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Environmental Profile of Mongolia

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EXECUTIVE SUMMARY

Mongolia is home to a tremendous array of outstanding natural landscapes—forested mountains, hilly grasslands, and the sweeping Gobi desert Many of these landscapes and the diversity of flora and fauna they support are unspoiled, giving them global significance In addition to biological resources, Mongolia enjoys a considerable endowment of mineral resources which together hold great promise for economic development and growth Mongolia can also boast a dynamic and increasingly environmentally-aware public, and a government that is attempting to make the transition from a command-control economy to a market-oriented one in innovative and responsible ways

The current transition, however, represents a crucial phase for Mongolia's natural environment Due to the country's geographic location, altitude, and climate, its environment is very fragile and requires longer periods to regenerate than most other places in the world In addition to having to grapple with degradation that occurred during the central planning era, Mongolia must also face environmental pressures brought about by rapidly changing economic and social conditions Although data are scarce, it is likely that the economic downturn that the country experienced after 1990 reduced emissions and discharges formerly produced by the industrial sector, thereby improving environmental conditions in areas of industrial activity The economic downturn, however, has also increased pressure on the environment in other ways as people turn to the exploitation of natural resources—often in illegal and damaging ways—to sustain themselves The economy has shown signs of variable growth since 1994, underscoring the need to manage natural resources well so that growth can be strengthened and sustained

Land resources have perhaps suffered the most since 1990 A dramatic increase in the number of livestock (from 25 8 million head in 1990 to almost 30 million in 1997) and a growing proportion of goats in herds has put pressure on fragile grasslands, particularly around population centers, where land is often denuded Nationwide, almost 51 percent of pasturelands are experiencing medium levels of degradation, and low and high degradation pasturelands make up another 45 percent combined Poor cropping practices have led to severe reductions in soil fertility, which in turn, have led to the abandonment of 45 percent of the area that has been cultivated in Mongolia in the last thirty years Most mining in Mongolia is open-pit, and virtually no reclamation activities have taken place, which further contributes to wind and water erosion and loss of land for grazing and other economic uses Many industrial (including power production and metallurgy) and domestic effluents, sludge, and other solid wastes are dumped indiscriminately on the land, causing localized problems of acute soil contamination, and particularly those associated with concentrations of heavy metals

Forest resources in the northern part of the country are exploited with little control Forest management skills are low, planning capacity is limited, logging permits are granted too freely, and unregulated cutting is rampant Clear-cutting is not uncommon Reforestation is not widely practiced and when it is, does not enjoy a high success rate because of the harsh climate, slow growth rates, and pressures from livestock These poorly managed logging

activities contribute to erosion and loss of habitat for wildlife and, left unchecked, they will exhaust Mongolia's limited but extremely valuable forest resources in less than one generation

The accelerating disruption of habitats is affecting biodiversity in Mongolia, but the seriousness of the threat is unclear because, though extensive research has been done, comprehensive baseline data are not available, and we simply do not know enough to fully understand the implications of continued human and physical pressures on the country's plant and animal resources Mongolia identifies 21 of the animal species found there as endangered, including the Asiatic wild dog, Przewalski horse, and wild camel An additional 29 species, including the snow leopard, reindeer, and altai wild mountain sheep, are identified as threatened The predominant activities that threaten biodiversity are overgrazing, deforestation, and hunting

Mongolia's limited and unevenly distributed water endowment is compromised by excessive withdrawals nationwide, and by localized discharges from industry, urban areas, and mining Almost 90 percent of the scarce precipitation that falls in Mongolia is lost through evapotranspiration In the Gobi region, groundwater is the main supply of water, and there is very little recharge of groundwater resources Data on water quality are scarce, but show that some stretches of major rivers are polluted, particularly the Tuul River, which runs through Ulaanbaatar At the first monitoring station southwest (down river) of the city, just after the river has passed through the industrial zone, samples show that water quality is rated as Classification V, or highly polluted (the most polluted category) There are significantly polluted stretches along the Khangal, Orkhon, Kherlen, and Kharaa Rivers where they pass by large mining or urban sites Wastewater treatment capacity is low, both in industries and by public treatment plants because equipment is lacking, or currently not functioning Most drinking water for non-apartment dwellers (80 percent of the population) is supplied by wells and the water is often contaminated by *e coli* and in some cases, heavy metals

Air quality in urban areas is negatively affected principally by heat and power generation, industry, and to an increasing degree, by automobiles Most heat and electricity is generated by coal-burning plants, and the more than 80 percent of the population that lives in traditional and/or informal housing generates its own heat using inefficient stoves burning coal, wood, dung and other materials Most of the commercially available coal is lignite, and although its sulfur content is low, its ash content is high, accounting for most of the anthropogenically produced particulate matter in the air Air quality is much worse in the winter, and concentrations of NO_2, for example, exceed Mongolia's standards by 50 percent in Ulaanbaatar Wind-borne particulate matter from fires, power station ash pits, and eroded lands damaged by overgrazing, poor agricultural practices, and open-pit mining affect many other parts of the country

Mongolia has made great strides in establishing an appropriate legal framework for environmental protection However, there are gaps in the legislation and more significantly, substantial gaps in the supporting regulations and policies A further impediment to the successful implementation of the laws, regulations and policies that do exist is the weak institutional framework Many of the 37 core staff members of Ministry of Nature and

Environment have updated their skills and knowledge through training in the last several years, but the inspectors and rangers in the field *who bear the principal responsibility* for implementing environmental laws, policies, and regulations have received little training and moreover, have few resources at their disposal In fact, most inspectors, unless they have their own vehicles, are not able to visit the area that they are supposed to cover Another obstacle to successful environmental management from the top decision-making level on down, is the fact that often, the economic, political, and social incentives *not* to enforce the law are considerable

RECOMMENDATIONS

The fundamental causes of the environmental problems Mongolia faces stem from three basic conditions

- A naturally fragile environment,
- A population that exploits natural resources in an unsustainable (and often illegal) fashion for lack of alternative income sources, and
- Inefficient manufacturing, production, extraction, and consumption patterns/methods inherited from the central planning era

The activities recommended for USAID support are intended to address *causes* of environmental degradation rather than the *effects* Preventing damage to the environment is preferred to, and less costly than, cleaning up after the damage has been done A significant part of Mongolia's economy is natural resource based, so mitigating negative environmental impacts associated with the extraction and use of natural resources is essential to ensure long-term and sustained economic growth It is likely that a considerable portion of the population will remain engaged in primary sector activities such as herding, mining, logging, and cropping so the adoption of more environmentally-friendly practices is essential The successful revitalization of the industrial, mining, and energy sectors—through privatization and small enterprise development—will depend on correcting the inefficient practices and technologies that were symptomatic of the central planning period

The following interventions would have a tremendous positive impact in protecting Mongolia's unique environment while contributing to sustainable economic growth They are recommended as activities that can be incorporated into on-going or planned USAID projects the Energy Privatization and Commercialization Program under the Economic Policy Support Project (EPSP) Rural Civil Society Project (RCSP), and the upcoming farmer-to-farmer initiative known as SPICE

Energy Sector Privatization and Commercialization Program (under EPSP)

The principle objective of the Energy Sector Privatization and Commercialization Program is to restructure the highly centralized, state-owned system, so that is more efficient and

responsive to customer demands The two most important sub-sectors are coal and electricity [1]

Pricing Policy – Pricing needs to be restructured so that general subsidies are removed and the full cost of providing energy is reflected in the prices Based on an environmental valuation[2], which would place a dollar value on negative externalities caused by the power sector, the pricing structure should then be revised to internalize the full costs of energy production and distribution

Environmental Standards – Standards for emissions, effluents, and environmental impact must be designed, along with enforcement mechanisms that heavily rely on market-based mechanisms and not command-control regulations As energy sector assets are "unbundled" and privatized or commercialized, managers of new entities should have resources available to them to assist them in attaining compliance in the most cost-effective way possible

SPICE

The upcoming initiative known as SPICE is intended to support producers and processors in the rural private sector by transferring skills through a farmer-to-farmer program

Forest Management Support – Technical assistance would be provided to demonstrate appropriate techniques for developing forest management plans, harvesting and processing logs, marketing forest products and by-products, and either using or disposing of waste Demonstration sites would be established to introduce new technology and better forest-management and logging practices

Improve Health and Quality of Livestock – This component includes three sub-components

- Increase herders' access to high quality inputs, including nutrition and other feed supplements, better veterinary services, animal shelters to protect herds during extreme weather, and good pasturelands [3]
- Improve herders' access to better breeding stock so that higher productivity can be achieved with fewer animals (especially cashmere goats)
- Improve information dissemination so that herders are aware of the availability of improved livestock and inputs

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[1] Petroleum has been discovered in the southern part of the country, but is not yet extracted on a commercial scale

[2] Environmental valuation could include assessments of the cost of pollution prevention and / or remediation or, if no remedial actions are taken the costs to society in terms of health care, and losses to the economy in terms of lowered worker productivity

[3] Obviously cash is needed to purchase inputs The re-establishment of market links access to credit access to market information and improved sorting, handling, storing, transportation and marketing of goods will all be critical developments in the livestock sector

Rural Civil Society Project (RCSP)

The primary objective of RCSP is to help create the conditions needed for broad-based economic growth in rural Mongolia This involves establishing and strengthening democratic civil society organizations as the foundation for sustained economic growth, and forging linkages among NGOs, national and local government, and the private sector, to represent local interests and shared needs

Promote Improvements in Post-Harvest Handling and Processing Facilities for Forest Products – Activities under this component would support the development of commercial interests in producing and marketing forest products These would include finished or semi-finished wood products, such as furniture, construction timber, crates and boxes, and carts They would also include the processing and marketing of industry by-products such as sawdust and off-cuts, which are currently treated as waste

Build Capacity to Monitor and Enforce Forestry Laws and Regulations – In order to improve environmental protection and compliance, the dissemination of information about environmental laws and regulations should be included in the development of information systems that are planned under RCSP to meet the economic and business needs of rural dwellers Currently, neither resource users nor local government inspectors are fully aware of the laws and regulations

Improve the Distribution of Livestock by Rehabilitating Water Wells – Conduct an inventory of existing wells, design criteria for determining and prioritizing eligible wells, and then develop viable mechanisms (associations, private-public partnerships, etc) for rehabilitating the wells A more evenly distributed water supply will help to redistribute herds, thereby reducing the pressures on many over-grazed areas

Develop Management Capabilities in the Livestock Sector – Utilize the media (in lieu of an extension service), conduct skills transfer through hands-on exercises, provide technical assistance to herder associations to help strengthen them institutionally so that those engaged in herding and livestock production can attain higher economic returns, while reducing environmental impacts

Identify opportunities to supplement conventional energy supply with renewable energy sources This component already features in the AID Energy Restructuring project One potential opportunity to employ renewable energy sources may be to introduce dual-source power generators in aimag centers These generators operate on wind or solar power, but they can also burn oil or coal as needed to supplement the cleaner sources

Environmental Problem	Natural Causes	Human Causes
Land Degradation (desertification, loss of topsoil and other erosion, decrease in fertility of pasture and croplands)	Low rainfall High winds Extreme temperatures Thin topsoil Steep slopes Fires	Livestock herds too big in some areas More horses, cattle and goats, fewer sheep Inappropriate mining and industry practices Inappropriate cultivation practices Multi-tracking (off-road traffic) Fires
Deforestation (depletion of limited, but valuable, forest resources)	Fires Insects Slow growth rates for natural and replanted regeneration	Destructive and unregulated commercial logging techniques Insufficient and poorly managed reforestation Unregulated cutting for domestic fuelwood Fires
Loss of biodiversity	Same natural causes as for land degradation leads to loss of species and habitat	Hunting Overgrazing Pollution Deforestation
Air and Water Pollution (generally localized problems)	Fires High winds Low flow-rates in rivers for most of year Temperature inversions in localized situations	Overall inefficiency in manufacturing, which results in excess energy/inputs use and production of pollutants & waste Coal burning in power plants, ghers and industrial boilers Increase in the number of vehicles, many of which are old and poorly maintained Inappropriate use and disposal of chemicals Inappropriate disposal of solid and liquid waste

CHAPTER ONE
DESCRIPTION AND STATUS OF THE ENVIRONMENT

BACKGROUND AND INTRODUCTION

1 1 Introduction

The land area of Mongolia is approximately 1,560,000 square kilometers, approximately the size of Alaska, or twice as big as Texas The country is landlocked, and nowhere is it closer than 700 km to the ocean Mongolia lies between 42° and 52° north of the equator, at an average elevation of 1,580 meters above sea level Elevations range from 532 meters in the Khokh Lake depression up to 4,374 meters on Khuiten Peak in the Tavan Bogd Mountains These geographic characteristics mean that Mongolia is generally dry and windy, and that it experiences extreme seasonal and diurnal temperature variations Figure 1 identifies geopolitical features

Mongolia can be divided into six general natural zones on the basis of variations in climate, soils, natural vegetation, fauna and geomorphology The natural zones are high mountain, taiga forest, mountain forest steppe, steppe, desert steppe, and desert The locations of the zones are shown in Figure 2 Dividing Mongolia into regions or zones is useful for understanding both its physical and its economic geography, because usually the economic activities found in an area are closely related to the physical conditions and natural resources found in that area Descriptions of the physical characteristics and primary economic activities of each zone are given in the following section The primary sources for this information were The Biodiversity Conservation Action Plan for Mongolia (MNE, 1997a), the National Plan of Action to Combat Desertification in Mongolia (MNE, 1997b), and Mongolia's Wild Heritage (MNE/UNDP/GEF/WWF, 1996)

1 2 Economy

Mongolia's economy bottomed out in the early 1990s, and has shown signs of variable growth since 1994 GDP depends largely on earnings from copper (which accounts for almost half of exports) and the expanding gold production, the combination of which boosted government revenues to over 29 percent of GDP in 1997 The GDP had peaked in 1996 due to the high price of copper (and the fact that copper production had again reached pre-transition levels), but dropped in 1996 when copper prices plummeted by 25 percent Again, growth edged up in 1997, driven by the rapid expansion of the mineral sector (which had increased by 21 percent since the previous year) and moderate growth in the service sector Manufacturing growth (particularly in the construction materials, textiles and garments, and food processing subsectors) dropped sharply in 1997 as a result of tightened credit Agricultural growth, which had been rapid from 1992 to 1996, eased to 2 5 percent in 1997 Growth in the agricultural

sector is due to increases in livestock herding, which more people have turned to for lack of other employment opportunities, cropping has declined Nearly 800,000 people (38 percent of the population) live below the national average poverty line of $17 per month, and poverty is experienced to a greater degree in aimag and soum centers than in larger population centers (World Bank, 1997 and World Bank, 1998)

1 3 Natural Zones

High Mountain – The High Mountain zone is about 60,000 km² in area, representing about 4 percent of the land area of Mongolia The zone is remote, exposed, and subject to glaciation Most of it lies above the tree line Extremely cold temperatures, year-round snowfall, and high winds are typical The growing season is short, and natural vegetation is predominantly found in alpine-sedge meadows, swamps, and moss- and lichen-covered boulder fields

The High Mountain zone includes parts of Uvs, Bayan-Ulgii, Khovd, Zavkhan, and Gobi-Altai aimags There are no major settlements in this zone, and no mineral exploitation or industry Agricultural production includes limited grazing of cattle, sheep, goats and yaks In some southern parts of the zone, irrigation makes fruit, berry, melon, and fodder production possible The area has potential for ecotourism, but on a limited scale because the area is remote and communications are very difficult

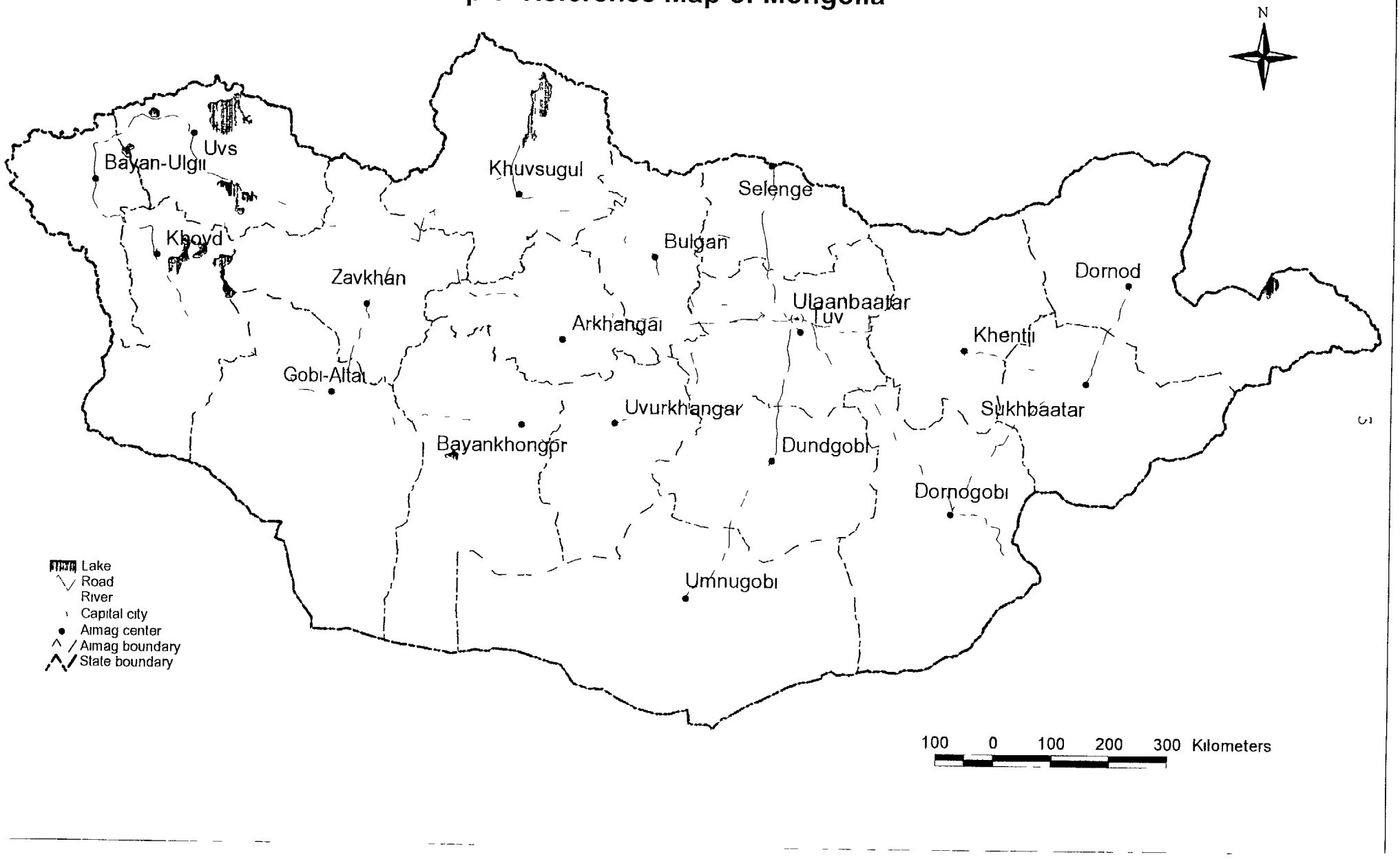
Taiga Forest – Covering 130,000 km² (8 percent), this zone is characterized by boreal coniferous forests, predominantly Siberian Larch and Siberian Pine The Taiga Forest zone enjoys relatively high precipitation (300 – 400mm/year)

Parts of Tuv, Selenge and Bulgan aimags lie within the Taiga Forest zone Logging, wood processing, and mining of coal, copper, gold and other mineral resources are the major economic activities in this zone As well as being home to most of Mongolia's population and primary and secondary industrial activity, it is also the principal cropping area in the country Extensive wheat cultivation is practiced in the zone, and barley, rye, oats and a few vegetables are also grown to support both human and animal populations Dairy cattle and sheep are the primary grazing animals raised in the zone

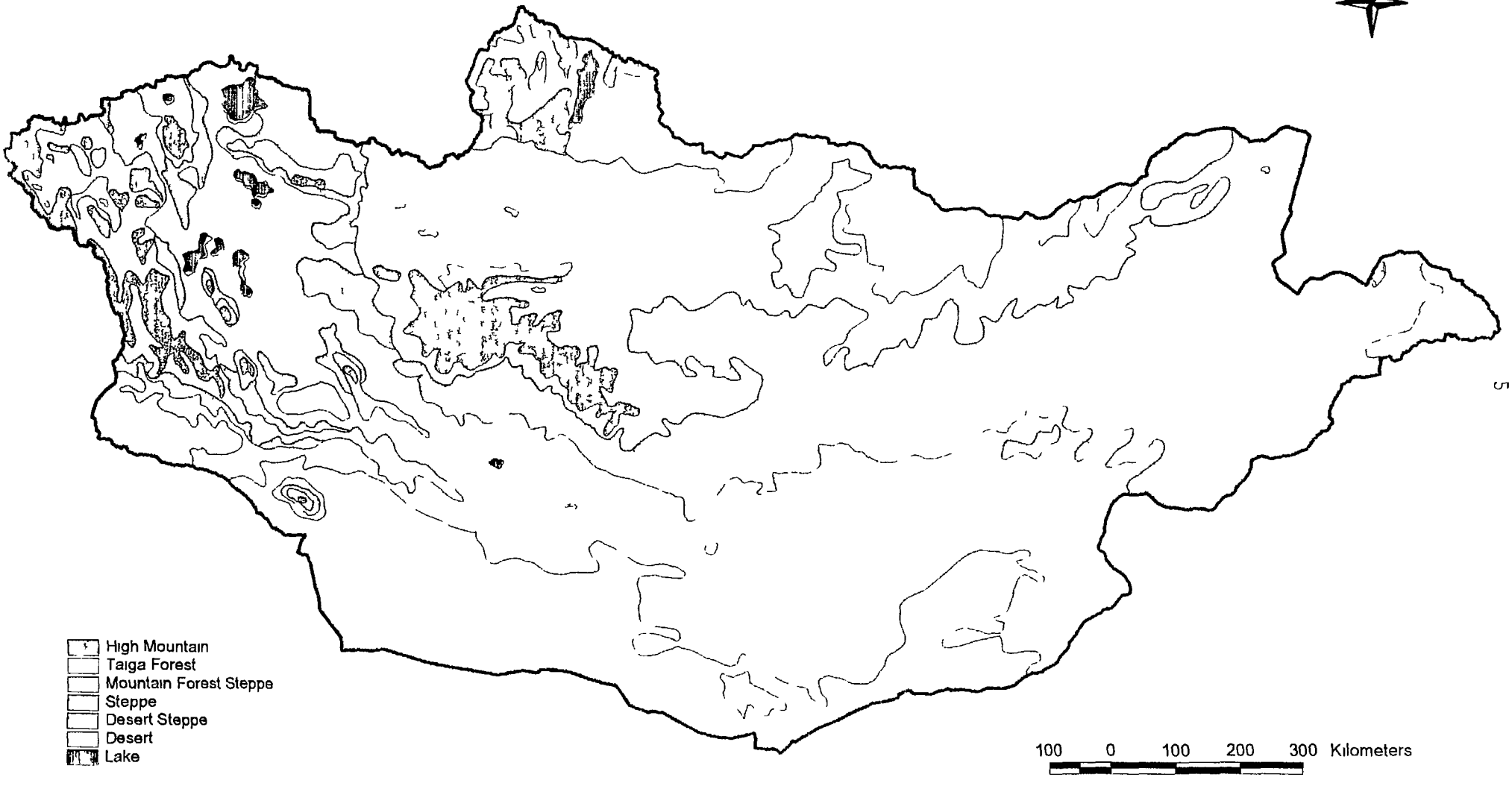
Mountain Forest Steppe – The Mountain Forest Steppe is the largest of Mongolia's natural zones, extending across 400,000 km² (26 percent) of the country Natural vegetation is mixed coniferous forest and grassland Hills and wide valleys characterize the landscape Though the environment is fragile and the carrying capacity of the land quite low, pasture, wood and water are all available This is one of most heavily populated of the 6 zones

Parts or all of Arkhangai, Khuvsgul, Zavkhan and Bulgan aimags make up the Mountain Forest Steppe zone Livestock herding and limited grain production is the principal agricultural activities Industrial production is limited to forestry and small-scale wood-processing activities Tourism centered around Khuvsgul Lake makes a significant contribution to the local economy

Map 1 Reference Map of Mongolia



Map 2 Natural Zones of Mongolia



Steppe –This essentially treeless zone occupies approximately 330,000 km² (21 percent) of Mongolia's territory It includes one of world's last remaining natural grassland ecosystems It is the most important zone for grazing in eastern and central Mongolia Natural resources and land cover are very sensitive to human activity, particularly in the southeast where accordingly, population is very sparse

The Steppe zone includes parts of the aimags of Dornod, Khentii, Sukhbaatar, Dornogobi and Dundgobi The most important economic activities are livestock herding and associated grain and hay production for fodder Recent exploration for oil has met with some success and may provide an alternative and potentially lucrative source of income

Desert Steppe –This low-lying, arid zone of approximately 300,000 km² (19 percent), receives only100-125mm of precipitation per year Strong winds cause severe dust storms during the long dry season Vegetation typically consists of low grasses and shrubs

Desert – The Desert zone extends across 340,000 km² (22 percent) of Mongolia's land area An extreme climate, rugged and varied landscape, and sparse vegetation characterize the zone It is home to many threatened species including the wild ass, Gobi bear, and wild camel As the name of the zone suggests, it is very dry, with an average annual rainfall of less than 100mm It is not uncommon for areas within the zone to have no rain for two or three years Seasonal temperatures range from -40°C to +40°C, and winds can blow up to 140km/hour

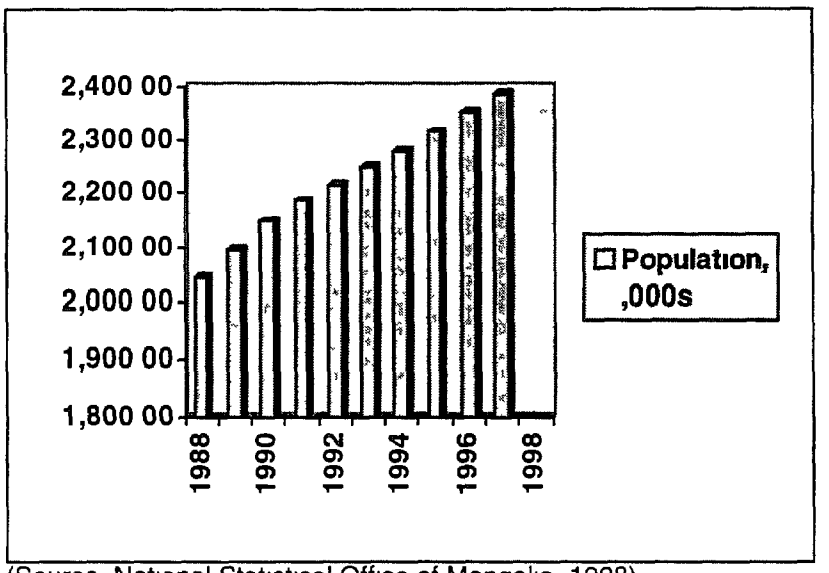
The Desert Steppe and Desert zones together include parts or all of Gobi-Altai, Bayankhongor, Uvurkhangai, Dundgobi, Umnugobi, and Dornogobi aimags Economic activity is severely restricted by poor soils and lack of water Melon and vegetable growing is possible on a very small scale near oases Otherwise, the economy of the region is heavily dependent on the cashmere goat industry

These geophysical and climatic characteristics together produce an environment that is rich in resources, but that is uniquely fragile The time needed for the environment to regenerate is much lengthier in Mongolia than in temperate or tropical climates Sustained economic growth is therefore linked to—and dependent upon—careful management and use of environmental resources

1 4 Population

Between 1988 and 1997, the population of Mongolia grew from 1,997,000 to 2,387,000 at an average annual rate of 1 8 percent The annual rate of increase peaked between 1989 and 1990 at 2 6 percent, since then it has been steady at between 1 3 percent and 1 8 percent The sudden slowdown in the rate of population growth after 1990 probably reflects the uncertainty, and the real and anticipated hardships, associated with the transition from a centralized command economy to a democratic, free-market based economy

Figure 1 1 Population of Mongolia, 1988 – 1997



(Source National Statistical Office of Mongolia, 1998)

Average population density across the country is 1 5 people/km², lower than any other country in Asia, but this figure masks a very uneven distribution of the population Densities in and around major settlements are very high, and it is in these areas that one can witness some of the most extreme manifestations of environmental stress (denuded pasture, dry wells, dust storms, piles of trash, cleared tracts of forest etc) Nomads tend to gather around operating wells and other sources of water, and increasingly along transportation routes These areas, too, are experiencing environmental degradation Throughout most of rural Mongolia, population density is very low, but even at low densities, people are exerting sufficient pressure on the country's natural resource base to cause concern (Whitten, 1998)

Even though 52 5 percent of the population of Mongolia lived in urban areas at the beginning of 1998, the proportion has declined from 56 5 percent in 1993 The three largest urban centers have either remained steady (Darkhan) or slightly increased their share of the national population (Ulaanbaatar and Erdenet) Over the same period of time, the proportion of the population living in other urban centers dropped from 23 6 percent to 18 3 percent, and the rural population grew from 43 5 percent to 47 5 percent of the total These trends indicate that there has been a significant movement of people away from aimag and soum centers both to the country's three major cities—and in larger numbers, into the countryside

This means that the decline has been entirely in soum and aimag centers Just over half the population may live in towns and cities with more than 500 residents (thus meeting the definition of "urban" according to the 1993 "Law on Urban and Town"), but many urban residents are unemployed or under-employed, and many others engage in rural activities, mostly herding, in suburban pastures and further from settlement centers Urban infrastructure, services and jobs are still not developed to the point at which they can meet the needs of most of the country's residents

Table 1 1 Changes in Urban and Rural Population, 1993 – 1998
(Population figures in '000s, and as percent of total)

	1993		1994		1995		1996		1997		1998	
	Pop	perc ent	Pop	perc ent	Pop	perc ent	Pop	perc ent	Pop	perc ent	Pop	perc ent
Ulaanbaatar	589	26 6	599	26 6	610	26 7	619	26 7	634	26 9	650	27 2
Darkhan	86	3 9	93	4 1	88	3 9	90	3 9	91	3 9	93	3 9
Erdenet	53	2 4	64	2 8	65	2 8	66	2 8	68	2 9	73	3 1
Other Urban	523	23 6	473	21 0	459	20 1	428	18 5	433	18 4	436	18 3
Total Urban	1251	56 5	1229	54 6	1222	53 6	1203	51 9	1226	52 1	1252	52 5
Rural	964	43 5	1021	45 4	1058	46 4	1115	48 1	1127	47 9	1135	47 5
Total Population	2215	100	2250	100	2280	100	2318		2353	100	2387	100

(Source National Statistical Office of Mongolia 1998)

CHAPTER TWO
OVERVIEW OF ENVIRONMENTAL FACTORS

WATER RESOURCES

2 1 Water Resources

An average of 361 billion cubic meters (BCM) of precipitation falls in Mongolia annually, but roughly 90 percent is lost to evapotranspiration Reportedly, of the remaining 10 percent, around 63 percent becomes surface run-off, and 36 percent infiltrates into the soil Of the surface flow, 95 percent flows out of the country in the major rivers and only a small percentage remains in the lakes and basins of Mongolia (Batjargal, 1993)

Data in Tables 2 1 and 2 2 give characteristics of rivers and lakes in Mongolia The Selenge River watershed is the largest, and encompasses five major sub-basins Seasonal flows in the rivers vary and in winter, virtually stop in many rivers because of the freezing temperatures

