

Country Report on Natural Disasters in Mongolia

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1. Geographical Considerations

Mongolia is situated in Central Asia, 1600 km from the Pacific '3000 km from the Arctic Ocean and 5000 km from the Mediterranean. It experiences a continental climate, with hot summers (temperature up to 41⁰ C) and cold winters (temperatures to -53⁰ C)..Diurnal temperature changes too can be very large. Rainfall is relatively low, varying from 5 cm in the southern desert region, to 40 cm in mountain areas. 80 to 96 % of precipitation falls in the warm period from April to October. In the south, significant rainfall begins in July.

About 40 % of the country is ~ 40 % hills (1000-1500m), and the remainder denotation plain. The landscape includes alpine, mountain taiga, forest steppe, steppe, Gobi, and desert regions. Rivers draining to the south and west terminate in inland lakes/salt lakes.

Crop growing season is short, 70 to 130 days, depending on location and altitude Unseasonable frosts can destroy up to 30 % of crops. Crops are mainly root crops, wheat, garden vegetables,(including greenhouse vegetables near Ulaanbaatar) and hay fodder. The main agricultural production is animal husbandry with herds of cattle, sheep, horses, camels, and goats.

Wind speeds are often high, with dust and sand storms 40 days per year over a large part of the country, and in some regions over 100 days per year.

The population of Mongolia was estimated to be 2.3 million in 1994, with about 27% of the population in the capital. The most densely populated rural areas are the river valleys in the forest Steppe zone. The least populated are the semi desert, desert and mountain taiga zones. Rural population is 34% of the total, urban population 57%.

Disaster losses must be seen in relation to the gross national products. Per capita income is at present 100 to 110 US\$. Although there is undoubtedly a significant natural economy

which is non monetary (animal production and growth of vegetables for own Consumption etc.). 510000 Persons or 23% of the total population are recorded as living below the government established poverty line.

Agriculture is a dominant part of the economy, and livestock breeding is a dominant part of agriculture. The total head of livestock is 25 million, mostly sheep and goats, with 22% being horses, cattle and camels. Livestock density is close to the carrying capacity of available pasture, and in some seasons exceeds carrying capacity. Livestock losses per year have varied between 500 000 and 1 million head since 1986, with the average loss between 1986 and 1992 being 800 000. Between 50 and 93% of the losses are due to disasters. Note that the losses represent 5% of the herd and 6 to 10% of the Gross National Product.

2. Potentially Natural Disasters in Mongolia

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

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 |
| Cold rain | Industrial hazards |
| Hail | Toxic chemical |
| Wildfire | Radiation |
| Drought | Accident (road/air) |
| Desertification | |

A natural disaster is a natural phenomenon or phenomena occurred covering relatively large territories and leading to human casualties or substantial damages to property and causing thereby serious obstacles to smooth operation of the society. That whether this or that phenomenon is a natural disaster or not depends upon not only its intensity but much more upon its socio-economic and ecological consequences. In view of this, the issue of natural disaster shall be considered in association with the social economic situation at the level of a given country's development, the people's life styles, infrastructure development, etc. For example, the phenomenon of so called "white zud" (severe winter conditions) when pastures are snow-drifted due to heavy snowfalls taken place in winter-spring seasons is referred to the category of natural disaster only under the conditions of our country with its transhumance cattle-breeding economy and would not be regarded as a natural disaster in any other countries with the settled type of civilization. A strong earthquake occurred in a desert place without human settlements is not disastrous for Mongolia whereas if it takes place in any other country with densely populated areas it would cause heavy losses and casualties which occurs rather frequently.

Also, it is not such a rare occasion when natural phenomena of seasonal character turns into a natural disaster how insignificant its intensity may be. It refers to such events as snowfall occurrence in summer and rainfalls in winter seasons and the like.

Natural disasters can be qualified by their origin as geological (earthquake, soil heaving), atmospheric (drought, zud, etc.), biological (epidemics, etc.)

The extent of a natural disaster area varies. For instance, if zud, extreme low temperatures, droughts are to extend to the territories of several soums (villages) and even aimags (provinces), the lightning, violent wind occurrence is referred to only one object. One type of natural phenomenon is frequent to be accompanied by another ones. If a heavy snowfall is accompanied by strong winds it turns into a blizzard, when the cattle freezes to death being buried under the snow and if this phenomenon lasts for several days, the cattle eventually perishes. Due to a volcano eruption the snow of snow-capped mountains thaws causing a flash flood. Some natural phenomena might overgrow to the level of a disaster

due to wrong human actions. The ill-considered cutting down of the forest growing on the river estuaries increases the flood risk. Due to soil erosion the excessive rainfall water that can not be absorbed by the soil vegetation or into the soil turns into a flood water.

Though there is a Mongolian proverb saying "Disaster occurs all of a sudden without warnings" nowadays thanks to the achievements of modern science and technology it is time to reject this belief. Any natural phenomenon, including diseases, has proper regularities relating to its development which proceeds through several stages. The natural disaster development can be divided into the following five stages depending upon the ways to combat it and to mitigate its damages and consequences entailed.:

preparation stage

approaching stage

performance stage

fading stage

recovery stage.

In order to mitigate consequences of a natural disaster actions shall be designed and developed with regard to each stage of its development. Which option of steps shall be chosen for this or that concrete disaster shall be solved promptly at the preliminary preparation stage. For example, a river overflows its banks due to heavy rains fallen or thawing of snow-capped mountains' snow or ice, therefore, preconditions for flooding have been provided well before the event itself takes place, so responsive measures to be undertaken shall vary depending upon where, when and how much flood is likely to occur. It means that options and alternatives most suitable for each of such options shall be worked out and prepared long before it would take place.

2.1. Zud

Zud (severe winter conditions) is a phenomenon when cattle is lost en mass due to lack of fodder in winter, spring and autumn seasons. Our herdsmen used to divide the zud conditions into :

white zud

black zud or tuurain zud

storm zud

iron or glass zud

which depends upon the factors serving to their occurrence.

When heavy snowfalls take place late in autumn and at the beginning of winter and the pastures are under a deep cover of snow and cattle unable to reach the pasture fodder perishes and dies in winter-spring seasons it is called a white zud, when due to a long snowless period cattle perishes suffering due to lack of water and lots of cattle are gathered around a single well, the pasture is overgrazed and eventually the cattle perishes is called black zud. The black zud accompanied by extreme low temperatures turns into a really "black" zud. The winter of 1969 is the classical example of such a black zud. When snowfall is accompanied with blizzards for an extended period, the snow is covered with crust of ice, and cattle being unable to go up has to go downwind, it is called a stormy zud. The zud of the notorious year of the Monkey (1944-1945) is the classical example of this type of zud. When wet snow fallen early in spring-winter and late in autumn or after the snow cover has been formed, suddenly thaw sets in, due to which a thin crust of ice is formed over the snow so that the cattle could not reach fodder even if the snow cover is thin, and eventually perishes, is called iron or glass zud. In years with iron zud several layers of ice are often formed over the snow. It sometimes occurs when rains fall in winter

period. White and stormy, cold zud may occur in a combined manner and then it is the great zud. Some researchers prefer to call it a combined zud (Chogsom, 1962).

According to historical data, whenever zud occurs in Mongolia with its pasture cattle breeding, it turns into a national level disaster. The disastrous consequences of zud have some definite relationship with the previous year's grassland yield. It is proved by many evidences that most disastrous zud events occur mainly after a droughty summer-autumn period. If the summer was droughty and arid, the zud should be expected to occur even if there are not so much snowfall in winter. If the grassland yield was sufficient in summer, the zud conditions would not be formed even if much snow would fall in winter. During the summer before the year of the Monkey (1994-1945) there was a red zud covered the entire territory of Mongolia (a zud extended to the whole territory of the country happened also in 1972 over the last 6 decades), the heavy snow started falling since November and its depth reached 15-28 cm, with bitter frost throughout the winter (after 1940 no such a year with so low temperatures to keep on since November through January, February and till March was recorded any more in Mongolia) and over 8 million head, i.e. one third of the national herd of Mongolia that was recorded in the course of the 1994 inventory were lost.

As can be seen from the historical sources, zud extended to more than a half of the country's territory were recorded during the years of 72 B.C., 1308, 1337, 1340, 1450, 1608, 1626, 1821, 1825, 1839, 1884, 1875, 1891, 1901, 1935, 1944, 1949, 1953, 1956, 1963, 1966, 1967, 1987, 1992 A.D. Surveys conducted since 1640 in the eastern regions of Mongolia (former Tsetsenkhan, Tusheet khan aimags) have shown that zud covering over 75% of the territory of the country occur once in 20-22 year-period and winters when zud did not occur even in one soum are very rare. However, zud can happen in any part of the country.

2.2. Drought

Drought is a natural phenomenon leading to the loss of cultivated and grassland vegetation yields and moreover, to the depletion of soils fertility. Drought and desertification are a most complicated process stipulated by a number of factors. If in any agrarian country the drought and desertification issues are directly related with that country's survival, for our country with its grassland cattle breeding-based economy it rarely causes such consequences as famine, mass losses of livestock but, nonetheless, is of especial significance for the country's sustainable development.

A drought is the result of lack or insufficiency of precipitation and excessive evaporation leading to a hydrologic imbalance and consequently, water shortages in the soil and the vegetation and, as a result, to the crop damage and reduction of its yield. The occurrence of drought is of double dependence upon the grassland utilization and agrotechnical culture (level of operation). The direct consequences of a drought are such as losses of yield, its reduction and its eventual outcome is desertification. Thereby, at the international level the issues of drought and of desertification are generally considered coupled together.

Chapter 12 of the XXI Century programme is entitled "wise use of sensitive ecosystems and combating drought and desertification" and the notion of desertification is defined as "the process of soil degradation and depletion owing to the impact of a range of various factors in arid and semi arid regions without sufficient moisture content going on under the anthropogenic impact". Some of our geographers understanding the desertification schematically as a desert and a process of alteration according to its original meaning tried to confine the desertification studies to the issues of sand drift only. But in the International Convention for combating drought and/or desertification affecting the world's countries including Africa it is clearly indicated "Drought and/or desertification", so it would be appropriate to consider those issues together.

Over 90 % of Mongolia's territory is referred to arid, semi arid, moderate arid and moisture deficient regions, 41.3% or 647.0 thousand square kilometers of its territory is occupied by a Gobi desert region which makes the issue of drought and desertification of especial prominence.

The major factors causing soil degradation are drought and soils weathering due to wind and humidity factors.

Drought is regularly recurrent once in 10 years in the country's forest steppe and steppe zone whereas in the desert zone it has a 2-year cycle. According to the historical documents, the red drought occurred in Mongolia in 68 and 46 B.D. and 1248, 1254, 1337, 1372, 1727, 1827, 1952, 1854, 1860, 1882, 1884, 1885, 1892, 1927, 1935, 1941, 1944, 1946, 1951, 1968, 1970, 1972, 1980, 1986, 1988, 1989, 1991 A.D. The drought may be classified with respect to its intensity as slightly droughty - when the grassland yield is poor, droughty - the yield is very scanty, red drought - no vegetation growth at all. When drought lasts for years the ground water's level lowers down, no vegetation flourishing raining incessantly.

The quantitative characteristics of drought may be estimated by different drought indices and vegetation index (meteorological satellite-based data). According to a drought assessment index derived by D. A. Ped the drought occurrence tends to increase in Mongolia since 1940. If in 1941-1950 a drought extended to over 50% of the country's areas occurred 3 times, in 1951-1960 and in 1961-1970 once, in 1971-1980 twice, then in 1981-1990 it recurs four times.

The soil degradation and depletion is intensified when the desertification-related natural factors are accompanied by anthropogenic actions. It can be illustrated by the state of affairs in Mongolia over the last 40 years regarding such factors as:

utilization of grasslands without any rotation for an extended period

woods and forests have been destroyed and cut down in larger quantities for wood firing purposes

powerful chemical substances have been applied to protect vegetation and liquidate pests due to which many soil micro organisms have been destroyed

the irrigation activities not carried out according to a rational schedule, has resulted in the soil salivation and swamping processes developed

due to such activities as geological prospecting, motor transportation and military actions intensified the soil technogenic erosion and degradation rates have increased

During the last 30 years the total number of livestock has increased in Mongolia by 44 % while the volume of grasslands reduced by 20%. Due to the overgrazing of the existing grassland its yield per hectare has dropped by 19-44%. On the country's scale there are 1,222 square kilometers of grassland reserves of which 24% are exposed to erosion (over 50%), vegetation diversity changes as for 7.7 million hectares of grassland.

Over the last 40 years when agriculture started developing in the country 46.5% of arable rotation areas are recorded to suffer of moderate and high degree of erosion.

Nearly 70% of the abandoned land are not cultivated due to heavy soil degradation. The amount of humus in an erosion-exposed area is reduced by 29.3-48.7% which should be assessed as disastrous for our country with its poor soil resources.

Another factor leading to the soil degradation is a lack of forests. Nearly 10% of the country's territory is covered with forests but its scarce forest reserves are being reduced due to the intensive timbering and logging, destroyed by forest fires, or by insects. Annually 10-14 thousand hectares are cut down, 2,3-2300.0 thousand hectares of land destroyed due to fires, approximately 100 thousand hectares of forests are damaged by insects.

It is the other reason for Mongolian rivers' waters being shoaled along with an increasing threat of floods. The saxaul bushes growing in the Gobi and desert zone are increasingly being applied as fuel which promotes the sand drifts. In a period between 1975-1990 the average vegetation duration of saxaul bushes is become as short as nearly a half of that recorded previously and an area with growing younger saxaul bushes decreased by 34.2% and that with medium age bushes - by 42.0 thousand hectares, accordingly.

2.3. Winds and storms

a) Blizzards

One of most disastrous meteorological phenomenon that causes in a very brief time greatest damages to an economy with grassland animal husbandry is blizzard which is next to drought and desertification phenomenon with respect to its harmful consequences. On estimating the damage caused by blizzards occurred in the eastern part of Mongolia in between 1980-1984 it is established that on the average, 740 thousand US\$ damage was caused by one blizzard (D.Myagmarjav, 1987). If blizzards are recorded to occur in the country's desert regions and the Depression of Great Lakes comparatively rarely (about one day per year) in the Khangai and Gobi boundary areas it makes up 10-15 days and in the Khyangan range's western part up to 20 days.

In Mongolia a blizzard that lasts over 9 hours and is accompanied with over 16 m/s winds is qualified as of special danger. Blizzards to continue less than one hour or over 12 hours not occur so often, the occurrence of blizzards which duration ranges between 1.0-3.0

hours is 30%, of 3.1-6.0 hours - 20-30% and of 6.1-9.0 hours - 15% . According to the historical data, there are approximately 30-60 hours, on the average, of blizzards occurring in the Khangai and Gobi boundary area and in the eastern steppe. During the snowstorms cattle going downwind and the herdsmen following their cattle are frequent to get lost and freeze to death. Also due to winds blowing from the south the cattle pens and corals are snow-bound and flocks of cattle could be buried under snow in their pens which occurs sometimes. If winds are blowing from different directions, the snow around the bushes and feather grass is drifted over by snow and then even camels can not survive without fodder in the Gobi steppe. If we consider some facts referring to snowstorms occurred during the last 30 years, it turns out that:

during a heavy blizzard happened on April 15-21, 1980 which extended to a half of Mongolia's territory, the wind speed reached sometimes 40-55 m/s and the blizzard that lasted over 60-70 hours killed 43 persons and 0.9 million head of cattle.

during the March 19-22, 1987 blizzard occurred on the territory of Khentii, Sukhbaatar and Dornogobi aimags claimed the lives of 19 people and 37 thousand head of cattle

during the snowstorm occurred on January 18-22, 1988 on the territory of Dornod, Khentii, Sukhbaatar and Dornogobi aimags which continued 30-37 hours 6 people died and 114 people that were tendering their cattle had to stay overnight in the outdoors due to which 5 people froze to death, 30 gers (national dwelling) fell down, 3 buildings' roofs were blown off with the wind, nearly 10 thousand head of cattle perished and 720 cattle pens were blocked with snow

during the heavy blizzard raged on May 5-6, 1993 and covered the territories of 6 central aimags of Mongolia 16 people lost their lives, about 100.0 thousand cattle perished and such examples can be continued.

b) Dust storms

Mongolia is regarded as a country where dust storms are rather common. The dust carried with the winds from the Central Asiatic Gobi desert has definite impacts upon the countries of Eastern Asia. On the other hand, the dust risen and carried away by the wind is considered as one of the major causes of soil erosion. Violent dust storms sometimes hamper the driving of cattle to another pastures and they can block the road traffic. People staying in the steppe overnight are frequent to get lost and freeze to death. A strong dust storm that can be seen in the Mongolian Gobi called by the Mongolians "ugalz" (simoom). Dust is often carried away when the wind is strong and there are plenty of such material as sand and dust available so in the Mongolian gobi the number of dust days is 30-60 per year. The most dusty place in Mongolia is the Mongolian sand's southern edge where annually the amount of dust days accounts for 660 hours in total for 124 days. A dust

storm is likely to last for about 3-6 times, but in springs there are examples when it blows for up several days.

