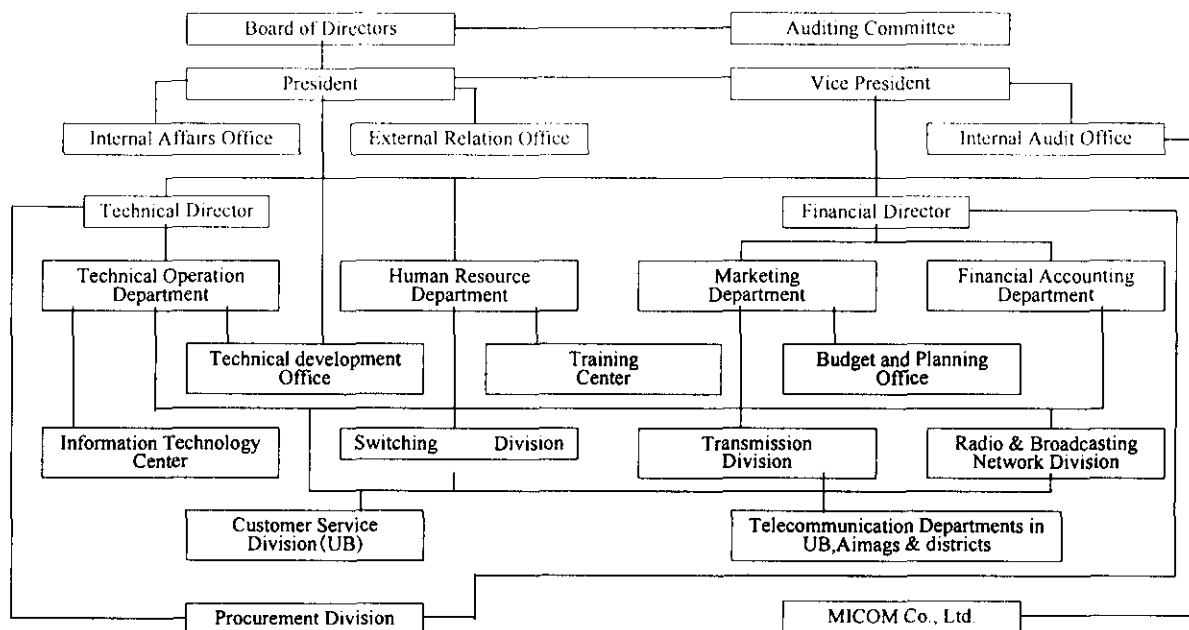


Figure 14.1-5 Organisation Structure of Mongolia Telecom Co. Ltd. (MT)

- **MRC (Mongolian Railway Company)**

The company constructed Optical fibre cable(24 cores, STM-1, 1,402km) along railway side and leases cores to MT and other private telecommunication companies. And also the company provides PSTN service in 5,500 in Ulaanbaatar and 11,000 subscribers in 18 Aimags.

Share holders of (MRC) are Mongolian Government and Russian Government who have each 50% share.

- **Civil Aviation Authority**

The company is a Governmental Implemented Agency and basic telephone service license(for local and long-distance service) was given in 2001.

The company provides the service to 300 subscribers in Ulanbaatar (switching system capacity is 3,000) and has aviation communication system in 21 Aimag airports utilizing VSAT.

- **Infomnet Co. Ltd.**

The company was given the license of PSTN and data communication services in December, 2001, and installed 500 subscriber lines in Ulanbaatar with 2,000 exchange capacity and also provides data communication in 21 Aimags.

(b) Cellular telephone

Following two(2) companies provide cellular telephone service:

Company	Established	Share holders	System	No. of subscribers	Service areas
MOBICOM	Mar 18, 1996	<ul style="list-style-type: none"> • Newcom: • KDDI: • Sumitomo: 	GSM	160,000	9 cities
Skytel	May. 1999	<ul style="list-style-type: none"> • SK Telecom: • Taihan Electric Wire: • Univcom: 	AMPS CDMA	40,000	8 cities
Total				200,000	

Mobicom provides WLL (MobiFone), VoIP and Internet services.

Skytel provides payphone service, VoIP and Internet services.

Both companies have no plan to expand services to Sum level areas at present due to no profit.

(c) ISP (Internet Service Provider)

Following six(6) companies provide mobile service:

Company	Established	Share holders	No. of subscribers	Service areas	Remarks
Bodicomputer	1998	Bodiinternational	500	UB	
Datacom	1997		3,000	UB	
Mobinet	1999	Mobicom	500	UB	
MCS	2001	Nomin Electronics	200	UB	
Micom	1999	MT	1,000	UB & 23 Aimags	
C&C Sky	2002	Skytel		UB	
Total			5,200		

(d) IDD (International Direct Dialling) Service

By liberaization of IDD from Jan. 2002, six (6) companies are providing IDD service including VoIP (Voice over Internet Protocol) system. The providers are MT (PSTN); Skytel (IP-Network); Mobicom (IP-Network); Micom (IP-Network); Incomnet (IP-Network); and Railwaycom (PSTN).

14.1.2 Analysis of Institutional Issues

(1) Summary of Policy and Strategy

Basic Policies and Strategies of Telecommunication Law and Telecommunications Sector Policy Statement of 2001 are summarized as Table 14.1-2:

Table 14.1-2 Basic Policy and Strategy of Sector Development and Privatisation

Basic Policies		Development of Telecommunications services and market by liberalization of telecommunication sector
		Telecommunication service development in rural areas by <i>universal service obligation fund</i>
Main Strategies	(1) Privatisation of MT	To transfer the other State-owned assets than back-bone networks to MT and sell the state owned shares to investors
		To keep the back-bone networks and international facilities as State own assets, develop it and lease to telecommunications providers
	(2) Universal Service Obligation Fund (USOF)	To be raised from telecommunications providers for new investments and operating deficit make-up of the rural telecommunications entity
	(3) Financial Resource	To explore the possibility of utilizing all available resources such as foreign, domestic investment, loans, aids, donations. But, the result of FIRR calculation (being at 1.026%) has caused the rural telecommunications entity to limit its financing sources to ODA grants, government investments, subsidies from Universal Service Obligations Fund and donations
	(4) Liberalization of IDD, radio frequency, etc. by license	Free entrance of international service from Jan. 1, 2002, etc. (Note: IDD service providers in Oct., 2002: MT, Mobicom, Skytel, Micom)
(5) Regulatory Body	Restructuring of CRC (completed in July 2002 by the order of the Prime Minister) and PTA.	

(2) Main Issues on Telecommunications Policy and Strategy

In spite of severe circumstances for telecommunications development in Mongolia, i.e. many small towns/villages (Sums) in vast countries, very few population, long distance between villages, very poor roads and electricity, etc. are big obstacles for development and investment, Mongolian Government has been tackling to develop telecommunications networks and services as the most important infrastructure, especially in rural areas.

In this line, Basic Policy and Strategy of Sector Development and Privatisation seems very good, however the following issues should be resolved in order to implement it:

(a) Telecommunication development plan

- A long term Master plan for Telecommunication development is not arranged and the development frame work with scopes and investment costs are not clear.

(b) Technology

- Cost effective telecommunication network technologies for Mongolian geographic speciality which is vast and few population density are not established.

(c) Revenue and expenditure of rural telecommunication

- Operation of Aimag level (Aimags and Sums) is at a deficit and investment incentive is very low.
- The detailed revenues and expenditures (real cost) demarcated in the Capital and Aimag level are not clear.

(d) Universal service obligation for rural telecommunication development

- Definition of universal service obligation such as target services, service areas and implementation time are not clear.
- Responsibilities of regulatory bodies are not clear.
- Implementation schedule is not clear.
- Company formation of USO providers is not clear.

(e) Universal Service Obligation Fund and applicable

- Fund calculation basis and amount is not clear
- Fund contribution procedures and methods from providers are not clear.
- Natures, kinds and costs of projects and O/M cost applicable to fund are not clear

(f) Flow of financing for telecommunications projects

- Flow and utilization/distribution of telecommunication financing are not clear.

(g) State-owned back-bone network facilities and lease

- Already privatised companies own back-bone networks except international network and necessity of State-owned back-bone network is less.

(h) Privatisation

- All lease fees of network assets are not necessarily utilised for telecommunication projects
- Detailed concession items for investors of rural telecommunication development are not clear.

14.1.3 Recommendations on Institutional Issues

In order to develop and implement Basic Policy and Strategy of Sector Development and Privatisation, the followings are recommended:

(1) Rural Telecommunications (Telecom) Development

At present, rural telecom development framework such as scope, investment costs, etc. by development phase is not specifically prepared and is not made open; therefore the rural development target is not clear.

In order to promote rural telecom development, priority areas and projects by phase that are based on the Master Plan should be made clear and open, and all available financial resources for investment should be mobilised in realistic manner.

(2) Technical Aspects for Investment

- a. Cost effective rural telecom network systems suitable for many rural settlements of small demand spread in the country's vast territory are not established.

Cost effective systems that are available under current technologies should be selected in time in the light of world technology trends.

- b. Efficient common utilization system of backbone transmission systems that are currently owned by the respective entities including the private companies is not established.

In order to utilize efficiently the backbone systems, MOI, CRC & PTA should pertinently regulate and instruct the owners for avoidance of duplicated investment, reduction in lease rental to operators.

(3) Profit and Loss of Rural Telecom Networks

As the telecom operations of Aimags and their respective Sums show losses, there is little incentive for investment.

More effective management by introduction of automatic call connection, centralized O/M and management information system, etc. is needed.

Revenues should be increased by upgrading service quality and enhanced marketing activities.

Available concessions such as tax exemption, free charges of land and building, etc. should be considered to be given to rural telecom providers.

Lease rental of backbone systems should be reduced for rural telecom providers.

A long-term policy for supporting rural telecom networks by subsidies such as Universal Service Obligations Fund (USO Fund), etc. should be established.

Proceeds from the sale of the Government's stocks of Mongolia Telecom (MT) should be utilized for rural telecom development.

(4) Policy and Regulations of USO (Universal Service Obligations)

Implementation of USO is behind schedule.

MOI needs to take a strong policy and leadership for USO.

Responsibilities and authorities of CRC and PTA should be made clear.

Implementation schedule of USO should be decided clearly.

(5) Universal Service Obligations Fund (USO Fund)

- a. Classification of accounts (revenues and expenditures) and calculation system of profit and loss that have clear distinction between the Capital network and the Aimag/Sum networks are not established.

There should be established the accounts classification and the calculation system.

In order to clearly show the operations results of Aimag/Sum networks and utilization of USO Fund, separation of local company(ies) covering Aimag/Sum network(s) from existing MT should be considered.

- b. Definition of services and areas by phase of USO and penalty in the event of breach are not clear.

Under consensus of operators and the whole population, there should be made clear the definition of USO services and the penalty.

- c. Calculation method of USO Fund (including its basis) to be contributed by the concerned telecom operators is not clear

Calculation method of the USO Fund (including its basis) contributed by providers should be made simplified and clear.

- d. Kinds, nature and amount of costs to be borne by USO Fund are not clear.

Utilization of the Fund should be limited to project/new investments and O/M costs for Aimag/Sum networks of rural telecom development.

(6) Nationalisation (State-owning) of Backbone Transmission System and its Lease to Operators

- a. Investment plans of backbone network of private companies, utilization rules among operators and tariffs of the existing backbone networks are not clearly regulated.

MOI, CRC & PTA should immediately establish a backbone investment plan, make a rule for efficient use and control of the backbone network.

- b. As each private provider holds own backbone system, nationalisation of backbone systems is less significant.

Establishment of a joint venture company by the owners/investors of backbone system should be considered in order to promote rationalised utilization as well as effective investment.

- c. Investment funds for the country's telecom development have to be depending more or less on ODA, accordingly nationalisation of backbone systems is inevitable in medium and long-term.

Another master plan study for development of backbone transmission systems and its implementation are required. The above-stated idea of joint venture should be studied under that master plan.

(7) Privatisation

Not entire amount of lease rental collected from MT is utilized for telecom development.

The Government is requested that the entire amount except for those disbursed for debt servicing should be used for rural telecom development.

Proceeds of the sale of the Government's stocks of MTC should be utilized for rural telecom development. (Refer to Item (3))

(8) Giving Incentives to Investors

Kinds of concessions to rural telecom investors are not clear.

Available concessions such as tax exemption, free charges of land and building, reduction in lease rental, etc. should be considered for rural telecom providers. (Refer to Item (3))

From standpoint of the Government's international commitments to shift the country towards market economy, it will be useful to establish specific development areas for the implementation of incentives and a limited period of availability.

(9) Discount or Subsidy of Telephone and Internet Charges/Fees to Users in Rural Areas

Telephone and internet charges/fees of users in the remote areas of the country are heavy burden to their household income.

The incentive should be granted to rural users, for example; in further discounted tariffs from the regular ones for residential users within a capping of certain volume of telephone calls and internet every month (with exception of unlimited discounted tariffs for hospitals, schools and other public service installations).

(10) Establishment of Comprehensive Rural Development Plan

Comprehensive rural development plan is not firmly established.

As a driving force of rural telecom development, utilization of the potentiality of private enterprises should be promoted by fostering environment for set-up and growth of SME (Small & Medium Enterprises).

Upgrading of services by enhancement of facilities for hospitals, schools and other public service installations should be considered.

(11) Finance Resource

All sorts of finance resources are required for the enormous investments, and PTA should open and clear the fund system and the Master Plan with the priority projects to all investors, foreign countries, etc.

Flow and utilization/distribution of telecommunication financing is complicated and not clear as illustrated in Figure 14.1-6. It should be clear for the existing providers and new investors to understand easily reasonable for fund and investment.

(12) Prioritisation and Effectiveness of Investment

A long term Master Plan should be arranged, and investment priority areas and projects in each phase of the frame work should be open to investors and donors in order to get investment.

It is under study to integrate all Sums to about 75 big Sums in order to promote resident welfare and employment, also for effective infrastructure investment. If it is implemented in near future, it may be cost-effective for telecommunications investment, so should be watched and the priority of projects should be considered.

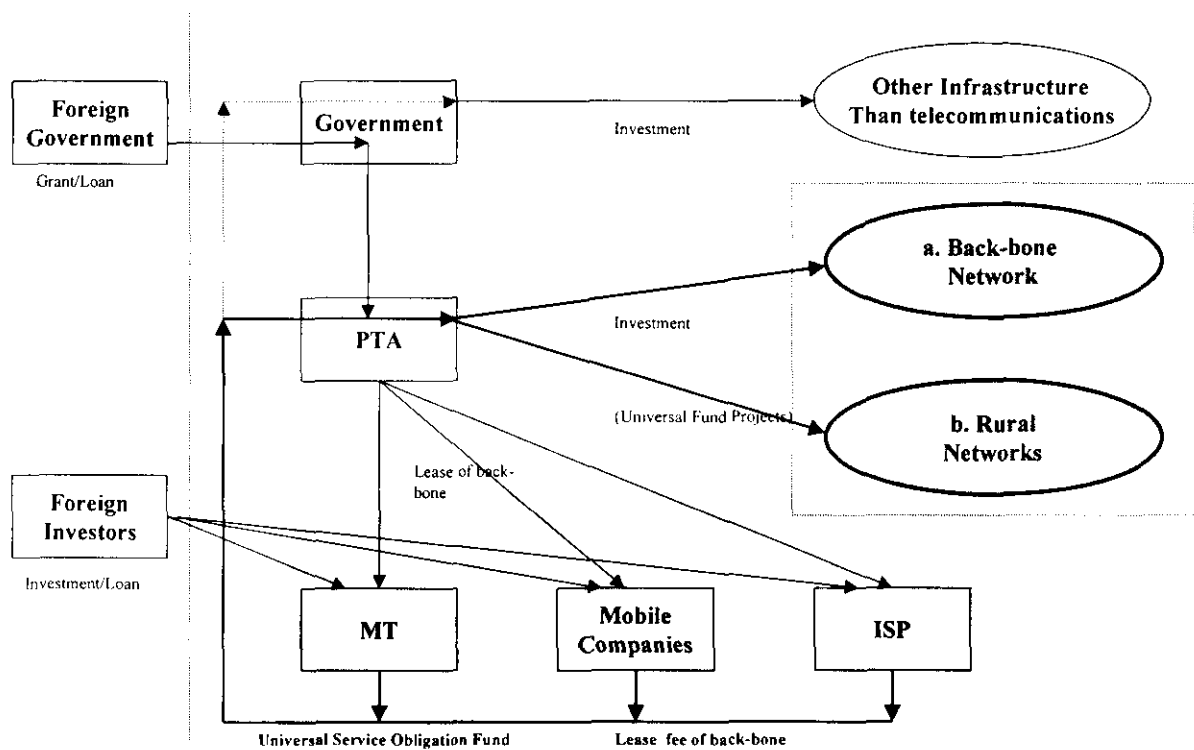


Figure 14.1-6 Telecommunication Investment Flow in Mongolia

14.2 Organisation Plan

In general, an organisation is to be established and structured functionally as the most appropriate in order to achieve management strategies and objectives, considering that:

- Management policy and strategy (objectives)
- Business plan (short/medium/long term)
- Human resource development (personal development, training)
- External requirements (Government policy, Customer needs)

And also the organisation should be re-structured in accordance with changes of management strategies and objectives.