Table 2 1 Characteristics of Main Rivers

Name of River	Length, km		Catchment Area, km^2		Annual Volume of run off, km^3
	Total	In Mongolia	Total	In Mongolia	
Arctic Ocean Basin					
Selenge	1444	593	425245	281267	9 14
Eg	475	475	40454	40454	2 74
Delgermuren	445	445	26640	26640	1 08
Orkhon	1124	1124	132855	132855	3 60
Tuul	704	704	49840	49840	0 76
Pacific Ocean Basin					
Onon	808	298	94010	28425	1 85
Kherlen	1264	1090	NA	108439	0 62
Khalkh Gol	NA	233	30465	22775	0 91
Inland Basin of Central Asia					
Khovd	516	516	49670	49670	2 40
Tes	735	NA	35344	NA	1 10
Zavkhan	765	765	51517	51517	0 66
Bairdag	310	310	27277	27277	0 32

(Source MNE, 1996, *Nature and Environment in Mongolia*)

The lakes are found primarily in the northern and western parts of the country Lake Khovsgul is by far the biggest—containing 381 km^3 of water—and is 85 times larger than the next biggest lake It has served as an important trade waterway, and until recently, served as the main delivery route for petroleum products from Russia Transport across the lake was

reportedly banned in 1993 because of pollution caused by shipwrecks, tanker trucks falling through the ice, and leakage from onshore facilities Several industries function on its shores

Table 2 2 Morphological Features of Main Lakes

Name of Lake	Catch-ment Area, km^2	Altitude, m	Water surface area, km^2	Length, km	Width, km		Depth, m		Volume of water, km^3
					Average	Max	Average	Max	
Khuvsgul	4925	1645	2730	136	20	40	138	262	381
Uvs	71100	759	3350	84	40	76	12	20	39 6
Khar Us	70450	1157	1852	72	26	27	2 0	4 4	3 43
Khyargas	11550 0	1028	1407	75	19	31	47	80	6 0
Khar	72000	1132	575	37	16	24	4 2	7 0	1 42
Durgun	80200	1132	305	24	13	17	14	27	4 37
Achit	10500	1435	297	24	12	18	2 0	5 0	0 66
Buir	20200	581	615	40	15	21	6 0	10	3 74

(Source MNE, 1996, Nature and Environment in Mongolia)

Glaciers cover 539 59 km^2 of Mongolian territory and are found in the mountains in the western part of the country The region that has the highest percentage of coverage is around Khuiten peak in the Tavan Bogd mountains, where 107 98 km^2 are covered by a total of 17 glaciers

The availability of water resources naturally affect development patterns, and is one of the criteria that determine the carrying capacity of an area Table 2 3 illustrates the uneven distribution of water According to the data, the five aimags that have the most water

Table 2 3 Water Quantity by Aimag

Name of Aimag	Area (km^2)	Population	Rivers		Lakes	Springs	Total Water (km^3 /yr)	Volume of total which is ground-water (km^2/year)	Percentage of total which is ground-water	Km^2 of water per km^2 area
			Number	Total Length km						
Arkhangai	55000	103000	856	9404	188	576	2 680	0 53	19 8	0487
Bayan Ulgii	46000	90100	109	3728	67	199	2 896	0 53	18 3	0629
Bayankhongor	116000	89500	169	3559	34	459	1 512	0 31	20 5	0130
Bulgan	49000	63300	388	5501	71	369	1 165	0 35	30 0	0237
Gobi Altai	142000	74100	86	1242	28	630	0 809	0 20	25 0	0057
Dornogobi	111000	48200	2	20		115	0 108	0 07	64 8	0010
Dornod	123500	84600	128	3060	179	300	0 669	0 40	57 2	0054
Dundgobi	78000	52700	1	54	10	128	0 102	0 05	49 0	0013
Zavkhan	82000	105800	189	3139	91	406	2 932	0 47	16 0	0357
Uvurkhangai	63000	112900	220	2789	35	558	1 060	0 32	30 2	0168
Umnugobi	165000	44800	na	Na	Na	319	0 143	0 07	49 9	0009
Sukhbaatar	82000	59100	13	130	29	261	0 116	0 09	77 6	0014
Selenge	42800	102900	170	2962	23	137	2 886	0 39	13 5	0674
Tuv	81000	110900	192	3120	26	316	3 411	0 49	14 4	0421
Uvs	69000	101900	76	2397	45	280	1 212	0 11	9 1	0176
Khovd	76000	90400	93	1973	23	321	1 630	0 12	7 4	0214
Khuvsgul	101000	120100	860	16800	181	687	7 099	0 97	13 6	0703
Khentii	82000	75200	259	7202	164	837	2 272	0 60	26 4	0277
TOTAL			3811	67080	1194	6898	32 732	6 07	18 5	

(Source MNE 1996)

resources per area are, in descending order, Khuvsgul, Selenge, Bayan-Ulgii, Arkhangai, and Tuv The four aimags that have the least water per area, in ascending order, are Umnubgobi, Dornogobi, Dundgobi, and Sukhbaatar Not surprisingly, in these four aimags which comprise the southeastern part of the country, groundwater comprises between half and three quarters of the scarce water resources Groundwater in the desert tends to be hard and highly mineralized Nonetheless, nationwide in 1993, 283 million m^3 (between 2 25 and 4 5 percent of the total groundwater resource) (Whitten, 1998) were withdrawn for livestock, irrigation, and other human consumption Given the high evapotranspiration rates, it is unlikely that much of this withdrawal was recharged It is estimated that only 3 percent of the annual precipitation infiltrates into the soil to replenish groundwater supplies (Batjargal, 1993)

Water Quality

The sections on Mining, Industry, and Human Settlements discuss water quality in greater detail, but the Ministry of Nature and Environment identifies five principle reasons for deteriorating water quality

1) Release of wastewater from industrial and residential areas without treatment,
2) Insufficient treatment provided by plants because equipment is old, obsolete, and sometimes because of electricity failures,
3) Violation of regulations to protect "sanitary zones"—protected areas around water supply sources,
4) Improper dumping of solid and dry wastes,
5) Improper handling, storage, and use of chemicals and fertilizers

A five-grade classification system established in 1989 is used in Mongolia to characterize water quality of surface water Several indices for oxygen condition, mineral composition, organic pollution, biological indices, toxic substances, and physical/sensory indices determine the purity grades

Grade I	Highly pure
Grade II	Pure
Grade III	Slightly polluted
Grade IV	Polluted
Grade V	Severely polluted

Examples of highly pure rivers include the Terelj (in its upper reaches), Tamir, and Zelter Stretches of other major rivers show signs of contamination as they pass by urban areas, mining sites or locations of other significant extractive or processing activity For example, the Tuul River, as it approaches Ulaanbaatar is rated as Grade II and by the time it reaches the Songino monitoring station just southwest (downriver) of the city, it is rated as Grade IV Sources of pollution are insufficiently treated wastewater, effluents from factories that do not provide wastewater treatment, runoff from various urban activities (including uncontrolled solid waste disposal), and leachate from the ash pits at CHP No 3 The Khangal River at Erdenet, where the country's most significant copper mine and processing sites are, is

classified as Grade IV The Orkhon River, which passes by mining and logging areas, is classified as Grade III The Tuul River at Orkhontuul, more than 100 km from Ulaanbaatar and just beyond its confluence with the Okhon River, is classified as Grade III The Kherlen River near Baganuur (site of the country's largest supplier of lignite coal) and the Kharaa River near Darkhan, are classified as Grade III (DanEduc a/s/ADB, 1997e)

The natural purifying capabilities of rivers in Mongolia are limited by seasonal variations in flow, and the fact that many of them are frozen in the winter For example, concentrations of pollutants in the Tuul River in Ulaanbaatar increase by a factor of 40 to 50 during periods of low flow, particularly in the wintertime

2 2 Atmosphere

The air in Mongolia is notably dusty for natural reasons The aridity, windy conditions, and erosion-prone soils naturally contribute dust and particulate matter to air Approximately 26 major dust storms occur each year (Batjargal, 1993) Agricultural activities (such as poor tilling practices and overgrazing), human-induced forest fires, open-pit mining, power production, transportation, and industry exacerbate the high particulate counts and further reduce air quality through the production of other pollutants

Meteorological stations which monitor various atmospheric phenomena are found across the country in virtually every sum and aimag center Data are sent to the Hydrometeorological Agency in Ulaanbaatar on a daily basis by radio While most environmental indicators were never extensively monitored, and such activity has even declined in recent years for lack of funding, the meteorological monitoring network remains intact and seems to function reasonably well

In 1977, 21 air quality monitoring stations were established in 17 towns and settlements to monitor sulfur dioxide, nitrogen dioxide and carbon monoxide However, funding problems have reduced the frequency, quantity, and quality of data gathered over the past ten years

Ambient air quality standards for urban areas exist for four contaminants, as Table 2 4 shows Draft ambient air standards are now under consideration

Table 2 4 Ambient Air Quality Standards in Mongolia

Air Pollution Parameter	Pollution Concentration (mg/m^3)	
	Daily Mean	Hourly Mean
Sulfur dioxide	0 050	0 50
Nitrogen dioxide	0 040	0 085
Carbon monoxide	1 0	3 0
Dust	0 150	0 5

(Source MNE)

The data in Table 2 5 suggest that average ambient concentrations of monitored pollutants between 1984 and 1995 do not exceed the standards However, the methodologies used to

gather and present such data are unclear and therefore, inconclusive Seasonal data in Table 2 5 show that concentrations of pollutants in winter approach, and in some cases, exceed, standards (Again, methodologies used to gather and present data are unclear, and are shown here for illustrative purposes) Increased coal burning and in some places, temperature inversions, are accountable for the increased concentrations of pollutants in the winter

Table 2 5 Concentrations of Air Pollutants in Major Cities, 1984-1995

	Mean concentrations of pollutants, 1984-1995		Winter mean concentrations of pollutants, 1984-1995			
City/settlement	SO_2, ug/m^3	NO_2, ug/m^3	SO_2, ug/m^3	NO_2, ug/m^3	CO, mg/m3	Dust, ug/m3
Ulaanbaatar	8	45	14	59	2 2	155
Darkhan	7	22	17	28	NA	NA
Erdenet	7	26	7	47	1 05	50
Choibalsan	7	24	8	23	0 9	NA

(Source MNE, 1996, *Nature and Environment in Mongolia*)

A recent study by JICA concluded that on an annual basis, SO_2 pollution is below limits, even though higher concentrations are found in winter than in the summer In the 1991-1994 study period, permissible concentrations of NO_2 were frequently and significantly exceeded (DanEduc a/s/ADB 1997e)

Global Climate Change

The average annual temperature in Mongolia has increased by approximately 0 7 degrees Celsius in the last 50 years or so, and has caused the melting of permanent snow, glaciers, and permafrost in some high mountain ranges where climate warming has been most apparent (MNE/UNDP/GEF, 1998) Many specialists attribute desertification to the effects of the changing global climate on Mongolia's fragile resources Up to 60 percent of the greenhouse gases emitted in Mongolia are generated by the energy sector

Mongolia also contributes small amounts of greenhouse gases to the atmosphere Table 2 6 indicates emissions of greenhouse gases in 1990

Mongolia's total emissions are miniscule when compared with those of China Emissions of carbon dioxide in Mongolia are slightly more than New Zealand and less than half those of Portugal Methane emissions in Mongolia are roughly a third of those in Nepal, and about the same is in Sweden Mongolia's contribution of nitrous oxide is negligible (WRI, et al , 1998)

Table 2 6 Greenhouse Gas Emissions (1000 tons), 1990

Sector/Activity	CO2	CH4	N20	NO	CO
Energy	13970	14 2	0 04	1 3	50 0
Combustion					
Coal and Petroleum products	13970				
Biomass (non-CO2)		4 9	0 04	1 3	50 0
Fugitive					
Coal mining		9 3			
Industry	220				
Cement production	220				
Agriculture		300 5			
Livestock		300 5			
Land Use Change & Forestry	18	0 0	0 0	0 0	0 0
Grassland conversion	4107				
Abandoned land	-1137				
Forests					
Annual Growth	-6505				
Commercial Logging	3553				
Waste		14 5			
Solid Waste		13 7			
Wastewater					
Industrial wastewater		0 4			
Domestic wastewater		0 4			
Total Emissions	**14208**	**328 9**	**0 04**	**1 3**	**50 0**

(Source MNE, 1996)

2 3 Land Resources

From the economic standpoint, a land use/land cover classification system is more useful than the agro-ecological system described above However, reliable data in the form of land use/land cover maps are not available in Mongolia at present Many reports contain land use/land cover statistics, but no common classification system is used, and—areas reported cannot be verified by measuring areas on maps or comparing different sources The Mongolian Law on Land (MLL), which came into effect on 1 April 1995, defines standard classes for land use/land cover, and should therefore promote the systematic mapping and monitoring of changes over time The seven primary classes are agricultural land, cities, villages and other settlements, transportation and network land, forest resources land, water resources land, reserve land, and, special needs land (Wingard, J R , 1996) In Table 2 7, these primary classes are broken down according to the classification system specified in the MLL, and official government area estimates are given for each sub-class (MNE, 1996)

Based on available data, it is possible to make some general observations about trends in land use and land cover changes in Mongolia Table 2 7 shows what happened between 1990 and 1993 In the following section these trends are updated to take into account recent changes, and the environmental implications of those changes are discussed

Table 2 7 - Land Use/Land Cover, 1990 – 1993

	Area (km²)			
Land Use/Cover Class	**1990**	**1991**	**1992**	**1993**
Agricultural Land	**1,215,840**	**1,221,022**	**1,195,653**	**1,162,485**
Crops	13,377	12,816	12,145	11,815
Abandoned Agricultural Land	301	844	1,461	1,710
Fruit Cultivation	9	10	12	10
Hay-Making	13,571	13,460	13,473	13,374
Pasture	1,187,686	1,192,997	1,167,667	1,134,695
Agricultural Facilities	896	895	895	881
Cities, Villages and Other	**5,246**	**5,599**	**5,636**	**5,971**
Settlements	4,717	5,010	5,047	5,401
Industry and Mining	529	589	589	570
Transportation and Network Land	**1,996**	**2,298**	**2,296**	**2,272**
Railroads	216	216	215	217
Roads and Tracks	1,734	2,037	2,036	2,012
Communications Lines	46	45	45	43
Forest Resources Land	**151,884**	**144,031**	**152,185**	**136,224**
Natural Forest	114,319	120,399	113,568	103,936
Forest Belts	3	4	4	4
Forest Plantations	6	6	6	8
Saxaul	37,556	23,622	38,607	32,276
Water Resources Land	**16,246**	**16,306**	**16,323**	**16,314**
Rivers, Streams and Springs	2,467	2,292	2,309	2,309
Lakes and Ponds	13,779	14,014	14,014	14,005
Reserve Land	**92,515**	**95,813**	**96,176**	**88,525**
Livestock Tracking Routes	26,600	29,670	26,606	26,573
Inter-Aimag Preserve Pasture	3,384	2,770	5,835	2,079
Hay Land for Emergency Fodder	6,329	6,326	6,302	6,315
Unused Land	30,617	30,608	30,618	25,695
Unusable Land	25,585	26,439	26,815	27,863
Special Needs Land	**81,249**	**82,365**	**110,483**	**151,327**
Defense	24,709	25,932	25,924	25,922
Recreation	397	290	267	233
Protected Areas	56,143	56,143	84,292	125,172

(Source MNE, 1996)

Agricultural Land – *Includes pasture, hayfields, cultivated land, planted land, fallow land and all other land allocated for agricultural construction and production*

Most agricultural land in Mongolia is pastureland, which in 1993 extended across more than 1 1 million km² (73 percent) of the country's total land area (Table 2 7 above) Of the remaining 28,000 km² of agricultural land[1], the dominant crops are cereals, and especially wheat, and fodder Agricultural processing facilities occupy a significant area of almost 1,000 km²

[1] The total area of pastureland shown in Table 2 7 (Land Use/Cover 1990 – 1993) is 1 134 695 km² whereas that shown in Table 2 8 (Pasture Degradation 1998) is 1 263 590 km² This suggests and increase of 128 895 km² of pastureland between 1993 and 1998 and an increase of this magnitude cannot possible have occurred Discrepancies like these are common in all the data sets reviewed for this report They are the result of inconsistencies in the ways data are collected analyzed and reported and they reflect very real difficulties faced by MNE in fulfilling its responsibilities – a huge territory to cover poor communications infrastructure and inadequate human technical and financial resources

Table 2 8 - Pasture Degradation, 1998 (km²)

	Level of Pasture Degradation				
Aimag	**Not Degraded**	**Low (10 percent)**	**Medium (20 percent)**	**High (30 percent)**	**Very High (>50 percent)**
Arkhangai	1,348	9 882	24,707	8,984	
Bayan-Ulgii	417	5,841	20,863	12,517	2 086
Bayankhongor	2,382	19,053	57,161	16,672	
Bulgan		7,274	27,277	1,818	
Gobi-Altai	2,769	18,462	58,155	12,923	
Dornod		21,252	73,320	11,689	
Dornogobi		37,683	50,923	13,240	
Dundgobi		22,183	44,367	5,176	2,218
Zavkhan		10,310	37,118	21,308	
Uvurkhangai		5,982	23,929	26,920	2,991
Umnugobi		90 970	41,083	14 670	
Sukhbaatar		7,726	61,818	7,727	
Selenge	983	5,900	3,933	7,866	983
Tuv	1,801	6,603	24,611	24 011	3,002
Uvs	2,821	14 105	19,747	19,747	
Khovd		6 040	33,217	21,140	
Khuvsgul	5,905	11,812	20 669	20 669	
Khentii	3,055	19,550	20,161	12,219	6 110
Darkhan				446	
Ulaanbaatar					755
Erdenet				530	
Choir					
Totals	**21,481**	**320,629**	**643,061**	**260,274**	**18,145**
Percent	**1 7%**	**25 4%**	**50 8%**	**20 7%**	**1 4%**

(Source MNE/UNDP/GEF, 1998)

Data for 1998 indicate that most of the pastureland has been degraded to some extent, and that for over 80 percent of pastureland, the level of degradation is "medium" to "high" (Table 2 8 above)

Reports suggest that since 1993, the total area of cropland has declined, and much of the land still classified as agricultural has been seriously degraded through overgrazing, inappropriate farming techniques (deep-tilling, poor rotations, lack of either chemical or organic fertilizers, poor or non-existent pest-control regimes), multi-tracking, mineral exploitation and abandonment The MNE reports that 171,000 hectares of cropland had been abandoned in 1993 (See Table 2 7 above) An estimate of the current situation suggests that more than 500,000 hectares of formerly productive cropping land has been abandoned, and has now lost up to 20 percent of its original soil fertility as a result of wind and water erosion, leaching, and other processes This represents a loss of approximately 45 percent of the area that has been cultivated in Mongolia during the last 30 years (MNE/UNDP/GEF, 1998)

Table 2 9 Agricultural Crop Areas, 1970 – 1993

	1970	1980	1990	1993
Wheat	348 000	423,900	532,600	466,800[1]
Other Cereals	71,500	151 600	121,500	37,400[1]
Potatoes	2,900	7,400	12,200	8,500
Vegetables	1,400	2,400	3,600	2,900
Fodder (hay and silage)	30,800	136,700	117,800	NA
Total Area	454,600	722,000	787,700	NA

[1] Harvested Area
(Source World Bank, 1995)

Cities, Villages and Other Settlements – *In addition to the built-up areas mentioned in the class name this class includes land devoted to industry and mining*

Some cities, villages and other settlements are expanding in Mongolia, primarily as a result of rural-urban migration Ulaanbaatar, Darkhan and Erdenet are the main growth centers, but other aimag centers are also attracting migrants from rural areas and from smaller soum centers Prospecting and mining activities are expanding at an increasing rate, as people seek alternative livelihoods to traditional herding and jobs in the contracting—though formerly extensive—Soviet-style bureaucracies

Transportation and Network Land – *Land outside of cities, villages and other settlements which is allocated for energy, thermal heating, water supply, postal routes, communications lines railway lines roads, tracks, paths and other transportation routes*

The trend in this class is stable for railroads and communications lines, and steady growth for roads and tracks However, the figures reported include only official road and track construction, and ignore the extensive networks created all over the countryside by off-road vehicular traffic Destruction of valuable pastureland by multi-tracking is a serious and growing problem, current estimates suggesting that 800,000-1,000,000 hectares have been lost in this way in recent years (MNE *Biodiversity Conservation Action Plan*, 1997)

Forest Resources Land – *Land covered with forests, saxaul, stumps, meadows, protective strips, and land allocated for growing forests*

Mongolia's forests cover approximately 175,000 km², or 11 2 percent of the total land area The dominant species are larch (*Larix sibirica*), saxaul (*Haloxylon ammondendron*), Siberian pine or cedar (*Pinus sibirica*), Scotch pine (*Pinus sylvestris*), and birch (*Betula spp*) The proportion of forest of each type is given in Table 2 10 Coniferous forests are dominant in north-central aimags, and saxaul scrubland is most common in the south and southwest

Table 2 10 Composition of Mongolia's Forests

Species	Composition (percent)
Larch (Larix siberica)	60 7
Saxaul (Haloxylon ammondendron)	16 0
Siberian pine or cedar (Pinus siberica)	7 8
Scotch pine (Pinus sylvestris)	4 0
Birch (Betula spp)	7 3
Other Species	4 2

(Source FAO, 1997)

The northern forests are part of a transitional zone between the Siberian taiga forest to the north, and the grasslands to the south They typically grow on steep slopes in the mountains, between 800 meters and 2,500 meters above sea level Most of the forest in this region is not accessible by road The saxaul forest thrives in under harsh, arid conditions in the south and southwest Here it is important as groundcover protection against erosion and desertification, and as seasonal fodder for cattle

Water Resources Land – Rivers, lakes, ponds, springs, glaciers, and riparian zones (wetlands)

Reserve Land – Any land not included in one of the five classes described above

Special Needs Land – May be taken by the state from any of the above six categories for strategic and emergency uses Special Needs Lands might include national defense facilities, state border land (a 5km-wide strip along international borders), facilities for foreign diplomats, consuls and resident representatives, livestock herding roads, inter-aimag reserve pastures, state hayland, and state travel and tourist centers and treatment facilities

Degradation of Land Resources

Land degradation refers to physical damage and the subsequent reduction in economic value of land in Mongolia Physical damage is most clearly seen in areas where natural vegetation cover has been reduced or removed, and soil is left exposed to forces likely to cause erosion This type of land degradation is usually the result of human activities that often strengthen and accelerate natural processes Human activities contributing to land degradation in Mongolia include mining, deforestation, overgrazing, inappropriate cropping techniques, and off-road driving Once the vegetative cover has been disturbed, natural conditions such as high winds, low rainfall, and steep slopes, combine to erode the country's shallow topsoil, limit the productivity of crop and pasture land, and slow the re-vegetation of ecologically disturbed areas (DAI/USAID, 1995)

Table 2 11 Restoration of Anthropogenically Degraded Land

Degraded Land	Area Degraded (ha)
Overgrazed land	7,714,000
Abandoned agricultural land	576,000
Areas around mines and oil wells	1,240
Areas affected by commercial timber extraction	176,344
Fuel wood extraction	194,767
Multiple tracking	800,000 –1,000,000

(Source MNE, Biodiversity Conservation Action Plan, 1997)

2 4 Flora and Fauna

The diversity of wild species reflects the tremendous range in transitional ecosystems described in the Introduction Given its latitude, Mongolia does not have the biodiversity of a tropical area, but is nonetheless unique because it supports assemblages of species that are not found elsewhere, and it still has significantly large, functioning ecosystems The numbers of species found in Mongolia are described below according to the major groups

Table 2 12 The Number of Species in Mongolia According to Major Groups

Group	No of Species	No of Genera	No of Families
Vascular plants	2710	641	122
Lichens	930	133	39
Moss	417	162	38
Algae	647	168	59
Fungi	875	136	28
Mammals	136	22	8
Birds	426	181	58
Reptiles	22	14	7
Amphibians	8	4	4
Fish	75	39	12
Mollusks	36	--	--
Insects	12 000	3,200	350

(Source MNE, 1997a)

The Red Book of Mongolia identifies a total of ninety-eight species of rare and endangered species Twenty-one species are considered endangered, and twenty-nine are considered threatened Endangered species include the Asiatic wild dog (*Cuon alpinus*), Przewalski's horse (*Equus przewalskii*), Mongolian saiga (*Saiga tatarica mongolica*), and the wild camel (*camelus bactrianus ferus*) Threatened species include the snow leopard (*Uncia uncia*), reindeer (*Rangifer tarandus*), gazelle (*Gazella subgutturosa*) and the altai wild mountain sheep (*Ovis ammon*)

Detailed plant inventories have not been conducted, so the figures in Table 2 12 are not precise Although endemism of animal species is low in Mongolia, there are 229 known species of higher plants that are endemic The Red Book of Mongolia lists 134 very rare

plant species, and 252 species as rare Many plant species have significant economic importance For example, grasses and other pasture plants are essential for supporting livestock and wild animals Moreover, there are 845 species that are considered to have medicinal value, 68 that are important for their soil-binding qualities, and 120 species that are important food plants (MNE, 1997a) Because there are so few forestry resources overall, all species are ecologically and economically important

The economic value of wildlife has long been recognized, but is being exploited increasingly on an informal (i e , illegal) basis Between 1960 and 1989, an annual average of 1,400,000 marmots, 8,000 foxes, and 14,500 wolves were hunted under permit for meat and fur In 1995, a quota of 12,000 head was set for gazelles (MNE, 1997a) The fact that quotas have not been established on the basis of reliable data about species populations and the increase in poaching have likely led to the overexploitation of some species Other threats to biodiversity include destruction of habitat areas, desertification, deforestation, competition from livestock (overgrazing), urbanization, interbreeding of wild and domestic species, eradication of natural predators, rodent pesticide application, declining water quality and quantity, wildlife trade, and illegal hunting Foreign hunters typically engage in hunting trophy animals (argali sheep, moose and elk) or fur-bearing animals Demands for fur and animal parts that are considered have medicinal properties in Asia (antlers, genitalia, or internal organs) are generally met by local hunters for export

2 5 Natural Risks

A variety of natural risks affect the economy and environment of Mongolia Poor transport and communications infrastructure and a lack of resources handicap the ability of the population to effectively predict and mitigate their affects

Blizzards The risk of blizzards varies across the country, the average annual number of blizzard days in the steppe region is two, while in the eastern part of the country, is eight In mountainous regions, blizzards can last up to eight days Blizzards can significantly harm wildlife, forest resources, livestock, agriculture, as well as humans directly, and the poor infrastructure makes relief efforts difficult Table 2 13 illustrates the selected consequences of recent blizzard disasters in Mongolia, 1986-96

Table 2 13 Consequences of Recent Blizzard Disasters in Mongolia

Date	Place	Fatalities	Livestock Lost	Other Consequences
Sept 1995	Eastern Mongolia	45	NA	NA
Sept 1993	Central and East	11	5,000	20% of potato crop lost
May 1993	Central Mongolia	17	100,000	
Oct 1992	Central and West	4	500,000	
1988	Dornod, Khentii, Shukhbataar, Dornogobi	6	10,000	Major property damage

(Source ADB Strengthening the Role of the Ministry of Nature and Environment in Disaster Management June 1997)

Zud *Zud* is a Mongolian word for natural calamities—or more precisely, a combination of calamities—that prevent livestock from accessing grazing pasture for an extended period *Zud* can be created by wind, snow, cold periods, and ice and is related generally related to the intensity, duration and repetition of snowfalls Of all the natural disasters in Mongolia, *zud* inflict the most damage to livestock herds historically in 1944-5, eight million head (nearly 1/3 of the national herd) were lost, and in 1967-8, two million head (8 percent of the total herd) were lost

Flooding Snow melt causes flooding in the east, north, and west and generally affects soil quality and fertility, cropland, water quality, and infrastructure, but rarely human settlements Heavy summer rains can cause flooding in the Gobi region, where river channels are generally very shallow A special phenomenon known as the *dibaish* occurs when heavy rain falls on snow or ice, creating a torrent of ice and water *Dibaish* flows typically occur in mountains without forest cover, though they have been recorded in the capital city of Ulaanbaatar, as well They cause property damage, and sometimes kill people and livestock

Dust Storms Most of the country is affected by dust storms for at least 40 days per year, and in some areas, for up to 100 days per year Wind speeds have been recorded at 144 km/hour Livestock are gravely affected when dust storms last more than ten days

Drought Mongolia has a very low rainfall and is very prone to droughts The frequency of droughts is said to be increasing, with the arid southern region experiencing one every 2-3 years, and the steppe zone, every 4 5 to 5 3 years Droughts that affect at least half of the country have occurred 12 times in the last 50 years, and on average, kill 350,000 livestock They also reduce crop growth by half, and significantly reduce herd fertility

Earthquakes About 80 percent of Mongolia is earthquake-prone In this century, there have been eleven earthquakes that have recorded an intensity of 6 8 or greater—almost a third of which were registered at more than 8 on the Richter scale About a third of major cities and towns are in active earthquake zones Traditional houses, *ghers*, are resistant to earthquake damage, but settlements with taller structures and buildings of more conventional construction are at risk Fire caused by earthquakes in settled areas, as well as damage to infrastructure, are also risks

Wild fires Mongolia's dry climate is one contributing factor to the high incidence of wild fires in the country A total of 1,065 fires have burned 30,000 km^2 of land cover in the last 15 years, including 20 percent of the total national forest area About 100 large grassland fires occur each year, destroying from 7,000 to 8,000 km^2 of grazing land

Human-Induced Risks Accidents, design flaws, mismanagement, and natural phenomena contribute to the occurrence of disasters associated directly with human activity Table 2 14 shows the estimated annual frequency and risk indices for selected environmental emergencies in Mongolia

Table 2 14 Estimated Annual Frequency and Risk Indices for Selected Environmental Emergencies

Type of Emergency	Annual Frequency	Loss of Life		Economic Losses			
		Per Incident	Risk Index	Livestock	Other Resources	USD	Risk Index
Flood runoff	14	20	2 9	5 000	Property	5 000	72
Flood snowmelt	20	20	4 0	5 000	Property		03
Flood dibaish	20	22	4 4	5 000	Property	500	13
Drought	43	0	0	350 000	Pasture up to 50%	150 000	64 20
Blizzard	1 50	50	75 0	200,000	Loss of GNP		9 00
Heavy snow	1 50	10	15 0	50,000	Loss of GNP		2 25
Zud	18	0	0	5,000,000	Loss of GNP		27 00
Earthquake	10	20	2 0	10,000	Property	1 200	15
Fire forest	71 0	0 2	14 2		Forest up to 20%	220	15 62
Fire grassland	91 0	0 37	33 0		Pasture	100	9 10
Tailings pond collapse	2 0	0	0	5 000	Rivers/groundwater	150	30
Chemical plants	10	30	3 0		Not applicable		0
High rise buildings	03	50	1 5		Property		0
Power failure	05	500	25 0		Not applicable		0

In addition, there are risks from the improper transport, handling, storage and disposal of chemicals, liquid fuel, and pesticides and fertilizers, as these activities are not closely regulated or controlled Deteriorating facilities, lack of appropriate facilities, and lack of awareness about proper procedures increase the risk of emergencies

The tendency towards these natural disasters is greatly exacerbated—directly and indirectly—by a variety of human activities, as the next section illustrates

CHAPTER THREE
HUMAN IMPACTS ON THE ENVIRONMENT

3 1 Agriculture—Cropping

The productivity of what are already fragile—and in some cases, marginal—lands for growing food crops is diminishing in Mongolia by inappropriate farming practices Not only are farming techniques making land less economically productive, they are also causing or exacerbating serious environmental problems The five practices primarily responsible for the degradation of agricultural land are deep tilling, failure to incorporate nitrogen-fixing crops in rotation programs, inadequate or inappropriate application of inputs, driving heavy equipment on farmland, and abandonment

