

**MONGOLIA**  
**NATIONAL SUMMARY REPORT**  
**IDNDR**

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**SECTION A: PROFILE**

(This section contains relevant basic information about your country.  
Please complete and check the information already included.)

**1. Composition of National Committee (Focal Point):**

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(Please list the names of the institutions represented and indicate in the brackets the number of members for each group)

\* **Ministries [ ]**

- Ministry of Nature and Environment (15)
- Civil Defence Board (14)
- National Development Board (3)
- Ministry of Food and Agriculture (6)

\* **Academic & Research Institutions [ ]**

- Hydrometeorological Research Institute (43)
- Institute of Water Problems (6)
- Forestry and Wildlife Institute (5)
- Central Environmental Research Laboratory (21)
- Seismic Station (10)

\* **Non-Governmental Organizations [ ]**

- Mongolian Association for Conservation of Nature and Environment (15)
- Mongolian Green Movement (10)

- \* **Media [ ]**
  - Mongolian Radio (3)
  - Mongolian TV (3)
  - Newspaper (8)
- \* **Private Sectors [ ]**
- \* **Insurance [ ]**
  - Mongol Daatgal (24)
- \* **Public Services (e.g. meteorological, etc) [ ]**
  - Hydrometeorological service (1500)
  - Forest and Plant service (5)
  - Water management service (3)
- \* **Others [ ]**

## 2. Internal organization of the National Committee

(Please describe hierarchy, responsibilities, coordination and cooperation mechanisms in natural disaster reduction activities.)

- The Department of Science, Monitoring and International Cooperation of the Ministry of Nature and Environment is the National Focal Point of Mongolia for the IDNDR.
- The national focal point for IDNDR has its Council which includes 20 members representing the above mentioned organizations.
- There is State Permanent Emergency Commission responsible for planning, management and coordination of both natural hazards and man-made disaster reduction activities in Mongolia.

## 3. Prevailing hazards

Type	Location	Affected Population
Snow storm	entire territory, specially eastern part of the country	1-16 deaths in average every year
Wind storm	entire territory, specially in Gobi & steppe areas	1-5 deaths in average every year
Wildfire	central and eastern provinces	3-18 deaths in average every year
Heavy snow	entire territory except Gobi provinces	12 deaths in 1993
Flood	central and western provinces	220 deaths since 1966

(Please attach additional information if necessary)

#### 4. Recent natural disasters

Type	Location	Affected Population	Losses
Heavy snow 1993	Zabhan, Gobi-Altai Bayanhongor provinces	12 deaths	850000 livestock
Wildfire 1993	Dornod, Sukhbaatar	8 deaths	3753000 livestock, 54000 ha, forest
Flood 1993	Central part of country	9 deaths	large number of bridges and roads
Snow storm 1993	Arhangaik Uburhangai Bulgan Selenge provinces	17 deaths	100000 of livestock

#### 5. National socio-economic conditions

- 
- \* Population: 2.25 million
  - \* Gross-National Product (GNP): 247.5 million US\$
  - \* Per-Capita Income: 110 US\$

#### 6. Availability of assistance to other countries in the field of natural disaster reduction.

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(Please list potential resources, scientific expertise, technology, etc.)

- \* Expert and/or advisor dispatch in case of snow storm, heavy snow, flood.

#### 7. International assistance required for natural disaster reduction

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(Please indicate requirements for scientific expertise, technology, resources etc.)

- \* Establishment of natural disaster monitoring network and data management system with required technical and financial assistance;
- \* Natural disaster reduction technology transfer;
- \* Financial assistance, when a natural disaster occurred;
- \* Technical means to fight wildfire;

- \* Measures to combat drought and desertification;
- \* Natural disaster risk assessment;
- \* Education and Training.

## SECTION B: STRATEGIES AND ACTIVITIES

(This section deals with current or planned strategies and activities)

### 1. Steps towards achieving the 3 main Decade targets

**(a) Comprehensive national assessments of risks from natural hazards, with these assessments taken into account in development plans;**

**(a) Comprehensive national assessments of risks from natural hazards, with these assessments taken into account in development plans.**

- Classified and identified natural disasters in Mongolia are as follows:

- \* Severe storms (blizzards & dust storm);
- \* Heavy snow, Zud, Cold rain, Cyclone way;
- \* Flood;
- \* Earthquake;
- \* Wildfire;
- \* Drought and Desertification;
- \* Ecological and Industrial disasters;
- \* Radiation.

- Research studies have been carried out on the following:

- \* Spreadness, frequency and intensity of severe storm, blizzard and dust storm;
- \* Meteorological condition for heavy snow fall, frequency and regime of zud;
- \* Flood regime, spreadness, intensity and frequency;
- \* Earthquake occurrence, intensity, spreadness and mapping;
- \* Wildfire frequency & spreadness, and meteorological & natural conditions for wildfire occurrence;
- \* Drought frequency, intensity & spreadness, and mapping;
- \* Desert area and desertification intensity;
- \* Vulnerability assessment of natural hazards.

- Planned studies are as follows:

- \* Further identification and detailed classification of prevailing natural hazards in Mongolia;
- \* Detailed study on frequency, spreadness & intensity of each type of natural disaster and mapping;
- \* Damage assessment for each type of natural disaster;
- \* Detailed vulnerability assessment of natural hazards;
- \* Integration of natural hazard assessment in economic policy-making.

**(b) Mitigation plans at national and/or local levels, involving long-term prevention and preparedness and community awareness;**

Activities conducted:

- Legislative
- \* Approval of guidelines, including duties and responsibilities of State Permanent Emergency Commission;
- \* Government resolution on natural disaster prevention measures and its implementation;
- \* Preparation of new Land law draft and its submission to the Parliament;
- \* Preparation of drafts of Laws to protect water and forest;
- Institutional and others:
- \* Preparation of decentralization policy for economic development and human settlement;
- \* "Zamyn-Uud" railway junction extension project;
- \* "Trans-Asian Highway through Mongolia" project;
- \* Master plan on telecommunication development upto 2010;
- \* Reconstruction of flood protection dam in Ulaanbatar;
- \* Scheduled civil defence training.

Economic failure in transition period is the main obstacle to combat natural disaster.

**(c) Ready access to global, regional, national and local warning systems and broad dissemination of warnings.**

There is warning and alarm system operating during 24 hours to warn people about any type of natural disaster. However, equipments or facilities are very out-dated.

Cities and centres of provinces have their own civil defence warning and alarm system. People living in countryside can only be warned through radio and TV set. However, due to scarce population density, there is no opportunity to warn everybody using radio, TV and other means.

It is highly desirable to have access to regional and global warning system.

## **2. Present national plan for natural disaster reduction**

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**a) Time span covered:**

National plan for Natural Disaster Reduction 1992-2002.

**b) Agencies, institutions and organizations involved:**

- \* State Permanent Emergency Commission.

**c) Implementing agencies:**

Ministry of Nature and Environment  
Civil Defence Board  
Academy of Sciences

**d) Funds available for implementation:**

Government budget  
International financial institutions & donors.

**3. Legislation introduced and enacted in relation to natural disaster reduction**

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\* In 1990, the government established State Permanent Emergency Commission by its resolution No. 276 and approved its rules.

In 1993, the Government adopted resolution on natural disaster prevention measures, and coordinated the duties and activities of central and local government agencies, and approved regime on the transmission of meteorological warning.

**4. Disaster mitigation activities completed or underway:**

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**a) Identification of hazard zones: hazard assessment**

**Title of project:**

Natural hazards (Frequency and spreadness of drought, heavy snow, earthquake, wind storm).

**Status:**

- Reference
- Map of hazard spreads

**Participating institutions in the country and/or on the international level:**

Ministry of Nature and Environment  
Academy of Sciences

**Costs of project:**

3500000 Tg (national currency)

**Sources of funding:**

Government budget

**Implementing agencies:**

- Hydrometeorological Research Institute;
- Mongolian National University;
- Institute of Geography and Geocryology;
- Seismic station.

**Address (telephone and fax-number) of the agency in charge:**

Khudaldaany gudamj-5, Ulaanbaatar 11, Mongolia  
Fax: 976 1 321 401  
Telex: 79343 MACNE MH

***b) Monitoring, prediction and warning***

**Title of project:**

Meteorological disaster (Forecasting methods of drought, heavy snow, win storm, dust storm and flood).

**Status:**

Development and application of forecasting method.

**Participating institutions in the country and/or on the international level:**

- Hydrometeorological Research Institute;
- Mongolian National University;
- Institute of Geography and Geocryology.

**Costs of project:**

2200000 Tg

**Sources of funding:**

Government budget

**Implementing agencies:**

- Hydrometeorological Research Institute;
- Mongolian National University;
- Institute of Geography and Geocryology.

**Address (telephone and fax-number) of the agency in charge:**

Khudaldaany gudamj-5, Ulaanbaatar 11, Mongolia  
Fax: 976 1 321 401  
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**c) *Short-term Protective measures and preparedness***

**Title of project:**

1. National Plan of Action to Combat Desertification in Mongolia, 1992-1994
2. Workshop on Natural Disaster Reduction Issues, Ulaanbaatar, 1993
3. Operational Natural Disaster Communication and Information Transmission System.

**Status:**

- Completion of elaborating National Plan of Action in 1994
- Preparation of workshop materials for publication.

**Participating institutions in the country and/or on the international level:**

State Emergency Commission

**Costs of project:**

1. 90000 US\$
2. 500000 Tg
3. 80000-90000 Tg (current expenditure per year)

**Sources of funding:**

UNEP funding for elaboration of National Plan of Action to Combat Desertification.  
Government funding for organizing the Workshop.

**Implementing agencies:**

Ministry of Nature and Environment  
Hydrometeorological Research Institute  
Corresponding local branches.

**Address (telephone and fax-number) of the agency in charge:**

Ministry of Nature and Environment, Khudaldaany gudamj 5, Ulaanbaatar 11, Mongolia  
Fax: 976 1 321 401  
Telex: 79343 MACNE MH  
Tel: 976 1 329 619

**d) *Long-term preventive measures***

**Title of project:**

Creation of natural disaster monitoring and prevention system.

**Status:**

Anticipated to be elaborated in 1994-1997.

**Participating institutions in the country and/or on the international level:**

Ministry of Nature and Environment  
An International Organization

**Costs of project:**

5000000 US\$

**Sources of funding:**

No donor.

**Implementing agencies:**

- Ministry of Nature and Environment
- Information and Computer Centre and other
- Research Institutes of the Ministry.

**Address (telephone and fax-number) of the agency in charge:**

Ministry of Nature and Environment, Khudaldaany gudamj 5, Ulaanbaatar 11, Mongolia  
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**e) *Land-use and risk management***

**Title of project:**

Land Law and New Management for Land.

**Status:**

New Land Law will be enacted in first quarter of 1994 and new land-use management will be introduced.

**Participating institutions in the country and/or on the international level:**

State Emergency Commission

**Costs of project:**

350000000 Tg

**Sources of funding:**

Government budget

**Implementing agencies:**

- Ministry of Nature and Environment
- Ministry of Food and Agriculture;
- Civil Defence Board.

**Address (telephone and fax-number) of the agency in charge:**

Ministry of Nature and Environment, Khudaldaany gudamj 5, Ulaanbaatar 11, Mongolia  
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**f) *Public education and information***

**Title of project:**

TV-Radio Education Programme on the theme of "Warning and Prevention of Natural Disasters".

**Status:**

So far, the project is in planning stage and is expected to be commenced in 1994.

**Participating institutions in the country and/or on the international level:**

State Emergency Commission

**Costs of project:**

6000000 Tg

**Sources of funding:**

Government budget

**Implementing agencies:**

- Ministry of Nature and Environment;
- Civil Defence Board;
- TV and Radio companies.

**Address (telephone and fax-number) of the agency in charge:**

Ministry of Nature and Environment, Khudaldaany gudamj 5, Ulaanbaatar 11, Mongolia  
Fax: 976 1 321 401  
Telex: 79343 MACNE MH  
Tel: 976 1 329 619

## 5. Plans to fully achieve Decade targets by the end of 1999

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(As in 4 above, for each area of activity [i.e., hazard zoning/assessment, monitoring, preparedness, etc] please indicate as applicable, the project title, the participating institutions in the country and/or on the international level, the costs of projects, the sources of funding and the implementing agencies.)

- Review National Plan of Action for Natural Disaster Reduction, and look for more financial sources;
- More actively participate in international cooperation organized within the Decade;
- Conduct detailed Hazard and Vulnerability assessment of natural disaster, and prepare projects for bilateral and multilateral aid programme;
- Conduct training and educational activities on natural disaster-related issues among people.

## SECTION C: INTERACTIONS

(This section focuses on international involvement in the IDNDR.)

### 1. Publications on IDNDR-related subjects:

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(E.g. manuals, brochures, bulletins and other publications of relevance to IDNDR. Please mention title, author/institution, place and year of publication)

- \* National Plan of Action to Combat Desertification in Mongolia, December 1992 (publication in 1994).

### 2. IDNDR meetings and conferences held or planned:

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(Please indicate, date, location, organizing agency, national and international participation.)

- \* UNEP/WMO/Ministry of Nature and Environment Workshop on "Degradation of Arid, Semi-Arid Ecosystem under Critical Environmental Conditions, Ulaanbaatar-Dalanzadgad, 24 August-6 September 1992;
- \* National Seminar on "Preventive measures for natural disasters" Ulaanbaatar, Ministry of Nature and Environment, National Focal Point for IDNDR, 1994 (planned, no donor);
- \* International Scientific Seminar on "Natural Disaster Monitoring, Prediction and Warning" Ulaanbaatar, Ministry of Nature and Environment, National Focal Point for IDNDR, 199 (planned, no donor).

### 3. Current or planned partnerships and cooperation related to IDNDR with other countries

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(Please indicate Governments, National Committees, Institutions or Organizations involved.)

- \* Joint Mongolia-Japan project on "Integrated system for Natural Disaster Observation & Environmental Information" Mongolia (planned 1995)
- \* UNEP/Mongolia Workshop on "Specific Condition on Gobi Arid & Desert Areas of Central Asia & Way of their improvement" Ulaanbaatar (planned 1995)
- \* UNEP/UNDP/WMO/Mongolia project on "Natural Disaster Monitoring and Information System" (planned 1997-1998).

## SECTION D: EVALUATION

(This section analyses national progress and outlines possible improvement.)

### 1. Overall evaluation of national disaster mitigation programmes including, but not limited to, those initiated after IDNDR and achievements up to now

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(Please elaborate on whether the targets set by the National Committee, if any, the national disaster mitigation plans or other IDNDR activities have been met. If not, please indicate reasons.)

National Focal Point for IDNDR cannot represent or express the Government Policy on Natural Disaster Reduction.

However, National Focal Point has the influence on the Government policy or activities only through State Permanent Emergency Commission.

### 2. Review of the IDNDR

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(Critique of the Decade to date and suggestions for improvement/modifications in the second half.)

It is suggested:

- to create Worldwide Convention on Natural Disaster Reduction;
- to prepare regional strategy to combat natural disaster;
- to establish regional training centres dealing with natural disaster reduction issues or problems;
- to increase the roles of UN organizations and programmes such as WMO, UNDP, UNEP, etc. in building national capacity to reduce natural disaster;
- to request biggest banks, funds and foundations assist disaster-prone developing and least developed countries to deal with natural disaster.

IDNDR Mid-Term Review and  
the 1994 World Conference on Natural Disaster  
Reduction

DETAILED NATIONAL REPORT: MONGOLIA

December 1993

The Government of Mongolia

This report was prepared for the International Decade for Natural Disaster Reduction Mid-Term Review and the 1994 World Conference on Natural Disaster Reduction by Dr.Ts.Adyasuren, Director, Science, Monitoring and International Cooperation Department ( Focal Point for IDNDR ), Ministry of Nature and Environment of Mongolia and Mr.B.Ganbaatar, Senior officer of the same Department, in collaboration with Dr.Z.Batjargal, Minister for Nature and Environment and Dr.L.Natsagdorj, Director, Hydrometeorological Research Institute.



