Ministry of Nature, Environment and Tourism

REPORT ON THE STATE OF THE ENVIRONMENT OF MONGOLIA

2008-2010

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Ulaanbaatar

2011

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FOREWORD

Today environmental issues are some of the most important issues globally due to population growth and increased human consumption combined with technological achievements, manufacturing developments and extreme increases in natural resource utilisation. The United Nations Conference on Environment and Development (UNCED) held in Rio de Janeiro in 1992 produced the Rio Declaration on sustainable development, which included a new global socio-economical and environmental development concept for the protection of the environment for future generations, technological production with minimum use of resources, energy, and water, and also called for thrifty lifestyles with minimum waste.

Due to anthropogenic climate change and human activities, the Mongolian economy and people's lifestyles are being affected by increased environmental pollution, unpleasant effects of desertification, degradation of pasturelands, intensification of sand movements, decreases in Mongolian forest reserves, reductions in water reserves, decreases in animal and plant species, increased soil erosion, and decreased land fertility. The Mongolian Government has given special attention to decelerating the negative changes in the state of the environment by protecting the environment, ensuring proper use of natural resources, undertaking rehabilitation work, and improving environmental management.

The Ministry of Nature, Environment and Tourism (MNET) announced the year of 2008 as the "Year of Supporting Non-Governmental Organisations" and organised a national consultative meeting for non-governmental organisations, and supported the establishment of civil society cabinet. Through this activity, government and civil society stepped into a new era for environmental protection. 2009 was announced as the year for "Capacity building of preservationists", regional workshops for capacity building of preservationists were organised and 796 preservationists attended the workshops. Also, MNET organised consultative meetings for local environmental specialists jointly with the Parliament Standing Committee on Environment, Food and Agriculture. The year of 2010 was announced as the year for "Improving forest management" and as a result of sufficient budget allocations, the main source of harmful forest insects was successfully combated.

From the results of research into the state of the environment in last three years we developed and published the "Report on State of the Environment of Mongolia" for public access. In the last three years many positive and negative changes have been made in the environmental field in Mongolia. The public, civil society organisations, and governmental organisations have started to focus more attention on environmental issues and have started to do more comprehensive activities in this sector and participation and cooperation with each other has increased.

The President of Mongolia participated in the Conferences of the Parties, United Nations Framework Convention on Climate Change and the United Nations General Assembly and gave

a speech about the effects of climate change in Mongolia, adapting to climate change and about combating desertification.

The Mongolian Parliament has taken a daring step by making legal adjustments to stop environmental pollution and erosion, and renewed the national policies on climate change and water reserves.

The Mongolian Government, for the purpose of drawing attention to climate change and desertification issues and to call for effective measures against climate change, organised a special government meeting in Gashuunii khooloi in Bayandalai soum of Umnu-Gobi province. At the meeting the National Program on Combating Desertification was revised and approved.

The MNET developed complex documents about combating air pollution in Ulaanbaatar and introduced them to the Parliament and the Government. The new Law on Air Pollution and the "Innovation" National Program was approved. According to the new law, every air polluting source must make payments for air pollution and these funds can be used to combat air pollution.

The Report of State of the Environment for 2008 to 2010 states that there are increasingly negative impacts on the environment, for example: air pollution rates are increasing in the capital and other big cities; desertification is increasing across Mongolia; rehabilitation work on land damaged by mining activities are insufficient; the forest reserve area is decreasing; water reserve management is insufficient; water pollution is increasing in some areas; and illegal use of biodiversity is not decreasing.

To decelerate the negative changes in the state of the environment there is a need to improve implementation of the legal framework and economy consistent with Mongolia's ecology. The primary mid-term strategies of the Government are the protection of native characteristics, economic leverage for environmental protection, and expenditure on rehabilitation work based on ecological and economic assessments.

I verify that the data and information contained in this report on current issues are the results of real research into the current situation. It draws on the work of international and non-governmental organisations, trainings, reports of research institutions, presentations, and published information sets with scientific evidence.

If the words, terminology, report composition, or meanings used in this report do not fulfil your needs please don't hesitate to contact or write to us. Your suggestions are very valuable to us and help to improve the quality of future reports.

CABINET MEMBER OF THE GOVERNMENT OF MONGOLIA,

THE MINISTER FOR NATURE, ENVIRONMENT AND TOURISM L.GANSUKH

CHAPTER ONE

MONGOLIA'S CLIMATE

1.1. Climate condition and changes

In Mongolia between 2008 and 2010 average annual air temperatures were 0.8-1.8°C warmer than the long term mean air temperature.[1] In 2008, average summer air temperatures were 1.1-3.5°C higher than the long term mean air temperature in the Western region, 1.2-4.0°C higher in the Central and Southern regions, and 1.1-3.8°C higher in the Eastern region. In 2008, average winter air temperatures were 1.1-7.3°C warmer than the long term mean air temperature for November and December. In 2008, precipitation increased across 20 per cent of the country compared to the long term average, it decreased in 50 per cent of the country and 30 per cent of the country had precipitation the same as the long term mean precipitation level.

In May 2009, air temperatures were 1.1-4.9°C higher country compared to the long term mean air temperature for each province, but average air temperatures in Mongol-Altai, Khentii highlands, Bulnai, Tarvagatai, Khan Taishiriin Nuruu and Tes river basin were the same as the long term mean. Average air temperatures increased by 1.1-3.5°C in the north and north-eastern regions in June compared to the long term averages, and decreased by 1.1-3.1°C in the northwest and eastern regions. In July, average air temperatures were 1.1-4.2°C higher in the areas of Selenge, Dornod, Gobi-Altai, Uvs lake and Great Lakes' Hollow, Lakes' valley, Khonin Usnii khooloi, Altai Inner Gobi, and Gobi compared to long term averages. Average air temperatures decreased in Mongol Altai, Khangai, Khentii and Khuvsgul highlands regions, and average air temperatures remained as same as the long term mean in other areas.

In January 2009, average air temperatures for winter were the same as long term means across the country. Average February temperatures were 1.5-3.1°C lower in Khentii highlands compared to the long term average air temperature. Winter air temperatures in 2009 ranged from minus 30-46°C in most areas of Mongolia.

[1] Report of National Agency of Meteorology, Hydrology and Environment Monitoring

In 2010, the annual average air temperature in Altai and Khangai mountainous areas increased by 0.1°C, in Gobi region it increased by 0.3°C, in the Central region it decreased by 0.2°C, and in the Eastern region it decreased by 0.7°C compared to long term mean air temperature.

The air temperature averaged minus 1.9 °C over 2010, the area with the lowest average annual air temperature was Renchinlhumbe soum of Khuvsgul province which averaged minus

7.1°C and the highest was +2.6°C which was observed in Zereg soum of Khovd province. In January and February, air temperatures ranged from minus 43-48°C at night to minus 34-39°C during the day in the regions of Darkhad's hollow, Ider, Tes, Buyant, Baidrag, Kharaa, Yeruu, Orkhon, Selenge, Tuul, Kherlen and Khalkh river basin.

In 2010, the average annual precipitation level across Mongolia was 202.8 millimeters; summer precipitation averaged 185.7 millimeters or 91.6 per cent and winter precipitation averaged 17.1 millimeters or 8.4 per cent of the total annual precipitation.

Throughout Mongolia annual precipitation decreased by 6.6 millimeters compared to the long term average. The Altai and Khangai highlands received 219.1 millimeters of precipitation over 2010. The highest precipitation was 332.1 millimeters in Tsetserleg of Arkhangai province, and the lowest was 69 millimeters in the Zereg basin, Khovd province.

In August, cloud seeding activities increased precipitation by 37.9-68.9 millimeters in Baruunturuun and Zavkhan soums of Uvs province. Annual precipitation averaged 247 millimeters across the central region, the highest level of 310.3 millimeters was recorded in Erdenesant soum of Tuv province, and the lowest was 195.1 millimeters in Bayan soum of Tuv province. These amounts were 25 millimeters lower than the average long term annual precipitation level in these areas. Across the Eastern region the annual precipitation level averaged 276.9 millimeters. The highest level of precipitation was 401.5 millimeters in Binder soum of Khentii province which is located in Khentii Mountains and the lowest was 176.7 millimeters in Matad soum of Dornod province which is located in Menen Steppes. In the northern mountainous areas of the Eastern region, and in Choibalsan soum of Dornod province, the precipitation level increased by 1.6-79.4 millimeters compared to the long term average. In the steppes of the south-eastern regions, the precipitation level decreased by 23-63.7 millimeters. In Gobi regions, the annual precipitation level averaged 110.3 millimeters; the highest level recorded was 183.8 millimeters in Dalanzadgad soum of Umnu-Gobi province and the lowest precipitation level was 52.1 millimeters in Ehiin river oasis which is located in Bayankhongor province. Summer biomass conditions from 2008 to 2010 are shown in the figures below.

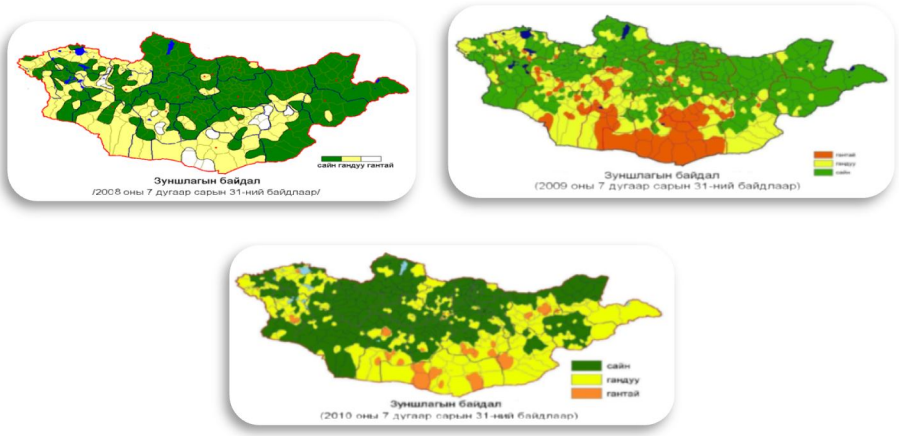


Figure 1. Summer biomass levels; 2008, 2009 and 2010

1.2. **Extreme climate events and natural disasters.**

Researchers claim that the frequency of extreme and disastrous weather events has been increasing in recent years due to global warming and climate change. In Mongolia, the number of incidents caused by extreme weather each year is increasing. In the years up to 2000 the number of disastrous events each year was around 20 but this number has doubled since 2000.

Between 2008 and 2010 there were a total of 153 disaster events caused by weather, most of these were strong winds, storms, and run-off floods.[2]

In 2008, Mongolia was hit by 47 extreme weather events including 11 thunderstorms (lightening) and 9 cases of strong winds and storms. In 2009, 49 extreme weather events were recorded in Mongolia including 13 cases of strong winds, 13 storms, and 13 cases of flooding. In 2010, a total of 57 extreme weather events were reported including 19 strong wind storms, 10 cases of flooding and 6 cases of gusty winds.

Table 1. Frequency of extreme and disastrous weather events

Disastrous incidents classification	Meteoric										Water		Climatic				Total	
Synoptic classification	Front origin						Convex origin						Other					Forest and steppe fires
Incident name	Wind storms	Heavy snow	Wet snow	Sudden frost	Rain	Cold rain	Gusty wind	Thunder storm	Hail	Lightening	Downstream flood	Spring flood	Intense heat	Freezing	Avalanche	Dzud		
2008	9	1	2	4	3	-	5	-	3	11	6	1	2	-	-	-	47	177
2009	13	-	2	3	2	1	5	1	1	6	13	-	1	-	-	1	49	117
2010	19	-	1	1	-	-	6	2	1	7	10	1	2	3	3	1	57	104

[2] Report of National Agency of Meteorology, Hydrology and Environment Monitoring

In 2008, extreme weather events resulted in 82 human casualties, the death of 414,918 head of livestock, and estimated damages amounting to 3476.8 million tugriks. In 2009 the disasters resulted in 47 human casualties, the death of 446,402 head of livestock, and 12,388 million tugriks in damages. In 2010, eight human casualties, the death of 9.7 million head of livestock, and 52,739.6 million tugriks in damages were suffered.

Table 2. Damages from extreme weather events from 2008 to 2010

Year	Number of incidents	Number of human casualties	Number of livestock lost	Damages (million tugriks)
2008	48	82	416,087	3476.8
2009	49	47	446,402	12,388.0
2010	57	8	9,700,000	52,739.6

Most damages were caused by wind storms and gusty winds in 2008, by downstream floods in 2009, and by thunderstorms and hail in 2010 (Figure 2).

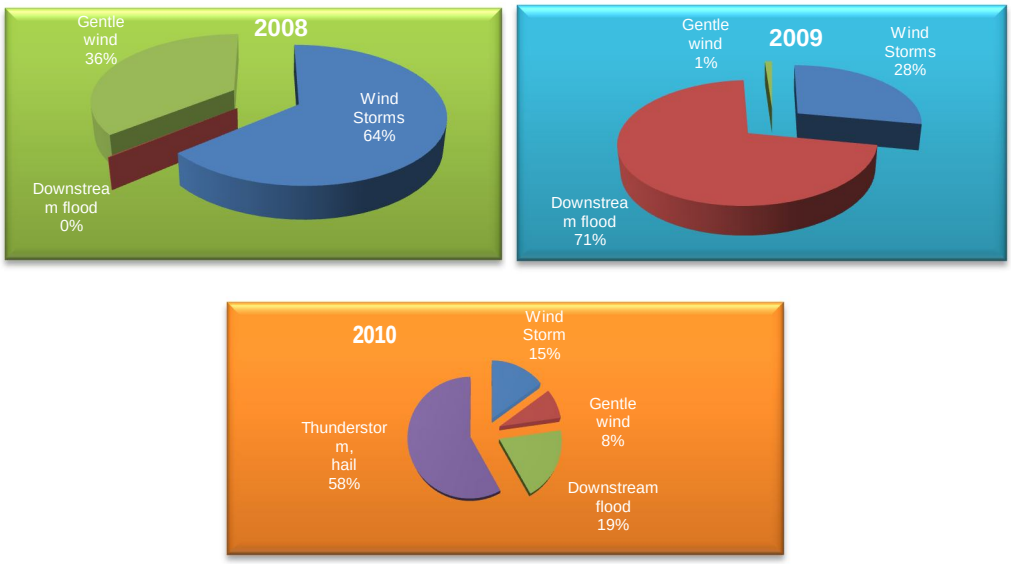


Figure 2. Extreme and disastrous weather events by type (percentage)

On April 18, 2008, a strong wind storm in Uvs province caused 1371.2 million tugriks in damages which was the most damage caused by a natural event in the year of 2008. As a result of this incident, 21 power line poles fell and power was cut to Bayan-Ulgii, Uvs and Khovd provinces. About 170 gers and the roofs of many buildings were damaged, a steam boiler pipe was broken in Ulaangom, and about 600 head of livestock were buried under sand.

Figure 3. Damages from the strong wind storm of April 18, 2008

In 2010, a total of 19 wind storms, two intense heat events, three freezing cold events, one heavy, wet snow event and one sudden frost occurred and resulted in one human casualty, the death of 539 head of livestock and 141.8 million tugriks in damages.[3]

In winter of 2009 and 2010, 175 soums and 18 provinces were affected by dzud where 9,700,000 head of livestock were destroyed and 526,076 million tugriks of damages was incurred. The winter snow thickness from 2008 to 2010 is shown in the figure below. Drought affected 10 per cent of Mongolia in 2008, 20 per cent in 2009, and 10 per cent in 2010.

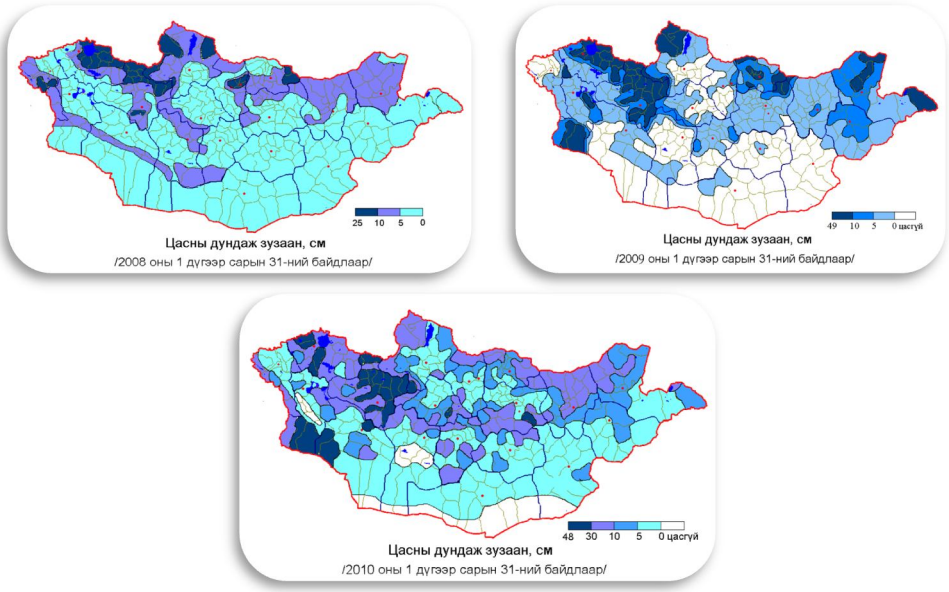


Figure 4. Snow thickness at 31 January (averaged across each region) in 2008, 2009 and 2010

[3] National Emergency Management Agency report, 2010

CHAPTER TWO.

NATURAL RESOURCES

2.1. State of, and changes in, Mongolia's land resources

Changes in the use of Mongolian land resources from 2008 to 2010 are illustrated in Table 3.

Table 3. Basic classification of land resources (2008-2010)

Year	Types of land resource	Total area	Land for agriculture	Land for towns, villages and other urban settlements	Land for roads and other infrastructure networks	Land with forest resources	Land with water resources	Land for state special needs
2008	Quantity ('000 ha)	156,411.6	115,824.7	530.1	371.3	14,227.3	665.5	24,792.7
	Percentage	100 %	74.0 %	0.34 %	0.23 %	9.1 %	0.42 %	15.85 %
2009	Quantity ('000 ha)	156,411.6	115,586.2	543.8	383.6	14,315.5	665.5	24,917.1

	Percentage	100 %	73.90 %	0.35 %	0.25 %	9.15 %	0.42 %	15.93 %
2010	Quantity ('000 ha)	156,411.6	115,525.9	620.6	407.1	14,297.9	682.8	24,877.3
	Percentage	100 %	73.87 %	0.39 %	0.26 %	9.13 %	0.44 %	15.91 %

At the end of 2010, Mongolian land resources comprised of 115,525.9 thousand hectares of agricultural land (73.87 per cent of the total land area), 620.6 thousand hectares of land for town, villages and other urban settlements (0.39 per cent), 407.1 thousand hectares of land for road and other infrastructure networks (0.26 per cent), 14,297.9 thousand hectares of land with forest resources (9.13 per cent), 682.8 thousand hectares of land with water resources (0.44 per cent), and 24,877.3 thousand hectares of land for state special needs (15.91 per cent).[4]

[4] The report of the Administration of Land Affairs, Geodesy, and Cartography of 2010

Agricultural land: Agricultural land covers 115,525.9 thousand hectares or 73.87 per cent of the total land area. Agricultural land consists of 111,255.7 thousand hectares of pastureland (96.3 per cent), 1714.9 thousand hectares of hay production fields (1.48 per cent), 932.4 thousand hectares of cultivated land (0.81 per cent), 306.6 thousand hectares of arable land (0.27 per cent), 54.7 thousand hectares of land for purposes of agricultural construction and other relevant facilities (0.05 per cent), and 1261.6 thousand hectares of land which is not suitable for agriculture (1.09 per cent). The change in land area for agriculture by its classification for the last three years is shown in Table 4.

Table 4. Changes in land area for agriculture ('000 ha)

№	Classification of land resource	2008 ('000 ha)	2009 ('000 ha)	2010 ('000 ha)
1	Pastureland	111,485.2	111,227.3	111,255.7
2	Hay production fields	1823.3	1825.0	1714.9
3	Cultivated land	835.7	906.0	932.4
4	Arable land	363.3	312.1	306.6
5	Land for purposes of agricultural construction and other facilities	55.6	54.2	54.7
6	Land not suitable for agriculture	1261.6	1261.6	1261.6
Total		115,824.7	115,586.2	115,525.9

Land for towns, villages and other urban settlements: Land for towns, villages and other urban settlement is comprised of 620.6 thousand hectares or 0.39 per cent of total land. Of this, 55.5 thousand hectares or 8.94 per cent is construction land, 318.3 thousand hectares or 51.29 per cent is for public facilities, 27.9 thousand hectares or 4.5 per cent is for manufacturing facilities, 177.4 thousand hectares or 28.59 per cent is for mining sites, and 41.5 thousand hectares or 6.69 per cent is for ger areas. Changes in the makeup of land for towns, villages and other urban settlements in last three years are shown in Table 5.

Table 5. Changes in the makeup of land for towns, villages and other urban settlements

№	Classification of land resource	2008 ('000 ha)	2009 ('000 ha)	Change 2008-09 ('000 ha)	2009 ('000 ha)	2010 ('000 ha)	Change 2009-10 ('000 ha)
1	Construction land	52.1	55.0	2.9	55.0	55.5	+0.5
2	Public facilities	296.9	294.2	-2.7	294.2	318.3	+24.1
3	Manufacturing facilities	7.8	9.5	1.7	9.5	27.9	+18.4
4	Mining sites	137.2	146.3	9.1	146.3	177.4	+31.1
5	Ger district areas	36.0	38.8	2.8	38.8	41.5	+2.7
Total		530.0	543.8	13.8	543.8	620.6	+76.8

Mining sites: The total area of land for mining purposes increased by 31.1 thousand hectares in 2010 compared to 2009 due to licenses issued in Ulaanbaatar and 11 provinces.