Relationship among business, organisation, management and human resource plans, and relation and examples of management strategies/objectives, improvement items and contents are shown in Figure 14.2-1 & 2.

This Chapter covers MT organisation.

14.2.1 Current Status of MT Organisation

MT's organisation was re-structured in 2000 in order to enhance the company's management and organisation, the coordination of activities of company's departments and divisions, their internal organisation and MT has been successfully carrying out its operations under the new structure.(MT Annual Report in 2000)

Main Re-structuring points were as follows:

- Headquarters as management are organized President-->Vice President-->2 Directors(Technical & Financial)-->Departments/Offices and the chain of directions became clearer than before
- Divisions/Centres in Headquarters as main management of Ulanbaatar and Aimags are divided into seven (7) and management and support for Ulanbaatar and rural areas is enhanced
- Aimag and Sum organisation is basically not changed, although human resource is decreased

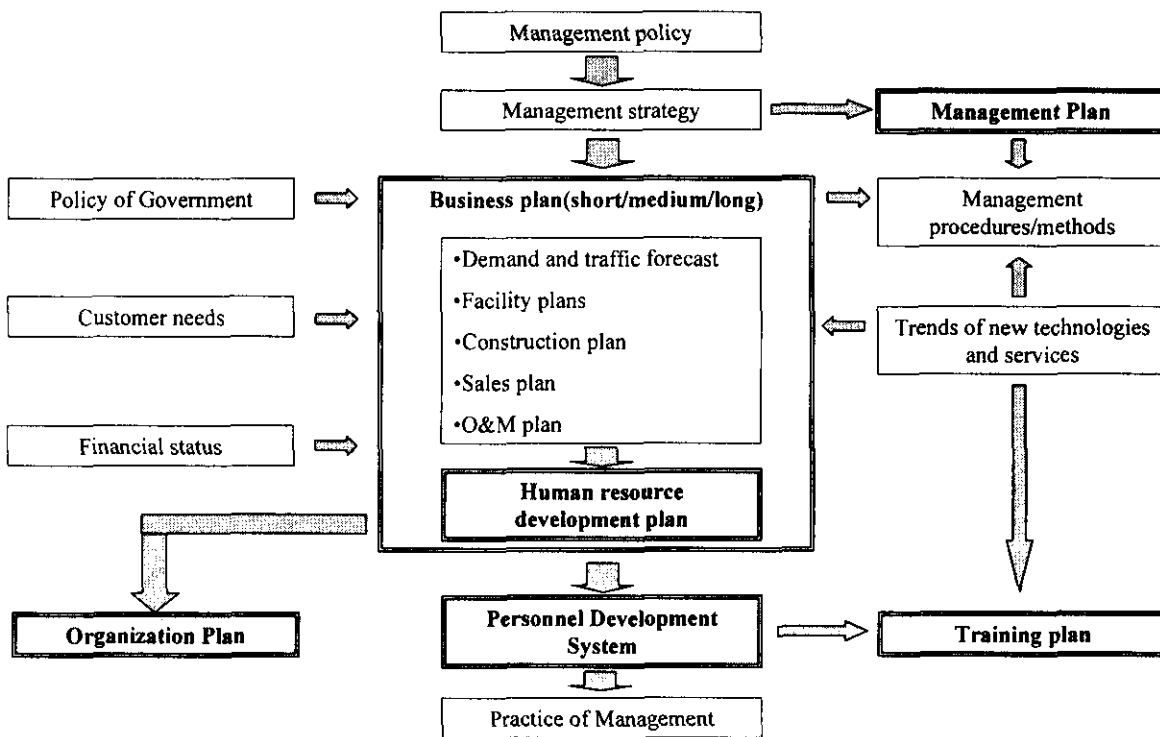


Figure 14.2-1 Relationship among Business Plan (Short/Medium/Long), Organisation Plan, Management Plan, Human Resource Plan

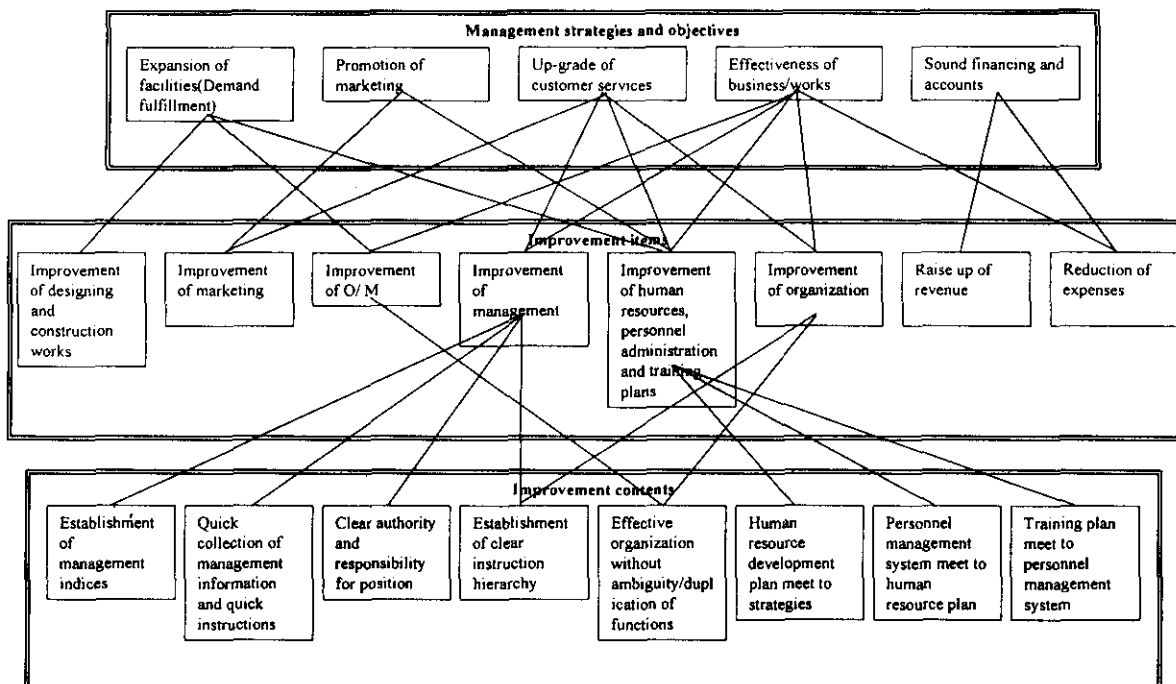


Figure 14.2-2 Relationship and Example of Management Strategy/Objectives, Improvement Items and Contents

The current organisation chart of MT is shown in Figure 14.1-5 and the organisation chart of Selenge Aimag as example is shown in Figure14.2-3.

The features of MT organisation is summarized as follows:

- (1) At present no planning, design, construction functions for big investment projects, because the State (PTA) owns most of telecommunications assets of MT, and PTA plans and manages the projects, as a result MT has only O/M functions except recently introduced WLL in Ulanbaatar and small expansion by MT (the State owned assets except back-bone networks will be transferred to MT by selling, currently it is not realized)
- (2) Management on Ulanbaatar are more important than in Aimag/Sum level due to development level and size of profit
- (3) Each Aimag and District manages about 10-20 Sums as control tower of rural areas
- (4) Sum office is composed of manager, engineers/technicians, operators, accountants, drivers, etc. with 3-10 employees

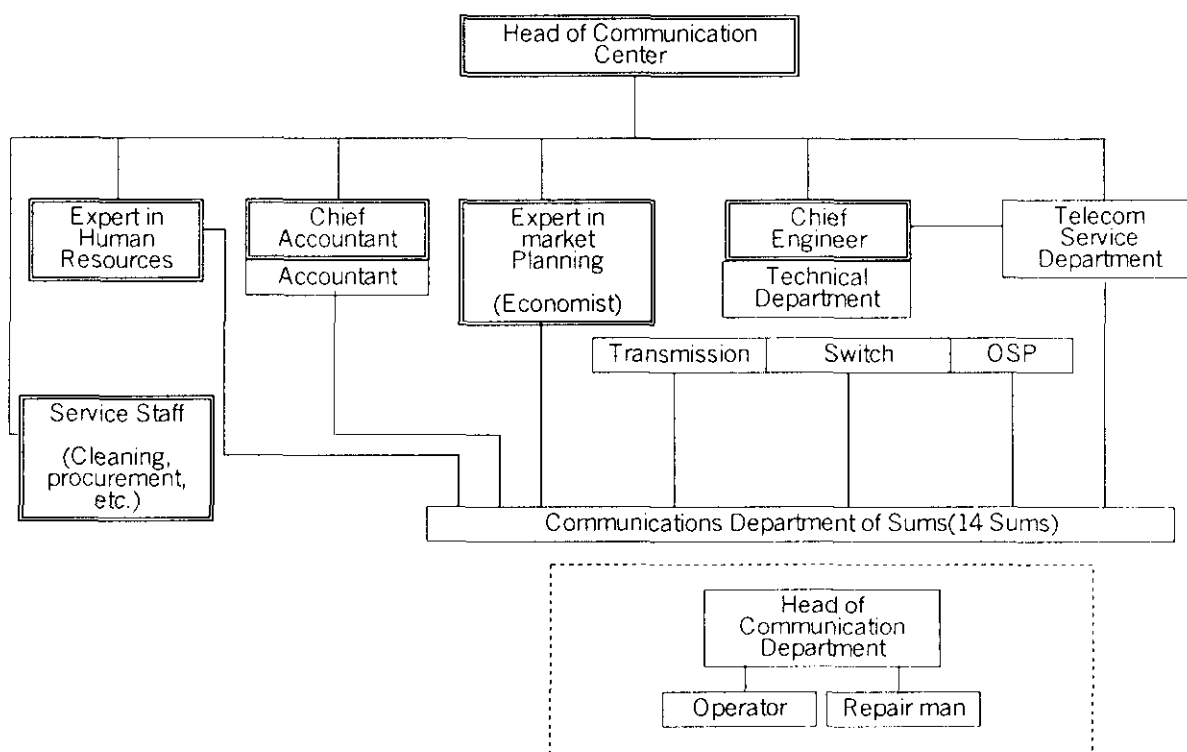


Figure 14.2-3 Organisation Structure of Selenge Aimag and Sums

14.2.2 Issues on Present Organisation and Directions on Improvement

The issues on present organisation and directions on improvement are analysed as follows:

- (1) To decrease human resource in Aimag/Sum level is not so easy due to many small offices, but it is absolutely necessary through introduction of digital systems and automatic call connection
- (2) Management on Aimag/Sum level is ordered by Headquarters, but it is not necessarily on Aimag/Sum staff's own initiative
- (3) Skill of engineers/technicians are not enough for digitalisation and new technologies due to under introduction of these, therefore urgent and intensive training is needed for them
- (4) Productivity of small offices with very few subscribers are very low and these should be integrated as much as possible before digitalisation, etc.
- (5) In Ulanbaatar and some Aimags/Sums such as along railway side, already competition on customer services started, and marketing and customer service section should be enhanced.

14.2.3 Organisation Plan

(1) Examples of Organisations

Organisation should be re-structured functionally based on the policy and strategy of the company, which is changed by business market and its realization.

From this viewpoint, it is useful to refer the examples of developed and developing countries. Here two (2) examples of NTT as developed country and Sri Lanka as developing country are described.

(a) NTT's organisation in 1998(Refer to Figure 14.2-4)

Main features are as follows:

- Roles and obligations of Headquarters and regions/branches are functionally demarcated.
- Authority delegation from HQs to regions/branches is completely realized.
- Division/department by service segment is established. (Long-distance communications, Business communications, Multi-media service, Global business)
- Customer oriented service divisions are incorporated in each service segment.
- Cost centres/divisions such as R & D, Procurement & supply, Training, Pension and health insurance, Hospital are separated from other profit divisions

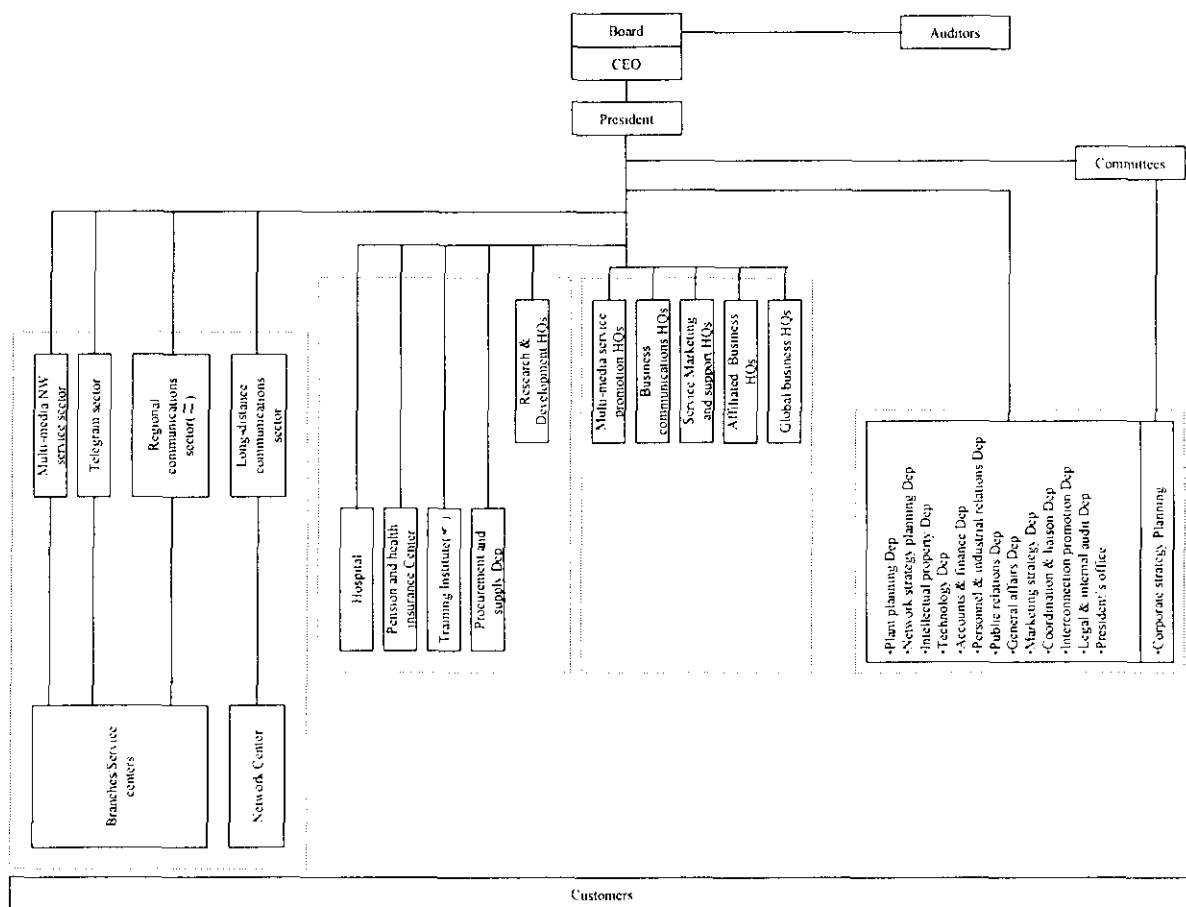


Figure 14.2-4 Organisation Chart of NTT (As of 1998)

(b) Sri Lanka Telecom's Organisation in 2002 (Refer to Figure 14.2-5)

Main features are as follows:

- Roles and obligations of Headquarters and regions/branches are functionally demarcated.
- Authority delegation from HQs to regions/branches is partially realized.
- Division/department by function is established.(Customer service, Marketing & IP, IT, NW planning & Engineering, etc.)
- Customer oriented service divisions such as Customer service, Marketing and IP are established.
- Cost centres/divisions such as Procurement, Training are not separated from HQs.

It can be said that NTT's organisation is a matured one and SLT's organisation is a semi-matured one. Generally a pre-matured organisation is functionally centralized style, because it is more effective for management to instruct and control directly staff with less own initiative.

The other hand a matured organisation already has own initiative in each division, it is not necessary to instruct and control directly, rather it is important how to take staff's initiatives.