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## DETAILED NATIONAL REPORT

Title: National Report of MONGOLIA  
Prepared for the IDNDR Mid-Term Review and the 1994  
World Conference on Natural Disaster Reduction

Chapter: 1. OVERVIEW AND EXECUTIVE SUMMARY

### Introduction

Mongolia is a landlocked country located in great distances from the world's oceans i.e. 1600 km from Pacific in the east; 5000 km from Mediterranean sea in the west; and 3000 km from the Arctic ocean in the North. The climate of Mongolia is harsh. Historical climatological data strongly suggest that the Mongolian climate is gradually growing drier. Separated from the moderating influences of the oceans, Mongolia experiences great extremes in temperature; wide temperature fluctuations in both diurnal and annual temperatures are common.

Mongolia is a mountainous country, consisting of mountains, hummocks and high denudation plains. Mountains (1 500-3 000 m) occupy more than 40 per cent of Mongolia's total territory, hummocks (1 000-1 500 m) 40 per cent, and the rest by denudation plains. ( Figure 1 ).

Mongolia is one of the most sparsely populated countries in the world and one of the countries with the youngest age structure of the population. The average annual population growth rate is 2.7 per cent.

Mongolia is taking first steps towards greater diversification of its external trade with free market economies and the establishment of market-oriented economic systems. The country is experiencing economic failure and other difficulties during the transition period.

Mongolia is frequently exposed to different types of natural disaster, such as snow and dust storm, drought, zud, flood, wildfire, heavy snow, plant diseases, and etc.

Most natural disasters occurred in Mongolia often cause the loss of life and property damages equal to tens of millions USD, and severely affect the agricultural sector, specially livestock breeding, the basic economic sector of the country. The Government of Mongolia is continuing to draw the attention to natural disaster reduction-related issues as before, although the country is in deep economic crisis.

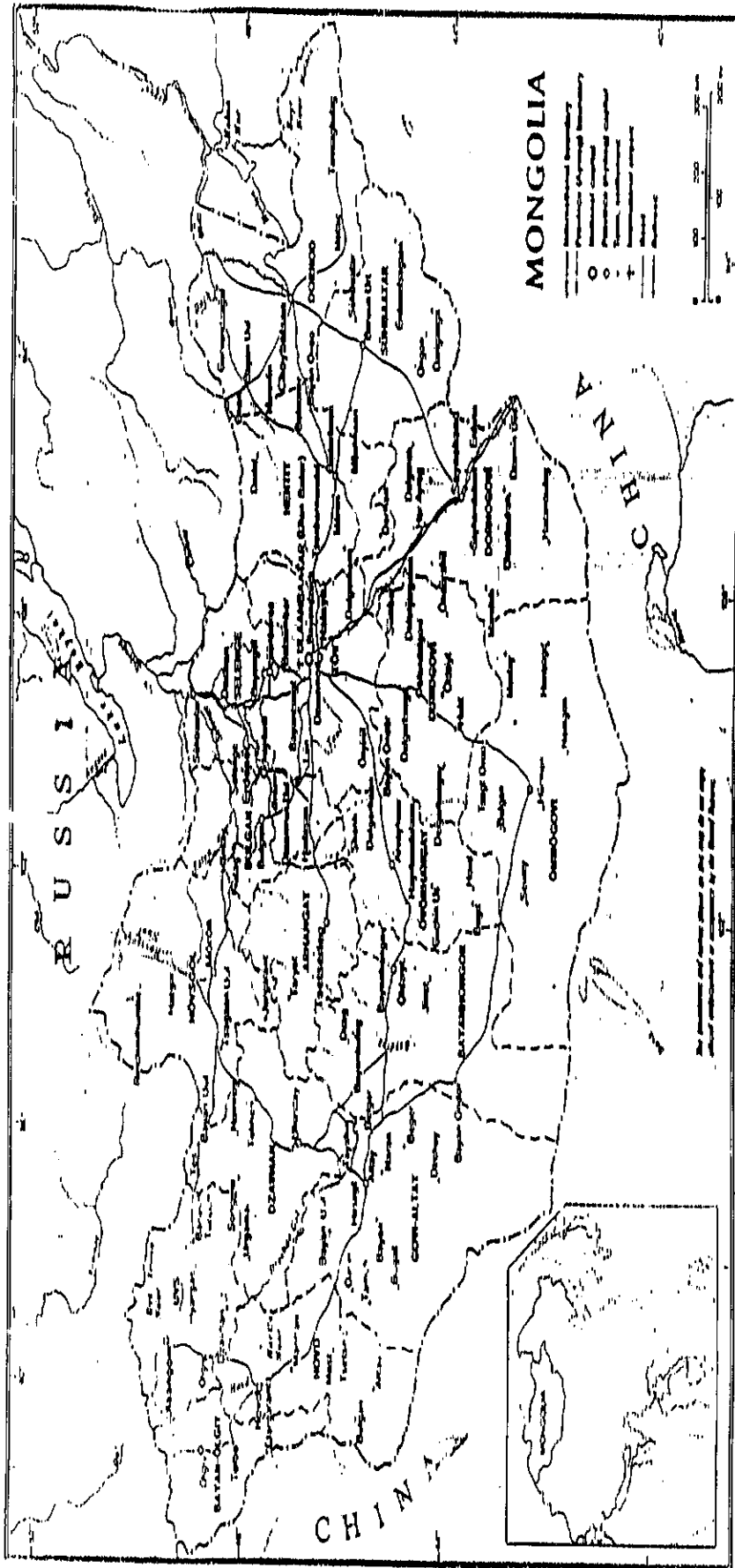


Fig.1 The territory of Mongolia

## II. RISK ASSESSMENT

### A. Hazard assessment

Mongolia is a country where the following natural disasters occur frequently: meteorological such as blizzard; heavy snow; dust storm; "zud" ; rain water flood; dibaish flow; snow melt flow, and others such as earthquake; wildfire; drought; and desertification; etc.

Natural disasters occurred in Mongolia are presented in Table 1.

Table 1. Types of natural hazards in Mongolia

Major hazards	Minor hazards
Blizzard	Lightning
Heavy snow	Locust infestations
Dust storm	Plague
Zud	Epidemic disease
Flood ( three types)	Ecological hazards
Earthquake	Industrial hazards
Wildfire	Toxic chemical
Drought	Radiation
Desertification	Accident ( road/air )

Those hazards can occur practically in any part of Mongolia in different frequency, and cause the loss of life and property damage.

The frequency of relative intensity of prevailing hazards is presented in Table 2. which shows that the occurrence of blizzard, dust storm and heavy snow with severe and moderate intensity is from 38.9 upto 50.6 percent. Rain, snow melt and dibaish floods take the occurrence every year, and specially the last mentioned (80.0% of intensity) can often bring to critical situation. Wildfire is one of the most frequent natural hazards in Mongolia.

In Mongolia, detailed studies including mapping and zonation of natural hazards have not been carried out until now. However, we can look at some hazard assessment carried out at more macro level.

"Zud" - severe winter with heavy snow and lowest air temperature and strong wind all combined together.  
( name in Mongolian )

Table 2. Frequency of Relative Intensity of Disaster Risk

Disaster	Intensity, per cent		
	severe	moderate	low
1. Blizzard ( snow storm)	12.7	26.2	61.1
2. Heavy snow	18.5	29.7	51.8
3. Dust storm	24.2	26.4	49.4
4. Zud	3.8	13.4	19.2
5. Rain water river flood	10.9	34.8	54.3
6. Dibaish flood	80.0	15.0	10.0
7. Snow melt flood	8.0	28.0	64.0
8. Earthquake	-	-	-
9. Wildfire	-	-	-
10. Drought & desertification	6.0-7.0	22.7	20.7

#### 1. Blizzard

Blizzard takes place in Mongolia usually between September and May. Duration of blizzard occurrence fluctuates from 0.3 day to 9.7 day. Mean annual number of blizzard occurrence in its geographical distribution is shown in Figure 2.

Blizzard mapping is rather difficult task, because its geographical distribution is highly dependable on cyclone shift, relief of territory, and on a number of characteristics of snow cover (e.g. density, depth, duration) and of wind (direction speed, etc.). Mapping is practically impossible for mountainous areas.

Severe blizzards occurred recently:

- Heavy snow fall (20-60 cm of depth) taken place in central part of Mongolia during 5-7 May 1993 was combined with strong wind (24-34 m/sec.) As a result 17 people were killed, and 100 000 livestock lost.

- The same event, strong wind combined with snow fall, hit central and eastern part of Mongolia during 25-27 September 1993, killing 11 people and several thousands of livestock. About 20 percent of crop (potato) was lost.

- Snow fall taken a place in central and western part of Mongolia during 18-22 October 1992 was reached about 1 metre in depth at some places and combined with strong wind (18-24 m/sec), killing 4 people and 500 000 livestock.

- During 18-22 January 1988, a blizzard swept across Dornod, Hentii, Sukhbaatar and Dornogobi provinces, killing 6 people and 10 000 livestock, and causing substantial damage to property.

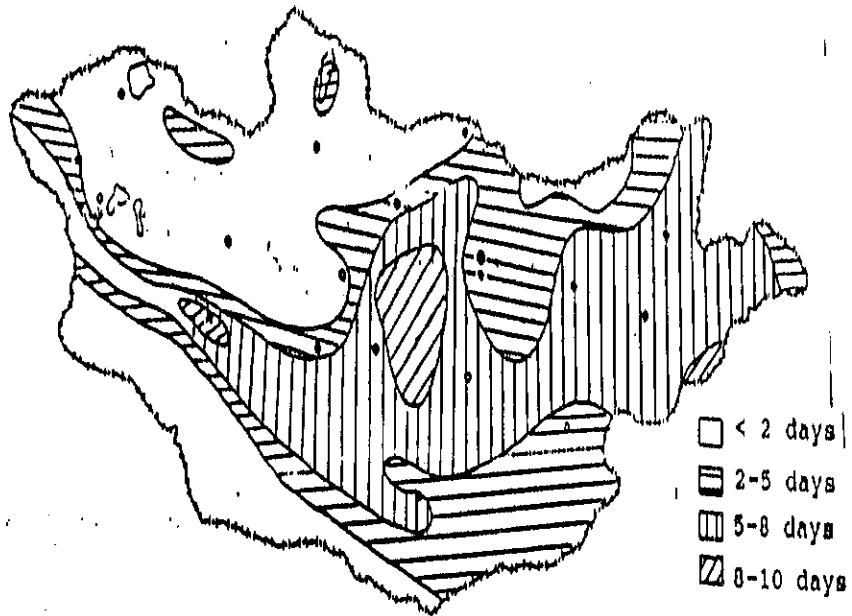


Fig.2. Geographic distribution for number of days with blizzards

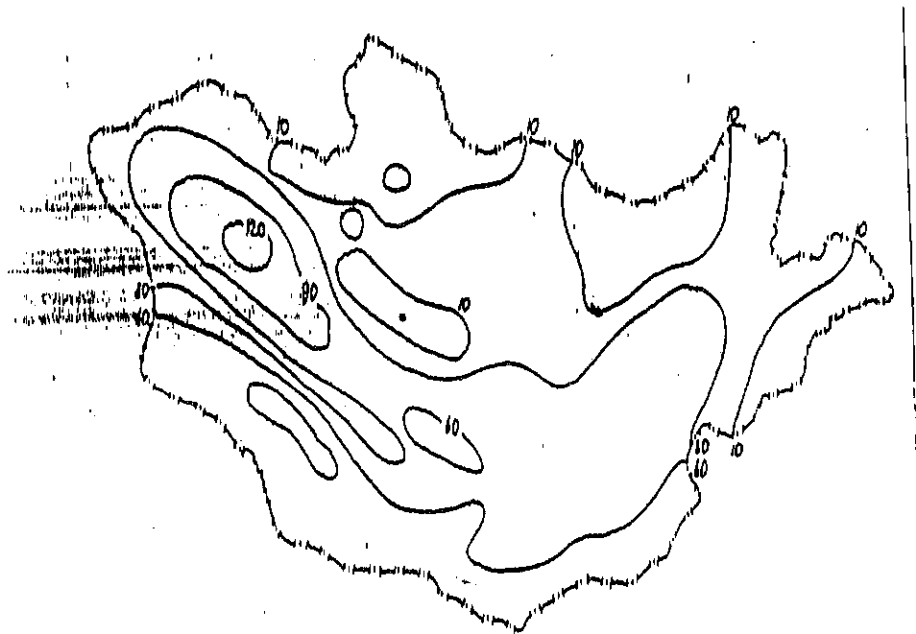


Fig.3. Number of days with dust and sand storms

# of days

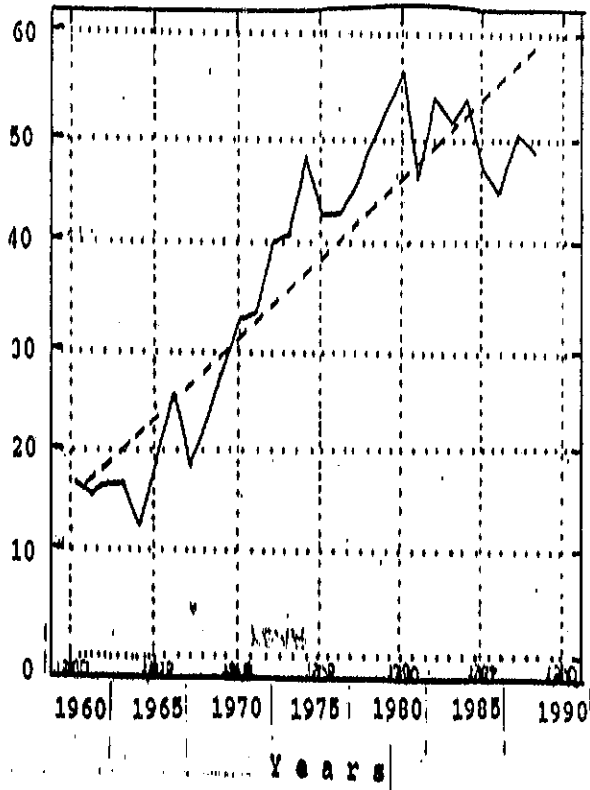


Fig.4. Frequency of days with dust storms

## 2. Heavy snow

In winter, the territory of Mongolia is almost completely covered by snow. Snow depth exceeding 3 cm. aggravates livestock breeding and causes damage to the economy of the country.

For heavy snow in Mongolia, the frequency of intensity is as follows: severe-18.5%, moderate-29.7, low-51.8%. This shows that heavy snow is quite prevailing hazard in Mongolia. Depth of heavy snow often reaches 140-150 cm. in Uvs nuur depression, 65-80 cm. in the Gobi region and 100-120 cm. in other areas.

Recent heavy snow hazards:

- A violent heavy snow fell in March of 1993 in Bayanhongor, Gobi-Altai and Uburhangai provinces, reaching 34-90 cm. in depth severely affected the population and livestock. More than 850 000 livestock were lost and the property equal to 1.7 billion Tg. (Tugrik-national currency) was damaged.

- Another heavy snow (70-80 cm. in depth) hit the central part of the country during 12-13 May 1992, and caused the loss of several thousands of livestock.

## 3. Dust storm

Most of soil degradation cases in Mongolia are induced by human activities such as overgrazing and overexploitation which consequently increase sand and dust storm frequency.

Sand or dust storm is mostly observed in the Gobi Desert region, particularly in the Great Lakes Valley as much as 71 to 125 times, in the Southeast Gobi 70 to 98 times, and around the Arts Bogd Mountain 80 times per year ( Figure 3.)

Figure 4 demonstrates that the number of days with dust storm is increasing decade by decade. A tendency in the increasing number of days with dust storm is one of the factors for desertification. The intensity of dust storm is high.

The increasing number of days with dust storm means that the cause to the economy is also increased.

Recent dust storms:

- A dust storm (speed- 40 m/sec.) hit Dornogobi province on June 2, 1992, killing 7 people and about 800 livestock. 197 gers (national house) were destroyed and the economy of the province was largely damaged.