Since the 1960s the process of urbanization intensified, a new economy's sector of agriculture appeared, the soils started being ploughed in rotation, cooperative movement overwon, the livestock was specialized by its kinds and placed en masse in one place to be tendered by specialized brigades; new industries of geology, mining and motor transport developed, the soil erosion coupled with the Gobi aridisation started developing and the threat of dust storms increased. It can be easily illustrated by the fact that the number of dust days has increased nearly 3-4 times during the 90s as compared with the 60s.

If we would take it by decades then in the Gobi aimags the number of dust days was 16, on the average, during 1960-1969, in 1970-1979 it constituted 23 days and in 1980-1989 has risen up to 41 days.

There are neither reliable information nor definite criteria to assess the information on the damages resulted from dust storms. On November 27-30, 1991 a strong dust storm with gusts achieving 28-40 m/s swept through territories of the country's 12 aimags, approximately 51.5 thousand square km of arable lands were left bared without topsoil so that there were no possibilities for livestock grazing on the pastures.

According to the estimates provided by the meteorological institute's research worker d. Jamiyanaa, annually 4,000 tones of sand and dust are being carried away into the atmosphere out of an area of 1 square km in the region of Zamyn-Uud.

c) Strong wind

Annually strong winds with gusts speed coming up to over 15 m/s occur in the Gobi region 30-76 days, in the steppe region 30-76 days, in the forest steppe region 5-15, in the Khangai, Khovsgol, Khentii alpine taiga regions 1-5 days.

A strong wind (tornado) is recorded to last for about 1-2 hours in winter and summer seasons and 3-6 hours in spring and autumn seasons. The maximum wind speed exceeds 40 m/s in the gobian and steppe region but when a foehn wind overgrows into a tornado its speed is over 40 m/s which is possible to occur anywhere on the territory of Mongolia. The wind with most speed measured was recorded on April 16, 1980 in the surroundings of Ulaanbaatar on top of Morin-Uul reaching 55 m/s and when a strong tornado raged on the territory of the centre of Batshireet soum's Tsagaan us brigade in Khentii aimag on July 21, 1974 its speed exceeded 100 m/s. When a foehn wind occurred in Buyant-Ukhaa on June 19, 1949 at 17.00 its speed was 40 m/s. When a foehn wind was recorded in the surroundings of Ulaanbaatar on July 6, 1973, its speed registered at the meteorological station was 28 m/s but its part stretched through the eastern part of Tolgoit from Buyant-Ukhaa and went by the back of Chingeltei uprooting and bending the forest trees. The most disastrous tornado taken place recently was that happened on June 33, 1997 on the territories of Arkhangai, Ovorkhangai, Tov and Bulgan aimags with a speed of 28-34 m/s when many supports of high transmission lines were downed and many gers and property blown off causing to the citizens only damages in the amount of more than 100 million.

2.4. Flood

Floods occurring in our country fall into rainfall, flash and spring floods.

a) Rainfall flood. Due to heavy precipitation in the river's basin region the river waters overflow against its banks, that is what is called a rainfall flood. According to the historical data, heavy floods took place in 1751, 1785, 1800, 1830, 1854, 1864, 1867, 1869, 1897, 1910, 1911, 1915, 1922, 1927, 1932, 1936, 1938, 1940, 1966, 1967, 1972, 1976, 1993, 1995 and 1997. The precipitation flood has a 4-6, 9-11, 22-26, 40-50, 67-70 year- cycles.

The rainfall flood causes great damages when it happens in more densely populated areas. During July 11-12, 1966, the water level of the river of Tuul increased by 3.12m against its usual level and a flood occurred overflowing the capital city's industrial region, damages caused in the amount of 300 million togrogs, i.e. 7.5 million US\$ and 130 people lost their lives. In 1993 floods were recorded in Uvs, Zavkhan, Gobi Altai, Bayankhongor, Arjhangai, Bulga, Selenge, Khentii aimags when scores of bridges were crushed and many households whose gers were built around the river banks were swept away with the floodwater. According to incomplete data being available, over 1.0 million USD worth of damage was caused.

b) Spring flood takes place usually in the rivers originating from the Mongolian Altai, Khovsgal, Khangai ranges and it was recorded to take place in 1962. This type of flood usually occurs in the spring when following heavy snowfalls the snow melts, the thawing of snow-capped mountains ice and snow goes on intensively.

c) Flash flood is one of natural disasters which claims an immense toll of human lives. After shower rains in mountainous localities their Quaternary loosen sediments are dissolved and washed away with the rainfall water producing thus a flash flood.

This type of flood may occur anywhere in our country. As preconditions for this flood are created by shower rains it is frequent to be combined with foehn winds and hails.

2.5. Hails and lightning

Hails occur frequently in the summer in Mongolia and the damage they cause is considerable . Regions most vulnerable to hail and lightning risk are Khangai, Khentii and Khovsgal mountain regions. The information that is available concerning the damages hails caused is not complete. According to the studies conducted in 1994 on territories of Selenge, Tov, Khentii, Bulgan and Arkhangai aimags being the major granary region of the country, the harvest on 23,164 hectares of arable areas was lost due the hail. It means that estimating harvest per hectare to be 8.8 centners, its economic damage would amount to 713 million togrogs at the rate effective at that period.

On August 4, 1984 hailstones being the size of an egg fell in Khentii aimag's Bayan-Adarga soum and, as locals evidenced, the soil was actually turned upside down. During a hail fallen on July 31, 1972 in Orkhontuul soum of Selenge aimag local people said that when

big hailstones were falling down they heard a whizzing sound as if it were airplanes flying over the place.

On August 4, 1988 a strong shower rain and hail occurred in Nariinteel soum of Ovorkhangai aimag destroying 4 gers and claiming the lives of 14 people as well as loss of 200 head of cattle.

2.6. Biological disasters

Though no fundamental studies have been carried out in respect of biological disasters that occur in Mongolia, they obviously cause substantial damage.

Microtus brandtii mouse

This mouse (*Microtus brandtii*) being an endemic Central Asiatic species is the major rodent spreading over an area of 24 million hectares in Mongolia's gobian and steppe regions that destroys grassland.

The most reproductive period of this mouse which usually happens in arid and dry seasons is registered to take place during 1928-1929 and 1943-1944 in Eastern Mongolia, between 1955-1956 on territories of Khentii and Tov aimags, in 1964-1965 in Dundgobi and Ovorkhangai aimags. As was noted by Dr. Davaa (1968), the outbreak of this mouse with its spread to an extensive area occurs every 12-13-years.

Other insects

1. Grasshopper, dragon-fly and meadow butterfly are widely spread on the pastures and arable areas of Mongolia and big populations of Orthoptera grasshoppers are recorded to be available on the territory of Khovd aimag's Mos and Monkhkhairkhan soums. According to the 1984-1994 studies there are 56 subspecies of 35 species of 4 genera of grasshoppers and 12 species of dragon-fly in Mongolian Altai's alpine pastures. The area damaged only by Orthoptera grasshopper amounts to 422.94 thousand hectares of 16 soums in Gobi-Altai, Khovd and Bayan-Olgii.

A substantial number of harmful pests and insects as the Siberian khur butterfly, oroosgol khur, biir suult, Jakobson's toluur, larch lynx's khuilagch, etc. are spread in the forests of Mongolia destroying woods and trees. The amount of area destroyed by the swarms of insects is as much as that affected by fires.

Table 2. Area of spread of forest pests (1,000 hectares)

| Year | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 |
|------|-------|-------|-------|-------|-------|------|
| Area | 116.0 | 150.0 | 150.0 | 141.0 | 106.0 | 24.2 |

| 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 |
|------|------|------|------|------|------|------|------|-------|
| 26.6 | 32.2 | 24.0 | 27.0 | 33.1 | 25.2 | 29.1 | 32.6 | 135.0 |

3. Such diseases as plague, rabies, brucellosis, smallpox, meningitis and the like could turn into epidemics. Of them most serious consideration shall be given to plague. Many ecologists believe that there is a cycle including such stages as drought and aridisation - outbreak of parasite pests - development of epidemics - people infected. The plague is spread from the natural locus zones of this disease, among them are the Eastern steppe, middle steppe, Ovorkhangai's Baidrag-Tui, Bogd-Buyant, Khankhokhii-Bulnai, Kharkhiraa-Turgen, Siilkhem, Tsengel-Tsambagarav, Khokhserkh-Monkhkhairkhan (B. Avirmed and others, 1993). The plague occurrences recurred in the middle of the 1940-1950s and since mid the 1960s till the 1990s its occurrence is high. As for the plague outbreaks, since the end of the 19th century, during 1880-1894, 1899, 1918-1920 there was an intensification of epidemics natural locus zones, their occurrences risen, too: if in 1931-1934 there were recorded no plague outbreaks, in 1935-1944 there were 1-3 outbreaks per year on the average. It intensified again and in 1946 there was recorded one such outbreak, in 1947 10, in 1948 14 and in 1949 29 outbreaks. During the 1950-1960s it dropped and since 1980s tends to rise again.

2.7. Earthquakes

The entire territory of Mongolia pertains to an active seismic zone. Earthquakes with over 6 magnitude are recorded to take place in Mongolia more than 40 times during the last two decades. Earthquakes with above 8 magnitude occurred 4 times in the 20th century only.

As is clear from this figure most of earthquakes occur in the region of Altai, Khangai, Khovsgol and Bulnain ranges.

Some data referring to the earthquakes taken place on the territory of Mongolia are presented on Table 3.

Table 3. Large scale earthquakes

| Epicentre | year of earthquake | Loca Latitude | tion longitude | Magnitude (Richter's scale) | Intensity in the epicentre |
|--------------|--------------------|---------------|----------------|-----------------------------|----------------------------|
| 1.Bugs river | 1500-2000 | 49.2 | 99.6 | (68)(6.8) | (9) |
| 2.Chikht | 1000-1500 | 49.2 | 90.3 | 7.1 | 9-10 |
| 3.Myangan | 1000-1500 | 45.3 | 97.4 | 7.7 | 10-11 |
| 4.Chandman | 500-1000 | 45.2 | 98.0 | 7.3 | 9-10 |
| 5.Bulgan | 500-1000 | (46.2) | (91.4) | (7.4) | (10) |
| 6.Bij | 500-1000 | 45.7 | 94.1 | 7.3 | 9-10 |
| 7.Bug river | 500-1000 | (41.1) | (98.8) | (7.8) | (8) |

| | | | | | |
|---------------------|---------------|--------|--------|-------|-------|
| 7. Bus river | 500-1000 | (51.1) | (98.8) | (7.0) | (9) |
| 8. Jargal | 500-1000 | (51.4) | (99.9) | (7.0) | (9.0) |
| 9. Malchin | 300-500 | (49.7) | (93.2) | (6.6) | (8.9) |
| 10. Zuun lake | 300-500 | 49.0 | 99.8 | 7.8 | 10-11 |
| 11. Egiin davaa | 300-500 | 47.0 | 99.6 | 7.8 | 10-11 |
| 12. Sagsai | 200-300(1570) | 48.5 | 89.7 | 7.4 | 10 |
| 13. Ar Khotol | 200-300 | 47.5 | 91.8 | 8.0 | 11 |
| 14. Unegt | 1903 | 43.3 | 104.8 | 7.5 | 10 |
| 15. Tsetserleg | 1905 | 49.5 | 97.3 | 7.6 | 10 |
| 16. Bulgai | 1905 | 49.2 | 96.8 | 8.2 | 11-12 |
| 17. Mongolian Altai | 1931 | 46.8 | 89.9 | 8.0 | 11 |
| 18. Shand | 1950 | 51.8 | 100.1 | 7.0 | 9 |
| 19. Gobi-Altai | 1957 | 45.0 | 100.5 | 8.1 | 11-12 |
| 20. Bayantsagaan | 1958 | 45.1 | 98.7 | 6.9 | 9 |
| 21. Buur khyar | 1960 | 43.2 | 104.5 | 6.7 | 9 |
| 22. Mogod | 1967 | 48.1 | 103.0 | 7.8 | 10-11 |
| 23. Uureg lake | 1970 | 50.3 | 91.3 | 7.0 | 9 |
| 24. Takhiin shar | 1974 | 40.5 | 94.0 | 6.9 | 9 |

2.8. Forest and steppe fires

According to scholarly surveys, 55.6% of the country's total area is located in a zone exposed to forest and grassland fires and a considerable fraction of the country's territories covered with forests are in a zone assessed as of highest fire risk. The fire risk rates established basing upon types of forests are given in Table 4.

Table 4. Fire risk rates according to the forest typology characteristics

| Aimags, city | Categories | | | | |
|--------------|------------|----|-----|----|---|
| | I | II | III | IV | V |
| | | | | | |

| | | | | | |
|----------------|------|------|-----|-----|-----|
| 1.Bayan Ulgii | 100 | | | | |
| 2.Uvs | 100 | | | | |
| 3.Khovd | 100 | | | | |
| 4.Zavkhan | 94.2 | 5.2 | - | 0.3 | |
| 5.Khovsgol | 89.2 | 10.8 | - | - | |
| 6.Bulgan | 80.6 | 19.4 | - | - | |
| 7.Selenge | 60.0 | 39.0 | 1.0 | - | |
| 8.Zuunkharaa | 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.Khentii | 87.0 | 13.0 | - | - | |
| 12.Bayan-Uul | 47.0 | 52.5 | 0.5 | - | |
| 13.Ovorkhangai | 95.0 | 5.0 | - | - | - |

As can be seen from the Table 4, 98.5% of the total territory is referred to categories I and II according to the fire vulnerability gradation.

The probability of outbreaks of fire in the country's forests and steppe areas substantially increases in dry periods of spring and autumn. Over 60% of the forest fires are recorded to take place during a period from April to May and 65.5% break out between 12.00-16.00 hours. Although in most cases fire outbreaks were triggered by man's actions (63.6%), there are also natural factors leading to fire outbreaks. In other words, when there is plenty of inflammable material in the forest, the weather is dry, winds speed is higher, all this provides favorable preconditions for a fire outbreak. There is a very insignificant probability of forest fire outbreak when the amount of precipitation is over 2.0 mm. Fires raging in arid pastures is often associated with the wind. When on April 11, 1986 a violent wind rampaged through the territories of eastern aimags, a fierce steppe fire covering 711 thousand hectares of Dornod aimag's 7 soums killed 33,700 head of cattle, destroyed over 160 pens, 90 gers, its damages were estimated to amount to 10.6 million togrogs, and 14 people were injured and died. According to the recent statistics, 50-60 forest fires and 80-100 grassland fires are recorded to occur in Mongolia every year. The fire occurrence, and the amount of area affected by fire are shown in Table5.