The total mining area increased because of: an increase in gold mining sites in Buregkhangai soum of Bulgan province; 3 additional mining leases in Khongor and Shariin gol soums of Darkhan-Uul province; additional licensing for mining purposes in Jargalant soum of Orkhon province; improved accounting of land resource in Dornod province; additional mining site licensing and additional customs control field in Umnu-Gobi province; an increase in the number of gold mining sites in four soums of Tuv province; increased number of coal mining sites in Bukhmurun soum of Uvs province; an increase in gold mining sites in Khyargas soum of Uvs province; and an increase in mining sites in Norovlin and Bayan-Adraga soums of Khentii province.

Table 6. Land for mining sites

Year	Land for mining sites ('000 ha)
2008	137.2

2009	146.3
2010	177.4

Land for roads and other infrastructure networks: In 2010, total land area used for roads and other infrastructure networks was 407.1 thousand hectares which is an increase of 23.5 thousand hectares compared to 2009. In this category, railways cover 27.1 thousand hectares or 6.66 per cent, roads cover 303.1 thousand hectares or 74.45 per cent, land for air transportation covers 8.6 thousand hectares or 2.11 per cent, and other infrastructure networks cover 68.3 thousand hectares or 16.78 per cent.

Table 7. Changes in land for roads and other infrastructure networks

№	Classification of land resources	2008 ('000 ha)	2009 ('000 ha)	Change 2008-09 ('000 ha)	2009 ('000 ha)	2010 ('000 ha)	Change 2009-10 ('000 ha)
1	Railway	19.1	25.8	6.7	25.8	27.1	1.3
2	Roads	281.8	283.9	2.1	283.9	303.1	19.2
3	Land for air transportation	9.7	9.7	0.0	9.7	8.6	-1.1
4	Land for water transportation	0.002	0.002	0.0	0.002	0.002	0.0
5	Land for infrastructure networks (eg cables and pipes)	60.8	64.2	2.1	64.2	68.3	4.1
Total		371.4	383.6	12.2	383.6	407.1	23.5

From Table 7, it can be seen that land for railways increased by 1.3 thousand hectares, this is a result of an increase in land for railways in Dornod and Darkhan-Uul provinces.

Land with forest: In 2010, the total land area of classified as forest land was 18,565.5 thousand hectares. Land with actual forest cover was 12,917.5 thousand hectares or 69.58 per cent, lands that could be forested but are currently without forest cover was 4712.1 thousand hectares or 25.38 per cent, and the area within forest lands that are not able to support forests was 935.9 thousand hectares or 5.04 per cent. Total area of land with forest has decreased by 68.4 thousand hectares in 2010 compared to 2009 (Table 8).[5]

[5] The report of the Administration of Land Affairs, Geodesy, and Cartography of 2010

In 2009, the national forest land inventory was updated for Selenge province. The updated forested land inventory showed a decline in the national forested land area of 68.4 thousand hectares in 2010.

Most of the forested land of Mongolia is taiga with no infrastructure and is unreachable which does not allow silviculture practices including clearing and nursing. As a result of the lack of management and use of timber, forests are decaying and aging naturally and there has been an increase in forest fires in recent years. Aged forests constitute 55.7 per cent of the total land with forest cover and 76.3 per cent of forested land. Currently, 1190.4 thousand hectares of forests are irreversibly damaged from forest fire, 95.6 thousand hectares of forests have dried out from forest blights, 249.1 thousand hectares has been cleared for lumber, and 0.9 thousand hectares has been damaged by natural disasters. These are the main factors that contributed to forest reserve degradation.

Forest reserves near cities and other settled areas have suffered due to illegal logging.

Table 8. Changes in land with forest reserves

№	Classification of land resource	2008 ('000 ha)	2009 ('000 ha)	Change 2008-09 ('000 ha)	2009 ('000 ha)	2010 ('000 ha)	Change 2009-10 ('000 ha)
1	Land covered with forest	13301.0	13039.2	-261.8	13039.2	12917.5	-121,7
2	Forest damaged by forest fire and blights	877.8	1111.2	+233.4	1111.2	1280.0	+168,8
3	Deforested forest area	225.4	240.2	+14.8	240.2	249.1	+8,9
4	Forest breeding area	257.7	197.0	-60.7	197.0	169.6	-27,4
5	Other land of forest reserve	4187.2	4046.3	-140.9	4046.3	3949.3	-97
Total		18849.3	18633.9	215,4	18633.9	18565.5	-68,4

Currently timber is only used for firewood or during the building phase of construction (not actually used as a building material) and therefore only around 27 per cent of a felled tree is used productively. There are not well developed forest management plans that include plans for forest protection and sustainable forest uses with mid- and long-term goals. Compared to the size of the country the forest area is small, but the forest area per capita is ten times greater than in the world average and twenty times greater than in Europe. However, revenue from forests to the national budget is still not significant.

Land with water resources: In 2010, the total land area with water resources was 682.8 thousand hectares or 0.42 per cent of total land in Mongolia. Rivers and streams account for 227.3 thousand hectares or 33.29 per cent of the land for water resources, lakes and ponds account for 439.9 thousand hectares or 64.43 per cent, iced riverbeds 1.1 thousand hectares or 0.16 per cent, and headsprings 14.5 thousand hectares or 2.12 per cent. Changes in land area with water resources occurred in Dornod, Darkhan-Uul and Sukhbaatar provinces.

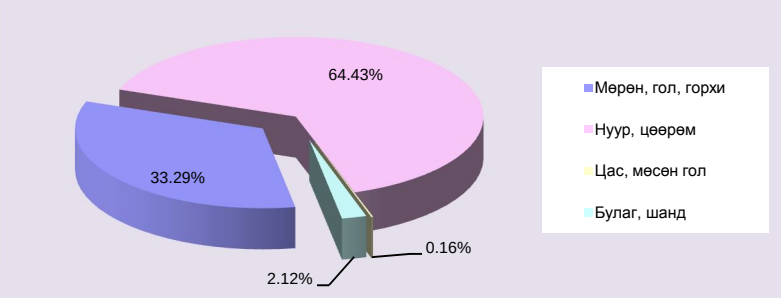


Figure 5. Types of water resource by percentage of land area

Land for special state purposes: In 2010, total land area used for special state purposes covered 24,877.4 thousand hectares or 15.9 per cent of Mongolian territory. Out of which 20,943.9 thousand hectares or 84 per cent are state protected areas, 3112.0 thousand hectares or 13 per cent are state border areas, 124.1 thousand hectares or 1.0 per cent is state defense territory, 0.03 thousand hectares or 0.001 per cent is land for foreign diplomatic missions and consulates, 2.5 thousand hectares or 0.009 per cent is for scientific and technological research, and environment and weather observation, 503.1 thousand hectares or 2.0 per cent is for inter-province reserve rangelands, 110.9 thousand hectares or 0.4 per cent is for state fodder fund hayfields, 24.5 thousand hectares or 0.1 per cent is land leased for oil production, and 2.1 thousand hectares or 0.008 per cent are special economic zones.

In 2009, land for state special purposes was 24,917.1 thousand hectares and in 2010 it decreased by 39.7 thousand hectares. Changes for last three years are shown in Table 9.

Inter-province reserve rangelands increased by 54.2 thousand hectares as a result of the Government decision in March 17, 2010 to designate 2988 hectares in Bayannuur soum, 19,245 hectares Dashchilen soum, and 4756 hectares in Rashaant soum of Bulgan province, 7151 hectares in Undurshireet soum of Tuv province, 9432 hectares in Burd soum, 10,850 hectares in Bayan-Undur soum of Uvurkhangai province, 6423 hectares in Delgerkhaan soum, and 11212 hectares in Erdenesant soum of Tuv province as lands for state special purposes.

By the 27th resolution of the Parliament of May 28, 2010, land for state special purposes for armed forces and for border patrols was approved, thereby the 196th Government resolution of July 20, 2010 and the 87th Government resolution of June 14, 2000 about “Classification of land for defense special purposes” became ineffective. As a result of these changes, the country’s land for defense and security purpose decreased by 94.0 hectares.

Table 9. Changes in land for state special purposes

№	Classification of unified land resource	2008 (’000 ha)	2009 (’000 ha)	Change 2008-09 (’000 ha)	2009 (’000 ha)	2010 (’000 ha)	Change 2009-10 (’000 ha)

1	Land for state protected areas	20,943.9	20,943.9	0.0	20,943.9	20,943.9	0.0
2	Land for state border areas	3112.0	3112.0	0.0	3112.0	3112.0	0.0
3	Land for state defense territory	218.1	218.1	0.0	218.1	124.1	-94.0
4	Land for foreign diplomatic missions and consulates	0.03	0.03	0.0	0.03	0.03	0.0
5	Land for scientific and technological research, and environment and weather observation	2.5	2.5	0.0	2.5	2.5	0.0
6	Land for inter-province reserve rangelands	378.7	503.1	124.0	503.1	557.3	+54.2
7	Land for state fodder fund hayfields	110.9	110.9	0.0	110.9	110.9	0.0
8	Land leased for oil production	24.5	24.5	0.0	24.5	24.5	0.0
9	Special economic zones	2.1	2.1	0.0	2.1	2.1	0.0
Total		24,792.7	24,917.1	124.4	24,917.1	24,877.4	-39.7

2.1.1. Land ownership

On 31 December 2010, 160,611 households in the provinces and 84,734 households in the capital, making a total of 245,345 households, held land ownership titles for 27,348.99 hectares of land obtained free of charge. The five provinces with the greatest number of households with land ownership were Ulaanbaatar (84,734 households), Selenge province (14,075 households), Dornod province (13,334 households), Orkhon province (12,585 households), and Uvurkhangai province (12,296 households).[6]

[6] The report of the Administration of Land Affairs, Geodesy, and Cartography of 2010

Figures 6 and 7 show the numbers of households with land ownership titles and the amount of owned land.

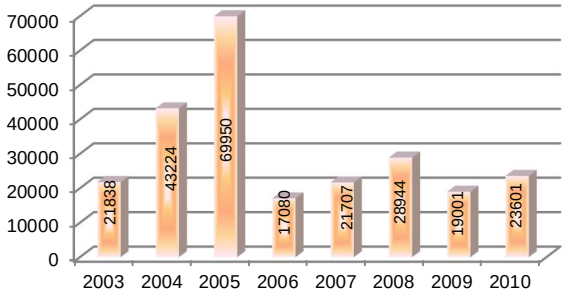


Figure 6. Number of households with land ownership (national level)

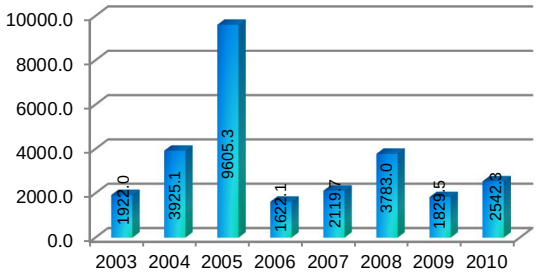


Figure 7. Amount of land owned for household purposes

At the end of 2010, 92 households obtained 18.16 hectares of land for business purposes, 44 households obtained 1.48 hectares land from auctions, and 11 households obtained 3.93 hectares of land for agricultural purposes.

2.1.2. Land quality changes

The main factors causing land degradation and desertification of land are climate change, overgrazing of pasturelands, decrease of soil productivity, forest fires, blights, unsustainable use of forest reserves, and mining activities. The degradation is summarized below in accordance with the Format GT-6 terminology for land damage.

Cultivated land: Only 30 per cent of the previously used 1.2 million hectares of cultivated land are used today for cultivation. In 2010, 250.4 thousand hectares of cultivated land was damaged throughout the country. Of which 46,438.6 hectares were damaged by wind, 5865.5 hectares were damaged by water, 142,887.1 hectares suffered degraded productivity, 53,181.5 hectares were destroyed by rodents and pests, 1344.4 hectares were affected by polluted soil, 450 hectares were polluted by chemical substances, and 285.3 hectares were affected by other factors.

The extent of damage to cultivated land varies by region, but overall damage increased in 2010 by 66,122.3 hectares compared to 2009. Greater damage was experienced on cultivated land in dry and low humidity regions which are susceptible to wind erosion. In Bayankhairhan soum of Zavkhan province, and Baruunturuun soum of Uvs province land productivity has been

degraded due to a lack of utilization of the land, and in Mandal, Javkhlant, and Saikhan soums there was a significant increase in the amount cultivated land affected by wind erosion.

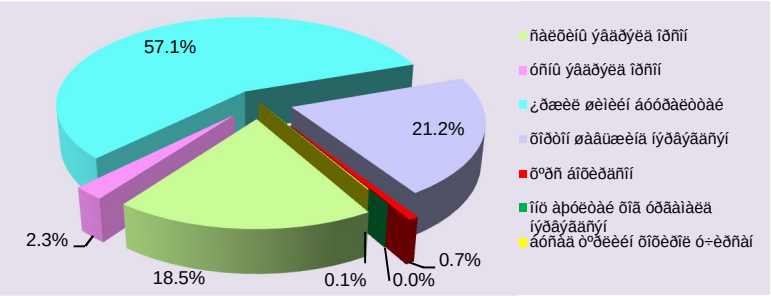


Figure 8. Damages to cultivated lands, 2010

Town, villages and other settlements: The number of settlements is increasing resulting in degradation of land surface, loss of vegetation cover, and increasing sand movements. Waste from industrial and non industrial activities, and household waste disposed of in the environment have resulted in increased air, water, and soil pollution.

Damages to land in towns, villages and other settlements account for 8543.9 hectares, of which 1311.4 hectares have lost vegetation cover, 3049.8 hectares are affected by sand movements, 4017.5 hectares are polluted by non industrial waste, 68.5 hectares are polluted by industrial waste, 4.8 hectares are polluted by chemical and nuclear substances, and 92.1 hectares are damaged by other pollutants.

The provinces with the most area of damaged land in towns, villages and settlements are Sukhbaatar, Gobi-Sumber, Zavkhan, Gobi-Altai, Tuv and Khuvsgul. At the national level, the greatest level of damage was 476.7 hectares in Zavkhan province, and 390.7 hectares in Khuvsgul province which lost vegetation cover. The most significant problem in Sukhbaatar and Tuv provinces has been land covered by sand movements, in Orkhon province it has been land polluted by industrial waste, and Gobi-Sumber, Dorno-Gobi, and Gobi-Altai provinces it has been land polluted by non industrial wastes.

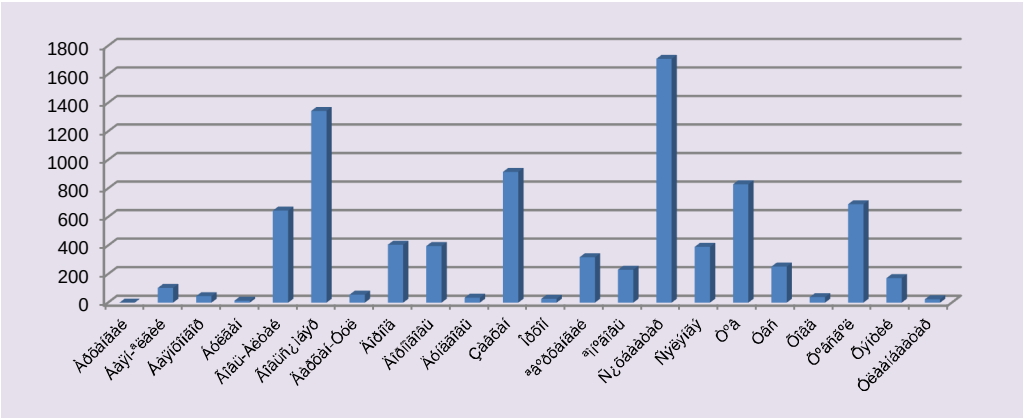


Figure 9. Damages to land in towns, villages and settlements

Damages to land with forest reserves: Mongolia's forest reserves are greatly affected by forest fires, diseases, pests, mining activities, and illegal logging. In 2010, 375.7 thousand hectares of land with forest reserves were affected by various factors including 39.0 thousand hectares burned in fires, 95.6 thousand hectares destroyed by diseases and pests, and 42.2 thousand hectares affected by mining activities.

Table 10. Damaged forest reserves land

Year	Affected by fire ('000 ha)	Affected by disease, pests and insects ('000 ha)	Affected by mining ('000 ha)
2008	91.0	59.5	0.05
2009	161.0	59.8	0.04
2010	39.8	95.6	0.04

The area affected by forest fire in 2010, compared to 2009, decreased by 122 thousand hectares. By 2010, 42.2 hectares of land with forest reserves were affected by mining activities. The area suffering from destroyed trees, bushes and shrubs increased by 1.2 thousand hectares compared to 2009, and forests affected by diseases and pests increased by 35.8 thousand hectares. The number of forest fires in Zavkhan and Khuvsgul provinces has significantly increased and forests affected by diseases and pests increased in Uvurkhangai, Arkhangai and Khuvsgul provinces.[7]

[7] The report of the Administration of Land Affairs, Geodesy, and Cartography of 2010

Damage to land with water reserves. In 2010, a total of 935 hectares of land with water reserves were damaged, of this 24.7 hectares of land were polluted surface and ground water areas, 40 hectares of land near river banks were damaged from industrial contamination, 579.9 hectares near river banks were damaged by mining activities, and 291.3 hectares of land were reported as damaged due to other reasons. In 2010, damage to land with water reserves decreased by 7583.5 hectares compared to 2009, because of a decrease in the pollution of land near river banks from surface and ground water, industrial and mining activities. At the national level, Dornod province was an area greatly affected by industrial pollution and the affects of mining exploration activities.

Land excavated and damaged: The development of mining industry is very important for the future of Mongolia, however the booming mining industry will contribute to land degradation enormously. Exploration of mineral resources, preparation of construction materials, construction of roads, geological exploration, and maintenance activities require the excavation of surface soil and creation of overburden which leads to soil erosion and damage to the land surface.

In 2010, a total land area of 19,419 hectares had been excavated and damaged, of which 1904.5 hectares was damaged from geological excavation, 16,061.5 hectares damaged from mining exploration, 305 hectares from defense and security related activities, 97.9 hectares from construction, engineering and maintenance, and 1049.6 hectares from roads, transportation, communication and construction maintenance. 6645.4 hectares of land was damaged from mining explorations in Tuv province, 3021 hectares in Selenge province, 2174.9 hectares in Uvurkhangai province, 2152 hectares in Orkhon province, 1709 hectares in Khentii province and 1093.7 hectares in Umnu-Gobi province. These areas were mostly damaged by land excavation.[8]

Damage to pastureland: By 2010 pastureland damage had reached 6.8 million hectares, which was 92.1 per cent of all damaged lands at the time. Table 11 shows pastureland damage in last three years (2008, 2009 and 2010).

Table 11. Damaged pasturelands (’000 ha)

Year	Degraded	Damage from water and wind	Became swamp land	Affected by sand movement	Destroyed by rodents, pests and insects	Affected by desertification	Affected by mining explorations
2008	5454.8	571.6	0.258	873.7	4266.4	194.1	18.3
2009	4494.8	47.4	4.8	563.4	4311.5	320.8	272.6
2010	2589.2	17.4	0.9	312.0	2784.8	941.6	129.4

Compared to 2009, pastureland damage in 2010 from degradation was reduced by 1905.6 thousand hectares, damages from water and wind reduced by 30.0 thousand hectares, swamped land reduced by 3.9 thousand hectares, land affected by sand movement reduced by 251.4 thousand hectares, areas affected by pests and rodents reduced by 1526.7 thousand hectares, and lands affected by mining activities was reduced by 143.2 thousand hectares, but the area affected by desertification increased by 620.8 thousand hectares.[9]

[8] The report of the Administration of Land Affairs, Geodesy, and Cartography of 2010

[9] The report of the Administration of Land Affairs, Geodesy, and Cartography of 2010

2.2. Desertification

Approximately 90 per cent of Mongolia’s pasturelands have been affected by desertification and land degradation, of which 5.0 per cent has been classified as having experienced very strong desertification, 18.0 per cent strong desertification, 26 per cent medium desertification and 23.0 per cent low desertification according to desertification map and evaluation work.[10] The desertification process of Mongolia was investigated and studied by scientists and researchers of the Geo-Ecological Institution under the title “Dynamic tendency of Mongolian desertification” from 2004 to 2006, and additional clarifications were made in 2008.

A desertification map was developed and renewed at the provincial level. Table 12 shows the level of desertification across the provinces.

[10] National Program on Combating Desertification, 2010

Table 12. Areas affected by desertification at provincial level

Province	Without desertification (%)	Weak desertification (%)	Medium desertification (%)	Strong desertification (%)	Very strong desertification (%)
Arkhangai	56.26	32.92	10.02	0.80	0.00
Bayankhongor	36.21	23.13	24.16	13.08	3.43
Bayan-Ulgii	56.29	22.61	10.52	3.43	7.14
Bulgan	48.57	33.21	13.96	4.26	0.00
Darkhan-Uul	39.57	36.80	23.63	0.00	0.00
Dornod	27.31	41.46	30.04	1.19	0.00
Dorno-Gobi	3.77	11.83	21.20	53.00	10.20
Dund-Gobi	0.21	0.50	33.27	53.89	12.12
Gobi-Altai	35.31	25.19	23.61	11.67	4.23
Gobi-Sumber	0.19	7.55	17.40	74.56	0.30
Khentii	27.30	28.20	27.78	16.21	0.50
Khovd	22.99	30.73	20.45	19.30	6.52
Khuvsgul	79.28	16.19	4.26	0.27	0.00
Umnu-Gobi	23.25	27.32	26.97	20.38	2.08
Orkhon-Uul	96.97	0.00	3.03	0.00	0.00
Uvurkhangai	9.04	12.05	33.00	43.53	2.38
Selenge	60.63	31.76	7.56	0.05	0.05
Sukhbaatar	1.39	24.69	48.75	22.96	2.21
Tuv	21.92	29.61	36.62	11.66	0.18
Ulaanbaatar	15.68	37.33	36.48	8.33	2.19
Uvs	19.16	10.77	15.10	33.94	21.02
Zavkhan	38.17	17.30	21.72	16.33	6.49

There are no areas of forest land affected by strong desertification, however the forest areas experiencing medium desertification are increasing. In the Gobi region the areas with above-average desertification levels covered around 24 per cent to 48 per cent of the land, and in Dund-Gobi, Dorno-Gobi, Uvurkhangai and Umnu-Gobi provinces more than 50 per cent of the land has been affected by desertification.