- Another dust storm swept across the territories of 12 provinces from 27 to 30 November 1991 and caused great damage to the economy of the country. This storm destroyed 558 gers, 370 fences, 108 wood houses, 1500 square metres of glasses, and many others. The damage was estimated at 3.8 million Tg.



#### 4. Zud

The livestock is a basic sector of Mongolian economy.

Zud is a mongolian term and it happens when grazing livestock is lost through unaccessibility to pasture affected by heavy snow in very cold and high speed windy climate condition.

Snow in Mongolia usually falls from the end of October through November, and from the end of March to first half of April.

Zud occurs, when snow fall frequency is high, duration is long and volume is large. Snow fall duration is fluctuated from one day to 2-5 days, and sometimes, even more than 10 days.

The frequency of zud occurrence for last three centuries is presented in Table 3 which shows that the frequency of zud occurrence increases.

Table 3. Zud Frequency

Disaster	Centuries		
	XVII	XVIII	XIX
"Big" zuds	15	31	41

In 20th century, violent zuds happened in 1901, 1935, 1944-1945, 1949-1950, 1953-1954, 1956-1957, 1963-1964, 1966-1967, 1967-1968, 1987-1988 and 1992-1993, covering more than 50 % of the territory of Mongolia in each case.

Livestock, the basic economic sector of Mongolia, is severely affected by zud. For example, in 1944-1945 zud 8 000 000 heads of livestock ( 32 % of total ) and in 1967-1968 2 000 000 heads of livestock were lost.

#### 5. Flood

In Mongolia, there are three types of flood depending on geographycal relief and natural seasons. Those are:

- rain water flood;
- snow melt flood;
- dibaish flow.

Rain water flood and snow melt flood have 34-45 per cent of severe and moderate intensity. Dibaish flow has 80 per cent of severe and 15 per cent of moderate intensity.

The regions exposeable to flood are shown in Figure 5. There is more probability for rain water and snow melt flood occurrence

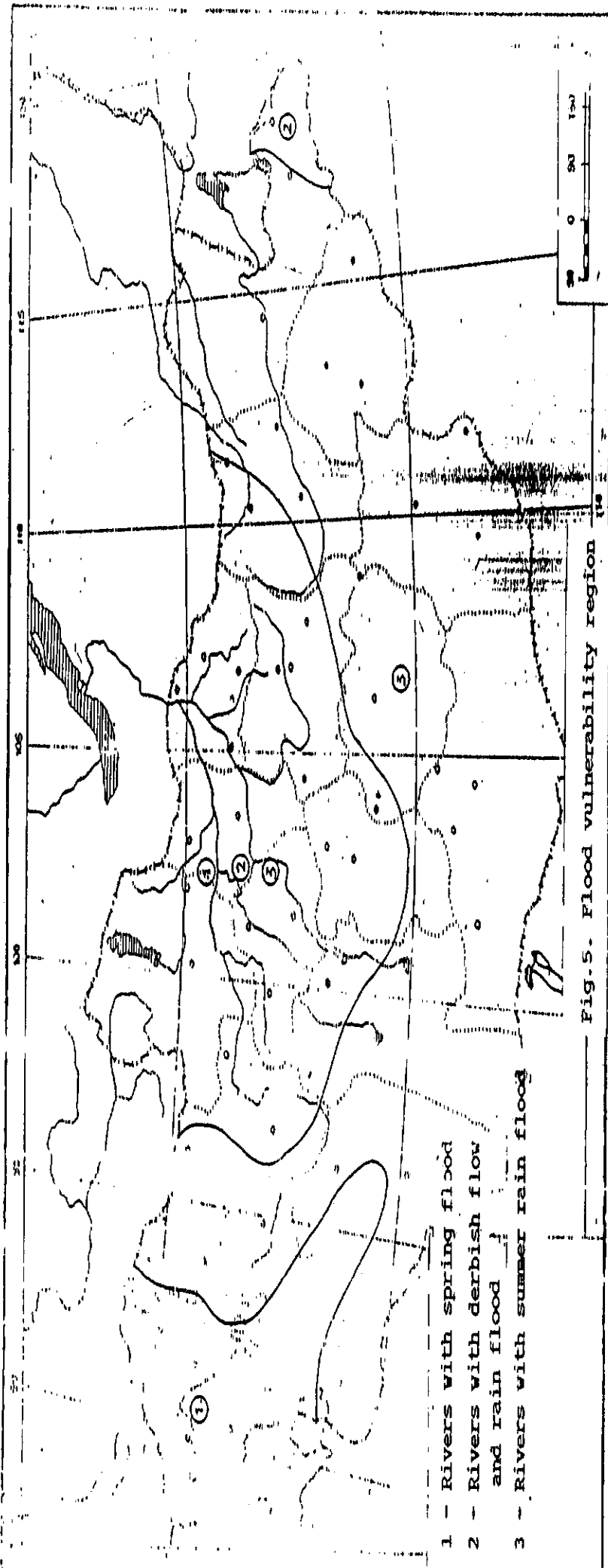


Fig.5. Flood vulnerability region

- 1 - Rivers with spring flood
- 2 - Rivers with derbish flow and rain flood
- 3 - Rivers with summer rain flood

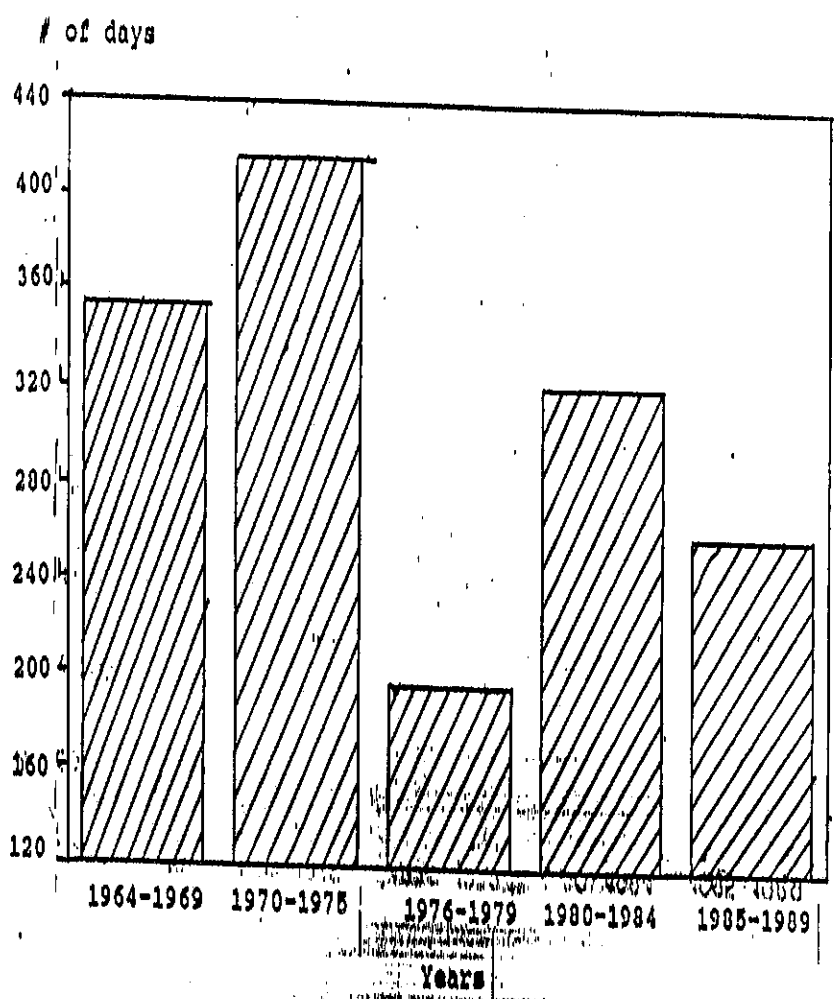


Fig. 6. Number of earthquakes

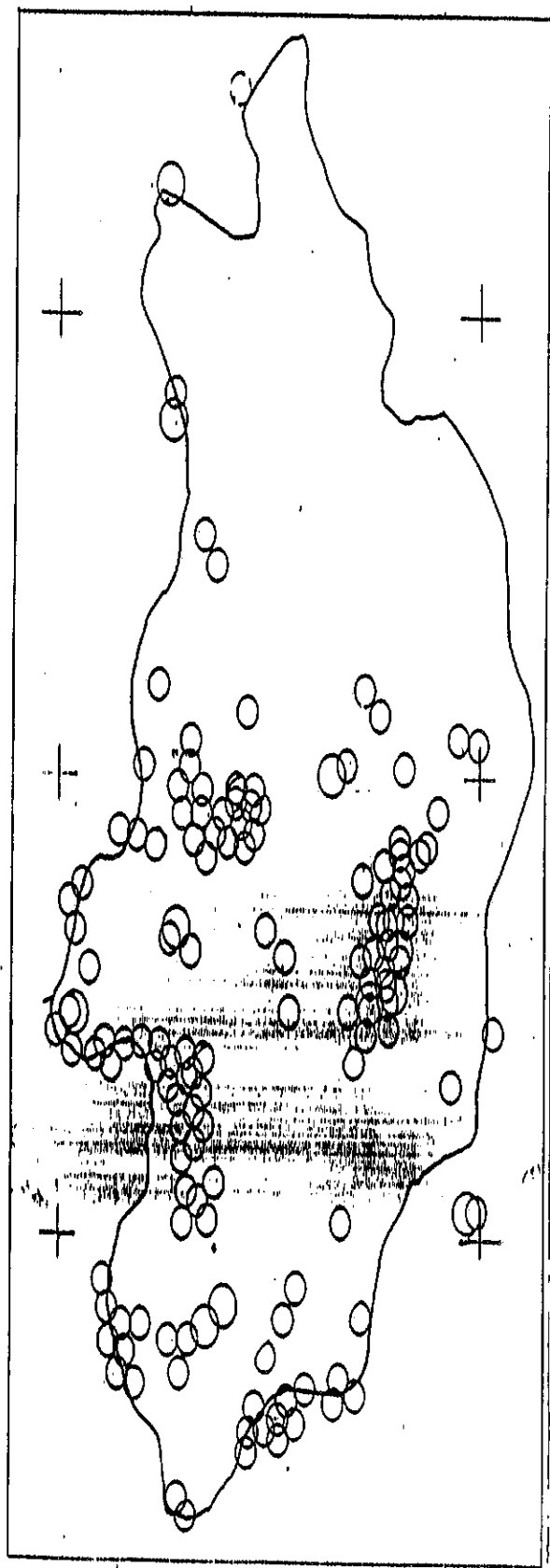


Fig. 7. Epicenters of Mongolian earthquakes

in Hangai, Hentii and Huvsgul mountain, and in valleys between them. Heavy rain fall floods were created in the above regions in 1993, 1986, 1972, 1967, 1966, 1940, 1938, 1936, etc. and snow melt floods in 1984, 1977, 1975, 1973, 1969, 1966, 1961.

A rain water flood of 1966 in Ulaanbaatar increased Tuul river level by 3.12 metre and caused damage to the property (7 500 000 USD). More than 100 people killed by this flood. Another flood in 1983 killed 12 people and caused about 1 100 000 USD damage to the economy of the country.

The frequency for rain water flood occurrence is 5-6, 10-12, 24-26, 36-40 years and for snow melt flood 4-6, 9-11, 22-26, 40-50 years.

There is also an increased probability for dibaish flow occurrence in Altai and Hangai mountain regions. But data on caused damages are not available due to scarcity of big settlements and low population density in that region. However, a dibaish flow taken place at the capital city in 1982 killed 22 people and 0.5 million USD damage to the economy.

#### 6. Earthquake

With four earthquakes assigned magnitudes of 8 or greater, Mongolia has been one of the most seismically active intracontinental regions of the world. In past 20 years more than 40 earthquakes have been observed in our country. The frequency of a number of earthquakes is shown in Figure 6 and location of their epicenters in Figure 7.

The Figures show that most of earthquakes occur in Altai, Gobi-Altai, Hangai, Huvsgul and Bulnai mountains.

Range and intensity of substantial earthquakes are shown in Figures 8 & 9. Information on major earthquakes were collected by modern measuring equipments and during the paleontological investigations.

Earthquakes mostly cause damage to road, transportation, settlements and industry sectors. Data on major earthquakes are presented in Table 4.

#### 7. Wildfire

Forest/grassland fire is one of the prevailing hazards in Mongolia. Totally 1065 forest fires were occurred in the past 15 years, destroying 3 million ha. of forest which is about 20 per cent of total forest in Mongolia. It is estimated that about 224.9 thousands ha. of forest completely lost their ability to grow.

Forest/grassland fire is mostly caused by man or natural phenomena in spring and autumn dry seasons. 55.6 per cent of entire territory of Mongolia are categorized as more vulnerable to forest/grassland fire.

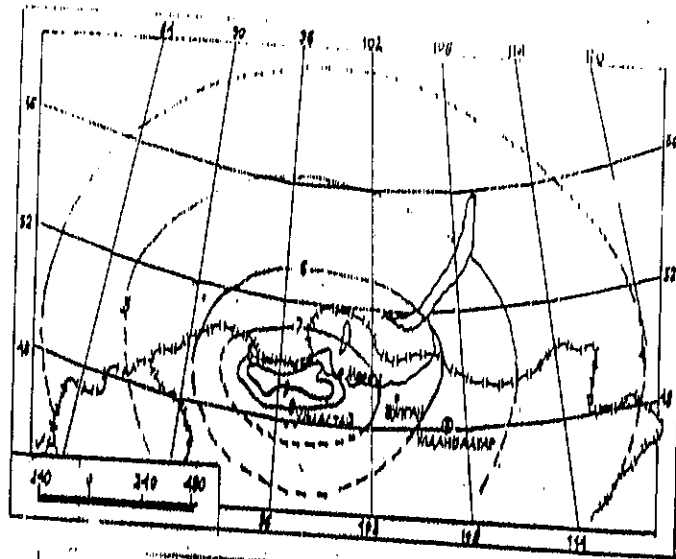


Fig. 8. Distribution of earthquake intensity in Khangai mountain

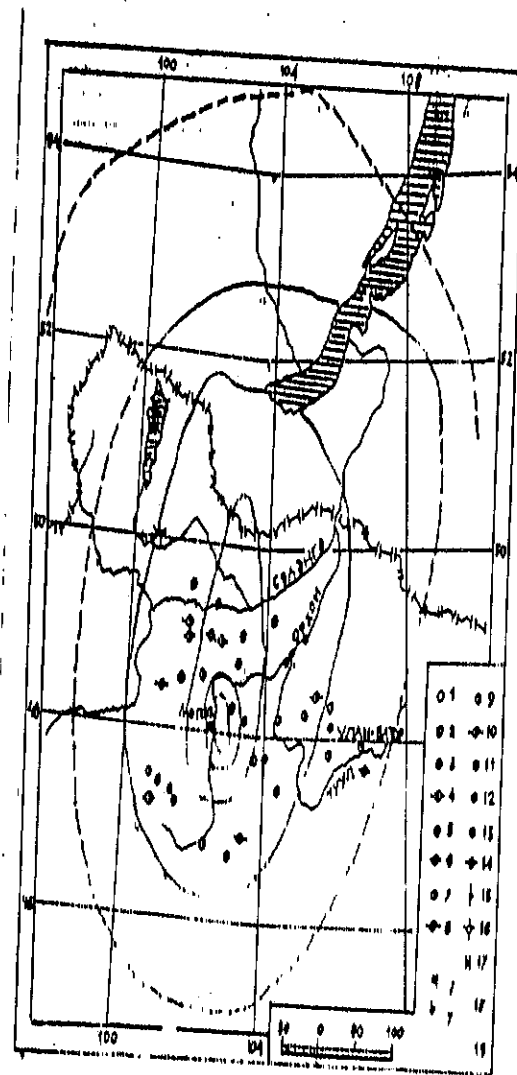


Fig. 9. Distribution of earthquake intensity in Mogod region

Table 4, Major Earthquakes

Name of place where earthquake occurred	Age of paleo-seismogenic structure, & year of Earth-quake	magnitude (Richter scale)	Intensity of earthquakes in epicenter
1. Bugsei gol	1500-2000	(6.8)	(9)
2. Chihtei	1000-1500	7.1	9-10
3. Myangai	1000-1500	7.7	10-11
4. Chandmani	500 -1000	7.3	9-10
5. Bulgan	500 -1000	(7.4)	(10)
6. Bij	500 -1000	7.3	9-10
7. Bugsei gol	500 -1000	(7.0)	(9)
8. Jara gol	500 -1000	(7.0)	(9)
9. Malchin	300 -500	(6.6)	(8.9)
10. Zunnuur	300 -500	7.8	10-11
11. Egiindavaa	300 -500	7.8	10-11
12. Sagsai	200 -300	7.4	10
13. Ar-hutel	200 -300	8.0	11
14. Unegt	1903	7.5	10
15. Tsetsrleg	1905	7.6	10
16. Bulnai	1905	8.2	11
17. Ashani	1931	8.0	11
18. Mondin	1950	7.0	9
19. Gobi-Altai	1957	8.1	11-12
20. Bayan-Tsagaan	1958	6.9	9
21. Burynhyar	1960	6.7	9
22. Mogod	1967	7.8	10-11
23. Uragnuur	1970	7.0	9
24. Tahiinshar	1974	6.9	9

Source: S. Baljinnnyam, S.D. Khilko, Monhoo & others  
Earthquakes and Basis of the seismic zoning of Mongolia

Forest vulnerability to fire is given in Table 5 in which it is seen that 98.5 per cent of forest fire belong to I and II category of vulnerability.