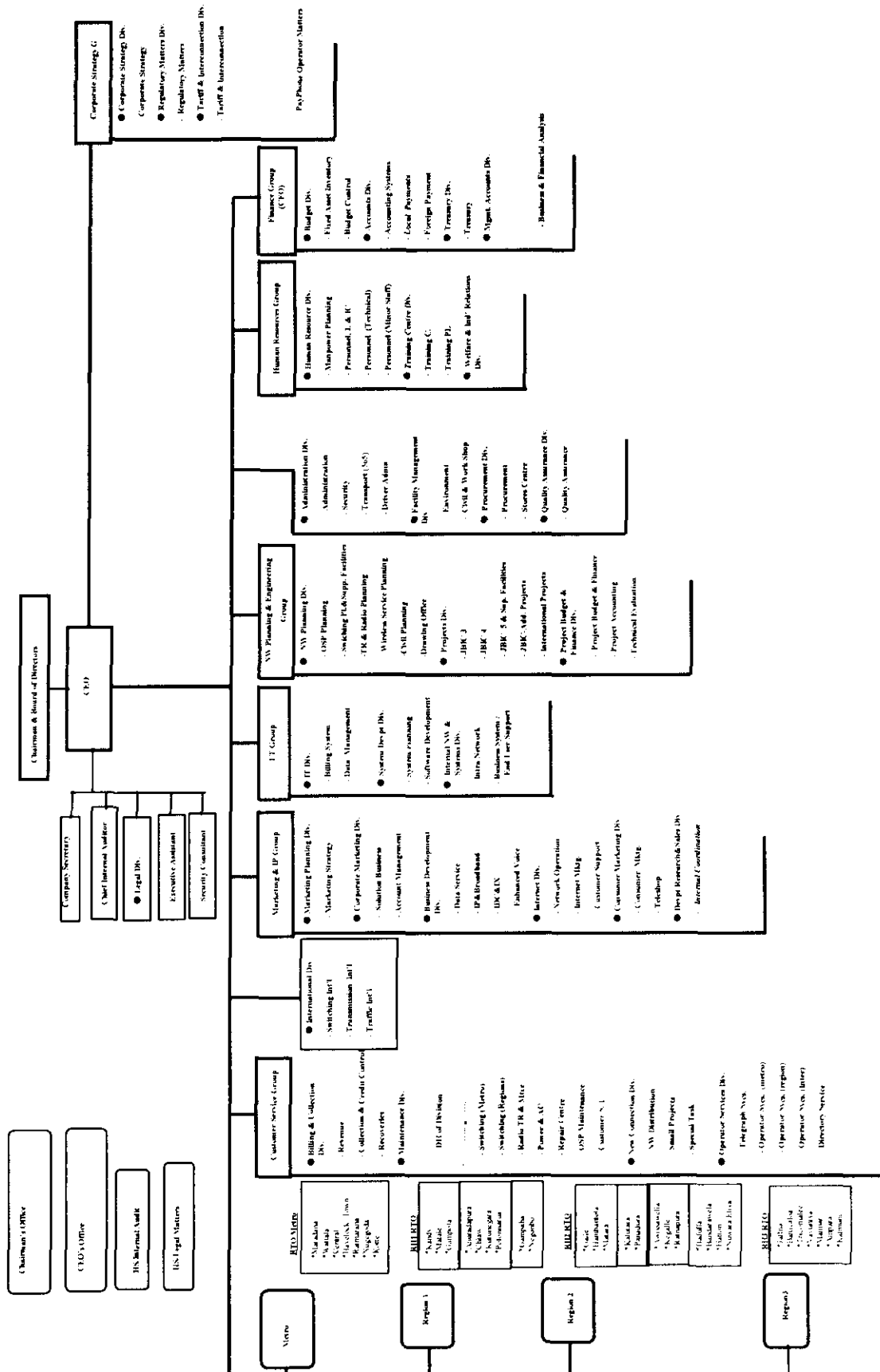


Figure 14.2-5 Organisation Chart(Sri Lanka Telecom)

(2) Required Organisational Functions

Directions of improvement of the organisation and the example organisations are described in Section 14.2.2 and above.

Through the above comprehensive viewpoints, main required organisational functions will be summarised as follows:

- (a) Enhancement of Aimag/Sum level management by training/seminar
- (b) Decrease of Aimag/Sum level human resource by introduction of digital systems and automatic connection, and integration of offices
- (c) Skill-up of Aimag/Sum level staff by introduction of digital systems and new technologies such as IT & IP
- (d) Enhancement of customer oriented services such as marketing and improvement of quality of service
- (e) Delegation of Headquarters authorities to Aimag/Sum by staff's own initiative
- (f) Introduction of integrated organisations of Aimag centres (current organisation by each Aimag unit will be too small for management unit)

(3) Framework of Re-Organisation

Re-organisation framework for realization of the above organisational functions will be divided into 3 phases considering re-organisation timing, and re-organisation, structure and authority in each phase should be in accordance with business objectives and human resource development plan. The summary of re-organisation in each phase is illustrated in Figure 14.2-6.

- (a) Phase-1:
 - Enhancement of Aimag/Sum level management
 - Skill-up of Aimag/Sum level staff
 - Decrease of Aimag/Sum level human resource
- (b) Phase-2:

- Decrease of Aimag/Sum level human resource
- Skill-up of Aimag/Sum level staff
- Enhancement of customer oriented services
- Delegation of Headquarters authorities to Aimag/Sum

(c) Phase-3:

- Enhancement of customer oriented services
- Delegation of Headquarters authorities to Aimag/Sum
- Introduction of integrated organisations of Aimag centres

		Present(2002)	Phase-1(2002—2008)	Phase-2(2009—2013)	Phase-3(2014—2020)
Re-organization			To re-organize HQs & Aimags for suitable functional scheme	To re-organize Front-line for customer oriented services	To introduce Integrated Aimags and Profit & Cost Center System
Structure		<ul style="list-style-type: none"> •HQs:Functional •Aimag center: Functional •Aimag/Sum Front-line: Functional 	<ul style="list-style-type: none"> •HQs:Functional •Aimag center: Functional •Aimag/Sum Front-line: Functional 	<ul style="list-style-type: none"> •HQs:Functional •Aimag center: Functional •Aimag/Sum Front-line: Customer oriented service 	<ul style="list-style-type: none"> •HQs:Functional •Aimag center: Functional and integrated •Aimag/Sum Front-line: Customer oriented service •Profit and Cost Center System
Authority		Centralization(partially Delegation) (Mainly by centralized HQs)		Delegation(Decentralization) (Mainly by front-line of Aimags)	
Required Policies	Business Objectives	<div style="border: 1px solid black; padding: 5px; width: fit-content;">Digitalization/Expansion of Aimag/Sum networks and development of IT</div> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin-top: 10px;">Enhancement of Aimag/Sum level management</div>		<div style="border: 1px solid black; padding: 5px; width: fit-content;">Enhancement of customer oriented services & introduction of new services</div>	
	Human resource	<div style="border: 1px solid black; padding: 5px; width: fit-content;">Decrease of Aimag/Sum level human resource</div> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin-top: 5px;">Skill-up of Aimag/Sum level staff</div>		<div style="border: 1px solid black; padding: 5px; width: fit-content;">Establishment of personnel evaluation system</div>	

Figure 14.2-6 Framework of Re-organisation

(4) Implementation of Re-Organisation

Based on the framework, MT will make a detailed re-organisation plan and implement, taking in account of organisation configuration, which describe features of each organisation style as shown in Figure 14.2-7, and also future development of telecommunication sector such as State-owned back-bone systems, spread of mobile telephones to rural areas and separation of Aimag/Sum level operation.

1. Hierarchy Organization

1. Functional Organization: Organization focused on functional/specialized Input for achievement of corporate objectives (Functional Div./Sec. such as Technical, marketing, finance, human resource, etc.)

- Performance of high quality and efficiency
- Limited authorization and responsibility
- Slow arrangement and decision among functional organizations
- Less managers with broad scale knowledge

2. Divisional Organization: Organization focused on Output for achievement of corporate objectives(Div./Sec. for specified products, region, customers, etc.)

- Quick management decision through delegation
- More managers with broad scale knowledge
- Slow arrangement and decision among divisional organizations

2. Variable Organization

1. Matrix Organization: Combined organization with both functional and divisional configuration(staff belongs simultaneously to two organizations)

2. Cluster Organization: Organization in which staff carries out an unit job individually or by group(such as consultancy work)

3. Project Team: Special Organization for solution of works/issues which existing organizations can hardly resolve(Intersectional member team)

Figure 14.2-7 Organization Configuration

14.3 Management Plan

14.3.1 General

Management concept will be summarized below:

- Corporate management is to drive improvements and successfully translate the strategy into action through the organisation and the effectiveness and efficiency of its programs, processes and human resource.
- Management is to function the management cycle of the following PDCA(Plan, Do, Check and Action):
 - * **Plan:** To plan business strategies(mission, vision, improvement programs and targets)
 - * **Do:** To implement the strategies
 - * **Check:** To check and analyse the progress, process and performance
 - * **Action:** To take necessary actions for feedback to the implementation as a result of the above

This plan recommends the methodology and framework of MT's management through the analysis of current issues.

14.3.2 Current Status of Management

MT is managing with the following indicators:

- Income and expenditure (annual budget)
- New connection (new connection and demand, waiting list)
- O/M (fault and call completion)
- Billing and collection (collection only)
- Human resource (comprehensive performance)
- Training (courses and trainees)

The detailed management indicators and methods in MT are shown in Table 14.3-1.

Table 14.3-1 Management Indicators and Methods in MT (as of 2002)

Category	Sub-category	Indicator Item	MT	Management unit	Management Period	Report route	Remarks	
Income & Expenditure	Annual budget	Income	X	Sum	Semi-annually	Sum-->Aimag-->HQ	Reflecting past 3 yaers' results & new connection plan	
		Expenditure(Budge	X	Sum	Semi-annually	Sum-->Aimag-->HQ		
New connection	New connection	No. of new connections	X	Aimag	Monthly	Aimag-->HQ	Reflecting expansion plans	
		Average installation	X	Aimag	N.A.	Aimag-->HQ	Immediate installation	
	Demand	No. of applicants	X	Sum(not sure)	Monthly	Sum-->Aimag-->HQ	Database in Aimag centers	
		Waiting hist	X	Sum(not sure)	Monthly	Sum-->Aimag-->HQ		
O & M	Fault	Waiting duration(month)	X	Aimag	Monthly	Aimag-->HQ	Allocating certain figures to each telephone office	
		No. of complaints	X	Aimag	Daily	Aimag-->HQ		
		No. of Faults & Recovery	X	Sum	Daily	Sum-->Aimag-->HQ		
	Call completion	Fault rate	No. of complaints	X	Sum	Monthly	Sum-->Aimag-->HQ	Traffic measurement period and detailed methods are not clear
			Local call	X	Aimag(Digital Switch)	Monthly	Aimag-->HQ	
			Long distance call	X	Aimag(Digital)	Monthly	Aimag-->HQ	
			International call	X	Aimag(Digital)	Monthly	Aimag-->HQ	
Billing & collection	Billing	Interconnection	X	Aimag(Digital)	Monthly	Aimag-->HQ	Bill issuance is only for business customers	
		Rate of bill	---	---	---	---		
	Collection	Delay of	---	---	---	---		Payment places are only telephone offices
		Collection rate	---	---	---	---		
		Amount of non-collection	X	Sum	N.A.	Sum-->Aimag-->HQ		
Human resource	Performanc	Delay of collection(month)	---	---	---	---		
Training	Training	Comprehensive performance	X	Aimag	Quarterly	HQs	Evaluating income, faults, etc.	
		No. of trainees(plan vs	X	Training Center	Semi-annually	Training Center-->HQ		

Note:

- *1: Available data only(by hearing, etc)
- *2: X means : MT introduces indicators
- *3: --- means: MT does not introduce indicators or not clear
- *4: N.A. Data is not available

The results of performance is discussed by director level in every week and if necessary, actions are taken to Division/Department, etc.

The forms and procedures are not clear.

14.3.3 Analysis of Management Issues

Management issues of MT are analysed as follows:

- (1) Minimum indicators to be managed as telecommunication operator are implemented, but the detailed procedures and forms are not necessarily clear
- (2) Management strategy and corporate culture is not clear

- (3) Control of Budget (income and expenditure) is carried out, but the control period is semi-annual and also analysis of settlement of account at Aimag/Sum level is not clear
- (4) Bill issuance is only for business customers due to less development of postal and banking services, and charge collection is not managed
- (5) Common Database for required management, communication system among offices (Internet, WAN) and MIS (Management Information System) is not introduced

14.3.4 Management Plan

(1) Performance Management Methodology

Management is to function PDCA and for this purpose, BSC(Balanced Scorecard) performance management methodology is useful.

This methodology is a conceptual framework for translating an organisation’s strategic objectives into a set of performance indicators distributed among the following four perspectives (Figure 14.3-1):

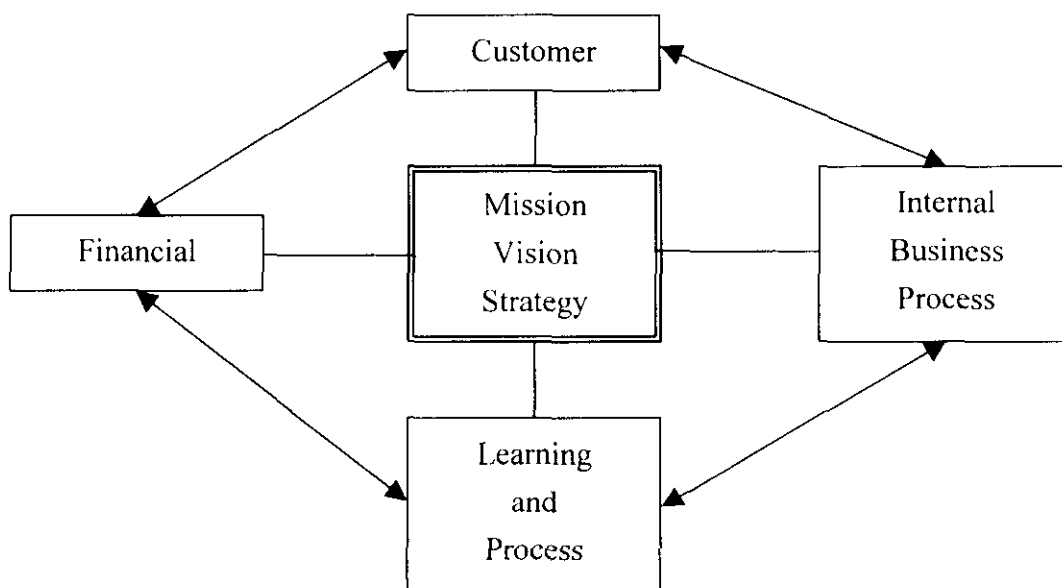


Figure 14.3-1 Balanced Scorecard Strategic Perspectives

- (a) Financial Perspective: How do we get the best deal for the government and shareholders?
- Profit,
 - Revenue,
 - Expenditure(Investment & O/M cost),
 - Dividend to shareholders,
 - etc.
- (b) Customer Perspective: How do our customers see us?
- Percentages of customers satisfied with timeliness and quality
 - Backlog of new connection,
 - Installation time for new connection,
 - Tariff,
 - etc.
- (c) Internal Business Processes Perspective: What kind of business processes do we excel at for customers and shareholders?
- Quality of service,
 - New technology,
 - New services,
 - etc.
- (d) Learning and Growth Perspective: Do we continue to improve and create value?
- The extent of reliable management information,
 - Skill training of employees,
 - Employee satisfaction
 - Etc.

The performance indicators should be established and be maintained to measure the progress of strategies, and through the above balanced scorecard, MT can monitor both its current performance (finance, customer satisfaction, and business process results) and its efforts to improve processes, motivate and educate employees, and enhance information systems.

(2) Example Performance Indicators

Considering the above mentioned management methodology, MT's key management/performance indicators will be in Table 14.3-2.

In order to implement properly this system, the following points should be taken carefully:

- A corporate strategy planning section under the top manages this system and periodical meeting.
- Only available and meaningful indicators should be selected.
- Indicators should have grade of importance or priority for management needs
- Unit to be managed which means a responsible unit for performance (HQs or region, etc.) should be clear.
- Management period should be clear (monthly, quarterly, semi-annually, annually)
- Reporting route should be clear.
- Instructions for improvement as a result of meeting should be clearly issued by the top.

Table 14.3-2 Example of Management/Performance Indicators for Telecommunication Operators

Category	Item	Indicators	Priority	Management unit		Management Period	Report Route	Remarks
				Whole country	Aimag			
Income & Expenditure	Monthly account	Income(classified)	P-1	X	X	Monthly	Aimag-->HQ	
		Expenditure(classified)	P-1	X	X	Monthly	Aimag-->HQ	
New connection	New connection	No. of new connection	P-1	X	X	Monthly	Aimag-->HQ	
		Average installation	P-2	X	X	Quarterly	Aimag-->HQ	
	Demand	No. of applicants	P-1	X	X	Monthly	Aimag-->HQ	
		Waiting list	P-1	X	X	Monthly	Aimag-->HQ	
		Waiting duration(month)	P-2		X	Quarterly	Aimag-->HQ	
O & M	Fault	No. of complaints	P-1	X	X	Monthly	Aimag-->HQ	
		Recovery time(hours)	P-1	X	X	Monthly	Aimag-->HQ	
		Fault rate	P-1	X	X	Monthly	Aimag-->HQ	
	Call completion ratio	Local call	P-2	X	X	Quarterly	Aimag-->HQ	
		Long distance call	P-2	X	X	Quarterly	Aimag-->HQ	
		International call	P-2	X	X	Quarterly	Aimag-->HQ	
		Interconnection	P-2	X	X	Quarterly	Aimag-->HQ	
Billing & collection	Billing	Rate of bill	P-1	X	X	Monthly	Aimag-->HQ	
		Delay of	P-1	X	X	Monthly	Aimag-->HQ	
	Collection	Collection rate	P-1	X	X	Monthly	Aimag-->HQ	
		Amount of non-collection	P-1	X	X	Monthly	Aimag-->HQ	
		Delay of collection(month)	P-2	X	X	Quarterly	Aimag-->HQ	
Training	Training	No. of trainees(plan vs	P-3	X		Quarter	HQ	

Note:

1. Priority: P-1 is the most important
2. Management unit: organizations to be controlled
3. Management period: period to be reported and analysed
4. All results are reported to the top management and necessary actions should be taken on time

(3) Management Framework

As shown in Figure 14.2-2 (Relation & examples of management strategy/objectives, improvement items and contents) and Figure 14.3-2 (Relationship among Corporate Management, Organisation and Human Resource Management), the management plan is to improve the management performance based on the policy, strategy and target.