Deep Tilling–Common tillage practices are both damaging to the land and expensive Land degradation is evident in soil erosion, dust storms, increased evaporation of already scarce moisture, and reduced fertility The most commonly practiced techniques require heavy machinery that was introduced by the Soviets prior to 1990 Much of this equipment is now inoperable, and spare parts are difficult and expensive to buy (World Bank, 1995)

Crop Rotations–The most widely used rotation system is wheat followed by fallow Strips approximately 60 meters wide are cultivated or left fallow in alternate years Pulse crops, legumes, canola, and other nitrogen-fixing crops are not generally part of rotation systems currently practiced in Mongolia This tends to drain the land of its nutrients, making it less productive (Eubanks, 1998)

Fertilizers and Agrochemicals–Prior to 1990, subsidized chemical fertilizers were imported from the Soviet Union and applied at excessive rates to maximize, rather than optimize, production During this decade the application of fertilizers has been inadequate – virtually no fertilizer has been applied to wheat fields This is primarily because it has been too expensive for farmers with limited access to credit or foreign exchange to buy Lack of fertilizer has contributed to the decline in soil fertility on agricultural land, but has also reduced pressures on water and soil resources from the characteristic over-application that occurred prior to 1990

Soil fertility has also been lost to weed proliferation in fields that have not been adequately protected by either mechanical or chemical means Chemical herbicides and pesticides have not been widely used during the last 8 years for the same reason as fertilizers have not been widely used—most farmers cannot afford them Weed control has therefore primarily been achieved through tilling, where it has been achieved at all Chemical weed control has advantages over mechanical means in that it does not expose the soil to excessive moisture loss or wind erosion (World Bank, 1995)

Compaction–Compaction is very destructive to Mongolia's thin top soil The structure of the soil is destroyed as essential air and water spaces are squeezed out

The problem stems from repeated driving of heavy equipment across fields, most of this occurring prior to 1990 Large implement-drawing tractors and trucks loaded with grain were the most damaging (Eubanks, 1998), and today the problems are compounded by widespread multi-tracking of relatively light-weight passenger vehicles across croplands and pasture

Abandonment–Huge, state-owned and operated farms have been abandoned because of lack of resources to maintain operations at such large scales Similarly, large portions of formerly state-owned farms that have been privatized—especially in Dornod—have been abandoned because of poor soil fertility and the fact that new farmers do not possess the correct skills This represents both loss of economic opportunity and a serious concern about the well-being of the environment in Mongolia The major environmental threats to cultivated land that has been abandoned are continued wind and water erosion, and subsequent loss of topsoil and fertility Natural vegetation is slow to regenerate in Mongolia's harsh climate and short growing season, so the abandoned lands will not revert to pasture very quickly, if at all

3 2 Livestock Herding

Overgrazing–The most serious environmental damage from livestock herding is overgrazing caused by too many of the wrong kinds of animals grazing on the land When land is grazed beyond its structural and nutritional carrying capacity, the result is loss of overall vegetative cover, reduction in the number of species of flora (biodiversity), erosion of topsoil, and a decline in productivity of the land As shown in Table 2 8, every one of Mongolia's 22 aimags is suffering from overgrazing and the degradation of pasturelands

In 1990, Mongolia had approximately 25 8 million head of livestock grazing on 1 3 million square kilometers of pasture land at a density of 20 head per square kilometer By 1996 the total number of livestock had increased to approximately 29 3 million head giving a density of 23 head per square kilometer (Agriteam Canada Consulting Limited/ADB, 1997) This additional 3 5 million head, or 13 6 percent increase, is putting Mongolia's grasslands under severe pressure as the carrying capacity of the land is reached In areas close to settlements operational wells, rivers and other sources of water, and along major migratory corridors, the carrying capacity of the land is exceeded The result is that large areas of land are denuded of vegetation leaving them susceptible to erosion from wind, water, and human and animal traffic

More significant than the increase in the total number of livestock is the change in the composition of the national herd As shown in Table 3 1, the trend has been the proportions of goats, cattle and horses to increase, and the proportion of sheep and camels to decrease The effects of this shift have been to increase the demand for forage to feed the larger horse and cattle herds, and to exacerbate land degradation by allowing greater numbers goats to graze Not only has the national herd got bigger, it has got proportionately hungrier and more destructive

Table 3 1 Change in Composition of the National Livestock Herd, 1990 – 1996 (million head)

			Change, 1990 - 1996	
	Head, 1990	Head, 1996	Head	%
Sheep	15 083	13 561	-1 522	-10 1
Goats	5 126	9 135	+4 009	+78 2
Cattle	2 849	3 476	+0 627	+22 0
Horses	2 262	2 771	+0 509	+22 5
Camels	0 538	0 358	-0 18	-33 4
Totals	25 858	29 301	+3 443	+13 3

(Source Agriteam Canada Consulting Limited/ADB, 1997)

Under the central planning regime, livestock production had been collectivized and heavily subsidized through the provision of inputs, including fodder The State Emergency Fodder Fund (SEFF) had been established to provide fodder during extended periods of harsh weather, but by the end of the 1980s, herders routinely relied on fodder from the SEFF as supplemental feed for their herds in the wintertime Since 1990, the scale of SEFF operations has decreased markedly, commercial fodder trading is undeveloped, and a lack of cash with which to purchase fodder have all put serious constraints on herders It is possible that herd sizes prior to 1990 exceeded the grazing capacity of many territories, but that the seriousness of the environmental situation and its potential adverse economic impacts were obscured by the provision of fodder by the SEFF

In the early 1990s, collectivized livestock production was abolished Private herders are required to obtain a grazing permit from the governor of the aimag or soum in which they wish to graze The system, however, is very loosely applied, and moreover, confusion over jurisdictions further undermines the permit system Permits are often issued rather freely, and once issued, are difficult to revoke Experienced herders now have to compete with those who have recently entered the sector, and herder absenteeism is on the rise, especially near urban areas A sound pasturelands management system has not yet evolved to meet the new demands, and in fact, the rapidly changing pace of the sector makes the development of a sound system difficult

3 3 Forestry[1]

The total forested area in Mongolia is 17 5 million hectares—or 11 2 percent of the total land area The most common tree species that are logged are larch and pine It is estimated that the area of potential commercial forests is 5 to 6 million hectares In addition to logging activities, a substantial amount of forest cover is lost through fires and insect damage Between 1978 and 1990, the average annual area of forests lost to fire was 186,000 hectares In the same period, between 4,000 and 150,000 ha were lost to insects

[1] Data in the forestry section unless stated otherwise is taken from FAO 1997

In the 1980s, the annual logging volume was about 2 5 million square meters Concerns about the rapid rate of forest depletion impelled MNE to reduce the annual allowable cut (AAC) to 1 million square meters in 1990 In the past 20 years, forest area has decreased by 1 2 million ha, and although 50,000 ha has been replanted during that period, it is likely that reforestation was not successful because the seedling survival rate is very low There were 40 nurseries that produced an estimated 2 8 million seedlings annually, but the number of them that are operating today is unknown

In 1987, management responsibilities for the forestry sector were given to MNE In the early 1990s, as part of the restructuring that the entire economy was undergoing, the management of wood harvesting, transportation, processing and some reforestation activities were transferred to a state organization called Oi Mod Corporation Many of Oi Mod's assets and activities have subsequently been privatized

MNE is responsible for determining the annual quota of total timber that can be harvested, and quotas are allotted to each aimag It is then up to the aimag and soum governors to determine which zones can be harvested in order to stay within the limits of the quota, and they are required to issue permits accordingly However, it appears that the issuance of permits is not based on scientific rationales Proper management is further complicated by

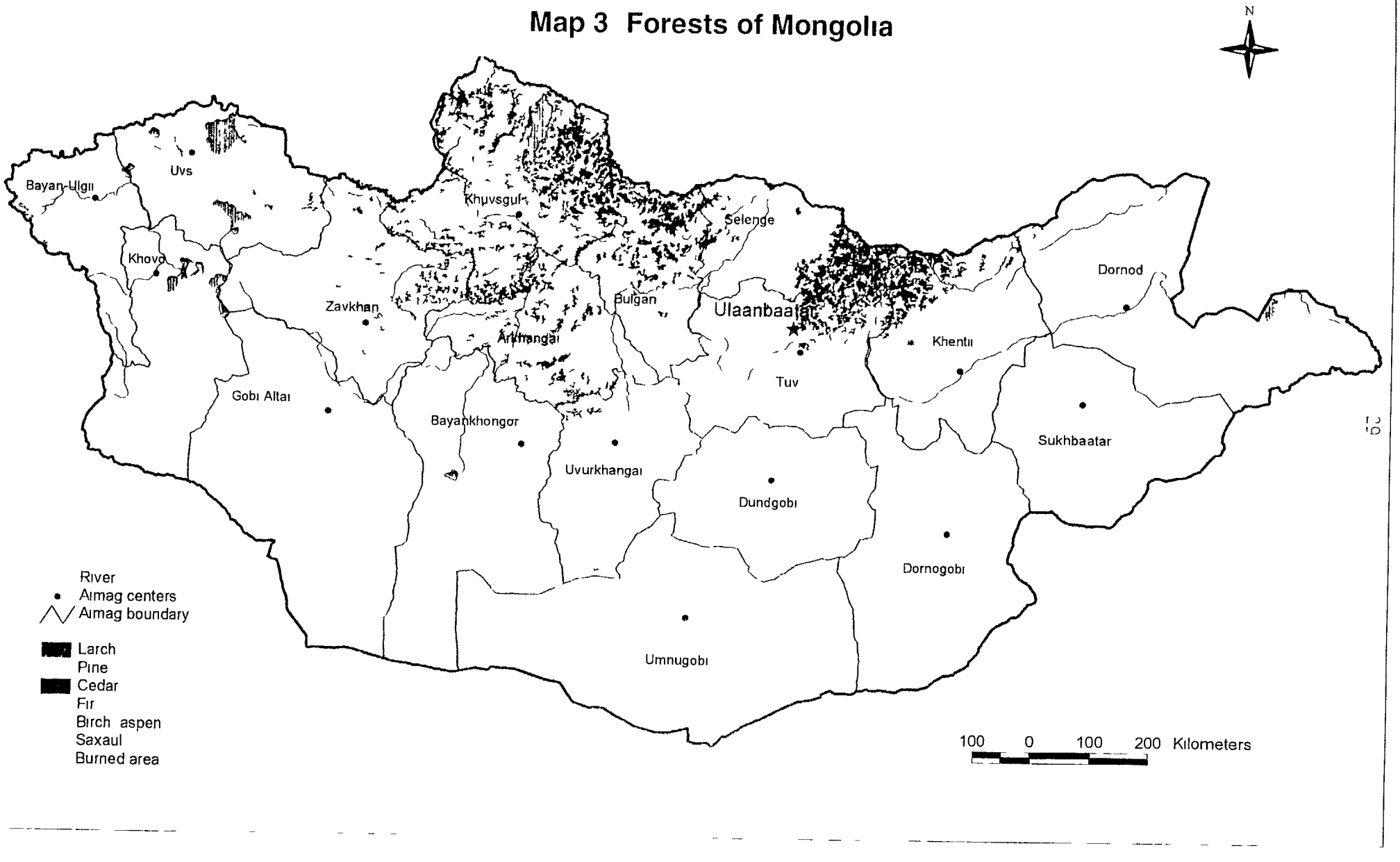
- Jurisdictional confusion over permitting rights (i e , governors issue permits for territories that are not theirs),
- Little enforcement of reforestation requirements (and low success rates because of the harsh climate and pressures from livestock), and
- A considerable, though unquantified, amount of illegal logging

While the number of people officially employed in the forestry sector has decreased,[2] as has the annual allowable cut (the amount sanctioned by MNE), it appears that logging activity has not decreased There are many economic incentives to engage in illegal logging Furthermore, confusion stemming from the privatization of former state logging companies and sawmills makes regulation difficult In many cases, former state employees still engage in logging and use registered sawmills, but it is challenging for inspectors to determine on an individual basis whether each person has a permit Moreover, the challenge of regulating logging is compounded by the fact that small, private mills are fairly mobile, making the monitoring of milling activities even more difficult

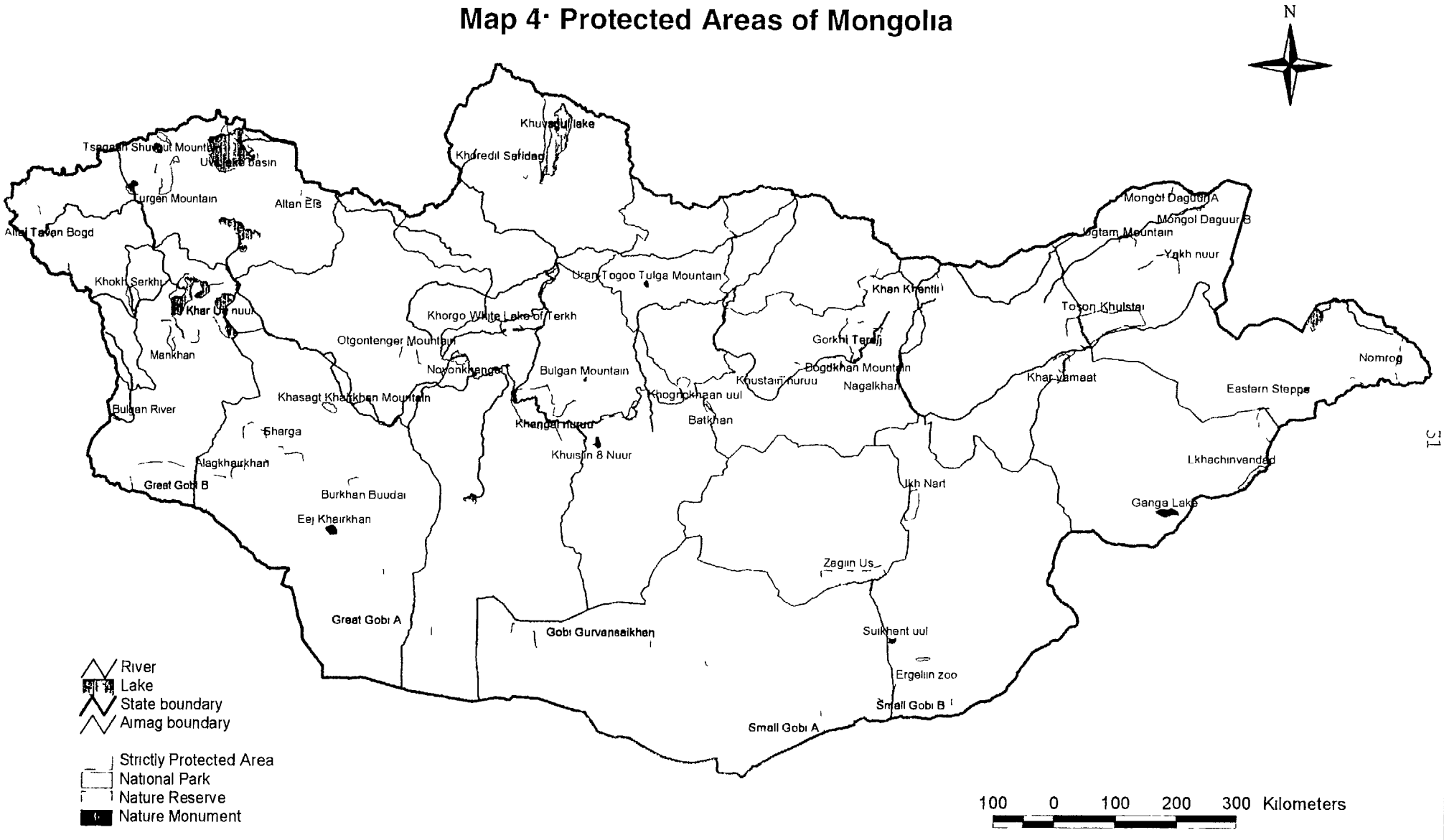
Logging techniques and equipment are obsolete and high-impact Clear cutting is not uncommon and even when trees are selectively felled, the remaining stands are often damaged Trunks (logs) are dragged to the roads, which destroys the groundcover Reforestation requirements are not enforced, and replanting, when undertaken, does not have a high success rate because of the harsh climate and pressures from livestock

[2] From 1992 to 1994 the number of employees dropped by one third from 10 500 to about 7 000

Map 3 Forests of Mongolia



Map 4· Protected Areas of Mongolia



In addition to threatening long-term opportunities for economic growth, deforestation has many negative environmental impacts The logging activities themselves destroy groundcover and cause erosion of the top soil Moreover, the loss of the protective vegetative cover leads to long-term—and rapid—erosion from wind and rain MNE attributes reduced flows in many major rivers to deforestation in the upper watersheds and recharge zones The loss of groundcover and soil increase run off at the time of precipitation (sometimes causing flooding), but reduce infiltration rates, which disturb the hydrological links between ground and surface water (The groundwater table is lowered, and cannot therefore contribute to surface flows through the hydrological links) Deforestation also negatively impacts biodiversity by destroying habitats and seriously disturbing the delicate balances that are found in forest ecosystems

In summary, the rapid depletion of forest resources has six major causes – unsustainable commercial logging practices, unregulated cutting for fuelwood, construction and export, encroachment of cropping and pastureland, ineffective forest laws and regulations, forest fires, and insect damage (FAO, 1997, World Vision International, 1997) See Section 2 3

3 4 Protected Areas

Mongolia has a long history of setting aside lands under protected status Between 1709 and 1799 hunting, cultivation and logging were prohibited on sixteen mountains in the country Bogd Khan, a mountain south of Ulaanbaatar, has been protected since the twelfth or thirteenth century as a holy place and was established as Mongolia's first official protected area in 1778

Mongolia's commitment to the protection of its unique landscapes and wildlife remains strong despite the economic difficulties associated with the transition Since 1993, fifteen protected areas have been added to the eleven that comprised the protected areas system prior to 1990 Currently, there are 38 protected areas that cover 17 4 million hectares of land, or 11 1 percent of the country Mongolia asserts that it intends to place 30 percent of the total territory under protected status Currently, the protected areas system is comprised of 12 Strictly Protected Areas, 7 National Conservation Parks, 13 Nature Reserves and 6 Monuments By virtue of their size Nature Reserves and Strictly Protected Areas are the main components in the protected areas network

Strictly Protected Areas (SPAs) are ecologically important natural areas with "particular importance for science and civilization," and which protect "natural features" and prevent "environmental imbalance "

National Conservation Parks (NCPs) are natural areas with historical, ecological and cultural value that are intended for development of tourism

Nature Reserves are areas set aside to protect or restore natural features or natural resources There are four types of Nature Reserve, each protecting a different type of feature or

resource a) Ecosystem or "natural complexes," b) Rare and Endangered plants or animals, c) Fossil animals or plants, and 4) Geological formations

Natural and Historical Monuments are intended to protect Mongolia's historical and cultural heritage and include natural landscape features such as waterfalls, caves, and volcanic formations, as well as archaeological and religious sites (MNE, 1997a) Table 3 2 lists the protected areas in Mongolia

Table 3 2 Protected Areas in Mongolia

#	Classification and Name	Area (1000 ha)	Year Established
	Strictly Protected Areas		
1	Great Gobi	5311 7	1975
2	Khukh Serkh	65 9	1977
3	Bodg Khan Uul	41 6	1974
4	Khasagt Khairkhan	27 4	1965
5	Khan Khentii	1227 1	1992
6	Numrug	311 2	1992
7	Dornod	570 4	1992
8	Mongol Daguurian	103	1992
9	Otgontenger	95 5	1992
10	Uvs Nuur Basin	712 5	1993
11	Small Gobi	1839 1	1996
12	Khoridol Saridag	188 6	1997
	Total Area	10494 3	
	National Conservation Parks		
1	Khuvsgul	838 1	1992
2	Khorgo Terkhiin Tsagaan Nuur	77 3	1965
3	Gobi Gurvansaikhan	2171 7	1993
4	Gorkhi Terelj	293 2	1993
5	Altai Tavan Bogd	636 2	1996
6	Khangai Nuruu	888 5	1996
7	Khar Us Nuur	850 3	1997
	Total Area	5755 1	
	Nature Reserves		
1	Nagaikhan Uul	3 1	1957
2	Batkhan Uul	21 8	1957
3	Lhachinvandad Uul	58 8	1965
4	Bulgan Gol	7 6	1965
5	Khustain Nuruu	49 9	1993
6	Ugtam Uul	46 2	1993
7	Sharga Mankhan	390 0	1993
8	Zagiin Us	273 6	1996
9	Alag Khairkhan	36 4	1996
10	Burkhan Buudai	52 1	1996
11	Ergeliin Zoo	60 9	1996
12	Ikh Nart	43 7	1996
13	Khugnukhaan Uul	47 0	1997
	Total Area	1091 3	
	Natural and Historical Monuments		
1	Bulgan Uul	1 8	1965
2	Uran Togoo Uul	5 8	1965
3	Eej Khairkhan	22 5	1992
4	Khuisiin Naiman Nuur	11 5	1992
5	Ganga Nuur	32 9	1993
6	Suikhent Uul	4 8	1996
	Total Area	79 3	

(Source MNE/UNDP/GEF 1998)

Permitted activities within the protected areas are determined not only by the status, but also by zones within the protected areas For example, Strictly Protected Areas (SPAs) and National Conservation Parks (NCPs) are divided into three zones The only activity allowed in the "pristine" zone of SPAs is non-intrusive scientific research The uses allowed in the SPA "conservation zone" (the second category of protection) correspond with those in the "special zone" of NCPs Tourism is allowed only in the SPA "limited use zone" and in the NCP "travel and tourism zone " The "limited use zone" in NCPs and the general provisions in Nature Reserves are fairly permissive, allowing traditional livestock husbandry, road construction, and the construction of tourism infrastructure (GTZ, 1997)

Comprehensive regulations to clarify what activities are permitted in the various zones and under what conditions have yet to be developed Moreover, buffer zones around protected areas, referred to in the Mongolian Law on Special Protected Areas as "peripheral zones," are not clearly defined The lack of clarity and regulations about permitted uses means that by default all kinds of activities (such as mining and hunting) take place, thereby potentially compromising the effectiveness of the protected areas

Financing staff and conservation activities is difficult because there is no reliable flow of income Although the allocation from the central budget was increased from 39 million Tugrug in 1994 to 63 million Tugrug (US 78,750) in 1996, it is not enough to meet even minimal management standards Theoretically, protected areas are supposed to earn 25 percent of their budgets by charging tourism fees, but often, significant portions of tourism fees and land use fees (which are charged to tour providers, and are three times higher in protected areas than outside of them) are either not collected or are passed on to the local government

3 5 Tourism[3]

The combination of Mongolia's fabulous landscapes, wildlife, and indigenous culture form a powerful draw for tourism Although the tourism season is short and turnover is relatively small, tourism is an important sector of the economy Estimates about tourism's foreign exchange earnings vary between 5 and 10 percent in 1995, and its contribution to GNP in 1995 was estimated at 4 5 percent (taking into multiplier effects) Currently more than 200 private companies compete with the former state controlled tourism agency, Juulchin However, only about 20 to 40 of the firms are considered to offer professional service Some firms bypass regulations in their provision of visits to protected areas

Because visitation volumes are low, the overall environmental impact of tourism is relatively small, with the exception of especially popular sites such as the Karakorum area, Gorkhi Terelj National Conservation Park, and the Yolin-Am gorge in Gobi Gurvansaikhan National

[3] This section is based on information from *The Development of Ecotourism in the Protected Areas of Govi Gurvansaikhan Gorkhi Terelj and Khan Khentii* prepared by GTZ in 1997 and conversations with environmental specialists in Mongolia

Conservation Park In these areas, impacts are localized and result from the generation of solid waste, water use, lack of sanitation, and off-road driving

Protected Area managers note that domestic tourists do not tend to be as environmentally aware as foreign tourists and are more likely to engage in environmentally damaging behavior such as littering, contaminating water, and illegal hunting

Hunting tourism is the most controversial form of tourism because the impacts of permitted and illegal hunting on wildlife are not known However, earnings from regulated hunting tourism (which are calculated separately from regular tourism), were estimated to be $US 3 million in 1997 The charges for an argali sheep, depending on its size and region, range from US$ 20,000 to 35,000 Mongolian ibexes and red deer cost US$ 1000, brown bears—US$2,500, elk—US$ 3,500, and lynx—US$2,000 per animal Technically, 70 percent of such earnings should go to the state budget, 20 percent to the local administration and 10 percent to the hunting company However, in practice, in 1993, the state (MNE) received only 5 percent, the aimag and soum governments received 5 percent each and the remaining 75 percent went to the hunting companies

Economic gains could be considerably higher, and environmental impacts lower, if management of tourism were improved The goals should be promotion and regulation of tourism in protected areas, rather than restriction Hunting tourism should be managed more strictly The fee structure for entrance to protected areas and other services must be re-evaluated, and management of the revenues generated must be more transparent

3 6 Energy

The energy sector in Mongolia is an extremely important one from economic and environmental perspectives, and although it is undergoing restructuring, it still bears many telltale marks of its establishment during the era of central planning Five combined heat and power plants (CHPs), managed by the state power authority (EA), supply 85 percent of the electricity for the country, district heating for roughly half of the large urban population, and steam for a number of industries (World Bank, 1996) Table 3 3 illustrates characteristics of the CHPs None of the CHPs meet international environmental standards Recent donor-financed rehabilitation efforts (including those of USAID) of the CHPs in Ulaanbaatar, Darkhan, Erdenet and Choibalsan, have been of an emergency nature to keeping them functioning

Table 3 3 Characteristics of Combination Heat and Power Plants in Mongolia

Plant Location	Existing Electrical Power Capacity (MW)	Existing Heat Capacity (BTU/hour)	Actual Consumption of Coal per Year (Tons)	Year Constructed
Ulaanbaatar (No 2)	21 5	117 0	120,000	1961-1970
Ulaanbaatar (No 3)	148 0	803 0	900,000	1969-1980
Ulaanbaatar (no 4)	540 0	1385 0	2,000,000	1983-1990
Darkhan	48 0	340 0	230,000	1962-1966
Erdenet	36 0	239 0	240,000	1982-1987
Choibalsan	36 0	230 0	200,000	1964-1969

From Turner Collie & Braden , 1997

Data from 1995 indicate that isolated stations (diesel-generated engines for electricity supply and heat-only boilers (HOBs) were found in 218 of Mongolia's 316 soums, and in 11 of the 18 aimag centers Many function at reduced capacity, if at all, due to lack of spare parts and/or fuel (World Bank, 1996) [4] The remainder of the population that lives in ghers (the name of the traditional tents which in urban areas, also connotes any other type of informal dwelling) use coal, wood, or dung to fuel highly inefficient stoves Alternative energy sources such as geothermal, small-scale hydropower, wind, and solar energy are not widely used, though the potential from climatic and natural resource endowment perspectives is high

Domestically produced coal provides 80 percent of the country's commercial energy supply Petroleum products from Russia account for 19 percent and the balance of 1 percent is made up by electricity imports from Russia (World Bank, 1996) Petroleum reserves in the eastern part of the country have only recently been exploited, and do not yet contribute significantly to the commercial energy supply [5]

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[4] USAID has donated 8 diesel generators (two sets each to Bayankhongor Gobi-Altai and Khovsgol and one each to Umnugobi and Zavkhan aimags) These generators are 40 percent more efficient than the ones they replace Japanese ODA is replacing diesel generators in soum centers The Government of Germany has rehabilitated Darkhan plant and have committed 20m DM to do the same at Choibalsan Koreans are donating $8m soft loan for coal-fired plant in Dalanzadgad may rehabilitate another small plant in a western aimag

[5] There has been some testing of crude oil burning at CHP No 4 in Ulaanbaatar

Table 3 4 Characteristics of the Three Major Coal Fields in Mongolia

	Baga Nuur	Sharyn Gol	Shivee Ovoo	Tavan Tolgoi
Location	130 km east of UB	150 km north	350 km south of UB	South Gobi
Reserves	Part of 75 billion tons[1]		Part of 75 billion tons [1]	1 6 billion tons [1]
Type of coal	Lignite	Lignite	Lignite	Coking coal [1]
Avg Kcal/kg	3200-3500 [1]	3800 4000[1]	2200-2700 (to date) 3300 (design) [1]	8110 [3]
Characteristics	18-35% moisture content and 12 – 21% ash [1]	18-35% moisture content and 12 – 21% ash [1]	18 35% moisture content, and 12 – 21% ash [1]	8 000 kcal/kg 8 5% moisture, 20% ash [1]
Sulphur content	Less than 1% [1]	Less than 1% [1]	1 5% [1]	Less than 1% [1]
Quality	Good	Better than Baganuur	Low	High
Capacity (mtpy)	4	1 5	1 2	
1993 levels of production (mtpy)	2 8	1 1	0 5	
Main consumers	UB CHP no 4	UB CHP No 3, CHPs in Darkhan & Erdenet key industries	UB CHP No 4 and small consumers	
Minegate prices in 1995 (Tug/ton)	2,500	3 500	2200	
Average Incremental Costs (AIC) est 1995	2,400 – 3 200	3 200 – 4 000 (for production thru 2000, then high stripp ing ratio after that will drive up AIC)	AIC low unless measures to improve quality are expensive	
AIC usd/ton	6-8	8-10 (1995-99), 12 15 (2000 on)	NA	
Production design/tech	Soviet	Soviet	Mongolian	
Economic prospects	Best the country has (low stripping ration of 3 5 m3 of overburden per ton of coal) quality needs to be made more uniform and consistent	LT prospects aren t good because future stripping ratio is 6 1 however, several consumers are set up for its higher quality coal and retrofitting them to use low quality coal would also be costly	Probably low (because quality of coal is so low) but costs not studied dewatering an issue (both in terms of financial and environmental costs)	
Main issues / problems	Remove rail overburden haulage system (operating at 40% efficiency) and replace with 10 15m3 excavators and 85 ton trucks	Focus on coal that has no more than a 3 1 overburden/coal ratio, make investments based on these prospects if consumers willing to pay for the higher quality coal then let them!	Coal being excavated is oxidized, and there are hydrogeological conditions not identified during exploration that give coal a high moisture content no sorting or sizing now (mazut must be added, which makes it uneconomical)	Good LT prospects if under private sector financing (export potential) low stripping ratios, thermal coal seams up to 8 000 Kcal/kg coking coal there too

(Information compiled from World Bank 1995a)

There are16 operating mines and roughly three quarters of coal used comes from the three large scale open-pit mines of Baganuur, Sharyngol, and Shivee Ovoo There is one medium-scale (0 6 mtpy) mine at Aduunchuluun in eastern Mongolia The remainder are 12 smaller-scale (i e , less than 0 25mtpy) "aimag" mines, all but one of which are open-pit Table 3 4 identifies key characteristics of the three principle mines, plus the Tavan Tolgoi coal field in Umnugobi Aimag Coking coal from Tavan Tolgoi is used at the scrap iron processing plant in Darkhan, but due to electricity shortages at the mine, poor equipment, and transportation problems the mine is not able to meet the Darkhan plant's energy requirements [6]

The coal at the three principal mines varies only slightly Sulfur content is considered low, while the ash content is high Table 3 4 (Coal field characteristics) describes the characteristics of the three principal coal mines Coal from the Baganuur mine is slightly radioactive, making appropriate disposal of the ash especially sensitive Specialists at MNE note that particulate matter from coal burning is the most significant air quality problem