2.3. Changes to the subsurface and mining activities

By the end of 2010, a total of 4137 exploration and mining licenses were issued for 26 million hectares of land.

[11]Report of Ministry of Mineral Resources and Energy, 2010

Table 13 shows the current exploration and mining licenses by provinces.

Table 13. Current exploration and mining licenses by province

Province/Capital city	Total		Types			
			Mining		Exploration	
	Number of licenses	Area (ha)	Number of licenses	Area (ha)	Number of licenses	Area (ha)
Nationwide	4137	26,006,461.8	1158	520,920.6	2979	25,485,541.2
Tuv	488	729,844.2	215	37,644.6	273	692,199.7
Dorno-Gobi	475	2,915,517.6	108	27,033.2	367	2,888,484.4
Umnu-Gobi	414	6,668,846.2	55	275,546.0	359	6,393,300.2
Selenge	359	436,850.4	137	29,670.5	222	407,179.9
Khentii	267	702,586.8	76	14,319.5	191	688,267.4
Dund-Gobi	245	1,254,572.3	45	9,964.6	200	1,244,607.7
Gobi-Altai	237	3,698,320.0	12	1,199.7	225	3,697,120.2
Ulaanbaatar	231	19,766.7	148	11,057.7	83	8,709.0
Dornod	214	1,489,800.4	50	18,316.0	164	1,471,484.4
Bayankhongor	205	1,590,361.2	55	15,078.3	150	1,575,282.9
Sukhbaatar	201	1,321,001.4	33	5,649.7	168	1,315,351.8
Uvs	156	807,543.6	41	5,985.1	115	801,558.5
Bulgan	138	750,090.9	56	14,981.5	82	735,109.4
Darkhan-Uul	130	56,289.6	67	8,718.7	63	47,570.9

Khovd	129	1,291,814.5	17	3,781.8	112	1,288,032.7
Bayan-Ulgii	97	648,736.1	19	5,829.4	78	642,906.7
Khuvsgul	85	331,624.4	15	1,262.6	70	330,361.8
Uvurkhangai	80	339,674.5	31	11,986.7	49	327,687.9
Zavkhan	79	552,163.8	5	6,810.4	74	545,353.4
Arkhangai	69	201,670.5	25	8,686.5	44	192,984.1
Gobi-Sumber	27	179,575.1	7	4,709.7	20	174,865.4
Orkhon	14	19,811.6	6	2,688.5	8	17,123.1

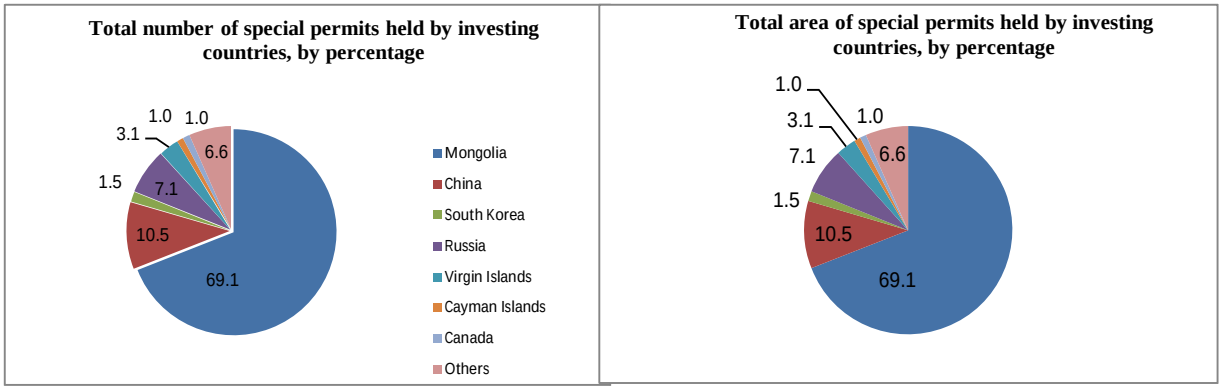


Figure 10. Total number and area of special permits held by investing countries, by percentage

The Mongolian Government is supporting export oriented products and has announced that the mining industry is a priority sector for Mongolia. The Government supports this policy by providing tax allowances, by promoting the companies that introduce alternative technologies and by offering favorable conditions for foreign investment in the mining sector. In 2010, industrial production increased by 10 per cent or by 169.7 billion tugriks (compared 2005) reaching 1874.6 billion tugriks. This growth was driven by increased production of petroleum, fluoride, coal; the share of these products in total industrial production increased from 16.7 per cent in 2005 to 91.8 per cent in 2010. In 2010 the state budget collected: increased taxes from higher product prices amounting to 186,526.8 million tugriks; income from special permit payments on exploration and mining of mineral resources of 33,394.5 million tugriks; income from payments for using mineral resources of 107,985.3 million tugriks; and income from compensation payments for exploration previously undertaken by the government of 2000.7 million tugriks. Through the “Minerals Law” the environmental protection plan and monitoring program received, from 124 entities, payments amounting to 682.52 million tugriks in 2008. In 2009 the amount was 385.40 million tugriks, and in 2010 943.30 million tugriks was collected with the money going to the environmental protection guarantee fund. The money collected from an entity and deposited in this fund is refunded if the entity completes its rehabilitation work for

the selected year. A sum of 21 million tugriks was refunded in 2008, 125.5 million tugriks in 2009, and in 2010 1 million tugriks was refunded to one entity. An inspection of the implementation of legal obligations under the environmental protection law of permit holders for special mineral resources exploitation was organized in 2010. Of the entities included in the joint inspection, 15.8 per cent were rated as A (good), 36.8 per cent as B (satisfactory), and 47.4 per cent were rated as C (not satisfactory). As for the implementation status of environmental monitoring programs, 10.5 per cent were rated as A (good), 21.1 per cent as B (satisfactory), and 68.4 per cent were evaluated as C (not satisfactory). A summary of rehabilitation work on damaged sites due to mining activity is shown in Table 14.

Table 14. Summary of rehabilitation work

Registered year	Registered entities	Planning (ha)		Execution (ha)		Amount of expenditures (million tugriks)
		Technical rehabilitation	Biological rehabilitation	Technical rehabilitation	Biological rehabilitation	
2008	243	1216.57	1064.3	898.8	807.9	6063.6
2009	166	597.9	813.2	494.84	280.6	7164.4
2010	147	873.1	549.6	688.1	389.75	8279.27
Total		2687.5	2427.1	2081.74	1478.25	21,507.27

Damaged and abandoned land affected by mining activities in Khentii, Arkhangai, Uvurkhangai, Bayankhongor, Umnu-Gobi, Dorno-Gobi, Darkhan-Uul, Dornod, Dorno-Gobi, Gobi-Sumber, Dund-Gobi, Sukhbaatar, Tuv, Bulgan and Selenge provinces totaled 3984.46 hectares in 2009 and 2010. This total occurred in 500 areas in 56 soums of these 15 provinces. In the last few years the number of people engaged in artisanal mining has decreased. The number of people engaged in artisanal mining was 72,817 in 2006. In 2007 it was 66,179, in January 2008 it was 53,959, in July 2008 30,119 and in 2009 there was a slight increase to 35,000.[12]

[12] Report of Mineral Resource Authority, 2010

2.4. Changes in the National Protected Area Network

Between 2008 and 2010 the area classified as strictly protected did not increase, but in 2010 national park area increased by 757,189 hectares to reach 9,987,094 hectares (43.38 per cent of all protected areas) compared to 9,229,905 hectares in 2009. Mongolia's nature reserves increased by 88,100 hectares to reach 2,094,370 hectares (9.29 per cent) compared to 2,006,270 hectares in 2008 and nature monument areas increased by 11,900 hectares to reach 113,983

hectares (0.51 per cent) compared to 102,083 hectares in 2008. By 2010, 14.54 per cent of the total territory of Mongolia had been placed under the state protection. Changes in national protected areas are shown in the table below.

Table 15. Changes in national protected areas

National Protected Area	2008 (ha)	2009 (ha)	2010 (ha)
Strictly Protected Area	10,554,523	10,554,523	10,554,523
National Park	9,229,905	9,780,305	9,987,094
Nature Reserves	2,006,270	2,094,370	2,094,370
Nature Monument	102,083	113,983	113,983
Total	21,892,781	22,543,181	22,749,970

Detailed changes of the national protected area network (areas newly declared as protected) in 2010 are shown in table below.

Table 16. Changes in national protected areas in 2010

Name of new protected area	Area (ha)	Type of National Protected Area	Date	
Mongol els	271.313	National Park	2010	Parliament decree 06
Ulaagchinii khar nuur	259.403	National Park	2010	Parliament decree 06
Khuren belchir	11.843	Nature monument	2010	Parliament decree 06
Altan khukhii	90.735	Nature reserve	2010	Parliament decree 06

2.5. State of water resources and its changes

Mongolia's total water reserve is 608.29 cubic kilometers, of which 34.6 cubic kilometers are rivers, 500 cubic kilometers are lakes, 62.9 cubic kilometers are permanent snow and glaciers, and 10.79 cubic kilometers is underground water reserves.

The distribution of surface water reserves is uneven with 380 cubic kilometers located in Khuvsgul Lake, which is 63.4 per cent of total surface water and 74.6 per cent of total drinking water.

Seventy percent of Mongolia's surface water reserve is located in highlands such as Altai, Khangai, Khentii, Khuvsgul and Ikh Khyanganii mountain ranges which make up 30 per cent of the total territory of Mongolia.

Rivers and lakes: In years of rich water supply just 5 per cent of Mongolian rivers yield a total of 69.5 cubic kilometers, while in years with low supply there is a 75 per cent decrease to only 23 cubic kilometers. The major river flows in Mongolia come from the Selenge, Orkhon, Kherlen, Onon, Bulgan, Khovd, Baidrag and Khalkh gol rivers and their annual water flow rates have been calculated at 5 per cent, 50 per cent, and 75 per cent of water supplies.

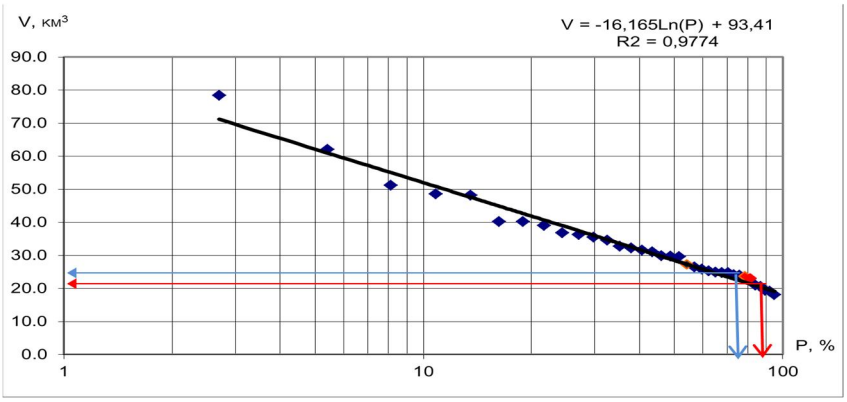


Figure 11. Annual Mongolian water flow with different supplies, cubic kilometers per year

In 2009, Mongolian river flow rates were 83.3 per cent lower than the annual average, and in 2010 it was 76 per cent lower (Figure 11).

In 2009 and 2010, the total accumulated water resources were 21.1 and 24.1 cubic kilometers which are 39.0 per cent and 30.3 per cent lower than the annual average respectively. Water flows have tended to increase demonstrated by some previously dried rivers, springs, ponds and lakes reviving from the last 14 to 15 years of low water flows.[13]

[13] Report of National Agency for Meteorology, Hydrology and Environment Monitoring, 2010

Since 1978, total river flow in Mongolia increased until 1993 when it reached a high of 78.4 cubic kilometers. It then slowly decreased until 2000 when it reached 19 cubic kilometers followed by an increase of 7 cubic kilometers in 2001. 2002 saw the lowest water flows, but in 2003 flows were average. Between 2004 and 2010 low water flows were experienced which usually happen once in 3-7 years. In Mongolia's difficult climate the frequency of low rainfall years is high. According to D. Tsedevsuren (1998) from 1740 to 1940 drought occurred on an average only once every 72 years, and dzud occurred once every 110 years. However, from the end of 1960 to beginning of 1980, 17 years of low rainfall was experienced and many rivers and springs went dry. Lakes such as Goviin tagan nuur or Orog, Taatsiin Tsagaan, Adgiin Tsagaan, Haya and Ulaan nuur have dried out as well as Ulaan Tsutgalan waterfall. 1996 to 2010 saw another 12 years of low rainfall. Lakes in the Gobi region, especially the Taatsiin Tsagaan, Adgiin Tsagaan, Ulaan, and Orog, are continuing to dry out.

Today's dry climatic conditions differ from the previous dry period from 1960 to 1980 because the intensity of the dryness greater (Figure 12).

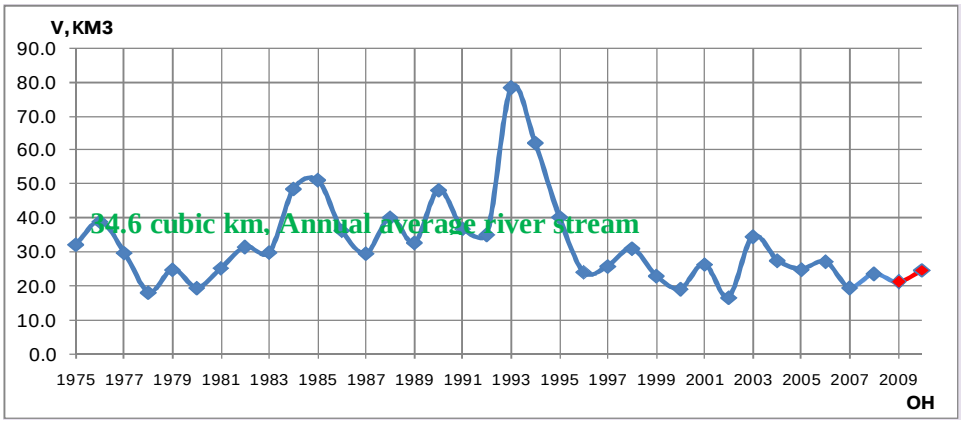


Figure 12. River flow variation in Mongolia, cubic kilometers per year

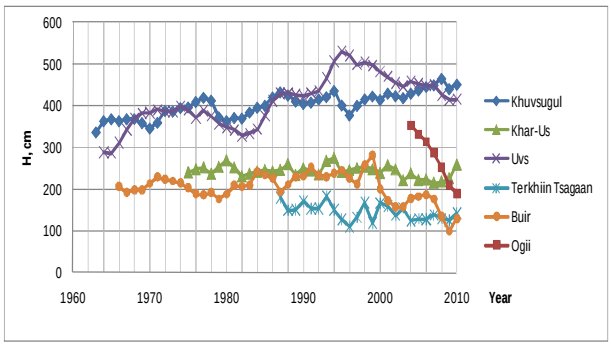
Rivers begin to ice over in the first days of November with greatest ice thickness in the last ten days of February. In February 2009 ice thickness ranged from 40 to 184 centimeters, and in February 2010 it ranged from 35 to 197.

It was observed that the spring floods lasted until the end of April, and in large rivers the floods were not as intense due to slow warming and a long spring season.

Lakes: From the beginning of the 1960s until the middle of the 1990s, the water level of large lakes of Mongolia increased, however it has been decreasing in the last 13 to 14 years. The water level in Lake Khuvsgul is continuing to increase. Since 1993 Lake Uvs water level has decreased a bit while since 2001 Khar-Us lake's water level has decreased by 32 centimeters. Additional decreases include: since 2000, Terkhiin-Tsagaan lake by 42 centimeters; and since 2004, Ugii lake (which is in steppe region) by 144 centimeters. In the Gobi region decreases since 1998 have been: Lake Khyargas by 281 centimeters and Lake Buutsagaan by 603 centimeters. All these measurements are over the period ending in 2009. The water levels of lakes in steppe and Gobi regions have decreased to record lows.[14]

[14] Report of National Agency for Meteorology, Hydrology and Environment Monitoring, 2010

However, in 2010 in the steppe region the water level in Lake Buir increased by 31 centimeters compared to the previous year. While in the Gobi region Khar-Us lake level increased by 33 centimeters, Terkhiin Tsagaan lake in Khangai region increased by 17 centimeters and Tui river flow temporarily reached Oro g lake .



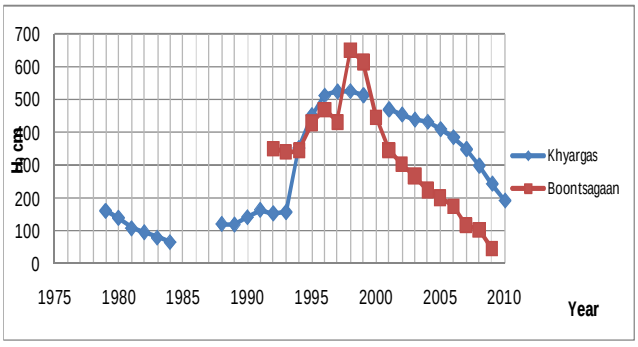


Fig ure 13.

Range of water levels in lakes

Lake water balancing elements change due to water level variations. Water balancing elements of Khar-Us lake are stable with little variation. Evaporation from Uvs lake has been increasing in recent years and causing a decrease the water level. In the steppe and Gobi regions there has been increased evaporation and low discharge into lakes and so the water levels in these regions are the lowest compared to other lakes.

In Mongolia's harsh climate, the frequency of low rainfall years are increasing due to climate change. But in 2010 it was noticed that the intensity of the dryness decreased and air humidity increased.

A lot of socio-economic damages occurred from many short thunderstorms in 2009 and 2010.

Glaciers: We can classify a total of 262 glaciers by location, altitude, formation, and shape mode into 11 systems. The majority of ice caps and glaciers are mountain glaciers (75.2 per cent), 21 per cent are valley glaciers, and 3.8 per cent are surface glaciers. Tsambagarav Mountain glacier is a surface glacier, Potanin, Alexander and Granegiin glaciers are valley glaciers, Tsagaan buurug river basin glaciers are mountain glaciers and Munkhkhairkhan glacier is a valley glacier.

In the last few years research on Kharkhiraa, Turgen, Tsambagarav and Tavanbogd mountain glaciers was started. These glaciers were 50.13, 43.02, 105.1 and 88.88 square kilometers in 1940 (by M1:100000 topo drawing) and in 2002 (through investigation by LANDSAT satellite) the glaciers had decreased by 30 per cent, Kharkhiraa and Turgen mountain glaciers decreased by 37.5 per cent and 21.4 per cent; Tsambagarav mountain glacial area had decreased by 13.4 per cent in 1992, by 28.8 per cent in 2000, and by 31.9 per cent in 2002 compared to data from 1940. Stream from glaciers and the water level of rivers and lakes are increasing. For example the amount of glacial and snow melt flowing to the Kharkhiraa and Turgen streams increased by 8 per cent and the water level of Uvs Lake is at its highest level since 1570 (by dendro-chronological method).

From 2007 to 2009 the water research sector of the Institute of Meteorology and Hydrology implemented "Mongolian surface water reserve, mode, resources, and its assessment forecast" project. In the scope of the project 580 glacial areas which were located in 42 mountains decreased by 22 per cent from 1940 to 2002 and streams heading from these glaciers increased the water levels of related rivers and lakes.

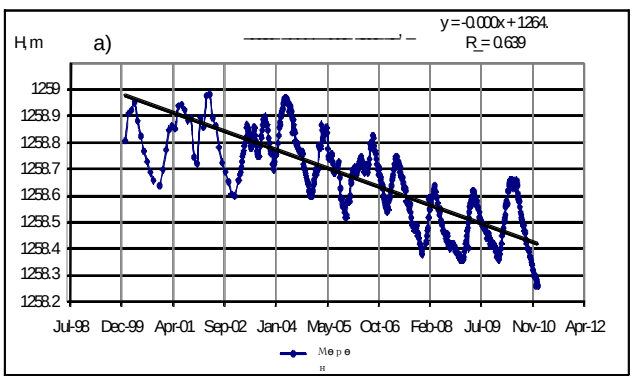
Underground water: The underground water quality, water level and water reserve capacity are decreasing, associated with the decrease in the surface rivers. Groundwater monitoring sites are located in Murun (Khuvsgul province), Arvaikheer (Uvurkhangai province) and Ekhiin river. Between 1997 and 2010 the underground water level decreased at these sites.

The decrease was 0.50 m at Ekhiin river, 3.2 m in Arvaikheer and 0.55m in Murun (between 2000 and 2010) (Figure 14).

Research results of the underground water reserve from 2008 to 2009 are shown in Table 17.