Table 5. Outbreaks of forest fires and amount of area destroyed by fire (thousand hectares)

| Year | Outbreaks | Affected area | Average area |
|------|-----------|---------------|--------------|
|------|-----------|---------------|--------------|

| | | | |
|-----------|-----|-------|------|
| 1971-1975 | 240 | 521.3 | 21.7 |
| 1976-1980 | 524 | 107.2 | 0.20 |
| 1981-1985 | 212 | 335.9 | 1.58 |
| 1986-1990 | 315 | 850.2 | 2.6 |
| 1991-1995 | | | |

As for the amount of area affected by fires starting from 1980, some 25% of the country's forest resources or 2.4 million hectares of land were destroyed and their damages amounted to 32.6 billion togrogs in 1996.

2.9. Radioactivity and chemical toxic substances

Although there are no permanent large-scale sources for radioactive contamination in Mongolia as, for example, nuclear power stations, etc., the country is situated between two nuclear powers, namely the Russian Federation and China, located nearby its frontier zone are powerful nuclear power stations already functioning or to be put in operation in future. So far, we have not been provided with relevant information concerning the consequences entailed due to nuclear tests made during the 1960s on the territories of Kazakhstan and China and in the atmosphere. The utilization in great quantities of coal (Baganuur, etc.) with its high radioactive and thorium concentrations, when the air pollution rate of the city increases, accordingly, the content of radioactive substances (radon 222, etc.) in the atmosphere increases as well which has serious effects on health of city residents increasing the rate of lungs diseases .

According to the general assessment made by the National University's Radiation control laboratory with respect to the rate of radioactivity in the atmosphere over Mongolia it is established to be equal to 12-17 mcrad/hours. The content of radon in the atmosphere is about 2.2 bc/m³ in the summer but in the winter with the start of heating season it is recorded to rise thrice. The complex beta activity of the atmosphere is likely to grow to 2.4 mbc/m³ in the winter from 0.5 mbc/m³ in the summer. After the Chernobyl nuclear plant accident in 1986 it rose to 264 mbc/m³ which was as much as 200 times in comparison with the normal background and only after 25 days it was registered to drop to its usual rates.

The uranium complex beta activity constitutes for Ulaanbaatar 8.9-29.9 bc/m². But right after the Chernobyl power plant accident it was registered to go up 100 times compared with its usual rates amounting to 183.3 bc/m² and only after a week since the accident its values became normal.

During the last few years chemical substance and products are being applied in our country in ever increasing quantities. If in 1990 about 1,000 kinds of chemical substances were used in Mongolia, according to a survey carried out in 1994, 1297 enterprises and business entities were established to be applying 3,774.3 tones of chemical substances of ,2765 kinds (including more than 10 thousand pharmaceutical substances and

preparations) out of which 52.4 tones of chemical substances waste were disposed of to open landfill sites, of which 68 were released into the atmosphere, 790 into the water, 600 kinds of chemical substances were released in the soil. Parallel with that over 100 tones of chemical substances which fail to meet relevant requirements for use are being stored in warehouses. Given on the national level, of currently being used chemical substances 350 kinds of substances are to affect the nervous system, 720 are harmful for the skin, 650 have asphyxiating effects, 543 affecting emotionally (fear), 130 affecting the mental faculties, 2,300 kinds of general impacts. During the last decade there have been registered 8 cases of large-scale poisoning related with the application of chemical substances, or their storage as a result of which 587 people were recorded to be sick and 17 persons died.

The storage and protection of chemical substances is inadequate. For instance, out of the total amount of chemical substances used on the country's scale, some 56.7% are stored in warehouses designed for this purpose, 20.8% in warehouses not designed for this purpose, 11.7% in the outdoors, 9.8% in offices and premises. In Ulaanbaatar such dangerous toxic substances as chlorine and ammonium hydrates are stored concentrated in one place in large quantities.

2.10. Other hazards

Natural disasters, their combined socio-economic and ecological impact are not confined to a few of above mentioned phenomena only. Any phenomenon and conditions that exceeds some certain limits may turn into a disaster. Among them are such as early frosts especially if they last for a long period of time, extremely high air temperatures, heavy rains fallen after the shearing of sheep, heavy snowfall in spring and autumn, water pollution exceeding its admissible limits resulted from accidents, air contamination level overrating due to unfavorable weather conditions, avalanches from the snow-capped mountains, snow slides, landslides, contamination penetrating from neighboring countries through air and water, shortly, any phenomenon and event that takes place out of its season may have disastrous consequences.

Of the above spring and autumn snowfall shall be regarded specifically. It differs from the zud. For example, during March 15-21, 1993 a 57-62 mm rain over the southern slopes of the Khangai range resulted in a 34-90 cm snow cover (snow drifts with a depth up to 160 cm) which was reported up to the middle of April causing substantial damages as the losses of 840 thousand head of livestock and the death of some 40 people because the roads were snow-blocked and they could not get any medical aid and care.

There are many cases when heavy rains in the summer (herdsmen call it "cold rain") resulted in losses of livestock, especially sheep, due to their chilling effects upon the sheep which had not adapted yet after their shearing and even herdsmen are reported to be frozen to death as well. According to surveys carried out, 84.8% of rains fallen early in summer had such effects that the driving of livestock to pasture grazing was delayed, if over 5.0 mm rainfall continues for a period over 8 hours combined with below -8°C air temperatures or accompanied with winds lasting even for a short period, it leads to losses of sheep, anyway. On the night of June 24-25, 1974 a heavy rain with strong winds that lashed on the territory of Sukhbaatar aimag killed 60 thousand head of sheep.

The cases of livestock losses due to cold rains most likely to occur in the steppe and gobian regions where there are no running water sources. In other words, the sheep after being sheared were not treated properly (by washing in cold water, etc.).

By now, it is recorded that under the influence of global warming, the rivers and lakes' ice cover tends to become thinner so there is a growing number of car accidents taken place when the ice broken down under the vehicles.

In connection with growing foreign contacts and ties of Mongolia and climate change going on the global scale some new, biological, disasters might be added to the list of disasters as well.

Due to late summer and early spring frosts the probability of agricultural yield losses is to increase. On June 4, 1992 -5...-12°C frost was recorded in the country's agricultural regions as a consequence of which the crop harvest on 20 thousand hectares of arable lands, of potatoes on 788 hectares, of vegetables on 73 hectares, of berries and fruit on 36 hectares of land and early vegetables on many hectares of land were lost

In connection with global warming the permafrost will gradually reduce, the soil heaving and ice crust formation processes are likely to take place in addition. According to some statistics, buildings in about a score of villages were crashed due to the soil heaving phenomenon.

3. Response to Natural Disaster

The response to natural disaster includes immediate measures taken on the part of the Permanent Emergency Commissions of all levels (state, aimag, capital, soum and district), ministries, agencies, economic entities, organizations and citizens in the event of natural disaster or after it in order to save human lives, protect property and cope with its effects.

Responsive measures shall be provided for in aimag, capital city, district's civil defense plans and also basing upon the specific features of a disaster occurred and its effects measures to cope with its effects shall be determined by the Permanent Emergency Commissions of all levels (state, aimag, capital city, district).

Aimags, capital city, districts shall specify in their civil defense plans measures to be taken in respect of each type of disasters indicating their time limits and people (organizations) to be responsible for when a natural disaster occurs or is pending and organize actions to respond to the disaster and cope with its effects in accordance with the above plans at the national, aimag, local level.

On receiving the information about any disaster occurred at the national level, in conformity with the decisions issued by the State Permanent Emergency Commission, relevant measures for coping with its effects with combined efforts of military units of the civil defense being its major force and 7 squads stationed in aimags and localities for combating natural disaster, are undertaken by the Civil Defense Department of Mongolia. Apart from the major civil defense forces, also efforts and resources of ministries, specialized organizations and aimag, capital city, soum and district organizations and citizens are involved in the measures for coping with the effects. If a disaster has covered

an extensive area, or coping with its effects is beyond the capacity of the above forces, then units and squads of the armed forces and other army units are mobilized to deal with response to disaster.

3.1. Challenges arising in connection with the elimination of the consequences of natural disaster

In the course of arrangement of actions designed to cope with the consequences of a disaster, some challenges are to arise depending upon the specific features of a disaster, its risk, planning, organization, the level of forces' preparedness, capability to function, etc.

Warning information sent out regarding the type of a disaster, within the established time limits, or, not, if there were no possibilities to notify about it, renders to certain extent influence upon the actions on mobilizing forces and coping with the disaster consequences.

If it is predicted in advance where and when a climate dangerous or extremely dangerous phenomenon is to occur, when actions to issue preliminary public warnings, prevent from it and minimize its consequences are undertaken, then a possible damage that the population and their property would sustain potentially decreases to due extent and nothing to hinder the activities aimed at eliminating its consequences are to arise.

But during climatic force major circumstances as the ruin flood and earthquakes that are to develop in a very short span with a greater intensity and which at the current level of modern science and technical, technological methods are not possible to predict, substantial damages are to be caused to the population and property and lots of challenges are to cope with in arranging and carrying out actions for eliminating its consequences. For example, a ruin flood occurred in 1982 in Ulaanbaatar and a strong wind storm raged in 1997 in Ovorkhangai, Arkhangai and Bulgan aimags occurred all of a sudden and no measures to warn and notify the population were carried out.

Sometimes, when warning information on natural disasters is not sent out on time or the warning information is wrong, all this only hinders the actions for eliminating the consequences. For example, in the spring of 1991 when the warning issued from the Meteorological Institute and saying that a strong blizzard was expected in the three eastern aimags, was announced wrong over the local radio that a strong dust storm was to occur, due to which the local authorities, herdsmen and residents instead of providing preparations to protect their livestock from the blizzard were engaged in activities for the prevention from and combat with forest and steppe fires due to which the human lives were lost and 26 thousand head of livestock perished covered with snow and much difficulties had to be cope with to combat the snow and severe winter conditions and eliminate their consequences. Also, sometimes it turned out that in some soums their system to transmit warning information system did not function properly or at all, and even if the information was received duly, the soum's communications officers conveyed the information to the respective persons and organizations with a delay, and the population who did not get any practical experience in carrying out actions in keeping with the warning did ignore it.

As sooner actions for eliminating the consequences of a disaster could be undertaken, accordingly, the more successful their outcome would be and it is more appropriate to

carry out such actions within a period of 2-3 weeks. In practical life, warning information is not being sent out in due time, the preparedness and preparations of organisation to combat disasters are inadequate, sometimes due to a coincidence with the festivities and celebrations observed throughout the country the actions for liquidating the consequences of a disaster are delayed dragged out considerably and fail to give due results.

Another challenge to hinder the actions for liquidating the consequences of a disaster is that there are no opportunities to eliminate the consequences of a disaster with the efforts and forces of this or that locality's only or the reserve means and technical means of management control system of an organization dealing with the combat with disasters are damaged. For example, when a steppe fire breaks out annually in Dornod aimag covering the territories of many soums, the communication between the soums and bags were broken off because the supports of the communication lines linking the soums and bags were destroyed due to the fire which hindered actions on assessing the fire situation and mobilizing man power and forces and means to extinguish the fire.

While there are possibilities to take pictures of a forest and steppe fire disaster area applying the Ministry of Nature and Environment's Information and Computer Centre's GIS system to clear up the situation in the region, sometimes it is necessarily required that the state, aimag and local commission visit the disaster area to clarify the situation on the spot and meet with the residents of the soums, bags and households when there are no other ways to communicate with due to the effects of the disaster.

There are no small air planes and aircraft's and amphibian with proper technical means specifically designed to conduct observations and inspection from the air and the ground and as a result of that a few MI8 planes of MIAT company and of the armed forces are being hired at a high price to apply for this work. The aimags and local authorities have no planes and aircraft's of their own due to which they have no possibilities to carry on independently observations and inspection and, consequently, make decisions for themselves during the disaster occurrence.

Under the current circumstances of a market economy the supplies required for the actions taken to eliminate the consequences of a disaster are the issue of concern. It includes alongside supplying people affected by a disaster, with foodstuffs, warm clothes, temporary accommodation facilities, gers, tents, medicines and medical aids also the supply with food of those people who are mobilized to eliminate the consequences of a disaster.

In providing the supplies, the financial issue and relief aid to be granted to the victims based upon the estimates of the aimag, locality's damages suffered, the activities on raising, distribution and transportation of relief commodities and materials from the reserves of the standing emergency commission, economic entities, organizations and citizens are dragging out.

On the other hand, in the budgets of some aimags and localities expenses required for combating disasters are not provided for and reserve funds to reimburse the expenses required for liquidating the consequences of a disaster are not set up from the local budgets due to which the expenses of the organizations and citizens mobilized to liquidate the consequences of the disaster are not possible to be covered for each of such cases. On account of all this, there is a negative tendency towards evading to take part in actions for

liquidating the consequences of a disaster shown apparently on the part of economic entities, organizations and citizens.

Some challenges are to crop up during the arrangement of the actions on liquidation of the disaster consequences in connection with the fact that economic entities, organizations and citizens being involved in actions for liquidating the consequences of a disaster and rescue operations are not informed properly of the structure, organization and policies and strategies of the organization in charge of the action on combating the disaster, and some specialized establishments' experts have not been duly trained, so it causes difficulties in ensuring their interactions and co-ordinate the management. Such was a case during the 1997 plague disease incidence.

In the course of actions for liquidating the consequences of a disaster requests are raised on the part of lots of international establishments and foreign countries on providing a relief aid but due to a delay in submitting estimates on the expenses required for the liquidation of a disaster and reliable information on the amount of damages caused from the local administration there are frequently occurred such difficulties when the aid promised to be granted from international establishments could not be obtained and had to be given back or the assistance failed to meet the requirements of the given aimag and locality or be delayed. For instance, during the 1996 year's fire a 165 thousand US dollar worth assistance provided by international establishments and foreign countries was not taken and distributed among aimags and soums in due time owing to the fact that the authorities of the aimags and soums affected by the disaster failed to notify in a timely manner the standing emergency commission of their expenses incurred in connection with the liquidation of this disaster.

3.1.1. Challenges in responding to natural disasters

In the course of arrangement of actions designed to cope with the effects of disasters, some challenges are to pose depending upon the specific features of a disaster, its severity, planning, organization, the level of forces' preparedness and capacity to action, etc.

Alarm warning information shall be disseminated within the established time limits regarding the type of a disaster, otherwise, if there are no possibilities to disseminate the warning information about the disaster, it may affect, to certain degree, the actions for coping with its effects and mobilization of forces and resources.

If forecasts are made in advance about such dangerous or extremely dangerous phenomenon defining where and when it is to occur, and, accordingly, measures are undertaken to disseminate alarm warning information, ensure protection and mitigation of its effects, then its possible effects on the population and property would decrease to due extent and the measures undertaken for coping with its effects would not be hampered.

However, during such dangerous phenomena as flash floods and earthquakes developing rapidly and with great intensity which not always are possible to forecast depending upon the level of scientific and technological development, the population and property are seriously affected and lots of challenges are to be faced in arranging and carrying out actions for coping with their effects. For example, a flash flood occurred in 1982 in Ulaanbaatar and a storm raged in 1997 in Ovorkhangai, Arkhangai and Bulgan aimags

started all of a sudden and no measures for alarm warning and information dissemination were undertaken.

Sometimes it turns out that the warning information about natural disasters was not timely disseminated or the warning was wrong, posing thereby additional challenges to the measures for coping with effects of disasters. For example, in the spring of 1991 when the warning made by the Meteorological Institute about a strong blizzard to occur in the three eastern aimags, was misunderstood and the local radio announced about a strong dust storm, measures for prevention of and combating forest and grassland fires were undertaken by the misinformed local authorities, herdsmen and locals instead of preparations for protection of their livestock against the blizzard which resulted in the death of people, 26 thousand head of livestock were lost during the blizzard and much efforts were made to combat the heavy snowfall and zud and cope with their effects. Also It has been established that in some soums their communications system for disseminating warning information was not functional, and even if the warning information duly disseminated was received, the soum's communications officers delayed in conveying this information to respective officials and organizations, and the population who had neither practical experience nor training in undertaking measures due to be provided according to the warning information just ignored them.