In Mongolia, approximately 50-60 forest fires and 80-100 grassland fires occur every year in average, and they destroy more than 70 thousands ha. of forest and 700-800 thousands ha. of grassland.

In the first half of 1993, 470 fires killed 33 people and burnt 31 gers, 5000 heads of livestock, 76 fences, 200 telegraph-poles, 2 wells and about 85 per cent of pastureland in Erdenetsagaan, Halhgol and Sumber villages of Suhbaatar province.

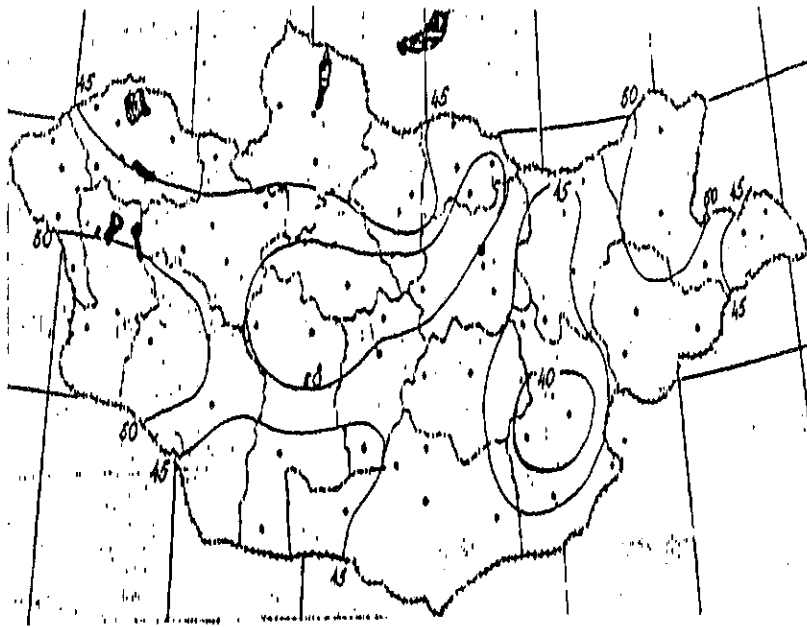
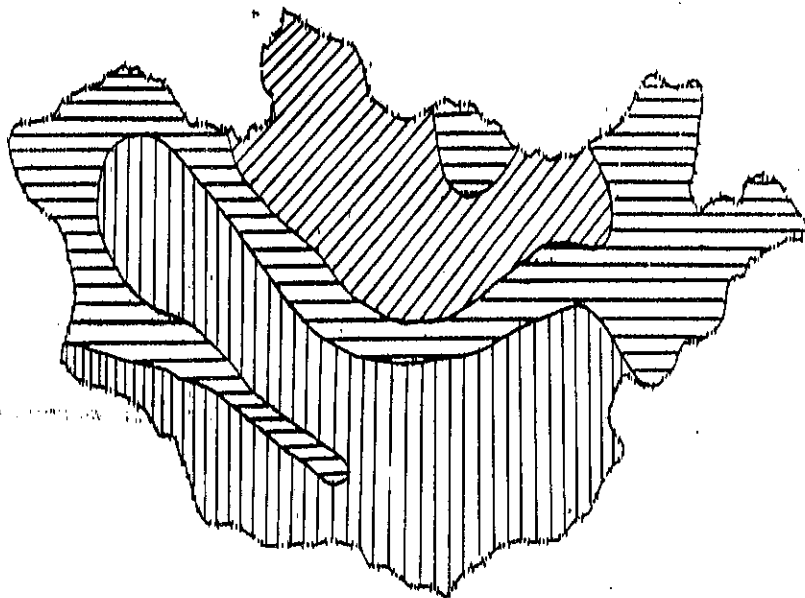


Fig.10. Mean average for number of days with drought (Apr-Sept)






-  severe drought (one time per 2-3 year)
-  moderate drought (one time per 4.4-5.3 year)
-  slight drought (one time per 6-8 year)

Fig.11 Drought vulnerability region



Table 5. Classification of forest by vulnerability to fire.

No :	Provinces, cities	: Category of forest vulnerability to fire				
		: I	: II	: III	: IV	: V
1.	Bayan-Ulgii	100				
2.	Uvs	100				
3.	Hovd	100				
4.	Zavhan	94.2	5.2		0.3	
5.	Huvsgul	89.2	10.8			
6.	Bulgan	80.6	19.4			
7.	Selenga	60.0	39.0	1.0		
8.	Zuunharaa	47.8	52.0	0.1		0.1
9.	Ulaanbaatar	50.3	40.2	6.9	2.3	0.3
10.	Tov	55.3	40.0	4.7		
11.	Hentii	87.0	13.0			
12.	Bayan-Uul	47.0	52.5	0.5		
13.	Uburhangai	95.0	5.0			

#### 8. Drought and Desertification

Being located in dry land areas, Mongolia is one of the drought prone places in the world. Number of days with drought is mapped and presented in Figure 10. It is seen that central and south provinces of Mongolia are most often exposed by drought. Areas exposeable to drought are shown in Figure 11.

Drought frequency in south Mongolia and steppe zone is 2.0-3.1 years and 4.4-5.3 years respectively. Figure 12 shows how the drought frequency calculated by drought index is changed year by year. There is a increasing tendency in drought frequency.

Drought covering more than half of entire territory of Mongolia has occurred in 1991, 1989, 1988, 1986, 1980, 1972, 1968, 1959, 1951, 1946, 1944, 1941 and many years in the back. Drought taking a place in more than half of the territory of Mongolia kills 300-400 thousands livestock and reduces vegetable growth almost by half.

Drought affects not only socio-economic sphere of the country, but accelerates desertification process.

Figure 13 shows the assessment of status of land degradation in arid zone. About 41.3 per cent ( of which 19.5 per cent-Gobi, & 21.8 per cent-Desert area ) of entire territory of Mongolia are occupied by Gobi and Desert area. Degraded land in Mongolia can be divided into the following three groups: 1) degraded rangeland and deserted land; 2) degraded cultivated land, 3) deforested land.

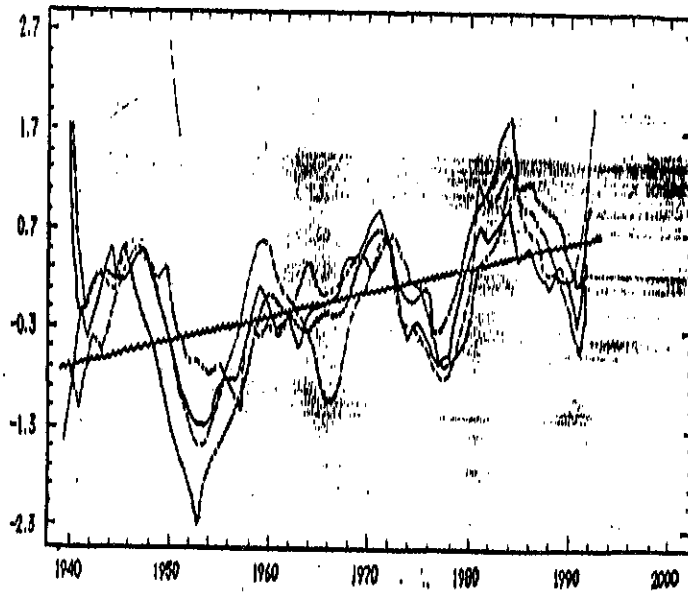
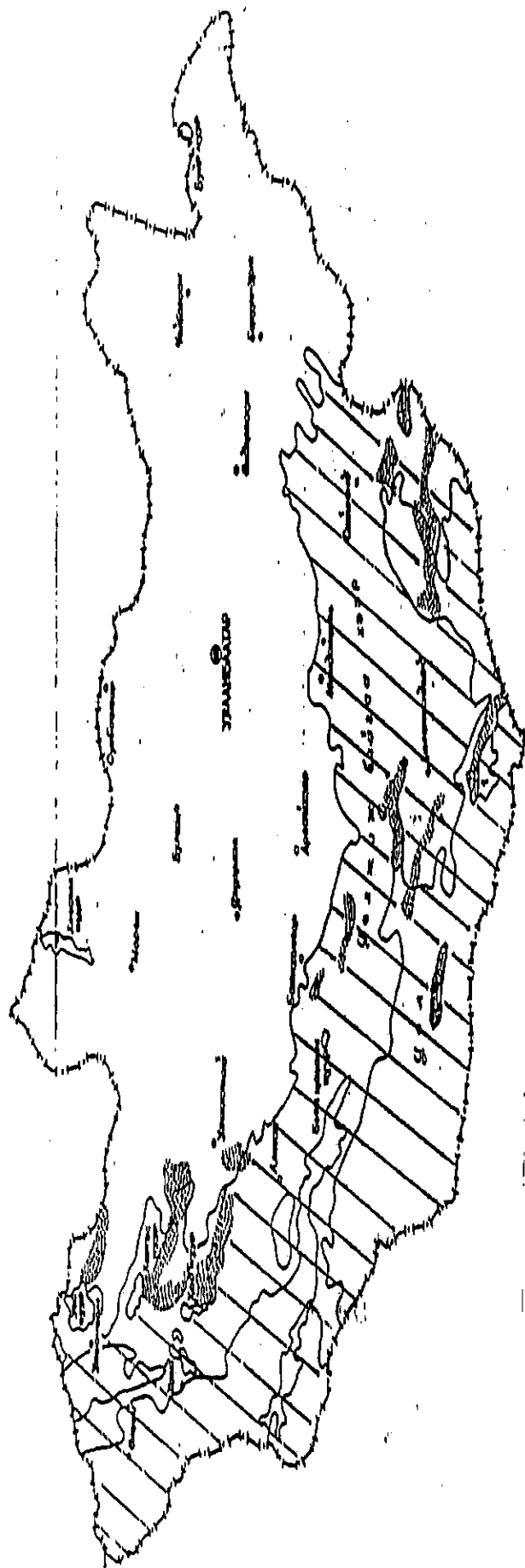






Fig.12. The drought index of Mongolia



-  The area of nonaffected by desertification
-  The area under desertification
-  Sandy area
-  The area with active sand movement

Scale 1:10 000 000

Fig.13. Land degradation in Mongolia

1) Degraded rangeland and deserted land. There is a difference between pasture yields in north and south parts of the country. This difference is increasing year by year, and currently the pasture yield in north is 3.18 times more than in south. This shows that desertification is in increasing tendency ( Table 7).

Table 7. Desertification extent in Mongolia

	Slight	Moderate	Severe	Very Severe	Total thousand sq. km.
Rangeland	76%	20%	3%	1%	1.222.2

Table 8 presents statistics regarding areas occupied by sand since 1941.

Table 8. Area occupied by sand ( thousand ha.)

Year	1941	1950	1960	1970	1980	1990
Area	4332.0	4339.6	4347.2	4354.8	4362.4	4370.0

As of 1990, this sand areas have been increased by 38 thousands ha. over the 1941 area.

Considering the convert to desert, an estimated 160 thousand ha have undergone some degree of desertification, exhibiting a loss of vegetation, an increase in sand cover, and development of sand dunes. Baidrag, Tui, Taats and Ongi river flows were decreased by 25-33 per cent and more than 80 tributaries to the above rivers were disappeared. This was the reason of five lakes drying up in Gobi area. Table 9 presents the number of depleted tributaries and disappeared lakes.

Table 9. Depleted tributaries of rivers (A)  
and Lakes disappeared (B).

	A	:	B
River	: Tributaries : depleted	:	: Lakes : disappeared : Water area : lost
Baidrag	44		Ongyn Ulaan 175
Taats	25		Orog 140
Ongiin & Tuin	15		Tsagaan shal 33.1 Adgiin tsagaan 11.5 Taatsyn tsagaan 9.9

The decline of water resources in arid area of Mongolia has negatively affected the vegetation cover. Thus the vegetation cover's productivity has fallen down, the vegetation cover itself has diminished and the plant species have diminished in number.

Totally more than 1 million ha. of pasture land were degraded, and as of 1990 the pasture yield has decreased 1.8-2.0 times as compared to 1960.

Degraded cultivated land. The total area of cultivated land in Mongolia was increased ten times during the last 30 years and now it is 1.36 million ha.

Table 10 presents main result of research studies conducted in 1991 in 1.204.4 thousand ha. of crop land area. (90% of total).

Table 10. Degradation of cultivated land

	Total	Slight %	Moderate %	Severe %
Cultivated land (thousand ha.)	1204.4	58.9	28.2	12.6

Thus, the crop land area is being degraded and its productivity is being lost. The organic matter ( humus ) in degraded crop land has decreased by 29.3-48.7 per cent.

It is estimated that during the last 30 years 889 tons of soil were lost from every ha. of degraded cultivated land and 1.889 tons of soil from every ha. of severely degraded cultivated land. More than 90% of crop land have been eroded by wind and water.

As a result of degradation, about 110 thousands ha. of cultivated land have been excluded from the crop land rotation.

Deforestation. Approximately 8 per cent of entire territory of Mongolia is covered by forest.

About 10 000-14 000 ha. of forest are harvested annually for the industrial purpose where as only 5 000 ha. are reforested. This results in a net loss of forest which is further increased by frequent forest fires and other calamities such as insects (Table 11).

Table 11. Deforestation Indicators

Indicators :	unit :	years					
		1886	1987	1988	1989	1990	1991
Timber harvested by industry	thous. cubic metre	2.181	1.919	1.800	1.790	1.350	892.7
	thous. ha.	13.2	11.5	10.8	10.7	8.1	5.3
Forest fire	thous. ha.	28.6	143.3	2.3	17.4	648.8	-
Insects	thous. ha.	39.5	32.0	42.9	47.8	50.4	-

## B. Vulnerability assessment

### 1. Natural conditions

Mongolia has 1 564 118 square km. territory which is divided into five natural zones: mountain taiga, forest steppe, steppe, gobi and desert.

The south boundary of world's permafrost and north boundary of world's desert area cross the territory of Mongolia.

Climate is the over-riding element of Mongolian agriculture. It is characterised by very low temperatures and low and erratic rainfall. Winters are long and cold with an average of seven months with mean daily temperatures below zero. The average annual temperature fluctuates between -5.3 deg.C and + 4.0 deg.C. In the mountainous northern and north-western parts it is below zero while in the south and south-east it is below zero. The lowest recorded temperature is -53 deg.C and the highest is +41 deg.C.