Table 17. Review of underground water basin reserves from 2008 to 2009

№	Province, soum name	Name of basin	Amount and reserve exploitation rate, m^3/day, (l/s)				Determination date
			A	B	C_1	Total	
A. Funded by Mongolian development fund							
1.	Khentii province Undurkhaan town	Undurkhaan	2764.8 (32.0)	2246.4 (26.0)	691.2 (8.0)	5702.4 (66.0)	2008.12.15
2.	Zavkhan province Uliastai town	Bogdiin gol	6480 (75.0)	4320 (50.0)	-	10800 (125.0)	2008.12.10
3.	Dorno-Gobi province Zamiin uud soum	Sevkhuuliin toirom	2635.2	-	2635.2		2007.12.01
4.	Selenge province Sukhbaatar town	Orkhon	7776.0 (90.0)	5184.0 (60.0)	4320.0 (50.0)	17280.0 (200.0)	2009.02.20
B. Funded by private entities and organizations							
5.	Umnu-Gobi province Tsogttsetsii soum	Naimantiin khundii	-	3196.8 (37.0)	1382.4 (16.0)	4579.2 (53.0)	2009.01.01
6.	Gobi-Altai province Tseel soum	Taliin shand	-	-	4536.0 (52.5)	4536.0 (52.5)	2009.01.01
7.	Umnu-Gobi province Khanbogd soum	Gunii khooloi	-	41774.4	33393.6	75168.0	2008.01.01
8.	Ulaanbaatar city Khan-Uul district	Tuul River basin, right portion of “Current airstrip supply”	-	15396.5 (178.2)	7153.92 (82.8)	22550.42 (261.0)	2009.01.01
9.	Khovd province Must soum	Boorchiin gol	-	-	18765.0(217.0)	18765.0 (217.0)	2009.01.01
10.	Dorno-Gobi province Mandakh soum	Narangiin khooloi	-	1278.7 (14.8)	1417.0 (16.0)	2695.7 (31.2)	2009.01.01
11.	Dund-Gobi province Ulziit soum	Khairkhan	-	-	94.7(1.09)	94.7 (1.09)	2009.01.01
TOTAL:			17020,8 (19.7)	73396.8 (366)	74389.02 (443.39)	162171.42 (1006.79)	



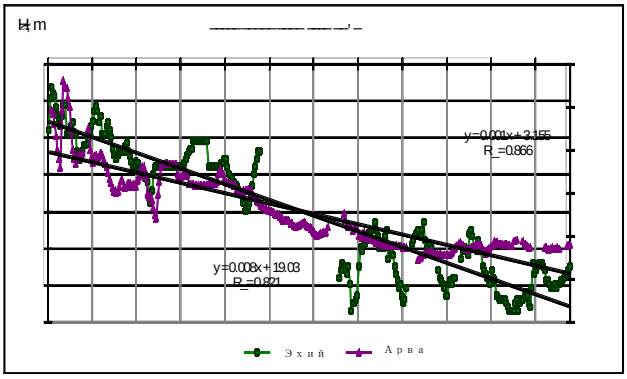


Figure 14. Underground water decrease by Meteorology, Hydrology and Environmental Monitoring (a-Khuvsgul province Murun, b-Ekhiin river and Arvaikheer)

Protection of water reserve: In 2010, 132 meteorological, hydrological and environmental monitoring networks (116 for rivers and 16 for lakes) conducted observations of aquifer levels and temperatures at 26 water-holes and wells as well as 11 head-water springs. Observations and investigation of sample plankton, benthos and plant content were made at 140 points. In last few years the Mongolian government has arranged several works on water reserves, focusing particularly on fresh water reserves. In 2009, the Mongolian Parliament passed a policy restricting mineral exploration at river sources, reservoir and forest source areas "Exploring mineral resources at river source, water reservoir, forest source restriction." The scope of enforcement of the law included 17 per cent of the total Mongolian territory, identifying 109 border areas in 314 soums of 17 provinces as restricted from mineral exploration at river sources, water reservoirs, and forest source areas. 3335 areas in 314 soums within 21 provinces, in total 89,049.49 square kilometers were placed under protection. In 2007 accounting was done to identify areas that would be placed under protection. This accounting covered 71.6 per cent of the total territory (Table 18). Identifying simply protected areas depended on location, geomorphology and geological formations in Khangai mountain regions at elevations from 200 to 500 meters and in Steppe and Gobi regions at elevations from 500 to 5000 meters headlands and validated by geographical coordinates.

Table 18. Determined protected areas with water reserves (by province)

No.	Province name	Lakes	Rivers	Springs	Mineral water
1	Arkhangai 7873.4 km^2	37	20	34	21
	Number of protective areas: 241 Number of coordinate points: 2380				
2	Bayan Ulgii 4103.4 km^2	30	15	0	3
	Number of protective areas: 49 Number of coordinate points:1686				
3	Bayankhongor 5925.1 km^2	79	43	23	63
	Number of protective areas: 143 Number of coordinate points:1236				
4	Bulgan, Orkhon 6072.63 km^2	69	13	0	4
	Number of protective areas: 84 Number of coordinate points:1272				
5	Dornod 6277.25 km^2	21	76	62	11
	Number of protective areas: 186 Number of coordinate points:992				
6	Dornogobi 1359.02 km^2	1	2	127	179
	Number of protective areas: 310 Number of coordinate points:825				
7	Gobi-Sumber Dund-Gobi 772.78 km^2	6 2	0 5	16 107	9 29
	Number of protective areas: 176 Number of coordinate points:929				
8	Gobi-Altai 9961.78 km^2	80	39	76	40
	Number of protective areas: 235 Number of coordinate points:2913				
9	Khentii 1987.44 km^2	134	80	277	0
	Number of protective areas: 113 Number of coordinate points:1727				
10	Khovd 9016.66 km^2	142	47	196	59
	Number of protective areas: 447 Number of coordinate points:3549				

11	Khuvsgul 1959.65 km^2	5	63	9	3
	Number of protective areas: Number of coordinate points:				
12	Umnu-Gobi 4110.05 km^2	0	3	60	66
	Number of protective areas: 132 Number of coordinate points:552				
13	Sukhbaatar 3124.27 km^2	20	56	62	43
	Number of protective areas: 279 Number of coordinate points:935				
14	Tuv 2643.79 km^2	63	64	47	4
	Number of protective areas: 158 Number of coordinate points:2594				
15	Uvs 7856.37 km^2	57	112	120	7
	Number of protective areas: 272 Number of coordinate points:2330				
16	Uvurkhangai 3265.34 km^2	48	9	77	12
	Number of protective areas: 148 Number of coordinate points:1025				
17	Zavkhan-9017.64 km^2	53	164	56	0
	Number of protective areas: 268 Number of coordinate points:2643				
18	Darkhan Selenge 3723.45 km^2	1 81	14 2	6 4	2 5
	Number of protective areas: 94 Number of coordinate points:749				

Protection of headstreams: In 2008, a total of 161 headstreams were protected and restored. In 2009 a total of 203 headstreams were protected. In 2010, 145 headstreams were protected and restored using government funds, 32 headstreams were protected and restored using local funds, 172 headstreams were protected by international and national projects, and 37 headstreams were protected by economic entities and citizens.

Water utilization: 80 per cent of the Mongolian population use groundwater. In 2010 population reached 2.7 million and annual water use reached 88.9 million cubic meters. [15]

[15] Report of Water Authority, 2010

Groundwater, snow, ice and surface water are the main water sources for pastoral livestock farming. In 2008, the number of livestock was 43.3 million and annual livestock water use was 123,900,000 cubic meters. Today there are a total of 41,614 wells in use, of which, 15,385 are artesian wells, 6,102 are short pipe wells, and 20,127 are manual wells. In 2008, for agricultural field development, the Government announced the “Third campaign for cultivation of virgin lands”. Under this campaign annual water usage was 20 million cubic meters, using 108 water irrigation systems on 25,428.3 hectares land. From 2008 to 2010, there were a total of 182 mining sites in operation, of which, Erdenet, Tumurtiin Ovoo, Olon ovoot, and Boroo mining sites were the largest water users. Annual water usage for the mining industry was 93.8 million cubic meters. Water use for cashmere production, wool washing, carpet production, cashmere thread production, felt and felt boot production, fur products, leather processing, bread, candy, building trades, meat and dairy products, and flour industries was 18 million cubic meters. Total nationwide annual water use amounted to 157.2 million cubic meters, which is an increase of 30 per cent compared to 1995. Calculating the average annual water use by the food industry, we see that from 2008 to 2010 water usage for production of vodka, wine, beer, soft drinks and pure water accounted for 0.8 million cubic meters.

Total industrial water usage from 2008 to 2010 is shown in the table below. [16]

[16] Water resources, protection and use of Mongolia, 2008

Table 19. Total industrial water usage

Water using fields	Thermal power station	Mining industry	Manufacturing industry	Total annual water usage
Total water usage (million cubic meters/year)	27.6	93.8	36.0	157.4

According to Water and Budget laws, Government decrees, and related legislation, in 2008 charges for water usage was collected from 177 entities and organizations, in 2009 from 76 entities and organizations, and in 2010 from 109 entities and organizations.[17](Table 20).

[17] Report of Water Authority, 2010

Table 20. Payments for water usage to Government budget (2008-2010)

Year	Payments (tukrigs)
2008	3 700 000 000
2009	3 200 000 000
2010	4 700 000 000

2.6. Forest reserves

Mongolian forests consist of approximately 140 different species of trees and bushes. Forests in Mongolia can generally be divided into: coniferous forest, which include larch, pine, cedar, spruce, and fir; and deciduous forest, which consists of, birch, aspen, poplar, elm, willow and shrubs. As of 2010, the Mongolian forest reserve area covered 18,565.5 hectares of land, out of which, 12,917.5 hectares of land mass is covered with forest. The forest reserve area composes 11.87 per cent of the total territory of Mongolia, while forest covered area (area purely covered by trees) composes 8.26 per cent of the total territory. 75.1 per cent of Mongolian forest is coniferous and deciduous forest and 24.9 per cent is saxaul forest. Forest reserve changes in last three years are shown in Table 21.

Table 21. Changes in Mongolian forest reserve (’000 ha)

Indicators	From detailed land survey results		
	2008	2009	2010
Total area of forest reserve	18,849.3	18,633.9	18,565.5
Area covered with trees	13,301.1	13,039.2	12,917.5
Natural forest	12,583	12,331.1	12,218.7

	Shrubs and calligonum	717.8	706.2	696.9
	Planted forest	0.3	1.9	1.9
Woody quality of forest, %		8.5	8.34	8.26
Non-forested area		4309.2	4550.8	4712.1
	Scattered forest	2939.4	2987.2	2997.3
	Burned area	818.3	1051.5	1184.4
	Logged area	225.4	240.2	249.1
	Naturally growing forest area	257.7	197	169.6
	Planted forest area	2.9	8.3	9.2
	Areas affected by forest insects	59.5	59.8	95.6
	Forests dropped by wind		0.9	0.9
	Dead saxaul	6	6	6
Total area suitable for forest		17610.4	17590	17629.6
Area not suitable for forest		1238.9	1043.9	935.9

In past three years, total forest reserve has decreased by 283,800 hectares, while areas covered with forest have decreased by 383,600 hectares. Forest loss due to fire increased by 366,100 hectares, while logged forest areas increased by 23,700 hectares over that time period. Forest growth, environmental conditions, growth intensity, tree quality, forest reserve average timber cruise meanings are different for each tree species, depending on environmental, climate, and geographic conditions.

In 2010, the average forest quality was rated as 3.67, average density was 0.39, biomass was estimated at 107.5 cubic meters per hectare, annual growth was 0.89 cubic meters, average age for coniferous tree was 121 years old, and average age for deciduous tree was 43 years old (Table 22).

3.4 million hectares forest reserves are under special protection, of which 3.03 million hectares are coniferous and deciduous forests, and 370,000 hectares are saxaul forest. Total forest reserve is 279.7 million cubic meters. 18.2 per cent of the total forest reserves are classified as specially protected areas.

Table 22. Mongolian forest resource parameters, 2010

Tree species	Natural forest areas (ha)	Forest reserve (cubic meters)	Average			1 ha forest covered areas	
			Age, (years)	Forest quality	Density	Biomass, (cubic meters)	Annual growth rate (cubic meters)
FOREST							
Larch	7,383,888	1,034,055,452	134	4.28	0.50	140.0	0.99
Pine	496,544	63,711,811	107	3.92	0.50	128.3	1.15
Cedar	683,935	120,805,194	141	4.64	0.51	176.6	1.23
Spruce	26,310	3,576,572	121	4.33	0.50	135.9	1.09

Fir	1370	238,800	109	4.03	0.44	174.3	1.36
Birch	1,234,990	83,894,596	51	4.21	0.50	67.9	1.28
Aspen	37,043	2,322,724	61	4.16	0.42	62.7	1.01
Poplar	21,832	1,290,829	43	4.30	0.51	59.1	1.43
Elm	3712	83,780	39	4.49	0.32	22.6	0.50
Willow	101,487	1,923,207	24	4.45	0.43	19.0	0.88
Total	9,991,111	1,311,902,965		3.89	0.42	131.3	1.05
SAXAUL							
Saxaul	2,227,638	1,527,121	25	3.45	0.34	0.7	0.03
NATIONWIDE							
Nationwide total	12,218,749	1,313,430,086		3.67	0.39	107.5	0.86

The amount of forest areas under protection decreased by 582,000 hectares, and the amount of utilized forest areas increased by 293,000 hectares in 2010 compared with 2008. Degraded tree species include pine and fir (Tables 23 and 24).

Table 23. Change of forest reserve by tree species (cubic meters)

Tree species	Year 2008	Year 2009	Year 2010
Larch	1,074,902,791	1,058,469,147	1,034,055,452
Pine	86,722,896	66,724,634	63,711,811
Cedar	129,859,687	126,785,786	120,805,194
Spruce	4,263,959	3,604,955	3,576,572
Fir	366,620	238,800	238,800
Birch	91,756,801	86,528,309	83,894,596
Aspen	2,531,832	2,447,268	2,322,724
Poplar	1,801,329	1,326,945	1,290,829
Elm	88,168	53,076	83,780
Willow	1,542,300	1,832,679	1,923,207
Saxaul	1,527,121	1,527,121	1,527,121
Total	1,395,363,504	1,349,538,720	1,313,430,086

Table 24. Change in forest area, square hectares

Forest area	2008	2009	2010
Protected area	15,972,048	15,910,921	15,390,025
Areas under exploitation	2,877,270	2,722,979	3,175,525
Total	18,849,318	18,633,900	18,565,550

In 2008 the detailed forest reserve planning map was created through forest organization, forest status and taxation indicator renewal work in Arkhangai, Uvurkhangai, Bayan-Ulgii provinces, as well as in Huder and Altanbulag soums of Selenge province and in the green areas of Ulaanbaatar city; similar works were conducted in forest reserves in Selenge province in 2009 and in the forest reserves of Bulgan and Orkhon provinces in 2010 (Table 25).

Table 25. Extent of forest maintenance

Indicator	2008	2009	2010
Forest maintenance (’000 ha)	1576.0	1790.4	1935.5
Research on harmful forest insects (’000 ha)	1200.0	1204.7	1522.7
Combating harmful forest insects (’000 ha)	72.0	82.1	298.5

In recent years climate change, drought, forest fires, anthropogenic environmental degradation and the emergence of harmful insects had negative impacts on forests on scales that resemble natural disasters. Of a total of 700 species of harmful insects registered in Mongolia, 300 species from 168 genus, 56 families and 7 orders, had significant negative impacts on forests in Mongolia. The Siberian moth (*Dendrolimus sibiricus Tschw*), gypsy moth *(Lymintria dispar L)*, Jacobson's Spanworm (*Erannis jacobsoni Diak*), Rusty Tussock Moth (*Orgyia antique*), and larch needle stripper moth (Steganoptycha Semasia diniani Gn) are increasing in both number and distribution. In 2008, research on harmful forest insects was conducted for 1,200,300 hectares of land, out of which 82.2 per cent or 986,700 hectares of land were affected by harmful forest insects, and 473,800 hectares had above average or a very high concentration of harmful

forest insects. Projects to combat harmful forest insects have been organized in 60 soums across 10 provinces, in the green areas of Ulaanbaatar city, and in Bogd Khan Mountain protected area, covering a total of 72,020 hectares of land. 685 million tugriks have been allocated for these projects. In 2009, research and studies on forest harmful insects were conducted for 1209.5 thousand hectares of land, out of which 45.7 per cent or 550.1 thousand hectares are affected by harmful forest insects. Works against harmful forest insects have been organized in 35 soums of 12 provinces, in green areas of Ulaanbaatar city, and in Bogd Khan Mountain protected area, in total of 82,100 hectares land. In total 685 million tugriks was allocated for these works. In 2010, research and study works on forest harmful insects have been conducted on 1522.7 thousand hectares of land, out of which 23 per cent or 351.2 thousand hectares lands are affected by harmful forest insects. Work against forest harmful insects have been organized in 58 soums of 12 provinces, in green areas of Ulaanbaatar city, and in Khan Khentii protected area, a total of 298,523 hectares of land and 2.985 billion tugriks have been allocated for these works (Figure 15).

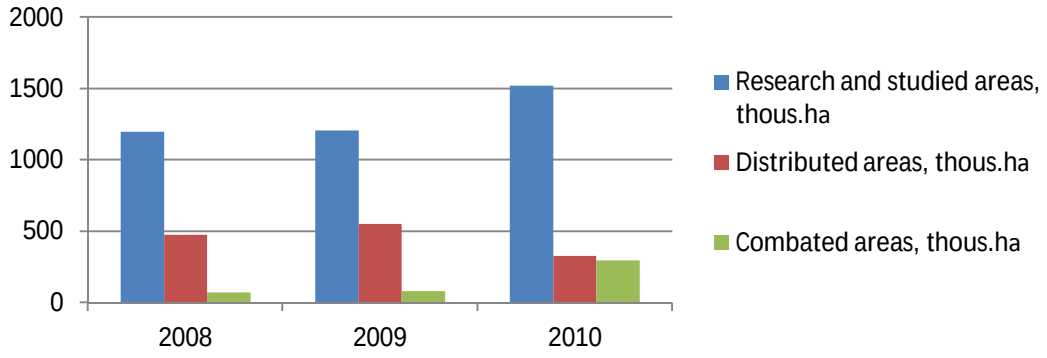


Figure 15. Harmful forest insect's distribution and amount of combated areas from 2008 to 2010

In 2008, there were 178 incidents of forest- and wild-fires in 6 districts within Ulaanbaatar as well as 96 soums of 14 provinces. A total of 1018.99 thousand hectares of land was affected. Of the land affected, 91,000 hectares of forests were affected fire and 927,990 hectares of steppe ecosystems were affected by fire. Total monetary damage caused by forest- and wild-fires was 17.6 billion tugriks. Ecological degradation accounted for 17.2 billion tugriks in damages; material damage accounted for 34.7 million tugriks; and direct expenses accounted for 347.0 million tugriks. The causes of 96 forest- and wild-fires have been identified.

In 2009, there were 120 incidents of forest- and wild-fires in the territories of some districts within Ulaanbaatar, as well as 67 soums across 15 provinces. A total of 405,000 hectares of land was affected. Of the land affected, 161,000 hectares of forest ecosystems were affected

by fire and 24,000 hectares of steppe ecosystems were affected. Total monetary damage caused by forest- and wild-fires was 605.2 million tugriks. Ecological degradation accounted for 533.8 million tugriks in damages; material damage accounted for 2.1 million tugriks; and direct expenses accounted for 69.3 million tugriks. The causes of 84 forest- and wild-fires have been identified.

In 2010, there were 104 incidents of forest- and wild-fire in 6 districts within Ulaanbaatar, as well as 47 soums of 13 provinces. A total of 39,770 hectares of forest ecosystems and 974,747.1 hectares of steppe ecosystems were affected. The total monetary damage caused by forest- and wild-fires was 944.6 million tugriks. Ecological degradation accounted for 623 million tugriks; material damage accounted for 315 million tugriks in damages; and direct expenses accounted for 54.5 million tugriks. The causes of 96 forest- and wild-fires have been identified. Two human casualties and 11 human injuries occurred from forest- and wild-fire.

Forest fires over the last 3 years are shown in the table below.

Table 26. Forest fires that occurred from 2008 to 2010

No.	Forest fire information		Measurement	2008	2009	2010
1	Forest fires	Province	Number	14	15	13
		soum	Number	96	67	47
2	Number of forest fires		Number	178	120	104
3	Burnt out area		(’000 ha)	1018.9	405.0	1014.5
4	From these:	Forest	(’000 ha)	91.0	161.0	39.8
		Steppe	(’000 ha)	927.99	244.0	974.7
5	Ecological damage		million tugriks	17200.0	533.8	623.0
6	Total damage		million tugriks	17600.0	605.2	944.6

17 new rules and regulations have been developed and enforced under the Law on Forests, with the purpose of promoting proper use of forest reserves, enhance good logging management and eliminate illegal logging. From 2008 to 2010, a total of 177 soums across 15 provinces developed and implemented forest management plans. In 2008, a total of 649,500 cubic meters of lumber were produced, out of which 98,500 cubic meters were used for industrial purposes, and 550,900 cubic meters were used for firewood. In 2009, total of 503,800 thousand cubic meters of lumber was prepared from 14,941.8 hectares of land. 76,000 thousand cubic meters were used for industrial use, and 427,800 cubic meters were used for firewood, out of which 36,000 thousand cubic meters was harvested from forest maintenance (trimmings), 288,400 cubic meters was from clearing the forest floor and 179,400 cubic meters was from commercial felling. In 2010, a total of 671,000 cubic meters of lumber was prepared. Of which, 87.6 thousand cubic meters were used in industrial applications, 583,400 cubic meters were used for firewood; of which 41,000 thousand cubic meters were sourced from forest maintenance,

438,000 cubic meters from clearing the forest floor and 192,000 cubic meters from commercial felling (Table 27).

Table 27. Amount of prepared wood

Type and amount of prepared wood	2008	2009	2010
Amount of prepared wood ('000 m^3)	649.5	503.8	671.1
From these: Wood for industrial use ('000 m^3)	98.5	76.0	87.7
Firewood ('000 m^3)/	550.9	427.8	583.4

In 2009 organized state inspections of forestry agency technology and specialists. Renewed the authorization of the professional organization and by 2010, 183 organizations had the forest professional organization's authorization (Table 28).

Table 28. Amount and work directions of forest professional entities with special authorization

No.	Line of activity	Number
1	Forest reserve counting and registration, forest organization	12
2	Combating harmful forest insects and their related illnesses	14
3	Forestation, forest rehabilitation, tree breeding	86
4	Preparation and usage of cedar nut	4
5	Forest maintenance, clearing and commercial felling	82
Total		183

In 2009, 145 illegal logging incidents were identified and 1412.53 cubic meters of wood were confiscated. 81 criminal cases were opened where the damages were above the wage floor.

At the provincial level a total of 769 illegal logging incidents were identified and 9,887.71 cubic meters of wood were confiscated. In 2010, 561 illegal logging incidents were identified and 2531.5 cubic meters of wood were confiscated. 719 bags of wood, wood for the construction of 2 houses, and 4 saws were found as evidence of illegal logging for which fines amounting to 25.8 million tugriks were charged. A total of 263.9 million tugriks was used to conduct ecological and economic assessments and the results were transferred to legislative bodies.

Nationwide a total of 9,512 hectares, 7,606 hectares, and 9,167 hectares of land was afforested and rehabilitated by government, entities, and organizations budgets in 2008, 2009 and 2010 respectively (Figure 16).