The sooner actions for coping with the effects of a disaster are undertaken, the more effective they are. It is more appropriate if such actions are carried out within a period of 2-3 weeks. In practice, warning information is not disseminated in due time, the level of preparedness and preparations of organization to combat disasters is inadequate, sometimes the actions for coping with the effects of a disaster, due to their coincidence with the festivities and celebrations observed throughout the country, are largely drugged out and, accordingly, their effectiveness is low.

Another problem to hinder measures for coping with disasters is associated with the lack of capacities to cope with the effects of disasters with the efforts of a given locality only or the resources, forces and technical facilities of the management system of organizations combating disasters are destroyed. For example, when a steppe fire breaks out in Dornod aimag affecting many its soums, the communication between the soums and bags often fails because the poles of the communication lines linking the soums with bags are destroyed by the fire hindering thereby activities on assessing the present situation and mobilizing manpower, forces and resources to extinguish the fire.

Essential for effective organization of actions for coping with disasters are assessments of damages resulted from disasters, monitoring being carried on and assessments of the present situation made in shortest time possible during the implementation of actions for coping with effects.

While there are possibilities to clear up the situation in the region through using photographs of a wildfire-disaster area taken from the air by the Ministry of Nature and Environment's Information and Computer Centre's GIS system, sometimes it is needed that visits be made by the state, aimag and local commissions to the disaster area in order to get acquainted with the situation on the spot and to arrange meeting with local residents of soums, bags if other communications facilities are damaged due to the disaster.

As there are no small aeroplanes, aircraft's and amphibians equipped with technical means to conduct air observations and monitoring several MI8 planes of MIAT company and of the armed forces are being hired at a high price to apply for this work. The aimags and local authorities have no planes and aircraft's of their own due to which they have no possibilities to carry on independently observations and inspection and, consequently, make decisions for themselves in the event of disasters.

Under the current circumstances of a market economy there is a problem in respect of supplies required for the actions undertaken to cope with effects of a disaster. It includes along with supplying people affected by a disaster, with foodstuffs, warm clothing, temporary shelters, gers, tents, medicines and medical aids, also the supply of food for those people who are mobilized to cope with the effects of a disaster.

In providing the supplies, activities on raising, distribution and transportation of relief commodities and materials allocated from the reserves of the State Permanent Emergency Commission and provided by economic entities, organizations and citizens are carried out basing on the estimates of aimag and locality's damages, for solving the issue of finance and providing relief aid to the victims, which usually drags out.

On the other hand, in the budgets of some aimags and localities expenses required for combating disasters are not provided for and reserve funds to reimburse the expenses required for coping with effects of a disaster are not set up from the local budgets and, thus, expenses of organizations and citizens mobilized to cope with effects of disasters are not possible to be covered for each of such cases. As a consequence of all this, there is a growing tendency for economic entities, organizations and citizens to evade participating in actions for coping with disasters.

Some challenges are to pose during the arrangement of actions for coping with disasters in connection with the fact that economic entities, organizations and citizens involved in actions for coping with disaster and rescue operations are not informed properly of the structure, arrangement, policies and strategies of the organization being responsible for combating disasters, some of staffs of specialized organizations have not been duly trained, which makes it difficult to ensure their interactions and co-ordinate their management, as it was observed during the incidence of plague in 1997.

In the course of actions for coping with disasters many international establishments and foreign countries offer their assistance but due to a delay in providing estimates on the expenses required for coping with disaster and information from the local administration on the amount of damages there frequently arise such difficulties when the relief aid that international establishments promised to grant had to be given back or the assistance failed to meet the requirements of the given aimag and locality or too delayed. For instance, during a fire occurred in 1996 relief assistance in the amount of 165 thousand US dollars provided by international establishments and foreign countries was not taken and distributed among aimags and soums in due time because the authorities of the aimags and soums affected by the disaster failed to timely notify the Permanent Emergency Commission of their expenses incurred in connection with coping with the disaster.

3.1.2. Requirements for effectiveness of measures in response to disaster

According to international practical experience, there are two major factors as keeping the authorities and forces properly informed and maintaining the forces' capability and preparedness to action, that are required to ensure the effectiveness of actions designed to cope with disasters. Without considering the above two important factors no actions for coping with disasters would be effective even if there are provided well-considered plans, adequate management and organization system and highly qualified experts. Moreover, the efficiency of responsive actions depends directly upon the measures to ensure the preparedness and the relevant policies to be pursued in this sphere, planning, arrangement of management, training and many other matters will be considered in the following chapters.

It is important to ensure uniformly the preparedness of forces and means to be applied in actions for coping with disasters, since sometimes non-preparedness of just one organization badly affects the final outcome of the disaster combating actions. In view of this, it is desirable to strengthen with respect to the system of management to be provided during a disaster period, the capacities of specialized organizations and agencies of aimags, capital city and districts along with that of the military units of civil defense being the major civil defense force, structures responsible for combating natural disasters in seven aimags

As is clearly seen from the state of affairs concerning the organization at national, aimag and local levels of responsive actions for coping with natural disasters occurred recently in our country, the management and co-ordination of efforts during a disaster period is improper, there are no regular systems existing at national, aimag and local levels, co-ordination and control in the disaster affected area are often lost owing to which the responsive actions are delayed, and, accordingly, the consequences exacerbated, as it was during the fire in the spring of 1996. It evidently shows that the current state of organization of actions for coping with disasters carried out at levels of aimags, capital city and its districts is inappropriate for the current, market economy's conditions and can not meet the present day's requirements.

3.1.3. Improvement of response to natural disasters

1. System of arrangement of actions in natural disaster period

It is desirable that the system of actions to be carried out under the disaster period in the conditions of Mongolia be arranged at national, aimag, soum and local levels in the following way:

Its structure shall include the aimag's governor, the aimag and soum's emergency force (team), the mobilization commission, planning, forces and means rear supplies, finance and accounting divisions.

The planning, force and means division shall have its subdivision to be responsible for the current situation assessments, determination and planning of requested forces and means, mobilization and demobilization of above forces, the rear supplies division shall have its

services and supplies subdivisions, the former being comprised by the communications, medical care and foodstuff provision groups, the latter consisting of the supplies, accommodation, means and facilities provision, mobile machines and appliances supplies and service.

The financial and accounting division will have its subdivision dealing with working hours record, procurement of technical means, compensation issues.

On arranging in such a way the management and control during a disaster period possibilities will be provided to ensure proper co-ordination in solving such issues as the planning of actions to combat and respond to the disaster, forces, rear supplies, funding and finance, which would be more cost-effective.

This system of management and control without a permanent staff of its own provides for non-staff personnel to be formed by the decision of governors of all levels (aimag, capital city, soum and district) to function only during the period of a disaster and including staff of governor's offices' as well as managerial staff and executives of other economic entities and enterprises to be mobilized on a temporary basis.

The emergency team will include persons assigned by the mobilization commission, and relevant technical means and will be composed structurally of its chief to be in charge of the arrangement and control over the rescue and coping with effects on the spot, or a specialized mobile group or team's head. The number of senior chiefs and a mobile group's heads will be determined depending upon the extent of a disaster and opportunities available with respect to the forces and means and it would be most appropriate if from 7 to 10 persons would be under one senior chief's command.

Management system organization scheme to operate under crisis conditions Aimag's Governor

Emergency team (senior chief, mobile groups and teams' heads)

Mobilization commission (Planning, forces and means division (Force and means subdivision, Situation assessment subdivision, Planning subdivision), Rear supplies division (Communications subdivision, Medical care subdivision, Foodstuffs and accommodation subdivision, Mobile machines and appliances supplies and service subdivision), Finance and accounting division (subdivision on operation (working hours) records, Technical means purchase subdivision and payment and accounting subdivision)

3.1.3.2. System of communications and alarm warning and information

The alarm warning and information communication system being of special significance for a success of responsive measures to cope with disasters shall comply with the following requirements:

early warning about the preconditions for a natural disaster to occur

if there is any doubt whether or not the pending natural disaster predicted would really occur, alarm warning information shall be disseminated to a limited number of people,

notably managerial staff in order to avoid disturbing the smooth operation of economic entities, organizations and residents.

as soon as the alarm warning actions are accomplished respective decisions and resolutions shall be issued concerning the response to natural disasters and how to cope with its effects

immediate actions shall be arranged to make the public informed of the decisions passed

With respect to our country it is necessary to change the former four-alarm signal system designed for announcements in the wartime as the "air-raid alarm", the "all-clear", the "radiation alarm" and the "chemical alarm" approved by Resolution No. 170 of the government of Mongolia to be replaced by such alarm signals as the "earthquake", the "flood alarm", the "fire alarm", the "human and animal epidemic disease", the "tornado alarm", the "blizzard alarm", etc. which shall be explained to the general population in most plain and explicit form through the aimag, capital city and district's civil defense headquarters, with establishing required training schemes to train people in their application.

Once the aforementioned alarm warnings are given it is required that all schools, kindergartens, offices and public places be closed, the preparedness of the emergency power plants and other system lines' equipment for operation be checked, the supplies of foodstuffs, potable water, warm clothes, firewood and other necessities be made by residents and along with that measures required to prepare the evacuation of people, etc. shall be taken in the case of emergency.

In order to ensure that actions to respond to disaster are carried out in the shortest time possible and with most efficiency a system is needed to be set up to arrange response to natural disasters and ensure the co-ordination and general management of actions of managerial staff, forces and organizations involved in. For this, the actions to respond to disaster shall be carried out in relevant stages. There are three rates (levels) of the civil defense's preparedness state as the "day-to-day", "heightened" and "general". Though the above mentioned preparedness rates are easy to put into practice in respect of the headquarters, military units and divisions referring to the civil defense system as well as other military bodies but the civil organizations' leadership has little experience and knowledge of operations that shall be performed according to the above levels.

Therefore, it is desirable that information on the main stages of actions in response be provided to civil organizations in a plain and intelligible form adopted to their specifics, to be guided by in their further activities. In particular, actions in response may be carried out proceeding through such its stages as alarm warning, assemble managerial staff and forces, ensure their preparedness to action, start their action and the like. The advantage of a step-by-step implementation of responsive actions is that the head in charge of alarm warning dissemination could stop the action without proceeding to its next stage if it turns out that the disaster warned about is not to occur. Thereby opportunities will be provided to ensure the preparedness to responsive action for all involved organizations and at the same time it will allow to avoid undertaking unnecessary and thus inefficient activities.

Proper regulation and co-ordination of joint efforts to respond to disaster will be the major condition enabling to use to full capacity all the organizations involved in disaster

combating actions, ensuring its due performance and avoiding any faults and shortcomings. In foreign countries, the co-ordination of jointly implemented actions is carried out from a specifically designed centre of command and co-ordination furnished with special equipment. Such a centre on co-ordination and management is needed to be set up with the State Civil Defense Department to conduct operation on the national level.

In order to successfully carry out responsive actions it is necessary to provide a reliable communications system.

Another important matter relating to the organization of responsive actions is a communications system supplied with its own power sources which would allow it to operate when or if it turns out that the basic communications system can not function properly due to the damages received during the disaster occurrence.

Regarding such specific features of Mongolia as its great territorial expanses, scarcely populated, with a harsh continental climate, etc., the communications system shall comply with the following requirements to be able to operate in the event of disaster:

to cover the country's cities, settlements, districts and industrial regions with comparatively dense population and concentration of industries (a communications system set up basing upon fixed communication units)

organize the communications system in such a way that it will cover every corner of the country, be linked up to the national and international communications systems and provided with opportunities to communicate through telephone, fax, computer and satellite systems (a mobile communications system)

be provided with facilities allowing to work in co-ordination with a public communications system but not limited to its capacities, if need be

be possible to be supplied with power from a low-power electrical generator, compact, suitable to be used in field conditions and easy to be handled by people without specialized training and education

be strong enough to withstand any hard conditions of operation including shaking, dusty and moist environments and harsh climatic conditions (temperatures ranging from -50 up to +40°C, rainfalls, snowfalls, etc.)

made applying the latest technical and technological achievements and in compliance with the standards and requirements established by the master plan for developing the communications system of Mongolia.

Proceeding from the above, a fixed communications system is required for the state civil defense headquarters, its units and squads to operate under the disaster conditions, being independent from the public communications network. A SW radio receiver which capacity allows to maintain a radio contact at a distance over 500 km, is considered to be the most appropriate one. At present the Khovsgol, Arkhangai, Selenge, Khentii, Dornod and Bulgan aimags' civil defense squads to combat natural disasters communicate with Ulaanbaatar applying such communications means. In future it is desirable to extend the radio communications network to all aimags' civil defense headquarters.

For ensuring immediate actions of the specialized units involved in actions in response to natural disasters, their leadership working in the disaster-affected area a mobile radio communications system is of special significance.

This system shall be comprised by a USW IM radio system to be applied for communications operations in cities, settlements and in the disaster area and a SW radio system which will allow to communicate with Ulaanbaatar. Actions are being taken on the part of the parliament to supply some aimags' civil defense emergency squads with such a communications system.

3.1.4. Improvement of response to natural disaster

It is impossible to carry out effective actions in response without estimates of the damages resulted from disasters, rescue operations and actions for coping with disasters, and many other things that will need to be done. For conducting surveying and inspections and ensuring an adequate assessment of the situation such matters shall be considered and corresponding plans and arrangements made well in advance as air surveying and inspections, arrangement of observations and monitoring in the area, assessments of the situation provided by all organizations and officers concerned with arrangement of actions to combat disasters in the localities close to the disaster area's centre. In most of cases activities on general observation and inspection are required to be arranged immediately in the area where the disaster has occurred.

The information, data received after respective surveys and inspection measures have been conducted, and assessments of the present situation made are of special prominence for undertaking immediate response actions. In view of this, it is necessary to purchase for the State Civil Defense Department low-power aircraft's and aeroplanes as well as amphibious vehicles capable to travel over rough ground and go by water to supply to the civil defense units and divisions and arrange training abroad of experts-observers.

The capability to supply materials, means required for carrying out rescue operations is another factor that enables to achieve a success. The following items are required to be delivered immediately to the people suffered from the disaster when it's over: foodstuffs, potable water, warm clothing, materials to be required to build temporary shelters, medicines, medical items, etc.

The issue of tentative estimates of expenditure to be incurred in the course of action in response which shall be duly reflected in the local budgets and of allocation from the state funds of the above commodities and materials is specified in the State Permanent Emergency Commissions' Charter.

If the responsive actions are not possible to be carried out by ordinary means, along with mobilizing forces and technical facilities of aimags and localities in conformity with relevant laws, it is possible to mobilize the armed forces and other military units and squads to be involved in responsive actions.

For instance, in carrying out actions for coping with disasters military units and squads of the armed forces may help conduct rescue actions, render emergency aid to those affected, arrange field hospitals, supply with foodstuffs, implement clean-up and

disinfecting actions in the disaster zone and organize engineering, transport and communications services.

The training provided to units and squads of the armed forces mobilized to carry out actions for coping with disasters shall comply with the following requirements :

Units and squads of the armed forces shall maintain preparedness to action under any crisis conditions when there is a threat of large-scale disaster to occur in any aimag, locality, city and settlement of the country.

Units and squads shall be capable to organize first-stage response on arriving in the disaster affected zone showing such qualities as self-dependent management, communications, reliable command, and high maneuverability

Units and squads shall maintain preparedness to action round the clock in any weather conditions far away from their place of stationing

Training of high level shall be organized for personnel that will be involved in actions for rescue and coping with natural disaster.

