

# Principal Environmental Concerns: An update

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Certain portions of the text that follows reproduce the material contained in the 2001 CEA. This is done for convenience and only in those cases where the 2001 account continues to be valid.

## Land Degradation

**T**he official designation of lands, which is not synonymous with actual use,<sup>13</sup> is reproduced in Table 1. As to the area under each category, noticeable is the reduction of agricultural, especially pasture- and forestland, by about 10% in each case since 1998. Although part of this decline is due to recategorization of land, the remainder is due to a worrisome element, the impact of land degradation.

Land degradation in Mongolia is a matter of four main processes.

- (i) **Pasture degradation.** This takes a number of different forms, ranging from lower fodder yield, worsening composition of grasses, and rodent damage to damage caused by vehicles or outright pastureland loss. In the country's steppes and the Gobi fringes, pasture degradation can come close to, or become synonymous with, desertification.
- (ii) **Soil degradation on farmed areas.** Farming in the extremely fragile Mongolian conditions is fraught with environmental dangers, soil erosion foremost among them.
- (iii) **Loss of productive land.** Land is lost to mining, roads, military installations, and other uses.
- (iv) **Forest degradation.** Forest fires, insects, and illegal harvesting contribute to forest degradation.

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<sup>13</sup> Inconsistencies in Mongolian land classification and (especially) land use statistics are common but not too serious. The greatest gap between the official designation and actual use is under the categories of forestland and arable land. These are discussed in various places in the text.

**Table 1: Classification of Land in Mongolia**  
(1998 and 2003)

Land Classification	1998		2003	
	'000 hectares	% of total	'000 hectares	% of total
Agricultural Land	129,132	82.6	115,580	73.9
Pastureland	125,740	80.4	111,281	71.1
Hay Production Land	2,045		1,809	
Arable Land	953		706	
Other	394		1,784 <sup>a</sup>	
Towns, Villages, and Settlements	377	0.2	433	0.3
Roads	330	0.2	353	0.2
Forests	17,852	11.4	14,674	9.4
Water Resources	1,665	1.1	943	0.6
Reserve Land	7,056	4.5	0 <sup>b</sup>	
State Special Purpose Land	0		24,428 <sup>c</sup>	15.6
<b>Total</b>	<b>156,412</b>	<b>100.0</b>	<b>156,412</b>	<b>100.0</b>

<sup>a</sup> Includes 1.26 million hectares described as unsuitable for agriculture

<sup>b</sup> The category abolished in 2002

<sup>c</sup> Includes, among others, protected areas

Source: Ministry of Nature and Environment.

In what follows, the situation under the first three headings is summarized, reserving more room for forest degradation, which is described separately.

## Pasture Degradation and Desertification

Late 1990s official data on pasture degradation are given in Table 2.

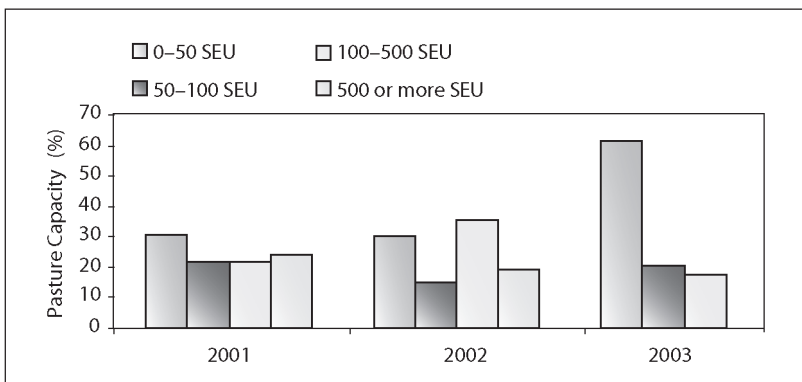
**Table 2: Extent of Pasture Degradation in Mongolia**  
(late 1990s)

Extent of Degradation	Slight	Moderate	Severe	Very Severe	Total Area
Percent	76	20	3	1	<b>100</b>
Area (million hectares)	92.8	24.4	3.6	1.2	<b>122.2</b>

Source: Government data.