And also Management strategy and Corporate culture should be clear for employees and customers as shown in Figure 14.3-3.

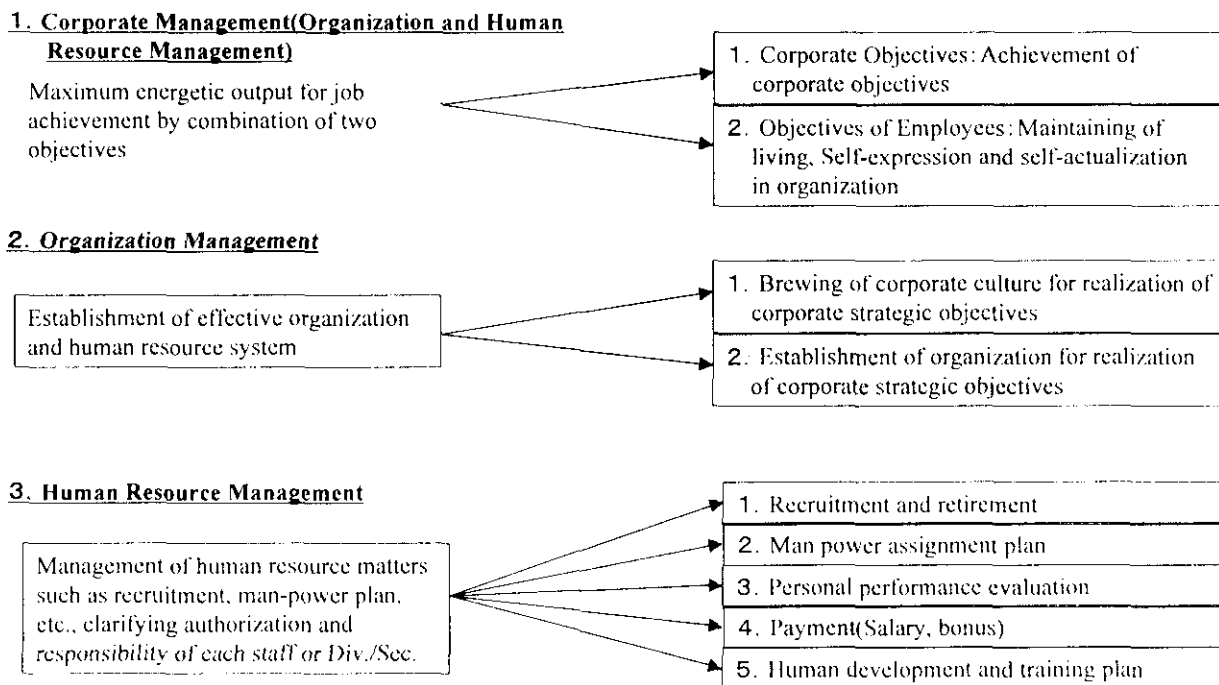
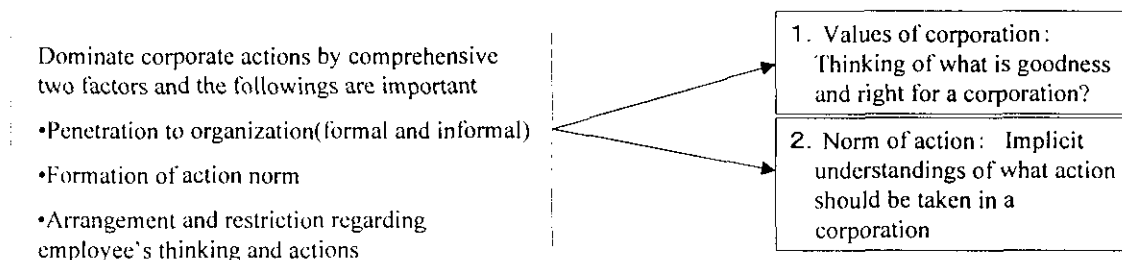


Figure 14.3-2 Relationship among Corporate Management, Organization and Human Resource Management

1. Definition of corporate culture



2. Type of corporate culture

1. Human Relation Type: Respect for human harmonization and
2. Venture Type: Respect for individuality and creativeness
3. Strategy Type: Respect for planning, rationalization and effectiveness
4. Bureaucracy Type: respect for rationalization, stability and efficiency

Figure 14.3-3 Management Strategy and Corporate Culture

Through the analysis of management issues, MT's management framework as policy, strategy and target will be as follows, dividing into three (3) phases:

- (a) Phase-1:
 - To establish the detailed indicators and forms
 - To establish standards work flows
 - To make common database for management
 - To establish office communication system

- (b) Phase-2:
 - To introduce MIS
 - To review management system

- (c) Phase-3:
 - To introduce MIS
 - To review management system

The framework of management plan is illustrated in Figure 14.3-4

		Present(2002)	Phase-1 (2002—2008)	Phase-2 (2009—2013)	Phase-3 (2014—2020)
Business Policies	Management Plan	Minimum management indicators	<ul style="list-style-type: none"> •To establish the detailed indicators and forms •To establish standards work flows To make common database for management To establish office communication system	To introduce MIS To review management system	
	Business Objectives	Digitalization/Expansion of Aimag/Sum networks and development of IT Enhancement of Aimag/Sum level management		Enhancement of customer oriented services & introduction of new services	
	Human resource	Decrease of Aimag/Sum level human resource Skill-up of Aimag/Sum level staff		Establishment of personnel evaluation system	

Figure 14.3-4 Framework of Management Plan

(4) Implementation of Management Framework

In order to implement the above framework, the followings are recommended:

(a) Management strategy and Corporate culture

Management strategy and Corporate culture should be established as shown in Figure 14.3-3

(b) Detailed management/performance indicators and forms

Referring to the example of indicators (Table 14.3-2) and considering the priority, indicators should be decided and implemented

(c) Standard work flows

New connection, billing and collection, account, budget control, fault control, call completion control, etc. should have standard work flows with duration, responsibility, forms, etc. of segment works and all related staff should keep the work flow.

(d) Common database for management

Management data such as budget, new connection, demand, fault, etc. should be stored in a database and should be utilized commonly for management staff. It is a precondition of MIS introduction.

(d) Office communication system

In order to manage the database at each office, communication system among offices such as internet, WAN is absolutely necessary, so MT should introduce a dedicated communication system between Headquarters and Aimags/Sums. It is also a precondition of MIS introduction.

(e) MIS (Management Information System)

The above integrated (c) & (d) system with application software is MIS and it is useful for top people to get information and make decisions and control for

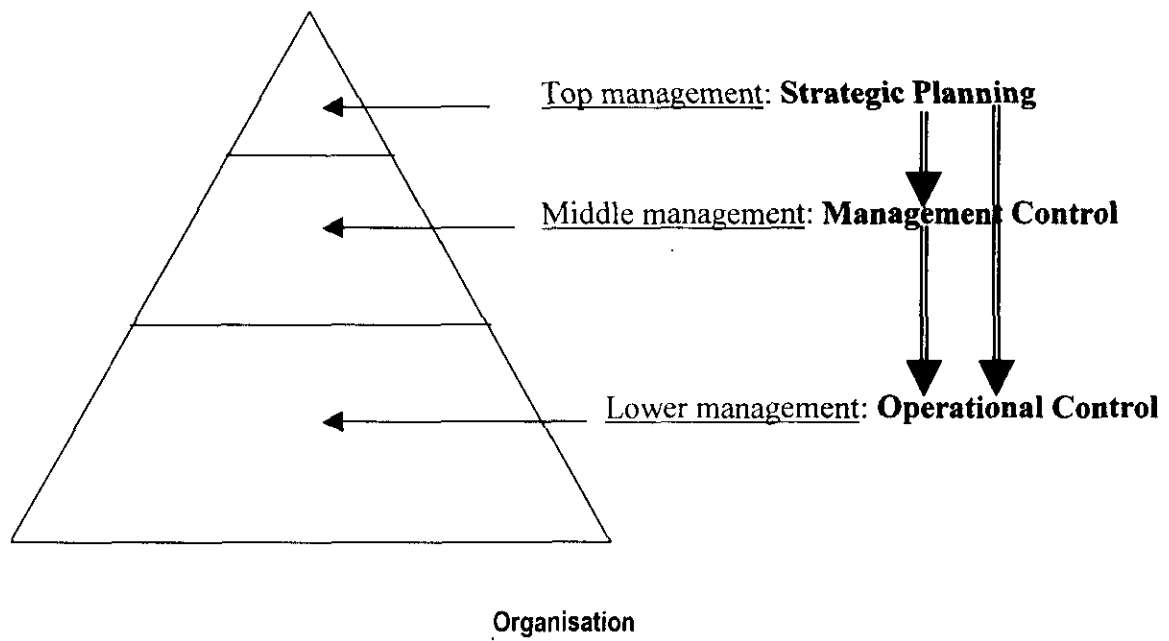
management. The relation among Management level, role and item is shown in Table 14.3-3.

It should be introduced step by step:

- step 1: Database,
- step 2: communication system,
- step 3: integrated system and application

Table 14.3-3 Management Level, Role and Item

Management level	Management role	Management Item
Top management	Strategic planning:	<ul style="list-style-type: none"> - Corporate policy/strategy - Organisation plan - Policy of Human resource plan - Policy of Financial plan - Marketing policy - Temporal expenditure policy
Middle management	Management control	<ul style="list-style-type: none"> - Establishment of budget - Human resource and Staff plan - Personal performance evaluation - Accounting - Advertisement - O/M control - Measurement/evaluation/improvement of company performance
Lower management	Operational control	<ul style="list-style-type: none"> - Implementation of each Top/Middle management item - Detailed implementation schedule and control



(f) Review of management system

As mentioned in this section, management should be based on the policy and strategy of the corporation (business plan), therefore it should be reviewed on time and reflected properly.

CHAPTER 15

SPECTRUM MANAGEMENT PLAN

CHAPTER 15

SPECTRUM MANAGEMENT PLAN

15.1 General

In proportional to the growth and expansion of economic and social activities, the radio frequency utilization is dramatically increasing in Mongolia. The development of telecommunications is recognised to closely link to the economic development of a country. Many wireless services (mobile phone, paging, broadcasting, and transceiver) have been recently licensed in this regard.

Frequency (or spectrum) management can be defined as a complex of administrative and technical measures necessary to ensure the operation of radio stations of different radio communication services at any given time without causing or receiving harmful interference at national and international levels.

The communications Regulatory Council (CRC) was established in 1995 by an order of the Ministry of Infra-structure (MOI), Mongolia.

In recent, illegal radio stations are increasing, therefore, the improvement and expansion of spectrum management functions/organisation are indispensable matter in Mongolia.

In this report, Radio Regulation uses the following terms regarding frequency distribution according to the following definition.

Table 15.1-1 Terms for Frequency Distribution

Frequency Distribution to	Term	Remarks
Services	Allocation (to allocate)	
Areas or Countries	Allotment (to allot)	
Stations	Assignment (to assign)	

In the report, the “frequency monitoring” is same as “spectrum monitoring”.

15.2 Frequency Allocation and Reuse

15.2.1 General

- (1) International Frequency Allocation

The international frequency allocation has been defined in the Table of Frequency Allocation of the Radio Regulations (RR) as stipulated in the ITU Constitution.

This Frequency Allocation Table is reviewed and revised as required by the World Radio communication Conference (WRC) of the ITU.

(2) Frequency Allocation in Mongolia

The CRC has built and completed the strategy on dividing and using of radio frequencies, planning of channels of the national resource within the framework of the international frequency allocation decided by the ITU.

The radio frequencies have been allocated to the various services based on the Radio Regulations in Mongolia (100 MHz-30 GHz) in Mongolia, which belongs to region 1, is shown in the data book (Vol. V).

In addition to the allocation to services, the assignment to radio stations is carried out application by application from users (refer to section 15.5 Frequency Licensing), but allotment, especially for HF/VHF to areas is executed according to no guidelines, therefore the guidelines for frequency allotment shall be established in Mongolia.

15.2.2 Specific Frequency Allocation

In addition, the specific radio frequency bands have been stipulated in detail by Governmental order of ministry of MOI. Figure 15.2.2-1 shows Mongolia radio frequency allocation in the bandwidth from 800 MHz to 1000 MHz.

According to the frequency band for IMT-2000 as shown in Figure 15.2.2-2 it is recommended to assign the radio frequency bands in Mongolia in preparation for future service expansion of the Mobile Communication Services.

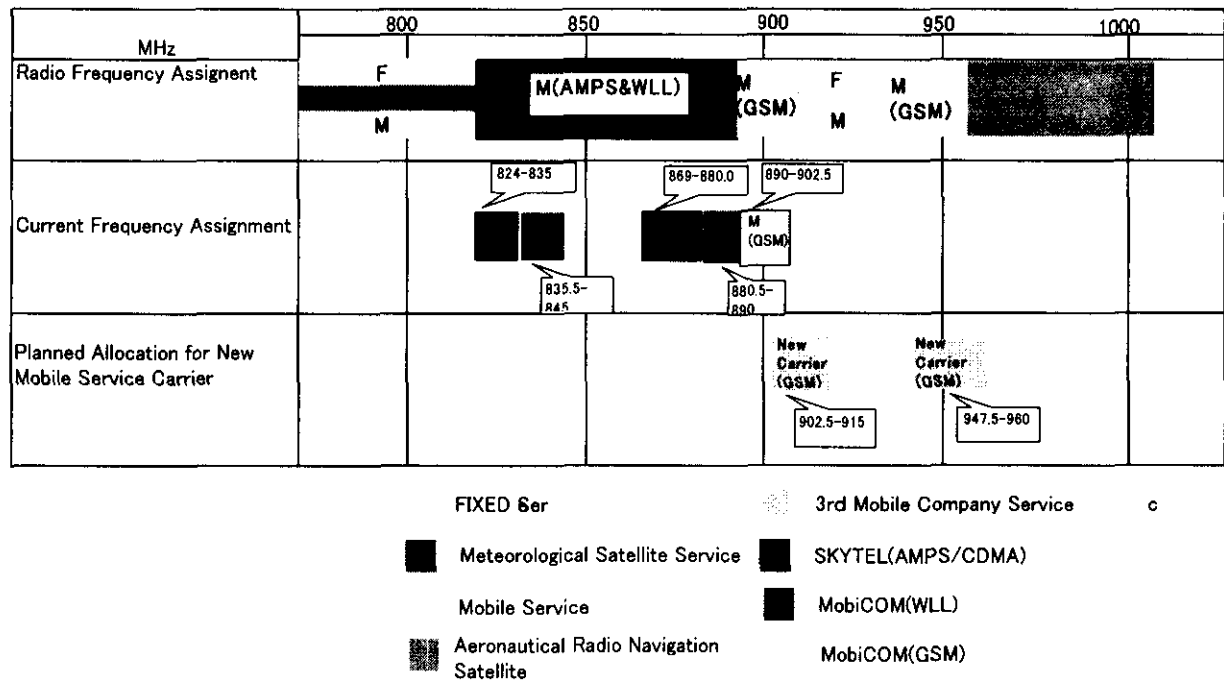


Figure 15.2.2-1 Mongolia Radio Frequency Allocation (800 MHz to 1000 MHz)

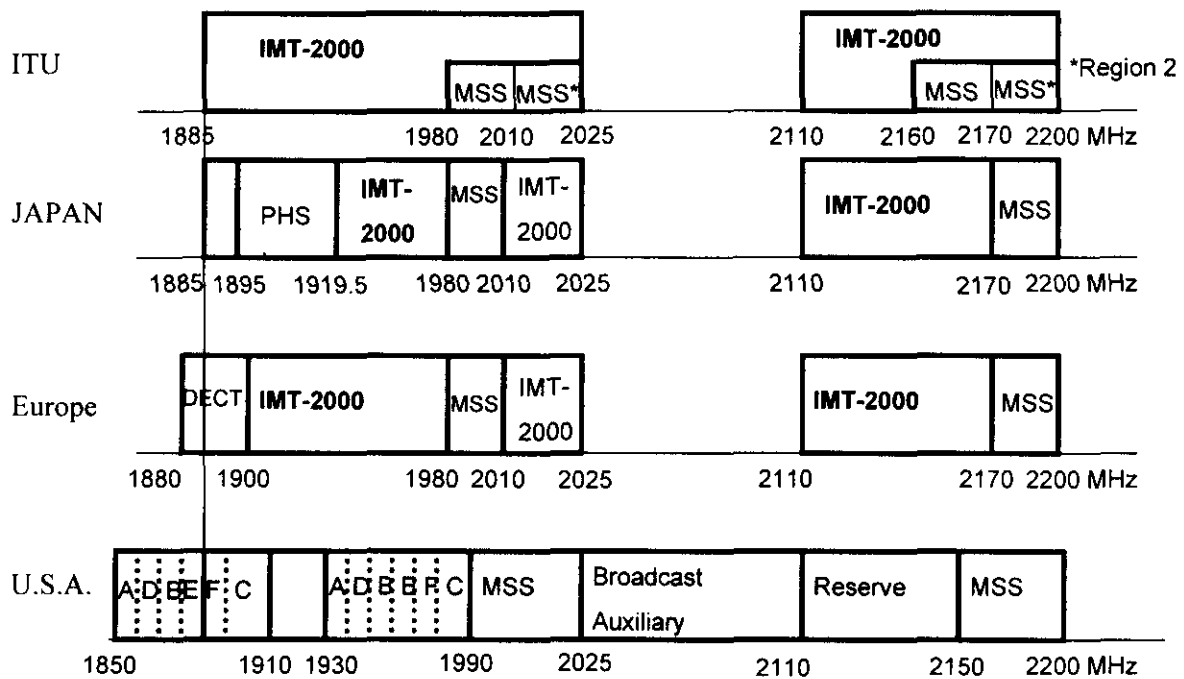


Figure 15.2.2-2 Frequency Band for IMT-2000

15.2.3 Frequency Allocation and Reuse in Japan

(1) General

In Japan the national frequency allocation has been also decided according to the ITU Radio Regulations.