During their actions in the disaster area they shall work in close co-operation with local state and administrative bodies, civil defense headquarters and units, establishing a flexible management system

Within the scope of actions designed to cope with disasters units and squads are desirable to be assigned to act in the following fields in accordance with the armed forces' civil defense task:

carry on air and ground-based observations, determining the level, extent and size of damages

conducting reconnaissance surveying in the disaster area, determine routes and ways leading to the centre of the disaster area

set up a mobile group to deal with rescue actions

assist in rescue work by assigning engineer and technical staff equipped with powerful technical facilities with high cross-country ability

communications units and squads shall take actions to provide radio and telephone communications services with the centre of a disaster area

rear units squads shall supply the population in the disaster area with foodstuffs and shelters along all roads and routes

apply military medical units and squads to help the medical organizations set up hospitals in the disaster area, render first and specialized medical aid and care, to strengthen their efforts

military air crafts and air planes are possible to be applied for air transportation and air reconnaissance purposes as well as in other actions.

But in view of the country's vast expanses, its population being thinly scattered all round the country, limited capacities that are available in terms of roads, communications, and alarm warning arrangement, operational movements of little groups to disaster areas, a quite different approach is required to application of units and squads being already stationed in aimags and countryside for actions to cope with adverse effects to be resulted from natural disasters, emergency conditions, local nature, climate, geographic specifics.

For example, it is advisable to train units and squads positioned in Zuun bayan, Omnogobi aimags in combating and coping with tornadoes, blizzards, droughts, zud conditions and wildfires, the occurrence of which is high in those aimags, while for units and squads of Tov aimag and Erdenet city it is desirable to conduct a training in activities required during wildfires, floods and earthquakes occurring often in Khangai, Khentii mountain regions.

Actions for coping with disasters and accidents

| Shortcomings or challenges | Ways of solution, recommendations |
|----------------------------|-----------------------------------|
|----------------------------|-----------------------------------|

Search and rescue actions

| | |
|--|---|
| <p>Role to be played by ministries and agencies in search and rescue actions is not determined</p> <p>2 Equipment and technical facilities required for rescue operation is not sufficient</p> <p>3 In some aimags there are no search and rescue groups to work on the local level</p> <p>4. Lack of specially trained people to deal with rescue operation</p> | <p>set up within the structure of ministries and agencies rescue and search groups, arrange the training of people for the groups</p> <p>work out a programme on supplying civil defense's military units and squads and rescue groups with rescue technical facilities and equipment</p> <p>conduct training of rescue groups, draw up training curricula, programmes and methodics, build up an educational logistical support</p> <p>set up rescue groups in Arkhangai, Khovd, Dornod and Tov aimags</p> |
|--|---|

Disaster communications information and management

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|---|---|
| <p>A shortage of mobile communications equipment and technical facilities</p> | <p>Establish a disaster data base in ministries and agencies and connect up to the state information network</p> |
| <p>Disaster information and data communication between ministries, agencies and NGOs is not provided timely</p> | <p>set up a integrated disaster data base at the state civil defense department</p> |
| <p>Actions on disaster information and data collection, their processing, summing up, distribution are inadequate</p> | <p>conduct surveys and studies into potential disasters and accidents at the level of ministries and agencies and include relevant data and information in the state civil defense department's disaster database</p> |
| <p>The disaster communications and information management system is inadequate</p> | <p>include information and data on major showings, force, material technical facilities, equipment reserves of ministries and agencies in the reference database of the state civil defense department</p> |
| | <p>link ministries and agencies to the state civil defense department's database to promote an exchange of data and information</p> |
| | <p>equip rescue groups and units with radio sets to communicate</p> |

Rear supplies

| | |
|--|---|
| <p>No system of procurement and distribution of assistance goods and materials</p> | <p>With introduction of a disaster and accident management system the issue of distribution, transportation and spending of rear supplies will be gradually solved in consistence with measures to be taken to improve the system's arrangement</p> |
| <p>Goods and materials designed for coping with disaster or given in assistance are wasted in vain</p> | |

Present situation assessment

| | |
|--|---|
| <p>Assessment of present situation and information to the superior authority informed is delayed</p> | <p>— Perfect the techniques for estimating disasters, accidents and needs</p> |
|--|---|

| | |
|---|---|
| The assessment of present situation is not adequate and correct | Disseminate information according to a master table on present situation information |
| No experience and skills in estimating the present situation and its handling | Set up in the disaster data base an operational information base to transfer information on the present situation with respect to disasters and accidents |
| | Link aimag, capital city and district's civil defense headquarters to a computer network |

3.2. Post-disaster rehabilitation and recovery operations

According to the international experience accumulated, in order to ensure a perfect performance of actions designed to liquidate the disaster consequences it depends upon two major factors as to keep the authorities and forces properly informed all the time and ensure the preparedness of the forces, their readiness for actions. Without taking into account of the above two important factors whatsoever plans, management, organization system, experts are provided the liquidation actions would not give proper results. Moreover, the efficiency of responsive actions depends directly upon the measures to ensure the preparedness and the relevant policies to be pursued in this sphere, planning, arrangement of management, training and many other matters will be considered in the following chapters.

It is important to ensure uniformly the preparedness of forces and means to be applied in the disaster liquidation actions, for sometimes non-preparedness of just one organization badly affects the final outcome of the disaster consequences liquidation actions. In view of this, it is desirable to strengthen with respect to the system of management to be provided during a disaster period, the capacities of specialized organizations and agencies of aimags, capital city and districts along with that of the military units of civil defense being the major civil defense force, structures responsibly for combating natural disasters in seven aimags

As is clearly seen from the state of affairs concerning the organization at the national, aimag's and local levels of responsive actions for liquidation of consequences of natural disasters occurred recently in our country, the management and co-ordination of efforts during the disaster period is improper, there are no regular systems existing at the national, aimag's and local levels, co-ordination and control are often lost in the disaster affected area owing to which the responsive actions are delayed, and, accordingly, the consequences exacerbated, as it was during the fire in the spring of 1996. It evidently shows that the current state of organization of actions for liquidation of consequences of disasters carried out at the level of aimags, the capital city and its districts are inadequate to the current, market economy's conditions and can not meet the requirements of reality.

3.2.1. The current status of rehabilitation

The current status of actions for recovery, rehabilitation and coping with adverse effects resulted from natural disaster in Mongolia is assessed based upon the progress of post-disaster actions, challenges posed and experience gained after most serious disasters occurred over the last few years, in particular after 1990. For example, a post-disaster review made with respect to the liquidation of the damages, rehabilitation and recovery operations implemented in connection with such large-scale natural disasters as a heavy snowfall (zud) occurred in the spring of 1993 extending to the territories of more than 30 soums of Bayankhongor, Gobi-Altai and Zavkhan aimags, 417 wildfires raged on the territories of about 120 soums of 16 aimags during the spring and autumn of 1996, the first incidence of plague disease broken out in August 1996, зуд extended to the territories of nearly 70 soums of a score of aimags for a period of up to four months during the 1996-1997 winter, also a foehn wind damaged more than 10 soums on Arkhangai, Bulgan and Ovorkhangai aimags' territories in the spring of the same year, has established that, in most cases, there was nothing excepting the plan of action of the civil defense system's organizations to serve as a guidebook; no funds ear-marked for disaster management including relief aid to the victims, especially with regard to the administrative and territorial units where due to the lack of proper funds and materials there were neither proper capabilities nor preparations for arranging actions to cope with the effects, provide relief assistance to disaster-affected citizens rendered homeless, who lost their cattle and property, left without any means of subsistence; and undertake on their own rehabilitation and recovery measures, which repeatedly has taken place.

As far as the actions for coping with adverse effects resulted from natural disaster and their recovery are concerned, the composition and scope of such recovery actions, requirements for and sequence of recovery actions, factors of significance in this respect can be defined as follows:

3.2.2. Composition of recovery actions and their sequence

The post-disaster recovery consists of a complex set of management, arrangement, economic, technical and financial measures and actions designed to bring to normal the operation of organizations, economic entities and industrial sectors affected by the disaster.

The recovery actions include two major aspects as the recovery and reconstruction.

The recovery actions' composition, types of actions to be implemented, funds to be allocated, duration and specifics may vary depending upon the extent of damages the given place, sector, territory suffered due to the disaster. Along with that, as a result of the effects of particular types of disaster, some specific conditions may be created. For instance, the activities on repairing and reconstruction of bridges and roads broken after the flood or of an industrial enterprise damaged due to an explosion, or afforestation efforts made to recover forest resources destroyed due a forest fire all are qualified as rehabilitation and recovery actions but each of them has its own specifics.

The recovery actions are carried out in the following sequence:

analyses to the extent of damages caused and to the respective estimates made

arrange operations in the affected zone of a working group and team of experts consisting of competent organizations and specialized establishments' specialists to get acquainted with the progress of recovery actions and draw up appropriate conclusions

make a tentative estimate of funds required for coping with the effects and recovery actions, draw up respective designs and have them duly authorized at appropriate level of management

determine the subjects to implement actions referring to rehabilitation and coping with effects, e.g., households, private persons, organizations, economic entities, administrative and territorial units (aimags, the capital city, soums, districts, etc.), sectors (ministries, agencies, departments), the state emergency standing commission, the government and determine the scope of their responsibilities

once those to implement (be responsible for) the above mentioned actions are determined, there is a need to set the time limits for recovering this place or entity and specify stages of actions to be carried out

when the issue of funding required for the rehabilitation actions has been solved, organizations, economic entities and other subjects to carry out actions (rehabilitation, reconstruction, recovery of production by means of short and long-term projects, etc.) shall be assigned and contracts thereon made or tenders invited to select from among Mongolian and foreign enterprises.

arrangements shall be made at any level for executing decisions by any level of administration including the government, ministry, aimag, the capital city, district, economic entity, organizations, taken on the above issues in respect of rehabilitation and recovery of disaster-affected establishments, cities, settlements, sectors, units.

3.2.3. Factors of significance and challenges posed during rehabilitation and recovery actions

The following factors are to have effects upon the planning of rehabilitation actions and their implementation:

limited opportunities in respect of timing to ensure a realistic planning in keeping with the current situation for rehabilitation and coping with effects which is understandable considering that disasters usually happen unexpectedly and therefore they are hard to be planned beforehand,

in the course of rehabilitation and recovery actions, there arises a necessity to solve instantly, due to the current situation specifics, a wide range of issues referring to the industrial, technical, technological, economic and social spheres

in planning recovery actions according to the possible disaster' tentative assessment it is made on the basis of averaged and rough estimates due to which it will be necessary to verify them carefully and estimate and determine all over again the components and capacity of recovery actions, forces and funds to be required

it will be important to determine properly the duration and sequence of solving issues to crop up in the course of recovery actions

if as a disaster consequence there is no control to be enforced on the part of a given economic entity, or the local and central administrative system, taking into account that it will inevitably tell upon the direction and organization of the comprehensive rehabilitation actions it is necessary to take immediate measures in respect of management and organization

if there is a need for large-scale financing and funds to be provided such issues shall be considered and solved properly at state, governmental, administrative unit and organization's levels and, in some cases, it may be needed to request for assistance from the international community and foreign countries

the shortage of technical facilities (aeroplanes, aircraft's, machines, tractors, other equipment) required for coping with effects and rehabilitation actions

it should be taken into consideration that provided all issues referring to finance, resources and others have been adequately solved, some difficulties may arise in connection with the infrastructure damages as the traffic halted, bridges broken, failures in the power supply, and, in addition to them, issues associated with its poor development.

Apart from those general factors also the positive and negative sides of a multitude of different factors ? namely, the local and sectoral specifics, the weather conditions of that period, people's aspirations and commitment, logistical support, remoteness from the centre should be regarded as well.

3.2.4. Resources for recovery actions

The basis for planning disaster combating and recovery actions in particular, shall be adjusted in line with the economic and social development guidelines and conceptions of sustainable development taken at sectoral, administrative, territorial and regional levels, and duly reflected in relevant documents and papers as the action programmes of the government.

A greater portion of the funds allocated to combat disasters was spent on measures undertaken to cope with their effects and recovery actions, so, in order to avoid in future so much waste of money an emphasis must be placed on ensuring due prevention and maintaining proper preparedness levels. It could be summed up that such expenses are necessary to be reflected in the annual central and local budgets.

On the other hand, it would be worthwhile to consider setting up on the national and aimag's scale a foundation for combating disaster that will be built up by allocations from the state budget, non-budgetary revenues, foreign and national contributions and donations and spent in conformity with its regulations which shall be duly authorized.

In undertaking recovery action the principles of centralized utilization of resources and their partial utilization shall be implemented. When a disaster happens appropriate corrections and adjustments shall be made in the plans outlined in peacetime and on this basis required arrangements shall be made to ensure their adequate implementation .

The major reason for a successful implementation of any recovery action is, apart from being provided with sufficient financial capacities, also availability of a system of preparedness, training, expertise of administration, organizations concerned, forces, means, responsibility and initiative of those responsible for it. The above factors are needed to be addressed in peace time by means of policy, planning and regulations provided at all levels of administration.

One of the major components of rehabilitation is the estimates made as for technical facilities, equipment and logistical support required, depending upon the rehabilitated unit's state, kinds of actions to be done, and their procurement and supply from foreign and home markets and enterprises in such quantities and of such quality that could satisfy relevant standards and requirements.

Organizations dealing with the implementation of recovery programmes shall be supplied with information and data, and analyses be made; the programmes being implemented shall be provided with management and its progress be supervised; the programmes shall be successfully implemented; due assistance and support shall be rendered to the implementation of the programme activities.

1. Organizations that should supply with information and data and make analyses and assessments are as follows:

- organizations directly concerned with combating natural disaster as the State Permanent Emergency Commission, Mongolian Parliament's Office
- ministries and agencies' departments and divisions in charge of planning
- ministries and agencies of the government
- international relief assistance establishments
- non-governmental organizations and
- statistical, press and information agencies.

2. organizations that should define categories and scopes of programmes

- the government
- aimag and local governor's offices
- non-governmental organizations
- international relief assistance establishments

3. organizations that should provide the programme management and supervise its progress

- ministries, agencies and departments assigned by the government

4. Organizations that should be responsible for programme implementation:

- ministries and agencies of the government

- private sector's organizations acting on contractual basis
- international relief teams
- international and national non-profitable organizations
- programme implementing specialists

5. Organizations that should provide support and assistance in programme implementation:

6. n governmental organizations

- banking organizations
- other volunteer organizations
- press and information organizations

3.2.5. Objectives to be set forth in connection with the implementation of recovery actions

1. The main activities to be done within the framework of recovery action include a wide range of long-term comprehensive measures designed to recover the disaster-affected area's social and economic sectors by rehabilitation and reconstruction measures, and, therefore, are needed to be implemented, in the most of cases, under the schemes of the national development master plan. To this end, particular aspects of recovery action shall be reflected in the national development plan.