State of the Environment data for 2003 (Figure 1) suggest that further degradation has taken place since the late 1990s. Pastureland dominates other categories of land under threat. Areas under particular pressure are some 15 million hectares near rural settlements, natural water sources, and towns. Not surprisingly, given that the impact of decollectivization of herding was superimposed on a far greater fragility of the underlying ecosystem, degradation and desertification pressures have been particularly severe in the steppe and Gobi areas.<sup>14</sup> In any event (and in a depersonalized world of resource allocation), it is not absolute degradation but the speed of deterioration that should guide remedial investments. (Let desert be desert and try to reverse deterioration in areas that are potentially much more productive.)

**Figure 1: Pattern of Pasture Degradation  
(2001–2003)**



SEU = sheep equivalent unit. The following weights are used in calculating SEU: sheep = 1.00, cattle = 5.00, horse = 6.00, camel = 8.40, and goat = 0.86.

Source: Ministry of Nature and Environment.

The 2001 CEA made the dismantling of collectivized herding and the subsequent search for alternatives the core of the analysis of pastureland degradation. That document can be examined to review main arguments. By now, numerous projects are under way in Mongolia to tackle the problem of pasture degradation (Table A6.3, Appendix 6). Although approaches vary

<sup>14</sup> Although official figures of areas occupied by sand have remained stable since 1940, amounting to about 4.3 million hectares, lakes and tributary streams have been drying up in Mongolia's southern areas and moving sand dunes have damaged wells and other structures.

(and a much-needed harmonization of approaches is being finally attempted), the remedial steps are well understood but not easy to take. Action has targeted one or several preconditions of livestock mobility (restoration and maintenance of water wells, locally agreed regimes of pasture use that place limits on the pasturelands' characteristics as commons, emergency response, and others). Worth noting is that 2000 and 2001 *dzuds* (severe winter weather [Box 10]) resulted in animal stocking that is not historically high (Table 3)<sup>15</sup> and a decline in the number of small herders (from its peak in mid-1995 of over 200,000 herding families). Considerable efforts are directed toward new forms of community-based land use and herder cooperation (distinct from the discredited cooperatives of the past). Applying the provisions of the Land Law to pastureland is among the key challenges.

If the essential requirement of reduced pastureland degradation is greater livestock mobility, this has not always been clearly translated into policy. Instead, a recent policy calling for more intensive animal husbandry (Resolution #29 of *Ikh Hural* [the Parliament] of 2003) does not clearly distinguish between intensive livestock production—inappropriate in Mongolian conditions, where fodder on stump is cheap, unlike other forms of fodder supply—and other forms of animal husbandry that may well thrive in the vicinity of settlements. If the policy is advocated as a means of reducing pasture degradation in the vicinity of settlements, proponents need to explain better how the policy would reverse pasture degradation under new institutional and market circumstances and what complementary actions would need to be taken to achieve the environmental objective.<sup>16</sup> More than anything else, nondogmatic and market-backed solutions to animal husbandry are needed, with a parallel vigorous action on facilitating livestock mobility.

Pasture degradation and desertification are now more readily recognized as a crosscutting theme with links to an evolving framework of land ownership and management and the pattern of alternative employment opportunities. Other important links to global climatic trends exist. Since the last review of the topic in 2001, more work has been done in Mongolia on the subject, under the aegis of the United Nations CCD and UNFCCC.<sup>17</sup> The results give more substance to concerns about the impact of global

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<sup>15</sup> The statistical weakness of this estimate is important to acknowledge, nevertheless. A more accurate measure would require the use not only of sheep equivalent unit but also a pastureland equivalent (rather than gross area).

<sup>16</sup> These comments are not meant to minimize the complexity of the issue. Particular patterns of intensified management may be favored by the meat processing industry as a means of controlling animal disease and optimizing processing schedules.

<sup>17</sup> See Adyasuren 2002 and Batima, et al. 2003, respectively.

**Table 3: Population and Livestock in Mongolia**  
(1918–2003)

<b>Population and Livestock</b>	<b>1918</b>	<b>1924</b>	<b>1940</b>	<b>1970</b>	<b>1990</b>	<b>2000</b>	<b>2003</b>
Population	648,000	684,000	744,000	1,265,000	2,149,000	2,407,000	2,510,000 <sup>c</sup>
Livestock							
Camel	228,000	270,000	643,000	633,000	537,000	323,000	256,000
Horse	1,150	1,340	2,358	2,318	2,262	2,661	1,958
Cattle	1,078	1,510	2,723	2,108	2,849	3,028	1,784
Sheep	5,700	8,400	15,384	13,312	15,083	13,206	10,706
Goats	1,488	2,100	5,096	4,204	5,126	10,077	10,603
Total Animals	9,644	13,620	26,204	22,575	25,857	29,295	25,308
SEU <sup>b</sup>	22,263	29,574	55,653	48,801	54,668	58,719	44,324
Arable Land (hectare)	–	–	26,000	744,000	1,347,000	1,176,000 <sup>a</sup>	706,000 <sup>a</sup>
Pastureland SEU <sup>b</sup> per square kilometer of pastureland	–	–	140,151,000	139,940,000	124,285,000	129,294,000	111,281,000
			39.7	34.9	44.0	45.4	39.8

— = no data available.