While absolute temperatures are the obvious indicators of the climatic difficulties for agriculture in Mongolia, the real limit to production is the low levels of incident energy. Despite 260 days of sunshine, total heat units above 10 deg.C rarely exceed 2000 and in some districts are less than 1000. With limited incident energy and relatively low rainfall the effective growing period is short, generally from 80 to 100 days though it can vary from 70 to 990 days to 100 to 130 days depending on altitude and location.

Climatic stress, particularly unseasonal frost, can cause harvest losses of between 10 and 30 per cent of crops. Climatic stress can also cause significant loss of quality, particularly in cereal and vegetable crops. Low temperatures are the major cause of livestock deaths in the winter and spring due to a shortage of fodder and poor condition of animals.

Wind speeds in excess of 5 metres per second can cause significant moisture loss and erosion. Spring is a particularly windy season which can cause significant erosion when cultivating seed-beds and planting crops. Strip cropping at right angles to the prevailing wind is widely practiced as an erosion control measure.

The average annual precipitation is 100 to 400 mm. Rainfall distribution differs greatly depending on the natural zone and on the season, though in a general sense rainfall declines from north to south across the whole country.

The main rain period for most areas starts in mid-June, though in the Gobi it does not start until July. This means that plant growth is very slow until well into the warmer period which is another restraint on productivity. Some 86 to 96 per cent of precipitation falls in the warm season which continues from April

until October with 66 to 78 per cent falling in July and August alone.

The national soil survey records 34 soil types in Mongolia. The principal soil type is dry-steppe chestnut soil which covers some 40 per cent of national area. Other major soil types are brown desert-steppe and grey brown desert soils. A maximum area of 1.7 million ha ( 1.1 per cent of total area) is considered to be suitable for arable use, compared to the 1.3 million ha. currently used.

The combination of altitude, rainfall distribution and soil type has produced six definable vegetation zones or natural regions in Mongolia. These are alpine tundra, mountain taiga, mountain steppe and forest, steppe, desert steppe and desert. The principal agricultural areas are the mountain steppe and forest, steppe and desert steppe.

## 2. Social condition

As of end 1992, the population of the country was estimated at 2.3 million. The average annual population growth rate is 2.7 per cent and such a high growth rates are expected to continue up to the year 2000. Mongolia is one of the countries with the youngest age structure of the population.

In 1992 the number of people under 15-year age bracket was 42.0 per cent of the entire population.

The most densely populated areas in the countryside are river valleys of the forest-steppe zones, and the least populous are the semi-desert zones and the mountainous taiga regions. More people live in the northern part of the country. The capital city Ulaanbaatar is the most densely populated region in the country with 580 000 people.

At present, the rural and urban populations account for 43 and 57 per cent, respectively.

Dynamism of population growth is given in Table 12.

Table 12. Urban and Rural Population  
( in thousands )

year	Total : population	Urban : population	Rural : population
1956	845.5	183.0	662.5
1969	1.197.6	527.4	670.2
1979	1.595.0	817.0	778.8
1989	2.043.4	1.165.9	877.5
1990	2.100.0	1.211.9	888.1



The Gross National Product of Mongolia is being reduced year by year (since 1990). Data on GNP for last several years are given in Table 13. The reduction in GNP is related to the transition of centrally planned economy into market one.

Table 13. Gross National Product  
( in million )

1985	1986	1987	1988	1989	1990	1991
8155.3	8052.1	8350.7	9012.8	9544.4	9295.3	17459.8 *

\* High rate of inflation.

Per capita income is 110 USD only. It means that Mongolia is in the category of least developed countries.

With the deterioration of the poverty situation in the social sector ( the old poor and the emergency of the new poor ), it appears that Mongolia's poverty problems re reaching a critical point.

The main economic index shows that national income dropped by 14 per cent every year since 1990 and now is only equivalent to the 1983 level. The purchasing ability of the population dropped by 42-61 per cent during the same period of time, whereas for the first 7 months of 1993 that indicator went down by 42 per cent. A major portion of the drop belongs to the purchase of staple food and main necessity items. As a result the daily caloric intake is only 1600 - 1750 cal.per day. Population growth has been adversely affected by abortion which was increased almost two times.

Unemployment and crime rates are increasing due to economic decline particularly, in the cities. The number of registered unemployed increased by 8 100 compared with the beginning of 1993.( Table 14.)

Table 14. Unemployment Rate  
( in thousand )

1987	1988	1989	1990	1991	1992	1993
21.4	28.9	30.0	45.7	55.4	54.0	62.0

Today the total registered unemployment stands at 62 000. In 1993 about 510 000 people or 23.2 % of total population are living below the government established poverty line, as compared to 250 000 people in 1990. About 87 800 people or 4 % of the population are living in extremely poor and desperate conditions.

### 3. Economic condition.

Mongolia's basic economic sector is agriculture and a dominant subsector in agriculture is livestock breeding. Mongolia has about 25 million heads of livestock of which 78 per cent are small livestock ( sheep and goats ). Total area used for agriculture production is estimated to be 118 million ha. or 76 per cent of national land area. The greater part of this area is used for extensive grazing.

There could be 55 710 400 heads of livestock in 1990, if total livestock numbers would be expressed in sheep units. It means 47 heads of sheep are in 1 square km. In some areas, this condition affects the carrying capacity of pasture and causes land degradation.

On the other hand, insufficient natural pasture yield is the second negative factor which causes damage to normal livestock breeding. Natural pasture yield by province is given in Table 15.

Table 15. Natural Pasture Yield.

Name of province	Nature Pasture (thousand ha.)	Annual average yield per ha. (100 kg)
Arhanqai	4483.5	3.9
Bayan-Ulgii	4171.4	2.6
Bayanhongor	8724.5	2.2
Bulgan	2953.5	4.3
Gobi-Altai	8901.3	2.5
Dornogobi	10190.1	1.8
Dornod	9052.6	3.5
Dundgobi	7400.4	2.9
Zavhan	6844.2	3.3
Uburhangai	5983.1	3.1
Umnugobi	14673.2	1.4
Suhbaatar	6727.8	3.8
Selenga	1786.4	4.8
Tuv	6027.8	3.8
Uvs	5666.9	2.1
Hovd	5960.9	1.7
Huvsgul	5927.2	4.0
Hentii	6083.1	4.7
Darhan	178.9	5.1
Ulaanbaatar	74.8	2.9
Erdenet	53.0	5.8
TOTAL	121864.4	Mean 2.8

Table 16 presents data on the loss of livestock for past several years in Mongolia.

Table 16. Numbers of livestock lost

(in thousand)

year:	1985	1986	1987	1988	1989	1990	1991	1992
loss:	642.2	818.6	806.5	941.0	510.3	673.2	871.0	978.8

It is estimated that different types of natural disaster have caused 51-93 per cent of livestock loss.

Mongolia has 1.3 million ha. of crop land area. Agricultural production is a high risk activity. Climatic stress imposes severe potential limits on productivity and in an erratic and unpredictable manner. As a consequence, the rational approach to resource allocation in agriculture is not so much to maximise productivity or income, but rather to minimise the penalties from risky outcomes.

It is observed that due to greenhouse effect and severe soil erosion, the crop yield going to be reduced year by year (Table 17).

Table 17. Crop Records  
( 000'tons)

Year	Cereal	Wheat	Potatoes	Veget.
1988	814.4	672.2	97.9	51.2
1989	839.0	686.7	148.0	54.9
1990	721.5	598.9	129.2	35.4
1991	596.2	539.1	95.1	46.2
1992	493.8	450.0	76.9	14.6
1993	491.4	n.a.	54.7	11.1

Damage to the country's economy by natural disaster depends on the type and intensity of disasters and on their proneness.

Table 18 presents general view of disaster-prone areas with regard to economic vulnerability. Economic vulnerability for some types of disaster is given below.

#### Blizzard

Blizzard is one of the meteorological hazards and can occur anywhere, particularly in steppe area within the territory of Mongolia. Blizzard-prone area includes the territories of Dornod, Suhbaatar, Dornogobi, Umnugobi, Tuv, Dundgobi, Uburhangai and Bayanhongor provinces which have 20 per cent of population and 25 per cent of livestock. Blizzard occurs 5-20 times every year, killing about 20 people, and causing property damage equal to about 200 million Tg ( e.g. in 1991-1993, more than 40 people were killed by blizzard ). Measures taken against blizzard have no success, so far.

Table 18. Disaster proneness and economic vulnerability

Province	Population: :(thousand)	Livestock : thous.head:	Economy :	Type of disaster
Arhangai	92.0	1504.0	livestock wheat	blizzard, heavy snow, zud, drought, flood, wildfire, earthquake
Bayan-Ulgii	101.0	1159.9	livestock	blizzard, heavy snow, wildfire, dust storm
Bayanhongor	81.0	1674.5	livestock wheat	blizzard, heavy snow, zud, dust storm, flood drought, earthquake, desertification
Bulgan	57.0	1021.2	livestock wheat	blizzard, heavy snow, zud, flood, wildfire, earthquake
Gobi-Altai	68.0	1696.6	livestock	blizzard, heavy snow, zud, drought, dust storm, earthquake, desertification
Dornogobi	48.3	890.9	livestock	blizzard, dust storm, desertification, drought, heavy snow, zud
Dornod	86.9	888.9	livestock	blizzard, drought, flood, wildfire, zud, heavy snow
Dundgobi	53.0	1571.1	livestock	blizzard, dust storm, drought, desertific. zud, heavy snow
Zavhan	95.9	2079.9	livestock	blizzard, wildfire, flood, heavy snow, zud, earthquake
Uburhangai	104.8	2022.3	livestock wheat	drought, blizzard, heavy snow, zud, flood
Umnugobi	44.9	927.9	livestock	drought, desertific. blizzard, zud, heavy snow, flood

( continued )

Province	Population: :(thousand)	Livestock : :thous.head:	Economy :	Type of : disaster
Suhbaatar	55.6	1035.8	livestock corn.	drought,blizzard, heavy snow,dust storm,wildfire
Selenga	84.3	500.0	livestock wheat	blizzard,flood, heavy snow,zud, drought,wildfire
Tuv	107.8	1653.5	livestock	blizzard,flood,zud, heavy snow,drought, wildfire
Uvs	91.6	1585.3	livestock	earthquake,blizzard zud,heavy snow,wild- fire
Hovd	83.4	1636.6	livestock	earthquake,blizzard zud,heavy snow,flood wildfire,dust storm
Huvsgul	110.9	1788.2	livestock wheat	earthquake,flood,zud blizzard,wildfire, heavy snow
Hentii	75.0	1380.4	livestock	zud,heavy snow,flood blizzard,wildfire
Ulaanbaatar	579.0		energy leather cashimer	blizzard,earthquake, flood,dust storm, heavy snow,radiation toxic chemical, industriail hazards, ecological hazards, fire, accident
Darhan	88.4		skin wheat energy	blizzard,flood,heavy toxic chemical,fire, industriail hazard, ecological hazard
Erdenet	57.1		copper energy	blizzard,heavy snow, fire, industriail & ecological hazards, toxic chemical, radiation

### Heavy snow

Heavy snow mostly falls in mountainous and steppe areas of Mongolia, covering territories of 16 provinces which have 95 per cent of population and 85 per cent of livestock. Heavy snow cuts down the access of livestock to pasture and as a result many animals are remained without fodder and died. For example, heaviest snow occurred in Bayanhongor, Gobi-Altai and Uburhangai provinces in March of 1993 killed 12 people and 850 000 heads of livestock, and caused property damage equal to about 1.7 milliard Tg. Means to mitigate affects of natural hazards are limited in Mongolia.

### Dust storm

Dust storm is one of the most prevailing natural hazards in Mongolia. The frequency of dust storm occurrence in half of the entire territory with speed of more than 40 m/sec. is 5-30 days and in the Gobi 10-30 days. During the past 30 years, the number of days with dust storm has been increased 3 times.

There are about 25 per cent of population and 45 per cent of livestock in dust storm-prone region. Dust storm causes damage to livestock breeding facilities, and kills small animals such as sheep and goats.

It is estimated that dust storm occurring in a place with 1 km width during 100-600 hours takes away some 5-10 thousands tons of soil.

### Zud

The frequency of zud occurrence in Mongolia is 1-2 years and it takes place partly in the territory. More than 60 per cent of entire population and 90 per cent of livestock are exposed to zud. Zud is categorized into 6 types depending on the features and causes of damage to property. Table 19 presents the categories.

Zud causes a lot of damages to property and affects social and economic sphere of the country during many centuries past. If zud occurs in combined manner, the damage is much more increased. Many efforts to reduce zud's affectness were unsuccessful.

### Flood

Mongolia is frequently exposed to flood. Flood is divided into three categories: rain water flood, snow melt water flood and dibaish flow.

In Mongolia, most of settlements are located in river valleys, so that they easily affected by flood. There is a number of cases that flood had affected many settlements, caused damage to property including houses, bridges, dams and roads, and killed a lot of people.

Table 19. Disaster Definition

- 
1. White Disaster: Snow depth
 

Area Class:	Forest Steppe	-10-15 cms.
	Steppe	- 8-10 cms.
	Semi-Arid Steppe	- 5- 6 cms.
  
  2. Cold Disaster: 10 deg.C under normal average for area over continuous period.
 

Area Class:	Forest Steppe	> 10 days
	Steppe	> 7 days
	Semi-Arid Steppe	> 5 days
  
  3. Wind Disaster: > 10 m/sec in winter-spring season over continuous period ( chillfactor ).
 

Area Class:	Forest Steppe	> 5 days
	Steppe	> 4 days
	Semi-Arid Steppe	> 3 days
  
  4. Black Disaster: No snow ( and no water ), death from lack of water.
  
  5. Mixed Disaster: Combination effect.
  
  6. Ice Disaster: Late autumn rains or snow smelt forming ice layer on pasture making feed inaccessible.
- 

Zud causes a lot of damages to property and affects social and economic sphere of the country during many centuries past. If zud occurs in combination with other disaster, the damage is much more increased. Many efforts to reduce zud hazard were unsuccessful.

Approximately 800 000 people ( e.g., Ulaanbaatar-580 000, Darhan-88 000, and Erdenet-57 000, etc. ) live in settlements. Of this population, 26 per cent are 9 years old and below, and 3 per cent are 70 years old and above.

A number of snow melt water floods occur in mountainous areas every spring. This flood affects settlement areas, but mostly causes damage to soil quality and fertility, crop land, railway and roads.

Dibaish flow takes places at the end of summer in mountains without forest and sometimes leaves people and livestock dead, and property damaged. For example, dibaish flow occurred in Ulaanbaatar in August of 1992 killed more than 20 people and caused half million USD property damage.

The economy of the country loses 5-6 million USD from rain water flood, 0.7-1.0 million USD from snow melt water flood and 1-2 million USD from dibaish flow. Floods in 1991-1993 killed 62

people and damaged 85.8 million Tg property.

Flood protection measures are planned to be taken in more flood-prone areas.

### Earthquake

There are many cases with severe earthquake which has left a lot of people and livestock dead in the territory of Mongolia in its history.

Most violent earthquakes were observed in 1761, 1905, 1931, 1957, 1967, and 1974 with magnitudes of 8 or greater (Richter scale). 1957 earthquake hit one sum centre, killing more than 20 people and several thousands of animals, and destroyed houses and other facilities of living equal to 10 million Tg of that time. Very large components of reserve and left-lateral strike-slip faulting characterize a zone roughly 250 km long and more than 30 km wide.

About 80 per cent of entire territory of Mongolia belong to places with magnitude of 7 and greater (Richter scale). Since 1970 there were earthquakes with magnitude of 5 and greater.

### Wildfire

Approximately half of the territory of Mongolia can be exposed to wildfire. In the past 20 years, 2.9 million ha. of forest were exposed to wildfire. In average, 50-60 forest fires and 80-100 steppe fires occur every year in Mongolia and 60-70 thousands ha. of forest and 700-800 thousands of pasture are burnt. So that the average annual damage from wildfire is about 10.9 billion Tg. In 1991-1993, there were 337 wildfires that burnt 3 753 000 ha. of pasture.