(2) Frequency Allocation in Japan

The technical standards and available frequency bands are formulated and established as MPHPT (the Ministry of Public Management, Home Affairs, Posts and Telecommunications of Japan) ordinances by the following procedure:

(a) Preparation of Draft Technical Standards and Available Frequency Bands

The MPHPT prepares the draft report based on the advice from the Telecommunications Technology Council.

(b) Submission to WTO

The draft report is sent to international organisations such as WTO to seek opinion.

(c) Reference to MPHPT ordinance

After that the technical standards and available frequency bands are referred to the Radio Regulatory Council by the MPHPT as a draft MPHPT ordinance regarding radio equipment rules.

(d) Deliberation

The Radio Regulatory Council asks opinions of interested parties, and deliberates on the draft.

(e) Establishment of MPHPT Ordinance

Based on the Council's report the MPT establishes the MPHPT ordinance.

(f) Specific Radio Frequency Allocation in Japan

The specific radio frequencies are allocated to various services/systems in Japan. The allocations to major services are shown in Table 15.2.3-1.

Table 15.2.3-1 Specific Radio Frequency Allocation in Japan

Frequency Band	Services/System	Remarks
ISM (2440,2450, 2455 MHz)	Small Power Wireless Access system (Radio Subscriber System)	
To use frequency bands of fixed/mobile telemeter systems and rural satellite communications network	Disaster Prevention Administration Usage	88% of 3200 municipalities in Japan
To use frequency band of rural satellite communications network	Regional satellite communications network	32 prefectures, 3200 earth stations
C(6/4 GHz), Ku(14/12 GHz), Ka(36/33 GHz)	Fixed satellite communication services	13 satellites for domestic services
800 MHz and 1.5 GHz bands	Portable and automobile telephone	
280 MHz band	Radio paging	
380 and 250 MHz bands	Cordless telephone	
1.9 GHz band	PHS (Personal Handy phone System)	
400 MHz band	Train public pay phone	
12/14 GHz bands	Land mobile satellite data communications system	
60, 400 and 800 MHz bands	Anti-disaster administration radio	
400 MHz band	Digital mobile communication system for public use	
400 MHz band	Taxi Radio	
800 MHz and 1.5 GHz bands	MCA (Multi Channel Access Trunked system)	
2.45 , 19 GHz bands	Radio LAN system	
400 MHz band	Remote security system	
1.5 GHz band	GPS (Global Positioning System)	

15.3 Spectrum Control

The spectrum control is being carried out by the CRC (Communications Regulatory Commission) according to the Telecommunication Act (Effective date: January 3, 1996) and Asia Pacific Telecomm unity (APT) implemented technical and regulatory assistance in radio frequency spectrum to the CRC in order to improve the work.

15.3.1 Communications Regulatory Commission

The basic role of the CRC is to assist and recommend the Ministry of Infrastructure on State policy towards communications and in charge of execution of laws, issuance of operation licenses, type approval, complaints, services and tariff etc. regarding telecommunications operation, services and manufacturing. Communications law, Radio frequency law and other applicable legislations shall govern the activities of the CRC.

The CRC is an independent organisation and comprised of a Chairman and 6 non-executive members who are nominated by the Prime Minister on the basis of a proposal by the Cabinet member with portfolio for communications. Payment revenues derived from its regulatory services to licenses and radio frequency exploitations shall finance the Commission.

The CRC locates in Ulaanbaatar and shall set up branch councils in the national territory.

15.3.2 Legal System

The CRC is trying to build a complete legal document system regarding the management of frequency spectrum. The present situation of legal system is as follows:

(1) Radio Law

As a principal law for the spectrum management in Mongolia it is based on the Radio Law, which came into effect on June 23, 1999.

(2) Radio Standard

It is required to build Mongolia radio standard system to ensure that all of imported equipment is uniform and causes no interference, and to save radio frequencies. At present, the radio standard system has not yet been completed.

(3) Radio Regulation System

It is necessary to build the registration system and coordinate with international frequency to protect national frequency utilization. The necessary measure for this matter have already been taken and completed to build them.

(4) Decisions concerned to Spectrum Control

To effectively execute the spectrum control in Mongolia, decision regarding spectrum control has been described in the law on the Communications Regulatory Commission.

15.3.3 Obligation of CRC

The details and obligations are as following:

- (1) To furnish authorized organisations with information and develop proposals on the state policy on communications;
- (2) To grant, suspend and revoke licenses, monitor applications of license conditions and requirements, establish contracts within the framework of policies on communication;
- (3) To approve general terms of interconnection agreements between networks and procedures of revenue distribution;
- (4) To approve accounting methodologies for service tariffs, monitor service tariffs dominating a market;
- (5) To create conditions for fair competition in communications sector;
- (6) To ensure implementation of universal service obligations;
- (7) To work out communications standards, have them duly approved by relevant authorities, and monitor their applications;
- (8) To elaborate an integral numbering plan of networks and implement it;
- (9) To make radio frequency allocations and conduct monitoring;
- (10) To determine regulatory service fees to licensees;
- (11) To settle various disputes between licensees and customers within its specified powers.

15.3.4 Organisation

The Ministry of Infrastructure (MOI) mainly carries out the spectrum management (frequency utilization planning, allocation and issue of licence for radio spectrum usage).

The Radio frequency regulation and control division in the CRC has the following rights and duties laid down in the radio spectrum law:

- (1) Determine requirements for licensees to utilize radio frequency and monitor its implementation;
- (2) Establish technical performances for verification of radio equipment and test;
- (3) Record lists of national integrated registration of radio frequency allocation
- (4) Study and determine radio frequency bandwidth demands and requirements fix the special purpose utilization in collaboration with relevant organisations;
- (5) Study tariffs, demands and supplies of radio equipment or radio frequency utilization, radio frequency propagation, electric magnitude compatibility, assessment methodology, organize investigation works;
- (6) Deploy its specialists in working groups of standard formulation of the ITU, set up working or study groups as well;
- (7) Allocate radio frequency bandwidth according to the national radio frequency allocation table;
- (8) Conduct the following inspections with the purposes to implement provisions stipulated in Article 20 of the radio spectrum law and 9.1.19 of the Communications Law as follows:
 - (a) Determine and test radio equipment's frequency propagation, radiation and location, monitor and establish compatibilities of technical and utilization standard and nominal requirements;
 - (b) For the purpose to protect radio spectrum users detect illegal customers terminate their activities, test and measure compatibilities of imported radio devices to international and national standards;
 - (c) Participate in international radio frequency control;

- (d) For the purpose of studying radio spectrum radiation and confirmation of violations of applicable legislations and decisions, signals of the controlled noise sources may be used only as evidence for investigation and evaluation and upon their completion they are to be removed;
- (e) For the purpose of settling customs complaints, proposals and disputes (except court cases), conduct measurements and regulate.

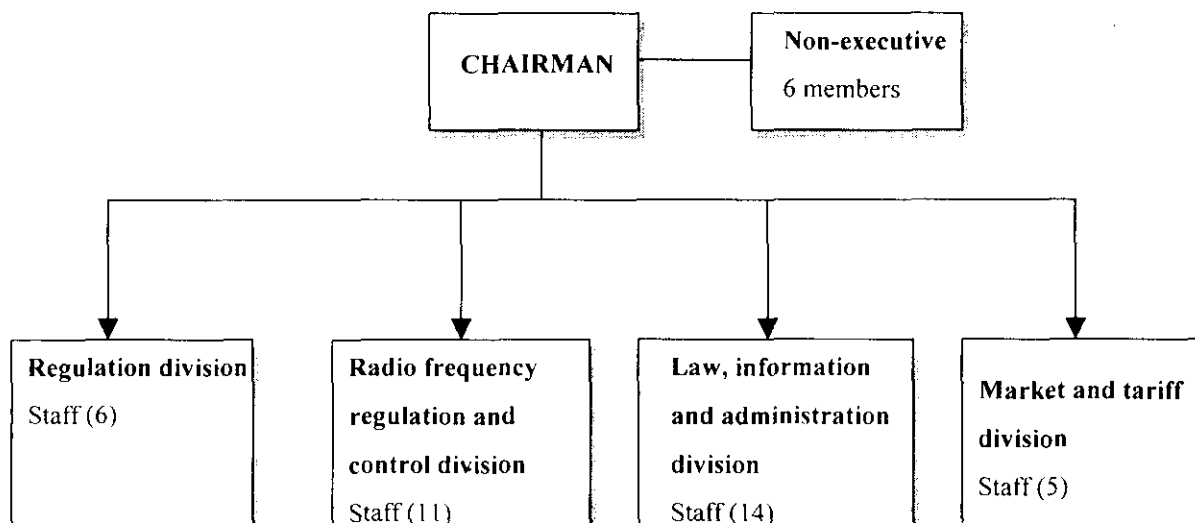


Figure 1.5.3-1 Organisation of Communications Regulatory Commision (CRC)

15.3.5 Spectrum Control Activities

The spectrum control activities stipulated in ITU-R SM 1048 have been carried out by the CRC in Mongolia as follows:

(1) Record Keeping

Database containing frequency assignment/allocation/allotment, information for individual license holders and technical data is maintained in personal computers of monitoring station in Ulaanbaatar. At present, computers are of personal type, but shall be upgraded to workstation in future.

(2) Frequency Assignment

Radio frequency assignment is carried out according to the ITU recommendations. For the purpose of interference calculation, the tool (ELLIP system for workstation) will be

introduced in near future.

(3) Border Coordination

Coordination with bordering countries (Russia and China) is carried out by the Mongolia government (MOI)

(4) Notification to the Radio Communication Bureau (BR)

Radio Communication bureau notification and creation of notification are carried out to comply with the ITU recommendation/Radio Regulations.

(5) Radio Frequency Usage and Service Fee

The radio frequency usage and service fee is established by the MOI and the CRC carries out fee collection.

(6) Monitoring

The CRC performs the frequency monitoring.

(7) Equipment Approval Process

Equipment approval such as provision of authorization, certification, type acceptance and type approval is carried out under the preparation of CRC.

(8) Reports Generation

Reports regarding license conditions and statistics data can be done by the CRC corresponding to necessity of reporting

(9) User Interface

It is available for a user interface of spectrum control activity in Mongolia. At present, user interface for license application is a document type.

15.4 Frequency Monitoring System

15.4.1 General

The development of telecommunications is recognized to be closely linked to the economic development of a country. Many wireless services (mobile phone, paging, broadcasting, and transceiver) have been recently licensed in this regard.

Frequency (or spectrum) management can be defined as a complex of administrative and technical measures necessary to ensure the operation of radio stations of different radio communication services at any given time without causing or receiving harmful interference at national and international levels. Mongolia adopted the Radio Law of Mongolia in 1999.

The following difficulties have been revealed in the operation of frequency management, spectrum monitoring and regulation in Mongolia:

- (1) Lack of the monitoring, testing and engineering equipment
- (2) Urgent need of the human resources development in the spectrum management
- (3) Urgent need of the establishment administrative structure, tools for spectrum management, engineering and software package

Frequency monitoring is carried out by the CRC, however, the facilities and equipment for frequency monitoring is obsolete and insufficient. The MOI has a plan to improve frequency monitoring system for inspecting and controlling of radio frequencies.

The objectives of the improvement project (Renovation of Frequency Management and Type Approval Laboratory for Communications Regulatory Body in Ulaanbaatar) are as follows:

- (1) To allow the country to control the use of radio spectrum in order to ensure availability of radio frequencies for orderly use and development of radio services in the country
- (2) To define and adopt the necessary regulations, create an appropriate national spectrum regulatory structure; and
- (3) To provide the necessary technical, monitoring, computer and information support

enabling the spectrum regulatory structure.

15.4.2 Frequency Monitoring Area

At present, there is only one monitoring station in Ulaanbaatar and in near future number of monitoring centres shall be expanded to five stations. Current Ulaanbaatar monitoring station is engaged in the work of radio monitoring every three hours. Measurement of electric field strength and evaluation of radio broadcasting (164 KHz, 4850 KHz) with SINPO code according to the five-grade system are implemented. The measurement and quality evaluation in a rural area other than Ulaanbaatar is now made once a year using mobile patrol car.

It is now evaluated as a grade 5 when the measurement result of the strength of electric field is more than 50 db.

The first priority about expansion project of monitoring station is given to the most industrially developed Ulaanbaatar region, the second one – to the Bulgan-Erdenet-Darkhan region (central Northern part of the country) and the third one – to the Choibalsan-Ondorkhaan-Barun-Urt region (Eastern part of the country) and to Altai region (Western part of the country).

In this respect it is proposed to establish the first stage expansion of monitoring centres: at Ulaanbatar, Bayankhongor and Ondorkhaan. The second stage monitoring centres shall be: established at Khovd and Barun-Urt.

15.4.3 Facilities and Equipment for Frequency Monitoring

Old-fashioned type of facilities and equipment for frequency monitoring is now used and the quantity of these facilities and equipment are insufficient considering the drastic expansion of radio frequency utilization in Mongolia.

The present equipment list of frequency monitoring station at Ulaanbaatar is shown in Table 15.4.3-1.

Table 15.4.3-1 Equipment List of Ulaanbaatar Frequency Monitoring Station

No	Name of Measuring Equipment	Frequency Bandwidth	Measurement Range	Other Data	Monitoring Purpose	Present Situation
1	Level Meter for TV, Satellite Receiver and FM Radio Signal	SAT:920-2150 MHz TV:45-867MHz FM:45-867MHz	30-120 dB μ V	220V,50Hz or 12V 2.8Ah	Mobile Use(Radio, TV CATV, VHF)	Good
2	Selective Level Measuring SMV-11	9 KHz-30 MHz	-20 to 125 dB μ V	220 V, 50Hz or 12V	Monitoring LF, MF, HF	Good
3	XPLORER test receiver (Auto Tracker)	30 MHz-2 GHz	100 μ V	7.2V,RS232 interface with 500 frequency storage	Mobile Use(Radio, TV and VHF)	Good
4	3000A Plus Frequency Measurement	10 Hz-3 GHz	<600 μ V	RS232 interface, internal memory	Mobile use (Radio, TV and VHF)	Satisfied
5	Oscilloscope CI-70				TV, Radio, Telecom Use	Bad
6	Frequency Modulation Measurement	CK3-26	60-300 KHz		Mobile Use Radio TV	Satisfied
7	HF receiver	P-399	3-30 MHz	Auto-tuning 60 Frequency	HF Monitoring	Good/ Satisfied
8	VHF radio detector	P-326	100-400 MHz		VHF Monitoring	Satisfied
9	TV Signal Generator	CT-35	75 Ω	SECAM	TV, CATV	Bad
10	Radio Wave Noise Generator	NNB 8, NNB 11, NNB 12	50 Ω	3-30 MHz	Radio Jamming	Good
11	Multi Meter	Multi function changeable	1000 V/750 V	2 M Ω	Measuring Equipment	Good
12	High Frequency Signal Generator	Γ 4-18	0.3-3.5 MHz		Measuring Equipment	Satisfied
13	Antenna, Feeder	Multi-element type (LF, AM, HF) Helical type Antenna	30-300 MHz 0.3-30 MHz	75 Ω	Receiver Antenna	Good
14	Spectrum Analyzer	Spectrum Analyzer	9 MHz- 3.5 GHz	75 Ω	Monitoring	Good

In order to reinforce radio monitoring at frequency monitoring centre it is recommended to introduce DEURAS (DEtect UNlicensed Radio Stations) system.

The radio monitoring station is shown in Figure 15.4.3-1. Other than the DEURAS system, the following types of monitoring equipment are recommended to use:

- (a) Electric Field Strength Meters
- (b) Frequency Counters
- (c) Radio Monitoring Apparatus such as spectrum analyzer
- (d) Tone Signal Identification Apparatus
- (e) ATIS Signal Decoder
- (f) Automatic Spectrum Recorder
- (g) Wattmeters
- (h) Monitoring and Test Receiver (9KHz to 2.75 GHz)
- (i) Radio Goniometers
- (j) Signal Generators
- (k) Radio Apparatus for Internal Communications
- (l) Radio Apparatus for Control of Radio stations
- (m) Digital Direction Finder (20 MHz to 3 GHz)

DEURAS system has the following four functions and it consists of sensor station , central station and mobile sensor station:

- (i) DEURAS Direction finder

Sensor stations installed direction finder equipment on the towers or rooftop of buildings in nationwide major towns is connected with central stations of the provincial communication office to monitor an unlicensed radio station automatically by high-speed data transmission lines. The measuring frequency is from 25 MHz to 3 GHz.