SEU = sheep equivalent.

<sup>a</sup> of which only 209,000 ha were sown in 2000 and 225,500 in 2003

<sup>b</sup> SEU: sheep = 1.00, cattle = 5.0, horse = 6.00, camel = 8.40, and goat = 0.86 (following the Mongolian *bod* [unit of counting animals] concept, instead of the international method, in which sheep = 1.0, cattle = 5.0, horse = 6.0, camel = 7.0, and goat = 0.9)

<sup>c</sup> 2003 population figure was extrapolated from the official 2,475,000 in 2002 at a 1.4% growth rate.

Sources: Data for 1918–1990 are based on Karamisheff, W. 1925. *Mongolia and Western China, Tienstsin*. Cited in Humphrey and Sneath (1995) and *National Economy of the MPR for 70 years 1921–1990*. Data for 2000 are from *Mongolian Statistical Yearbook 2000*. Data from 2003 are from *Monthly Bulletin of Statistics*.

warming on pastureland and the condition of permafrost (with a complex sequence of repercussions), the changing behavior of Mongolia's wetlands, a shift of the vegetation line northward,<sup>18</sup> further forest degradation and reduction of suitable habitats within protected areas (Batnasan 2003). These are important findings. Nonetheless, the balance of land degradation and desertification causes continues to lean toward anthropogenic factors, not climatic (or indirectly anthropogenic, to be more precise) factors. In any case, Mongolia may be risking too much by waiting for a reversal of climatic

<sup>18</sup> ADB (2001a) points out that when such shifts are described in terms of forest boundary, they may unwittingly reinforce a rather narrow view of forests and trees in the Mongolian landscape, because they draw a sharp line between forests and nonforests, leaving many vital forms of tree and shrub vegetation (tree shelters in pastures, desert shrubs, etc.) out of consideration.

trends. The emphasis on adaptive strategies in recent rounds of UNFCCC-related work (Batima 2003) is therefore appropriate.

Given the importance of the topic for Mongolia, a brief summary of the institutional setting is needed. Mongolia ratified the United Nations CCD in 1996 and was host to that convention's Asian Regional Thematic Program Network 5: Strengthening Capacity for Mitigating Drought Impact and Desertification Control.<sup>19</sup> The National Committee to Combat Desertification was established in 1997. The National Research Center to Combat Desertification within the Mongolian Academy of Sciences was created in 1998. The National Action Plan to Combat Desertification was first drafted in 1998. An extensive monitoring network exists and is structured around the National Agency for Meteorology, Hydrology and Environmental Monitoring (NAMHEM)<sup>20</sup> within the Ministry of Nature and Environment (MNE) and the Central Environmental Monitoring Network. Disaster management and early warning systems are in place, and recent legislative revisions provide another element of Mongolia's response. Taken together, these give a good indication of the importance attached to the topic by Mongolia. Recent assessments (Adyasuren 2002) identified insufficient integration of data on drought and desertification, tendency to see desertification as only an environmental problem, and insufficient public involvement as principal areas of weakness.

## Loss of Productive Land

The 2001 CEA put the area of pastureland lost to multitracking<sup>21</sup> in the last decade at about 300,000 hectares (i.e., averaging about 30,000 hectares per year). This is admittedly less than 0.025% of Mongolia's total land area but more than 0.500% of the total area of productive land and an even higher percentage of the best land (i.e., land useable by vehicles). Two new elements need to be added to these figures. First, multitracking is not necessarily a problem caused only or mainly by outsiders. Much of it is due

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<sup>19</sup> Links with other Asian regional thematic program networks (i.e., Asian Regional Thematic Program Network 1: Desertification Monitoring and Assessment [People's Republic of China], Asian Regional Thematic Program Network 2: Agroforestry and Soil Conservation [India], Asian Regional Thematic Program Network 3: Rangeland Management and Sand Dune Fixation in Arid Areas, and Asian Regional Thematic Program Network 4: Water Management [Syria]) are weak.