More than 70 thousand ha. areas are affected by insects and locust infestations, annually.

### Drought and Desertification

About 40 per cent of total population and half of the livestock live in drought prone and desert areas. Drought covering more than 50 per cent of the territory of Mongolia kills approximately 300-400 thousands heads of livestock every year and 14-15 per cent of crop are lost. Country's livestock breeding farms loose 3-4 billions Tg. and crop land agriculture loses 2.9 billions Tg. every year due to drought occurrence. Unofficial statistics say that at the country level, the agriculture loses 6.7 billions Tg or 18.7 millions USD every year from drought. This is estimated as a direct damage to the agriculture. If indirect damage or loss is estimated, the total damage will be equal to about 10 billions Tg. or 20-30 millions USD. In the past decades, desertification has become more active.

Desertification has brought many damages to the environment, including pasture land degradation, loss of soil fertility, and reduction of crop growth. The total annual loss at country's level from desertification is estimated at several tens of thousands Tg. Unfortunately, desertification is affecting more



and more areas from year to year.

It is estimated that desert area with 1500-2000 km. in width is moving 500 m. away from south to north every year.

Sometimes, people have to move 200-300 km. away in order to avoid adverse affect from drought.

#### Facilities/Infrastructure

**Infrastructure.** Future mineral development in Mongolia will face substantial infrastructural difficulties. There is almost no transport infrastructure, except the rail line traversing the country from the former Soviet Union to China and small branch lines from that artery to existing mines. This is a major constraint for bulk commodities, including copper and coal. In addition, outside the GES grid, power supply is undeveloped. In the Gobi desert, where potential coal and copper operations have been identified, the development of railroad, power, and water supply would be a prerequisite for mineral operations.

**Trade Routes.** As a land-locked country, Mongolia has limited options for exporting its minerals. The traditional trade route goes north into Russia and then westward, via the Trans-Siberian rail line to the former Soviet republics and Europe. One option is the old route north and then east to the port at Vladivostok. However, this haul, over 4 000 km, would seriously damage the economics of most Mongolian mineral development opportunities. The alternative is south and east through China. Indeed, major developments in the Gobi desert would open up the opportunity to develop a new Chinese-gauge rail line south to connect to the World Bank-financed Inner Mongolia line being constructed to provide a coal route east.

**Transport.** Despite rapid industrial development, Mongolia's transport infrastructure remains seriously inadequate. This hinders the flow of factors of production and distribution, the availability of commodities, and the development of internal markets. The transport sector grew relatively rapidly during the 1980s, averaging about 5 per cent annually.

Mongolia has some 1 800 km of rail line and an additional 200 km of shunt-lines and side tracks.

Despite its large territory, Mongolia has only 42 000 km of main roads- an average 27 m per square km- of which only 1 300 km are paved and most in poor condition.

With a vast territory and low population densities that cannot justify high standard surface networks, long-distance passenger transport within Mongolia is mainly by air. In 1990, about 774 000 passengers were carried in average distance of 700 km. International air transport is less developed. There are direct links only with Irkutsk, Moskow, Beijing by MIAT, AEROFLOT, and CAAC.

Ulaanbaatar, the capital city, is the main generator of traffic, the corridor north to the Russian border is the most intensively used. Darhan, the second largest city, is about half way along this corridor, at the junction with a branch to the west that serves the third largest city, Erdenet. These three cities account for about 35 per cent of the population and most industrial activity.

Personal mobility by modern means is low. Many individuals in the countryside ride horses. Motorized road transport is also used. Total inter-city travel is under 1 000 km per person annually. Some 75 per cent of Mongolia's freight moves by rail. Almost half is domestic coal, most of it for the main power plants in Ulaanbaatar.

Telecommunication. Since the 1920s, Soviet aid has enabled Mongolia to establish a national postal and telecommunications network as well as a limited international communications network. The development of telecommunications reflects the characteristics of the spatial distribution of Mongolia's population and the vastness of the country. The urban areas have the basic infrastructure.

In spite of the difficulties posed by geography and a small population thinly scattered over 18 provinces, a large proportion of the population has access to telephone services. There are 4 lines per 100 people in 1990 for the country as a whole. The density is higher in cities: for instance, 6 lines per 100 persons in Ulaanbaatar ( 33 500 lines ), which accounts for one fourth of the population.

Mongolia has a motorized intercity mail delivery and a reasonably well-developed postal system.

There are 16 radio transmitters operating in VHF, short, medium and long wave ranges. Almost every family has a radio, an estimated 20 radios per 100 persons, 450 000 in all. There are 4 TV programs, three Mongolians and one from the former Soviet Union.

### Energy

Electricity, generated with domestically mined coal and imported diesel fuel, is the principal source of energy in Mongolia. It is also one of the major industrial subsectors, accounting for about 11 per cent of the total industrial value and employing about 16 000 people.

Mongolia's total installed generating capacity is 845 MW but dependable capacity is around 800 MW. Electricity is produced by two distinct systems. The Central Electricity System (CES) consists of five coal-fired thermal plants with capacity of 690 MW. CES is connected to the Russian grid by a 220 kV. line to Irkutsk. The CES covers 30 per cent of Mongolia's territory and supplies electricity to main cities and to six central aimags (provinces) where 50 per cent of the population live.

The other system, the decentralized electricity production and distribution system, is comprised of diesel-powered generators in 11 aimags with an installed capacity of 119 MW, and of a 36 MW coal-fired plant at Dornod. In 1990 this system generated about 400 MWh or 12 per cent of domestic production.

### III. MITIGATION ACTIVITIES.

#### The Institutional Framework

##### a) State Permanent Emergency Commission.

The Government of Mongolia is responsible for all activities (planning and implementation) related to prevention and mitigation of, and combat to, all types of natural disaster, and relief. In 1990, the Government of Mongolia established the State Permanent Emergency Commission (SPEC) by its resolution No.276 in order to introduce co-ordinated activities among the government agencies against any type of natural disaster. Measure to combat natural disasters are organized jointly or separately by Civil Defence Board, Ministry of Nature and Environment, Ministry of Defence, Ministry of Trade and Industry, Ministry of Health, Ministry of Food and Agriculture and others under the guidance of SPEC. The SPEC has the following functions:

- preparation of a National Disaster and Calamities Preparedness Plan;
- organization of disaster coordinating down to the ministerial and local governmental level;
- coordination of relief activities and taking measures to reduce consequences;
- organization of reconstruction or rehabilitation measures;
- disaster mitigation activities.

SPEC has its branch in each province and large cities. Since 1991 the activities of the branches are being coordinated under the Commission's Plan.

##### b) State Civil Defence Board

The State Civil Defence Board operates under SPEC in emergency, and has the following functions:

- duties of civil defence in peace-time;
- quick dissemination of information on natural disaster, warning and alarm operations.
- civil defence education and training;

- mobilization of all civil defence means and facilities when disaster occurs;

- Relief activities.'

#### Ministries

Ministries have duties or responsibilities in accordance with their functions to prevent, mitigate, relief, educate and build national capacity to combat natural hazards.

\* Ministry of Nature and Environment: natural disaster-related data collection and processing; forecasting and warning, dissemination of other operational information to public community.

\* Ministry of Construction: disaster-resistance measures; reconstruction or rehabilitation.

\* Ministry of Road, Transportation and Communication: disaster prevention and mitigation policy; warning and alarm system maintenance; and transport supply.

\* Ministry of Finance: financing reconstruction and relief measures.

\* Ministry of Fuel and Energy: fuel and energy supply in emergency.

\* Ministry of Food and Agriculture: food reserve to meet natural hazard.

\* Ministry of Health: medical equipment supply; organization of medical service and aid.

Focal Point for International Decade for Natural Disaster Reduction

Science, Monitoring and International Cooperation Department of the Ministry of Nature and Environment is the National Focal Point for International Decade for Natural Disaster Reduction.

The Focal Point has the following functions:

- comprehensive national assessment of risks from natural hazards;

- mitigation plans at national level, involving longterm prevention and preparedness and community awareness;

- ready access to global, regional, national, and local warning systems.

- international cooperation;

- policy and strategy for natural disaster reduction.

## Mitigation Practice and Management

### A) Non-Structural

Legislation. In 1990, the Government established State Permanent Emergency Commission by its resolution No.276 and approved its rules.

In 1993, the Government adopted resolution on natural disaster prevention measures, and coordinated the duties and activities of central and local government agencies, and approved regime on the transmission of meteorological warning.

B) Financial Resources. Financial resources to reduce natural disaster are limited. Planned expenditure for natural disaster mitigation and rehabilitation activities in 1993 is given in Table 20.

Table 20. Expenditure for natural disaster reduction ( 1993 ).

Measures	Expenditure ( million,Tg.)
Telecommunication system for hydrometeorological data transmission	120.0
Afforestation	82.0
Flood protection	8.8
Combat desertification	2.6
Combat wildfire	3.0
Earthquake studies	2.3
Land rehabilitation	9.8

Natural disaster reduction expenditure is planned as a part of overall nature protection measures.

C) Land use planning. Water and Forest Management; Building Codes and Practices.

Land. Table 21 presents land use situation in Mongolia.

Until 1990, all land and the associated resources in Mongolia were the property of the state. Under the new 1990 Constitution and the draft Land Law developed 1991, private ownership of land has been made possible. According to the draft of Land Law, there is a wide opportunity for citizens to possess and lease land.

Table 21. Land Use Pattern

Type of land area	Area, 9000 ha.
1. Farm land	
- Cultivable land	1.321
- Hay producing land	1.355
- Pasture land	118.768
- Other land	30.0
2. Forest land	15.200
3. Water bodies	1.625
4. Protected land reserves	7.011
5. Other (settle., special purpose)	9.003
Total	156.411.8

The main government new land use policy is as follows:

- Provision of land possession and leasing to citizens;
- Limitation on crop land expansion;
- Limitation on settlement areas expansion;
- Land pricing;
- Stopping cultivation of non-productive and marginal land;
- Scheduled restoration within 3 years by current users;
- Land restoration direct/end-user fees;
- Reduce grazing in degraded areas, irrigation and pumping;
- Plant shelterbelts/Plantations of desert shrubs and tree;
- Improvement of land use techniques and technology.

Water.

Mongolia is an arid country. The potential water resources are 34.6 cubic kms. Out of this the surface water resources are 22.0 cubic kms. and useable resources of the underground water are 12.6 cubic kms. So water resources available for use are very limited.

Due to a gradual change in Mongolian climate caused mainly by a gradual increase in the frequency of drought years and increased human impact, watersheds have been decreased. Some rivers and a number of lakes have been dried up in the Steppe and Gobi desert area.

During the last 20 years, due to the rapid population growth and an extension of irrigated agriculture and industrial development, the consumption of fresh water has been increased 3 times over in the last decade. By the year 2000 we expect water consumption to increase to 1.3 million cubic metres per day, or twice the present rate.

Some policy of the Government with regard to water resources management are as follows:

- improvement of water supply in Gobi region and desalinization of salted water;
- wise use of water resources in large towns;
- water pricing;
- re-use and re-circulation of water used;
- separation of drinking water from industrial one;
- accumulation of rain and snow melt water for industrial and agricultural use;
- afforestation in river source areas.

#### Forest

It is estimated that forest of Mongolia is 1 276 million cubic meter which occupy 10 million ha. area i.e., about 8 per cent of the territory. The official average forest loss rate estimate for the past 27 years is 174 000 ha. per year. At this rate of forest loss, it has been estimated that Mongolia will be completely devoid of forests by the year 2050. During the period of 1970-1990 timber harvest fluctuated between 1.4 and 2.8 million cubic meters per year with the lowest harvest rate occurring in 1990.

The predominant factor in forest loss in Mongolia is fire. Between 1963 and 1985 an average of 154 000 ha. of forest were destroyed by fire every year.

Destructive forest insects are another significant factor in forest loss. Insects have destroyed 10 000 to 150 000 ha. of forest annually in the years since 1967. Roughly 12 000 ha. of forest land are replanted annually.

The main policy for sound forest management are as follows:

- introduction of up-to date technology to timber harvesting;
- upgrading of existing forest surveying equipment and capabilities; and performance of comprehensive, periodic surveys;
- identification of sustainable rates of forest harvest in various regions of the country;

- upgrading of the current reforestation programme;
- reduction in the waste and inefficiency in forest product use;
- improvement of the transportation infrastructure, allowing more even distribution of pressure on forest resources and application of less intensive harvest methods such as selective cutting.

#### Construction

Mongolia still does not have reliable earthquake-resistant construction technology. In Mongolia, there are very few buildings equipped with earthquake-resistant facilities and means. However, gers (national houses) are more resistant to earthquake and can be damaged, but in lesser extent.

Since 1990, decentralization policy for people and industry is going on in urban development planning and regional ( province meant ) development is emphasized.

#### Education and Training

Mongolia has inadequate educational and training facilities on natural disaster reduction-related issues. In 1994, the Permanent Emergency Commission in cooperation with State Civil Defence Board will organize the following training seminars:

- civil defence training among state and private entities;
- training on natural hazard prevention for local government people;
- training on natural disaster relief among professional services.

Seminars or workshops on natural disaster-related issues are not organized in Mongolia. Due to financial difficulties we can not take part in seminars and workshops organized abroad.

There are no educational programmes on natural disaster and its prevention, mitigation, and other issues for primary and secondary, even for universities.

#### Public awareness

There are inadequate activities organized for public awareness on natural hazards. Warning and alarm on all types of natural disaster are transmitted through radio and television over entire territory of the country. But, there is no activity for increasing public awareness among the people in peace-time. Unfortunately, radio, television and newspapers provide special programmes only after a natural disaster already occurred.

No propaganda is provided on natural disaster-related problems. No books and brochures for public awareness are edited.



## Structural measures

a) Flood protection. River flood protection dams have been constructed in Ulaanbaatar, Darhan and other cities. Dibaish flow protection dams also were constructed in mountainous area of Ulaanbaatar city.

b) Housing Due to accelerated urbanization in the last three decades, the demand in house building was increased greatly. In this connection, a large number of 5-9 storey equipped houses have been built in cities. Schools and kindergartens are also in equipped buildings which can be more vulnerable to earthquake than other ones. Since 1990s, the government housing policy is being basically changed. The citizens are encouraged to construct own individual, small houses. In Mongolia, roofs of small houses are easily damaged by strong wind and dust storm. There is no project on wind-resistant roof design, so far.

## Issues

a) Research challenges. Since 1970s, there have been made attempts for the study, evaluation and forecasting of some hydrometeorological disasters. This time, the research studies on frequency and regime of snow and dust storms, and their forecasting are being conducted successfully. Meteorological conditions for heavy snow fall have been identified. Some research studies were conducted for mapping drought and zud, and earthquake. Methodological guidelines for flood forecasting are being prepared.

Furthermore, the following are expected to be prepared:

- physical statistic method for snow and dust storm forecasting;
- drought forecasting method; establishment of early warning system;
- mathematic model for flood forecasting;
- long-term forecasting method for heavy snow and zud.
- mapping necessary elements for conducting natural hazard assessment;
- detailed vulnerability assessment; the use of mathematical methods and GIS technology for this assessment.
- continued study for earthquake forecasting using radon measurement.
- research study on the influents of drought and desertification;
- national action plan to combat desertification.

## Acceptable Risks

Greenhouse phenomenon affects Mongolia and consequently climate is being dried. As a result, there is a tendency in increasing drought frequency, intensity and occupied area. This adversely affects agricultural sector, one of the basic economic branches of the country. On the other hand, natural disasters such as flood, snow and dust storms, heavy snow, and zud continue to occur in the future. Unfortunately, we have very limited financial resources to combat and reduce natural disaster during the transition period from centrally planned economy to market one.

## Public health

In 1992, Health Law was enacted by Parliament in order to protect citizens' health in market economy conditions. In accordance with this law, health insurance for every body is being introduced from January 1, 1994.

At the beginning of transition period into market economy, Mongolia's medical service has faced a number of difficulties and mother's and children's mortality has been increased. However, the Government promises to change the situation within the following few years.