2. Before the implementation of recovery action it is necessary to collect relevant data and information, and the following sources may be used for gathering required information and data:

a) information to be obtained during the coping with effects of disasters:

- estimates of damages, their utilization, data and information on damages
- progress reports
- reports issued by ministries, agencies and non-governmental organizations on accomplishing the coping with the effects
- information gathered at the command centre
- reports and statements of international relief organizations
- information released from mass media means

However, above information and data are required to be re-processed and brought into such a form that

would enable to apply them for recovery actions

b) Post-disaster reports, statements and review

If they are provided as soon as the actions to cope with the effects have accomplished they could be applied in the programme formulation as a source of information

c) Information from the development programme

Recovery actions are directly co-ordinated and adjusted with the national development programme which is one of major requirements for recovery actions and, therefore, any information and data referring to the programme can be applied for recovery programme formulation

d) Information from specialized working groups

Valuable information is provided by specialized working groups sent to the disaster-affected area in post-disaster period to determine the need for any rehabilitation action to be implemented

e) information on basic data for recovery actions programme

This information includes data referring to the amount and scope of the recovery programme, viz:

project costs

- project implementation duration, schedule
- financial, material and manpower resources to be required for the project
- international relief assistance capacity

f) information and data on disaster occurrences recorded to take place in this region before

3. Recovery action policy is needed to be formulated and defined at the government's level. But the working group with a few members to conduct post-disaster monitoring is proved to be more effective. When the formulation of a policy is accomplished it is necessary to make certain that major components of recovery action are reflected therein. For example:

- is the participation of all major sectors desirable to be involved in recovery actions provided for in the policy
- it should be pointed out that it would take some certain period of time to study the recovery action's composition and organization

- co-ordination of the recovery action with the issues reflected in the national development programme, their interrelationship shall be taken into account
- an assessment shall be made to the capability of the forces to implement the recovery actions
- responsibilities and functions of key organizations in carrying out the recovery actions
- a system of supervision to be enforced on the part of the government over the recovery actions performance

4. After the recovery policy has been formulated, it is necessary to take steps on the management and organization of recovery programme formulation. There are the following options:

- members of the government
- commission headed by one of ministers (state permanent emergency commission)
- ministries and agencies provided with management from the government

Any of these management system will be efficient for ensuring overall responsibility and management in respect of recovery actions

5. On the basis of assessment and analyses made to all kinds of information and data the recovery action programme will be formulated and sectors and localities to implement it shall be reflected therein. The programme shall concentrate on the following priorities:

a) Issues to be formulated and developed at the governmental level:

- economic infrastructure (roads, bridges, railways)
- civic administration buildings and structures
- education, health care spheres' buildings and structures
- distribution of the population

b) At the private sector's level:

- industrial, trade and services' buildings and structures

c) At the local level:

- rehabilitation of the local cities, settlements, industries and services

6. Generally, recovery programmes are of high costs due to which before starting the recovery actions it is essential to secure funding required for its implementation. Also assessments shall be made to the forces and facilities to carry out recovery actions as equipment, materials, facilities, manpower, qualified professionals, etc.

7. It should be noted that the international relief organizations' assistance will be essential for carrying out recovery measures as it was for coping with the effects. This assistance may be provided in the following forms:

- financial
- equipment, instruments, materiel
- ear-marked for the implementation of particular projects
- international humanitarian assistance and that of religious establishments, etc.

8. A close co-ordination and adjustment of the recovery action with the national development programme shall be provided. In view of this, decisions determining the sequence of actions to be undertaken shall be passed at the governmental level duly adjusted to the national development programme

9. Irrespective of whether the recovery action is to be implemented entirely or partially, supervision shall be enforced over its progress anyway. The supervision is desirable to be carried out by one of the ministries. It would be easier to get any information required if all information and data are concentrated in one place.

10. In the course of implementation of the recovery action supported by the government's ministries and agencies there are limited capacities for organizations directly concerned with disaster combating actions as the parliament's office, and their executives to get involved in it. Without specialized instructions provided by the organizations in charge of disaster management and their staff of experts, new problems that could entail hazardous effects in the future may pose due to wrong assessments made in the course of implementation of large-scale programmes of recovery and reconstruction. In view of this, it is necessary that specialized guidance and advice be given on the part of organizations dealing with disaster management and ensure their close co-ordination with the national development programme.

3.3. Improvement of response to natural disasters

3.3.1. System of arrangement of actions in natural disaster period

It is desirable that the system of actions to be carried out under the disaster period in the conditions of Mongolia be arranged at the national, aimag, soum's and local levels in the following way:

Its structure shall include the aimag's governor, the aimag and soum's emergency force (team), the mobilisation commission, planning, forces and means rear supplies, finance and accounting divisions.

The planning, force and means division shall have its subdivision to be responsible for the current situation assessment, determination and planning of requested forces and means, mobilization and demobilization of above forces, the rear supplies division shall have its services and supplies subdivisions, the former being comprised by the communications, medical care and foodstuff provision groups, the latter consisting of the supplies, accommodation, means and facilities provision, mobile machines and appliances supplies and service.

The financial and accounting division will have its subdivision dealing with the registration of working hours, purchase of technical means, compensation issues.

On arranging in such a way the management and control during the disaster period possibilities will be provided to ensure proper co-ordination in solving such issues as the planning of response to disaster, liquidation of its consequences, forces, rear supplies, financial and funding, which would be more economical financially.

This system of management and control during disaster periods provides for non-staff personnel to be formed by the decision of the aimag, capital city, soum and district's governors only during the period of a disaster and consisting of the staff of the governor's offices' as well as managerial staff and executives of other economic entities and enterprises to be mobilized on a temporary basis.

The emergency team will be formed of the persons assigned by the mobilization commission and relevant technical means and will be composed structurally of its chief to be in charge of the arrangement and control over the rescue and liquidation of consequences activities on the spot, or a specialized mobile group or team's head. The number of senior chief and a mobile group's head will be determined depending upon the extent of a disaster and opportunities available with respect to the forces and means and it would be most appropriate if from 7 to 10 persons would be under one senior chief's command.

Management system organization scheme to operate during the disaster

occurrence Aimag's Governor

Emergency team (senior chief, mobile groups and teams' heads), Mobilization commission (Planning, force and means division, Force and means subdivision, Situation assessment subdivision, Planning subdivision), Rear supplies division (Communications subdivision, Medical care subdivision, Foodstuffs and accommodation subdivision, Mobile machines and appliances supplies and service subdivision), Finance and accounting division (subdivision on registration of working hours, Technical means purchase subdivision and payment and accounting subdivision)

3.3.2. System of communications and notification and information

The information and notification system is of special significance for a success of responsive measures for liquidation of consequences of a disaster and the following requirements are to be raised in this respect:

- the earliest warning of the preconditions for a natural disaster to occur
- if there are doubts whether or not the predicted natural disaster would take place, notifications shall be sent out limited to the managerial staff's scale only in order to avoid disturbing the smooth operation of economic entities, organizations and residents.
- as soon as the notification actions are accomplished respective decisions and resolutions shall be issued concerning the response to the natural disaster and how to cope with its consequences
- actions shall be arranged without delay to make the public informed of the decisions passed

With respect to our country it is necessary to change the former four-alarm signal system designed for announcements in the wartime as the "air-raid alarm", the "all-clear", the "radiation alarm" and the "chemical alarm" approved by Resolution No. 170 of the government of Mongolia to be replaced by such alarm signals as the "earthquake", the "flood alarm", the "fire alarm", the "epidemic disease communicable to people and or livestock", the "strong wind", the "blizzard", etc. which shall be explained to the general populace in a most plain and understandable form through the aimag, capital city and district's civil defense headquarters, with developing required training schemes to make the people trained to apply them.

Once the aforementioned signals are given it is required that all schools, kindergartens, offices and public places be closed, the preparedness of the emergency power plants and other system lines' equipment for operation be checked, the supplies of foodstuffs, potable water, warm clothes, firewood and other top priorities be made by residents and along with that measures necessary for preparing to evacuate the people, etc. shall be taken in case of emergency.

In order to ensure that actions for liquidating the consequences are carried out in the shortest possible time and with most efficiency a system needs to be set up to arrange the responsive actions with respect to natural disasters and ensure the co-ordination and general management over the actions the managerial staff, forces and organizations involved in. For this, the actions for liquidation of consequences shall be carried out in relevant stages. There are three rates (levels) of the civil defense's preparedness state as the "day-to-day", "heightened" and "general". Though the above mentioned preparedness rates are easy to put into practice with the headquarters, military units and divisions referring to the civil defense system as well as in other military bodies but the civil organizations' leadership has little experience and knowledge of operations to be performed according to the above levels.

Therefore, it is desirable to explain to civil organizations the responsive action's operation stages in a plain and intelligible form that should be more adopted to their specifics, to be guided by in their further activities. In particular, the responsive actions are possible to proceed through such stages as giving the relevant signals and warning hold a meeting with the participation of the managerial staff and forces, ensure their preparedness to action, make them start their action and the like. The advantage of a step-by-step implementation of responsive actions is that the head in charge of notification and information could cease the action without commencing its next stage if it turns out that the disaster warned about is not to occur. Thereby opportunities will be provided to ensure the preparedness to responsive action of all the organizations to be involved in and at the same time it will allow to avoid conducting unnecessary and thus inefficient activities.

Ensuring of proper regulation and co-ordination of joint efforts for liquidation of the consequences will serve as the major condition enabling to use to full capacity the organizations involved in disaster combating actions, ensuring its due performance and avoid any faults and shortcomings to be made. In foreign countries the work on co-ordinating jointly implemented actions is carried out from a specifically designed centre of operative co-ordination and management furnished with special equipment and it is needed to set up with the State civil department such a centre on co-ordination and management to conduct its operation on the national level.

In order to carry out successfully the responsive actions a reliable communications system is required to be supplied with.

Another important matter relating to the organization of responsive actions is to be provided with a communications system supplied its own power sources which would allow it to operate when or if it turns out that the basic communications system could not function properly due to the damages received during the disaster occurrence.

Regarding such specific features of Mongolia as her great territorial expanse, scarcely populated, with a harsh continental climate, etc., the communications system to operate during the disaster occurrence shall meet the following requirements:

- to cover the country's cities, settlements, districts and industrial regions with comparatively dense population and industrial concentration (a communications system set up basing upon fixed communication units)
- organize the communications system in such a way that it will cover every corner of the country, be connected up to the national and international communications systems and be provided with opportunities to communicate through telephone, fax, computer and satellite systems (a mobile communications system)
- be provided with facilities allowing to work in co-ordination with a public communications system but not be limited to its capacities, if need be
- be possible to be supplied with power from a low-power electrical generator, be compact, suitable to be used in field conditions and easy to be handled by people without specialized training and education
- be strong enough to resist any hard conditions of operation including shaking, tremors, dusty and moist environments and harsh climatic conditions (temperatures ranging from -50 up to +40oC, rainfall, snowfall, etc.)
- made by applying of the latest technical and technological achievements and satisfying the requirements raised in Mongolia's communications system development master plan.

Proceeding from the above, a fixed communications system it required for the civil defense headquarters of the national level, units and divisions to operate under the disaster conditions, being independent from the public communications network. A SW radio which capacity allows to maintain a radio contact at a distance over 500 km, is considered to be the most appropriate one. At present the Khovsgol, Arkhangai, Selenge, Khentii, Dornod and Bulgan aimags' civil defense divisions to combat natural disasters communicate with Ulaanbaatar applying such communications sets. In future it is necessary to extend the radio communications network to all aimags' civil defense headquarters.

For ensuring prompt actions of the specialized services involved in the actions for liquidation of the consequences of a natural disaster and their leadership who work in the disaster affected area a mobile radio communications system is of special significance.

This system shall be comprised by a USW IM radio system to be applied for communications in cities, settlements and in the disaster area and a SW radio system which will allow to communicate with Ulaanbaatar. Actions are being taken on the part of

the parliament to supply some aimags' civil defense's Standing emergency divisions with such communications system.

3.4. Improvement of response to natural disaster

It is impossible to achieve a success in carrying out the responsive actions without estimating the damages inflicted due to a disaster, rescue operations and actions to be provided to cope with its consequences, and many other things that will need to be done. For conducting observations and inspections and ensuring an adequate assessment of the situation such matters shall be considered and corresponding plans and arrangements made well in advance as estimates to be made with respect to air surveying and inspections, arrangement of observations and control on the area, assessment of the current situation provided from all organizations and officials concerned with the arrangement of actions to cope with the disaster in the localities close to the disaster area's centre. In most of cases activities on general observation and inspection shall be conducted without delay in the disaster area directly after the disaster has occurred.

The information and data received after respective surveys and inspection measures have been conducted and current situation assessment made are of special prominence for response actions to be undertaken promptly. In view of this, it is necessary to purchase for the state emergency department low-power aircraft's and aeroplanes as well as amphibious vehicles designed to travel over rough ground and in water to be supplied to the civil defense units and divisions and arrange training abroad of experts-observers.

Capability to supply with materials and means required to carry out rescue pertains serves as another factor which enables to achieve a success.

4. Disaster Monitoring and Prevention System

Measures to create a combined system on natural disaster information transmitting and processing, observing, forecasting and warning have been in operation since 1940. Today this system is based on the telecommunication Systems of the hydrometeorological service of Mongolia. This System consists of the following subsystems:

- Sub-system for observation and information collection
- Sub-system for data transmission and processing
- Forecasting and warning sub-system
- Geological and wildfire sub-system

Sub-system for observation and information collection

The National Hydrometeorological Service (NHS) is responsible for observing, forecasting, and warning of hydrometeorological disasters such as drought, zud, heavy snow, and dust

storms, strong wind, blizzard, cold rain, flood, dibasic flow, and weather conditions for wildfire occurrence. NHS has more than 400 gauging points, including meteorological, hydrometeorological and agrometeorological stations, BAPMON and greenhouse gas stations. Meteorological stations measure 8-11 elements 44 times a day; agrometeorological stations measure 4-7 elements 3 times a day, hydrometeorological station measures three elements per day.

In addition, there are a number of stations for air, water and soil pollution monitoring.

Sub-system for data transmission and processing

Hydrometeorological observation *data are* collected from 18 provinces and three cities by telephone channel and transmitted to the Information and Computer Center ('CC) of the Ministry of Nature and Environment where they *are* processed. Data on earthquakes, and *wildfire* occurrence are also collected by the same telephone channels. ICC *also* receives AVHRR *digital* data from NOAA satellites of the USA. ICC contains Mongolia's national center for hydrometeorological communication. This center is connected to Beijing and Novosibirsk and WMO regional centers, and it receives meteorological maps from Habarovsk, Tokyo and Beijing.

All incoming data are processed by VAX computing equipment. Although data are processed, no natural disaster data-base system was created until now.

Forecasting and warning sub-system

The Hydrometeorological Research Institute of the Ministry of Nature and Environment has responsibility for forecasting and warning of imminent hydrometeorological disaster: blizzard, dust storm, heavy snow, flood, *zud*, drought.

The forecasting and warning are have been approved under Government Resolution no. 68 of 1993.

Geological and wildfire sub-system

The Academy of Sciences of Mongolia conducts research studies on earthquake phenomenon. It has 10 study locations within the territory of Mongolia. The first earthquake observation station was opened at Ulaanbaatar, the capital city in 1957.

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

5. Legislative and Institutional Background

The purpose of this chapter is to review the institutional and legislative background to emergency preparedness in Mongolia and powers and responsibilities of ministries and agencies concerned with combating disasters as well as their interrelationships and coordination of their actions.

5.1. Legislative background

5.1.1. Constitution of Mongolia

Article 6, paragraph 4 reads: "the state may ... confiscate the land if its utilisation runs counter to health of people, nature, the environment and the national security interests."

Article 16, paragraph 2 reads: "is entitled to live in a healthy and safe environment and be protected against environmental pollution and ecological imbalance "

Article 25, paragraph 2 reads: "a state of emergency, whenever there is a natural disaster, other emergency or threat to life, health, economic conditions or social environment of the population of the entire country or part of it, may be declared to cope with their effects and safeguard the population and social environment ensuring its normal functioning"

5.1.2. Conception of National Security of Mongolia

(Annex 1 to Resolution No. 56 of the Great State Khural (1994))

External factors that may disturb ecological balance are as follows:

1. As a consequence of world climatic change, such as intensification of drought, change in amount and seasonal timing of precipitation, increase in the frequency of drought and winters, depletion of ozone layer;

Uncontrollable flows of radioactivity through air and water, chemical contamination, increase in acid rainfall, the spread of human and animal epidemic diseases, an outbreak of insects and pests that can destroy the pasture land and forest;

Turning actions in most effective way against nuclear tests to be carried out and organised on the territory of and adjacent to Mongolia territories.