Inefficiency is the hallmark of Mongolia's energy sector In 1994, almost 40 percent of the primary energy supply was lost in energy conversion, transmission and distribution The per capita commercial energy consumption in 1994 of 0 6 tons of oil equivalent (toe) per annum (down from 1 5 toe in 1990) is higher than any other member country of the Asian Development Bank (ADB, 1996)

Points of Inefficiency

- Mining operations a) Stripping overburden in advance, thereby subjecting coal to oxidization, b) Hampering quality by failing to pump intrusive groundwater, c) Mixing coal with overburden and other non-combustibles makes delivery more transport-intensive than need be, damages equipment, and creates additional particulate matter when burned

- Delivery a) Delivering coal of the wrong specifications to CHPs and other plants designed to consume a different grade of coal, b) Increasing the risk of spontaneous combustion by storing lignite too long

- Conversion a) Poor design and poor maintenance of facilities, b) Consumption of non-design coal, c) Conversion losses and station use of over 20 percent of energy produced (World Bank, 1996b), d) CHP No 3 uses/loses up to 35 percent within the plant

[6] The Darkhan plant imports coking coal Also a power station is being built in Dalanzadgad that may improve the electricity supply to the mine Export potential of coking coal to China is high

- Distribution Box 3 1 highlights the inefficiencies of the constant flow heating distribution system There are losses in the transmission of electricity distribution, as well

  - Heat Radiation losses, building losses, and water leaks account for 49 percent of the supplied heat (ADB, 1996)
  - Steam About 38 percent of total steam supply is lost through leaks and poorly insulated pipes
  - Electricity Losses estimated at 12-15 percent (ADB, 1996)

- Tariffs and collection Prices in 1996 were still at least slightly below the long-run marginal cost (LRMC) for electricity and well below the LRMC for heating (World Bank, 1995b) There are very few meters, particularly in the residential sector and collection rates are not high It is difficult to turn off services to those who do not pay their bills Moreover, the negative externalities of the power production are not captured in the pricing system, which undermines environmental protection efforts

Box 3 1 District Heating Design Flaws
a) The system has been designed to provide adequate heat for consumers located furthest away from the plants, thus supplying those closest to the plants with too much heat
b) Individual consumers have no control over their level of heat consumption and can adjust the temperature only by opening windows
c) If there is a change in outdoor temperature that requires adjustment at the CHP plant, the thermal inertia in the system results in a lapse of several hours before the temperature change is effected throughout the system
d) Because individual consumers cannot control their heat consumption it is not possible to use the pricing mechanism to encourage energy consumption
From Asian Development Bank Report and Recommendation of the President to the Board of Directors on a Proposed Loan to Mongolia for the Energy Conservation Project October 1996 Page 6
e) Few enterprises have heat meters and are charged by the volume of space heated Enterprise managers now have the option of having the heating turned off in unused spaces and can negotiate with the Energy Authority on a monthly basis If not enough heat and steam are used however and the water is returned to the CHPs too hot the CHP s ability to further generate heat are hampered because the returned water cannot perform its cooling function K O'Kane

The energy needs in rural areas are mainly met by the diesel generators that operate in aimag and soum centers, and supplemented by several thousand wind turbines and photovoltaic cells (PVs) in remoter areas In 1993, approximately 90-100 kW of power were wind generated (Worley, 1996) and the main users were clinics and schools using 50 W watt turbines, and several thousand nomadic families using 10W ones Up to 4,000 rural families use small photovoltaic cells The chairman of one wind turbine and PV manufacturer in Ulaanbaatar stated that nomadic families and other rural dwellers cannot buy turbines or PVs currently because they have no cash His company is not able to accept bartered goods as payment

Climatic conditions show high potential for solar and wind technologies On average there are 260 days of sunshine per year in Mongolia (2250 to 3300 hours), and daily insolation rates are high, given the northern latitude Photovoltaic cells are considered the preferred alternative energy option in the central and northern part of the country because the reflection from the snow in winter doubles the solar radiation USAID is presently funding the preparation of a wind atlas, which will identify the regions in which wind power would be most viable In general, the average annual wind speed in Dalandzadgad, Mandalgoi, Saynshand, and Baruun Urt (in the southern part of the country) varies between 4 and 5 meters per second (m/s) If areas are identified that have an average annual wind speed of 6

m/s, larger scale wind turbine generators may be considered economically viable (Worley, 1996)

Families in rural areas also use wood (and other cellulose materials) and dung to fuel their stoves, precluding their use as valuable fertilizers and soil stabilizers Another alternative fuel for rural dwellers is liquid propane gas (LPG), which is available in cylinders from Ulaan-Ude, Russia, though the high cost precludes wide adoption of this fuel type

The central and western parts of the country have some geothermal reserves—about 40 geothermal springs have been identified A brief investigation by Japanese consultants in 1994 reported that the Shargaljuut area of Bayankhongor Aimag has potential for small scale geothermal power generation (Worley, 1996)

Table 3 5 Hot Springs in Mongolia

Name of Spring	Temp C	Nearest Aimag Center	Dist To MV Sub-station (km)	Name of Spring	Temp C	Nearest Aimag Center	Dist. to MV Sub-station (km)
Tsenkher	86	Tsetserleg	13	Ih Shargaljuut	92	Bayankhongor	58
Bortal	46			Baga Shargaljuut	58	Bayankhongor	33
Gialgar	52	Tsetserleg	20	Ukheg	57	Bayankhongor	68
Tsagaan Sum	69			Teel	32		
Shivert	55	Tsetserleg	23	Orgoot	40		
Noionkhangai	38						
Chuluut	45						
Khujirt	55	Arvayheer	<1	Otgontenger	56	Uliastay	84
Mogoit	72	Arvayheer	17	Ulaankhaalga	37	Uliastay	51
Khamryin	39			Khojuul	45		
Giatruunii	36			Khaluun us	35		
Emt	39	Arvayheer	13	Zaart	44		
Khuremt	55	Arvayheer	17	Tsetsuuh	36		
Shargiin	30						
Taats	55						
Ihonon	88	Ulaanbaatar	180				
Bagaonon	73	Ulaanbaatar	150				

(Source Worley 1996)

Hydropower has also been explored in Mongolia A hydropower plant with an installed capacity of 220 MG has been proposed on the Eg River, shortly before its confluence with the Selenge River in the northern part of the country Prefeasibility studies have been done on at least eleven other sites in the country for hydropower facilities that would generate from 5 MW to 205 MW (Worley, 1996)

3 7 Industry

This section covers the industrial sector except mining and minerals processing which is addressed in a separate section

Aside from mining and metallurgy activities, most of the other industry in Mongolia can be classified as light industry Industrialization began in the 1940s, principally in the form of basic agroprocessing—mainly timber and tanneries Agroprocessing still comprises the main portion of industry, but now includes more value-added activity, such as carpet and shoe manufacturing, textiles, and food processing

Few data are kept on enterprise effluents, emissions, or solid wastes While officially, enterprises are required to work under the guidelines of enterprise-specific "environmental passports" (the pollution permitting system of the former Soviet Union), the system was never enforced, so passports were not prepared Moreover, enterprises are not yet required to self-monitor, and the Ministry of Nature and Environment, because of staff and other resource shortages, is not capable providing regular point source monitoring

The Ministry of Nature and Environment has taken steps to reduce the negative impacts of industry In 1995, a law went into effect that requires all planned enterprises to undergo an EIA In early 1998, the EIA requirements were expanded to apply to existing enterprises, as well, requiring that EIAs be completed before 2000 Plans are underway to design standards for emissions, discharges, and other wastes, which would be enforced through a pollution permitting system, (also currently under design) [7] The system, once it's in place, will have serious implementation weaknesses those who must implement it--the inspectors in the aimags and soums--have few resources (i e , no vehicles and very low salaries), little training, and are not MNE staff but rather local government staff

The majority of the enterprises in Mongolia were built using Soviet designs and to Soviet standards As one official in MNE points out, factories are grossly over-sized for Mongolia, and are characterized by tremendous inefficiencies in all systems heating, steam, water use, and electricity A few of the larger enterprises were outfitted with pollution control equipment, but a history of mismanagement and lack of resources for maintenance have exacerbated poor design and the associated inefficiencies, a trend that has accelerated dramatically in the past eight years Even relatively simple instruments such as controls on production equipment--which could aid management (and thereby reduce wastage)-- are often missing or broken Enterprises lack management plans for toxic compounds (including petroleum products) and as a result, such compounds are stored or dumped on site Moreover, there are no treatment facilities for the toxic materials used in and produced by the industrial sector in Mongolia

Given the lack of data, identification of industrial pollutants must be based on discussions with personnel at the Ministry of Industry and Agriculture and the Ministry of Nature and Environment, as well are on a review of the existing industries in Mongolia Specialists at MNE and MIA identified the sub-sectors listed in Table 3 6 as the most polluting

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[7] Pilot projects for standards and pollution permits were conducted under the ADB Ministry Strengthening project in 1997

Table 3 6 Some of the Most Polluting Industries in Mongolia

Industry	Comments
Power	*Emissions* CO_2, CO, SO_2, particulates, *Liquid/solid waste* fly ash (some of which may be radioactive)
Tanneries	*Effluents* heavy metals, oils, sulfides, nitrogen compounds, BOD_5, TSS
Food processing / Slaughterhouses	*Effluents* BOD_5, TSS, pH, fecal coliform organisms, oils/greases, *Solid wastes* pathogens, oils
Metallurgy	*Emissions* NO_x, SO_x, CO_2, CO, fluorides, particulates, heavy metals, *Effluents/sludge* sulfides, fluorides, phenols, cyanide, ammonia, oils, heavy metals, , waste electrolyte and cathode wash, anode wash, etc
Wool scouring	*Effluents* Oil and grease, sulfides, phenols, BOD_5, TSS, solvents
Cement	*Emissions* particulates, CO, SO_x, NO_x hydrocarbons, aldehydes, ketones, and VOCs *Effluents*—soluble alkalis
Furniture making	*Emissions* VOCs *Effluents* BOD_5, TSS, pH, solvents
Textiles	*Effluents* BOD_5, TSS, COD, oils and greases, chromium, phenols, and sulfides
Petroleum distribution	*Emissions* VOCs *Effluents* petroleum product contamination to surface and ground water, soils

(Source MNE)

Other polluting enterprises are scattered around the country Examples of polluting enterprises and the types of pollutants they produce include the following

Hotel/tourist facilities	Detergents
New/publishing industries	Organic solvents
Veterinary medicines	Toxics
Breeding/livestock facilities	Organic nutrient loading
Transportation	Petroleum contamination of ground and surface water and soil, VOCs

The Government of Mongolia has begun to auction the fully and partially state-owned enterprises It is likely that many of the enterprises are not viable, and some may require special measures to properly close them down (i e , properly dealing with stored toxic materials and uncontrolled dumped wastes, in particular) Current budgetary constraints will likely preclude such activities, many non-viable enterprises simply close their doors

Findings from an ADB-funded Technical Assistance project presented in Table 3 7 show in greater detail the environmental issues that are associated with six enterprises in Mongolia

Table 3 7 Pollution and Improvement Recommendations for Six Enterprises in Mongolia

Enterprise/location	Comments	Recommendations
Meat processing factory (Makhimpex)[8] Ulaanbaatar	Pretreatment of wastewater before disposing to City Wastewater Treatment facility consists of settling tanks and solid waste traps Wastewater may contain fats organic material nitrogen chlorides pathogens/bacteria, parasite eggs, and amoebic cysts	Increase environmental awareness and energy & waste management skills of staff do an environmental audit implement low cost energy saving measures (repair measuring instruments & leading valves insulate pipes), implement waste minimization measures (use less water in processing, separate cooling water and wastewater so that cooling water can be recycled)
Coal-Fired Thermal Power Plant (CHP No 3), Ulaanbaatar	Overall plant efficiency=63% in 1993 and 60% in 1994 No monitoring for NO2 or CO2 Water & electricity wastage high	Create environmental management unit in house, provide conditions for complete coal combustion reduce water and electricity usage, install stationary monitoring equipment for dust SO2 and NO2 line all evaporation ponds to prevent leaching
Wool Spinning Mill (Eermel Co) Ulaanbaatar	Wastewater contain heavy metals (chromium & copper) water & energy wasted in processing	Increase environmental awareness and energy & waste management skills of staff do an environmental audit implement low cost energy saving measures (repair measuring instruments & leading valves, insulate pipes) implement waste minimization measures (use less toxic dyes recycle dye solutions)
Cement Company & Lime Factory Darkhan	Treated wastewater discharged to land 1 5 km from plant some groundwater contamination likely High particulate count and perhaps, sulfur dioxide count in emissions (control system not functioning properly)	Energy & water conservation and waste minimization techniques and technologies needed Better air pollution control technology needed
Factory 'Skin (Sheepskin processing) Darkhan	Operating at 20% capacity, some pre-treatment of wastewater 50 tons of solid waste/month Potential leaching from wastes uses fats to produce soap	Greater care must be taken of the toxic chemicals found in wastewater Implement energy & water saving measures through auditing and metering Examine materials substitution to less toxic chemicals Care must be taken in chemicals storage & handling
DMA Iron Processing Darkhan	Wastewater discharged directly to central facility, emission control reportedly good	None

(Adapted from DanEduc a/s/ADB 1997a)

From data given in Tables 3 6 and 3 7, it is possible to conclude that industries contribute substantial amounts of pollutants to the environment and may exceed the environment's natural purifying capabilities Efforts are being made to correct these deficiencies by the Ministry of Nature and Environment, but require three principle developments/conditions to be successful

[8] Makhimpex has undergone some rehabilitative work under Japanese ODA, but the details of the work are not known

- Support of the government at large,
- Dissemination of information to industry managers about environmental requirements, and
- Training and skills development of inspectors at the aimag and soum levels, as they are the ones who bear the responsibility of implementing the policies and regulations that are in place and under development

3 8 Mining and Minerals Processing

Mongolia has significant deposits of coal, copper, and molybdenum, gold, tin, tungsten, fluorspar, and uranium, which are often laced with minerals such as silver, nickel, and zinc Six hundred mining sites have been identified, and 200 are currently in operation Map 3 3 shows the location of some main deposits

Table 3 8 Mineral Resources Deposits and Mines

Mineral resource	Mining sites / Deposits	Amount
Coal	200 mines	125 billion tons
Copper & molybdenum	100 deposits	9 thousand tons of copper, 250 million tons of molybdenum
Zinc and Lead	30 mines	3 9 thousand tons
Tin	12 deposits	16 million tons
Tungsten	20 deposits	220 million tons
Gold	120 mines	170 tons
Silver	2 mines	10 million tons
Fluorspar	360 deposits	18 thousand tons
Phosphorous	20 deposits	24 million tons
Zeolite	20 deposits	Unknown
Iron	260 deposits	600 thousand tons
Uranium	100 deposits	1 4 million tons
Rare metals	7 mines	400 million tons
Oil	N/A	411 thousand tons

(MNE, 1996)

Coal There are 200 deposits that contain at an estimated total of 125 billion tons In 1996, there were 12 mines for black coal and 7 for brown coal The largest mines are Baganuur, Sharyngol, Mogaingol, Tevshiin Gobi, Shivee Ovoo Tsaidam and Aduunchuluun See Maps 3 4 and 3 5 for the locations of deposits

Copper and molybdenum Over 100 deposits have been found in Mongolia, but two of the deposits are particularly economically attractive the Erdenet Ovoo and Tsagaan Suvrag deposits Over 20 million tons of ore are extracted annually from Erdenet Ovoo, and exports of copper and molybdenum have increased, respectively, from 351 and 3 3 thousand tons in 1989 to 486 and 3 8 million tons in 1996

Zinc and lead Over thirty deposits have been identified, containing an estimated total of 3 9 million tons

Tin The main deposits are located in the Khentii province

Tungsten Deposits are found mainly in the western province of Bayan-Ulgii

Gold Gold mining began on a large scale in the 1990s, and is found in both ore and placer forms

Silver The main deposits are in Asgat and Mungun-Undur

Fluorspar The mined deposits are in Khentii and Dornogobi provinces Fluorspar is one of Mongolia's main exports by volume

Phosphorous Deposits large enough to meet Mongolia's demand for phosphorous are found in the Khovsgul region

Zeolite There is enough zeolite in deposits to meet Mongolia's internal demand and produce enough for export

Iron Enough deposits to meet Mongolia's internal demand Currently, very little is mined

Uranium Deposits are under exploration in Dornod province, and mining techniques are under experimentation

Rare Earth Elements Small amounts of various rare earth elements have been identified

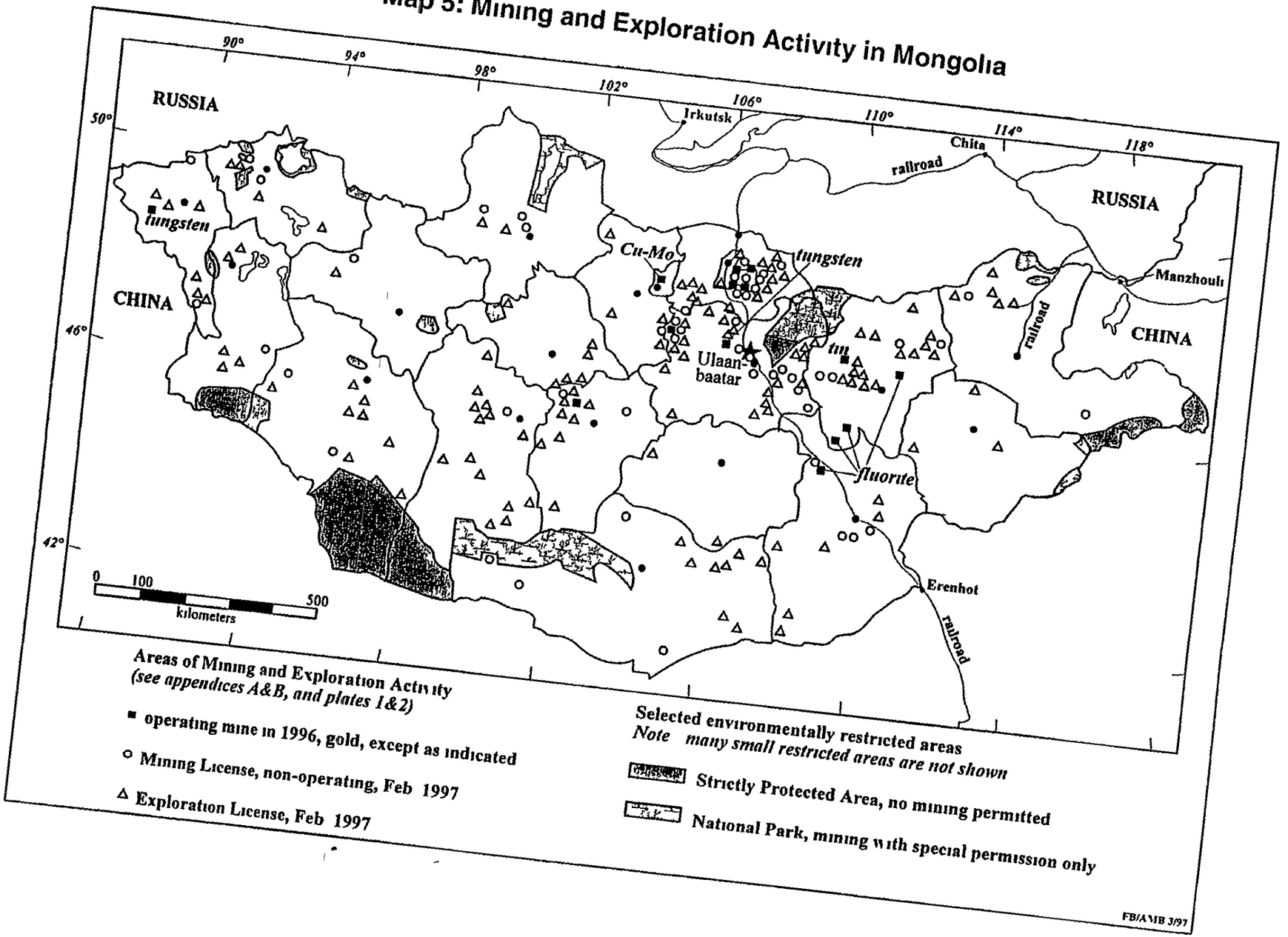
Oil Oil is being extracted on a small scale from deposits that have been discovered in southern Mongolia

Construction materials There are over 120 pits from which construction materials are mined

The extraction, processing and export of copper (and molybdenum), gold, coal, and fluorspar are the most economically significant activities in the mining/minerals sector Earnings from the copper concentrate and cathodes produced at Erdenet, for example, account for at least 50 percent of Mongolia's hard currency earnings

Mining and processing activities, however, extract a fee, despite their contributions to the economy (i e , via negative externalities) Most mining in Mongolia is open pit and no reclamation activity has taken place (except that which is being done under the World Bank-financed coal project at Baganuur) According to law, all open pits must be reclaimed but that is not enforced Gold mine operators in Zaamar region indicated that they were more

Map 5: Mining and Exploration Activity in Mongolia



Areas of Mining and Exploration Activity
(see appendices A&B, and plates 1&2)

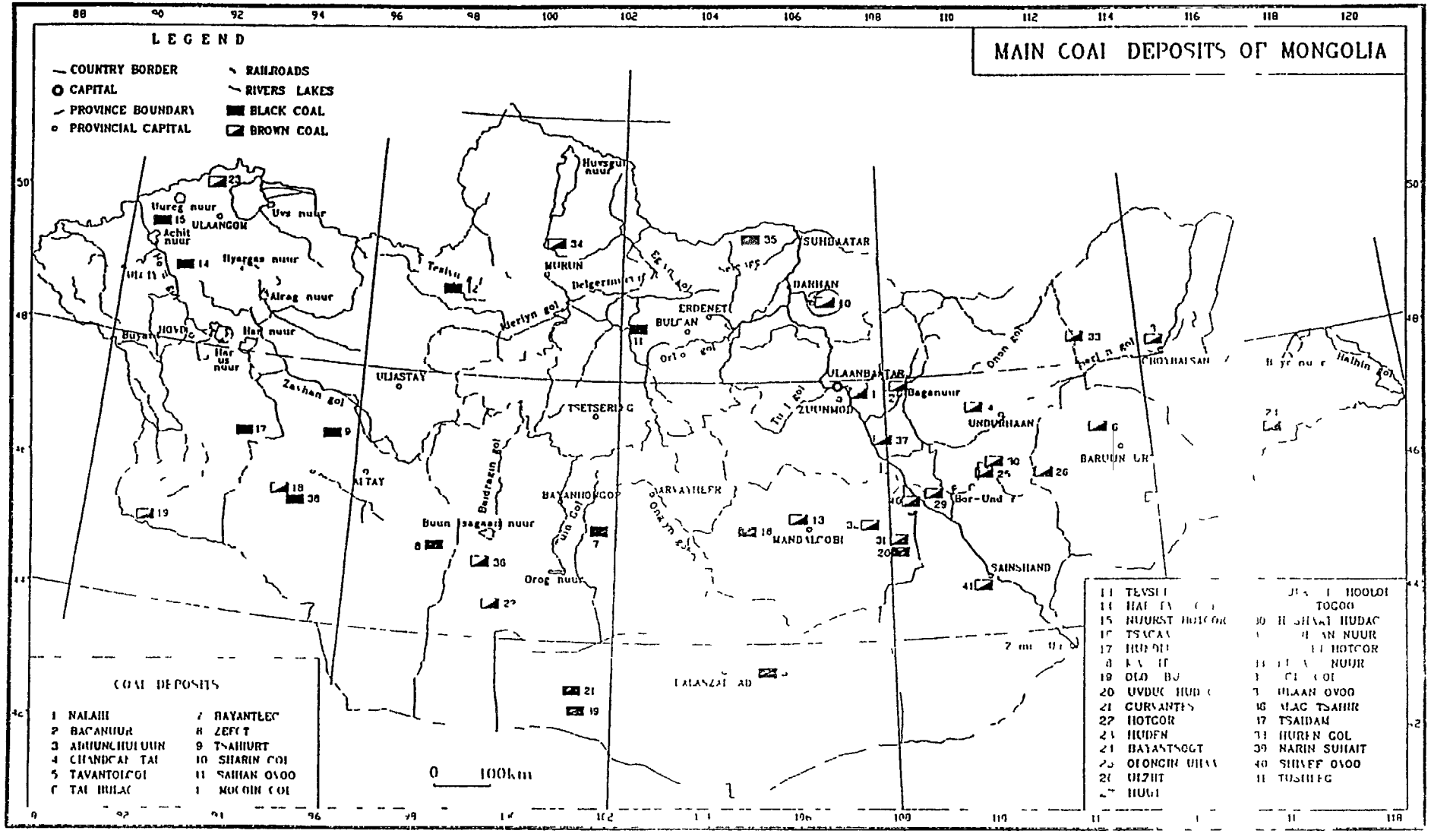
- ■ operating mine in 1996, gold, except as indicated
- ○ Mining License, non-operating, Feb 1997
- △ Exploration License, Feb 1997

Selected environmentally restricted areas
Note many small restricted areas are not shown

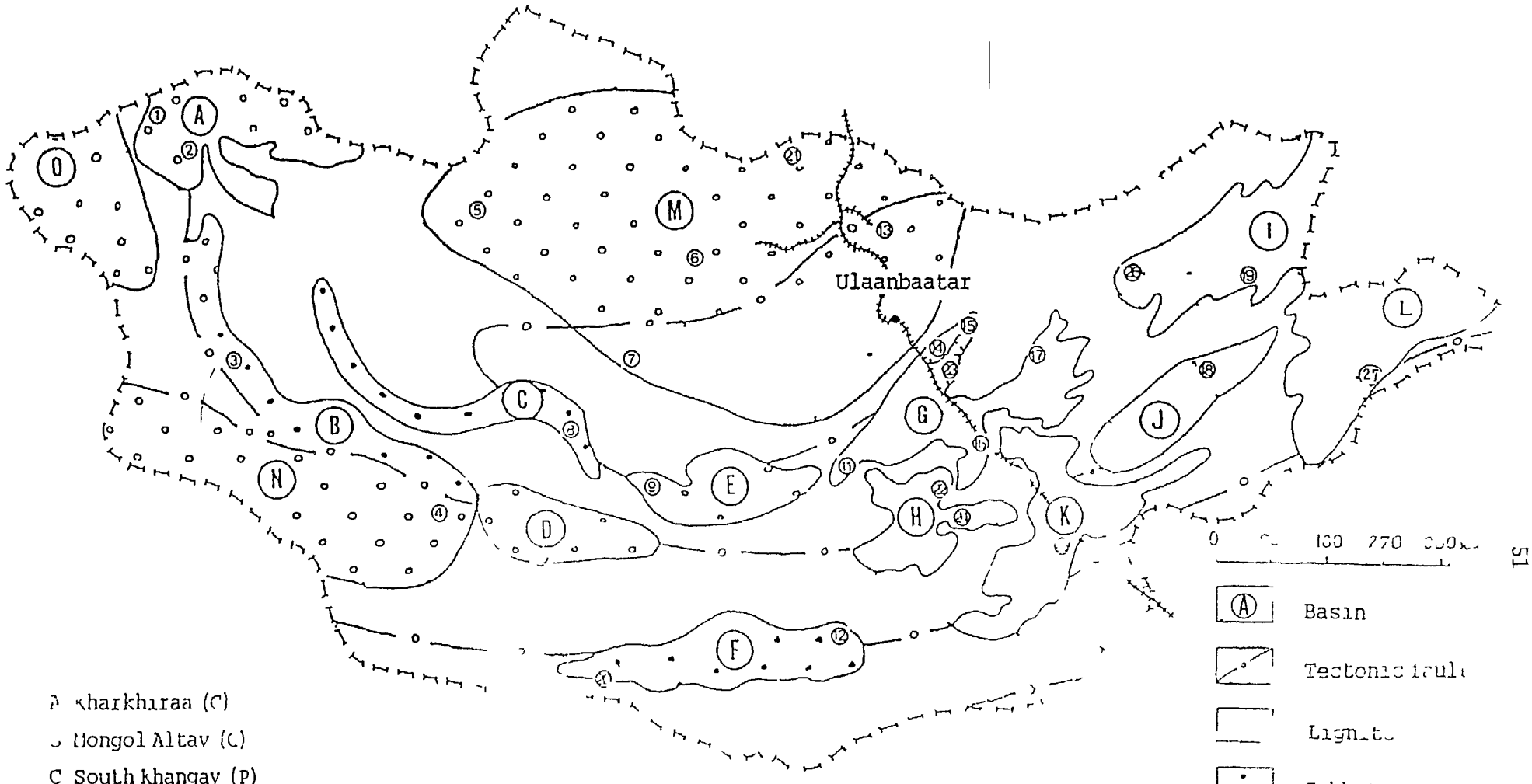
- Strictly Protected Area, no mining permitted
- National Park, mining with special permission only

FB/AMB 3/97

Map 6: Main Coal Deposits in Mongolia



Map 7: Distribution of Large-Scale Coal Bearing Basins



A Kharkhiraa (C)
B Mongol Altay (C)
C South Khangay (P)
D Big Bogdyn (J)
E Ongiyngol (J)
F South Govi (P)
G Choir-Nyalga (P)
H Middle Govi (C)
I Choybalsan (J)
J Sukhe Bator (K)
K East Govi (K)
L Tamtsak (K)
M Orkhon Selenge (J)
N Altay Gandtsa (C)
O Bayan-Ulegei (J)

C-Carboniferous, P-Permian, J-Jurassic, K-Cretaceous

Basin

Tectonic fault

Lignite

Subbituminous coal

Bituminous coal

Coking coal

Main coal deposit

likely to come under pressure from the community to perform reclamation activities than from state inspectors The pits and piles of overburden preclude use of the territory for other economic activity, such as grazing

Open pits create unproductive scars on the landscapes and their associated spoil dumps are subject to wind and water erosion, thus negatively affecting air and water quality and the productive capabilities of the surrounding countryside Water resources are negatively affected by the mining practices used in Mongolia Withdrawals from the Tuul River that are used for gold placer mining in the Zaamar region, for example, reduce the flow in the river Moreover, sedimentation from erosion of the piles of overburden alters the biophysical nature of the river Similarly, the overuse of groundwater in the region where fluorspar is mined (Khentii) has reduced the numbers of springs and oases, and has put many wells out of commission At least one fluorspar mining operation has been abandoned because of the negative impacts on the environment and the scarcity of water that is necessary for the mining process (MNE, 1996)

The mining company, Erdenet, has had to pay $500,000 per year in fines in the last several years for violations of environmental regulations (MNE/UNDP/GEF, 1998) There are questions about the safety of the dam at the wastewater reservoir associated with Erdenet--the dam is simply built up to meet the continuously rising sludge/liquid levels The reservoir is full of sludge (the complete composition of which is not known), and must exert a tremendous amount of pressure on the dam Wastewater is released to the environment untreated by the processing plant when there are power outages

Chemicals used in some metallurgical processing in Mongolia also threaten the natural environment and human health

- Sulfuric acid is used to extract copper from low grade ore at Erdemin, a company which produces cathodes using low grade copper ore from the Erdenet mine, very close to the city of Erdenet Erdemin was temporarily closed for not complying with all of the mitigation measures that were identified in its EIA (MNE/UNDP/GEF, 1998) The sulfuric acid extraction process is supposed to be a closed system, but leaks occur on occasion

- Sulfuric acid is also being used experimentally in Dornod to mine uranium A joint venture American-Mongolian company is using sulfuric acid to extract uranium from mined ore, and also to extract uranium from the ground by pumping sulfuric acid into the ground The company expects to begin commercial operations in the year 2000

- Cyanide is used to process gold ore in Umnugobi An official at the Ministry of Infrastructure Development stated that there have been reports of birds dying near the gold mining operation in Umnugobi Systematic and reliable environmental monitoring is lacking at the site