<sup>20</sup> In 2003, NAMHEM consisted of 120 meteorological stations, 183 meteorological points, 7 upper atmosphere stations, and 118 hydraulic observation points.

<sup>21</sup> Multiplication of tracks caused by vehicles traveling off-road, many carving new tracks.

to herders, who own a significant percent of registered vehicles (Table 4). That being the case, some of the damage is internalized, and it could be argued that this damage demands no remedial action.

**Table 4: Pattern of Vehicle Ownership by Herder Households**  
(1995, 1997, and 2002)

Vehicles	Households		
	1995	1997	2002
Motorcycles	26,700	26,226	32,641
Vehicles (Automobiles and Jeeps)	4,900	7,348	18,447
Households with Vehicles	31,600	43,574	51,088
<b>Total Households</b>	<b>169,308</b>	<b>183,636</b>	<b>175,911</b>

Source: *Mongolian Statistical Yearbook 1997* and *Mongolian Statistical Yearbook 2002*.

Second, the rate of land lost to multitracking increased in the mid-1990s with the growth of herding families and concentration of economic activities closer to settlements and as family- or group-based provision of supplies replaced collective provision. In Mongolia, the damage to pastureland caused by vehicles is too long-lasting to respond quickly to any future (and uncertain) reduction of off-road transport.

A similar lack of reliable figures makes it difficult to estimate losses caused by mineral exploration and mining activities in Mongolia.<sup>22</sup> Here, the impacts are different mine tailings and handling of overburden, often creating special risks absent in multitracking, where simple compaction is the chief or only culprit. More recently, the emergence of small-scale (or ninja) mining has produced new forms of land degradation, whose overall impact is nevertheless overshadowed by large-scale removal of overburden by industrial mining operators. Similar concerns, supplemented by potential risks to water quality, accompany losses of land to waste disposal sites, which

<sup>22</sup> The 2001 CEA found vastly different estimates, ranging from just over 1,000 hectares to millions of hectares of land degraded as a result of the activities of some 600 exploration and 200 active mining sites in Mongolia. The rate of mining exploration continues to grow. Based on field visit observations at Zaamar, a leading gold producing area of the country, the area disturbed, some of it irrevocably, is about 40 square kilometers, or 4,000 hectares. MNE put the area affected by gold mining between 1992 and 2001 at 5,500 hectares, not counting damage due to exploration activities. Adding other forms of mining, a figure of perhaps 50,000 hectares affected, so far, would seem reasonable, not counting a multiple of that figure affected moderately by exploration activities.

are said somewhat arbitrarily (United Nations Development Programme [UNDP] 2000) to have occupied 30,000 hectares of land.<sup>23</sup>

## Soil Degradation

Wind erosion affects almost all cultivated lands in Mongolia and steadily reduces their organic content. The area cultivated in Mongolia has declined from a peak of about 1.2 million hectares in the 1980s to about 400,000 hectares today. That which is a grave concern for the relevant production ministry (Ministry of Food and Agriculture) has become something of a relief to the environment's custodians. Removing the least suitable—usually the most fragile—areas from cropping could well be a particularly efficient way of reducing land degradation.<sup>24</sup> It is unlikely that a rapid change in technology away from deep plowing toward environmentally more benign cultivation methods (low tillage and others) will take place in the short to medium run. The problem has local and transboundary dimensions. The phenomenon of dust storms affecting the whole of East Asia has its origins in part in inappropriate land management practices in large segments of Central Asia, including Mongolia and Inner Mongolia. Through Regional Technical Assistance 6068: Prevention and Control of Dust and Sand Storms in North-East Asia, ADB was among the first specifically to respond to this challenge.

It is important to question rehabilitation and development policies for the crop sector that use past acreages as desirable targets for the future. The relatively weak strategic case for greater self-sufficiency in grains was mentioned earlier.<sup>25</sup>

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<sup>23</sup> Much more ought to be said about landscape scarring caused by uncontrolled dumping of waste, which is found on the outskirts of most Mongolian settlements. A positive new development has been rapid disappearance of scrap metal from these areas, as People's Republic of China demand has created a market for the commodity, and this demand is being met eagerly by Mongolia's people.

<sup>24</sup> The process could be accompanied by increased production in more suitable subareas (e.g., those once irrigated).