## Responsibilities/Enforcement

The Government of Mongolia takes overall responsibility for policy, strategy, and measures related to natural disaster reduction. Local governments are responsible for the same things at local level. Unfortunately, the Government can not deal with natural disaster reduction measures in appropriate manner. The enforcement of mitigation activities also is the central and local government responsibility, but there very few works have been done, so far.

Warning and alarm systems can effectively work in big cities and settlement areas, but due to scarce population density and inadequate communication systems, people in the countryside, sometimes, can not be informed with real time.

## IV. WARNING

### 1. System for Observing, Forecasting and Warning

Measures to create a combined system on natural disaster information transmitting and processing, observing, forecasting and warning have been started since 1930-1940.

Now this system is based on existing telecommunication system of hydrometeorological service of Mongolia.

Figure 14 shows general scheme of the system for Observing, Forecasting and Warning natural disasters.

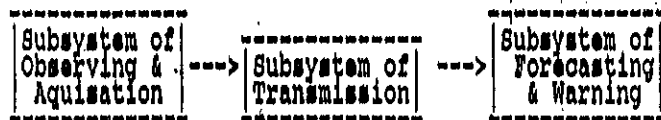


Fig.14. System for Observing, Forecasting and Warning

a) Sub-system for information collection:

- Hydrometeorological and drought;
- Geological and wildlife;

Hydrometeorological sub-system.

The National Hydrometeorological Service (NHS) is responsible for observing, forecasting and warning hydrometeorological disasters such as drought, zud, heavy snow, snow and dust storms, strong wind, blizzard, cold rain, flood, dibaish flow, and weather condition for wildfire occurrence. NHS has more than 400 gauging points, including meteorological, hydrological and agrometeorological stations, BAPMON and greenhouse gas monitoring stations. Location of those gauging points is presented in figure 15. Drought is estimated by processing collected data.

Meteorological station measures the following elements 4-8 times a day:

- air temperature;
- atmospheric pressure;
- air humidity;
- wind direction and speed;
- soil temperature;
- meteorological phenomena;
- snow and soil cover condition;
- precipitation;
- soil temperature in different depth;
- solar radiation;
- sunshine;

Agrometeorological station measures the following elements 3 times a day:

- air temperature;
- air humidity;
- wind direction and speed;
- meteorological phenomena;
- snow and soil cover condition;
- soil temperature;
- precipitation.

Hydrological station measures the following elements:

- water level;
- water charge;
- ice phenomena.

There are a number of stations for air, water and soil pollution monitoring. However, methodologies and equipments used for data processing and measuring are out-dated. Many stations face a lack of spare parts for measuring equipments.

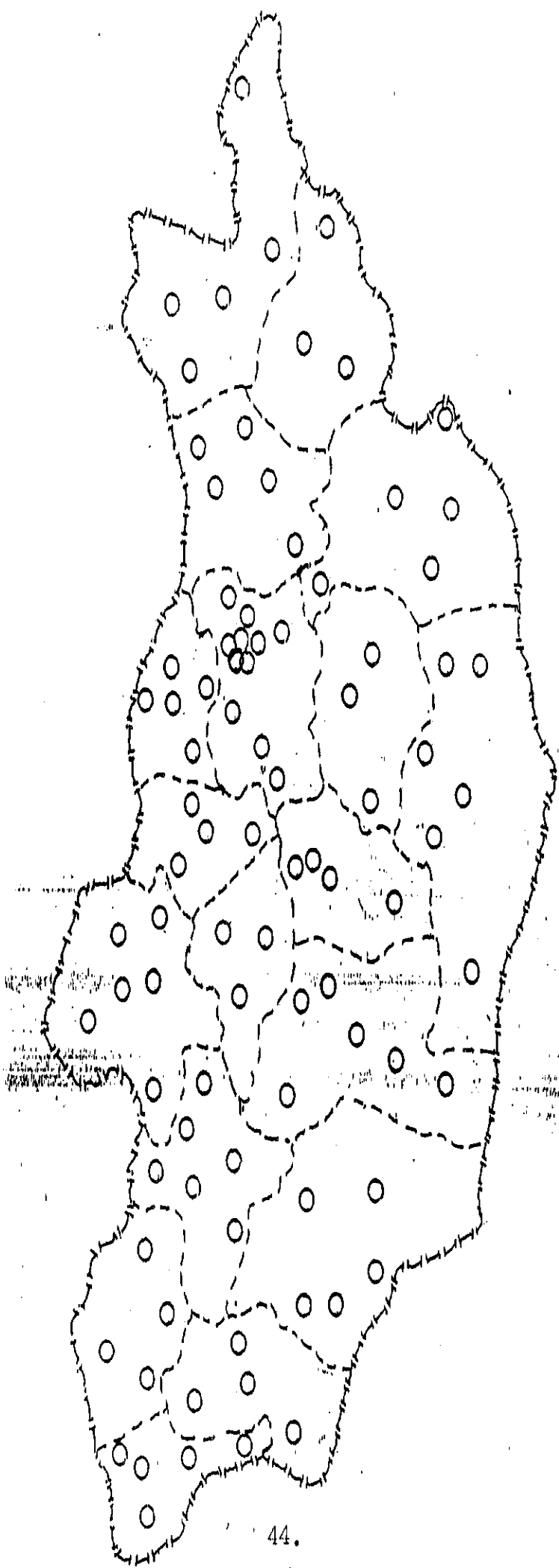


Fig. 15. Hydrometeorological network

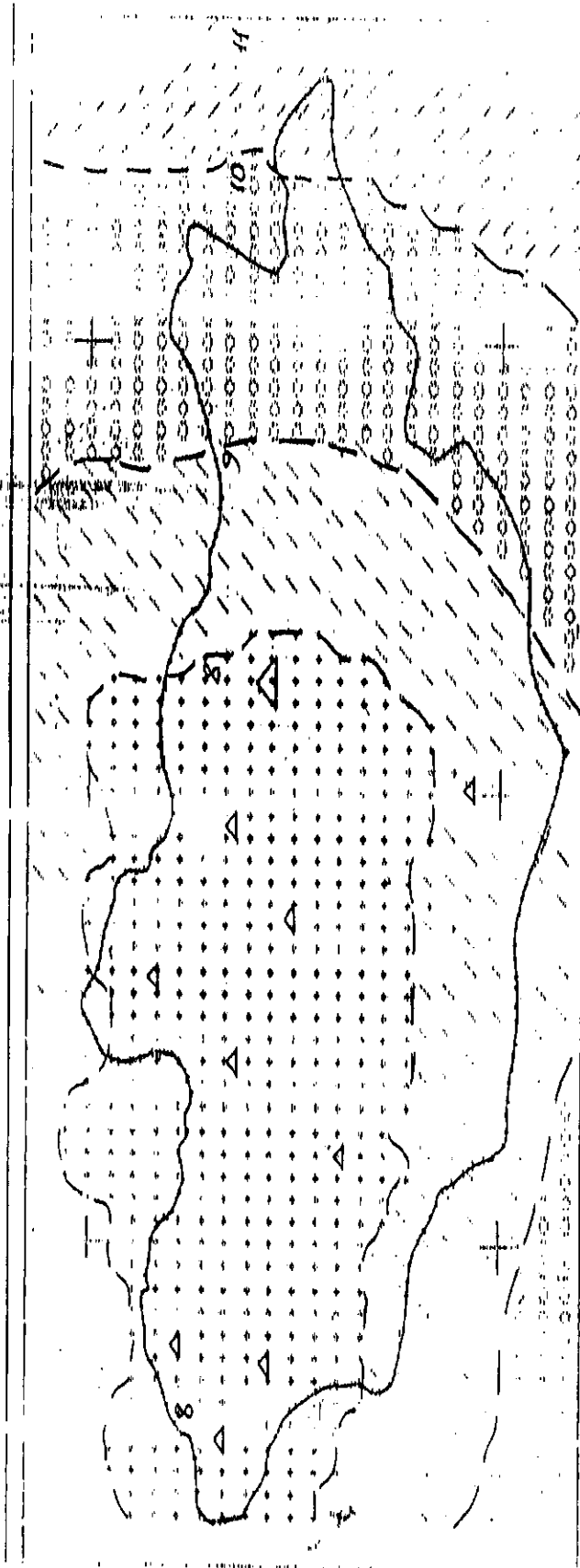


Fig.16. Location of earthquake observation

Geological and wildfire sub-system.

The Academy of Sciences of Mongolia conducts research studies on earthquake phenomenon. It has 10 studying points within the territory of Mongolia. Location of those points is shown in Figure 16.

First earthquake observation station was opened at Ulaanbaatar, the capital city, in 1957. Unfortunately, due to economic failure in transition period, the collection of data and their international exchange have been stopped.

There are no special points for wildfire observation. Information on wildfire occurrence is obtained by appropriate organizations from local government offices and people.

b) Sub-system for data transmission and processing.

All data on hydrometeorological observation are collected from 18 provinces and three cities by telephone channel and transmitted to the Information and Computer Centre (ICC) of the Ministry of Nature and Environment and processed there. Apart from this, data on earthquake, and wildfire occurrence are also collected by the same telephone channel. ICC receives AVHRR digital data from NOAA satellite of USA. ICC has, in its composition, national centre for hydrometeorological communication which is connected with Beijing and Novosibirsk, WMO regional centres, and receives meteorological images from Habarovsk, Tokyo and Beijing.

All data received are processed by computing equipments based on VAX computer. Although data are processed, no natural disaster data-base system was created until now.

c) Forecasting and Warning Sub-system.

Hydrometeorological Research Institute of the Ministry of Nature and Environment has the responsibility for forecasting and warning the following hydrometeorological disaster:

- blizzard;
- heavy snow;
- zud;
- dust storm;
- flood;
- drought.

The following forecasting and warning criteria has been accepted by Government resolution No. 68 of 1993.

Forecasting criteria:

Blizzard.

- wind speed: 10-16 m/sec, duration: more than 6 hours, combined snow fall.

Heavy snow.

- depth of snow falled during half a day: 5-10 mm,
- snow depth: 11 cm. in Gobi, 26 cm in steppe, and 30 cm. in forest-steppe zone.

Dust storm.

- wind speed: 16 m/sec., duration: 6-12 hours.

Zud.

- less livestock accessability to pasture

Flood.

- river water level reaches flooding level,
- met.conditions for dibiash flow formation.

Wildfire.

- 4th phase of fire occurance possibility  
( no rain and dried land surface )

Drought.

- less grass for livestock, and crop drying.

Warning criteria:

Blizzard.

- wind speed: 16m/sec. & greater, duration: 9 hours & more, combined snow fall.

Heavy snow.

- depth of snow falled during half a day: 10mm. & more.

Dust storm.

- wind speed: 16 m/sec. & greater, duration: 12 hours, dust

Zud.

- practically no livestock accessability to pasture

Flood

- river water level over flooding level

Drought

- no grass for livestock.



In emergency, people are warned 6-8 times through radio, and 1-2 times through television, or civil defence alarm system. Newspapers also can be involved in warning operation.

Special forecasting for stock breeding people is disseminated 2 times a day through radio and TV.

## 2. Issues

### a) Dissemination/Communication

It is a rather difficult task to warn everybody, specially in countryside. Not every stock breeding family has radio or TV set. Telecommunication is less developed and its capacity is limited. There is a need to improve old communication system and use space communication facilities in Mongolia. Automatic observation and warning system is a special need for natural disaster reduction.

### b) Interpretation/Education

There is no activity for the interpretation of the important natural disaster forecasting. Citizens have some knowledge only about meteorological disasters such as heavy snow, strong wind and flood. People have poor knowledge about earthquake and wildfire and more exposeable to them.

Measure taken to enhance people's knowledge about natural hazards are inadequate. There is no programme and plan in this matter.

### c) Individual and Institutional Response.

The ability to response natural disaster forecasting and warning at individual and institutional level is weak as a whole. Only livestock breeders can keep their animals near to home, when they are warned.

State Permanent Emergency Commission must take general coordination over the activities of other organizations and entities.

## V. INTERNATIONAL COOPERATION

### 1. Status

Mongolia is not cooperating with international organization and foreign countries on natural disaster reduction-related issues.

The reason for this is:

- a weak coordinating mechanism at country level;
- a limited opportunity to participate in internationally organized measures;
- a lack of financial resources to organize or participate in seminars, workshops, training and other measures organized abroad;

- inadequate technical opportunity to participate in international cooperation;
- inadequate coordination between neighbouring states and countries in the region on natural disaster reduction issues.

## 2. Issues

It is suggested:

- to create Worldwide Convention on Natural Disaster Reduction;
- to prepare regional strategy to combat natural disaster;
- to establish regional training centres dealing with natural disaster reduction issues or problems;
- to increase the roles of UN organizations and programmes such as WMO, UNDP, UNEP, etc. in building national capacity to reduce natural disaster;
- to request biggest banks, funds and foundations assist disaster-prone developing and least developed countries to deal with natural disaster.

## VI. OVERALL EVALUATION AND FUTURE PROGRAMME OF IDNDR ACTIVITIES.

### 1. Goals and Achievements

- Conducting natural hazard assessment, and mapping its outcomes in order to use them for decision-making and sustainable development purposes;
- Conducting vulnerability assessment of natural hazards for coordination of economic development, population growth or settlement;
- Reducing or mitigating natural disaster in accordance with:
  - \* legislation;
  - \* institutional framework;
  - \* science and information;
  - \* management;
  - \* training and education;
  - \* activities;
  - \* control and implementation;

### 2. National Goals for the Decade

- a) Comprehensive national assessments of risks from natural hazards, with these assessments taken into account in development plans:

- Classified and identified natural disasters in Mongolia are as follows:

- \* Severe storms ( blizzards & dust storm );
- \* Heavy snow, Zud, Cold rain, Cyclone way;
- \* Flood;
- \* Earthquake;
- \* Wildfire;
- \* Drought and Desertification;
- \* Ecological and Industrial disasters;
- \* Radiation.

- Research studies have been carried out on the following:

- \* Spreadness, frequency and intensity of severe storm, blizzard and dust storm
- \* Meteorological condition for heavy snow fall, frequency and regime of zud.
- \* Flood regime, spreadness, intensity and frequency;
- \* Earthquake occurrence, intensity, spreadness and mapping;
- \* Wildfire frequency & spreadness, and meteorological & natural conditions for wildfire occurrence;
- \* Drought frequency, intensity & spreadness, and mapping;
- \* Desert area and desertification intensity;
- \* Vulnerability assessment of natural hazards.

- Planned studies are as follows:

- \* Further identification and detailed classification of prevailing natural hazards in Mongolia;

- \* Detailed study on frequency, spreadness & intensity of each type of natural disaster and mapping;

- \* Damage assessment for each type of natural disaster;

- \* Detailed vulnerability assessment of natural hazards;

- \* Integration of natural hazard assessment in economic policy-making;

b) Mitigation plans at national and/or local levels, involving long-term prevention and preparedness and community awareness;

Activities conducted:

- Legislative

- \* Approval of guidelines, including duties and responsibilities of State Permanent Emergency Commission;

\* Government resolution on natural disaster prevention measures and its implementation;

\* Preparation of new Land law draft and its submission to the Parliament;

\* Preparation of drafts of Laws to protect water and forest;

- Institutional and others:

\* Preparation of decentralization policy for economic development and human settlement;

\* "Zamyn-Uud" railway junction extension project

\* "Trans-Asian Highway through Mongolia" project.

\* Master plan on telecommunication development upto 2010.

\* Reconstruction of flood protection dam in Ulaanbaatar;

\* Scheduled civil defence training.

✓ Economic failure in transition period is the main obstacle to combat natural disaster.

c) Ready access to global, regional, national and local warning systems and broad dissemination of warnings

There is warning and alarm system operating during 24 hours to warn people about any type of natural disaster. However, equipments or facilities are very out-dated.

Cities and centres of provinces have their own civil defence

warning and alarm system. People living in countryside can only be warned through radio and TV set. However, due to scarce population density, there is no opportunity to warn every body using radio, TV and other means.