- The cement plant and iron smelter in Darkhan, (which mainly processes scrap iron) also produce air and water pollution

Since 1995, those applying for exploration and mining permits have been required to get an EIA done and in January of 1998, a resolution was passed mandating that all existing enterprises (including mines) must have an EIA prepared before the end of the year 2000 Getting an EIA is a very expensive and political process Operators of mining and exploration ventures are also required by law to submit an environmental management plan to the aimag or soum governor In order to cover environmental liabilities, mine operators are required by the Minerals Law of Mongolia (4 30 12) to place 50 percent of their environmental protection budget in a special account in the local government to cover damages done to the environment that are not appropriately dealt with by the mining operator None of these articles are enforced

Reclamation

A World Bank financed project to improve coal mining operations at Baganuur includes a US$250,000 component to study the environmental impacts and implement the necessary reclamation activities The reclamation activities that will take place at Baganuur coal mine are likely representative of the activities that are needed at all other open pit mines in Mongolia and are therefore described here

The pits and spoil dumps occupy about 775 6 ha of land From this area, about 56,800 m^3 of topsoil has been pre-stripped and stockpiled, which amounts to 4 percent of total topsoil of the area Prior to 1997, no reclamation of spoil dumps had been implemented The soils are variable sandy and sandy-loam with few stones or rocks, and the terrain includes steep slopes of 32 to 35 degrees with heights of 30 to 40 meters Extensive wind and water erosion characterize the spoil dumps

Reclamation activities will include technical and vegetative reclamation

- Technical reclamation Filling pits, shaping slopes and covering with soil-forming materials

- Biological reclamation Ameliorating soils, establishing vegetation, and implementing a five year management plan to ensure a stable vegetation system

In addition to reclamation, steps will be taken to control fugitive dust created mainly along the haul roads, draglines and loading shovels, drilling, spoil dumps, and coal handling

Hazardous waste management is the third component, and also relevant to other mining activities in Mongolia

Table 3 9 Hazardous Waste Management at Baganuur Mine

Material	Present disposal method	Future disposal method
Waste lubricants	About 18 tons is sent for recycling The rest appears to be burned or lost to the ground	Will be recycled at suitable plant in Ulaanbaatar
Solvents for cleaning during maintenance	Four tons/year of spirit, gasoline, kerosene Burned in open tank at warehouse site	Five tons/year similar materials, will be incinerated by mixing with coal in the heating plant
Waste hydraulic fluids	Most is lost by leakage onto the ground from operating plant	Recycled or incinerated as above
Used tires and conveyor belts	Belt is reused Some tires used for buffers, most are burned beneath machines during winter to warm fuel tank and engine	Belt will continue to e reused, also some tires Remaining tires will be recycled via nearby dealer
Metal waste—scrap iron and welding residues	Reused or dumped around site, some tipped in landfill site	Reused or recycled wherever possible, unsuitable materials will go to landfill site

(Source World Bank, 1996)

3 9 Urban Settlements and the Urban Environment

The concentration of populations—characterized by domestic, industrial, commercial and transportation activities—create special stresses on the environment This is particularly true in Mongolia where urban environmental services were incomplete, and have deteriorated since independence Urban areas provide economic and social opportunities that are beneficial to growth, and therefore must be managed to optimize these opportunities

The overall rate of urban services is low in Mongolia and access to clean water and sanitation is a problem Nationwide, only 11 4 percent of apartment dwellers (which comprises 20 percent of the total population), whose access to water is considered much better than gher and other informal dwellers, receive cold water (only 7 percent receive hot water) Solid waste management has become an increasing problem in the larger cities of Ulaanbaatar, Erdenet and Darkhan, whereas in rural areas, officials in aimags and soums note that refuse piles left behind by nomads is a problem

This section focuses on air, water, solid waste, and transportation issues in Ulaanbaatar because

- It is the largest and most significant urban area in Mongolia (27 percent of the country's population—650,000 people—live in UB),
- More data and studies are available than for other urban areas,
- It captures the full array of problems that may exist in other cities, but on a smaller scale

Roughly 49 percent of the population lives in communal housing (apartment blocks) and have electricity, water, heat, supplied by the city The remaining 51 percent live in gher

districts, where water that has been brought in by truck is bought from kiosks and where most people have open pit latrines Increasingly, officials refer to the "suburban" areas—settlements that have sprung up in the last eight years within 50 kilometers of Ulaanbaatar, for example, that are inhabited by people who are involved in both urban and rural economic activities The draft housing law, which addresses privatization issues and includes sections on improving gher districts and other unofficial settlements through the provision of financial assistance and the promotion of organization for self-improvement, was submitted to Parliament on 17 June 1998

Air

There are several sources of air pollution in Ulaanbaatar

- Stoves in gher districts There are 60,000 or more stoves in use in gher districts It is estimated that 190,000 tons of coal and 160,000m^3 of wood are used each year as fuel sources in gher stoves (MNE 1996) Carbon monoxide is one of the main pollutants, and particularly harmful because the chimneys are so low Some specialists have expressed concern that the increase in the consumption of household chemical products has led to combustion of containers that hold potentially toxic residues in the ghers, which contribute to poor air quality

- CHP plants The pollutants collectively discharged by the 3 CHPs are 4 14 tons of ash, and undetermined amounts of NO_x, CO, CO_2, and SO_x (MNE, 1996)

- Independent coal-fired boilers There are 200 independent coal-fired boilers in Ulaanbataar that collectively consume 4,000 tons of coal MNE, 1996) Typically, their stacks are low Moreover, storage of the unsorted coal is usually in the open-air, which contributes more particulate matter to the air

- Industry In addition to particulates and other pollutants given off by independent boilers, industries contribute a variety of other air pollutants See section on Industry

- Transport The proportion of air pollutants contributed by mobile sources is growing Between 1994 and 1996, the number of private vehicles in Ulaanbataar doubled with a flood of old, imported cars from Europe Recent data indicates that there are now 24,000 autos in UB Very few, if any, have catalytic converters and most are old and poorly maintained It is estimated that the annual exhaust emissions from vehicles in Ulaanbaatar produce the following pollutants (DanEduc a/s, 1997e), which are about eight times less than in the former capital of Kazakhstan, Almaty

Pollutant	Amount (1000 tons/year)
Sulfur dioxide	189
Nitrogen Dioxide	1,662
Dust	413
Carbon monoxide	9,165
Total	11,428

A vehicle inspection program in 1995 revealed that 62 percent of all vehicles tested were in violation of pollution discharge limits In a 1996 study, eighty-nine percent of the pre-1993 Russian-manufactured cars violated permissible levels

More freight trucks and public buses are gasoline fueled than diesel fueled (82 18), but the ratio is changing as more diesel-powered vehicles are imported (World Bank, 1995b)

- Dust from wind erosion of surrounding countryside The pit containing fly ash from the power stations is 65 hectares, (MNE, 1996) and ash is not controlled

Winds tend to travel from the west and northwest, highlighting the poor planning and development of the city the three power plants are in the western part of the city, and most gher districts, where coal, wood, dung, and trash are burned in inefficient stoves, are located mainly on the northern side

Because of its valley location and size, temperature inversions and increased energy production/consumption in the winter exacerbate air quality, trapping polluted air close to the ground Between 80 and 96 percent of temperature inversions occur between October and April, typically when coal temperatures are from 7–11 degrees C and ground temperatures, between–21 and –39 degrees C (Batjargal, 1996)

Water Supply and Sanitation

Almost all of the 53,300 apartments, which house slightly more than 50 percent of the population in Ulaanbaatar, have water supply and sewerage services The per capita consumption of 420 l/day for apartment dwellers is high, though thirty percent of the water supplied is lost in route and losses in homes and industries bring the loss rate up to 50 percent (leaking taps and running toilets are common) The rest of the population that lives in the gher districts and other informal housing relies on water that is brought in by trucks and sold at kiosks or on neighborhood wells Consumption in these districts averages 10–15 l/day, more than 30 times less than in the communal housing district Four wells tested in gher districts around the city in 1994 revealed that in three, the levels of nitrates in three of the wells exceeded the standard by 10 to 50 percent Levels of total dissolved solids, chrome, manganese, iron, copper and *e coli* exceeded standards in one or more wells (Government of Mongolia, *et al* , 1995b)

The central wastewater treatment plant has a capacity of 230,000 m^3/day but treats about 170,000 m^3/day, using mechanical and biological methods Chlorine is added before the water is discharged into the Tuul River It is likely that the plant is not able to treat the heavy metals and other toxic materials that it receives Currently, there is almost no pretreatment at industrial sites Levels of chromium discharged from a commercial plant which treats effluents from 12 industries (mainly tanneries and agro-processors) range from 11 to 50 mg/l—or up to 200 times the permissible level (DanEduc a/s, 1997e)

Land Contamination

The soil content of heavy metals (nickel, copper, chromium, molybdenum, and tin) is rather high around the periphery of the city—in the north, where gher districts are, up the Selbe river valley, where landfills and dumps are, in the west, where power plants are, and in the southwest, where the main industrial zone is The unusually high concentrations probably reflect poor disposal practices of solid and liquid wastes, and could also be attributed to windborne pollutants that precipitate out (MNE, 1996, and Batjargal, 1996)

Pathogen and ammonia levels are high in soils in the gher districts because of the predominance of pit latrines and unmanaged solid wastes

Solid Waste[9]

There are no special treatment/handling facilities for industrial wastes, hospital wastes, toxic wastes, and other items such as tires The degree to which inappropriate disposal of such items pollute the environment and negatively affect human health is unknown

Solid waste is a problem in Ulaanbaatar, as the amount of waste grows, and the resources to manage it have shrunk The amount and composition of waste has changed since the 1940s with increasing industrialization, and markedly since 1990 when the market began to open to more package-intensive commercial goods and household items that are toxic in nature The Ministry of Nature and Environment estimates that the volume of solid waste has doubled every ten years

Official data suggest that 40 percent of wastes are transported to the three major dumps (Dari Ekh, Ulaan Chuluut, and Moringiin Davaa), but collection services have all but ceased for lack of financing (i e , low tariffs and low tariff collection rates) (Government of Mongolia, *et al* , 1996) At least 220 informal dumping sites occur in and around the city, but trash collects at the bases of waste chutes in apartment blocks, gullies, streets, open manholes, and depressions throughout the city Such piles are often set on fire to reduce the volume, creating irritating and noxious emissions

[9] All data in this section is from Government of Mongolia et al 1996

Between 1991 and 1996, Ulaanbaatar generated an average of 878 6 thousand tons of solid waste per year The average amount per sector is broken down as follows

Apartment and gher districts	510 m3
Industries and organizations	300 m3
Suburban areas	58 6 m3

Tables 3 10, 3 11, and 3 12 identify the different waste streams found in Ulaanbaatar In apartment blocks, paper, containers and packaging materials, and bones comprise the top three contributors to solid waste stream by volume In contrast, very little paper is found in the waste stream in the gher districts (presumably because it is burned internally in stoves), and ash is the major contributor by volume Dumped ash is difficult to control in the best of circumstances, and in the gher districts, contributes significantly to poor air quality Paper and other miscellaneous material are the major components in the industrial waste stream by volume, and paper is the largest contributor to the total waste stream by volume and percent

Table 3 10 Generation Rates in Gher Areas in Ulaanbaatar

District	Pop 1995	Solid Waste produced at 0 002 m3/day (Winter) and 0 001 m3/day (Summer)			Ash Solid Waste produced at 0 0012 m3/day (assuming ash waste 60% of total & 20% of initial volume)		Pop 2010	Solid Waste produced at 0 002 m3/day (Winter) and 0 001 m3/day (Summer)			Solid Waste produced at 0 0012 m3/day	
		Per week winter	Per week summer	Per year	Per week	Per year		Per week winter	Per week summer	Per year	Per week	Per week
Han Uul	26152	366	183	15377	220	7030	38033	532	266	41532	346	17997
Sukhbaatar	31446	440	220	18490	264	8453	43005	753	301	54788	391	20350
Chingeltei	60736	850	425	35713	510	16326	77890	1363	545	99232	709	36858
Bayanzurkh	49091	687	344	28866	412	13196	61014	1068	427	77732	555	28872
Bongino Khairkhan	71921	1007	503	42290	604	19332	66361	1161	465	84544	604	31402
Bayangol	21288	298	149	12517	179	5722	27526	482	193	35068	250	13025
Totals	260634	3649	1824	153253	2189	70058	313829	5359	2197	392896	2856	148504

Table 3 11 Composition of Solid Waste of Ulaanbaatar (on a five-year average)

Component	Apartments		Ger horoolol		Industry, institution		Road, square		Suburb area		Total	
	%	Volume, m3 (000)	%	Volume, m3 (000)	%	Volume, m3 (000)	%	Volume, m3 (000)	%	Volume, m3 (000)	%	Volume, m3 (000)
Iron	4 3	5 16	8 5	33 15	14 8	45 88	2 5	0 46	21 5	8 6	10 6	93 25
Wood	3 8	4 56	2 1	8 19	2	6 2	0 2	0 04	12 4	4 96	2 7	23 95
Papers	35 4	42 48	0 4	1 56	41 6	128 96	4 9	0 91	2 2	0 88	19 89	174 79
Cans	8 4	10 08	6 8	26 52	0 1	0 31	-	-	1 2	0 48	4 25	37 39
Glass	0 25	0 3	1 4	5 46	0 05	0 15	3 8	0 71	0 6	0 24	0 78	6 86
Container &	13	15 6	1 6	6 24	-			-	-	-	2 48	21 84
Fabric	5 5	6 6	11 4	44 46	3 6	11 16	0 05	0 01	0 25	0 1	7 09	62 33
Cast iron	none	-	0 3	1 17				-	2 1	0 84	0 23	2 01
Aluminum	none	-	1 05	4 09	-	-	-	-	1 2	0 48	0 52	4 57
Molybdenum	-	-	0 05	0 19		-	-	-	0 7	0 28	0 05	0 47
Bones	7 5	9	16 7	65 13	-	-	-	-	15 4	6 16	9 14	80 29
Ash	-	-	21 5	83 85	-			-	18 5	7 4	10 38	91 26
Building material	-	-	-	-	7 5	23 25	-	-	16 8	6 72	3 41	29 97
Livestock wastes	-	-	11 4	44 46			-	-	-	-	5 06	44 46
Rubber	2 8	3 36	0 4	1 56	1	3 1	0 1	0 02	0 1	0 04	0 92	8 08
Plastic	5 3	6 36	0 05	0 19	1 3	4 03	0 05	0 01	0 25	0 1	1 26	10 69
Clay	1 75	-	7 8	30 42	3 8	11 78	68 8	12 8	3 5	1 4	6 66	58 5
Other	12	14 4	8 55	33 36	24 2 5	75 18	19 6	3 63	3 3	1 32	14 58	127 89
TOTAL	100	120	100	390	100	310	100	18 6	100	40	100	878 6

Table 3 12 Generation Rates in Apartment Areas

		Solid Waste Generated at 0 0025 m3/day		Solid waste generated at 0 0013 m3/day (after removal of glass, cans, bones, etc)			Solid Waste Generated at 0 0025 m3/day		Solid waste generated at 0 0013 m3/day	
District	Pop 1995	Per week	Per Year	Per week	Per year	Pop 2010	Per week	Per year	Per week	Per year
Han Uul	28324	496	25775	258	13403	38120	667	34690	347	18039
Sukhbaatar	50954	892	46368	464	24111	68577	1200	62405	624	32451
Chingeltei	30459	533	27718	277	14413	40994	717	37304	373	19398
Bayanzurkh	53129	930	48347	483	25141	71505	1251	65069	651	33836
Bongino Khairkhan	51753	906	47095	471	24490	69653	1219	63384	634	32960
Bayangol	92550	1620	84221	842	43795	124560	2180	113350	1133	58942
Totals	307169	5375	279524	2795	145352	413409	7235	376202	3762	195625

MNE had attempted on an experimental basis to classify, sort, and recycle solid waste, but limited resources could not support the effort A considerable amount of recycling is done (up to 50 percent by volume) by the informal sector Scavengers sort out bones, metals, paper and cardboard, and glass to sell Some small-scale entrepreneurs specialize in the collection and marketing of items such as batteries, brass, aluminum and other products to larger recycling/processing companies located either locally or as far away as Beijing At least one women-run NGO in Ulaanbaatar is generating enough income through their recycling efforts to not only sustain the NGO, but their families

There is growing concern about the increase in the amounts of containers of household chemicals such as cleaning agents No proper centralized disposal/collection system exists, so containers are dumped or burned, potentially releasing toxic compounds into surface & groundwater (through leaching), soils (leaking) and air (burning)

Zoning/Planning

The zoning patterns that were established in the central planning period shaped the current development in the city The industrial zone is in the southwest part of the city The gher districts are located mainly to the west and north of the city Emissions from the power plants and other industries that are located in the industrial zone and from the gher districts are carried over the rest of the city by the predominantly westerly and northerly winds The "suburban areas" are spread throughout the Ulaanbaatar valley and are not zoned areas, but rather, informal settlements that have sprung up since 1990 Inhabitants of these settlements are attempting to take advantage of the opportunities that Ulaanbaatar offers, yet are still largely dependent upon herding activities to supplement their incomes Such settlements contribute to environmental degradation of the region they have almost no urban services, and the livestock that inhabitants keep degrade the land resources

Gher Districts

Gher districts and other informal housing districts (perhaps including "suburban areas") suffer a higher cost of living, less convenience, greater transportation problems, and greater difficulty accessing household necessities than formal housing districts Table 3 13 illustrates the ranking of major problems experienced by gher residents Water consumption in gher districts is 10 liters consumed daily (lcd), compared with the consumption rate of 420 lcd in apartment districts

Table 3 13 Ranking of Major Problems By Gher Area Residents

Infrastructure & services	%	Other services	%	Tasks done by themselves	%
Electricity	53	Bathhouses	83	Heating house/gher	96
Solid waste collection	51	Telephone	68	Bathing	53
Roads, streets & paths	45	Food shopping	32	House/gher maintenance	34
Water supply	40	Kindergartens	11	Fetching water	28
Storm water drainage	32	Schools	5	Sanitation	28
Public transportation	32			Keeping water out of plot	5
Bridges	11				

(Adapted from Government of Mongolia, *et al*, 1995b)

Smaller Settlements

Most aimag centers have central water supply and wastewater systems that provide coverage to 10 percent of the population (mainly in the central part where apartment buildings and offices are located) Water supply and wastewater treatment systems face a number of obstacles

- Difficulty functioning in winter,
- Irregular electricity supply,
- Difficulty in obtaining spare parts
- Old, obsolete, inefficient Soviet technology,
- No cost recovery

The remaining 90 percent of the population in aimag centers has limited access to quality water, and all have pit latrines Groundwater is the principle source for drinking water, and there is a dearth of wells that provide high quality drinking water A review of data for the settlements of Uliastai, Khovd, Moron, Ulaangom, and Ulgiy shows that there is a wide range in services The settlements that seem to have more sophisticated services (higher percentages of piped water and/or electric pumps) may actually suffer more currently because the electricity supply is unreliable or non-existent Pumps are in a state of disrepair, in general, and places that have electrical pumps are particularly disadvantaged because of disruptions in electricity supply In the winter, water supply systems (where they exist) and wells often do not supply enough water because of the freezing temperatures Often, people are forced to melt frozen surface water (from rivers, lakes, and snow) to meet their needs in the wintertime

Table 3 14 Water and Distribution Systems in Smaller Settlements

		Settlement (data in percentages)				
		Uliastai	Khovd	Moron	Ulaangom	Olgiy
Source of water	Manual off-take from river	5	2	2	15	2
	Hand winch (groundwater)	0	18	5	20	33
	Electrical pump (groundwater)	95	78	91	63	63
	Diesel pump (groundwater)	0	2	2	2	2
Distribution	Manually transported	5	20	4	35	42
	Truck to consumer	22	1	2	1	1
	Truck to kiosk	0	2	50	15	5
	Pipe to kiosk	0	15	38	12	5
	Pipe to consumer	73	62	6	37	47

(Compiled from W S Atkins International, Ltd, et al , 1997)

Sanitation in the same four settlements consists of pit latrines for 86 – 93 percent of the residents, with the remainder served by piped water born sewage systems The sewage systems empty into lagoons It is likely that pathogens from the pit latrines infiltrate the water supply

Three major projects and several smaller ones (implemented by PVOs) are currently under implementation to improve the provision of quality water (using hand pumps) and improve sanitation conditions [10] These projects seek to support the government's policy of encouraging the local community to manage their own water supplies through cost-recovery and self-maintenance However, in many cases, the local government has had to assume responsibility for the time being

No soum centers have central water supply or wastewater treatment systems, and access to a decent supply is critically bad in 80 soums Sanitation levels are also poor in the soums, compounded, of course, by the shortage of water

Water quality is also a problem Often, *e coli* and other pathogens from human and animal wastes contaminate groundwater sources and the general contamination of groundwater that occurs through leaching is exacerbated because sanitary protection zones around wells are not observed In places like the Gobi region, water is hard and highly mineralized, creating human health problems and corrosion in the pipes of small-scale heating systems Some French equipment is being used in Gobi to soften the drinking water supply In very remote rural areas, people are also forced to rely on contaminated and/or mineralized water supplied by the wells that were installed primarily for livestock

There are many sanitation issues surrounding the use of improperly constructed or maintained pit latrines In the eastern part of the country, for example, geological conditions

[10] WASH21 (Funded by the UNDP, AusAID and the Government of Sweden) is addressing the water supply sanitation and hygiene education needs of low income groups in about 50 rural soum centers and peri urban areas in five to six aimag The ADB is providing funding for the improvement of water supply and wastewater treatment in five western aimag towns (Ulaangan Khovd Olgi Uliastii Moron) JICA is providing improved water supply capacity in Altai City and Ulaanbaatar

complicate pit latrines in because bedrock is so close to the surface There, the feasibility of building septic tanks is being examined

Incidentally, there are high levels of nickel, copper, chromium, molybdenum, and tin in the soils in Erdenet, presumably because of the mining and processing activities there (DanEduc a/s/ADB, 1997e)

3 10 Transportation and Communications

The transportation network in Mongolia is limited, inhabiting the movement of goods and people internally and internationally Less than half of the road surfaces between the major cities of Ulaanbaatar, Darkhan, and Erdinet are paved The provincial road system consists of 112 km of paved road and 1,530 km of gravel roads

Because of the lack of good road surfaces or roads altogether, off-road driving is prevalent in the country-side This practice leaves scars on the landscapes as exposed, fragile soils are subjected to wind and water erosion Routes between the main cities, particularly, are heavily trafficked, and the Ministry of Nature and Environment conservatively estimates that multi-tracking has damaged 800,000 to 1 million hectares

The principle artery of the railway system is the 1,116 km long north-south line between Sukhbaatar and Zameen—Uud, which runs through Ulaanbaatar The system also includes several branch lines that link outlying towns to the north-south artery (455 km total) There is an unconnected 349 km long railway line in the eastern part of the country that provides access to mines in the region The fences along the railroads—especially the principle north-south artery—interfere with gazelle migration routes

3 11 Military Sites

Military sites and defense areas cover a total of 25,922 square kilometers (in 1993) in Mongolia, many of the sites are entirely or partially abandoned Military facilities had been built prior to 1990, primarily to serve the defense needs of the former Soviet Union and employed 24,500 servicemen 1988 The greatest concentration of military sites is along the rail corridor that goes from Ulaanbaatar to the border with China in SE Mongolia The Soviets abandoned them in haste, leaving behind untold quantities of toxic and other harmful materials (such as explosives) Local people have converted some of the facilities to suit their needs—using bunkers as protective corrals for their livestock, for example

CHAPTER FOUR
LEGAL, POLICY, AND INSTITUTIONAL FRAMEWORK

4 1 Introduction

The Ministry of Nature and Environment and the Government of Mongolia have made significant strides in creating a legal, policy, and institutional framework for environmental management under a market-oriented system Comprehensive and effective environmental management techniques prior to 1990 were virtually non-existent, and those that existed were of limited design and not widely applied

4 2 Legislation[1]

Since 1994, the Government of Mongolia has passed sixteen laws that have direct bearing on environmental protection Table 4 1 lists the relevant laws and the years in which they were passed

Table 4 1 Relevant Environmental Laws

Name of Law	Year Passed	Name of Law	Year Passed
Law on Land	1994	Law on Forests	1995
Law on Underground Resources	1994	Law on Natural Plants	1995
Law on Mineral Resources	1994	Law on Water	1995
Law on Protection of Livestock Genetic Fund & Health	1994	Law on Hunting Reserve Use Payments and on Hunting and Trapping Authorization Fees	1995
Law on Environmental Protection	1995	Law on Natural Plant Use Fees	1995
Law on Air	1995	Law on Water & Mineral Water Use Fees	1995
Law on Hunting	1995	Law on Fees for Harvest of Timber & Fuelwood	1995
Law on Protection from Toxic Chemicals	1995	Law on Special Protected Areas	1995

Institutional responsibility for implementation is shared among several national and local level bodies Responsibilities of the Ikh Khural (Parliament) of Mongolia and the Cabinet of Ministers encompass all national-level policy and law making activities The Ministry of Nature and Environment provides technical support to the Ikh Khural and Cabinet of Ministers, and implements the laws and policies passed by them MNE is also responsible for various coordination activities The Ministry of Trade and Industry's responsibilities in many ways mirror those of MNE, but from a development/exploitation perspective rather than a protection/conservation one Lastly, as a result of decentralization efforts, many responsibilities for environmental protection lie with local government institutions A discussion of the effectiveness of the institutional structures follows

[1] Information for this section was gleaned mainly from two documents Wingard J R 1996 and DanEduc a/s/ADB 1997c

The legal framework for environmental protection is relatively good, given the fact that Mongolia has had less than a decade to bring its legislation in line with the ongoing transition to a market-oriented economy There are , however, several major gaps The Law on Protection from Toxic Chemicals is very vague There is no law on liability for environmental damages, which may be of concern particularly to potential foreign investors, and perhaps decreases the degree to which other environmentally-related laws are observed Additionally, the conditions necessary to support the environmental legislative package such as regulations, policies, and implementing institutions (including the courts) are weak

The articles in the laws that address financial issues (e g , funding, fees, and fines) are extremely weak and vaguely worded, contributing to implementation difficulties The Mongolian Law on Special Protected Areas, for example, states that funding for Mongolia's protected areas system has four primary sources the central and local budgets, private donations, fines for violations of the law, and tourism Authority to establish fees and fines is not expressly delegated Moreover, the mandated distribution of fines and fees collected is also unclear Often, local level governments and agencies do not receive the money that is earmarked for them, further inhibiting their abilities to perform their duties

The laws can be grouped according to their subject

Water Resource Management

Water Law, Water & Mineral Water Use Fees Law, Protection & Use of Border Water (Bilateral Agreements with the Governments of Russia and the PRC)

The water law permits two types of water use (commercial and household), limits potential use (and withdrawal) to that which does not disturb a "natural and ecological balance" and establishes three types of water protection zones (Protected, Sanitary and Community Protection Zones) In some places, the wording is vague

Conservation of Wildlife and Natural Plants

Law on Hunting, Law on Payments for the Use of Hunting Reserves and on Authorization Fees for Hunting and Trapping), Law on Natural Plants, Law on Fees for the Use of Natural Plants, Convention on International Trade in Endangered Species (CITES), Convention on Biological Diversity, Cooperation for Environmental Protection (e g , bilateral agreements with the Governments of Russia, PRC, and the Kyrgyz Republic)

The laws do not adequately address the hunting and poaching pressures brought on by Mongolia's current economic situation in that they are too narrow in their scope and they do not provide for adequate resources for dealing with the problems An additional problem of the Hunting Law, for example, is that it includes very detailed provisions regarding implementation, which reduces the flexibility of implementation

Protection from Toxic and Hazardous Substances

Law on Protection from Toxic Chemicals

This law is considered the weakest of the laws implemented since 1990 There is no chemical industry in Mongolia,[2] but the importation of chemicals has risen from 1,000 types (or 3,000 if medicines are included) to 7,200 types Moreover, Mongolia has reportedly received requests to accept hazardous wastes from other countries for disposal in the Gobi desert The law and ancillary regulations fall short of providing a "cradle-to-grave" management plan for the monitoring and control of the production, export, import, storage, trade, transport, use or disposal of toxic chemicals

Regulation of Land Use and Protected Areas

Law on Land, Law on Special Protected Areas, Mining Law, Convention to Combat Desertification

Environmental problems related to land use are problematic in Mongolia because of the current uncertainties associated with private land ownership The Environmental Protection Law states that land and natural resources belong to the State, while the Constitution stipulates that Mongolian citizens have the right to own land (except for special use lands such as pasturelands, common use land, and land required for special needs) The government is proceeding with long-term leases of land for the time being Land is under increasing pressure from such activities as overgrazing, illegal dumping of solid wastes (and sludge from industries which may contain hazardous wastes), and the failure of mining operations to engage in reclamation activities

While the existing laws address the problems fairly well, they are not well implemented for lack of resources and political constraints

Management of Forests and Forest Resources

Law on Forests, Law on Fees for the Harvest of Forest Timber and Fuelwood

The stated purpose of the Mongolian Law on Forestry is to manage the protection, proper use and regeneration of Mongolia's forests It does not, however, define "forests" but rather, refers to "forest resources" in "forest territories " The law permits local governments to grant citizens, economic entities, and other organizations the rights to use the forests and forest resources based on a permitting process Forests are divided into three types of protected zones, and uses are restricted differently for each zone Although the law establishes state

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[2] A pilot study testing latest production technology for phosphate fertilizers and potential environmental impacts is now underway Reportedly the NGO community is adamantly opposing the establishment of a chemical industry in Mongolia (ADB Review of Environmental Legislation June 1997)

ownership of forests, permitted users may also "own" the resources on the land they lease, provided they pay the relevant fees, which creates confusion for those responsible for managing forests Provisions for user fees and fines for misuse are stipulated in the law

Air Quality Management

Law on Air, Vienna Convention for the Protection of the Ozone Layer, Convention on Climate Change, Montreal Protocol on Substances that Deplete the Ozone Layer

The law has four chapters that govern the general purposes, administration and information related to air quality, the various measures for protection, and the fines and penalties for violation of the law It is perhaps the broadest of the environmental laws, designed to guide comprehensive policy formulation The law gives tremendous responsibility to local governments to implement the law It also requires the Ministries of Nature & Environment and Health to draft air pollution standards, and stipulates that other ministries are responsible for the "professional control" over polluting emissions and their "hazardous impacts "

4 3 Policy and Regulations

Although the Ikh Khural and Cabinet of Ministers are responsible for enacting national level policy and laws related to environmental protection, it is the responsibility of the Ministry of Nature and Environment to provide the principle technical capacity (design and implementation) behind the laws and policy

Many of the policy changes that the MNE has adopted have been supported and guided by two projects funded by the Asian Development Bank The first was in 1995 and promoted the adoption of EIA procedures based on international standards The second, entitled "Strengthening Environmental Management Capability in the Ministry of Nature and Environment" took place in 1997 and included eight components Review of Environmental Legislation, Report on Training, Review of EIA Procedures, Report on Institutional Development, Report on Environmental Standards, Report on Environmental Monitoring, Strengthening the Role of MNE in Disaster Management, and Report on a Permit System

As with the legal framework and perhaps to a greater degree, the implementation effectiveness of the policies and regulations are limited by the fact that tremendous gaps exist Moreover, the conditions and resources to implement those that do exist are lacking