Implement a policy for restricting by legislative and economic levers any operation and actions which causes detrimental impact on the environment

Create a system for prevention of natural disaster and other emergencies

Study national conventional methods and technologies of providing for the population's needs in arid or desert areas, ensure the national preparedness to survive in the case of any possible meteorological events and phenomena

Enter into international agreements and treaties on environmental protection and recovery issues, introduce advanced technologies through developing projects in co-operation with sponsor countries in ecological sphere, create a system to prevent and combat any emergencies possible in the most cost-effective manner

5.1.3. Civil Defence Law

Article 6. Civil Defence functions are as follows:

Safeguard the population and property from weapons of destruction, carry out rescue operations in the affected area, render aid to victims and organise urgent recovery and rehabilitation actions

Undertake measures to protect livestock, domesticated animals, cultivated plants, foodstuffs, water sources, property from radioactive, chemical toxic and bacteriological contamination and cope with their effects

Disseminate warning information about destructive weapons, emergency and accident threat to the population, establish a warning information and management system and maintain their preparedness

Provide training to citizens in measures and techniques to protect from destructive weapons, disasters and accidents

Organize and train personnel required to carry out rescue and protection operations, maintain their preparedness, provide supplies of logistics (material, technical facilities, tools, instruments and implements, supply with spare parts

Organize and carry out rescue operations in the disaster or accident affected area.

Article 10. Structure and composition of Civil Defense management

Mongolian prime minister is the head of the State Civil Defense Department, governors of all levels (aimag, capital city, soum, district) are heads of respective Civil Defense units

The head of the Civil Defense Head will provide general supervision of civil defense actions of national level and the head of the state administrative organization concerned with civil defense issues will directly guide its activities.

4. The head of an economic entity or organization will also be the head of its civil defense

Article 13. Powers of the Civil Defense Department head are as follows:

Submit to the government for approval a plan of action for prevention of, protection, rescue of the population, property from any destructive weapons, disasters and accidents, response to emergencies and undertaking urgent recovery and rehabilitation measures, enforce supervision over its performance

6. Appoint commissions vested with the powers to carry out immediate actions for prevention of, protection and rescue from and response to emergencies, undertake recovery and rehabilitation measures, define main priority areas of their operation

Article 16. Powers of heads of civil defense units of aimag, capital city, soum, district, economic entities and organizations and of heads of civil defense divisions are as follows:

2. Make a preliminary estimate of the state and conditions of destructive weapons, disaster, accident threat and the amount of possible damages it may cause, outline and implement measures for protection from their hazards and carrying out rescue operations

7. Undertake measures to secure funding necessary for prevention of, protection from destructive weapons, disaster and accident hazards, actions in response, provide supplies of required materials, technical means and facilities, supply with spare parts.

Article 17. Functions of the state administrative organization in charge of civil defense issues

2. Equip civil defense organizations and units with qualified staff, arrange their training and specialization

4. Provide training to the population, build forces and means to carry out rescue operations and maintain their preparedness

5. Organize dissemination of warning information about the threat of destructive weapons, disasters and accidents to the population

7. Take steps to ensure that the construction of buildings and structures designed to deal with production activities possible to affect human health and the environment or employing a substantial number of workers to work all together, shall be provided in compliance with the major requirements set out in respect of civil defense

4.1.4. Law on fires in forest and steppe areas

Article 6. Powers of governors of all levels (aimag, capital city, soum, district, bag, residential block) are as follows:

1. Implement a fire protection and fighting plan, include relevant expenses in the annual budget, provide supplies of equipment, implements, foodstuffs and other items in conformity with standards and requirements set out from the government, supply spare parts

2. Undertake measures to train citizens in fire protection and fire-fighting techniques and operations

3. Governors of bag and khoroo levels shall exercise the following powers with respect to fire protection and fire-fighting:

- Undertake immediate actions for fire-fighting, make available all their facilities, inform about the outbreak of fire and fire-fighting progress

5.1.4. Law on environmental protection

Article 9. Environmental impact assessments

Impact assessments shall be conducted for the development of proposals and programmes, as well as for establishing contracts for the operation, initiation and expansion of production or services which may have adverse environmental impacts

Article 10. Environmental monitoring

1. The term “environmental monitoring” shall mean writing evaluations based on permanent observations, measurements, and research on the state of and changes to the environment, as well as developing measures for the termination and elimination of the adverse changes discovered.

3.3. Develop proposals for the prevention of adverse effects to human health and the environment due to natural disasters and eliminate damages

Article 22. Natural disaster and emergency areas

2. The government shall establish natural disaster and emergency area zones based on the recommendations of the State Administrative Central Organization

3. The State Administrative Central Organization, Civil Defense Department, governors of all levels, and other relevant organizations shall jointly take measures on the prevention and mitigation of natural disasters and emergencies, the elimination of damage, the enhancement of the environment, and the restoration of natural resources

4. All costs for the elimination of damages caused by natural disasters and emergencies shall be allocated from the state budget. After the investigation of causes, the responsible body shall be assessed for the full compensation of damage

Article 23. Environmental protection during states of emergency

Pursuant to the Constitution of Mongolia, measures for the mitigation of natural disasters and emergencies, the elimination of damages caused by them, and the protection of the environment and its natural resources in the territory of a state of emergency shall be conducted pursuant to the provisions and procedures stipulated by the Law on states of emergency

5.1.5. Law on Water

Article 9. Plenary powers of the State Administrative Central Organization

4. provide management for water reserves protection, restoration, prevention of water disasters, and elimination of damages to nature resulting from them

Article 10. Plenary powers of aimag and capital city governors

3. undertake measures to prevent the depletion, degradation, and pollution of water resources and water quality

Article 11. Plenary powers of soum and district governors

1. submit to the Citizen Representative Khural for approval plans for water collection, restoration, proper use, water quality protection, prevention of water disasters and elimination of their damages, and an estimated budget for implementation of such plans

5.1.6. Law on Air

Article 3. Administration of activities on air protection

2. The State Administrative Central Organization in charge of health shall fulfil the following functions on air protection:

draft standards on the admissible content of air pollution substances and on the level of hazardous impacts and have them adopted by the authorized organization

control air pollution and the hazardous impacts to human health

Article 5. Air quality monitoring

1. The State Administrative Central Organization in charge of nature and environment shall organize a monitoring network to regularly monitor of air pollution, hazardous impacts, and changes in small air components such as ozone and hydrogen

Article 8. Air pollution discharge and hazardous impacts permit

3. In the event of the unavoidable discharge of air polluting substances and the causing of hazardous impacts for admissible volumes which have no standards, the State Administrative Central Organizations in charge of health and nature and environment may jointly issue a temporary permit based on the characteristics and amount of the substance and its impact on human health and the environment

Article 9. Measures for the critical increase of air pollution and hazardous impacts

1. In the event of the critical increase of air polluting substances and hazardous impacts caused by disaster, commercial accidents or other reasons which exceed the level in the standards and becomes dangerous to human health and the environment, the management of the responsible economic entity and/or organization and the Certified Department shall immediately inform the aimag, capital city, soum, and district governors and the public

2. The economic entity or organization management, the Certified Department, and the governors together with other relevant organizations shall take urgent actions to determine the reasons for the critical increase of air polluting substances and hazardous impacts and eliminate the damage

3. To reduce air pollution and hazardous impacts, the economic entity or organization indicated in paragraph 1 of this Article or its official shall place the economic entity or organization in an emergency status or suspend its operation, and, if necessary, take measures to protect and evacuate the local residents as provided by the Mongolian Law on Civil defense

Article 15. Ozone layer protection

1. To protect the ozone layer and to prevent hazardous impacts on it, an organization authorized by the Certified Department and by the State Administrative Central Organization in charge of nature and environment shall monitor the status of the ozone layer and fluctuations in intensity of ultra-violet rays.

2. The State Administrative Central Organization in charge of nature and environment shall approve a list of substances which have hazardous impacts to the ozone layer.

A draft law of Mongolia on natural disaster insurance worked out jointly by the ministries of nature and environment and of defense has been submitted to the government for consideration. The draft law envisages the legislative basis to regulate the relationships associated with the extension of the scope of functions and operations carried on by the insurance organizations concerning the compensation of losses inflicted to citizens, economic entities and organizations and rehabilitation actions in the event of natural disaster for ensuring a sustainable development of the national economy.

Losses suffered by the citizens, economic entities and organizations due to natural disaster shall be compensated chiefly by the state and the present practice of cherishing hopes for the state compensations and foreign credit and assistance is inadmissible any more under the current conditions. Therefore, there is a need for more financial capacities to be able to compensate damages resulted from natural disasters, carry out immediate recovery measures to make things functioning normally. In this, natural disaster-related subjects, terms and conditions of insurance are given specifically to distinguish them from the types of commercial insurance and cases when such insurance would not be applicable are specified precisely.

The draft contains a provision saying that the natural disaster insurance shall be obligatory, but as it is not possible that insurance schemes extended to human health, life, animals are to cover them completely, it is dimmed that insurance is not necessary to be extended to the above as well. The draft law has not been discussed at the Great State Khural as yet.

5.1.7. Law on hydrometeorological and environmental monitoring

Article 4. Powers of the government are as follows:

4.1.2. Build up a system for applying hydrometeorological and environmental data and prevention of possible disasters and serious threats of environmental pollution

Article 6. Powers of the Central Administrative organization on hydrometeorological and environmental monitoring are as follows:

6.1.2. Take measures to provide services to citizens, economic entities and organizations with hydrometeorological and environmental information and prevent natural disasters and environmental pollution.

Article 7. Powers and responsibilities of governors of all levels (aimags, capital city, soums, districts, bag and residential blocks) are as follows:

7.1.3. Ensure adequate service with hydrometeorological and environmental information and data to be provided to citizens, economic entities and organizations located on their

respective territories, arrange actions to prevent possible natural disasters and environmental pollution

7.1.4. Assessing the extent of damages sustained on their respective territories due to natural disasters, make corrections to the procedure and regulations for mitigation of its effects, timely notify the state administrative organization of the damages incurred

Article 13. Dissemination of hydrometeorological and environmental information and data:

13.4. Any information on natural disasters shall be disseminated in the first instance through all communications means irrespective of their forms of ownership.

5.1.8. State policy towards ecological issues

3.11.5. Minimize the consumption of radioactive and chemical toxic substances causing detrimental affects upon human health, the environment and animals, strengthen the control over the sale, utilization, transportation, storage and import of some highly toxic substances

3.11.6. Ensure environmental safety through prevention of releases of radioactive and chemical toxic substances possible to take place during natural disasters, industrial and traffic accidents and elimination of their negative effects

3.11.7. The goals of improving the quality of the environment and ensuring its optimum spacious utilization shall be accomplished through remote sounding of environmental carrying capacity in relationship with climate change and possible adverse effects of natural disasters, the amount of pollution that is impossible to liquidate completely, be properly disposed of in an environment that suits best with respect to air, water and soil conditions, preserving the ecological balance, restrict the production, consumption and test of substances promoting the depletion of ozone layer and augmenting the greenhouse effects, take actions to promote an increase in the amount of precipitation and water reservoirs storage capacity, plant new trees and bushes, protect soil fertility from desertification.

5.2. Summary of Legislative Framework

Thus, we have reviewed the provisions of 7 laws, 1 conception and 1 policy of Mongolia concerning the prevention of natural disaster and industrial accident and coping with their effects.

As a matter of fact, Mongolia is a country where such natural disasters as drought, zud, flood, wildfire are common events occurring nearly every year in one of its regions, and along with this, it is a country with a highly susceptible environmental system which is easy to be affected by changes going on the global scale as climate change, aridisation, and desertification.

On account of the above, the fact that there are sufficient provisions on prevention and protection of natural disaster and industrial accident, mitigation and elimination of their effects, especially the provisions concerning such issues as monitoring and analyses of

natural disaster, data and information, industrial accident information, mitigation and coping with effects resulted from accidents specifying them distinctly are the positive aspect of those laws.

However, it should be underlined that there are some drawbacks and shortcomings in those laws as:

There no provisions delineating clearly the particular areas of responsibilities and functions of a number of organizations with similar powers and responsibilities including the ministry of nature and environment, the state civil defense department, aimag, capital city, soum, district, bag and residential block. The laws fail to make it clear which organization shall be responsible for the implementation of the provision on natural disaster and industrial accidents. For example, there is no clear statement indicating that it is the local authorities that are responsible first of all for undertaking steadily a set of measures designed to prevent floods and wildfires, and, when such a disaster already occurs, for implementing immediate actions. There is no denying that it may be used as a pretext to avoid accepting responsibilities and undertaking active measures, confining themselves to notification to their superior bodies and requests for assistance.

It seems to be appropriate to incorporate into the relevant laws additions and amendments specifying in detail the powers and responsibilities of the ministry of nature and environment, the state civil defense department and local authorities insofar as natural disaster is concerned and clarifying in what stage which organization shall assume overall responsibility (monitoring, database, formation of preconditions for natural disaster occurrence, prevention, combating disasters, rescue, rehabilitation actions, etc.).

Also it is necessary to indicate eligibly the scope of powers and responsibilities of enterprises, economic entities, organizations, the state civil defense department and local authorities insofar as prevention from hazards relating to industrial accidents and chemical toxic substances is concerned

It should be noted that there is a need for new provisions to be amended specifying the powers and responsibilities to be followed and abided by in large industrial centres where there is a greater concentration of population. The existing industries and economic entities shall be able to carry out safety analyses and prepare appropriate emergency plans on that basis and conduct relevant training and drilling.

5.3. Institutional Background

The major role during natural disasters and industrial accidents is to be played by the ministry of nature and environment, the state civil defense department, the state permanent emergency commission and local authorities.

In addition, it should be mentioned about voluntary public organizations and citizens whose part in such actions is prominent.

United Nations Disaster Relief Organization's management team in Mongolia

This team composed of staffs of the UNDF, UNDAF, UNCF and WHO as well as of UN Permanent Representative in Mongolia, was set up to help build up capabilities to develop

more efficient co-operation with the government and conduct a wide range of natural disaster combating actions.

Reflected in their regulations worked out by this team are many issues regarding organizational, research and relief aid aspects as the appointment of their member organizations' officers to deal with natural disaster issues, co-operation with the government and non-governmental organizations, foundation and financing of natural disaster management funds, co-ordination of its operation on natural disaster prevention and mitigation of its effects with the Mongolian governmental, public organizations and international establishments, sponsor countries.

It should be noted that the UN disaster relief organization's management team in Mongolia is an authoritative organization making its appropriate contribution to the national programme formulation and implementation.

5.3.1. Ministry of nature and environment

The Ministry of nature and environment has been empowered with particular functions on research work and studies, policy and information arrangement regarding natural disaster prevention and mitigation of its effects. So far , however, there is no unit in the composition of the ministry to be dealing solely with the above issues.

But in August 1996 a structural renewal was made with respect to the ministry and now it consists of four agencies and departments one of which is the natural disaster assessment and information department. Also a new function on environmental monitoring set out within the structure of the ministry was assigned to the hydrometeorological and environmental agency.

As a result of the above measures the research work, monitoring and information activities have intensified, the draft law on protection of natural disaster has been worked out, a national committee has been set up to regulate a 10-year natural disaster mitigation action, a tender was invited for developing a national programme for natural disaster management which is stipulated to be composed of such groups and subgroups as those on natural disaster assessment, analyses, long-range and short-range forecasting and a disaster alarm warnings information system.

Consequently, a system has been set up to supply in a timely manner all disaster-related information and data to organizations and citizens, interested, supervise and ensure that actions be undertaken to prevent natural disasters and mitigate their hazardous effects.

5.3.2. State Permanent Emergency Commission

The Charter of the state permanent emergency commission indicates that when the undertaking of such measures as rescue operations, protection, relief aid to victims, recovery, rehabilitation and coping with the effects resulted from natural and other types of disaster affecting the community including earthquakes, blizzards, heavy snowfalls, dust storms, droughts, zud, floods, wildfires turns out to be beyond the capacity of a given administrative and territorial unit and region, any actions being implemented in connection with this situation shall be guided and organized according to the provisions of this charter.

The staffing of the state permanent emergency commission is to be approved by the government.