- (ii) DEURAS Receiver

A control signal to make frequency-search suspect for an illegal radio station is transmitted from the central station to the corresponding remote sensor station and monitor the direction of the frequency and audio monitoring. The measuring frequency range is from 25 MHz to 2 GHz.

- (iii) DEURAS Mobile

It consists of directional finder processing equipment, remote control equipment and communication circuit processor (via satellite communication circuit) and measuring equipment for quality checking of the radio frequency. The measuring equipment is taken in a vehicle and it is possible to move anywhere to detect an licensed radio station.

The measuring frequency is from 25 MHz to 2 GHz.

(iv) DEURAS HF direction finder

It is to monitor the quality of HF frequencies and four sensor stations is installed nationwide to detect the coming direction of radio frequencies and those four sensor stations are connected with provincial central station by way of high-speed data circuits and it is possible to find the radiation point of specified radio frequency.

The measuring frequency is from 100 KHz to 30 MHz.

Those functions are summarized in the Table 15.4.3-2.

Table 15.4.3-2 DEURAS System

Type	Function	Remarks
Remote controlled direction finder system (DEURAS-D)	DEURAS Direction Finder	Installed in local medium-size cities (SUM Centre)
Remote controlled receiving system (DEURAS-R)	DEURAS Receiver	Installed in prefectural governments and major cities (AIMAG Centre)
Unlicensed radio station detecting vehicle (DEURAS-M)	DEURAS Mobile	Stationed in Regional Frequency Monitoring Centre
High frequency monitoring facility (DEURAS-H)	DEURAS HF Direction Finder	

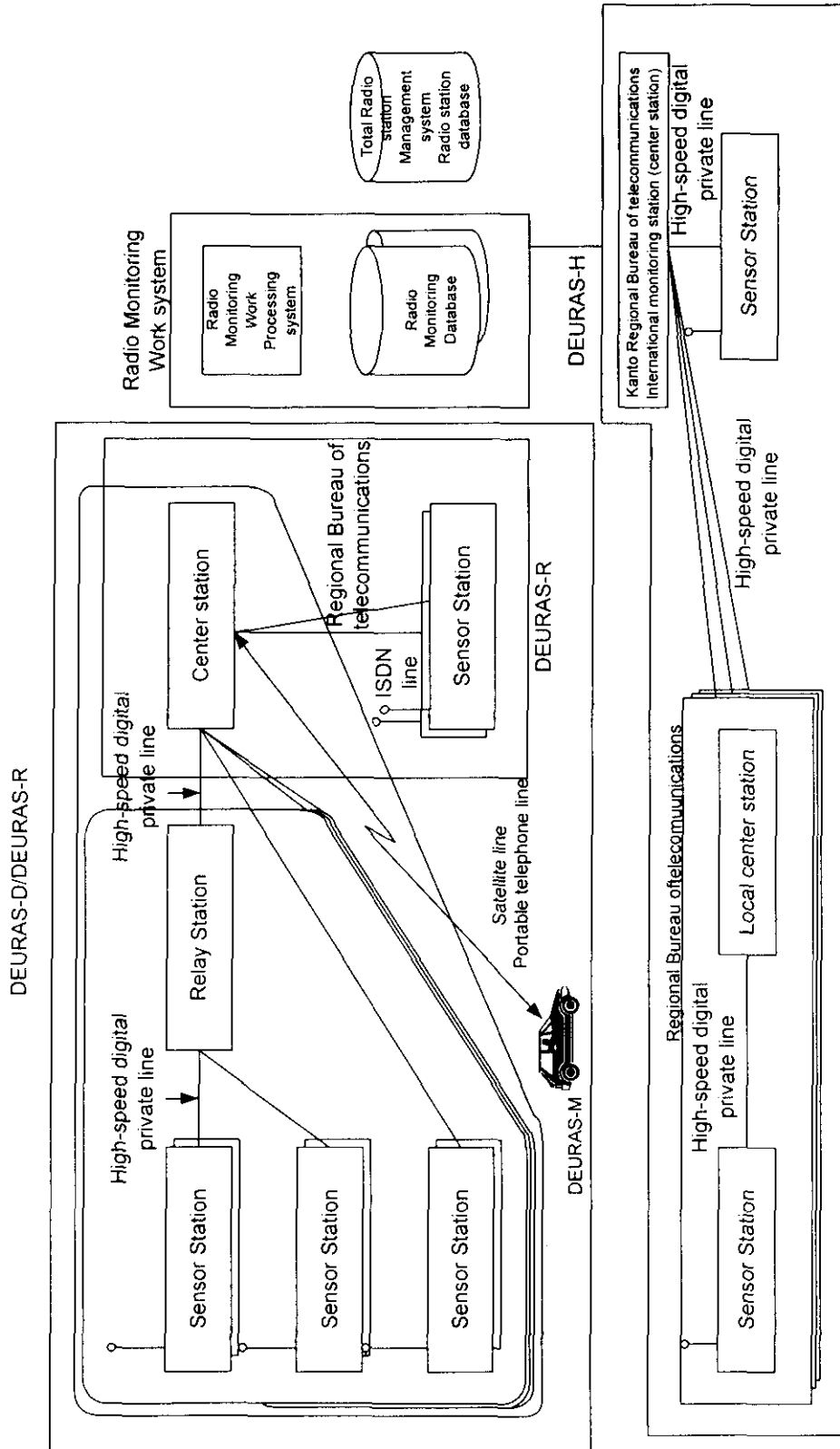


Figure 15.4.3-1 DEARUS System Configuration

15.5 Frequency Licensing

15.5.1 Procedure for Frequency Licensing

- (1) The Regulatory Committee shall grant a license to a legal person and citizen planning to conduct the following activities on the territory of Mongolia:
 - (i) To run Universal Communications Service
 - (ii) To use radio frequency and spectrum
 - (iii) To print postal securities

A term of licenses shall not exceed 20 years. The Regulatory Committee shall register communications service, operation and manufacturing by citizens or legal persons excepting the mentioned on the above.

- (2) The citizen and legal person applying for license shall forward to the Regulatory Committee its application with documents spelled out in the law. The application for license shall enclose documents stipulated in the legislation, and additionally shall enclose the following documents:
 - (i) Accounting and information on the applicant's capability in finance,
 - (ii) Economic and technical resources as well as in professional capacity.
 - (iii) Information on its activities (Coverage of its service, location, technology and tariff offer)
- (3) If the Regulatory Committee grants the license, then it shall conclude contract with the licensee. The Contract includes:
 - (i) Specific region to be covered and service access
 - (ii) Technological specifications of communications circuits, network and equipment
 - (iii) Prevention measures and obligations in case of emergency circumstances of war and natural calamities
 - (iv) Preconditions for the interconnection
 - (v) Rights and duties of the Regulatory Committee and the licensee
 - (vi) Others
- (4) The license applied for shall be refused by the Regulatory Committee if:
 - (i) There is not radio frequency bandwidth which the applicant requested for
 - (ii) The applicant has not been furnished which the applicant requested for
 - (iii) Public safety or interest and national securities aspects would be prejudices as a result of license being granted
 - (iv) If several applications are submitted for a license for one area then there shall

be selection tendering

- (5) Apart from those provisions specified in the law on Business Activities Licensing, the Regulatory Committee shall be entitled to revoke licenses if:
- (i) The Licensee fails to comply with its obligations under the Communications laws and contract
 - (ii) The Licensee discloses privacy of communications and correspondences relations
 - (iii) The Licensee has not started its business specified in the license for 1 year since its issuance
 - (iv) The Licensee conducts illegal activities not specified in the Law and contract

15.5.2 License Fee and Spectrum Utilization Fee

- (1) Fee for Radio Frequency bandwidth exploitation
- (i) A width of radio frequency band shall be established in accordance with ITU-R
 - (ii) Radio Frequency bandwidth shall be affected as shown in Table 15.5.2-1. Note that Television Broadcasting (TVB), Radio Broadcasting (RB), Radio Micro-wave and Cable Television Broadcasting at very high frequency (VHF, UHF) are excluded.

Table 15.5.2-1 Radio Frequency and License Fee

Radio frequency	Frequency range	Fee per one KHz (in Tug)
Very long (VLF)	<30 KHz	4,000
Long (LF)	30-300 KHz	3,000
Mid (MF)	300-3000 KHz	3,000
High (HF)	3-30 MHz	2,000
Very high (VHF)	30-300 MHz	1,000
Decimetres 1(UHF)	300-1000 MHz	500
Decimetres 2(UHF II)	1000-3000 MHz	150
Centimetre (SHF)	3-30 GHz	100
Millimetre (EHF)	30GHz <	50

- (iii) Radio frequency bandwidth for microwave station shall be effected as shown below.

Frequency range	Amount (Tug)
7 MHz	20,000
7-14 MHz	15,000
14 MHz<	10,000

- (2) Power and coverage fees

- (i) Power shall be determined on basis of radiation categories and technical standards in accordance with radio regulation of ITU-R.
- (ii) Television Broadcasting, Radio Broadcasting and Cable TV Broadcasting on very high frequency (VHF, UHF) are excluded
- (a) Power fees for very long, long and medium frequency bands are as follows:

Power range/KW	Amount (Tug)
<0.5	10000
0.5 - 1	15000
1-5	25000
5-10	40000
10-25	60000
25-100	80000
100-500	100000
500	120000

- (b) For high frequency bands:

Power range	Amount (Tug)
<50 mW	10,000
50 mW - 1 W	15,000
1 - 5 W	30,000
5 - 50 W	35,000
50 - 150 W	45,000
150 - 500 W	60,000
500 KW - 1.5 KW	80,000
1.5 KW <per each 1 KW	5,000

- (c) For very high frequency bands (VHF, UHF I, UHF II)

Power range	Amount (Tug)
< 100 mW	10,000
100 mW - 500 mW	12,000
500 mW - 1 W	25,000
1 - 5 W	30,000
5 - 10 W	35,000
10 - 25 W	45,000
25 - 60 W	50,000
60 - 100 W	60,000
100 W <per each 1 W	5,000

- (d) For Cent metric and Millimetre frequency bands (SHF, EHF)

Power rang	Amount (Tug)
< 100 mW	10,000
100 mW – 500 mW	15,000
500 mW – 1 W	20,000
1 – 5 W	25,000
5 – 10 W	30,000
10 – 25 W	40,000
25 – 100W	60,000
100 W <per each 1 W	200

- (3) Service type/classification fee

- (i) Micro-wave station:

Station classification	Amount (Tug)
a) Micro-wave station	15,000
b) Micro-wave repeater station	25,000

- (ii) Satellite communication:

Category	Amount (Tug)
Per each channel of satellite television	100,000
Per each channel of satellite <64 KHz	5,000

- (iii) Mobile station

Category	Constant meaning(Tug)
Base station/fixed station	20,000
Per mobile station	5,000

- (4) Service type

(i) Issuance, prolongation and transferring of license and certification	4000 Tug
(ii) Modification of license and certification	4000 Tug
(iii) Copy of license and certification	3000 Tug
(iv) Determination of radio frequency	5000 Tug
(v) Determination of location	5000 Tug
(vi) Detection of interference	50000 – 150000 Tug

15.6 Recommendations for Spectrum Management Plan

Comprehending and comparison of the present situation of spectrum management in Mongolia and in Japan can make the following recommendations. The improvement of the spectrum management should be implemented not only in hardware aspect, but also software aspect such as organisation and legal system. These issues to be solved are pointed out and some improvements are recommended herein.

(1) Frequency Allocation and Reuse

The radio frequency allocation allotment has been established by complying with the Radio Regulations and is being carried out adequately in Mongolia. For the effective utilization of radio frequency, the assignment to the users and reuse of radio frequencies should be executed according to the radio frequency allocation. In addition, the frequency allotment to areas shall be strengthened to avoid interference between radio frequencies allotted in different areas.

(i) Transition to new services/system

By transition to new service/system, it is better that aged and/or irregular radio transmission systems shall be replaced by the new transmission systems, and the radio frequencies for these systems shall be reused by the new radio systems.

(ii) Reuse by area

The radio frequencies are limited resource, so the utilization of radio frequencies should be carefully considered. Most of the radio communications systems can be reused by appropriate designing of the systems, therefore, the design of radio communications systems should be done considering the features and characteristics of the system to be applied. To promote effective reuse of the radio frequencies, two frequency transmission system designs in microwave path design and frequency reuse pattern method to cover large areas by limited radio frequencies in cellular system shall be considered carefully.

At present, the frequency allocation has been completed, and assignment to users/stations is properly carried out based on the frequency allocation table and frequency licensing procedure. However, the radio frequency allotment, especially for HF/VHF to areas has not yet been carried out due to lack of guideline of frequency allotment.

(2) Spectrum Control Activities

The spectrum control activities should be improved from the following viewpoints:

(i) Record keeping

Detailed utilization conditions of the existing users are not grasped completely by the CRC and the following technical data and information shall be correctly kept by the CRC.

- Number of systems

- Location of transmitter using coordinates
- Radio frequency
- Transmitted power (antenna power)

By comprehension of the corrected data and information other than technical data the database can be built up and the database will enable to implement the smooth spectrum control activities.

(ii) Computerization

Not only technical computation such as interference calculation, but also computerization of administrative work should be carried out in order to perform effectively and smoothly the spectrum control activities. The availability of the computer networking will enable to utilize databases nationwide and improve the spectrum control activities. The computerized network should be information exchanged with monitoring system and organisations concerned and the necessary data and information shall be disclosed through Internet, facsimile and computer communications as much as possible.

(3) International Frequency Coordination

The following activities regarding international frequency coordination shall be carried out:

- (i) Orbit position for geostationary Satellite
To enable to launch an own satellite by Mongolia, the orbit position for geostationary satellite shall be ensured through the international frequency coordination.
- (ii) Frequency Register and Coordination
The necessary international frequency coordination for frequency register and coordination shall be carried out on time.
- (iii) Border Coordination with Neighbouring Countries
The border coordination with neighbouring countries should be adequately carried out on time.

(4) Frequency Licensing

- (i) Extinction of Illegal Utilization
There are many illegal radio waves (users/stations) in Mongolia. The frequency licensing is carried out according to the stipulated procedure and fee as mentioned above. Illegal users besides the new licensee shall be ordered to

terminate as soon as possible.

(ii) **Subsidiary by License Fee and Spectrum Utilization Fee**

The license fee and spectrum utilization fee shall be utilized to improve the spectrum control in Mongolia. Especially, the facilities and equipment for frequency monitoring shall be improved by this fund.

(iii) **Modification of Licensing Procedure**

The frequency licensing procedure shall be modified according to the method of licensing application such as an introduction of online application and FD based application.

(5) **Frequency Monitoring System**

(i) **General**

By improving of frequency monitoring systems and establishment of powerful organisation, the illegal users/stations shall be supervised and controlled and radio frequency due to illegal radio waves shall be reduced.

(ii) **Frequency Monitoring Area**

The present frequency monitoring systems are necessary to improve rapidly in quantity and quality. To reduce illegal users, available frequency monitoring area shall be expanded nation-wide, especially in bordering and rural areas. At present, interference in cellular mobile services is now occurring in the border of Russia Federation and China. To solve such as interference, the expansion of monitoring area is indispensable.

(iii) **Facilities and Equipment for Frequency Monitoring**

To cover the target areas for frequency monitoring, facilities and equipment should be improved in quantity and quality. To correspond to the rapid expansion of the radio frequency utilization, the urgent establishment of new frequency monitoring system is essential matter to secure the radio frequency utilization in Mongolia.

(6) **Priority Project of Renovation of Radio Frequency Monitoring Facilities**

(i) **Background and Justification**

The Ministry of Infrastructure and the Communications Regulatory Body needs assistance from financing agencies as well as local funding to overcome problems encountered in the management of the radio spectrum, licensing activities and type approval. A communications Regulatory body to strengthen the needs of the spectrum

management of Mongolia was set up in 1996. Mongolia adopted the Radio law of Mongolia in 1999. The following difficulties have been revealed in the operation of frequency management, spectrum monitoring and regulation in Mongolia:

- (a) Lack of monitoring, testing and engineering equipment
- (b) Urgent need for the human resource development in this area; and
- (c) Urgent need for the establishment of an administrative structure, tools for spectrum management, engineering and software packages

The proposed project will help to overcome the current deficiencies in the system and generate revenues to strengthen and expand the spectrum management activities nationwide.

(ii) Objectives

- (a) To allow the country to control the use of radio spectrum in order to ensure availability of radio frequencies for orderly use and development of radio services in the country
- (b) To define and adopt the necessary regulations, create an appropriate national spectrum regulatory structure; and
- (c) To provide the necessary technical, monitoring, computer and information support enabling the spectrum regulatory structure

(iii) Implementation Period

Year 2003-2004

(iv) Estimation of Total Project Cost

Local Currency	0.1 Million US Dollars
Foreign Currency	1.4 Million US Dollars
Grand Total	<u>1.5 Million US Dollars</u>

CHAPTER 16

PRIORITY PROJECT AND FEASIBILITY STUDY PROJECT

CHAPTER 16

PRIORITY PROJECT AND FEASIBILITY STUDY PROJECT

16.1 General

There are two categories of the telecommunication systems of the fixed and mobile telephones for the development of the telecommunications services in the rural areas, including the Internet services. The projects under this Master Plan Study are targeted to develop the rural telecommunications system between Aimag centre and Sum centre.