Environmental Impact Assessments (EIAs) are reportedly sometimes little more than a nominal step in obtaining a permit to engage in manufacturing and extraction activities The process used by the relevant ministries to refer proposed projects to private firms that conduct EIAs is often political and part of a chain of kickbacks to those who grant permits Moreover, Governors and Inspectors in the aimags are not aware of all that an EIA entails

In addition to identifying specific types of projects for which EIAs must be completed (such as mining projects, oil projects, heavy industry projects, etc), the resolution on EIA procedures (Resolution #121, June 1994) also states that EIAs must be done on policies, master plans, and programs The failure to observe this stipulation—and the consequent separation of environmental policy from all other policy—constitutes one of the greatest weaknesses in the policy framework Almost all sectoral and national development policies have environmental implications It appears that the government's approach, however, is to formulate sectoral and development policies in the economic restructuring process and then apply existing environmental policies to them The adoption of strategic and sectoral environmental assessment—that is, comprehensive environmental assessments of policies, plans, and programs which internalize all negative externalities—would enable more accurate cost/benefit analyses and sounder decision-making

Most of Mongolia's few environmental standards are ambient standards for water, air, and soil quality In addition to revising the existing ambient standards, efforts are underway to design discharge and emission standards, which will be enforced through a pollution permitting system that is also under design The specialist at MNE who is responsible for establishing standards and designing the permitting system registered concern that the political will, resources, and institutional capacity at the local levels that are necessary to implement them are lacking Nonetheless, MNE plans to have standards and a permitting system in place by the end of 1998 The standards and permitting system will be first steps towards realizing ISO14000, which were adopted by the Mongolian National Standards Organization in May 1998

Mongolia has had a weak system of ambient environmental monitoring and is in the process of trying to begin monitoring pollution discharges and emissions These efforts are inhibited by a lack of equipment and trained staff Regional Environmental Analytical Laboratories generally have only the following equipment photoelectrocalorimeter, pH meter, aspirator, distilled water apparatus, drying box, analytic balance, and a technical balance and therefore, cannot perform complex analyses Staff and equipment at the Central Environmental Analysis Laboratory (CEAL) of MNE are also inadequate, and there is no reliable system in place to ensure that samples from outlying areas are delivered to CEAL and analyzed in a timely manner The permitting system that MNE is designing will require that enterprises have the capacity to monitor their own discharges and emissions This self-monitoring will be spot-checked by state inspectors

The Ministry of Environment is developing a scheme that operates on the "polluter pays" principle industries and other polluters must pay for the discharge/emission of permitted levels of pollutants, and are fined for discharges and emissions that exceed permitted levels Enterprises are thus encouraged to find ways to reduce pollution levels to below the permitted levels through the adoption of cleaner production technologies and management practices, thereby reducing the fees they must pay and avoiding fines altogether for exceedences

A final major weakness in environmental policy is the lack of clear financing mechanisms to realize environmental protection Officials in MNE stated the Environmental Fund, which

was established in the late 1980s on the Soviet model, has long been defunct Under the model, a significant percentage of fees and fines collected at the local level is supposed to remain there, while the rest is distributed to the central budget, MNE, or other special funds Revenues generated from environmentally-related activities (hunting, logging, protected areas entrance fees, etc) are collected at the local levels, but their distribution is far from transparent The lack of regulated financing mechanisms is detrimental to the ability of officials at the local levels to effectively carry out their responsibilities Similarly, percentages of fees (especially for operating licenses, for example) collected at the central level are not distributed to the local levels Another phenomenon that reduces management effectiveness and transparency is that of unofficial fees (or legitimate fees based on unofficial calculations) which are extracted by officials at various levels from those engaged—legally or illegally—in resource extraction

The Mongolian Environmental Trust Fund (MEFT) is an exception to the general dearth of financing mechanisms, although it is not yet actively disbursing funds for project implementation The METF was legally registered in the Netherlands in 1997 and in Mongolia in January of 1998 The objectives of the MEFT are to "fund projects which will contribute to the conservation and sustainable management of the land and its resources, including the diverse ecosystems, the wildlife and abundant biodiversity of Mongolia and to the reduction of desertification in Mongolia " (Mission statement as noted in the MTEF brochure) The GEF and several bilateral donors have pledged amounts to the fund, and the GEF will provide matching funds up to US$2 million, but so far, funds have not been received from international sources

4 4 Action Plans

The Government of Mongolia, in some cases with assistance from foreign donors, has prepared several Action Plans in the past four years Among the ones that have direct and indirect bearing on environment are the National Security Plan, the National Development Plan, the Mongolian Action Program for the 21st Century (MAP 21), Biodiversity Protection Action Plan, National Plan of Action for Protected Areas, Forestry Action Plan, National Plan to Combat Desertification, and the National Ecology Policy Others are currently under development the Water Resources Action Plan, The Comprehensive Ecological Education Plan, the Action Plan for Ecologically Clean Production, and the National Plan for Pollution Standards The plans vary from identifying goals and objectives to identifying concrete actions An official at UNDP reported that every aimag has its own Environmental Action Plan, but none were available and the process used to prepare them was not clear

4 5 International Environmental Cooperation

Mongolia has joined several international conventions (see Table 4 2) and has several agreements with Russia, China, the Kyrgyz Republic and Kazakhstan on various environmental topics Limited financial resources and internal preoccupations preclude a high level of observation of international agreements The bilateral agreement with Russia

about the Selenge River, for example, has not been observed, and the monitoring stations that were to have been established under the agreement on either side of the border have not been

Table 4 2 International Conventions to Which Mongolia Belongs

Convention	Year Joined
Convention on Biological Diversity	1993
Convention on Climate Change	1994
Convention on International Trade in Endangered Species of Wild Fauna and Flora	1994
Vienna Convention for the Protection of the Ozone Layer	1996
Convention on Combating Desertification and Drought	1996
Basel Convention on the Control of Transboundary Movement of Hazardous Wastes & Their Disposal	
Convention on Wetlands of International Importance Especially as Waterfowl Habitat	1997

(Source MNE)

The Director of the Department of International Cooperation at MNE stated that Mongolia is preparing to join four more international conventions the Rotterdam Convention, the PIC Convention, one addressing persistent organic pollutants, and one addressing chemical weapons prohibitions Some officials within the MNE registered concern that Mongolia is in a race to join international conventions without possessing an in depth understanding of them or the resources to abide by them, and suggest that scarce resources should be used on more immediate concerns

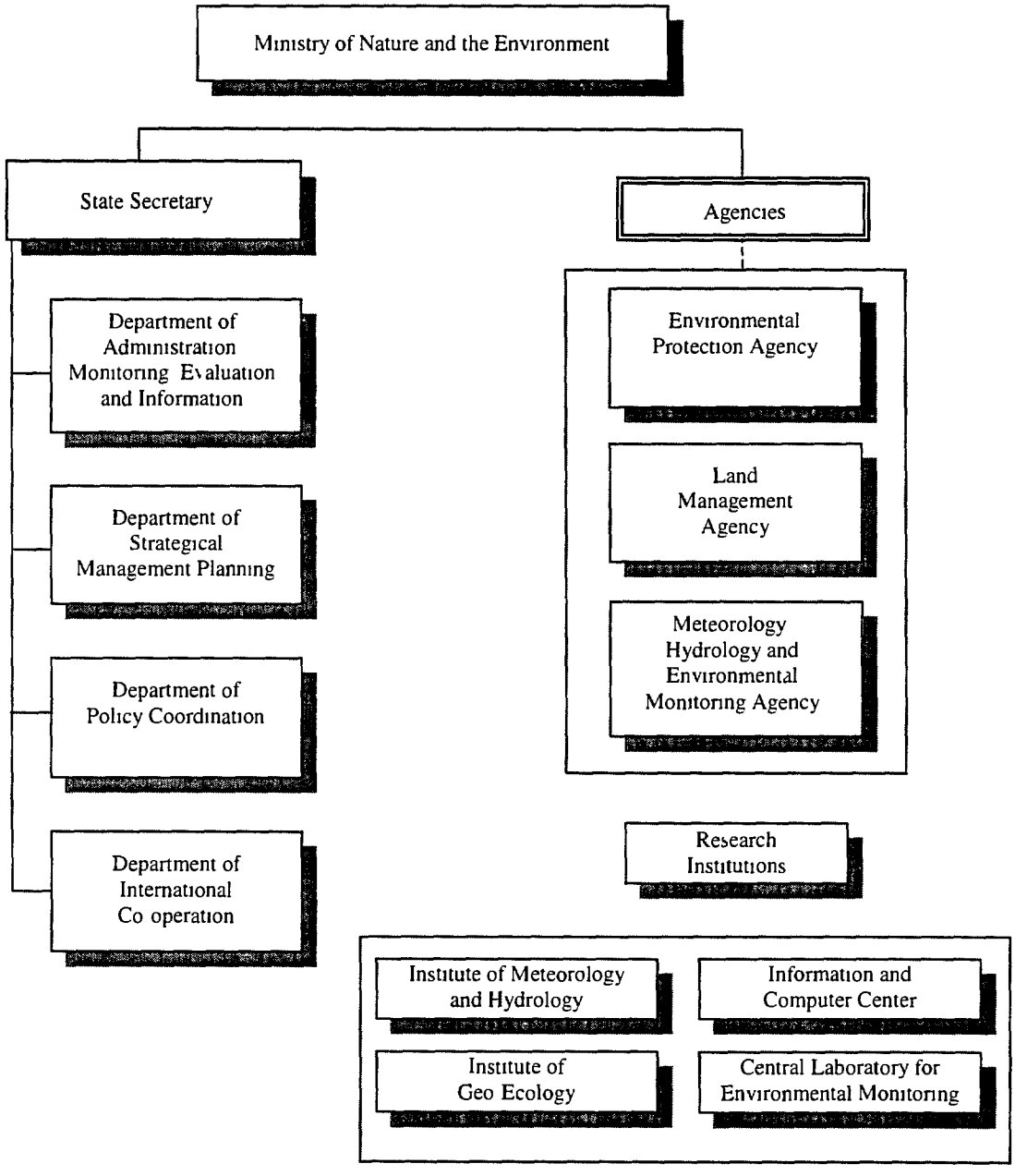
4 6 Institutional Framework

As mentioned earlier, the Ikh Khural and Cabinet of Ministers have responsibility for enacting national level policy and laws However, environmental technical capacity resides in the Ministry of Nature and Environment Among MNE's responsibilities are the following seven

- To organize the implementation of national policy on environmental protection, resource use, and sustainable development,
- To monitor implementation of environmental legislation,
- To organize the restoration or rehabilitation of resources damaged by unlawful actions,
- To approve, monitor, and provide technical assistance to local authorities and state agencies for implementation at the local level,
- To provide coordination across sectors and among regions,
- To establish limits on resource use and to develop and have approved appropriate standards of environmental quality, and
- To promote research and development, international cooperation, and the dissemination of information on environmental issues

The Ministry of Nature and Environment is organized according to Figure 4 1 With only 37 staff members in the Ministry at the national level (excluding staff at the associated institutes), MNE is unable to fulfill its mandate

Figure 4 1 Organizational Chart of Mongolia's Ministry of Nature and Environment



The majority of the burden of implementation of all environmental laws and policies resides at the local level Aimag and Capital City Governors have the following responsibilities, but have not received the necessary training and resources to be able to fulfill them adequately

- Develop measures of environmental protection,
- Transmit ecological information stored in local information databanks to the MNE,
- Control any activities of local business entities If necessary, the Governor shall also prohibit their activities that have adverse effects,
- Coordinate activities of the local environmental organizations,
- Equip chief inspectors with required tools and transportation

State Inspectors and Rangers (of which there are between 950 and 1,100, officially) carry out monitoring and enforcement activities but their responsibilities are not clearly defined According to the Mongolian Law on Environmental Protection, the four duties of the Inspectors are to monitor, inspect, collect information, and supervise and instruct rangers They have the authority to temporarily shut down operations if environmental violations are discovered, but they do not have the power to arrest Although by law they are required to have use of vehicles to perform their duties, current budgetary constraints preclude this, severely restricting the Inspectors

Rangers do not have to have college degrees and are limited in their ability to monitor the environment because they do not have the right to inspect

Training for MNE staff, governors, inspectors, and rangers has been inadequate Some staff members at the central office of MNE have received specialized training in the last several years However, comprehensive training for all MNE staff members has not taken place Moreover, the local government officials, inspectors, and rangers in the aimags and soums—those who are responsible for environmental management—sorely lack even basic training about the laws, regulations, and policies that have been enacted in the past several years Many may not be fully aware of what it is that they're supposed to implement, let alone how

The development of democracy and a vibrant NGO sector in Mongolia already shows great promise for extending the effectiveness of conventional environmental management strategies People are taking action through the growing number of non-governmental organizations (NGOs) that are tackling a wide range of environmental problems—from the "green" to the "brown " Table 1 in the Annex identifies the active NGOs and their projects The maturing civil society in Mongolia means that communities themselves are becoming more active in monitoring and sanctioning negative activities on the part of enterprises (including mining, logging, and production enterprises) Even as early as the mid-1980s, citizens in the Khovsgul region resisted the development of a phosphorous mine so plans were abandoned (MNE, 1997a) Gold mine operators in Zaamar indicated that they were more likely to come under pressure from—and respond to—residents in the region than from the state to perform reclamation activities

The business community has recently formed a Business Council for Sustainable Development which has close ties with the Mongolian Chamber of Commerce as well as with the international Sustainable Development Business Council that is based in Geneva, Switzerland Members are interested in learning more about clean production and economic ways of reducing their environmental impacts Interestingly, one of the first activities of the Council was to raise a total of US$5,000 through donations from about 20 of the Council's member firms for the Mongolian Environmental Trust Fund [3] This demonstrates that, while negative environmental impacts from enterprises are not likely to be resolved immediately due to the epidemic shortage of funds, there is a certain level of commitment to environmental protection

The number of private sector environmental consulting firms is growing in Mongolia In 1995, there were three firms licensed to carry out environmental impact assessments, and now there are at least twelve Preliminary EIAs are done by the Ministry of Nature and Environment, but these private sector firms often do the ensuing detailed EIAs The president of one of the first licensed firms, Orchlon, noted that many specialists in the environmental private sector in Mongolia are aggressive about trying to get information from the west about the latest practices in EIAs, clean production, and environmental management for enterprises It is likely that these firms will also develop the capacity to conduct environmental audits on existing firms This may be particularly useful for managers of newly privatized firms who will be motivated to operate on a for-profit basis, and therefore be interested in reducing their costs and wastes

[3] The contribution of the local firms is particularly remarkable because the foreign donor community has pledged at least three million dollars but has not yet disbursed any money to the Fund

CHAPTER FIVE
REVIEW OF THE NEAP

The National Environmental Action Plan was prepared in 1995 by consultants from the World Bank in conjunction with a Working Group and other specialists in Mongolia, based on a process that was initiated in 1993 Drafts prepared by the consultants and the Working Group were circulated to many ministries, and joint meetings allowed the other ministries to share their views and comments

The NEAP contains some background about each of the issues it identifies The problems identified as the highest priority issues are urban pollution (including air water, and solid wastes), water supply, land degradation, institutional and capacity building, and the application of environmental economics The next level of priorities as identified by the plan were hazardous wastes from mining and petroleum extraction, natural disasters, and forest resources, the development of public awareness, protection of natural heritage and appropriate tourism development

All of the activities (or stated more correctly, objectives) that feature in the NEAP are in Tables 5 1 and 5 2 Projects that have since been implemented which address needs identified in the NEAP are also briefly identified in Tables 5 1 and 5 2 For a better understanding of the projects that have been implemented to address the needs identified in the NEAP, please cross-reference with Table 2 in the Annex

Three years have passed since the first NEAP was finalized Most environmental specialists in MNE and the donor community say that the priorities have changed since the NEAP was developed Many specialists in the government (and MNE) are not aware of the NEAP, because there has been a high degree of turn-over in staff and also perhaps because it had not been widely circulated when it was prepared Other Action Plans (listed in Section 4 4) that have been prepared since 1995 are given equal weight with the NEAP

Based on discussions with specialists in the Ministry of Nature and Environment, the Ministry of Infrastructure Development, the Ministry of Agriculture and Industry, local inspectors in the aimags, and site visits, the priorities in 1998 are represented in the following table

Government ministries have consolidated since the NEAP was prepared in 1995 The following is a list of ministries, agencies and their abbreviations, as found in the following tables which were based on the NEAP document

Acronyms of former ministries and agencies as they appear in the 1995 NEAP

Asian Development Bank	ADB
Global Environment Facility	GEF
Local Governance	LG
Ministry of Culture	MOC
Ministry of Demography and Labor	MDL
Ministry of External Relations	MER
Ministry of Finance	MOF
Ministry of Food and Agriculture	MFA
Ministry of Energy, Geology and Mining	MEG&M
Ministry of Health	MOH
Ministry of Infrastructure Development	MID
Ministry of Justice	MOJ
Ministry of Nature and Environment	MNE
Ministry of Science and Education	MSE
Ministry of Trade and Industry	MTI
Mongolian Academy of Sciences	MAS
Mongolian Radio and Television	MRT
National Development Board	NDB
Non-Governmental Organization	NGO

Table 5 1 Summary Table of Highest Priority Actions (According To Neap)

	Implementation & Monitoring	Estimated Cost	Donor Activity
URBAN AIR POLLUTION			
Conduc t EIA or power generation improvement projects, require installation & maintenance of emissions treatment facilities and emission control equipment, provide staff training on environmental management skills	MEGM MNE	US$150k	
Develop & implement Enviro Master Plan for energy sector and revise the energy & Coal MP, develop staff capability for energy-environment management,	MEGM, MNE	US$ 150k	
Train staff on EIA, develop sectoral EIA guidelines, enforce EIA requirements for energy projects,	MEGM, MNE	US$ 20k	
Design and produce efficient stoves, conduct a study to assess dissemination of fuel for household (gas &liquid)	MEGM, MTI	US$ 300k	British Gov't donated funds to cover start up costs of local firm that makes efficient stoves, WB is considering a small loan to make efficient stoves more accessible to gher dwellers
Examine partially centralizing heating for urban households improve efficiency & complete combustion in boilers and household stoves	MEGM LG, MTI	US$ 200k	
URBAN WATER POLLUTION			
Improve monitoring of water quality (both chemical & bacteriological), provide sanitary toilet facilities and waste disposal for the gher communities, improve sewage and waste removal capabilities in the non-gher parts of the cities, improve and expand the wastewater treatment facilities Reduce leakage & wastage of water in urban areas, linked with installation of water metering devices & effective & equitable assignment of costs	??	US$ 20m	There is some PVO activity in water supply / sanitation provision across the country, including the WASH21 project (funded by UNDP and various bilateral donors) Dutch Gov't has identified rehabilitation needs of central wastewater treatment plant in UB
Tuul River pollution mitigation Est costs $200k	??	US$ 200k	Dutch Government (wastewater plant rehab)
URBAN SOLID WASTES			
Maintenance, reconditioning and, where necessary, strengthening of existing solid waste collection vehicle fleet, review and development of opportunities for enhanced recovery of recyclable wastes from the waste stream, evaluation of disposal options including the question of econ incentives, development of sanitary disposal sites to handle domestic & industrial solid wastes incorporating appropriate environmental controls	??	US$ 250k	WB feasibility study for UB n 1996, Dutch Government study in 1998 Independent NGO collection and recycling activities in UB and Darkhan
LAND DEGRADATION			
Complete & implement the National Plan of Action to Combat Desertification which will serve as the Land Degradation and Desertification, and Overgrazing sections of Mongolia's NEAP	??	??	National Plan of Action to Combat Desertification has been completed, and an implementation has been established in MNE

	Implementation & Monitoring	Estimated Cost	Donor Activity
Develop & implement restoration programs for certain particularly critical abandoned-cultivated areas	MFA, MNE	US$ 150k	
Improve the cultivation on currently cultivated areas which are subject to particularly serious erosion	MFA, MNE	US$ 300k	USAID Agricultural lands study (1998) proposes no till methods of farming
WATER SUPPLY			
Complete drafting of new water law, develop regulations and implement the law, establish training programs for the personnel required	MNE, MOJ, LG, MFA	US$ 25k	New Water Law passed April 13, 1995 and went into effect on June 5, 1995 Regulations to support the law are under preparation by MNE
Improve the supply and reduce the wastage of water in urban areas	??	US$ 2m	PVO activity+ WASH21 addressing some water supply needs in urban areas across the country
INSTITUTIONAL STRENGTHENING & CAPACITY BUILDING			
Strengthen the coordination between MNE and other line ministries, and strengthen MNE's enforcement powers	MNE , UNDP & line ministries	US$ 1m	Recommendations on how to strengthen coordination were made during the ADB Strengthening Environmental Institutions project (1997)
Strengthen the EIA procedures & implementation, develop training for EIA prep & monitoring	MNE & line ministries	US$600k	ADB projects EIA Development (1995) and Strengthening Environmental Institutions project (1997)
Strengthen MNE's monitoring and overview of gov't environmental performance Est costs $1m	MNE	US$ 1m	Recommendations on how to strengthen monitoring activities were made during the ADB Strengthening Environmental Institutions project (1997)
Complete & implement the comprehensive & ambitious Capacity 21 Programme involving training at both central and local government levels, as well as public awareness & education	MNE, NDB, UNDP, MSE, and line ministries	Budgeted under UNDP & GoM $1 5m	Capacity 21 project was abolished on the national level in 1997 and has since been abandoned at the local levels
ENVIRO ECONOMICS/ENVIRO INCENTIVES			
Continue implementation of the Canadian-Mongolian project on environmental economics develop and implement proposals for economic incentives, environmental financial mechanisms and methodologies	MNE & MDB	Grant	Canadian environmental economics project was implemented between 1995 and 1996
ENVIRO DEGRADATION FROM MINING & PETROLEUM ACTIVITIES			
Determine the geotechnical stability of Erdenet tailings dam, and assure its long term safety	MEGM & MNE	US$ 200k	
Determine the extent & magnitude of tailings dust contamination & water pollution from mining operations, and undertake necessary corrective & restoration actions	MEGM, LG, MNE	US$ 80k	The WB Coal Rehabilitation project is implementing reclamation activities at Baganuur coal mine ($250k)
Assess the extent & magnitude of environmental damage from oil leakage & other activities associated with oil exploration, and institute necessary control & restoration programs	MEGM, MID, MNE, LG	US$200k	

NEXT PRIORITY ACTIONS (according to the neap)			
NATURAL DISASTERS			
Develop & implement a master plan for disaster preparedness & disaster hazard reduction	SACD, MOF, MFA, MFE, MOH, LG, MNE	US$ 4 5m	Recommendations made to MNE about how to strengthen their preparedness for disasters during the ADB Strengthening Environmental Institutions project (1997)
PUBLIC AWARENESS & EDUCATION			
Review existing environmental programs to assess needed public awareness & public education efforts The Capacity 21 Programme, Mongolian Biodiversity Program, Plan of Action to Combat Desertification, and others all have important public awareness & education components	MSE, MNE, NDB, LG, NGOS, MRT and universities	US$ 2m	
BIODIVERSITY & TOURISM			
Continue implementation of the Biodiversity project and broaden the base of support within the gov't and public	MNE, LG, universities, and MAS	US$ 1 5m for Phase 1 thru 1995?	Phase II (Eastern Steppe Biodiversity project) launched in 1998
Establish a National Tourism Council for Mongolia	MTI, MNE, NDB, and NGOs	US$ 300k	
FOREST RESOURCES			
Develop and implement a master plan for forest management in Mongolia	MNE and LG	US$ 55 6k	Training in policy reform conducted by FAO (1996-8), Model forest management plans prepared for Selenge by JICA (1995-7), GTZ project addressing forest management in the West Khan-Khentii mountains is beginning in June 1998
Make logging sustainable and environmentally sound	MNE and LG	US$ 15k	See above
TRANSPORTATION			
Incorporate environmental considerations fully in the Transportation Master Plan and develop a comprehensive transportation policy which incorporates environmental considerations	MID and MNE	US$ 1m	

Table 5 2 Summary Table of Lower Priority Actions (According To Neap)

Action Identified in Neap	Implementation & Monitoring	Estimated Cost	Projects and Activities
URBAN AIR POLLUTION/ENERGY			
a) Inventory boilers and limit number of boilers b) Increase the number of users connected to the central system c) Conduct study to install advanced design stoves, treatment and emission control equipment d) Create an organization (or company) with adequate capabilities to provide effective maintenance of the boiler systems	MEG&M, MTI, MID, LG	US$ 1m	
Develop and implement coal preparation methods (washing and briquette manufacturing)	MEG&M	US$400k	
Conserve energy in industrial plants and in households a) Conduct an energy survey and implement demand side management, b) Conduct a study to support improvement of equipment and efficiency of its use and the potential for domestic production of more energy-efficient equipment, c) Revise and upgrade construction standards, d) Utilize differential measure of electricity and heating for users (meters) and implement load management, e) Develop packages/program of financing and economic incentives	MEG&M, MOF, MTI	US$700k	ADB *Energy Audit, Efficiency & Conservation Study* (1992), ADB *Energy Conservation Project* (1996) is installed some meters, repairing pipes, insulation on some heating pipes, valves in network
Improve public awareness on conservation of energy	MEG&M MRT	US$50k	TACIS *Rational Use of Energy project* raising awareness among the industrial sector, ADB *Energy Conservation Project* conducted energy efficiency demonstrations in some apartment blocks (1996)
Improve efficiency of fossil fuel use Develop and complete coal cadastre, implement coal quality control at the mines, introduce coal improvement methods	MEG&M	US$200k	Ministry of Foreign Affairs and Trade of New Zealand study has proposed better coal mining practices to improve quality of coal (Draft, 1998)
Energy conservation at power plants a) Revise the standards for use of energy in power stations, b) Revise construction standards for transmission lines and reduce loss of energy c) Install regulators	MEG&M	US$100k	ADB/WB/DANIDA/JICA/German aid to CHPs in UB, Darkhan and Choibalsan may improve energy efficiency, although that is not the primary objective
a) Develop solid and hazardous waste management in energy sector, b) Train staff on waste management skills	MEG&M, MNE	US$100k	
a) Conduct a study to investigate the possibility of ash reuse, b) Reassess the use of water and waste water discharges in existing plants and improve recycling	MEG&M, MNE	US$150k	
Implement Source Monitoring a) Develop emission/discharge standards b(Utilize complex emission/discharge control equipment, c) Power generation stations should be required to continuously monitor their air emissions and certain parameters, d) Train staff on environmental monitoring and management	MNE, MEG&M	US$200k	JICA provision of filters for CHP No 4 1997-8 (?)

Action Identified in Neap	Implementation & Monitoring	Estimated Cost	Projects and Activities
On the basis of on-going study of alternate energy sources (solar & wind) prepare plans for installation of pilot units at the most optimal sites, b) Provide financial support for production of solar & wind energy units, including needed accumulators, c) Provide training for users on maintenance skills	MEG&M, MNE, and MTI	US$1m	JICA donated lab analytical equipment to MNE in 1993
Hydroelectric program a) Implement small (w/o reservoir) hydroelectric projects at sites located on the basis of studies, b) Conduct complex study of identification of the hydro resources of the country, c) Develop EIA guidelines for hydro projects	MEG&M, MNE	US$5 m	
Cogeneration & advanced technology Conduct a study to 1) assess the potential of cogeneration or byproduct such as fuel cell or compressed air energy storage & waste burning, 2) transfer new advanced tech such as magnetohydrodynamics, 3) Investigate clean coal tech & liquid fuel from coal, 4) Investigate the potential of biogas (e g from methane)	MEG&M MTI	US$100k	The feasibility of using solar/wind co-generation units are under investigation by the TACIS *Rational Use of Energy Project* (1998)
URBAN WATER POLLUTION			
Pollution identification and mitigation in remote settlements a) Provision of a mobile laboratory which can do chemical & bacteriological analyses of wells & surface water supplies for remote, b) Identification & implementation of mitigation measures where pollution (including mineralization) exists	MNE, MOH, LG	US$180k	WASH 21 and similar projects run by PVOs
TOXIC CHEMICALS & HAZARDOUS WASTES			
(ST) Complete & maintain up to date inventory of toxic chemicals used within the country and develop & implement a registration procedure for import & handling of toxic chemicals	MNE, MTI, MFA, AND MOH	US$150k	
(MT) Develop a regulatory framework, and establish related training programs for handling, transporting, use and disposal of radioactive materials and toxic chemicals	MNE, MTI, MFA, MEG&M	US$10k	
(MT) a) Develop a master plan for the disposal of hazardous wastes, b) Establish standards, c) Identify location or locations for disposal	MNE MOH, MTI, MFA, LG	US$50k	
CLIMATE CHANGE			
a) Inventory, assessment & mitigation of activities which create greenhouse gases in Mongolia, in collaboration with the USEPA, b) Develop Mongolian Climate Change Action Plan with assistance from GEF and other donors	MNE NDB, MFA, MEG&M	US$ 1m	

Action Identified in Neap	Implementation & Monitoring	Estimated Cost	Projects and Activities
LAND DEGRADATION			
Develop and implement land use plans for each soum and aimag	MNE, MFA MID LG	US$ 600k	
Place land use planning experts in local gov't, and provide the necessary education and in-service training for them	MNE, MSE, MFA, LG	US$ 2m	
a) Develop & implement legislation and regulations to establish land use fees, and establish a land restoration fund from the revenues, b) Develop the needed land restoration technologies	MNE, Institutes of MNE, and MFA	US$300k	ADB *Strengthening Land Use Policies Project* may address this need (1995-6), ADB *Land Cadastre and Registration Project* (1998-2000?)
Control and reverse the overgrazing near settled areas	??	??	DANIDA *Development of a Resource Management Planning System for Rangeland Management* (1995-7) provided training and recommendations
Develop a realistic action plan for agricultural development	??	US$200k	
a) Improve the water use in irrigated ag lands to conserve water resources and reduce land degradation from salinization & waterlogging, b) Introduce improved irrigation methods and monitor water use	??	US$ 1 5m	
FOREST RESOURCES			
Make logging sustainable a) Establish & enforce cutting rotation and cutting areas b) Stop clear cutting in mtns, c) Stop cutting in key watershed areas, d) Use of animals for wood skidding, e) Improve efficiency of use of felled trees	MNE, LG	US$15k	Initial efforts underway in specific areas by JICA, GTZ, and UNDP/GEF
Reduce the demand for timbers	??	US$ 150k	
Reduce export of logs and sawn wood	MTI MNE	??	
Find new sources of fuel in rural areas	MNE, LG	??	NGO and PVO activity, TACIS *Rational Use of Energy Project*
a) Conduct a study to determine the real extent, status and trends, and costs of insect infestation, b) Seek to identify mitigation measures if there is indeed, a problem	MNE & universities	US$150k	
Develop afforestation programs along transportation corridors, in & around cities and other settlements	MNE, LG	US$250k	
a) Enlarge & improve existing nurseries & establish additional ones where needed, b) Improve the gene pool of nursery stock	MNE, MTI, LG	??	
Implement regs which require reforestation after logging, and protect newly reforested areas from livestock grazing	MNE, MTI LG	??	