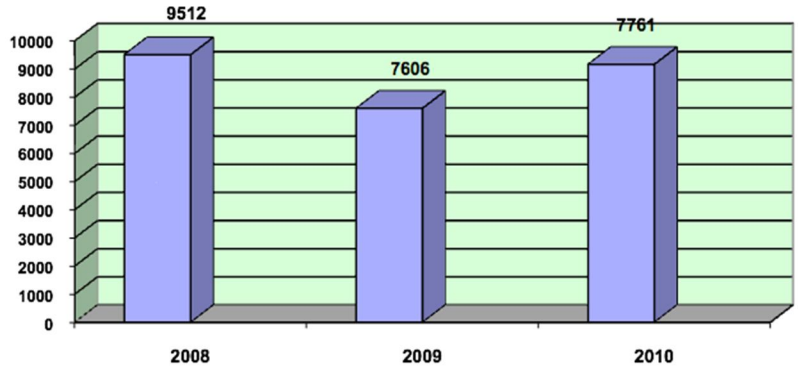


Figure 16. Amount of forest rehabilitation works

Under the Green Belt National Program, green strips were constructed over: 426 hectares 271.4 hectares, and 253 hectares of land in 2008, 2009 and 2010 respectively.

There were “Publicity Movements for Tree Planting” organized in 2009. A total of 499 entities and organizations, and around 70,000 citizens participated; 1194.4 thousand trees were planted.

The 63th official Presidential degree, “National Tree Planting Day” was issued in 2010. 1,744,600 trees and bushes were planted as a result of the decree. 7,637 entities and about 190 thousand citizens participated in tree planting activities. Research and registration on the state of green areas in Ulaanbaatar city was conducted in 2009.

The scope of the project covered 140 street areas; out of which grass areas were 5,622,861 square meters, 9,402 coniferous trees, 12,134 deciduous trees, and 796,931 shrubs and bushes. While the number of green areas is increasing, overpopulation and construction are putting pressure on green areas. In fact the amount of green area is half of the minimum standard for green area per person of 6.3 square meters.

A total of 42 hectares of land in 2010 in six areas conducted garden construction and tree planting programs. Those areas include: Sukhbaatar, Uvurkhangai, Zavkhan, Bayankhongor and Darkhan-Uul provinces and “Muruudliin Tsetsegleg”, Bayangol district of Ulaanbaatar. A total

of 284,500 square meters of tree and grass areas were planted in Ulaanbaatar, at a cost of 84 million tugriks.

2.7. State of flora resource changes

As of 2010, Mongolia has 2900 species of higher vascular plants from 666 genera and 134 families, 495 of moss species from 191 genera and 59 families, 930 species of lichens from 174 genera and 53 families, 1574 species and sub-species of algae from 288 genera and 105 families, and 838 species of fungus from 136 genera and 28 families.

There are 145 endangered plants registered in Mongolia that were previously abundant. Of these, 22 are rare plants and therefore have not fully been identified. There are another 133 species of plants are endangered and 355 species of plants that are rare. 11 species of lichen, 5 species of algae, 4 species of moss, 6 species of fungus and 8 species of plants are registered to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

71.6 per cent of endangered plants species are located within a limited area, 57.9 per cent don't have biological or agricultural reserves for replanting.

Annual authorization for plant collection and export was available for more than 60 plant species before 2008. The authorization number was reduced to 38 plant species in 2008. In 2009, a total of 416 authorizations were given for plant collection, plant export, and research purposes. In 2010, a total of 254 tons of plants from 46 species were prepared for industrial use, 82.5 tons of plants from 9 species were exported (Table 29).

Table 29. Authorization of plant export for industrial use, 2008 to 2010

Plant names		2008 (kg)	2009 (kg)	2010 (kg)
Äýðýâãýð æèðãýð¿¿	*Saposhnikova divaricata*	11557	58900	75000
Steppe white mushroom	*Tricholoma mongolicum*	0	3000	550
Ýãýë áàâðàí	*Peridium aqium*	0	6000	5000
Turkestan Juniper	*Juniperus pseudosabina*	0	1500	0
Chinese liquorice	*Glycyrrhiza uralensis*	0	6000	0

2.8. State of fauna changes

Counting of the even toed-ungulate populations across steppe, forest and mountain environments took place from 2008 to 2010 over the entire territory of Mongolia. 7.4 thousand

musk deer, 7.8 thousand moose, 8.0 thousand Mongolian Saiga antelope, 17.9 thousand wild sheep, 24.4 thousand wild goat, 16.8 thousand deer, 12.0 thousand blacktail, 38.0 thousand wild pig, 32.0 thousand roe deer, and 5.7 million Mongolian antelope were registered. Since 1992 wild horse relocation works have began. There were approximately 400 relocated wild horses as of 2010. Rare animal resources over recent years are shown in Table 30 below.

Table 30. Rare animal resources

No.	Animal species name	Research conducted on biological resource		Number of animals (head)	Province, soum
		Year	Organization		
Endangered mammals					
1	Leopard	2009	Mongolian Ecological Troposphere Association	809	Khovd, Gobi-Altai, Umnu-Gobi, Uvurkhangai provinces, area of 49 soums of these areas
2	Wild Asian ass	2009	Institute of Biology, Animal Merciful LLC	14051	Dorno-Gobi, Umnu-Gobi, Bayankhongor, Gobi-Altai, Khovd provinces
3	Saiga antelope	2010	WWF Gobi-Altai sector, Uvs lake basin observation point, Mongol Altai observation point, Institute of Biology	8	Bayan-Uul, Darvi, Tugrug, Khukh Morit, Sharga soums of Gobi-Altai province, Darvi and Chandmani soums of Khovd province
Rare mammals for hunting					
1	Blacktail	2008	Institute of Biology, Animal merciful LLC	11,978	Khovd, Gobi-Altai, Bayankhongor, Uvurkhangai, Umnu-Gobi, Dorno-Gobi, Sukhbaatar provinces
2	Wild sheep	2009	Institute of Biology, Animal merciful LLC	18,140	Arkhangai, Khovd, Uvs, Bayan-Ulgii, Bulgan, Gobi-Altai, Dorno-Gobi, Dund-Gobi, Umnu-Gobi, Zavkhan, Uvurkhangai, Sukhbaatar, Bayankhongor, Tuv, Khuvsgul, Khentii, Gobi-Sumber provinces
3	Wild goat	2009	Institute of Biology, Animal merciful LLC	36,018	Arkhangai, Khovd, Uvs, Bayan-Ulgii, Bulgan, Gobi-Altai, Dorno-Gobi, Dund-Gobi, Umnu-Gobi, Zavkhan, Uvurkhangai, Bayankhongor, Tuv, Khuvsgul provinces and Ulaanbaatar
4	Deer	2010	Institute of Biology	16,800	Arkhangai, Uvs, Bayan-Ulgii, Bulgan, Gobi-Altai, Zavkhan, Uvurkhangai, Sukhbaatar, Bayankhongor, Tuv, Khuvsgul, Khentii, Selenge provinces
Abundant mammals for hunting					
5	Mongolian antelope	2009	Institute of Biology	5,724,885	Dornod, Sukhbaatar, Khentii, Tuv, Dorno-Gobi, Umnu-Gobi, Dund-Gobi, Zavhan, Uvs, Uvurkhangai provinces
6	Roe deer	2010	Institute of Biology	32,000	Arkhangai, Uvs, Bayan-Ulgii, Bulgan, Gobi-Altai, Zavkhan, Uvurkhangai, Sukhbaatar, Bayankhongor, Tuv, Khuvsgul, Khentii, Selenge provinces
7	Wild pig	2010	Institute of Biology	38,000	Arkhangai, Uvs, Bayan-Ulgii, Bulgan, Gobi-Altai, Zavkhan, Uvurkhangai, Sukhbaatar, Bayankhongor, Tuv, Khuvsgul, Khentii, Selenge provinces

In the last five years, revenue payable from foreign hunters was 7.2 billion tugriks. The numbers and types animals hunted by foreign hunters from 2008 to 2010 are shown in the table below.

Table 31. Numbers and types animals hunted by foreign hunters from 2008 to 2010 (head)

Animal species	Wild sheep		Wild goat		Blacktail	Roe deer	Mongolian antelope	Grey wolf	Birds for hunting	Saker falcon (alive)
	In Altai	In Gobi	In Altai	In Gobi						
2008	13	47	99	101	10	17	85	15	364	266
2009	8	52	104	72	19	9	100	17	300	288
2010	14	36	127	36	-	6	57	29	212	218
Total	35	135	330	209	29	32	242	61	876	772

In 2010, 201 foreign hunters from 38 entities hunted: 50 wild sheep, 163 wild goat, 57 Mongolian antelope, 6 roe deer, 29 grey wolf and 212 hunting birds. 212 foreign fishermen were issued special certificates for fishing. Income from hunting amounted to 1.2 billion tugriks added to the government budget.

38 certificates were issued (20 for research purposes) for hunting animals and using their derived raw products for export. 298 hunting certificates were issued to foreign hunters. 44 certificates were issued (13 for research purposes) for plant collection and export of derived products. 29 certificates for collecting natural plants and their derived products were issued. Two certificates for importing plants and their derived products were issued.

Researchers from the Biology Institute, The Association on Leopard Protection and The Mongolian Association of Ecological Troposphere conducted research on, and counting of, the mazaalai bear, saiga antelope, and leopards in Umnugobi and Gobi-Altai provinces. The research included gathering information on their location, distribution and migration, using neck sensors. According to the research by the Biology Institute, total mazaalai bear population numbers are estimated at between 25 and 50. The Mongolian-Russian joint research expedition conducted research on Mongolian lakes and rivers including: Orog Lake, Tuin River, Zavkhan River, Khar Lake, Khar-Us Lake, Durgun Lake, Chono kharaikh River, Khongor ulung Lake, Uvs Lake, Tes River and Borshoog River. Research conducted by the Mongolian Taimen Foundation and WWF Mongolia found that there are around 2100 taimen in the Eg-Uriin basin, and around 700 taimen in the Onon Balj basin.

Research on saker falcon and other bird populations shows that there are about 6830 saker falcons in Mongolia.

Because of the harsh winters of 2008, 2009 and 2010, 19 wild sheep and 350 wild goats were found dead in Ulziit and Bayanlig soums of Bayankhongor province. 90 deer and 7 musk deer were found in Bayanbulag and Jargalant soums. 3000 wild goats were found dead in Buutsagaan soum. In Zavkhan province 15 deer, 4 wild goats, 2 wild sheep, and 9 roe deer were also found dead. Severe snowstorms killed 8 wild sheep in Altanbulag and Delgerkhaan soums in Tuv province. Animal numbers decreased due to malnutrition in Ulziit soum of Dundgobi province. In Khentii province it was observed that wild sheep numbers dropped as well. In the Otgontenger state protected area 5 deer and 15 roe deer were found dead. A large number of wild animals such as the wild Asian ass, wild horse, blacktail, and wild goats decreased in number in Tahiin shar nuruu, Havtag, Khukh undur, Khonin usnii Gobi which are located in region B of the Great Gobi State protected area. In Munkhkhairkhan national park, located in Bulgan soum of Bayan-Ulgii province, 36 deer, and 8 wild goats were found dead at the range site; 6 deer, 2 wild goats were also found dead. A total of 53.1 million tugriks were spent on biotech work for wild animals.

Domestication, breeding and farming of wild animals was promoted by: Selenge resort of Erdenet factory, Animal Merciful LLC, Mongolian Musk Deer Protection Foundation, Mongolian Open Association for Local Development, Mongolian Hunters Association and regular citizens. A total of 23 deer and 28 marmots were captured.

2.9. Ecotourism development opportunities

Ecotourism is the one of the top priorities for Mongolia. In 2010, the number of tourists reached 456,303, an increase of 10.8 per cent compared to 2009. The income from tourism sector reached 285 billion tugriks, 4.2 per cent higher than 2009.[18]

The Ministry of Nature, Environment and Tourism of Mongolia in cooperation with the Ministry of Nature and Environment of Japan implemented a project on tourism development from 2008 to 2010. The project divided the Mongolian territory into three regions, concluding that ecotourism development is possible in any region of Mongolia. According to their research, Mongolian tourist products are related to nomadic civilization, nature and environment which are very suitable for the development of ecotourism.

[18] Report of National Tourist Center, 2010

CHAPTER THREE

ENVIRONMENTAL POLLUTION

3.1. Air quality

Air quality varies in various settlement areas of Mongolia depending on the location, capacity, waste composition and structure, geography and climate conditions of the air pollution sources.

Ulaanbaatar air pollution is directly related to the city's location, atmospheric patterns, population concentration, industrialisation and density of air pollution sources. Until 2009, air quality was measured using two indicators at four locations. In 2009 the measurement network was improved by adding two air quality monitoring stations, and in 2010 a further five stationary stations and one mobile station were added (enabled by a soft loan provided by the French Government) and four stations were mounted under the jurisdiction of the capital city. Now Ulaanbaatar air quality is continuously measured by 3-8 stations at 15 locations (Figure 17).

Figure 17. Location of Ulaanbaatar's air quality stationary monitoring stations

The average levels of nitrogen dioxide and sulfurous gas from 2008 to 2010 in Ulaanbaatar as measured by the stationary air quality monitoring stations, are shown in the figure below (Figure 18).

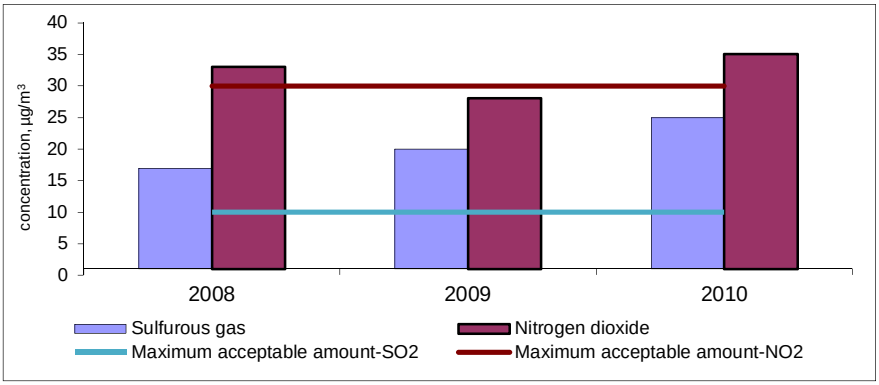


Figure 18. Average levels of nitrogen dioxide and sulfurous gas in Ulaanbaatar air (2008-2010)

In 2009, the average concentration of sulfurous gas increased by 3µg/m^3, but the nitrogen dioxide concentration decreased by 5µg/m^3 compared to 2008. In 2010, the average level of sulfurous gas and nitrogen dioxide increased by 5-7 µg/m^3 compared to 2009.

In 2009, the sulfurous gas level exceeded the maximum acceptable level for air quality standards and increased by 4.2 per cent compared to the previous year, nitrogen dioxide levels decreased by 13.2 per cent.

In 2010, sulfurous gas levels increased by 8.2 per cent and nitrogen dioxide levels increased by 12.8 per cent. The proportion of occurrences where the maximum acceptable level was exceeded are shown in the figure below. [19]

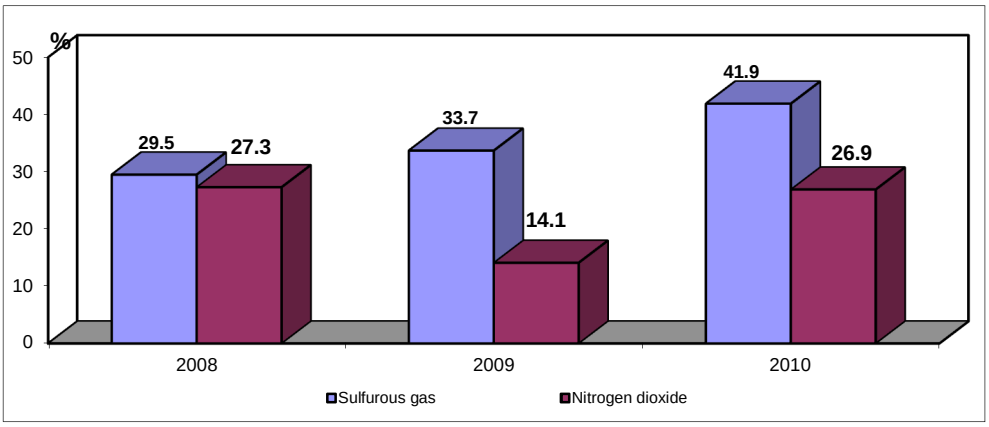


Figure 19. Proportion of observations that exceeded the maximum acceptable amount

[19]Report of Air Quality Professional Division of National Agency of Meteorology, Hydrology and Environment Monitoring

A comparison of the average daily concentration of sulfurous gas and the maximum acceptable level for air quality standards is shown in Figure 20.

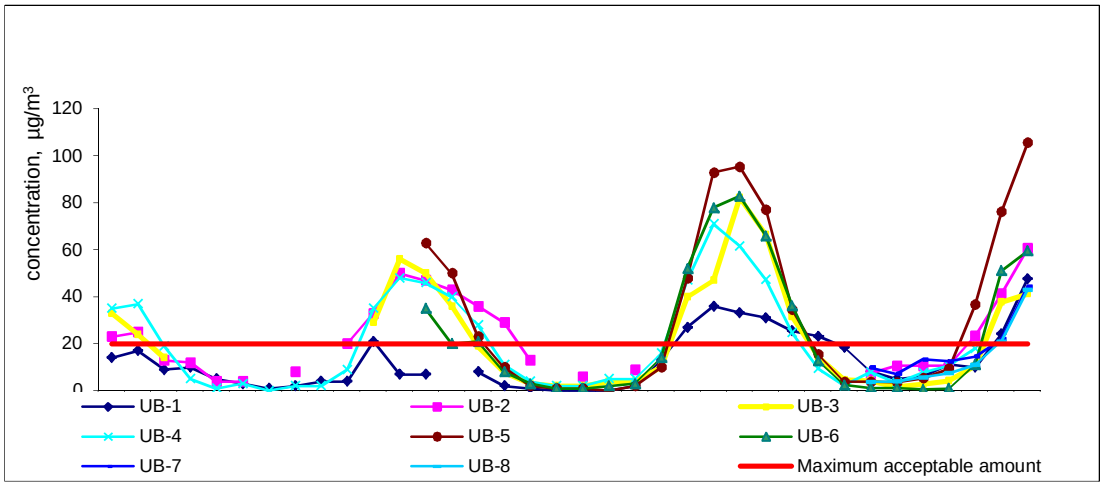


Figure 20. Daily concentration of sulfurous gas, monthly average (2008-2010)

The annual sulfurous gas concentration has increased year on year, and compared to 2008, the concentration in 2010 increased by a factor of 1.5.

A comparison of average daily concentration of nitrogen dioxide and the maximum acceptable level for air quality standards is shown in the figure below.

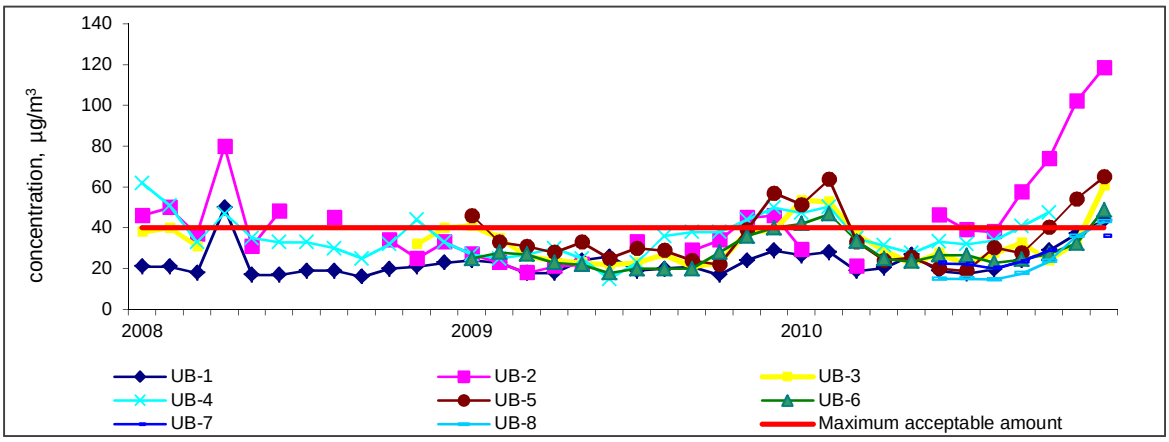


Figure 21. Daily concentration of nitrogen dioxide, monthly average (2008-2010)

The annual average concentration of carbon monoxide was 1400 µg/m^3 in 2009, but decreased by 342 µg/m^3 to reach 1059 µg/m^3 in 2010.

In 2010, the highest concentration, averaged over 8 hours, of carbon monoxide was 14,100 µg/m^3 recorded in December at the monitoring point at Baruun 4 zam (UB-2) and it exceeded the maximum acceptable amount by 1.4 times (Figure 22).[20]

[20]Report of Air Quality Professional Division of National Agency of Meteorology, Hydrology and Environment Monitoring

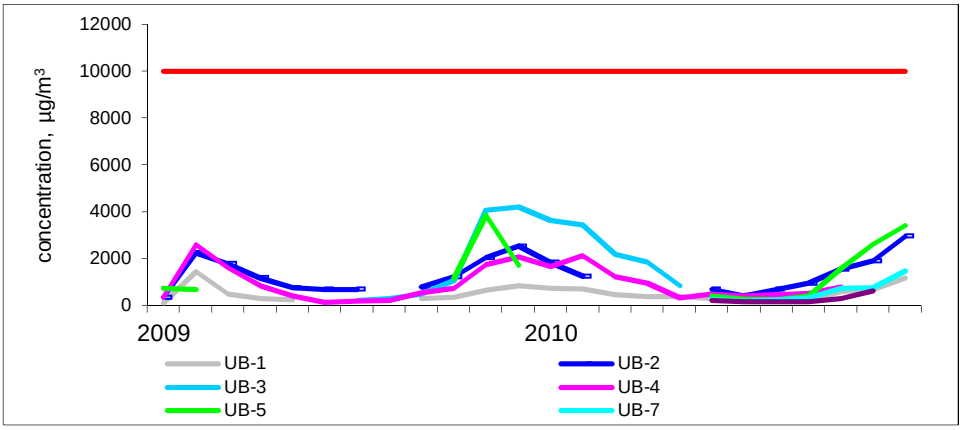


Figure 22. Daily concentration of carbon monoxide, monthly average (2009-2010)

The annual average concentration of large dust particles (PM-10) in Ulaanbaatar air reached 150 µg/m^3, three times higher than the maximum acceptable amount (50 µg/m^3), the highest daily average concentration was 1548 µg/m^3 which is 15.5 times higher than the maximum acceptable amount and was recorded in December at the monitoring point at 100 Ail (UB-5). In summer, large dust particle pollution was also observed. In spring and summer the concentration of large dust particles increases because of the climate, soil dryness, winds, storms, construction, and roadworks, and especially dust from roads.