The Government of Mongolia considers that the fixed telephone system for the development of the rural telecommunications system shall be applied as the first priority at the present stage, in case of the use of the Government funds including the ODA, although the mobile telephone service has been introduced into some major Aimag centres and Sum centres by mobile service operators now. For the selection of the priority projects, the following basic selection criteria is applied in this Master Plan Study:

- (a) Priority area for the rural social economic build-up to make contribution to the development in the rural areas;
- (b) Elimination of the ICT gap between the urban and rural areas for the establishment of the national information infrastructure;
- (c) Necessity for the emergency rehabilitation and expansion of the telecommunications facilities in the rural areas;
- (d) Un-funded priority projects;
- (e) Appropriate size of the project financing and effective investment; and
- (f) Consistency with the national and rural development plans and telecommunication development policy in the rural areas.

16.2 Selection Criteria of Priority Project, Aimag and Region

For the selection of the priority project, Aimag and region, the following criteria is applied in this Master Plan Study:

- (a) **Development Needs and Potentials for Rural Development**
For the selection and justification of the target Aimags within a region, the development needs and potentials for the rural development in all Aimag is analysed and evaluated.

- (b) **Economic Indicators of Rural Areas**
For the selection and justification of the target Aimags, the socio-economic criteria, such as GRDP per Capita, the economically active population (active labour force), and the total governmental services extended to each resident are comprehensively analysed and evaluated.
- (c) **Technical Factors in Sums**
The technical factors in Sums, such as the present subscribers and waiting applicants and the demand forecast of the fixed telephone in the year 2020, the power supply and the cost effectiveness for the digitalisation, are comprehensively analysed and evaluated.
- (d) **Comprehensive Evaluation for Selection of Important Sums**
All Sums in Mongolia are evaluated and ranked in each region from the comprehensive point of view of the rural development factors, socio-economic criteria and technical factors to be finalised.
- (e) **Selection of Aimag in a Region**
In consideration of the Government policy and the objectives of this Master Plan Study, the selection of Aimags is made one or two from a region, because Mongolia is consisted of five (5) regions, such as Western region, Khangai region, Central region, Eastern region and Ulaanbaatar region, and all Aimags belongs to either of them.

16.3 Selection Procedures of Priority Project

16.3.1 General

For the network development and rehabilitation projects, the selection of the Sums and Aimags, and the preparation of the lists of the priority projects and the feasibility projects will be done in the following procedures:

- (a) Selection and ranking of priority Aimags in a region;
- (b) Selection of important Sums;
- (c) Formation of priority project; and
- (d) Selection and listing of priority projects.

16.3.2 Selection and Ranking of Priority Aimags in a Region

In order to prioritise the regions and Aimags for selection of the priority projects as the rural development priority, the quantitative analysis of the rural development and socio-

economic criteria will be evaluated by relative score points consisting of the following four (4) factors, without weighting condition among each factors:

- (a) Social services needs
- (b) Development potentials
- (c) Preparedness factors
- (d) Economic indicators

The above result will also be utilized for the selection of important Sums. Aimag(s) of 1st and 2nd ranking in each region will be selected as the top and second priority Aimag(s), based on the analysis and evaluation result. Details are shown in Chapter 2, Table 2.7-6.

16.3.3 Selection of Important Sums

The important Sums will be selected, evaluating the following four (4) factors:

- (a) Comprehensive analysis and evaluation of Sums;
- (b) Priority evaluation of Sums by PTA;
- (c) Planned Inter-Sum centres; and
- (d) Demand in 2020.

(1) Comprehensive Analysis and Evaluation of Sums

Analysis and evaluation of Sums by the available data obtained from the first survey in Mongolia, such as the rural development projects, economic indicators, demand forecast, and technical factors of cost effective investment and power supply. Selection criteria are composed of five (5) categories below:

- (a) Aimag evaluation as total Sums scores by the rural development needs and potentials factors;
- (b) Aimag evaluation as total Sums scores by the key economic indicators;
- (c) Sums where the demand forecast and working lines of the fixed telephone are considerably bigger, and Sums where the populations and GRDPs are bigger and many people enjoy telecommunications services;
- (d) Sums where the initial investment costs are smaller and the investments are very effective, and Sums where the digitalisation of networks is cost-effective (the existing and/or planned transmission systems can be utilized for the provision of the new transmission systems concerned); and

- (e) Sums where the power supply is available and stable (by commercial power line or others).

For the above items, the comprehensive analysis and evaluation of Sums will be made by the following manners:

- (a) 1 to 5 score points will be given to each criteria; and
- (b) Comprehensive evaluation will be made by the total given score points of 5 criteria, giving 1 to 5 score points.

Table 16.3-1 Comprehensive Evaluated Score Points

Total Score Points	Comprehensive Evaluated Score Points
5-9:	1
10-13:	2
14-17:	3
18-20:	4
21-25:	5

Detailed criteria and evaluation method is attached in Annex 11-1.

(2) Priority Evaluation of Sums by PTA

The priority evaluation of Sums in the category A/B/C/D from viewpoints of PTA’s experts, who know the detailed information such as size, development possibility, etc., through the experience, will be taken into an account. Details for the priority evaluation of Sums by PTA is shown in Annex 11-2.

(3) Planned Inter-Sum Centres (Integration of Sums)

The Government of Mongolia has a future plan that some Sum centres will be integrated as certain "Inter-Sum centres". These integrated "Inter-Sum centres" will be evaluated as important Sums.

(4) Prioritisation of Important Sums

In order to prioritise the important Sums, the priority of Sums will be defined as shown below. Four (4) factors mentioned in the above items will be merged by applying “and condition” and “or condition” and prioritised “P-1”, “P-2”, “P-3”, “P-4” as shown in Table 16.3-2 below:

- (a) Sum of P-1 (Sums of the top priority):
 - (i) Comprehensive evaluated score points are "5" or "4"; AND
 - (ii) PTA's category is "A" or "B"; OR
 - (iii) Planned Inter-Sum Centres is "X";
 - (iv) Facilities provision will be implemented in the earlier stage of Phase I (between 2004 and 2006), and the demand in 2006 will be fulfilled.

- (b) Sum of P-2 (Sums of the second priority):
 - (i) Comprehensive evaluated score points are "5" or "4"; OR
 - (ii) PTA's category is "A" or "B";
 - (iii) Facilities provision will be implemented in the later stage of Phase I (between 2007 and 2010), and the demand in 2010 will be fulfilled.

- (c) Sum of P-3 (Sums of the third priority):
 - (i) Comprehensive evaluated score points are other than "5" or "4"; OR
 - (ii) PTA's category is other than "A" or "B";
 - (iii) Fixed telephone demand in 2020 is more than 90;
 - (iv) Facilities provision will be implemented in the earlier stage of Phase II (between 2011 and 2013), and the demand in 2013 will be fulfilled.

- (b) Sum of P-4 (Sums of the fourth priority):
 - (i) Comprehensive evaluated score points are other than "5" or "4"; OR
 - (ii) PTA's category is other than "A" or "B";
 - (iii) Fixed telephone demand in 2020 is less than 90;
 - (iv) Facilities provision will be implemented in the earlier stage of Phase III (between 2014 and 2020), and the demand in 2020 will be fulfilled.

Table 16.3-2 Prioritisation of Important Sums

Priority	Comprehensive Evaluated Score Points		PTA's Category		Planned Inter-Sum Centres		Fixed Telephone Demand in 2020
P-1	"5" or "4"	and	"A" or "B"	or	"X"	--	---
P-2	"5" or "4"	or	"A" or "B"	--	---	--	---
P-3	Other than "5" or "4"	or	Other than "A" or "B"	--	----	and	More than 90
P-4	Other than "5" or "4"	or	Other than "A" or "B"	--	----	and	Less than 90

16.3.4 Formation of Priority Project and Listing of Priority Project

(1) Formation of Priority Project

The formation of the priority project will be carried out as follows:

- (a) To select the priority Sums from the selection result of the important Sums;
- (b) To take account of proper size in financing, and simultaneous upgrading, rehabilitation and/or expansion of the switching system, transmission system and subscriber access network system; and
- (c) To include IT factor such as IT spot.

(2) Listing of Priority Projects

The priority projects formed through the process in the above item (1) will be orderly listed in the priority project list in consideration of the study result of the priority region and Aimags within a region analysed in the previous sub-section 16.3.2.

16.4 Analysis and Study Result of Priority Aimag and Region

The result of the rural development priority is shown in Table 16.4-1 below. Details are shown in Chapter 2.

16.5 Analysis and Study Result of Comprehensive Analysis of Important Sums

The study result of the important Sums selection, based on the methods in the previous section 16.3, is shown in Table 16.5-1. Details of the selection result of the important Sums are shown in Annex 11-2.

16.6 Priority Projects of Network Development and Rehabilitation Projects

In accordance with the procedures mentioned in the previous section 16.3, the priority projects of the network development and rehabilitation have been selected as the priority Aimags of the first and/or second ranking in a region, based on the Table 16.4-1. The project formation has also been carried out in accordance with the procedures mentioned in the previous section 16.3. As a result of the above study, the project list of the network development and rehabilitation is shown in Table 16.6-1.

Table 16.4-1 Rural Development Priority

Region	Region Rank	Aimag	Aimag Ranking
Western Region	3	1. Bayan-Ulgii	3
		2. Uvs	2
		3. Khovd	2
		4. Zavkhan	1
		5. Govi-Altai	2
Khangai Region	1	6. Khuvsgul	2
		7. Arkhangai	1
		8. Bayankhongor	2
		9. Bulgan	2
		10. Orkhon	3
		11. Uvurkhangai	1
Central Region	2	12. Selenge	2
		13. Darkhan-Uul	3
		14. Tuv	2
		15. Dundgovi	2
		16. Umnugovi	1
		17. Govisumber	3
		18. Dornogovi	2
Eastern Region	3	19. Khentii	1
		20. Sukhbaatar	2
		21. Dornod	3

Table 16.5-1 Summary of Priority of Sums

Priority	No. of Sums & Ratio		Demand and Ratio in 2020	
P-1: Priority-1	120	35.4%	36,078	59.6%
P-2: Priority-2	126	37.2%	15,831	26.2%
P-3: Priority-3	39	11.5%	5,616	9.3%
P-4: Priority-4	54	15.9%	2,993	4.9%
Aimags and District Centre	23	---		---
Total	362	100%(339)	60,518	100.0%
Inter-Sum "X"	66	---		---

Table 16.6-1 Priority Project List

Ref. No.	Project Name	Region Name	Cost (Million US\$)
1	Rehabilitation and Expansion Project of Telecommunications Network in Uvurkhangaï Aimag	Khangai	5.8
2	Rehabilitation and Expansion Project of Telecommunications Network in Selenge/Darkhan-Uul Aimag	Central	8.3
3	Rehabilitation and Expansion Project of Telecommunications Network in Zavkhan Aimag	Western	10.0
4	Rehabilitation and Expansion Project of Telecommunications Network in Khentii Aimag	Eastern	7.9
5	Rehabilitation and Expansion Project of Telecommunications Network in Umnugovi Aimag	Central	7.0

Note 1: The project in Arkhangai Aimag of Khangai region ranked in the 1st of the rural development priority is out of the above list because it is not possible to make joint use of the digital backbone transmission facilities.

Note 2: As for the priority project in Uvurkhangaï Aimag of Khangai region it is possible to make joint use of the digital backbone transmission facilities

Note 3: As for the priority project in Selenge/Darkhan-Uul Aimag of Central region, it is possible to make joint use of the backbone optical fibre cable transmission facilities and the backbone digital microwave transmission facilities that enables to make cost effective for the digitalisation of the trunk lines between Aimag centre and Sum centres.

Note 4: As for the priority project in Zavkhan Aimag of Western region it is not possible to make joint use of the digital backbone transmission facilities.

Note 5: As for the priority project in Khentii Aimag in Eastern region it is possible to make joint use of the optical fibre cable transmission facilities

Table 16.6-2 Priority Project List (2)

Ref. No.	Project Name	Region Name	Cost (Million US\$)
6	Rural HF/VHF Radio-to-Phone Automatic Patch Solution Project	All Regions	1.5
7	Renovation of Radio Frequency Monitoring Facilities	Ulaanbaatar	1.5

Note 1: Reference No. 6 project added in the priority list to improve the existing rural radio communication facilities in Bags.

Note 2: Reference No. 7 project added in the priority list for the urgent need for rehabilitation of the radio frequency monitoring facilities at Ulaanbaatar to correspond to the rapid expansion of the radio frequency utilization

Note 3: The satellite Internet rural access solution project that install VSAT satellite transmission terminals at total 66 Inter-sum centres is out of the above priority list taking the burden of the satellite transponder lease cost into consideration.

16.7 Method of Selection of Feasibility Study Projects

Out of the above priority project list feasibility study project(s) is selected in consideration of the following matters and the field survey for the Feasibility Study has been carried out:

- (a) Most urgent project(s) on the rural development, etc., in conformity with the policy of the Government of Mongolia;
- (b) Project(s) that brings substantial socio-economic benefits;
- (c) Project(s) that brings the maximum utilisation of the new network linking to the existing and new digital transmission trunk link;
- (d) Proper size of the project(s) from the point of the financial source;
- (e) Project(s) for which financing is not decided; and
- (f) Project(s) that does not exceed the work volume limit of the Study Team assigned under this Study.

. Finally, the Feasibility Study project covering 22 Sums from Uvurkhangai Aimag and Selenge/Darkhan-Uul Aimag areas was selected as shown in Table 16-7. Darkhan-Uul Aimag and Selenge Aimag is integrated one Aimag as a development area, based on the information brought by the Mongolian side that the merger of the two Aimag is upcoming.

Table 16-7 Result of Selection of Feasibility Study Project

Project Name	Region
Rehabilitation and Expansion Project of Rural Telecommunications Network in Uvurkhangai, Selenge and Darkhan-Uul Aimag areas (Rehabilitation of Rural Telecommunications System in Khangai and Central Regions of Mongolia)	Khangai and Central

CHAPTER 17

RECOMMENDATIONS

CHAPTER 17

RECOMMENDATIONS

17.1 Introduction

The strategies and targets stipulated under the MTSPS 2001 is to introduce more fruitful investment along the latest modern technologies in harmony with ensuring customers demands to ensures higher economic growth, to pursue an export-oriented economy policy, to improve the living standard of people, and to develop of the social welfare.

Though the investment cost for the telecommunications facilities in the rural areas, including the operation and maintenance cost, is higher than those on the urban areas, the Government of Mongolia intends the people in the whole rural areas to create the opportunity to utilize the telecommunications services beyond such obstacles.

In order to establish the proper telecommunications system in the whole rural areas of Mongolia in earlier time, this recommendation is aimed to improve the telecommunications sectors in aspects of the institutional, organisation, management, human resource, technical, financial, universal services obligation, etc.

This recommendation has been prepared, based on many findings through the field surveys results and the studies and discussions for the preparation of this Master Plan with the counterpart staff of MOI, CRC, PTA and MT during the study.

It is recommended that the Government of Mongolia to fulfil the recommendation mentioned below in order to have the opportunity to utilize the telecommunications services for the people in the whole rural areas.

17.2 Framework of Master Plan

The framework of this Master Plan has been studied and established under Mongolian Telecommunications Policies and summarized as follows. This recommendations are prepared based on the framework.

(1) Demand Forecast of Fixed Telephone in Sum Centres

The demand forecast and density of the fixed telephone in all Aimags in the year 2020 are 196,140 lines and 9.92 lines per 100 inhabitants respectively, including the demand forecast in all Sum centres are 60,780 lines in the year 2020.

(2) Demand Forecast of Fixed and Mobile Telephone in Sum Centre

The demand forecast and density of the fixed and mobile telephones in all Aimags in the year 2020 are 503,504 lines and 25.47 per 100 inhabitants respectively, including the demand forecast in all Sum centres is 158,467 lines.

(3) Fulfilment Plan of Fixed Telephone Demand Sum Centres

100% of the fixed telephone demand in major Sum centres of the major Aimags, where much initial cost is not required, will be fulfilled in the earlier stage (2003 - 2005) of the Phase-I, and that the target fulfilment will be 50% in the earlier stage of the Phase-I and 80% of the later stage (2006 - 2008) of the Phase-I, depending on the available funds.

(4) Fulfilment Plan in Bags

The automatic dial connection from the HF (High Frequency) transceiver available in Bag will be obtained through operator at Aimags or Sum centres in the Phase-I and be replaced with WLL (Wireless Local Loop) and/or VSAT system in the Phases-II and III.

(5) Fulfilment Plan of Mobile Telephone Demand

The fulfilment of the mobile telephone demand will be performed by the mobile telephone operators, considering that the mobile telephone operators are expanding the service areas from Ulaanbaatar to major Aimags and Sum centres, and the transmission channels from Aimag to Sum centre to be provided for the mobile telephone service under the feasibility study project will be leased to the mobile operators.

(6) Switching System Expansion Plan

The expansion of the switching system in Sum centre during the Phase-I will be realized by the DLC (Digital Loop Carrier), digital PABX (Private Automatic Branch

Exchange) and/or small digital switching system to provide the long distance and international subscriber dialling.