The office in charge of the commission's day-to-day operation is the state civil defense department. The commission has the following responsibilities and functions:

in co-operation with concerned state administration's central and local organizations undertake actions to ensure prevention of disaster and accident and preparedness to combat them provide an assessment to the situation and conditions of a disaster or accident in co-operation with specialized organizations, concerned; if it is proved that to cope with the effects of the disaster is beyond of the capacity of a given administration and region, take immediate actions to mobilize requested manpower, forces and means, undertake measures to cope with the effects resulted from disaster, rescue, render relief aid to those suffered during the disaster, and protect the population and the country's economy take decisions on and dispose in co-operation with organizations of the central and local authorities, officers concerned, of issues of directing according to the respective law manpower, means, transportation and communications facilities and materials from the reserve funds required for units dealing with such activities as coping with the effects of disasters and accidents, rescue, protection, rendering relief assistance to victims, evacuation; propose mobilization of required additional manpower, technical means and take part in taking decisions thereof.

The commission has the following powers:

- provide preparations to combat and prevent disasters and accidents, assign tasks and commissions with the state administrations' s central and local bodies, aimag, capital city's governors on issues referring to the elimination of effects resulted from them, ensure their performance and enforce supervision over their progress
- orders issued by the commission's head are the legal document for the implementation of the commission's decisions and disposal of funds in connection with the operations carried out
- any decision issued from the commission on a legitimate basis are binding upon and shall be followed and abided by all organizations of the central and local state administration, economic entities, officers and citizens
- staffs of aimag, capital city, soum and district's permanent emergency commissions shall be approved by governors of the given unit, their regulations shall be approved by governors of aimags and capital city, the commissions' day-to-day activities are managed by military, civil defense headquarters and officers. The permanent emergency commissions are headed by the governors of their respective units
- The state permanent emergency commission consists of a head, deputy head and 14 members, 22 aimag and capital city's commissions are composed of their head, deputy head and 8-10 members. Soum and district's commissions are comprised by their head, deputy head and 3-5 members. The commissions have no permanent staff of their own and their day-to-day operation is carried out by the state civil

defense department, aimag, capital city, soum and district's military and civil defense headquarters' officers, respectively.

5.3.3. State Civil Defense Department

The state civil defense department discharges the following functions:

- arrangement and management of all civil defense-related actions in peace-time
- alarm information and warnings about natural disasters and accidents
- organization of civil defense training of all levels on the country's scale, promotion of public awareness about civil defense
- during natural disasters and accidents conduct actions under the guidance of the state permanent emergency commission
- the state civil defense department consists of its head, deputy head, 2 divisions and 5 agencies. Aimag and capital city's civil defense units include 4-8 members and soum and district's staffing ranges between 1-3.

5.3.4. Ministry of Infrastructure Development

The Ministry for infrastructure development approved and issued in 1995 a programme of action to be implemented within the scope of the ministry's powers and responsibilities during natural disaster and accident occurrences. The programme specifies how such actions as prevention from disasters and accidents, rescue, relief assistance, mitigation of effects and rehabilitation actions shall be arranged and implemented within the infrastructure framework including communications, transport, motorways, residential estate, communal services and construction spheres. The programme shall be co-ordinated with the plans and programmes of the state permanent emergency commission and the state civil defense. The programme includes the following priorities:

- maintain preparedness of all levels regarding all technical means and equipment including satellite-based of the communications department, the radio
- supply with transportation facilities required in the case of natural disasters
- determine the resistance capacity of communal and residential buildings and structures to disaster effects, the extent of their damage and rehabilitate them
- rehabilitate and restore roads and bridges damaged during disasters and accidents
- annually procure reserves of materials, technical facilities and spare parts required necessarily in the case of disasters and accidents

It should be noted that in 1996 the fuel and power industry was not included in the composition of the ministry for infrastructure development and accordingly its functions were not specified in this programme. It is necessary that the functions and responsibilities

having been assumed by the fuel and power ministry in the event of disasters and accidents be taken over, renewed and incorporated into the above programme of the ministry for infrastructure development.

5.3.5. Other ministries

The Ministry of agriculture and industry is responsible for the supply of food for the population and reserves of fodder for livestock in the case of emergencies

The Ministry of health shall be responsible for the organization of actions on rescuing people injured during disasters, rendering first medical aid and supply of medicines and other medical stuff.

5.3.6. Public organizations

Along with the above state organizations concerned with particular responsibilities on prevention of natural disaster and mitigation of its effects, there are also a number of public organizations efficiently working in this sphere including:

The Mongolian Red Cross Society's council issued in 1997 the so called MRCS's conception to be guided by in ensuring preparedness to render relief aid to victims and prevention of disasters. The conception specifies in detail such matters as disaster prevention, preparedness to render relief aid, carrying out of actions on rendering assistance to victims, functions and major field of operation of the MRCS, functions of aimag, capital city, soum and district's RCS's committees and the like.

The actions of the MRCS's head and local organizations are divided into pre-disaster, during and post-disaster stages, functions to be discharged by the whole membership, activists, members of first-stage groups are defined and such issues as ensuring preparedness to action and arrangement of training and practical drilling are specified

The major function of the Mongolian Scouts is to conduct training and help acquire practical skills concerning the prevention of natural disasters, when a disaster occurs, protection of people and themselves and mitigation of adverse effects with the assistance of the school and territorial Red Cross Society's units.

Those public organizations conduct training to promote the public awareness about natural disaster involving wide strata of the population and contributing duly to enhancing their educational level and knowledge's due to which they play an important part not less than financial and economic relief aid.

6. Disaster Mitigation Measures

6.1. Disaster reduction plan

The international Decade for Natural Disaster Reduction (IDNDR, 1990-2000) was launched by United Nations General Assembly Resolution 44/236, adopted in December 1989, with the objective of reducing through concerted international action especially in developing countries, the loss of life, property damage, and economic and social disruption caused by natural disasters. Natural disasters, such as earthquakes windstorms, floods, wildfires, heavy snow fall, drought and desertification continue to strike and increase. Therefore a Program of actions was launched in order to implement the target activities of the Decade at the national level and to prevent as well as to reduce the effects of natural disasters.

The National Program on Disaster Reduction will be considered an integral aspect of the social and economic development policy of country, and activities for the implementation of this program will be undertaken to the year 2000.

The objective of the Program is to provide follow-up activities in Mongolia in order to achieve agreed targets of the Decade, namely, the development and strengthening national capacities and capabilities for natural disaster prevention, mitigation and preparedness.

In order to fulfill objectives the following measures will be undertaken:

I. Disaster assessment, analysis and evaluation

a/ Disaster assessment

b/Vulnerability analysis

II. Short and long term prevention measures

III. Collection and dissemination of documentation and information to improve public awareness of natural disasters and how best to deal with them

6.2. 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 they can be damaged, but to a lesser extent than conventional buildings

Since 1990 , a decentralization policy for people and industry has been effected in urban development planning and regional development.

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

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

6.3. Public awareness

There are insufficient activities organized for public awareness of natural hazards. Warnings and alarms for all types of natural disaster are transmitted through radio and television over the entire territory of the country. But, there is no activity for increasing public awareness among the people in non-disaster times. Unfortunately, radio, television and newspapers provide special programs only after a natural disaster has already occurred No propaganda is provided on natural disaster-related problems. No books and brochures for public awareness have been produced. 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 cannot be informed in time.

6.4. Research and development of Disaster-reduction technology

Since the 1970s , there have been attempts to study, evaluate and forecast some hydrometeorological disasters. Today 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. Methodological guidelines for flood forecasting are being prepared.

A part of the future work of the ministry involves refining the analyses, adding more detail, and evaluating them at the province level. An attempt has been made to make the values given here as accurate as possible, but further data collection in the field is r-d before values can be used for decision making.

The effectiveness of prediction and Warning depends both on the quality and lead time of prediction, and on communications channels. Prediction of blizzards, dust storms, and heavy snow can now be made in Mongolia with a lead time of 2 to 3 days, and a reliability of about 90 %.

High reliability is a necessity. Unreliable warnings are unlikely to be believed, reducing their effectiveness. Dissemination of information to herders is the least reliable aspect of the warning chain, because of the lack of telephones, radios, and TV in herder communities . It is estimated that only about 35 % have working radio. Note that a supply of batteries or access to electrical power is also needed.

6.5. Emergency Scenarios- Existing Responses

The following examples show some technological approaches for mitigation measures for blizzards, heavy snow and earthquake.

Blizzards

Blizzards occur in Mongolia generally between September and May. Duration may be short, just a few hours, or up to 10 days. Number of blizzard days varies between less than two days in the west of the country (except for mountains) to between 2 and 8 days in the eastern part of the country and 8-10 days in some mountains areas.

Blizzards can be extremely dangerous with heavy snow and up to 35 m/s wind. Table 6 gives a listing of recent blizzard disasters.

Table 6. Recent Blizzard disaster in Mongolia

| Year | Place | Fatalities | Livestock lost | Other |
|---------------------|------------------|-------------------|-----------------------|--------------|
| Consequences | | | | |
| September | | | | |
| 1995 | Eastern Mongolia | 8 | 48,000 | |
| May | | | | |
| 1993 | Central Mongolia | 17 | 100,000 | |
| September | | | | |
| | | | | |

| |
|---|
| 1993 Central and East 11 5,000 20% potato crop lost |
| October |
| 1992 Central and West 4 500,000 |
| 1988 Dornod, Hentii, 8 10,000 Properly damage |
| Sukhbaatar, Dornogobi |

Heavy snowfall can often prevent by preventing livestock from reaching pasture. It is hard to distinguish the consequences of blizzard (due to chilling) and *heavy snow* (due to exhaustion and starvation of livestock).

The following safety barrier diagram (Figure 1) shows the structure of emergencies involving blizzards, and the emergency measures which may be used to reduce risk. The sequence of events in a blizzard disaster begins with the weather turning bad and terminates with harmful events to persons, livestock and crops. The first barrier to disastrous consequences is prediction and warning. This can allow persons to seek shelter and given sufficient time can also allow herdsman to gather stock and take them to shelter.

Heavy Snow Fall

Heavy snow fall disasters differ from blizzards in that persons are not so much at risk. Damage is primarily caused by livestock being immobilized on the range or in shelters (pens cow shed, etc.) and unable to reach grazing. Figure 2 shows a safety barrier diagram for this situation.

The problems of warning and stock collection in the case of heavy snow fall are similar to those described above for blizzards. The consequences are less direct however. There are two major aspects of the problem, that of people obtaining supplies if snow lasts a long time, and that of providing fodder for animals which cannot reach pasture due to snow.

On farms there is unlikely to be a large shortage of food. The primary problem is in villages, where direct access to food may not be available if transport is halted for a long time. This is a question of the amount of snow falling and the length of time it remains. The mean depth for heavy snow fall is typically 10-15 cm, in mountain areas 20~25 cm. Extreme snow falls are up to 1.5 m in mountain areas. Transport becomes difficult with snow falls greater than 40 cm..

A problem is communication. Communication of snow warning to farmers can be made by radio, to the limit of access to radio receivers. Communications from farmers requesting aid, generally have to be made on foot or horseback.

When snow is heavy and the snow remains for longer periods, animals begin to weaken and die. Delays in feeding of one day are unlikely to cause significant damage but following two days without fodder, mortality begins to increase.

Earthquake

Earthquakes are - frequent in some parts of Mongolia. The consequences in villages are generally destruction of housing, roads and bridges. On farms the traditional gers houses are very resistant to earthquake damage. A safety barrier diagram for earthquake disasters is shown in Figure 3.

Earthquake prediction is difficult, but can be made in a percentage of incidents, particularly with a 1 to 2 day warning. But here again, there are the same difficulties in communication out to rural areas as described above for floods and blizzard warnings. Prediction can be used for increased awareness and possibly for evacuation of collapse-prone buildings, at least in summer. Earthquake preparedness training is an important aspect of this kind of disaster mitigation (Table 7).

Rescue, rehousing and rebuilding are important aspects of disaster mitigation for earthquakes, particularly in winter. There are two major problems in Mongolia which limit the speed of response at present. One is the difficulty of communicating from rural areas. The other is the difficulty of access, particularly during winter.

Table 8. Effectiveness of disaster mitigation measures for earthquake

| Safety Response Reliability Effectiveness Effectiveness Rehousing Overall |
|---|
| measures time of prediction of warning of rescue effectiveness |
| Earthquake days, hours 30% <30% <10/. |
| Prediction |
| |

| |
|--------------------------------------|
| Evacuation |
| Rescue days Depends on Depends on |
| humans location location |
| Rehousing days Depends on Depends on |
| location location |
| |

7. International Cooperation

Mongolia has joined the International Conventions on Climate Change Biodiversity Desertification and Ozone-layer protection. Its representatives have actively participated in conferences, regular meetings and other undertakings of the parties to the International Conventions concerned. It has explained its position and policy in relation to those aspects, and has taken measures to carry out its commitment in respect of the international community.

Mongolia actively participates in the International Decade Natural of Disaster Reduction, and collaborates with some countries in the field of information exchange, studies of new technology and personnel training. Its representative has prepared Mongolia's National Report and took part in the Yokohama Conference 1993.

Over the last two to three years, joint venture projects have been implemented with some developed countries. For example, with the US Environment Protection Agency work has been done on a Country Study Program on climate change, inventory of "greenhouse" gas, vulnerability assessment and mitigation policies. We have successfully completed an initial stage of this work, and have now started a second stage.

The Ministry of Nature and Environment of Mongolia in collaboration with some Japanese organizations have developed project proposals for natural disaster reduction and have presented them to potential donors.

Currently, we are cooperating with the Tsukuba University of Japan to implement a project on Global warming and climate change and studies of the mechanisms of the Central Asian climate.

With the help of the Asian Development Bank, we have started realization of a Project on Environment Management Capacity. Within the framework of this project, we have organized workshops on disaster management and early warning systems, "primit" system for tens of Mongolian specialists. These are the first steps designed to build national capacity. On the basis of the output of the workshops, we are now preparing an

action plan for development and training for disaster analysis, prediction and emergency planning support.

With the assistance of UNEP and UNDP, a national Action Plan to combat desertification has been elaborated, and a National Workshop on the combating of desertification has been held in Mongolia.

Mongolia is concluding agreements with its neighbors on natural disaster reduction. Recently, Mongolia and the Russian Federation signed an agreement on cooperation in case of industrial accidents, natural disasters and the eradication of their consequences.

Because of the economic situation, we are now experiencing some difficulties sending our representatives to international scientific conferences and workshops, and for training abroad.

In future, Mongolia is interested in cooperation with its neighbors in the Subregion and International Organizations on the subjects of measures for natural disaster reduction, prevention and management.

8. Conclusions

1. Natural disasters are very sensitive issues for Mongolia, especially from the economic point of view. Losses to herds, flocks and crops annually affect a very significant part of the country.
2. The high frequency of natural disasters and their extent presents a serious constraint which delays development of the country.
3. Natural disasters cause significant loss of life and of property.
4. The sheep flocks, cattle and horse herds of Mongolia represent a large portion of the wealth of the nation, and are an essential part of the livelihood of most Mongolians.. In the most extreme disasters in the past, over half of the national herd has been lost. Even larger disasters are possible.

5. *The* disasters contributing to losses of herds and flocks are heavy snow, blizzards, dust storms, drought, and floods.

6. Disaster response outside Ulaanbaatar is hampered by difficulties of communication, very long distances, and limited resources.

7. There is a weather monitoring and weather forecast' service which has a well functioning network of weather observation stations, and a well functioning forecasting capability. Effective use of this service will help to establish well functioning disaster prevention system.

8. There is a weak link transmitting natural disaster information to herders in remote parts of the country who especially need it. That is the link in communications. Only a fraction of herder families have radios. The supply of batteries is also a problem. These herder families who do have radios tend to use them sparingly, and they reserve battery power for weather forecasts and other disaster warning information.

9. Civil Defense activities could benefit from the use of modern risk assessment and emergency response ,effectiveness assessment methods, in order to optimize the use of limited resources.

10. The action plan should involve a program of training risk assessment, computer programming for risk analysis and emergency response communications, and disaster mitigation planning assessment.

11 The action plan also should involve development of pilot projects in risk assessment, disaster communications, and emergency planning