In 2009, five stationary monitoring points made PM-10 measurements and 29.8 per cent of the measurements exceeded the maximum acceptable amount (which is an average of 100 µg/m^{3}over 24 hours) by between 1.2 and 18.6 times. In 2010, 51.8 per cent of the measurements exceeded the maximum acceptable amount (Figure 23).

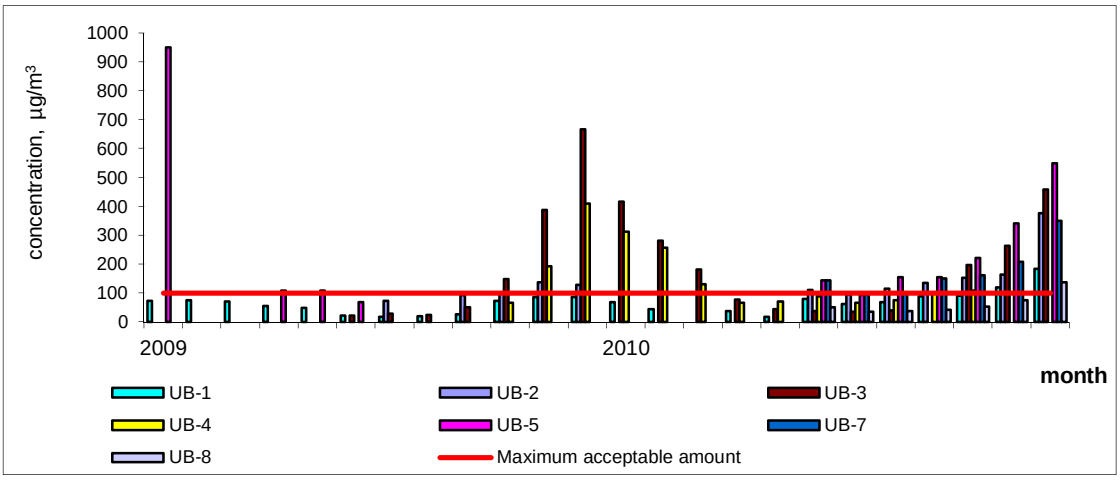


Figure 23. Average daily concentration of large dust particles (PM-10), by month (2008-2010)

In July 2010 the automatic air quality monitoring stations from France were installed which allowed for measurement of small dust particles (PM-2.5) and ozone (O_3) in the air. Small dust particle concentrations are shown in Figure 24. [21]

[21]Report of Air Quality Professional Division of National Agency of Meteorology, Hydrology and Environment Monitoring

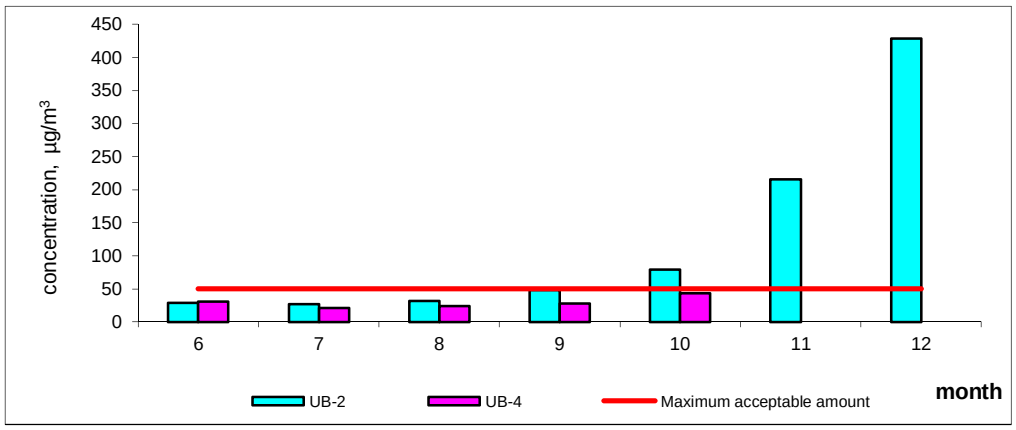
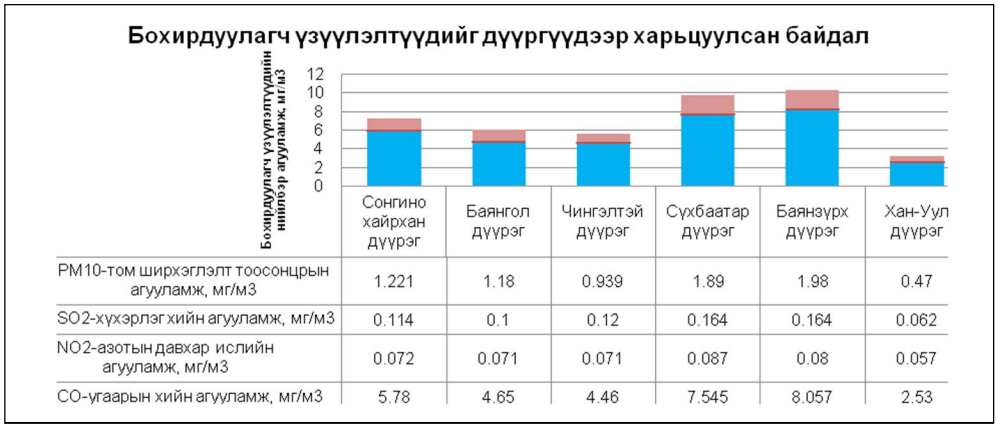


Figure 24. Daily concentration of small dust particles (PM-2.5), monthly average (2010)

In winter the concentration of small dust particles in the air increases. At Baruun 4 zam, 89.3 per cent of the measurements in October and 100 per cent of the measurements in November and December exceeded the maximum acceptable amount. At this location the highest daily average concentration exceeded the maximum acceptable amount (an average of 50 µg/m^3) by 22.9 times, and these results show that in winter there are very high amounts of small dust particle pollution in the air (Figure 25). [22]



	Сонгино хайрхан дүүрэг	Баянгол дүүрэг	Чингэлтэй дүүрэг	Сүхбаатар дүүрэг	Баянзүрх дүүрэг	Хан-Уул дүүрэг
PM10-том ширхэглэлт тоосонцрын агууламж, мг/м3	1.221	1.18	0.939	1.89	1.98	0.47
SO2-хүхэрлэг хийн агууламж, мг/м3	0.114	0.1	0.12	0.164	0.164	0.062
NO2-азотын давхар ислийн агууламж, мг/м3	0.072	0.071	0.071	0.087	0.08	0.057
CO-үгаарын хийн агууламж, мг/м3	5.78	4.65	4.46	7.545	8.057	2.53

Figure 25. Pollution indicators by district

Researchers determined that in the last few years allergic reactions associated with air pollution have increased in Ulaanbaatar. Air pollution is the main cause of cancer, respiratory diseases and coronary diseases. In 2010, of the top 5 illnesses within the population, respiratory and coronary diseases increased at the highest rate (Figure 26).[23]

[22]Report of Air Quality Professional Division of National Agency of Meteorology, Hydrology and Environment Monitoring

[23] Report of Ministry of Health, 2010

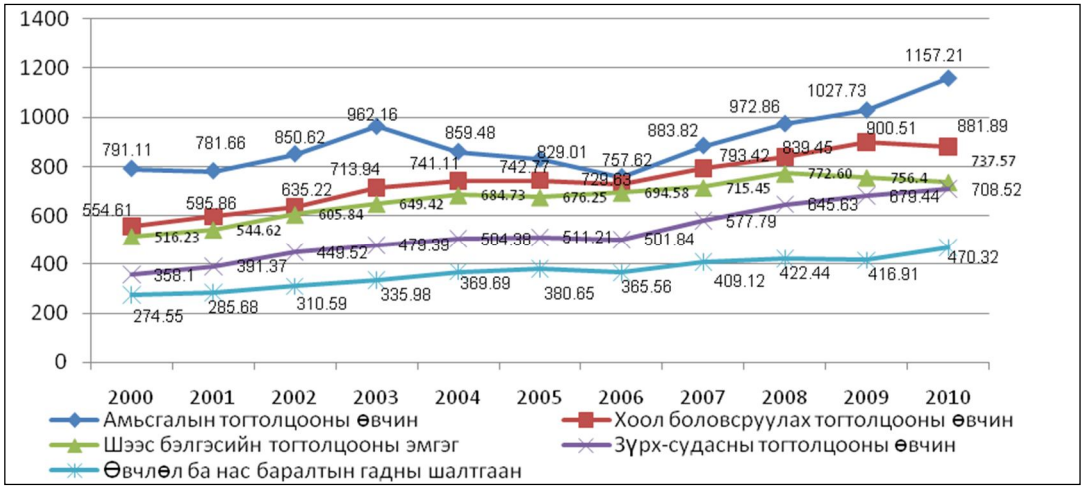


Figure 26. Top five illnesses, rate per 10,000 people

From research it was found that in winter the occurrences of respiratory disease increases particularly in children. 93.77 per cent of child respiratory diseases and 90.91 per cent of children's bronchitis cases are caused by air pollution.[24]

[24]Report of Air Quality Professional Division of National Agency of Meteorology, Hydrology and Environment Monitoring

Throughout the country there are 25 monitoring stations measuring sulfurous gas nitrogen dioxide, and taking once-a-day samples of carbon monoxide and dust particles. In 2010, annual average sulfurous gas concentrations were 8-43 μg/m^3, the highest annual average was 157 mg/m^3 in Murun city. Concentrations in Murun exceeded the maximum acceptable amount on three occasions, in Darkhan city the maximum acceptable amount was exceeded 52 times, in Arvaikheer nine times, in Tsetserleg seven times, in Ulgii five times, and in Dorno-Gobi once. In these cities air pollution increased to a certain extent and exceeded the maximum acceptable amount. It was observed that nitrogen dioxide pollution also increased (Figure 27).

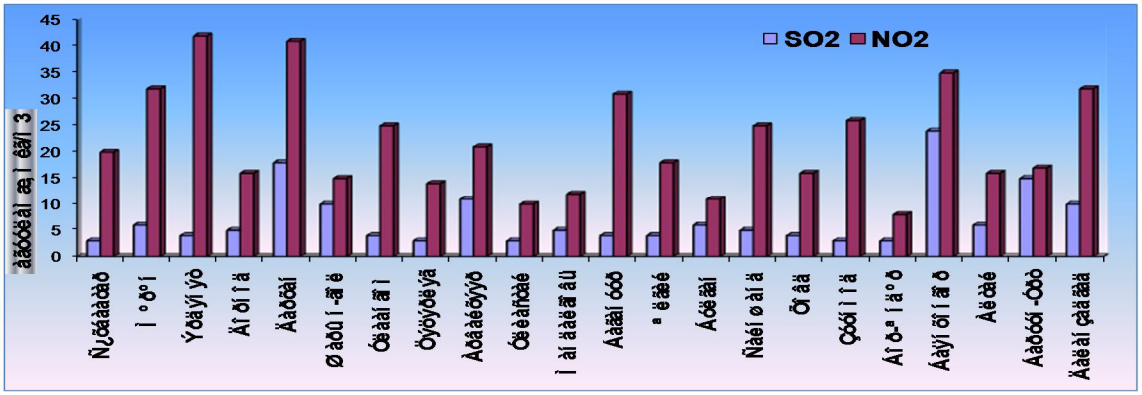


Figure 27. Annual average concentration of sulfurous gas and nitrogen dioxide in regional areas (2010)

In 2009, carbon monoxide measurements made in eight cities, and averaged over 30 minute intervals, show the annual average concentrations were 370-1250 μg/m^3, the highest average was 13,120 mg/m^3 in Murun soum. In 2010, annual average concentrations were 360-4050 μg/m^3 and the highest average was 29,750 μg/m^3, also in Murun soum. Carbon monoxide concentrations did not exceed the maximum acceptable amount (60,000 μg/m^3 averaged over 30 minutes).

The annual average concentrations of large dust particles in the air were 14-120 μg/m^3 in 2009, 1.3-2.4 times more than the maximum acceptable amount (annual average of 50 μg/m^3). In 2010 the concentrations were 18-172 μg/m^3, 1.5-3.4 times more than the acceptable amount. These concentrations were observed at the air quality monitoring stations around the country, except the monitoring station at Uliastai. In 2010 large dust particle concentrations increased by 4-76 μg/m^{3}compared to the previous year. The highest daily average in 2009 was 2875 μg/m^3 in Khovd city, 28.7 times more than maximum acceptable amount (24 hour average 100 μg/m^3). Khovd city also recorded the highest measurement in 2010, with a 24 hour average of 1703 μg/m^3, 17 times more than the maximum acceptable amount.

Dust measurements were taken in Darkhan and Sukhbaatar cities. In 2009 the annual average concentration of dust was 39 μg/m^3 in Sukhbaatar city, and 174 μg/m^3 in Darkhan city which is 1.7 times more than the maximum acceptable amount (annual average, 100 μg/m^3). The highest average over 30 minutes was 2470 μg/m^3, also in Darkhan city, and it was 4.5 times higher than maximum acceptable amount (30 minute average, 500 μg/m^3). Small dust particle (PM-2.5) measurements were made in the capitals of Orkhon, Uvurkhangai, and Arkhangai provinces using a weight method. Annual average concentrations were 45-136 μg/m^3 in 2009, 1.8-5.4 times higher than the maximum acceptable amount (annual average, 25μg/m^3) and in 2010 were 51-95 μg/m^3, 2-3.8 times higher than the maximum acceptable amount. In 2009, the highest daily average was 669 μg/m^3 in the capital of Arkhangai province, 13.4 times higher than maximum acceptable amount (24 hours average, 50 μg/m^3), and in 2010 it was 770 μg/m^3, 15.4 times higher than the maximum acceptable amount.

Based on the results of air quality measurements taken in regional areas, the capital cities of Darkhan-Uul, Khuvsgul, Orkhon, and Khovd provinces' air pollution rates are high compared to other provinces and in last few years the air pollution in the capitals of Uvurkhangai, Bayankhongor, Gobi-Altai, Selenge, Dorno-Gobi, and Umnu-Gobi provinces have increased significantly and exceeded the maximum acceptable amount on several occasions.

Environmental radiation levels are measured at 34 monitoring points, and measurements are taken at 8 and 14 o'clock in Takhilt and the industrial region of Ulaanbaatar. The monthly radiation levels ranged from 0.09 to 0.14 mk3v/hour and didn't exceed the long term average (Figure 28).

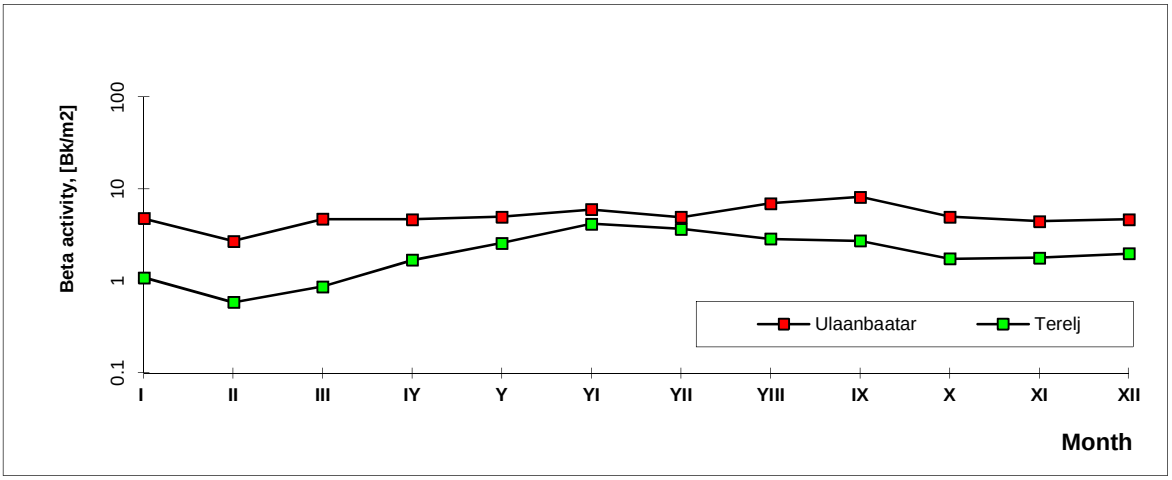


Figure 28.Environmental radiation dose capacity

3.2. Soil quality and pollution

Due to natural and human activities, soil structures have been damaged and have caused soil erosion. Because of poor human practices, soil erosion and plant cover in areas of Ulaanbaatar is increasing. In the last few years, in the city centre and suburban areas, sand and gravel exploration has increased. 214 soil samples were taken for analysis of pollution levels from the districts of Ulaanbaatar and the main chemical and physical properties are shown in Table 32.

Previously, Mongolian soil pollution research was focused on the study of heavy metals in soils, but in last few years research has started on microbial communities in the soil (Table 33).

Table 32. Main properties of soil

Districts		pH	CaCO3 %	EC dS/m	Stone, %	Sand, %	Dust, %	Mud, %
Bayangol	Average	7.52	1.57	1.31	33.7	60.9	28.9	10.2
	Max	8.16	3.88	8.65	60.0	70.3	36.6	15.0
	Min	5.63	0.00	0.10	0.0	55.7	20.5	7.7
Bayanzurkh	Average	7.57	1.20	0.90	33.02	56.34	32.56	11.10
	Max	8.38	6.54	4.16	62.50	71.80	52.68	16.49
	Min	6.23	0.00	0.04	0.00	30.83	19.02	7.72
Nalaikh	Average	7.29	0.23	0.16	33.75	59.00	29.63	11.37
	Max	8.01	0.91	0.44	65.00	65.95	36.58	15.03
	Min	6.12	0.00	0.05	0.00	48.39	23.41	9.18
Songinokhairkhan	Average	7.39	0.67	0.78	23.88	57.08	31.92	11.01
	Max	8.33	2.54	3.48	46.67	67.41	51.21	15.03

	Min	6.08	0.00	0.04	0.00	33.76	19.02	7.72
Sukhbaatar	Average	7.61	1.96	1.55	25.48	61.79	28.26	9.95
	Max	8.17	20.90	6.65	50.00	71.80	46.82	15.03
	Min	5.97	0.00	0.11	0.00	41.07	19.02	7.72
Khan-Uul	Average	6.91	0.63	1.68	11.69	53.23	33.43	13.34
	Max	8.23	3.82	9.53	50.00	67.41	51.21	26.74
	Min	4.75	0.00	0.04	0.00	33.76	21.95	7.72
Chingeltei	Average	7.62	1.18	2.40	30.62	58.37	30.99	10.64
	Max	8.39	3.20	7.53	53.85	71.80	40.97	17.96
	Min	5.76	0.00	0.08	0.00	41.07	20.48	7.72

Table 33. Heavy metals in Ulaanbaatar soil

Indicator	As	Cd	Hg	Pb	Cr	Cu	Zn	Fe
Average (UB 2010)	7.46	1.56	0.094	57	66	92	135	2021
Max	28.58	5.00	0.450	2413	657	783	478	6925
Min	1.83	0.60	0.025	2	8	10	27	890
N	66	63	59	115	115	111	111	111
Standard. MNS58:50	6	3	2	100	150	100	300	Standard. MNS58:50
UB 2008	0.138	55	64	51	79	UB 2008	0.138	55

By 2008, about 140 petrol stations, 40 oil reservoirs and 160 auto service stations were located and working in Ulaanbaatar. Oil product leaks from these sources are polluting the soil. Research results from soil sampling near auto service stations located in densely populated areas and open places without containment areas are shown in table below.

Table 34. Soil properties of oil polluted areas

Sampling site	pH	Oil products, %	$EC_{2.5}$dS	SO^{4-} mg/eqv	Cr mg/kg	Cu mg/kg	Pb mg/kg	Zn mg/kg	Fe mg/kg

Bayanburd Korean auto station service	7.64	9.5	0.303	0.016	22.4	57.5	70	217.5	2010
Bayanburd Oil material	8.15	18.1	0.749	0.512	187.75	782.5	2413.25	272.5	2600
Bayanburd Meltes auto station service	7.93	10.7	0.106	1.588	24.8	242.5	127.75	222.5	2335
Ikh Zasag Body repair	8.38	2.6	0.237	0.168	10.475	57.5	17	72.5	2080
1000 student apartments Soldering Copper	7.65	18.6	1.722	1.956	26.125	72.5	37.75	192.5	2195
Da khuree 1	7.38	23.2	0.345	0.04	18.475	232.5	174.25	220	2110
Da khuree 2	7.16	125	0.232	0	21.325	317.5	83	222.5	2177.5
Da khuree 3	7.53	8.3	0.356	0.008	18.8	252.5	85.25	212.5	2180
Da khuree 4	7.45	6.7	0.256	0.096	18.1	45	16.25	137.5	1887.5
Tavan Shar Yamaha service	7.63	9.9	0.66	0.46	10.025	40	19	177.5	1857.5
Bars market Auto parking	6.98	50.8	0.158	0	14.5	125	80	207.5	1725
Railroad station-1	6.94	6.5	0.124	0	12.25	57.5	35.75	127.5	1825
Railroad station-2	5.63	7.7	0.1	0	21.125	72.5	59	130	1870
Circus TM Petrol station	7.89	5.1	0.127	0	13.625	62.5	14.75	110	1777.5

In 2010 soil pollution increased compared to previous years. The results of 134 samples show the average lead concentration was 57 mg/kg and chrome 66 mg/kg, a slight increase compared to the previous year, copper was 92 mg/kg (increased by 80 per cent), and zinc was 135 mg/kg (increased by 60 per cent).