(7) Network Style and Expansion

The expansion of the switching system in Sum centre will be realized by the PSTN facilities in the earlier stage of the Phase-I. The VoIP system will be introduced in the later stage of the Phase-I, in considering with the comparison of both the technical innovation and investment cost concerned.

(8) Internet Services Expansion Plan in Sum Centres

The Internet services in all Sum centres will realized by the installation of the IT spot (PCs and printer for IT and Internet service such as the present Internet cafe are installed in MT office, including telephone and facsimile) will be established in the Phases-I and II.

(9) Reduction of Investment Cost per Subscriber

The investment cost in the rural area, which is about US\$ 2,600 per subscribers under this Master Plan Study and very expensive in comparison with the normal cost in the urban areas, shall be reduced by the adoption of the economical telecommunications system.

(10) Investment Manners in Phase-I

The investment of the telecommunications system in the rural areas during the Phase-I shall be commenced from the important Aimags and Sum centres of the high priority in view point of the social services needs and development potentials, considering the FIRROI (Financial Internal Rate of Return On Investment) for further investment.

17.3 Institution and Rural Telecommunications Development Policy

(1) Rural Telecommunications (telecom) Development

At present, rural telecom development framework such as scope, investment costs, etc. by development phase is not specifically prepared and is not made open; therefore the rural development target is not clear.

In order to promote rural telecom development, priority areas and projects by phase that are based on the Master Plan should be made clear and open, and all available financial resources for investment should be mobilised in realistic manner.

In order to facilitate the rural telecommunications development in Mongolia, the backbone network master plan should be reviewed.

(2) Technical Aspects for Investment

- a. Cost effective rural telecom network systems suitable for many rural settlements of small demand spread in the country's vast territory are not established.

Cost effective systems that are available under current technologies should be selected in time in the light of world technology trends.

- b. Efficient common utilization system of backbone transmission systems that are currently owned by the respective entities including the private companies is not established.

In order to utilize efficiently the backbone systems, MOI, CRC & PTA should pertinently regulate and instruct the owners for avoidance of duplicated investment, reduction in lease rental to operators.

(3) Profit and Loss of Rural Telecom Networks

As the telecom operations of Aimags and their respective Sums show losses, there is little incentive for investment.

More effective management by introduction of automatic call connection, centralized O/M and management information system, etc. is needed.

Revenues should be increased by upgrading service quality and enhanced marketing activities.

Available concessions such as tax exemption, free charges of land and building, etc. should be considered to be given to rural telecom providers.

Lease rental of backbone systems should be reduced for rural telecom providers.

A long-term policy for supporting rural telecom networks by subsidies such as Universal Service Obligations Fund (USO Fund), etc. should be established.

Proceeds from the sale of the Government's stocks of Mongolia Telecom (MT) should be utilized for rural telecom development.

(4) Policy and Regulations of USO (Universal Service Obligations)

Implementation of USO is behind schedule.

MOI needs to take a strong policy and leadership for USO.

Responsibilities and authorities of CRC and PTA should be made clear.
Implementation schedule of USO should be decided clearly.

(5) Universal Service Obligations Fund(USO Fund)

- a. Classification of accounts (revenues and expenditures) and calculation system of profit and loss that have clear distinction between the Capital network and the Aimag/Sum networks are not established.

There should be established the accounts classification and the calculation system.

In order to clearly show the operations results of Aimag/Sum networks and utilization of USO Fund, separation of local company(ies) covering Aimag/Sum network(s) from existing MT should be considered.

- b. Definition of services and areas by phase of USO and penalty in the event of breach are not clear.

Under consensus of operators and the whole population, there should be made clear the definition of USO services and the penalty.

- c. Calculation method of USO Fund (including its basis) to be contributed by the concerned telecom operators is not clear

Calculation method of the USO Fund (including its basis) contributed by providers should be made simplified and clear.

- d. Kinds, nature and amount of costs to be borne by USO Fund are not clear.

Utilization of the Fund should be limited to project/new investments and O/M costs for Aimag/Sum networks of rural telecom development.

(6) Nationalisation (State-owning) of Backbone Transmission System and its Lease to Operators

- a. Investment plans of backbone network of private companies, utilization rules among operators and tariffs of the existing backbone networks are not clearly regulated.

MOI, CRC & PTA should immediately establish a backbone investment plan, make a rule for efficient use and control of the backbone network.

- b. As each private provider holds own backbone system, nationalisation of backbone systems is less significant.

Establishment of a joint venture company by the owners/investors of backbone system should be considered in order to promote rationalised utilization as well as effective investment.

- c. Investment funds for the country's telecom development have to be depending more or less on ODA, accordingly nationalisation of backbone systems is inevitable in medium and long-term.

Another master plan study for development of backbone transmission systems and its implementation are required. The above-stated idea of joint venture should be studied under that master plan.

(7) Privatisation

Not entire amount of lease rental collected from MTC is utilized for telecom development.

The Government is requested that the entire amount except for those disbursed for debt servicing should be used for rural telecom development.

Proceeds of the sale of the Government's stocks of MTC should be utilized for rural telecom development. (Refer to Item (3))

(8) Giving Incentives to Investors

Kinds of concessions to rural telecom investors are not clear.

Available concessions such as tax exemption, free charges of land and building, reduction in lease rental, etc. should be considered for rural telecom providers. (Refer to Item (3))

From standpoint of the Government's international commitments to shift the country towards market economy, it will be useful to establish specific development areas for the implementation of incentives and a limited period of availability.

(9) Discount or Subsidy of Telephone and Internet charges/fees to Users in Rural Areas

Telephone and internet charges/fees of users in the remote areas of the country are heavy burden to their household income.

The incentive should be granted to rural users, for example; in further discounted tariffs from the regular ones for residential users within a capping of certain volume of telephone calls and internet every month (with exception of unlimited discounted tariffs for hospitals, schools and other public service installations).

(10) Establishment of Comprehensive Rural Development Plan

Comprehensive rural development plan is not firmly established.

As a driving force of rural telecom development, utilization of the potentiality of private enterprises should be promoted by fostering environment for set-up and growth of SME (Small & Medium Enterprises).

Upgrading of services by enhancement of facilities for hospitals, schools and other public service installations should be considered.

17.4 Operation and Maintenance

(1) Quality of Services and Network Performance Control

- (a) The indicators of the quality of service, network performance and facility control are recommended for monitoring total activity of Operation and Maintenance.
- (b) The preventive maintenance method covered all telecommunication facility are recommended on the category of the work scope, objective facility, checking method and objective item for facility quality control.

(2) Organisation for New Rural network

It is recommendable that the operation and maintenance of facility in the junction network and switching system, billing and collection work, new connection work and some management work etc. in Sum Centres will be centralized to Aimag Centre or Large Sum Centre for the efficiency and unification of work. On the other hand, each Sum centre should handle mainly the operation maintenance of the access network in Sum Centre.

(3) Improvement of Outside Plant Fault Repairing System

The execution of accurate repair work on the site is essential and work procedure, repair method and repair report are recommended for reducing the high fault ratio of outside plant.

(4) Settlement of New Connections System

With the extension of the rural telecommunication network, mass of new connection will be occurred at the commencement of new network and it is recommendable to provide the Task Force in Aimag centre to implement mass connection work of Sum centres. Otherwise, mass connection work should be included in the rural network expansion project together with the cutover work of existing subscriber lines. Work procedure of the service order in Sum centre and Aimag centre is also recommended.

(5) Network Management in Aimag Centre

Aimag Centres should manage the new rural network up to Sum Centre Switch with the NMS functions, which should be included in the new rural network system to monitor the Alarm and Traffic from Aimag Centre. The necessary operation works for rural network management are listed as a recommendation to be handled by Aimag Centre.

(6) Tools, Equipment, Maintenance Material and Vehicles

It is necessary to review the allocation of suitable tools and equipment for the operation and maintenance of the new digital rural telecommunication network. These should be basically stored in each Aimag centre. Proper volume of Maintenance material should be secured in the Aimag centre for the rural network. It is recommendable to procure the materials for three years of maintenance period in the rural network implementation project. It is recommend that 2-3 vehicles as minimum requirements should be arranged for the repair group of rural network in each Aimag centre to shorten the repair time of the fault in the rural network.

17.5 Human Resource Development**(1) Annual Human Resource Development Plan**

Based on the adjusted staff plan for the long term, MT should implement annual plan, reviewing business policy/strategy, the actual progress of network expansion, centralization of the operation and maintenance, etc., introducing factors of the Productivity Improvement and referring to developed country histories.

(2) Staff Allocation

MT should allocate staff to the headquarters and Aimgs/Sums by each phase, based on the microscopic staff estimation and long term staff allocation plan.

(3) Improvement of Productivity

Improvement of productivity is made by introduction/implementation of several effective tools such as digitalisation, automatic calls, centralization, re-organisation, etc. It is important to seek and implement effective and practical tools.

(4) Human Resource Management

In order to manage human resources at present and in future, it is necessary to monitor:

- (a) Capability of staff (including career development program)
- (b) Work volume of divisions/departments/jobs
- (c) Service levels required (fault rate, etc.)
- (d) Required manpower for divisions/departments/jobs (microscopic estimate)

For this purpose, a computerized human resource management system (mainly database) should be introduced and maintained.

(5) Training

MT should implement the training policy and target as annual training plan, based on the basic policy of training and framework of training. The main recommendations are as follows:

- Introduction of CDP(Career Development Program)
- Introduction of regional training centres
- Enhancement of training programs and courses
- Increase of training facilities and instructors and cooperation with other institutions such as universities and schools

17.6 Organisation and Management of MT

17.6.1 Framework of Re-Organisation

Re-organisation framework for realization of the above organisational functions will be divided into 3 phases considering re-organisation timing, and re-organisation, structure and authority in each phase should be in accordance with business objectives and human resource development plan.

- (a) Phase-1:
 - Enhancement of Aimag/Sum level management
 - Skill-up of Aimag/Sum level staff
 - Decrease of Aimag/Sum level human resource
- (b) Phase-2:
 - Decrease of Aimag/Sum level human resource
 - Skill-up of Aimag/Sum level staff
 - Enhancement of customer oriented services
 - Delegation of Headquarters authorities to Aimag/Sum
- (c) Phase-3:
 - Enhancement of customer oriented services
 - Delegation of Headquarters authorities to Aimag/Sum
 - Introduction of integrated organisations of Aimag centres

17.6.2 Management

(1) Establishment of Management Framework

MT's management framework as policy, strategy and target should be as follows;

- (a) Phase-1:
 - To establish the detailed indicators and forms
 - To establish standards work flows
 - To make common database for management
 - To establish office communication system
- (b) Phase-2:
 - To introduce MIS(Management Information System)
 - To review management system
- (c) Phase-3:
 - To introduce MIS
 - To review management system

(2) Implementation of Management Framework

In order to implement the above framework, the followings are recommended:

- (a) Management strategy and Corporate culture
- (b) Detailed management indicators and forms
- (c) Standard work flows
- (d) Common database for management
- (e) Office communication system
- (f) MIS (Management Information System)

17.7 Technical Aspects

17.7.1 Telephone Numbering Plan and Switching Network

(1) Expansion of Numbering Capacity

Numbering capacity expansion may be required for probable new comers in the international communication operators and mobile/WLL operators.

(2) Replacement of Existing PBX Systems with Digital Switch

The existing Sum centre PBXs are mostly not capable for distant direct dialling (DDD) service. They should be replaced with new switching system equipped with DDD function and other functions usually given to urban switching system.

(3) Reuse of Removed Switching Equipment in Other Sum

The digital switching equipment removed in early stage under the Master Plan Project should be re-used at a Sum centre which is running with aged analogue switching equipment.

(4) Same Service Function as Urban Area Switch

The new switching system should be equipped with functions to offer services which are offered to those of urban switching system.

(5) Succeeding Existing Network Configuration

The switching network wherein the Sum centre exchanges are connected with Aimag centre exchange in star type should be kept as it is. Such network form is practical, because the Sum centres are sparsely located and traffic among them is not big enough to provide direct circuits.

(6) Operation and Maintenance Centre

An Operation and Maintenance Centre should be established at Aimag centre when the digital switching system is installed at Sum centres. The Operation and Maintenance Centre should be equipped with such functions as to monitor the running status, to collect traffic data, to control subscriber database of the switching system.

(7) Signalling System ITU-T CCS No. 7

ITU-T Common Channel Signalling System No. 7 should be adopted to the protocol of the inter-exchange circuits between Aimag centre switching system and the Sum centre switching systems to be installed hereinafter.

(8) Collection of Switching System Traffic Data

Traffic data of switching system should be collected from the technical point of view at Aimag centre and Sum centre. The traffic data have been collected, in the past, in number of calls and in paid minutes. Such data are useful to grasp the network contribution to finance, but not useful always for evaluate the switching quality. The traffic data of switching system from technical point of view could be used also to design the network in the future.

17.7.2 Optical Fibre Transmission Network**(1) Clear Demarcation of Transmission Network**

Transmission networks, especially backbone systems, of several operators will be mutually utilized for rural development in order to avoid duplicated investment, and in case that a operator leases other operator's system and set up circuits/paths, rules of cost burden, demarcation of assets and O/M responsibility must be worked out. However, as it is not clear at present, immediate actions should be taken.

(2) Centralized Monitoring and Control System

An Operation and Maintenance Centre should be established at Aimag centre for the digital transmission system between Aimag and Sum centres. The Operation and Maintenance Centre should be equipped with such functions as to monitor the running status and to control the system for unattended operation in Sums.

17.7.3 Radio Transmission System and Spectrum Management**(1) Joint Use of Existing Microwave Sites**

For digitisation of rural telecommunication system between aimag centre and sum centre the existing microwave relay station facilities should be jointly used to save the development cost

(2) Effective Use of HF Radio Transceiver Equipment Provided by ODA

For improvement of Bag communications service solutions of rural HF radio to PSTN interconnection should be used to make automatic dial up connection with the PSTN telephone subscribers from HF radio transceiver equipment

(3) Recommended Technology for Rural Telecommunications

In order to improve the quality of service satellite- based (VSAT) technology and the technology based on point to multipoint will be appropriate for Mongolia.

(4) Effective Usage of Radio Frequency Spectrum

For effective utilization plan of radio frequency centralized and computerized radio spectrum monitoring system should be installed.

17.7.4 Cable Network (Junction and Access Network)**(1) Cable Design in Sum**

Currently subscriber cables and DP (Distribution Point) reach almost only within Centre areas in Sums, and Ger area customers have to burden the extension cable

charge. In order to develop rural telecommunications, DP of cables should be designed to extend up to Ger area.

(2) Improvement of Cable Entrance Method

Outside cables of most of Sum Centres are entered into the offices MDF through wall holes without protection. This entrance method should be improved by taking measures of manhole style for big Sums and pole style with protection for small Sums

(3) Reuse of Existing Wooden Poles

The existing wooden poles for open wire might be re-used for optical fibre and subscriber cables in consideration of reduction of investment cost. Therefore at the time of designing, a detailed study of the existing such as strength for tension, durable period, etc. is needed.

17.7.5 Power Facilities

(1) Summary

Reliability and stability of power supply facilities play a vital role in operation of telecommunication network, as failure or malfunctioning of power supply facilities usually results in discontinuation of the telecommunication services. Current power supply situations in rural areas of Mongolia are of a low standard, leaving much room for improvement in power supply.

For the past few years, a large number of diesel generators have been installed in most of the Sums under grant aid of Japan to meet basic human needs, making contributions to raising living standards of the rural people. Many of such Sums, however, have suffered from a financial burden, and have been forced to restrict operation of the diesel generators to a limited number of hours during nighttime.

Power supply from diesel generators installed at the Sums is not up to expectations of telecom offices in terms of power supply, while power supply from diesel generators of the Aimags or from grids (Central, Western and Eastern Energy Systems) are comparatively reliable.

As power supply situations at the telecommunication facilities at the target Sums greatly vary, power supply plans for the Master Plan Study must be prepared for the Sums in consideration of availability of reliable power sources at each Sum. Information on the current power supply situations at nearly all of the telecom offices at the target Sums was made available from MTC. Based on the information, a short-term power supply plan up to 2008 and mid- and long-term power supply plans up to 2020 have been prepared.

As stated in its policy, PTA intends to positively promote utilization and introduction of photovoltaic (PV) systems as a prospective power supply source for rural telecommunication network. The PTA policy and accelerated installation of PV systems at telecom offices at the Sums have been taken into account in formulating power supply plans.

As a result of sizing of individual PV systems and calculation of generated energy by PV systems based on power consumption of switching facilities and transmission facilities, a total capacity of PV systems is obtained at approximately 4,177kW with generated energy of approximately 11,395kWh/day.

(2) Recommendation

- a. Current reliability and stability of power supply from grids as well as from diesel generators at the Aimags shall be maintained even under an unfavourable scenario, or preferably shall be improved.
- b. Power supply from diesel generators at the Sums shall be greatly improved in terms of operational hours throughout the year so that any surplus electricity from the power generation can be utilized for power demand from the rural telecommunication network. This measure will benefit increase in load factor of the diesel generators, thus contributing saving for overall investment cost.
- c. Measurements of solar irradiation and wind speed shall be taken for the target Sums so that planning and design of PV systems or wind power systems can be practically made in consideration of renewable energy potentials at individual Sums.