Action Identified in Neap	Implementation & Monitoring	Estimated Cost	Projects and Activities
WATER RESOURCES			
a) Identify location and estimate quantity of ground water resources, giving priority to settlements that do not have adequate water supply, b) Establish a monitoring network based on wells of the amounts and quality of groundwater, c) Develop regs and standards for sustainable use of groundwater	MNE, MEG&M, MOH, LG	US$800k	
a) Establish regular monitoring of quantity & quality of surface waters, b) Develop regs and standards for sustainable use of surface water, c) Examine the feasibility of controlling water flow to retain more within the borders of the country, d) Research the possibilities for recharging ground waters, especially in the steppe & Gobi areas	MNE, MEG&M, MFA, LG	US$200k	
Obtain or develop equipment to demineralize & soften water for rural water supplies, esp in the Gobi and steppe areas		US$150k	French equipment for softening water used in Gobi on experimental basis
MINERAL RESOURCES/MINING			
a) Develop additional environmental standards and regulations where needed for waste management, pollution control and restoration of mining sites, b) Implement regular monitoring of enforcement, c) Develop relevant training programs for regulatory personnel	MEG&M, MNE, LG	US$ 50k	
(MT) Develop funding for restoration and environmental management through bonding, environmental performance, bonding, and compensation (suspension of license when is non compliance)	MEG&M, MNE, MOF	US$120k	
(MT) a) Increase funds available for environmental management and restoration, improve the recovery of commercial mineral resources (e g , more modern equipment processes and technologies), b) Obtain more in country value added (i e , economic benefits to Mongolia from further processing and product finishing within the country rather than exporting raw materials for processing elsewhere) through incentives and export restrictions on unrefined or unfinished products	MEG&M, MNE, MOF	US$450k	
Establish laboratory facilities as necessary at areas of high mining activity to facilitate monitoring and environmental assessment	MNE, MOF, MID, MEG&M	US$300k	
AGRICULTURE			
Actions are covered in other sections (land resources, land management, land degradation and desertification, rangeland and overgrazing, cultivated lands)			

Action Identified in Neap	Implementation & Monitoring	Estimated Cost	Projects and Activities
INDUSTRY			
a) Develop and implement environmental master plan for industry sector and revise existing master plan and other action plans which deal with it, b) Develop staff capability to undertake industry-environment management (training decision-makers in the central planning agency, MEG&M, and MNE) c) Extend the national industry planning function to include environmental consideration and introduce advanced analytical tools for planning activity	MEG&M, MNE, MTI, NDB	US$100k	APO Clean Production Seminars to be held in UB and Darkhan in autumn 1998
a) Implement Industrial Siting Management a) Limit development of new industry in UB, b) prohibit single/poorly supported industrial development in high value areas c) Encourage industrial development and waste processing in degraded areas, d) Develop industrial siting concepts including estates	MTI, LG	US$40k	
Strengthen EIA of industry projects a) Train staff on EIA, b) Develop sectoral EIA guidelines and criteria for industrial development projects	MTI, MNE	US$20k	ADB *EIA Project* and *Strengthening Environmental Institutions Project*
a) Enforce ecological passport requirement for industry, b) Develop permit system for industrial pollution, c) Develop package of financial and economic incentives, d) Establish clean technology information service	MTI, MNE	US$ 100k	MNE developing pollution permitting procedure, which would supplant Environmental Passports
Improvement of treatment facilities a) Require initial or otherwise adequate treatment of discharges, b) Require regular maintenance of existing treatment facilities	MTI MNE	US$1 5m	
Develop and implement waste management programs	MTI MNE, LG	US$500k	
Found co-disposal and co-treatment combines	MTI NDB, LG, MID	US$ 1m	
a) Develop and upgrade emission/discharge standards, b) Develop a monitoring program for waste discharges (installing monitoring equipment as necessary), c) Provide training for staff, d) Develop package of financial and economic incentives to reduce emissions and encourage recycling of wastes	MNE, MTI, MEG&M, MOF, LG, MID	US$150k	
Inventory and evaluate air pollution sources from vehicles, b) Develop a system to monitor motor vehicle pollutants, c) Establish automatic air pollution monitoring station in UB, d) Establish emission standards for motor vehicles, e) Develop a system of auto emission pollution taxes, f) Reduce or prohibit lead compounds in motor vehicle fuel	MNE, MID MOF, MOH, NDB	US$ 1m	
Improve roads within cities	LG, MID	US$ 1m	
Improve rural road standards to reduce off road traffic	LG, MID, MNE	US$50k	ADB and WB are funding main roads between the three major cities

Action Identified in Neap	Implementation & Monitoring	Estimated Cost	Projects and Activities
TOURISM/ECOTOURISM			
Develop a comprehensive tourism policy with a comprehensive tourism law and an ecotourism strategy for Mongolia along with environmental regulations particularly for the tourism use of parks and protected areas	MNE, NGOs	??	
Undertake a national inventory of the nation's natural heritage (parks, reserves and other areas which are significant for their biodiversity, outstanding natural scenery and phenomena) and cultural heritage (cultural, historic and scientific sites, monuments, and areas) which can serve as goals for ecotourists	MNE, MOC, LG, MSE, universities	US$ 190k	
Develop sources of funding, for example, from certain fees, for environmental management and maintenance of conservation areas used by tourism (an "ecotourism" fund)	MNE, NDB, MTI, MOC, MOF	US$120k	
a) Establish ecotourism circuits using a network of protected areas and cultural sites, b) Develop environmental management strategies to avoid damages, c) Develop ecorourism infrastructure in protected areas	MNE, MOC	US$280k	GTZ Study on *The Development of Ecotourism in the Protected Areas of Gobi Gurvansaikhan, Gorkhi Terelj and Khan Khentii* (1997)
Conduct EIA for proposed tourism developments and establish carrying capacity for tourist areas	MNE	US$ 450k	
Develop and implement a plan for providing tourist information/interpretation programs for natural and cultural heritage conservation and tourist management in each provincial and major national site	MOC, MNE, MSE, universities	US$21k	
URBAN DEVELOPMENT AND HEALTH			
Conduct a study and assessment to identify industries, etc, which have negative influence on human health (e g , through emissions or discharges)		US$50k	
Improve the outdoor toilets and waste receptacles in gher areas		US$20k	WASH 21 and other PVO projects
INSTITUTIONAL FRAMEWORK			
Continue development and implementation of new environmental legislation, and pay special attention to possibilities to create economic incentives for the enforcement of environmental laws	MNE, Parliament, MoF and MoJ	US$500k	MNE is developing economic incentives to address industry and other sectors
ENVIRO ECONOMICS/ENVIRO INCENTIVES			
Undertake economic-ecological assessment and valuation of the various natural resources and other environmental services and resources to establish a payment systems for their possession, use and consumption and fines for abuses	MNE, MFA, MEG&M, LG	US$5k	

Action Identified in Neap	Implementation & Monitoring	Estimated Cost	Projects and Activities
Develop and implement legislation and related standards and regulations that provide the legal basis for economic management of environment and resources on a sectoral basis	MNE, MoF	US$50k	
Develop and implement a "polluter pays" fee structure for air, water, and soil pollution, so that fees can compensate for damages to health and environment	MNE, MoH, and MoJ	US$15k	ADB *Strengthening Environmental Institutions Project* introduced the necessary concepts, MNE working on system development
ENVIRONMENTAL MONITORING & INFO SYSTEM			
Develop a national environmental monitoring system for sustainable development based on existing networks	MNE, MSE and NDB	US$5 8 m	
Develop an ecological data base	MNE, MSE, NDB	US$5 7 m	
PUBLIC PARTICIPATION			
Invite public comments on environmentally related gov t activities, through the media, Revise all laws and policies to include provisions for public participation	MNE, all other ministries, NGOs	US$100k	
Assign and initiate public affairs activities to vice ministers of all ministries and other organizations which have environmental and natural resource activities and responsibilities	MNE< NGOs, LG MOJ, and line ministries	US$10k	
Implement a program for regular encouragement and facilitation of public and NGO initiatives in environmental activities, such as tree planting, river cleaning, and soil protection	MNE NGOs, and LG	US$500k	
Organize symposia, workshops, conferences and other meetings on environment, impact assessment and projects to encourage maximum public participation	MNE, NGOs, MRT, and LG	US$100k	
STRENGTHENING THE ROLE OF NGOs			
Strengthen NGO participation in environmental activities such as implementation of public awareness, review of gov't programs, regulations, EIA, and implementation of appropriate governmental environment projects	MNE, MRT, NGOs, and LG	US$500k	
Support and strengthen NGO environmental periodicals	MNE, NGOs	US$100k	
Encourage/assist development of an NGO Council (when there are enough NGOs to warrant such action)	MNE, NGOs	US$30k	
INTERNATIONAL COOPERATION			
Review existing gov't activities in international cooperation in environmental affairs and, bearing in mind present gov't capacities, determine where additional initiatives/actions are needed, particularly in terms of international environmental conventions and agreements	MNE, MER, NDB, MTI	US$500k	

Action Identified in Neap	Implementation & Monitoring	Estimated Cost	Projects and Activities
Elaborate National Agenda 21, and when approved, initiate implementation	MNE, NDB	US$800k	MAP 21 launched on June 16, 1998
Conclude agreements with neighboring and other states (and international agencies) on environmental protection, combating of natural disasters, ecological security	ME, MNE NDB, and MDL	US$500k	
IMPLEMENTING THE NEAP			
Monitor the implementation of the NEAP and provide annual reports to the Cabinet, Parliament, and the public on the status of implementation	MNE, NDB, MOF		TACIS *Development of Environmental Policy in Mongolia and the CIS*, Phase II to assist with updating the NEAP and making project proposals in the NEAP more concrete (1998-9)
Prepare amendments to the NEAP and submit to Cabinet for approval when successful implementation, changing conditions or new information require additions to or changes in the NEAP	MNE and other ministries involved in the NEAP		TACIS *Development of Environmental Policy in Mongolia and the CIS*, Phase II to assist with updating the NEAP and making project proposals in the NEAP more concrete (1998-9)

CHAPTER SIX
RECOMMENDATIONS

6 1 Introduction

Mongolia is showing positive signs of economic growth as it makes the transition from a command-control economy to a market-oriented one After bottoming out in the early 1990s, the economy has shown variable signs of growth since 1994 This is a critical time for Mongolia's natural environment natural resource use is fundamental to economic growth in Mongolia, which underscores the need to protect the resource base in order to ensure sustained growth

The most serious environmental problems facing Mongolia at present are land degradation, deforestation, loss of biodiversity, and air and water pollution (particularly in urban areas) A wide range of natural processes and human activities combine to cause these problems in Mongolia's very sensitive and fragile environment The fundamental causes of the environmental problems that Mongolia faces stem from three basic conditions

- A naturally fragile environment,
- A population that exploits natural resources in an unsustainable (and often illegal) fashion for lack of alternative income sources, and
- Inefficient manufacturing, production, extraction, and consumption patterns/methods left behind as the legacy of the central planning era

The table on the following page describes Mongolia's environmental problems and their causes in more detail

In the section following the table, we present a series of recommendations for USAID interventions that are designed to address some of the gaps and weaknesses in the current system These interventions would have a tremendous positive impact in improving the protection of Mongolia's unique environment, while aiding economic growth The activities are linked to the three major ongoing or planned USAID programs in Mongolia – the Energy Privatization and Commercialization Program under the Economic Policy Support Project (EPSP), the upcoming initiative known as SPICE, and, the Rural Civil Society Project (RCSP) In the final section, we describe recently completed and on-going projects working to address serious environmental concerns in three sectors – energy, forestry and livestock We summarize the focus of each project, and highlight gaps and weaknesses in each of them

Current Environmental Problems and Their Causes

Environmental Problem	Natural Causes	Human Causes
• Land Degradation (desertification, loss of topsoil and other erosion, decrease in fertility of pasture and croplands)	• Low rainfall • High winds • Extreme temperatures • Thin topsoil • Steep slopes • Fires	• Livestock herds too big in some areas • More horses, cattle and goats, fewer sheep • Inappropriate mining and industry practices • Inappropriate cultivation practices • Multi tracking (off road driving) Fires
• Deforestation (depletion of Mongolia's limited, but valuable, forest resources)	• Fires • Insects • Slow growth rates for natural and replanted regeneration	• Destructive and unregulated commercial logging techniques • Insufficient and poorly managed reforestation • Unregulated cutting for domestic fuelwood • Fires
• Loss of biodiversity	• Same natural causes as for land degradation leads to loss of species and habitat	• Hunting • Overgrazing • Pollution • Deforestation
• Air and Water Pollution (generally localized degradation)	• Fires • High winds • Low flow-rates in rivers for most of year	• Overall inefficiency in production, which results in excess energy/inputs use and production of pollutants & waste • Coal burning in power plants, ghers and industrial boilers • More cars, trucks and buses, many of which are old and poorly maintained • Inappropriate use and disposal of chemicals • Inappropriate disposal of solid and liquid waste

6 2 Recommendations

The recommendations given below are linked to USAID's current program of activities in Mongolia—Energy Privatization and Commercialization Program (under EPSP), SPICE, and RCSP None of the activities we propose will require major re-programming efforts from USAID The interventions are intended to address the *causes* of environmental degradation rather than the *effects* Preventing damage to the environment is preferred to—and less costly than—cleaning up after the damage has been done The interventions are designed to improve environmental conditions while contributing to economic growth

Energy Privatization and Commercialization Program (under EPSP)

The principle objective of the Energy Sector Privatization and Commercialization Program is to restructure the highly centralized, state-owned system, so that is more efficient and responsive to customer demands The two most important sub-sectors are coal and electricity [1] The centralized Energy Authority provides 85 percent of the country's electricity, and uses 80 percent of the coal produced in Mongolia to do so From an environmental perspective, both sub-sectors are characterized by a high degree of inefficiency in production and distribution, and moreover, regulatory oversight is weak There are no specific environmental policies in place to in the energy sector Policy formulation and institutional restructuring should involve the following activities

Pricing policy An environmental energy specialist should spend three to four months with other energy sector specialists on the Energy Sector Privatization and Commercialization Program to ensure that all "market rationalization" policies are done in tandem Energy prices in Mongolia have historically been well below the long run marginal cost (LRMC), which encourages waste on the part of consumers Pricing needs to be restructured so that general subsidies are removed and the full cost of providing energy is reflected in the prices The environmental energy specialist should conduct environmental valuation[2] to place a numerical value on negative externalities caused by the power sector The pricing structure should then be revised to internalize the full costs of energy production and distribution

Environmental standards Standards for emissions, effluents, and environmental impact must be designed, along with enforcement mechanisms that heavily rely on market-based mechanisms and not command-control regulations As energy sector assets are "unbundled" and privatized or commercialized, managers of new entities should have resources available to them to assist them in attaining compliance in the most cost-effective way possible

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[1] Petroleum has been discovered in the southern part of the country, but is not yet extracted on a commercial scale

[2] Environmental valuation could include assessments of the cost of pollution prevention and / or remediation or if no remedial actions are taken the costs to society in terms of health care and losses to the economy in terms of lowered worker productivity

SPICE

The SPICE program is intended to support the rural private sector by strengthening production and processing capacity Through farmer-to-farmer programs, improving access to new technology and information, and establishing business and trade associations, the program intends to foster development of an efficient, productive, growth-oriented private sector The push for sustainable economic growth in the long term requires careful planning and management of Mongolia's natural resources, and sensitivity to it's fragile environment Following are suggestions for two ways in which USAID could provide support to help steer private enterprises away from practices that are currently degrading and depleting Mongolia's resource base at alarming rates The two sectors are forestry and livestock herding

Forest Management Support – Technical assistance would be provided to demonstrate appropriate techniques for developing forest management plans, harvesting and processing logs, marketing forest products and by-products, and either using or disposing of waste Demonstration sites would be established to introduce new technology and better forest-management and logging practices Demonstration activities include designing forest management plans, reforesting and rehabilitating logged areas, felling techniques, and new logging and processing technology

Improve Health and Quality of Livestock – Healthier, more productive animals would mean smaller herds that would be less demanding of land and water resources By mobilizing the private sector to improve access to services and information, and to improve the quality of veterinary, breeding, storing, handling, processing, transporting, marketing, and other services, some of the pressures causing localized overgrazing and groundwater depletion would be relieved Support for activities in three areas would help to –

- Increase herders' access to high quality inputs, including nutrition and other feed supplements, better veterinary services, animal shelters to protect herds during extreme weather, and good pasturelands [3]
- Improve herders' access to better breeding stock so that higher productivity can be achieved with fewer animals (especially cashmere goats)
- Improve information dissemination so that herders are aware of the availability of better quality livestock, inputs, and services

Rural Civil Society Project (RCSP)

The primary objective of RCSP is to help create the conditions needed for broad-based economic growth in rural Mongolia This involves establishing and strengthening democratic civil society organizations as the foundation for sustained economic growth, and forging linkages among NGOs, national and local government, and the private sector, to represent

[3] Obviously, cash is needed to purchase inputs The re establishment of market links access to credit access to market information and improved sorting handling storing transportation and marketing of goods will all be critical developments in the livestock sector

local interests and shared needs Local and national interests must include careful stewardship of the country's natural resource base if economic growth is to be sustainable The following recommendations are to support activities in the aimags and soums which will promote environmental sensitivity in the RCSP programs already planned Support for activities like these will be consistent with USAID's joint objectives to promote sustainable economic growth and foster local democracy

Promote Improvements in Post-Harvest Handling and Processing Facilities for Forest Products – Activities under this component would support the development of commercial interests in producing and marketing forest products These would include finished or semi-finished wood products, such as furniture, construction timber, crates and boxes, and carts They would also include industry by-products such as sawdust and off-cuts, which are currently treated as waste Sawdust can be used to make particle board, and it can be used as a soil conditioner or for boiler fuel There are numerous uses for off-cuts, including fencing, building-construction, and industrial and domestic fuel

Build Capacity to Monitor and Enforce Forestry Laws and Regulations – Here we recommend USAID provide direct support to MNE in its efforts to monitor logging activities and enforce laws and regulations A large part of this effort will focus on improving methods for acquiring, analyzing and disseminating information One of the first activities already planned for RCSP is the development of information systems to meet the economic and business needs of people living outside Ulaanbaatar Environmental information, including forestry laws and regulations, should be incorporated into the design of these systems, to better inform both the loggers and the government officials responsible for monitoring and regulating logging operations

Assistance would be provided to improve methods for gathering and disseminating information through aerial surveillance, remote sensing technology, and ground support networks Standard procedures for apprehending violators of forest protection regulations and for filing legal cases would be developed and institutionalized Information systems would be developed to help monitor logging activities against approved work plans, and to track documentation of logging operations (permits, management plans, revenue collection), and legal cases (apprehension, confiscation, court papers)

Improve the Distribution of Livestock by Rehabilitating Water Wells – The rehabilitation of strategically located wells would generate environmental and economic benefits Livestock herders would be encouraged to disperse their herds, relieving the pressure on pastureland and water resources around wells, rivers, lakes and ponds A more even distribution of livestock would also reduce pressure on grasslands surrounding urban centers, where some of the most severe problems associated with overgrazing are experienced Attracting herders to wells away from reforestation schemes would increase sapling survival rates

An inventory of wells must first be undertaken that includes information about the locations, conditions, and grazing capacity[4] of the surrounding environment Criteria for determining and prioritizing eligible wells include the physical conditions of the wells, proximity to areas suffering most from limited access to water, and proximity to urban centers At the same time, opportunities for engaging the private sector in well-rehabilitation efforts should be explored Activities would aim to promote commercial and cooperative leasing schemes, joint ventures, and other forms of business alliances

Develop Management Capabilities in the Livestock Sector The development of management capabilities is achieved by improving individual herders' knowledge base and by strengthening the institutional capacity of herder associations to improve their environmental and economic situations through collective action Activities would include

- Utilization of the media (in lieu of an extension service) to disseminate information and deliver training modules on relevant topics such as vegetation-livestock interaction, seasonal vegetation succession, livestock care, etc
- Capacity building through hands-on exercises such as having herder associations work with technical specialists to develop pasture management plans,[5] which would include provisions for maintaining infrastructure, such as wells
- Provision of technical assistance to herder associations to help strengthen them institutionally—from internal management skills such as bookkeeping, to marketing skills that will improve their collective negotiating power with purchasers
- Develop a conflict resolution capacity in herder associations to provide an internal and responsive vehicle for addressing disputes that arise in the implementation of pasturelands management plans (either between members or between different associations) Building this capacity will help ensure that pasturelands management plans will be observed and revised on a long-term basis

Identify opportunities to supplement conventional energy supply with renewable energy sources This component already features in the AID Energy Restructuring project One particular potential opportunity to employ renewable energy sources may be in supplementing conventional energy supply in aimag centers

6 3 Context for Recommended Interventions

The recommendations given above are related to the energy, forestry and livestock sectors Although many initiatives are already underway to address pressing needs in these sectors, there are gaps By responding to some of these opportunities, USAID can to actively support more rational, environmentally sensitive exploitation of Mongolia's natural resources The

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[4] Grazing capacity denotes the environment's ability to support X number of livestock through grazing while carrying capacity denotes the environment s ability to support *all* species including livestock, wildlife, and humans The determination of grazing capacity should be based on the carrying capacity of any given area

[5] Ideally pasturelands management plans would apply to lands held by herder communities / associations on long-term concession basis

resources The following is a summary of the major issues and the work in progress to address those issues in the three sectors

Energy

The energy sector in Mongolia—from production to consumption—negatively impacts the environment because of design inefficiencies, obsolete equipment, poor management practices, and wasteful consumption Illustrative examples of the causes of negative environmental impacts are

- Poor coal mining practices Coal is loaded with overburden and other impurities and is not sorted Failure to reclaim mined land causes severe wind (and water) erosion around mines
- Inefficient combustion in CHPs and old diesel generators that are found in aimags and soums Poor maintenance of generating equipment, obsolete equipment, and dirty fuel (particularly coal) produce harmful emissions, especially particulate matter
- Poor pollution control technology and management Scrubbers and ESPs do not reliably capture particulate matter (and NO_x, CO, and CO_2) Moreover, ash pits are not properly covered and are a major source of wind born particulate matter
- Delivery losses Almost 50 percent of heat, 38 percent of steam, and 12-15 percent of electricity are lost in distribution
- Wasteful consumption The lack of meters, poor understanding of energy conservation measures, poor management practices, and faulty equipment all lead to wasteful consumption
- Pricing While energy prices have been revised to more closely reflect their true economic cost (long-run marginal cost), they still do not capture negative externalities to the environment

The recently completed and on-projects outlined below represent the introduction of cleaner energy production and reduced energy consumption through the use of cleaner, more efficient technology, alternative sources of energy, and conservation The recommendations for USAID interventions discussed above complement and build on these activities to further promote a cleaner, economically sustainable energy sector

TACIS – *Rational Use of Energy Project* (1998-2000) The project will retrofit five enterprises with energy-saving devices that range from control instruments to insulation Preparing an energy management plan for industry, user manuals about metering and efficiency, and a periodic newsletter Marginally relevant to clean production

Asian Productivity Organization (APO) – *Clean Production Seminars* (1998) The APO plans to hold seminars for enterprise managers in Ulaanbaatar and Darkhan in the autumn of 1998

JICA – *Industrial Development Study* (1998), *Rehabilitation of Makhimpex the Meat Processing plant in Ulaanbaatar* (1994-8?), *Rehabilitation of Dairy Plant in Ulaanbaatar* (1994)

TACIS – *Rational Use of Energy Project* (1998 – 2000) The project will retrofit five enterprises with energy-saving devices that range from control instruments to insulation Preparing an energy management plan for industry, user manuals about metering and efficiency, and a periodic newsletter Examining the feasibility of expanding alternative energy use in rural areas—addition of up to 100 kW total Alternative energy sources that they may use include wind turbines and hybrid systems (1 kW solar/5 kW wind)

ADB – *Energy Conservation Technical Assistance* (1995) Energy audits were conducted in five industrial plants and low-cost energy conservation measures were undertaken Energy conservation plans were prepared One-week energy conservation training courses were given

ADB/WB/DANIDA – *Power Plant Rehabilitation in Ulaanbaatar*(1994 – present) While not specifically designed to address environmental problems, it is likely that new boilers will improve combustion The ADB project includes components to rehabilitate sections of the district heating network, install heat meters at key points, and provide training in power station operation and management

ADB – *Energy Conservation Project* (1998?—still awaiting approval?—2000) Objectives are to improve district heating reliability and reduce district heating losses by rehabilitating critical sections of the district heating system in UB, encourage end-use energy conservation through improved metering and through demonstration projects, and improve district heating system operation and maintenance through on-the-job training and technical support

New Zealand Ministry of Foreign Affairs and Trade – *Study on Improvement of the Organization and Effectiveness of the Mongolian Coal Sector* (1998) Includes proposals to improve the efficiency of coal mining practices to produce coal that burns cleaner

Forestry

Logging practices in northern Mongolia are rapidly depleting the nation's forest resources The practices are inefficient (wasteful, costly, and unsustainable) and very destructive from an environmental point of view Forest management skills are low, planning is limited, permits are issued too freely, and there is a lot of unregulated cutting The major problems are a general lack of knowledge about sustainable logging techniques, lack of alternative sources of income for rural families, poor business management capabilities, and weak enforcement of the laws and regulations on forests, failure to collect fees for harvest of forest timber and fuelwood, environmental protection, and protected areas

Directors of logging companies have many ideas for improving their operations from both an environmental and an economic point of view, but they lack technology and need access to

capital to put them into practice In terms of increasing productivity in the wood-processing industry, the logging companies would like to make better use of by-products such as sawdust, log ends, and off-cuts At present these are simply piled up next to the sawmill and left to rot Option for making better use of sawmill by-products include using sawdust for making particle board, as soil conditioner, or as boiler fuel for local industries, and using off-cuts for fencing, log cabin construction, and industrial and domestic fuel

The logging company directors also said they would like to improve their reforestation skills and learn about other sustainable, environmentally friendly forest management techniques They are aware of the legal requirements to reforest logged over land, but they do not have much experience doing it Sapling survival rates are low (25 – 45 percent) Damage to remaining trees and to the land in and around logging sites is high Operators do not know how to dispose of the huge amounts of waste generated by inefficient sawmills (they cannot even give fuelwood away because no transport is available to carry the off-cuts to the people in town who could use it) Piles of sawdust and off-cuts surround logging camps

Efforts have already been made to address some of the threats to Mongolia's forests Most of the effort to date has been targeted at conserving forest resources in protected areas and their buffer zones, and responding to emergency situations such as forest fires and insect infestations To complement this, more attention must be given to forests which do not lie in protected areas, and which are consequently at greater risk from over-exploitation Social and economic issues warrant more attention through the promotion of sustainable exploitation, rather than strict protection, in appropriate forested areas

The following is a summary of on-going projects in the forestry and wood-processing sector

UNDP/GEF – *Mongolia Biodiversity Project* (1994-1998) and *Eastern Steppe Biodiversity Project* (1998-2003) These projects are broad in scope, and activities are concentrated in protected areas Not much being done by way of improving approaches to forest-resource exploitation (i e the logging industry) either inside or outside protected areas Focus on protection rather than sustainable exploitation *Reforestation and Natural Disaster Management*

German Government (GTZ) – *Protected Areas and Buffer Zone Development Project* (1995 – 2007) A major effort to develop models for protected-area planning and management at two sites – the Gobi Gurvansaikan National Park, and the Gorkhi-Terelj National Park/Khan Khentii Strictly Protected Area The *Fire Prevention in the Khentii Mountains* project is trying to reduce loss of forest resources due to fire A project proposal for *Forest Management in the West Khan-Khentii Mountains* is currently under review (a feasibility study is being conducted in June 1998) This project will address some of the wider forestry issues both inside and outside protected areas in the region

UN/FAO – *Reorientation of Forestry Policies and Institutions of Countries in Asia in Reform to Market Economies* (1996-1998) Training was conducted through workshops and seminars in Mongolia, China, Vietnam and Myanmar The objective was to strengthen the capacity of

institutions in reform economies faced with new challenges as managers of the region's natural resource base

Government of Japan (JICA) – *Forest Resources Management Study in Selenge Aimag* (1995-1997) Model forest management plans prepared including land cover maps and planning guidelines for 160,000 hectares

SPR – *Rehabilitation of Fire-Stricken Forest Areas* (1997-1998) – In response to extensive fires in 1996, this project established two nurseries in Arhangai and Selenge aimags, and introduced clean-up measures to rehabilitate burnt areas

Livestock

The long-term viability of livestock herding is crucial to the economic development of Mongolia Measures must be taken to address the causes of the serious threat to sustainability posed by the reduction in area and deterioration in quality of the country's pasturelands Poor management practices, which tend to exacerbate and accelerate natural pasture degradation, include

- Concentrating large herds in areas too small to support them,
- Changing the composition of herds (more goats, horses and cattle, fewer sheep), and
- Substituting larger but less productive goats (in terms of cashmere and meat) for high quality *mongol yama*

Economic growth is essential to relieve the serious and increasing problem of rural poverty in Mongolia By extension, therefore, economic growth is essential to protect the environment against overgrazing and desertification For most of the rural population, this means growth in the livestock sector The maximum size of livestock herds is limited by the capacity of the land to meet all the needs of livestock herds, and in some places, notably near urban centers, reliable sources of water, and migration routes, this capacity has already been reached or exceeded There are still, however, large areas of the country which could support larger herds

There are three ways to promote growth in the livestock sector improving productivity of animals, promoting an environment which encourages expansion of livestock herds in under-utilized areas, increasing both the types of inputs and the level of inputs to the livestock production system Work already done in the livestock sector, through support from various donors, is summarized below Efforts must continue to promote the economic and environmental conditions needed to reverse current negative trends in livestock production Recommendations as to how USAID might contribute to this effort were given in the previous section

ADB – *Study of Extensive Livestock Production Systems* (1996-1997) This project generated and action plan for sustainable management of the livestock sector Many of the recommendations made below stem from this study

Government of Denmark – *Resource Management Planning System for Rangeland Management*(1995 – 1997) This project had a high-tech approach (remote sensing, GIS) for pilot sites in 4 soums in Arhangai and Dornogobi aimags The techniques developed may be applicable in other parts of Mongolia Can be good for distinguishing between healthy pasture and overgrazed land In general, remote sensing technology is an efficient and cost effective way of collecting data over large, relatively homogenous areas For detailed suitability analyses and mapping, extensive *ground* surveys would also be necessary

Government of New Zealand – *Evaluation of Natural Grasslands for Sustainable Development* (1995-1996) A small project to assess development options for pastoral land