The ammonium (organic pollution) level in the soil was 4.35 mg/100g, four times higher than the average for pasture land. The average concentration of phosphorus was 5.42 mg/100g, two times higher than the average for pasture land. The soil sulfur content is quiet high due to smoke and air pollution (SO4-1.16 mg-eqv/100g).

3.3. Water pollution

Water pollution in Mongolia has been tending to increase in the past few years. The main pollution factors impacting the water quality are non-treated or semi treated industrial and domestic waste water, waste thrown in river holms and ravines, flood debris, air and soil pollution and mud and clay from mining and construction production. Over 120 million cubic meters of waste water is disposed of without treatment annually, polluting the environment.[25]

[25]Report of Air Quality Professional Division of National Agency of Meteorology, Hydrology and Environment Monitoring

According to inspections and monitoring, surface water near urban areas and mining sites has a high rate of pollution. For example, the area where the Tuul River merges with waste water from the sewerage treatment plant of Ulaanbaatar (around 42 million cubic meters annually) between Songino and Tavantolgoi bridges is very badly polluted and the river is affected by mineral and organic pollutants. The pollution is mainly a result of the poor capacity and technological underdevelopment of the facility, but can also be attributed to the supply of over polluted waste water from the livestock raw materials processing plants to the treatment plant which causes difficulties in its operation, and also the disposal of waste directly to the natural areas surrounding the river. Khiagt, Khangal and Boroo rivers and other rivers around settled areas are being polluted by minerals at levels that exceed the standards.

Mining production, especially gold mining operations, causes pollution in 28 rivers and streams of eight provinces. Tuul and Yeruu rivers and their streams, basins of Bukhlee and Mogoi rivers, Bodont river of Tsenkher soum, Arkhangai province and many small rivers and streams of Orkhon river are impacted by large corporate gold mines, Terelj river of Khukhmorit soum of Tuv province, Khatagtain stream of Tsenkhermandal soum of Khentii province, Jargalant river of Umnudelger soum, the origin of Orkhon river and basins of Yeruu and Tuul rivers are affected by individual, private gold miners. Hand gold miners carry many hundreds of bags of gold to the rivers and wash it in the river causing pollution in the river, the river bed becomes blocked with mud and clay and some lakes have dried out. Particularly, the bed of Taats river of Uvurkhangai province has been blocked and the water level has gone down, thus the Taats white lake has dried out.

For the last two years the environment, in particular rivers, underground water and soil, has been polluted by toxic substances including sodium cyanide, sulfuric acid and mercury. Illegal operation of hand gold miners and their use of toxic and hazardous substances are making

it impossible to control the spread of those toxic substances in the environment. Continuation of these illegal activities is to the extent where it could substantially affect the environment of these regions.

As exploration of gold deposits increases, the cyanide, sulfuric acid and other toxic substances used in gold mining affect and pollute the river basins and these chemicals become the main sources of permanent pollution. Therefore there is a need to increase monitoring activities and analysis in these rivers in addition to continuing current activities.

Even when the rivers flow relatively quickly, pollution caused by animal husbandry such as ammonia and nitrate still contaminate the water. Therefore the carcasses of livestock affected by the drought should be buried and disinfected a distance of 300 m from rivers to protect rivers and ravines from various pollutants. This has become more important recently since livestock have been affected by infectious diseases including foot and mouth disease, malignant anthrax and equine influenza. Organically polluted water from a failure to take such measures is used for potable water and livestock water supplies during spring and summer which leads to prolonged recovery from other hardships such as drought, dzud and infectious disease.

In Mongolia waste water treatment plants have been established and used in urban areas since 1959. According to a study conducted between 2006 and 2009, a total of 133 waste water or sewerage treatment plants were counted, including 60 mechanical treatment plants, 69 biological treatment plants and 4 industrial treatment plants. Among them there are also 77 abandoned sewerage treatment facilities. 69,184 cubic meters of waste water from irregular operation of mechanical treatment facilities and 20,000 cubic meters of waste water from chemical treatment facilities is disposed of to the environment each day becoming major source of pollution. In 2008 under the project “Water of Mongolian clean springs”, 99 springs of 74 soums of 21 provinces and 28 springs in Ulaanbaatar, totalling 127 springs were assessed. 77.2 per cent of the all springs involved in the study were polluted by human and animal droppings and waste because there was no protection from these pollutants. Chemical pollution such as bacteria, ammonia, nitrate and organic substances were detected in the water because waste deposits, toilets, sewage and animal droppings were located within the protection zone (0-100m around the spring). Of the springs in the capital city settled area, 47 per cent were polluted by household waste because of settlements located close to the springs.

Based on the above descriptions and statistics, it has been concluded that water pollution in Mongolia has steadily increased.

Surface water quality

Water quality monitoring is conducted and compiled annually and a water pollution index is estimated at each monitoring point. To estimate the pollution index, indicators such as oxygen, easily oxidised organic substances, minerals, nitrogen, phosphorous, chrome and copper levels are measured, their annual average concentration is compared to the standard MNS4586-98 and considered in the context of spread and harm of the polluting factors. In 2009 surface water monitoring was carried out on 77 rivers and 13 lakes using 119 water quality monitoring units at a total of 148 points in accordance with the national program. 88 per cent of all rivers and lakes were classified as very pure or pure, 7 per cent were assessed as slightly polluted, 2 per cent were assessed as polluted and 3 per cent were classified as very or extremely polluted (Figure 29).

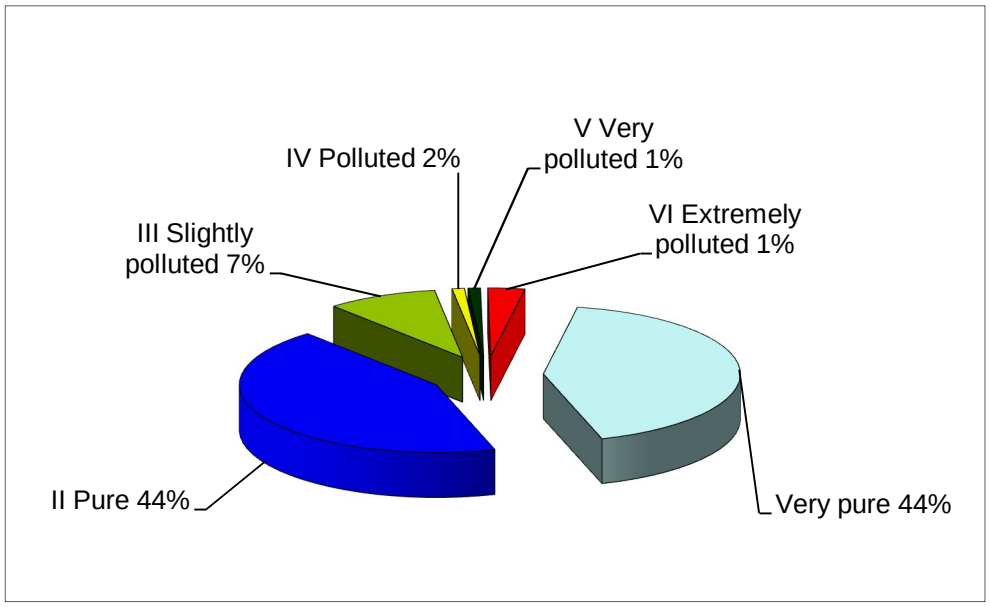


Figure 29. Surface water quality categories, 2009 (percent of rivers and lakes)

Rivers classified as “Less polluted”, or level III, are polluted by 1-3 indicators including minerals, nitrogen and phosphorous that exceed the water quality standard. In 2009 the number of slightly polluted rivers decreased to around half of the previous year and these rivers were re-classified as “Very pure” and “Pure” or levels I and II.

In 2010, according to the results of surface water quality monitoring carried out on 79 rivers and 13 lakes using 121 water quality monitoring units at a total of 150 points, the pollution index was estimated and water quality was assessed against 6 classifications. 88 per cent of all rivers and lakes were classified as “Very pure” and “Pure”, 8 per cent were assessed as “Slightly polluted”, 1 per cent were assessed as “Polluted” and 3 per cent were assessed as “Very polluted” or “Extremely polluted” (Figure 30).

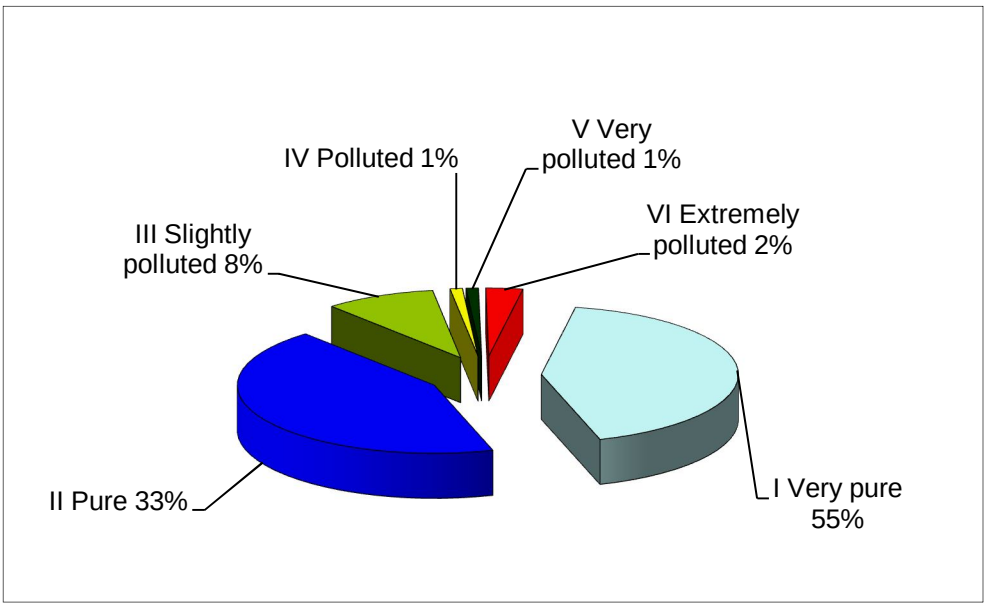


Figure 30. Surface water quality categories, 2010 (per cent of rivers and lakes)

In 2010, mineralisation of the Tuul River in summer was 29-128 mg/l downstream where the water merges with the outlet of the sewerage treatment facility, which is 2-5 times greater than the acceptable standard. In winter it fluctuated between 70.6-1168 mg/l which is 8-17 times greater than the standard (Figure 31).

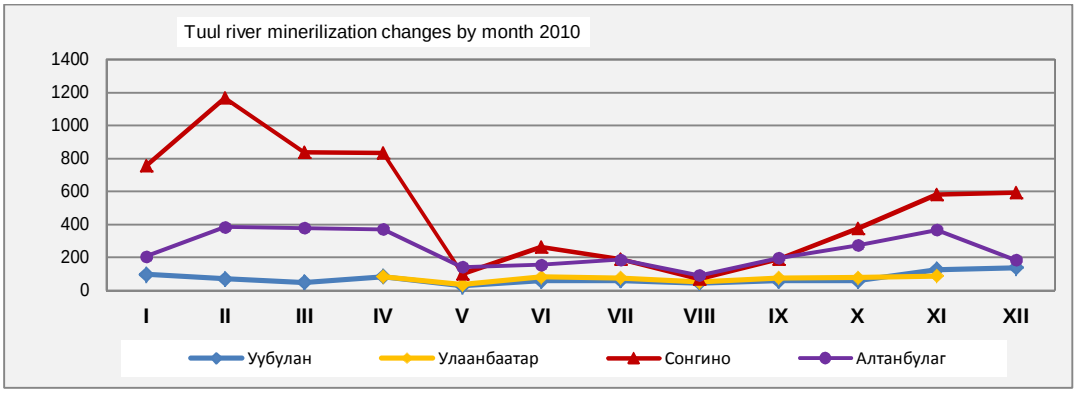


Figure 31. Mineralisation of Tuul river by month, mg/l (2010)

In spring, upstream of the city around Nalaikh district there is ammonium nitrate pollution. In March 2010 the level of pollution exceeded water quality standards by four times.

On the other hand, downstream of the city where the sewerage treatment plant discharges to the river, water oxygen levels vary. Oxygen levels around Songino and Khadankhyasaa have decreased substantially to 0.00-2.59 mg/l and in all months except for May, August and September it was classified as very or extremely polluted. Ammonium nitrate and mineral phosphorous concentrations in the river exceed the standard concentration by 10 times, ammonium nitrate concentration is 36-48 times greater than the standard, nitrite concentrations are 2-9 times greater, mineral phosphorous concentration 4-13 times greater, the biologically necessary oxygen concentration is 22-47 times greater than the standard, concentration of permanganate is 1.4-5.1 times greater and concentration of sulfate concentration exceeds the standard by 1.4 times [26] (Figures 32 and 33).

[26]Report of National Agency of Meteorology, Hydrology and Environment Monitoring

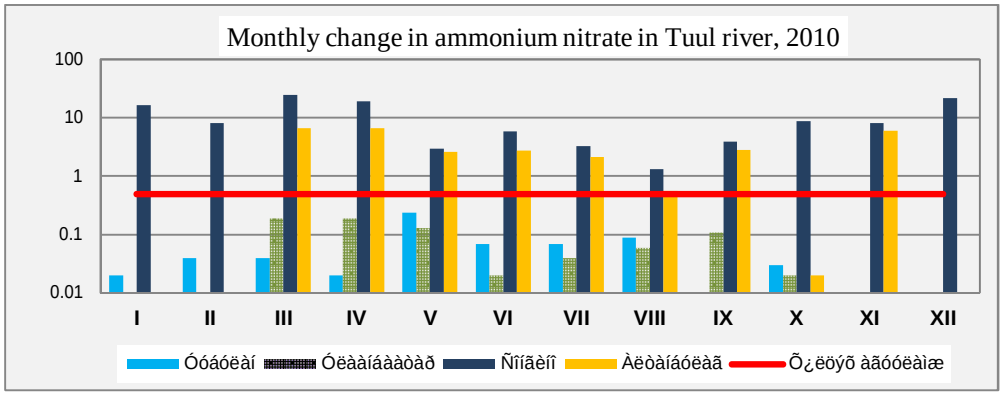


Figure 32. Monthly change in ammonium nitrate in Tuul river, mg/l (2010)

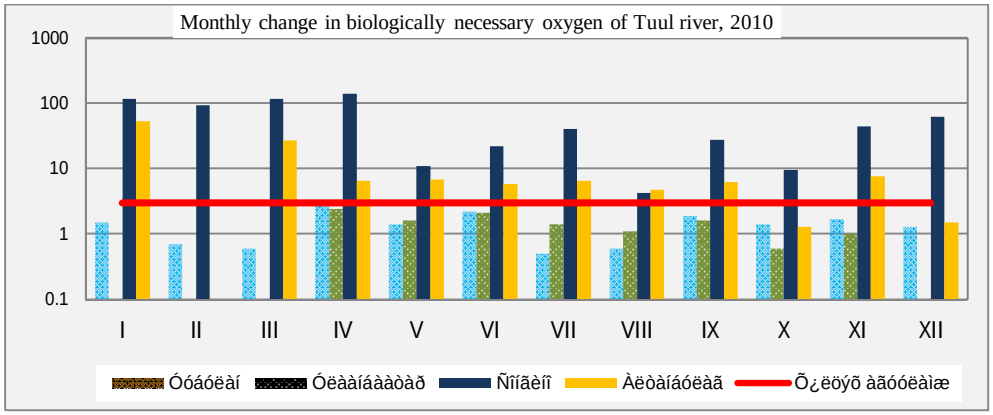


Figure 33. Monthly change in biologically necessary oxygen of Tuul river, mg/l

3.4. Environmental impact of chemically toxic and hazardous substances

The classification of chemicals in Mongolia was changed to comply with the international standard and this classification and its methodologies were approved and made effective by the joint order No. 04/04 of 2009 by the Minister for Nature, Environment and Tourism and the Minister for Health.

To comply with “Regulation on export, import, trans-boundary transportation, production and sale of chemically toxic and hazardous substances” chemical users must undergo an examination by the National Regulatory Council in charge of chemically toxic and hazardous substances before using the chemicals. In 2010 three entities had gone through this examination. In order to facilitate information sharing and transparency of the classification of chemical substances, a list of chemicals under the classification and information related to the chemicals is available to the public and relevant organisations through the website: www.mne.mn/chemical.

The Minister for Nature and Environment, the Minister for Food and Agriculture and the Minister for Health annually approve a joint decree which states which pesticides can be used for the protection of agricultural plants, which chemicals can be used for veterinary disinfection and sterilisation, chemical fertilisers that can be used for agricultural purposes, and other chemicals that can be used to combat domestic pests and other sanitary uses. The “Procedure to test and use pesticide, chemical fertiliser, domestic insect and rodent elimination and disinfection and sterilisation substances” was approved and implemented in 2009. In 2008 134 entities, in 2009 178 entities, and in 2010 358 entities obtained licenses from MNET to import, use, sell and produce a total of more than 358 chemicals.

Measures are taken to decrease the amount of chemical products used on pastoral land each year and to encourage the use of nature-friendly approaches to pasture management. In 2009 bio-pesticide was used for combating mice in an area of 100,000 hectares.

In order to decrease use of chemicals in agriculture, "Ulziingol" LLC of Selenge province has been producing bio-fertiliser from earthworms and this fertiliser has been used for agriculture.

As a result of a national study undertaken in 2007 and again in 2008, 145 gold milling operations that were illegally using mercury were stopped and 35.2 kg of mercury and 1200 kg of sodium cyanide that was used without licenses or and permission was collected. About 200 thousand tonnes of waste and slurry was contaminated with mercury and cyanide at 120 locations throughout ten provinces. As a result 53 hectares and dozens of springs were polluted.

The Government issued resolution No. 127 on "Some measures to take to neutralise chemically polluted soil and slurry". In accordance with the resolution, the Government allocated funds to neutralise polluted soil and slurry. From 2008 to 2009, 131,792 m^3 or 197,687 tonnes of waste and soil polluted with mercury and cyanide from 230 locations in 37 soums and 9 provinces was transported, neutralised and buried (Figure 34). Mercury and cyanide pollution that polluted the environment and adversely affected human and animal health was eliminated by stripping the top soil, neutralising and cleaning the soil over an area of 128,444 m^2 area that was polluted by the chemicals. 118.34 kg of mercury was removed during this cleaning activity (Figure 35).

Also included in the pollution cleanup efforts was clearing of mercury pollution in the Boroo river caused by a crack in the gold concentrator boiler/pot of "Mongolor" state owned company in 1956. The company had been mining gold ore in Mandal soum of Selenge province since 1913. The cleanup was conducted jointly with a project implemented by the Ministry for Environment of Czech Republic and 19,868 tonnes of polluted slurry, soil and gravel were transported and buried from the area. In total, an area of 10,245 m^2 was cleaned up and technical rehabilitation was carried out. 105 kg mercury was separated and taken from the area.

A total of 3.7 billion tugriks was expended from the state budget on the rehabilitation of areas contaminated with mercury and cyanide in Mongolia.

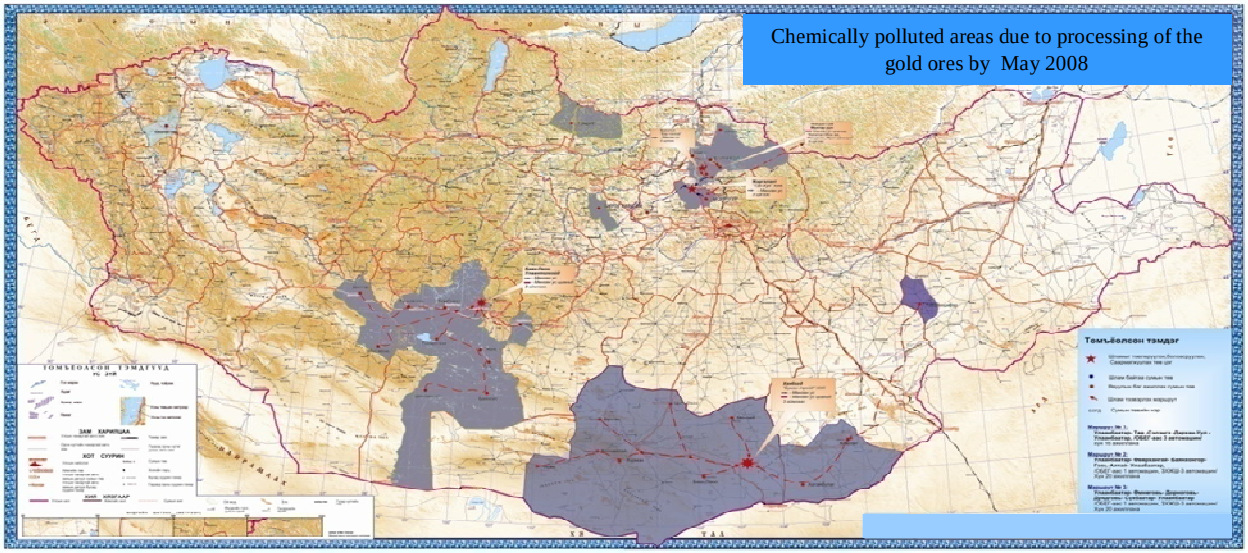


Figure 34. Polluted areas due to processing of gold ore using chemicals illegally

Figure 35. Transportation and neutralisation of slurry and waste polluted by the chemicals

The import of ozone depleting substances was reduced by around 89.36 per cent between 1999 and 2010 reaching 2.2 tonnes through the use of licenses to import cooler and freezer products with lower content of ozone depleting substances. By doing this, Mongolia fully implemented its duties in accordance with the International Convention of Vienna.