It is highly desirable to have access to regional and global warning system

3. Expectations and Plans for the Second Half of the Decade

- Review National Plan of Action for Natural Disaster Reduction, and look for more financial sources;

- More actively participate in international cooperation organized within the Decade;

- Conduct detailed Hazard and Vulnerability assessment of natural disaster, and prepare projects for bilateral and multilateral aid programme;

- Conduct training and educational activities on natural disaster-related issues among people.



NOTIFICATION / CONFIRMATION

To: Dr. Olavi Elo  
Director  
IDNDR Secretariat  
Palais des Nations  
CH-1211 Geneva 10  
Switzerland

Date: December 25, 1993

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Tel: 41/22 798 5850

From: Dr. Ts. Adyasuren  
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Science, Monitoring and  
International Cooperation  
Department, National Focal Point for IDNDR  
Ministry of Nature and Environment  
Mongolia

Fax: 976 1 321401  
Tel: 976 1 329619  
Tlx: 79343 MACNE MH

Subject: Preparation of National Reports for the World Conference on Natural Disaster Reduction, 23-27 May 1994 and the Mid-Term Review of the IDNDR.

With reference to the Mid-Term Review of the IDNDR, we are pleased to confirm our interest in participating in the 1994 World Conference and in preparing two documents reporting on our IDNDR activities, including plans for the second half of the Decade.

We also acknowledge receipt of the guidelines and format provided by the Secretariat and request that future correspondence on this matter be addressed to:

Name: Dr. Ts. Adyasuren

Title: Director, Science, Monitoring and International Cooperation Department, Ministry of Nature and Environment

Address: Ministry of Nature and Environment, Khudaldaany Gudamj-5, Ulaanbaatar-11, Mongolia

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MONGOLIA  
NATIONAL SUMMARY REPORT

IDNDR

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SECTION A: PROFILE

1. Composition of Focal Point:

Ministries:

- Ministry of Nature and Environment ( 15 )
- Civil Defence Board ( 14 )
- National Development Board ( 3 )
- Ministry of Food and Agriculture ( 6 )

Academic & Research Institutions:

- Hydrometeorological Research Institute ( 43 )
- Institute of Water Problems ( 6 )
- Forestry and Wildlife Institute ( 5 )
- Central Environmental Research Laboratory ( 21 )
- Siesmic Station ( 10 )

Public Services:

- Hydrometeorological service ( 1500 )
- Forest and Plant service ( 5 )
- Water management service ( 3 )

Non-Governmental Organization:

- Mongolian Association for Conservation  
of Nature and Environment ( 15 )
- Mongolian green movement ( 10 )

Media:

- Mongolian Radio ( 3 )
- Mongolian TV ( 3 )
- Newspaper ( 8 )

Insurance:

- Mongol Daatgal ( 24 )

2. Internal Organization of the National Focal Point.

The Department of Science, Monitoring and International Cooperation of the Ministry of Nature and Environment is the National Focal Point of Mongolia for the IDNDR.

The national focal point for IDNDR has its Council which includes 20 members representing the above mentioned organizations.

There is State Permanent Emergency Commission responsible for planning, management, and coordination of both natural hazards and man-made disaster reduction activities in Mongolia.

The State Permanent Emergency Commission takes overall coordination, when a natural disaster occurs.

The national focal point cooperates with the Commission on the following pre-disaster and post-disaster activities:

- Monitoring, forecasting, prediction and warning of some types of natural disasters; ( snow storm, heavy snow, flood, etc.)
- Preparedness and Public awareness;
- Education and Training;
- Search and Rescue;
- Relief;
- Damage assessment;
- Physical reconstruction;
- Natural disaster reduction planning and management.

### 3. Prevailing hazards

Type	Location	Affected Population
1.Snow storm	entire territory, specially eastern part of the country	1-16 deaths in average every year
2.Wind storm	entire territory, specially in Gobi & steppe areas	1-5 deaths in average every year
3.Wildfire	central and eastern provinces	3-18 deaths in average every year
4.Flood	central and western provinces	220 deaths since 1966
5.Heavy snow	entire territory except Gobi provinces	12 deaths in 1993



#### 4. Recent natural disasters

Type	Location	Affected Population	Losses
1. Heavy snow 1993	Zabhan, Gobi-Altai Bayanhongor provinces	12 deaths	850 000 livestock
2. Wildfire 1993	Dornod, Sukhbaatar provinces	8 deaths	3 753 000 livestock, 54 000 ha. forest
3. Flood 1993	Central part of country	9 deaths	large number of bridge and roads
4. Snow storm 1993	Dornod, Sukhbaatar Hentii, Central provinces	9 deaths	large amount of crops
5. Snow storm 1993	Arhangai, Uburhangai Bulgan Selenge provinces	17 deaths	100 000 of livestock

#### 5. National socio-economic conditions

Population: 2.25 million

Gross-National Product ( GNP ): 247.5 million USD

Per-Capita Income: 110 USD

#### 6. Availability of assistance to other countries in the field of natural disaster reduction.

Expert and /or advisor dispatch in case of snow storm, heavy snow, flood.

#### 7. International assistance required for natural disaster reduction:

- Establishment of natural disaster monitoring network and data management system with required technical and financial assistance;

- Natural disaster reduction technology transfer;

- Financial assistance, when a natural disaster occurred;

- Technical means to fight wildfire;

- Measures to combat drought and desertification;

- Natural disaster risk assessment;

- Education and Training;

## SECTION B: STRATEGIES AND ACTIVITIES

### 1. Step towards achieving the 3 main Decade targets

a) Comprehensive national assessments of risks from natural hazards, with these assessments taken into account in development plans

- Classified and identified natural disasters in Mongolia are as follows:

- \* Severe storms ( blizzards & dust storm );
- \* Heavy snow, Zud, Cold rain, Cyclone way;
- \* Flood;
- \* Earthquake;
- \* Wildfire;
- \* Drought and Desertification;
- \* Ecological and Industrial disasters;
- \* Radiation.

- Research studies have been carried out on the following:

- \* Spreadness, frequency and intensity of severe storm, blizzard and dust storm

- \* Meteorological condition for heavy snow fall, frequency and regime of zud.

- \* Flood regime, spreadness, intensity and frequency;

- \* Earthquake occurrence, intensity, spreadness and mapping;

- \* Wildfire frequency & spreadness, and meteorological & natural conditions for wildfire occurrence;

- \* Drought frequency, intensity & spreadness, and mapping;

- \* Desert area and desertification intensity;

- \* Vulnerability assessment of natural hazards.

- Planned studies are as follows:

- \* Further identification and detailed classification of prevailing natural hazards in Mongolia;

- \* Detailed study on frequency, spreadness & intensity of each type of natural disaster and mapping;

- \* Damage assessment for each type of natural disaster;

- \* Detailed vulnerability assessment of natural hazards;

\* Integration of natural hazard assessment in economic policy-making;

b) Mitigation plans at national and/or local levels, involving long-term prevention and preparedness and community awareness;

Activities conducted:

- Legislative

\* Approval of guidelines, including duties and responsibilities of State Permanent Emergency Commission;

\* Government resolution on natural disaster prevention measures and its implementation;

\* Preparation of new Land law draft and its submission to the Parliament;

\* Preparation of drafts of Laws to protect water and forest;

- Institutional and others:

\* Preparation of decentralization policy for economic development and human settlement;

\* "Zamyn-Uud" railway junction extension project

\* "Trans-Asian Highway through Mongolia" project.

\* Master plan on telecommunication development upto 2010.

\* Reconstruction of flood protection dam in Ulaanbaatar;

\* Scheduled civil defence training.

Economic failure in transition period is the main obstacle to combat natural disaster.

c) Ready access to global, regional, national and local warning systems and broad dissemination of warnings

There is warning and alarm system operating during 24 hours to warn people about any type of natural disaster. However, equipments or facilities are very out-dated.

Cities and centres of provinces have their own civil defence

warning and alarm system. People living in countryside can only be warned through radio and TV set. However, due to scarce population density, there is no opportunity to warn every body using radio, TV and other means.

It is highly desirable to have access to regional and global warning system

2. Present national plan for natural disaster reduction

a) Time span covered

National plan for Natural Disaster Reduction  
1992- 2002

b) Agencies, institutions and organizations involved:

State Permanent Emergency Commission

c) Implementing agencies:

- Ministry of Nature and Environment
- Civil Defence Board
- Academy of Sciences

d) Funds available for implementation: Cost-sharing

- Government budget;
- International financial institutions & Donors.

3. Legislation introduced and enacted in relation to natural disaster reduction

In 1990, the Government established State Permanent Emergency Commission by its resolution No.276 and approved its rules.

In 1993, the Government adopted resolution on natural disaster prevention measures, and coordinated the duties and activities of central and local government agencies, and approved regime on the transmission of meteorological warning.

4. Disaster mitigation activities completed or underway:

a) Identification of hazard zones: hazard assessment

Title of project: Natural hazards ( Frequency and spreadness of drought, heavy snow, earthquake, wind storm )

Status:

- reference
- map of hazard spreads

Participating institution in the and /or on the international level:

- Ministry of Nature and Environment
- Academy of Sciences

Costs of project: 3 500 000 Tg ( national currency )

Sources of funding: Government budget

Implementing agencies:

- Hydrometeorological Research Institute
- Institute of Water Problems
- Institute of Geography and Geocryology
- Seismic station

Address ( telephone and fax-number ) of the agency in charge:

Ministry of Nature and Environment, Khudaldaany Gudamj 5,  
Ulaanbaatar 11, Mongolia

Fax: 976 1 321401; telephone: 976 1 3 29619;  
Telex: 79343 MACNE MH

b) Monitoring, prediction and warning

Title of project: Meteorological disaster ( Forecasting  
methods of drought, heavy snow, wind storm, dust storm and  
flood ).

Status: Development and application of forecasting method

Participating institutions in the country and /or on the  
international level:

- Hydrometeorological Research Institute;
- Mongolian National University;
- Institute of Geography and Geocryology.

Cost of project: 2 200 000 Tg

Sources of funding: Government budget

Implementing agencies:

- Hydrometeorological Research Institute;
- Mongolian National University;
- Institute of Geography and Geocryology

Address ( telephone and fax-number ) of the agency in charge:

Khudaldaany gudamj-5, Ulaanbaatar 11, Mongolia  
fax: 976 1 321401, Tlx: 79343 MACNE MH

c) Short term-Protective measures and preparedness

Title of project:

1. National Plan of Action to Combat Desertification in  
Mongolia, 1992-1994.
2. Workshop on Natural Disaster Reduction Issues,  
Ulaanbaatar, 1993.
3. Operational Natural Disaster Communication and Information  
Transmission System

Status:

- Completion of elaborating National Plan of Action in 1994
- Preparation of workshop materials for publication

Participating institutions in the country and /or on the international level:

State Emergency Commission

Cost of project:

1. 90 000 USD
2. 500 000 Tg
3. 80 000 - 90 000 Tg (current expenditure per a year)

Sources of funding:

- UNEP funding for elaboration of National Plan of Action to Combat Desertification
- Government funding for organizing the Workshop

Implementing agencies:

- Ministry of Nature and Environment
- Hydrometeorological Research Institute
- Corresponding local branches

Address ( telephone and fax-number ) of the agency in charge:

Ministry of Nature and Environment,  
Khudaldaany gudamj 5, Ulaanbaatar 11, Mongolia  
fax: 976 1 321401, tlx: 79343 MACNE MH, Phone: 976 1 329619

d) Long-term preventive measures:

Title of project: Creation of natural disaster monitoring and prevention system

Status: Anticipated to be elaborated in 1994-1997

Participating institutions in the country and /or on the international level:

- Ministry of Nature and Environment
- A International organization

Cost of project:

5 000 000 USD

Sources of funding: No donor

Implementing agencies:

- Ministry of Nature and Environment
- Information and Computer Centre and other Research Institutes of the Ministry

Address ( telephone and fax-number ) of the agency in charge:

Ministry of Nature and Environment,  
Khudaldaany gudamj 5, Ulaanbaatar 11, Mongolia  
fax: 976 1 321401, tlx: 79343 MACNE MH, Phone: 976 1 329619

e) Land-use and risk management

Title of project: Land Law and New Management for Land

Status: New Land Law will be enacted in first quarter of 1994 and new land-use management will be introduced.

Participating institutions in the country and /or on the international level:

- State Emergency Commission

Costs of project: 350 000 000 Tg

Sources of funding: Government budget

Implementing agencies:

- Ministry of Nature and Environment;  
- Ministry of Food and Agriculture;  
- Civil Defence Board.

Address ( telephone and fax-number ) of the agency in charge:

Ministry of Nature and Environment, Khudaldaany gudamj 5,  
Ulaanbaatar 11, Mongolia.

fax: 976 1 321401, tlx: 79343 MACNE MH, Phone: 976 1 329619

f) Public education and information

Title of project: TV-Radio Education Programme on the theme of " Warning and Prevention of Natural Disasters".

Status: So far, the project is in planning stage and is expected to be commenced in 1994.

Participating institutions in the country and /or on the implementation level:

- State Emergency Commission

Costs of project: 6 000 000 Tg

Sources of funding: Government budget

Implementing agencies:

- Ministry of Nature and Environment;  
- Civil Defence Board;  
- TV and Radio companies.

Address ( telephone and fax-number ) of the agency in charge:

Ministry of Nature and Environment, Khudaldaany gudamj 5,  
Ulaanbaatar 11, Mongolia

fax: 976 1 321401, tlx: 79343 MACNE MH, phone: 976 1 329619

5. Plans to fully achieve Decade target by the end of 1999

- Review National Plan of Action for Natural Disaster Reduction, and look for more financial sources;
- More actively participate in international cooperation organized within the Decade;
- Conduct detailed Hazard and Vulnerability assessment of natural disaster, and prepare projects for bilateral and multilateral aid programme;
- Conduct training and educational activities on natural disaster-related issues among people.

#### SECTION C: INTERACTIONS

1. Publication on IDNDR-related subjects:

National Plan of Action to Combat Desertification in Mongolia,  
December 1992, ( publication in 1994 ).

2. IDNDR meeting and conference held or planned:

- UNEP/WMO/Ministry of Nature and Environment Workshop on "Degradation of Arid, Semi-Arid Ecosystem under Critical Environmental Conditions, Ulaanbaatar-Dalanzadgad, 24 August-6 September 1992;

- National Seminar on " Preventive measures for natural disasters" Ulaanbaatar, Ministry of Nature and Environment, National Focal Point for IDNDR, 1994, ( planned, no donor )

- International Scientific Seminar on "Natural Disaster Monitoring, Prediction and Warning" Ulaanbaatar, Ministry of Nature and Environment, National Focal Point for IDNDR, 1995 ( planned, no donor )

3. Current or planned partnerships and cooperation related to IDNDR with other countries

- Joint Mongolia- Japan project on " Integrated system for Natural Disaster Observation & Environmental Information" Mongolia, ( planned 1995 )

- UNEP/Mongolia Workshop on " Specific Condition of Gobi Arid & Desert Areas of Central Asia & Way of their Improvement" Ulaanbaatar, ( planned 1995 )



- UNEP/UNDP/ WMO/ Mongolia project on " Natural Disaster Monitoring and Information System"  
( planned 1997-1998 )

#### SECTION D: EVALUATION

1. Overall evaluation of national mitigation programmes including, but not limited to, those initiated after INDRD and achievements up to now

National Focal Point for INDRD can not represent or express the Government Policy on Natural Disaster Reduction

However, National Focal Point has the influence on the Government policy or activities only through State Permanent Emergency Commission.

#### 2. Review of the IDNDR

It is suggested:

- to create Worldwide Convention on Natural Disaster Reduction;
- to prepare regional strategy to combat natural disaster;
- to establish regional training centres dealing with natural disaster reduction issues or problems;
- to increase the roles of UN organizations and programmes such as WMO, UNDP, UNEP, etc. in building national capacity to reduce natural disaster;
- to request biggest banks, funds and foundations assist disaster-prone developing and least developed countries to deal with natural disaster.