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ANNEX

TABLE A

ALL EPA PROJECTS 1997-98

1997 98 Mongolian NGO Environmental Public Awareness Projects

No	Project	Organizations	Project Manager	Issue	Funding	Cost	Savings	Rem	Start	End	Site
1	Sustainable Ecotounsm Bogdkahn Mountain	Mongolian National Ecotounsm Society	Kh Nyamsuren	Protected Areas	$4 498	$4 044	$454	$0	May 97	Apr 98	UB
2	Mother Nature Law	Umnugobi Branch of Green Movement	N Khishgee	Eco education	$3 244	$3 243	$1	$0	May 97	Jan 98	SG
3	Environment Children Law	National Centre for Children	S Khatantuul	Eco education	$3 956	$2 892	$1 064	$0	May 97		UB
4	Fire 97	Youth Union of Khentei Aimag/Scouts	A Bolormaa	Forest fires	$3 136	$3 103	$33	$0	May 97	Dec 97	HN
5	Gobi s Nature through the Eyes of Children	National Commission of Conservation of Rare Animals	D Avirmed	Biodiversity	$5 500	$5 500	$0	$0	May 97	Dec 97	GA
6	How to Plant a Tree	Mongolian Foresters Association	Ts Banzragch	Reforestation	$2 445	$2 445	$0	$0	May 97	Aug 97	UB
7	Nature Environmental and Health	Mongolian Physiological Association	G Sukhbat	Eco education	$2 000	$1 883	$117	$0	May 97	Dec 97	UB
8	Protect Beaver Pheasant & Sea-Buckthorn of Khovd River	Khovd Branch of MACNE	P Togtokbaatar	Biodiversity	$4 309	$4 253	$56	$0	May 97	Feb-98	HV
9	Environmental Awareness Raising	Arkhangai MACNE/Mongol Journalists Ass n Arhangai	T Battulga	Protected areas	$3 931	$2 359	$1 572	$0	May 97		AR
10	Degradation of Land Resources	MACNE	Ts Chultemnamdag	Desertification	$3 994	$3,994	$0	$0	May 97	Jul 97	GA/SG
11	Nature Through Children s Eyes	International Children s Centre Nairamadal	A Khaltar	Eco education	$4 989	$4 989	$0	$0	May 97	Apr 98	UB
12	Children Play with Mother Nature	Mongolian Scout Association	Kh Baavgai	Eco education	$4 030	$4 030	$0	$0	May 97	Feb-98	UB
13	The World is Our Mother	Mongolian Countryside Information Movement	P Enkhtaivan	Eco education	$5 000	$5 000	$0	$0	May 97	Feb-98	UB
14	Health Air Pollution Women	Women and Development Movement	Ch Urjmaa	Air pollution	$4 500	$4 050	$450	$0	Aug 97	Feb-98	UB
15	Gobi Bear among Nature and Children	Sono Cooperative	A Bat Erdene	Eco education	$5 000	$5 000	$0	$0	May 97	Feb-98	UB
16	Environment of Metropolis	Mongolian Sea Buckthorn Association	D Myagmarjav	Gardening	$2 591	$2 438	$153	$0	May 97	Mar 98	UB
17	Conservation of Rare Animals	Mongolian Comm of Conservation Rare Animals MHA	O Dorjraa	Biodiversity	$4 000	$4 000	$0	$0	May 97	Apr 98	UB
18	Soil Fertility Management in Small Scale Farming	Mongolian Soil Fertility Association	Sh Purevsuren	Gardening	$3 398	$3 372	$26	$0	May 97	Jan 98	UB
19	Mongolian Traditional Training Method	Enviro Training Public Awareness Club / Bers Univ	Ch Gombosuren	Eco education	$2 849	$2 392	$457	$0	May 97	Apr 98	UB
20	Traditional Ways of Protecting Nature	Khan Altai Foundation	B Jargal	Desertification	$3 998	$3 976	$22	$0	May 97	Apr 98	SG
21	Plant and Animal Research at Otgontenger	Information & Methodology Centre MSU Biology Dept	Ts Tsendeekhuu	Eco education	$4 000	$4 000	$0	$0	May 97	Nov 97	ZA
22	Protect Gobi Areas from Desertification	Mongolian Women s Federation/ S Gobi Womens C	N Gerelsuren	Desertification	$6 000	$6 000	$0	$0	May 97	Jan 98	SG
23	Protecting Bogdkhan Mountain Reserve	Development and Environment	A Namkhai	Protected Areas	$4 489	$4 396	$93	$0	May 97	Apr 98	UB
24	Park of Graduates Named After the Mongolian Youth Association	Mongolian Youth Association	U Serentsetseg	Eco education	$6 000			$600	May 97		UB
25	Advocacy for Law on Protection	Mongolian Environmental Law Association	Ts Jamsran	Environment laws	$1 750	$1 689	$61	$0	May 97	Apr 98	UB
26	Blue Bag Campaign	Mongolian Women s Federation / Chingeltei WC	D Narantsetseg	Recycling waste	$4 000	$4 000	$0	$0	May 97	Feb-98	UB
27	Protect the Selbe River	Mother Nature Centre	A Chimidtseren	River pollution/waste	$4 494	$4 359	$135	$0	May 97	Aug 97	UB
28	Humans and Disaster	Meteorological Association	Z. Batjargal	Protected areas	$3 000	$2 868	$132	$0	May 97	Apr 98	HV/UV
29	Environmental Journalists Club	Press Institute of Mongolia	J Sunjidmaa	Eco journalism	$3 955	$2 869	$1 086	$0	May 97	Apr 98	UB
30	Fresh Air and Health	Mongolian Filmmakers' Association / Green Party	T Sarantuya	Air pollution	$3 992	$3 593	$399	$0	May 97	Apr 98	UB/DH/ER
31	Fresh Water	Mongolian Green Party	G Aurzana	River pollution	$2 600	$780	$1 820	$0	May 97		???
32	Ulaanbaatar City Air Pollution	Mongolian Green Party	G Tumenjargal	Air pollution	$2 500	$2 450	$50	$0	May 97	Apr 98	UB
33	Purifying and Maintaining our Clean Living Environment	Meteorological Association	P Nyamjav	Urban pollution	$2 998	$2 911	$87	$0	May 97	Mar 98	UB
34	Children of Mother Nature	Mongolian Knowledge Dissemination Society	P Junai	Eco education	$2 798	$2 796	$2	$0	May 97	Jan 98	UB
35	Natural Resources	Mongolian Green Movement	Ch Ishdorj	Eco education	$3 977	$3 579	$398	$0	May 97	Apr 98	UB
36	Gazelle	Dornod Aimag Hunters Ass n / Dornod MACNE	N Ganbaatar	Endangered species	$2 250	$2 130	$120	$0	Aug 97	Apr 98	DD
37	Mother Nature in My Town	Dornod Children s Centre / Seniors Assoc	V Dashnyam	Eco education	$2 273	$1 487	$786	$227	Aug 97	May 98	DD
38	The People s Eye	Hentii LEOS / Women Lawyers Assoc	B Dulanjav	Environment laws	$2 830	$2 809	$21	$0	Aug 97	Dec 97	HN

All EPA Projects 1997-98

39	Zorgol (Baby Caribou)	Hentii Scout Ass n / Hunters Assoc	Z	Enkhbold	Endangered species	$3 000	$ 2 856	$144	$0	Aug 97	Apr 98	HN
40	Protect Avraga Toson Complex	Hentii Trade Union / Engineers Assoc / MACNE	D	Avir	Land degradation	$2 000	$2 000	$0	$0	Aug 97	Apr 98	HN
41	Prevention of Steppe Fires	Sukhbaatar Red Cross Assoc iation	S	Chimiddorj	Steppe fire	$3 000	$3 000	$0	$0	Aug 97	Mar 98	SB
42	Steppe Deer	Sukhbaatar Labour Union / Womens Fed	G	Munguntsetseg	Endangered species	$2 000	$1 998	$2	$0	Aug 97	Jan 98	SB
43	Clean Environment and Healthy Life	Sukhbaatar Womens Federation / Scouts	Ts	Yanjmaa	Urban pollution/waste	$3 000	$2 790	$210	$0	Aug 97	Apr 98	SB
44	Let s Protect Danganga s Environment	Sukhbaatar MACNE / Green Movement	Y	Radnaa	Land degradation	$3 000	2582		$300	Aug 97		SB
45	Forest Fire	Bulgan Youth Association / Travellers Assoc	Ts	Tsogt-Ochir	Forest fires	$2 600	$2 600	$0	$0	Aug 97	Mar 98	BG
46	Protect Bulgan Uul	Bulgan Womens Federation / Green Movement	P	Oyunchimeg	Land degradation	$2 000	$2 000	$0	$0	Aug 97	Apr 98	BG
47	Protect Zuun Turuu River	Bulgan Trade Union	T	Erdene	Urban pollution/waste	$2 000	$2 000	$0	$0	Aug 97	Mar 98	BG
48	Save the Forest from Fire	Huvsgul Red Cross Association	Ch	Dorjpagma	Forest fires	$1 500	$1 500	$0	$0	Aug 97	Mar 98	HV
49	Protecting the Environment	Hatgal Womens Federation	D	Enebish	Waste management	$2 000	$1 950	$50	$0	Aug 97	May 98	HV
50	Forever Green Garden	Hatgal Green Movement	J	Oyunaa	Gardening	$1 500	$1 500	$0	$0	Aug 97	May 98	HV
51	Protect and Restore Ice in Yolyn Am	Environmental Protection Association of South Gobi	D	Daraghuu	Protected Areas	$2 500			$1 000	Feb-98		SG
52	Protecting the Pasture	Protecting Environment Ourselves Movement of SG	B	Zandraa	Overgrazing	$2 500			$250	Feb-98		SG
53	Soil and Roads	Citizen initiatives for Environmental Protection of SG	D	Byambasuren	Land degradation	$2 500			$1 000	Feb-98		SG
54	Reed and Wild Pig of Har Us	Public Council of Environmental Protection of Hovd	S	Shar	Endangered species	$2 500			$250	Feb-98		HV
55	Protect the Saiga	Mongolian Herders and Farmers Association	D	Altangerel	Endangered species	$2 500			$250	Feb-98		HV
56	Clean Environment – Life s Condition	Women s Federation of Gobi Altai	M	Nyamjav	Recycling waste	$2 300			$230	Feb-98		GA
57	Saxaul (Zag)	Environmental Protection Association of South Gobi	S	Barhaa	Endangered species	$2 700			$270	Feb-98		GA
58	Protect Mother Nature	Children s Centre of Zavkhan	D	Tumurbaasan	Eco education	$2 400			$240	Feb-98		ZV
59	Restore the Forest of our Sum	Nature Protection Foundation of Zavkhan	B	Oyun	Reforestation	$2 600			$260	Feb-98		ZV
60	Protecting Gashuun River	Women s Council of Uvs	N	Badam	River pollution	$2 400			$960	Feb-98		UV
61	Altan Ganuur (Roseroot)	Children s Organization of Uvs	M	Ankhbayar	Biodiversity	$2 600			$260	Feb-98		UV
62	Green Campus Zone	Darkhan Student Association / Sea Buckthorn Ass n	B	Enkhbayar	Land degradation	$2 000			$200	Apr 98		DA
63	Clean Environment Health	Sacred Frontier Movement / Womens Federation	D	Lkhagvadorj	Urban pollution	$2 000			$800	Apr 98		DA
64	Keep the Law	Selenge Womens Federation / MACNE (Selenge)	B	Zaya	Environment laws	$2 000			$800	Apr 98		SL
65	Protect Mineral & Spring Water	Talent Children s Centre / N&E Protection Council	O	Natsagdorj	Water pollution	$2 000			$800	Apr 98		GS
66	Reduce Water Consumption	Social Dev & Women Movement	A	Hatantumur	Water shortage	$2 000			$800	Apr 98		DU
67	Protect the River Khangal	Orkhan Womens Federation	D	Dulamsuren	River pollution	$2 000			$800	Apr 98		OR
68	Exploit Unexplored Resourses	Womens Fed of DomoGobi / Red Cross of DG	V	Boldmaa	Urban pollution	$2 000			$800	Apr 98		DO
69	Protect Zuunmod River	Green Movement of Tov / Environ Protect Council	A	Jambaldorj	River pollution	$2 000			$800	Apr 98		TO
70	Hailaast 98	Tov Youth Association / Parents and Teachers	H	Sukhbaatar	Mining degradation	$2 000			$800	Apr 98		TO
71	Protect Tsetserleg from Pollution	Womens Federation / Journalists Association	S	Dolgor	River pollution	$2 000			$800	Apr 98		AR
72	Maintaining Trees in Bulgan Sum	Seniors Association	D	Samdanmonkh	Reforestation	$2 000			$800	Apr 98		AR
73	Eco Education and Awareness	Arh Parents & Teachers Ass n / Forestry/Journalists	M	Shagdarsuren	Eco education	$2 000			$800	Apr 98		AR
74	Protect Toomin Nuruu	Green Movement of Arhangai	G	Jamts	Forest fires	$2 000			$800	Apr 98		AR
75	Ongi River	Overhangai Trade Union / Forest Workers Union	G	Sukhbaatar	River restoration	$2 000			$800	Apr 98		OV
76	Child is Friend of Nature	Bayanhongor Scouts Assoc / Childrens Organiz	D	Yundenbazar	Eco education	$2 000			$800	Apr 98		BA
77	Protect Black Tailed Gazelle	Bayonhongor MACNE / Youth Federation	N	Chunag	Overhunting	$2 000			$800	Apr 98		BA
					Totals	**$228 374**	**$149,873**	**$10,001**	**$18,297**			

1997 98 Mongolian Government Environmental Public Awareness Projects

				Funds	**$214 332**		**$218 373**					
				dif	**$14 042**		**$4 041**					
G1	Content of Teaching Materials of Ecological Education	Department of Primary and Secondary Education ME	N Nergui	Eco education	$4 850	$2 910	$1 940		Jul 97		UB
G2	Ecological Training Centre	Department of Primary and Secondary Education ME	Ts Tsogkhuu	Eco education	$9 480	$8 532	$948		Jul 97	Apr 98	UB
G3	Ecological TV Olympiad	Department of Comprehensive Education Ministry of Educati	B Oyuntsetseg	Eco education	$3 670	$3 461	$209		Jul 97	May 98	UB
G4	Environment and Law	Department of Law Coordination MNE	L Dorjseden	Enviro Laws	$4 600	$4 600	$0		Jul 97	Mar 98	ER
G5	Public Awareness of Strictly Protected Areas	Protected Area Office Ministry of Nature & Environment	N Odonchimeg	Protected Areas	$4 500	$4 500	$0		Jul 97	Apr 98	ZH/BO/AH
G6	State of Environment of Mongolia	Department of International Cooperation and Projects MNE	E Erdenebat	Eco education	$3 000	$3 000	$0	$300	Jul 97		UB
G7	Bogdkhan Information and Public Awareness Centre	Bogdkhan Strictly Protected Area MNE	R Enkhtuul	Protected Areas	$3 000	$2 966	$34		Jul 97	Apr 98	UB
G8	Introduction of MNE of Mongolia	Administrative Division Ministry of Nature & Environment	J Janjaadorj	Enviro policy	$3 500	$3 500	$0		Jul 97	Jan 98	UB
G9	Treaties and Conventions to which Mongolia is Party	Department of International Cooperation and Projects MNE	B Bolormaa	Enviro policy	$2 200	$2 034	$166		Jul 97	Apr 98	UB
G10	Weekly Public Awareness Day	Ministry of Nature & Environment	D Enkhsaikhan	Enviro policy	$8 000	$4 779	$3 221		Jul 97	May 98	UB
G11	Water Laws and Regulations	Ministry of Nature & Environment	N Saran	Water laws	$2 200	$2 200	$0		Jul 97	Dec 97	UB
G12	National Action Plan to Combat Desertification	Department of Natural Disaster Management MNE	D Enkhbold	Desertification	$3 000	$3 000	$0		Jul 97	Mar 98	UB
G13	Environment, Nature and the Times	Environmental Publicity Office MNE	S Oyunchimeg	Enviro policy	$3 000	$3 000	$0		Jul 97	Apr 98	UB
				Totals	**$55 000**	**$48 482**	**$6 518**	**$300**			
				Funds	**$ 55,000**						
			All projects	**Totals**	**$283 374**	**$198 355**	**$16,519**				

TABLE B

PROJECTS IN MONGOLIA

Table B – Projects in Mongolia
Table B1--Environment Sector Projects

Project Name	Dates (Start/Finish)	Implementing Agency	Donors/ Consulting Firms	Funding Amount	Objectives/Scope of Project
Mongolia Biodiversity Project	1994 – 1998	Bureau of Protected Areas, Environmental Protection Agency, MNE	UNDP/GEF Govts of Finland, Netherlands USA Mongolia	$1 5m	Phase I general/national in scope Ran for 3 5 years from 1995 Phase II called Eastern Steppe Biodiversity Project Initiated 6/5/98 Increase capacity of MNE to protect and promote biodiversity Support production of Biodiversity Action Plan, Support production of environmental legislation
Eastern Mongolia Biodiversity Project	April 1998 - 2003	As above	As above	$9 8	
National Plan of Action to Combat Desertification in Mongolia	1994 - 1995	MNE	UNDP, UNEP, UNSO ESCAP	$40 000 grant	Evaluate desertification to determine causes and effects Determine value of remote sensing techniques as tools for monitoring desertification, Produce National Plan of Action to Combat Desertification
Tuul River Pollution Mitigation Strategy/Action Plan	April 1995 - 1996	MNE	Govt of the Netherlands UNDP	$100 000 grant	Develop a Tuul River Pollution Mitigation Strategy and Action Plan, Introduce the polluter pays principle within existing legal framework, Implement specific pollution-mitigation measures to immediately remedy urgent pollution problems, starting with meat processing Train govt staff and people from private sector
Equipment for Reduction of Water Pollution			Govt of Denmark		Supply urgently needed equipment in conjunction with the River Tuul project

Project Name	Dates (Start/Finish)	Implementing Agency	Donors/ Consulting Firms	Funding Amount	Objectives/Scope of Project
Urban Wastewater Management Study, Phase I			JICA		
Protected Areas and Buffer Zone Development Project, Phases I and II	1995 – 2007 (12 years)	Bureau of Protected Areas, Environmental Protection Agency MNE	GTZ	DM21m	Will develop two model protected areas – South Gobi and Khentii Design and implement Protected Area Management Plans
Sustainable Development of Mongolia for the 21st Century	1997 – 1998	Inter-ministerial group chaired by Prime Minister	UNDP/GEF Govt of Mongolia	$800 000 grant	Strengthen capacity to incorporate sustainable development concepts into national economic development planning and development efforts Develop MAP21, Coordinate activities of NGOs, private sector education sector, local govt etc, Establish National Council for Sustainable Development to oversee development and implementation of policies and programs Implement pilot projects to build capacity for sustainable development initiatives
Fire Prevention in Yentiy Mountains	January 1998 – December 1999 (2 years)	MNE	GTZ	DM3m	
Khustain Nuruu Steppe Conservation Project	1995 – 1996	MNE	Govt of the Netherlands MACNE	$1 817 000	Conservation project part of which is the reintroduction of the takhi horse
Khustain Nuruu Cheese Production	1995 – 1997		Govt of the Netherlands, UNDP	$200,000 grant	Establish technically and financially viable cheese processing plant for herders in the Khustain Nuruu buffer zone
Environmental	1996 – 1998	MNE	UNDP Govt of the	$297,000 grant	Strengthen capacity of Mongolian govt and NGOs to

Project Name	Dates (Start/Finish)	Implementing Agency	Donors/ Consulting Firms	Funding Amount	Objectives/Scope of Project
Public Awareness Program			Netherlands		conduct public awareness-raising campaigns Manage small grants program for NGOs and others to fund environmental public awareness-raising activites ***Get digital version of list of 1997 awards from Ferguson***
Mongolian National Parks	1993-1997	Bureau of Protected Areas, Environmental Protection Agency, MNE	WWF	SF60,000/yr	
Coordination and Development of Conservation Program	1997 – 2000	MNE	WWF		Aims to develop, implement and promote WWF's conservation program in Mongolia
Snow Leopard Conservation Project	1997 – 2000	MNE	WWF		Goal to provide model for snow leopard conservation in specific area of Mongolian Altai range Four tasks 1 Status survey of snow leopards in a selected range, 2 Status survey of prey species in same range 3 Habitat quality assessment for snow leopard and its prey species, 4 Prepare and implement a conservation plan
Public Awareness Program for Altai-Sayan Region	1997 – 2000	MNE	WWF		Publish a booklet on conservation and a pamphlet on forests in western Mongolia
Environmental Awareness Program for Adults	1997 – 2000	MNE	WWF		Multi-media awareness-raising program
Hyargas Depression Protected Area	1997 – 2000	MNE	WWF		Aims to achieve legal protection for parts of the Great Lakes Basin in western Mongolia
NGO Network Strengthening	1997 – 2000	MNE	WWF		Workshops on how to establish and run an NGO, and providing technical assistance to new and existing NGOs
Khar Us Nuur Protected Area Management	1997 – 2000	MNE	WWF		Established in 1997 Provide office field equipment, training, technical support, help in preparing management plan

Project Name	Dates (Start/Finish)	Implementing Agency	Donors/ Consulting Firms	Funding Amount	Objectives/Scope of Project
Program					
Saiga Conservation Project	1997 – 2000				Establish 2 nature reserves (
Strengthening Environmental Management Capability in the Ministry of Nature and Environment	1995 – June 1997	MNE	ADB	$574 000 grant	Strengthen environmental management capacity of MNE, Review environmental laws Develop national minimum environmental standards, Strengthen environmental monitoring capabilities, Prepare a permit system, Strengthen local government capabilities Develop a public awareness and information program, Determine economic potential of toursim Develop and early warning system for natural disasters Review organizational structure of MNE
Rural Development/ Alternative livelihoods	April 1999 (tentative) -	MNE	Humboldt University (Germany)		Team of 5 will work in Khar us Nuur National Park with NGOs youth, women to identify what they want to do and how they can do it Hope to follow up with pilot project to test/demonstrate feasibility of options
Rural Civil Society Program (RCSP)	1998 – 2001		USAID		Promote business development in rural Mongolia Addresses Democracy
Mongolia Energy Sector Project (MESP)	7/92 – 4/93 4/93 – 5/96 10/96 – 12/97 10/97 – 9/00	Ministry of Infrastructure Development (formerly the Minstry of Energy and Geology)	USAID Morrison Knudsen (MK), TVA, National Renewable Energy Lab (US DOE)	$10 7m $23 5m $10 2m $0 2m $0 6m	Initial United Engineers and Constructors Contract First MK contract Second MK contract Wind Energy Resource Assessment of Mongolia Misc
Economic Policy Support Project (EPSP)	6/95 – 9/00 6/95 – 9/98		USAID DAI Academy for Educational Development (AED) Other training	$4 6m $1 1m $0 8m	Goals are to increase standards of living and increase social indices by helping with the GOM s transition from centrally planned to private sector-led, market-oriented economy 3 American trained economists now advisors to PM Large training component (12 to US) Established Training and Research Center Helping set energy prices Restructuring

Project Name	Dates (Start/Finish)	Implementing Agency	Donors/ Consulting Firms	Funding Amount	Objectives/Scope of Project
			institutes		energy sector Pension reform Privatization
Democratization Program	9/91 – 9/98 4/97 – 8/98		USAID The Asia Foundation (TAF) International Republican Institute (IRI)	$2 1m $0 6m	Set up new system of government and made sure it worked and strengthened weakest sector of Mongolia's democracy – civil society Currently concentrating on supporting development of NGOs and CINGOs in rural areas Legislative and Political Party development, and Parliament and Party Professionalization Program
Reforestation and Natural Disaster Management	1997 – 1998	MNE	UNDP	$329 000	
Small Project to Combat Desertification in Khukh-Mozit soum, Gobi-Altai aimag	April – June 1998	Institute of Geo-Ecology, MNE	UN	$22,000	
Project to Replace Pumping System at Ulaanbaatar Water Treatment Plant	May – August 1998	MNE and Ministry for Infrastructural Development	International Nordic Fund	***238 000	
MNE Information Center and Library	1997 – 1998	MNE	Govt of Australia		To establish an information center in MNE
Economic Valuation of Natural Resources and Environmental Costs	1997 – 1998	Department of Strategic Management and Planning MNE	Govt of Canada	$14,000	
Accounting for Ozone- Depleting	January – April 1998	Department of International	UN Department of the Convention on the	$6 000	

Project Name	Dates (Start/Finish)	Implementing Agency	Donors/ Consulting Firms	Funding Amount	Objectives/Scope of Project
Substances		Cooperation, MNE	Protection of the Ozone Layer		
Mapping of Gobi Desert	1995 -		UNDP	$40,000, grant	Undertake an interdisciplinary investigation of the Gobi Desert's biological and biotechnological resources, Facilitate cooperative development projects between Mongolian scientists and enterprises/entrepreneurs and foreign counterparts
Energy Efficient Social Services	1997 - 1999		UNDP	$2 000 000, grant	Promote the use of straw bale insulation in schools and other community buildings, thereby affording 90-95% energy savings and releasing limited funds for other activities and purposes, Train trainers in practical applications of the technology
Climate Change - Vulnerability and Impact Assessment	1997 - 1999		UNDP/GEF + ?ADB	$326,000 + $240,000 GEF, grant	Build capacity to actively and effectively pursue natural resource management activities related directly or indirectly to climate change mitigation and adaptation strategies
Economic Incentives for Environment and Sustainable Development	1995 - 1996		Govt of Canada	Grant	Contract research to local consultants and organize seminars on methodologies for incorporating economic costs and benefits in environmental assessments, and to explore economic incentives for sustainable development in a range of sectors
Development of a Resource Management Planning System for Rangeland Management	1995 - 1997		Govt of Denmark	$1,000 000 grant	Monitor natural resources using remote sensing and GIS in four soums (1% of country's total) in Arhangai and Dornogobi aimags, Provide soum authorities and herdsmen with appropriate information on areas where livestock grazing is posing a threat to the productivity of the system and also to inform them where good pasture exists, Train central and local government staff in the techniques needed to create better practical awareness of improved natural resource management planning systems in Government

Evaluation of Natural Grasslands for Sustainable Development	1995 - 1996		Govt of New Zealand	$88,000 grant	Assess development options for pastoral land
Forest Resources Management Study in Selenge Aimag	1995 - 1997		JICA	$200,000 Grant	Prepare a forest management plan for model areas of 30,000 ha based on (a) land cover maps prepared through LANDSAT analysis of some 4 28 million ha of Selenge aimag (b) forest management planning guidelines to be formulated for an intensive area of some 160 000 ha
Provision of Filters for the Takh 4 Coal-Fired Power Station	1997 - 1998		JICA	? grant	Reduce air pollution from the country's largest power plant ***Number 4?***
Strengthening Land Use Policies	1995 - 1996		ADB	$580,000, Grant	Assist GoM in the establishment of a sound legal and institutional framework for land records management that is consistent with the ownership of rights in land Help lay the foundations for an efficient agricultural sector based on private rights in land and market-based land transactions
Capacity Building for Disaster Mitigation	1997?		SPR?	$49 000 grant	Facilitate improving national capacity and public awareness on natural disaster prevention, preparedness and mitigation at national level
Rehabilitation of Fire-Stricken Forest Areas	1997 - 1998		SPR?	$280 000 grant	Facilitate recovery from ecological damage caused by the extensive 1996 fires through the reforestation of burnt areas, Establish two nurseries in Arhangai and Selenge - each will produce 10 million seedlings annually, enough to reforest 1000 ha Facilitate forest sanitation measures on 2000 ha of fire-stricken forest

Table B2 – Regional Environment Sector Projects

Project Name	Dates (Start/Finish)	Implementing Agency	Donors/ Consulting Firms	Funding Amount	Objectives/Scope of Project
Development of Environmental Policy in Mongolia and the CIS, Phase I	1997 – 1998	MNE	TACIS		Phase II planned for 1998 – 1999
Northeast Asian Mitigation of Pollution from Coal-Fired Power Stations Project	2 years	MNE Ministry of Infrastructure Development	ADB		Project approved but funding not available yet
Mass Media and Public Awareness Campaign on Environment in Mongolia and the CIS	April 1998	MNE	TACIS		
Reorientation of Forestry Policies and Institutions of Countries in Asia in Reform to Market Economies	1996 – 1998		FAO	$2 000,000 grant	Training and workshops in Mongolia, China, Vietnam and Myanmar

Table B3 – Planned and Proposed Environment Sector Projects for Mongolia

Project Name	Dates (Start/Finish)	Implementing Agency	Donors/ Consulting Firms	Funding Amount	Objectives/Scope of Project
Improvement of Meteorological Observation and Preventative Warning System	1998 – 2003	Metrorology, Hydrology and Environmental Monitoring Agency MNE	JICA	1 billion Yen	
Land Cadastre and Registration Project		Land Management Agency, MNE	ADB	$15m	Support transition to a functional private land market, Create enabling institutional environment for the land market to operate and for the collection of land fees, Design and implement a National Land Information System Undertake cadastral survey mapping
Forest Management in the West Khan-Khentii Mountains		Bureau of Forest and Hunting Nature Protection Office, Department of International Cooperation	GTZ	DM3 5m	Feasibility study team due in Mongolia, June 1998

TABLE C

CONTACTS IN MONGOLIA FOR ENVIRONMENTAL PROFILE ASSIGNMENT
(May 26—June 21, 1998)

Table C - Contacts in Mongolia for Environmental Profile Assignment
May 26 – June 21, 1998

Name	Title/Affiliation	Contact Information
Dr Osor AMARKHUU	President, Mongolian Association for Conservation of Nature and the Environment (MACNE)	(976-1) 367143 (t) (976-1) 313523 (t) (976-1) 367345 (f) macne@magicnet mn
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Mr Samdangiin BANZRAGCH	Director General, Environmental Protection Agency, MNE	(976-1) 327725 (t) (976-1) 328620 (f)
Mr David Barnhizer	Natural Resources Defense Council, author of MAP21 Executive Summary (UNDP)	(202) 289-2361 (t) (202) 289-1060 (f) dbarnhizer@nrdc org
Dr Judith Barry	AAAS Science Diplomacy Fellow, Environmental Office, Asia and Near East Bureau, USAID	(202) 712-5518 (t) (202) 216-3171 (f) jbarry@usaid gov
Mr Davaagiin BASANDORJ	State Secretary (Deputy Minister), MNE	(976-1) 321382 (t) (976-1) 321401 (f) baigyam@magicnet mn
Dr BATJARGAL Zambyn	General Director, National Agency for Meteorology, Hydrology and Environment Monitoring, MNE, - President, Mongolian Environmental Trust Fund, President, Mongolian Society for Support of National Parks	(976-1) 326592 (t) (976-1) 326611 (f) batbaig@magicnet mn
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Dr BATTOGTOKH	Executive Director, Mongolian Environmental Trust Fund	(976-1) 312771 (t/f) metf@magicnet mn
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Prof B CHADRAA	Chairman Scientific Production and Trade Corporation for Renewable Energy President, Mongolia Academy of Sciences Director Institute for Renewable Energy	(976-1) 322216 (t) (976-1) 321638 (f) chadraa@magicnet mn
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Mr T ENEBISH	Director General Department of Strategic Management and Planning MNE	(976-1) 312 428 (t) 321 401 (f) baigyam @magicnet mn
Mr Robert FERGUSON	Project Advisor Environmental Public Awareness Project	(976-1) 312 320 (t) 321 401 (f) aware@magicnet mn
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Mr GAMBOLD	Chief State Inspector Bulgan Aimag	
Mr Bandin GANBAATAR	Director International Cooperation Department, MNE	(976-1) 312 269 (t) 321 401 (f) baigyam@magicnet mn
Mr GANBAT	Responsible for promoting clean technology energy conservation, MNE	(976-1) 312 450 (t) 321 401 (f) baigyam@magicnet mn
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Mr Mark JOHNSTAD	Biodiversity Specialist	(406) 333-9003 (t/f) mjohnstad@econet org
Mr Ashim KHAUMDAS	Officer Strategic Planning Department, Ministry of Agriculture and Industry	(976-1) 323 442 (t) 322 289 (f)

Mr S KHUDULMUR	Director General, Environmental Protection Agency MNE	(976-1) 326 649 (t) 329 968 (f) mtt@magicnet.mn
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Mr Alois LIEGL	Project Coordinator Nature Conservation and Buffer Zone Development Project, GTZ	(976-1) 329 323 (t) 312 282 (t/f) gtzliegl@magicnet mn
Mr Kevin McCANN	Energy Advisor, EPSP (DAI)	(976-1) 312 884 (t) mccann@magicnet mn
Mr Jeff McKUSKER	Associate Director, Peace Corps, Mongolia	(976-1) 311 518 (t) 311 520 (f) mccusker@magicnet mn
Mr Kevin O'Kane	Team Leader, Mongolia Rational Use of Energy Project (TACIS)	(976-1) 321114 (976-1) 325458 (t/f) nifes@magicnet mn
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Ms Z UYANGA	Marketing Manager, Pacific American Commercial LLC	(976-1) 324 398 (t) 311 965 (f)
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Mr Baglat ZARIKKAN	State Secretary Ministry of Agriculture and Industry	(976-1) 325 887 (t) 323 442 (f)
Mr Dennis ZVINAKAS	US-Asia Environmental Partnerships (USAEP) Manila, Philippines	(632) 522 4411 ext 4454 (t) 521 5241 (f)