3.5. Hazardous and solid waste

An integrated facility to transport, eliminate and disinfect hazardous waste from medical clinics of Ulaanbaatar was established with an investment about 300 million tugriks in 2010. As of 2010, over 500 tonnes of hazardous waste had been collected from 13 clinics under the Health Ministry, 38 clinics under Health Department of the city, 35 family hospitals and 239 private hospitals and clinics totalling 325 clinics in Ulaanbaatar.[27]

[27] Report of Ministry of Health, 2010

Also, equipment (such as autoclaves, burning stoves, water treatment equipment, trolleys to carry waste, waste bins and autoclave bags) required for improving waste management was supplied to, and installed in, clinical hospitals of bigger cities in Darkhan-Uul and Orkhon provinces. According to the final statistics of 2009, each of 329 soums and towns in 21 provinces had 1-2 waste disposal sites and there were 5 disposal sites in Ulaanbaatar. The disposal site in Naran enger and the disposal sites of 13 provinces including Khuvsgul, Uvurkhangai, Darkhan-Uul, Tuv, Khentii, Sukhbaatar, Dornod, Dorno-Gobi, Dund-Gobi, Arkhangai, Zavkhan, Uvs and Khovd provinces are being maintained and furnished as ecologically friendly and imposing no harm on the environment as well as meeting hygiene standards.

72-75 thousand tonnes of waste has been dumped at 321 unregulated sites in regional areas and 147-150 thousand tonnes of waste at 11 unregulated sites in the city. 780-800 thousand tonnes of waste is created nationally per year of which 50 per cent or 340 tonnes is domestic waste, 50 thousand tonnes is construction waste, 1 tonne is clinical waste from Ulaanbaatar. A total of over 400 thousand tonnes of waste is buried by in landfill. As for the structure of the waste, ash accounts for 49-50 per cent of total waste in winter.

In 2008, 3194.1 million tugriks of government income was put into a waste service fund from which 2652.4 million tugriks was spent on waste transportation; and in 2009 income of 3452.6 million tugriks was put into the fund from which 2579.0 million tugriks was spent on waste transportation. In 2010, 140 million tugriks was spent on cleaning of flood embankments and ditches of Ulaanbaatar. 100 million tugriks was spent on underground road drainage pipelines, and 420 million tugriks on centralised waste disposal areas and landfill expenses. A total of 3,451.8 million tugriks was centralised into the waste service fund including 1305.4 million tugriks from businesses, 1305.7 million from households in apartments, 802.6 million from families in ger districts and 38.1 million from families' summer camps and other sources.

3.6. Environmental impact assessment

Since the transition to the market economy, unruly use of natural reserves has caused environmental pollution and degradation, and deficiency in natural reserves and much capital and force is needed to rehabilitate the environment. Now, any new construction or facilities must undertake an environmental impact assessment. The assessment ensures: measures to limit environmental pollution, degradation and depletion of natural reserves are considered and implemented as far as possible; the project capacity is improved; potential risks and losses to the project implementer are prevented; and any potential adverse impacts on human health and the environment are mitigated.

In 2008, experts examined material for 820 general environmental impact assessments, the results of the analysis were received and distributed to entities, 13 working group meetings were organised and at those meetings 451 detailed environmental impact assessment reports were discussed and approved.

In 2009, experts examined material for 492 general environmental impact assessments, the results of the analysis were received and distributed to entities, 14 working group meetings were organised and at those meetings 497 detailed environmental impact assessment reports were discussed and approved.

In 2010, experts examined material for 534 general environmental impact assessments, the results of the analysis were received and distributed to entities, 11 working group meetings were organised and at those meetings 520 detailed environmental impact assessment reports were discussed and approved.

As of the end of 2010, 92 entities conducted activities under approval from an environmental impact assessment.

Table 35. Results of general environmental impact assessments

Project name	**2008**	**2009**	**2010**
Gold deposit	91	82	44
Deposit of other minerals	50	75	117

Tourist camp	252	112	56
Plants	48	64	155
Gas stations, warehouse	185	121	141
Other projects	194	38	21
Total:	**820**	**492**	**534**

3.7. Measures to mitigate greenhouse gases

The Parliament of Mongolia ratified the Kyoto Protocol on 15 December 1999. The Protocol was implemented in 2005. According to the Protocol Mongolia has no specific quantitative target to decrease its greenhouse gas emissions. However, Mongolia has a duty to decrease greenhouse gases through Clean Development Mechanism projects created within the Protocol and sell emission permits generated through the projects to countries that are obliged to decrease their greenhouse gas emissions. By participating in the Clean Development Mechanism Mongolia helps countries with binding targets to decrease greenhouse gas emissions at the lowest cost, in the most effective way and contributes to creates sustainable development in Mongolia.

The Clean Development Mechanism (CDM) National Bureau is operating within the MNET. It has issued six Guarantee Letters for six projects. These projects include hydroelectric power stations of Taishir and Durgun, a project to renovate non-centralised steam boilers, a wind farm at Salkhit, a hydroelectric power station at Maikhan and a pellet and briquette plant. Three of the projects are registered with the United Nations Framework Convention on Climatic Change Secretariat and two are in the certification stage of pre-registration. Information on the projects conferred certification is shown in Table 36.

The hydroelectric power station project at Taishir was issued with 48 emission permits for its 48 tonne decrease in greenhouse gas emissions in January 2010. Currently the hydroelectric power station at Taishir has been issued with a total of 838 emission permits

between January 2008 and May 2010. The hydroelectric power station at Durgun obtained 14,468 emission permits from November 2008 to May 2010.

Table 36. Projects issued the guarantee letter/certification

Name of Clean Development Mechanism project	**Obtained certification letter (date)**	**Amount of decrease per year (tonnes CO_2/year)**	**Project participant (country where the project being implemented)**	**Project participant (other)**	**Current situation**
Hydroelectric power station at Durgun	2006/10/2	30,400	Power Authority, Government Implementation Agency	Mitsubishi UFJ Securities Co., Ltd	(11/08 – 05/10) 14466 certified emission reduction permits were issued during this period
Hydroelectric power station at Taishir	2006/10/02	29,600	Regulatory agency of the government, power authority	Mitsubishi UFJ Securities Co., Ltd	(11/08 – 05/10) 838 certified emission reduction permits were issued during this period
To renovate non-centralised steam boilers	2006/04/27	11,904	Procon North Power system, GmbH Mongol zuukh XXI LLC		Registered
Wind farm at Salkhit	2007/10/10	180,960	Newcom LLC, Mongolia		Certification process underway
Hydroelectric power station at Maikhan	2010/12/09	36,377	Usniierchim LLC		Pre certification stage

Pellet and briquette plant in Mongolia	2010/03/21	19,436	ATIC LLC	EnBW Trading GmbH	Certification process underway

CHAPTER FOUR

BUDGETARY AND NON-BUDGERY EXPENDITURE ON ENVIRONMENTAL PROTECTION

4.1. Income collected from utilisation of natural resources

Income collected for the utilisation of natural resources to state and local budget reached 7.8 billion tugriks in 2008, 10.8 billion tugriks in 2009, and 16.7 billion in 2010 (Table 37).

Table 37. Income collected from utilisation of natural resources, 2008-2010 (’000 tugriks)

Year	Payment for harvesting timber and firewood from the forest	Payment for water use	Land payments	Payments for utilising natural plants	Payments for hunting	Payments for utilising minerals	Payments for utilising non-mineral natural resources	Total
2008	1,507,463.9	2,811,510	2,352,657.5	35,772.5	114,726	904,669.1	109,298.2	7,836,097.2
2009	1,738,802.2	339,642.7	2,673,761.8	38,380.8	4,593,157.9	1,277,348.4	142,201.4	10,803,295.2
2010	219,738.4	4,716,837.5	5,653,201.3	41,488.7	4,059,351.1	1,922,030.5	150,392.8	16,763,040.3

The composition of income collected for the utilisation of natural resources in 2010 can be described by each type of payment. 219.7 million tugriks was collected for timber and firewood harvested from the forest, 4.7 billion tugriks was charged for water utilisation, 5.6 billion tugriks was collected for land utilisation, 41.4 million tugriks was for plant utilisation, 4.0 billion tugriks was from hunting licenses, 1.9 billion tugriks was from utilisation of mineral resources and 150.3 million tugriks was for the utilisation of non-mineral resources.

4.2. Nature, Environment and Tourism field disbursement from state budgetary and non-budgetary funds from 2008 to 2010

In 2008, the Government invested 1050.0 million tugriks for creating garbage dumps (landfills) with minimum negative impacts and meeting sanitary requirements in the centres of Arkhangai, Dornod, Zavkhan, Uvurkhangai, Tuv, Uvs, Khovd, Khuvsgul and Darkhan-Uul provinces. Also, 85 million tugriks was invested in repairs for regional office buildings of the

Ministry of Nature, Environment and Tourism in Bayan-Ulgii and Arkhangai provinces, out of which 65 million tugriks was from the state budget and 20 million tugriks from a GTZ project. A total of 284.0 million tugriks was invested for the repair of buildings of water and climate monitoring centres of 11 soums in Bayankhongor, Selenge, Bayan-Ulgii, Gobi-Altai, Uvurkhangai, Uvs, Khuvsgul and Khovd provinces, Khuvsgul Lake monitoring centre, and the Glacier research centre. 29 million tugriks from the government budget was invested in building repair works for the Special Protected Area office of Dornod province, Mongol Altai nuruu Special Protected Area administration office, and Khar us Lake National Park administration office. Also a total of 186.0 million tugriks was spent on weather station building repair works in 19 soums in Arkhangai, Bayankhongor, Bulgan, Gobi-Altai, Dund-Gobi, Umnu-Gobi, Dorno-Gobi, Sukhbaatar, Selenge, Tuv, Uvs, Khuvsgul and Khentii provinces.

1350.0 million tugriks were invested in the purchase of four automatic rocket bases which are used for cloud seeding to increase precipitation. For air pollution laboratories, 30 automatic weather stations and equipment for to establish a network for cloud seeding were purchased for a total of 2120.1 million tugriks. Improvements in provinces' administration bases and purchasing necessary equipment for Nature, Environment and Tourism offices and State Protected Area offices were allocated 760.0 million tugriks.

398.8 million tugriks was allocated from the Mongolian Development Foundation for validation of underground water exploration works in Uliastai city, Sukhbaatar city's ecology-hydrology research, water supply and usage exploration works of Undurkhaan city, water supply exploration works in Khujirt and Bogd soums of Uvurkhangai provinces, and works on renewing the norms of hydro-geological exploration.

In 2009, 701.6 million tugriks from the state central budget was allocated for the activities of the Minister for Nature, Environment and Tourism and were spent protecting biodiversity, conducting research, planting trees and protecting endangered plant reserves.

710.0 million tugriks was allocated to combating desertification, of which 705.1 million tugriks was spent on the activities and the remaining 4.9 million tugriks was saved from state central budget. In 2010, activities for combating desertification included protecting and preserving 145 springs in 21 provinces. To increase surface water several works were undertaken such as: making plans and norms for building man-made lakes; building facilities to preserve

rain and snow precipitation; identifying and analysing the current state and quality of water resources; facilitating monitoring networks to conduct these activities; building water and precipitation preserving areas at two different sites; and undertaking landscaping, geo-physical studies and geo-technical drilling on the Orkhon river dam building project.

In 2009, 720.0 million tugriks was allocated to neutralising toxic chemical substances and a further 21.8 million tugriks was allocated from the state central budget, bringing the total amount allocated to 741.8 million tugriks. 259.4 million tugriks was approved from the Environmental Protection Foundation which was fully dispersed. 21,814.3 million tugriks was allocated to the Minister of Nature, Environment and Tourism, and 99.4 per cent or 21,692.0 million tugriks was expended.

In 2010, 863.1 million tugriks was allocated to modernising garbage landfill points in Dund-Gobi, Khentii, Dorno-Gobi and Sukhbaatar provinces, 550.0 million tugriks was allocated to finishing the construction works of regional administration offices of the Ministry Nature, Environment and Tourism in Uvs and Bayan-Ulgii provinces, for the administration building of Mongol Els state protected area, and for purchasing technical equipment for preservationists.

Also 355.0 million tugriks was allocated to implementation of tourist programs in Khentii province which is the birthplace of Chinggis Khan; 53.4 million tugriks was allocated to afforestation works in Uvs province; 35.0 million tugriks was allocated to establishing green gardens, planting seabuckthorn and landscaping Baruun-Urt city’s green areas and for protection of the Havirgiin headspring in Ongon soum of Sukhbaatar province; 94.9 million tugriks was allocated to the Capital city mayor office to develop a project to combat Ulaanbaatar air pollution and improve the environmental conditions; 96.1 million tugriks was allocated to increase green areas in Chingeltei district (Ulaanbaatar); 12.0 million tugriks was allocated to Gobi-Altai province for creating green areas, establishing green strips, combating desertification and for feeding wild animals; and 29.0 million tugriks was allocated to Khatgal soum of Khovsgol province for tourism projects and the purchase of a portable swimming pool. In total, 1667.1 million tugriks was allocated and transferred to local governor offices.

CONCLUSION

There were some changes in environmental conditions from 2008 to 2010: air pollution in the capital city and other big cities increased, desertification increased across Mongolia, rehabilitation works of mining sites are insufficient, forest reserves are decreasing, in some places water pollution levels increased and illegal usage of animals and plants are not decreasing.

1. Global warming is becoming more intense in Mongolia. Average annual temperatures were higher than the long term average by 0.8-1.80 °C. Most of the precipitation (185.7 mm) was in the warm season, in winter season the amount of precipitation was 17.1 mm or 8.4 per cent of the total annual precipitation. Compared with the long term average precipitation level, precipitation in these years was lower by 6.6 mm.
2. Due to climate change, the number and frequency of natural disasters are increasing. From 2008 to 2010, 153 atmospheric origin natural disasters occurred, the most frequent disasters were strong winds and downstream floods. During the winter of 2009-2010, dzud (hard winter) occurred in 175 soums of 18 provinces, a total of 9.7 million head of livestock died, and 526.76 billion tugriks in damage was incurred. In 2008, 10 per cent of the total territory, 20 per cent in 2009, and 10 per cent in 2010 of the total territory was in drought.
3. Between 1996 and 2009 17.2 to 30.2 per cent of the rivers dried out and experienced drought, therefore there is a need to establish water reservoirs and make changes in river flows in years with enough precipitation and humidity.

   There is a need to allocate funds to increase water availability, introduce water saving and water reuse policies in industrial sectors, establish water protection in regional areas, conduct rehabilitation work, and undertake activities to prevent pollution and drought. Today the energy and agricultural sectors use the most water, but these sectors don’t pay for their water usage. This policy is very helpful for these sectors, but conflicts with the main principles of water policy.

   In the past few years water pollution increased drastically because citizens do not understand and fulfil their legal obligations regarding water pollution. Because of these issues there is an urgent need for legal improvements and tightening of the responsibilities on water pollution. In 2011, the MNET developed and presented for

approval the “Law on Water Pollution Remuneration” to the Government and there is urgent need for approval and implementation of this law.

4. According to the UN Convention on Combating Desertification, up to 90 per cent of Mongolian territory is affected by soil erosion and desertification, of which 5 per cent is experiencing very strong desertification, 18 per cent strong desertification, 26 per cent medium desertification, and 23 per cent weak desertification. The areas that are experiencing very strong desertification are Uvs Lake basin, Great Lakes basin, Lakes hollow and the dried and desert areas of Dund-Gobi and Dorno-Gobi provinces. Centres of 145 soums are affected by sand movements in the steppe and Gobi regions.
5. Comparing 2010 to 2009, the area affected by forest fires decreased by 122 thousand hectares. The amount of forest reserves affected by mining activities was 42.2 hectares, the same as previous year. But 1.2 thousand more hectares of tree, shrubs, and saxaul forest reserves were damaged compared with the previous year, and areas affected by harmful forest insects increased by 35.8 thousand hectares.
6. The number of rare plant species is increasing due to improper utilisation, mining activities, soil erosion, drought, and overgrazing. 71.6 per cent of the endangered plant species have a very limited distribution, and for 57.9 per cent there are no biological or agricultural reserves for replanting.
7. In 2010, income from licensed hunting to the state central budget was 1.2 billion tugriks, but expenditure for protection and breeding activities of these animals is very small.
8. From 2008 to 2010, the total State Protected Area increased by 857,100 hectares. By 2010, State Protected Areas occupied 14.54 per cent of Mongolian territory, but there is an urgent need for further increases to State Protected Areas.
9. In the early 1990s, researchers determined that one of the main duties of the Government is the protection of nature. Based on that determination, they developed a new term: ‘surrounding environment’, and relevant policies and concepts were developed accordingly. The term ‘surrounding environment’ refers to a healthy and safe environment for human living conditions and has a broader meaning than the term ‘nature’. Because of this new concept, between 1990 and 2005 responsibility for land policy issues was transferred from the jurisdiction of the Minister for Agriculture and Light Industry to the jurisdiction of the Minister for Nature and Environment. This shift

in responsibilities was seen as a good idea for protecting nature and natural reserves and ensuring proper use of natural resources. However, the new land policy was not consistent with international land planning policies for sustainable land management practices. Since 2005 Mongolian environmental laws have been restructured to protect land for forests, plants and animals that was not considered in previous policies. The policies enacted up to 2005 have been deemed to have been poor policies.

According to the "National Development Concept", 'land and natural resources are the main sources of the country's independence, national security and social development'. Based on this, in 1997 Parliament approved the 106th decree for a "Government Policy on Ecology" which highlights land use and protection: 'to rationally determine the classifications in the integrated land database, ecological characteristics, use of ecological resources, technologies and results of baseline evaluations must be considered. The ecological capacity of Special Protected Areas must be preserved while at the same time allowing for certain amounts of agricultural activities, pastoral land, urban livelihoods and mining activities. Finally, proper use of land resources would help preserve biodiversity in the area and facilitate protection of natural resources'. However, these policies are not being implemented by members of parliament or government bodies; solid measures are not being taken and attention is not been given to the issues, there is only concern for economic and social issues. Members are only addressing minor environmental issues, for example extinguishing fires, and are more concerned with other issues. As a consequence, implementation of land policy is being delayed making the issues more severe.

Because of the issues mentioned above, natural resource utilisation policy should be developed together with land planning and usage policy, and therefore land related issues should be under the jurisdiction of the Minister for Nature, Environment and Tourism.

10. In 2010, the amount of land damaged by mining activities was 1904.5 hectares, and the land damaged by industrial utilisation and mining was 17,966 hectares. Of this land, technical rehabilitation work was carried out on 4199.8 hectares and biological rehabilitation work was carried out on 4135.6 hectares.

    According to the "Law on Mineral Resources" mining companies must develop plans and programs to protect the environment annually and have them approved and conduct monitoring activities. In 2008, 124 entities' environmental protection plans and

environment monitoring programs were approved, in 2009 the figure was 166 and in 2010 it was 147. 2528.0 million tugriks was collected during this process and was placed in a special fund for nature protection and rehabilitation. In 2009 and 2010 the land damaged by mining activities but not undergoing rehabilitation was assessed in Khentii, Arkhangai, Uvurkhangai, Bayankhongor, Umnu-Gobi, Dorno-Gobi, Darkhan-Uul, Dornod, Dorno-Gobi, Gobi-Sumber, Dund-Gobi, Sukhbaatar, Tuv, Bulgan, and Selenge provinces. 500 areas totalling 3984.46 hectares of damaged land with no rehabilitation work were counted in 56 soums of 15 provinces.

There is an urgent need to improve the norms, standards, quality and intensity of rehabilitation work.

11. In the last few years, because of rapid development in the mining, industry and service sectors, chemical and toxic substances waste, such as oil, motor oil, many types of liquids, polluted filters, tires, batteries, containers and packages of chemicals, computers, mobile phones, and electronic waste, has increased each year. Because of a lack of proper waste collection facilities (government and private) waste is going directly to the environment. Also, according to studies in this sector, there are expired and substandard chemical substances that have been confiscated by the National Emergency Management Agency and the customs office and also chemical waste is stored at factories, laboratories, research institutions, universities, and schools. These substances are being stored in non-dedicated places because there are no facilities for neutralising and storing these hazardous substances. Some of the chemicals are deposited directly in the environment and are a threat to human health and the environment. Due to the circumstances mentioned above, there is an urgent need for government funding to establish proper environmentally friendly waste disposal facilities and to encourage the establishment of private companies in this field.
12. The main three air polluting substances in the capital city increased in 2010 compared with the previous years. Six automatic monitoring stations were purchased using soft loans from the Government of France and as a result air quality measurements have improved, the sensitivity to air quality change is greater resulting in more detailed data.

    From 2008 to 2010, import of ozone depleting substances decreased by around 89.36 per cent to reach 2.2 tonnes. Since 2010 Mongolia has imposed a total ban on CFC type

ozone depleting substances, successfully fulfilled international obligations, and also contributed to achieving the millennium challenge goals.

13. 16 projects are being implemented using funding from donor countries and international organisations at the Ministry of Nature, Environment and Tourism. Six projects are on natural resource sustainable development, two projects on forest policy and management, two projects on water policy and management, and four projects are on capacity building of bio-safety and hazardous chemical substances. 12 projects which started between 2005 and 2009 have an average completion rate of 73.3 per cent.
14. In last few years stripping of top soil, displacement of soil and soil structure damage has increased due to exploitation of mineral resources, preparation of construction materials, construction of roads, geological exploration and construction of buildings. It is very important to develop a responsible mining sector, improve legislation on rehabilitation work and improve economic conditions. High quality environmental impact assessments must be made to the established standards.
15. Income to the state central budget for exploitation of natural resources was 7.8 billion tugriks in 2008, 10.8 billion tugriks in 2009, and 16.7 billion tugriks in 2010. Income from exploitation of natural resources increased in last few years, but income from water and natural raw materials use fees must be increased to be consistent with international sustainable development policy implementation in Mongolia.
16. Gross domestic product is 8,255.1 billion tugriks and only 0.3 per cent is allocated for environmental protection, 60 per cent of the gross domestic product comes from the utilisation of natural resources or manufacturing and services related to natural resources. For sustainable environmental development, the Government must increase the budget allocation for environmental protection to 2 per cent of gross domestic product, and economic mechanisms should be used for more efficient for environmental protection. The following activities need to be undertaken: limit environmentally harmful activities, increase the funds for environmental protection, and decrease environmental degradation and pollution. In order to do these tasks there is an urgent need to increase ecological taxes for the import of products that generate hazardous substances, mineral resources and oil products.

Appendix 1. List of figures included in the report

Appendix 2. List of tables cited in the report

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