<sup>25</sup> A more charitable explanation for the strong push for domestic grain sufficiency could be the importance of the local production of alcohol, possibly offering multiplier effects (some positive).

## Forest Resources and Their Management

The 2001 CEA contains a summary of the situation as it existed around 2000, characterizing the sector then as neglected and crisis-ridden. Much of that summary remains intact. A recent World Bank-commissioned assessment (World Bank 2003b)—the only analytical look at the sector so far—has added to understanding and introduced new elements. Elevated within the new MNE-organization structure, the sector nevertheless remains crisis-ridden. A portion of the report's summary follows.

- The forestry sector in Mongolia is rapidly approaching a crisis for which it seems largely unprepared:
- The present estimated levels of forest harvesting are unsustainable; being at least 4 times the sustainable Annual Allowable Cut on the designated Utilization Zone and at least 1.75 times the sustainable Annual Allowable Cut if about 25% of the Protected Zone were made available for commercial harvest.
- The forest area zoned for utilization is inadequate to support a viable domestic wood-based industry or to attract the capital it needs to modernize for greater efficiency.
- Between 36 and 80% of total harvest is illegal. The Government receives no royalties or taxes on this and it severely distorts domestic prices for both construction wood and fuelwood.
- Market forces and prices are not reflected in the allocation of cutting quotas or in the setting of stumpage fees.
- Fuelwood currently constitutes between 65 and 80% of the total wood harvest and is used by many poor rural and urban households for both cooking and residential heating. If alternative sources of domestic fuel are not developed and current levels of forest depletion continue unabated, serious fuelwood shortages will begin to be experienced in urban areas by the end of this decade.
- Instead of dealing constructively with the primary problem of unsustainable resource exploitation, the Government has tended to focus on peripheral issues, such as an outmoded forest inventory system, fire control, insect and disease control, and reforestation, for which neither an ecological nor an economic rationale is apparent.

- Top-down enforcement of regulations has been ineffective. A two-pronged strategy involving gradual expansion of community forest management and strengthening of the existing government enforcement regime offers the best possibility to reduce illegal harvesting.

The facts behind these conclusions are that in Mongolia about 7% of total land area was under closed forest at the turn of the century, representing nonetheless a vast area of over 10 million hectares.<sup>26</sup> This figure excludes saxaul (*Haloxylon ammodendron*) shrubs<sup>27</sup> scattered on a further 2 million hectares or so in the southern portion of the country and the Gobi fringes.<sup>28</sup> The average standing volume of the northern closed forest is estimated to be 103 cubic meters per hectare, giving a total standing volume of around 1,300 million cubic meters (Table 5).

**Table 5: Estimate of Area and Standing Volume of Mongolian Forests (2000)**

Forest	Area (‘000 hectares)	Standing Volume (million cubic meters)
Larch ( <i>Larix siberica</i> )	7,527	1,030
Pine ( <i>Pinus silvestris</i> )	662	71
Cedar ( <i>Pinus cembra</i> )	985	161
Other Conifers	29	4
Broadleaf Species ( <i>Betula, Populus, Salix</i> )	1,199	86
Saxaul ( <i>Haloxylon a.</i> )	2,029	1
<b>Total</b>	<b>12,431</b>	<b>1,335</b>

Source: Crisp, et al. 2003. *White Book of Mongolian Environmental Situation 2000*.

Under a mean annual increment of 1.4 cubic meters per hectare, which is considered typical of the larch, pine, and cedar forests of Mongolia’s northern area, the total increment is in excess of 2 million cubic meters per year, seemingly a comforting figure when compared with the allowable cut, which is now around 600,000 cubic meters per year. However, to relate these estimates to the situation on the ground, the following elements are important.

<sup>26</sup> It is estimated that Mongolia lost about 2.2 million of closed forest since 1950 (World Bank 2003b)

<sup>27</sup> A shrub, normally less than 2 meters high, considered vital to erosion and desertification control in the southern part of the county.

<sup>28</sup> A more guarded statement of forest totals can be noticed in CEA 2001. This reflects uncertainty about the rate of forest depletion in recent years and incompleteness of recent forest inventories.

- (i) **Forest fires and insect damage in the past decade.** These have been extensive and put in doubt the validity of existing estimates of the standing stock and its increment.
- (ii) **Forest zoning.** Most of the forested area is unavailable for production under the existing system that distinguishes strict, protected, and utilization zones. Of the total area of 17.8 million hectares designated as forest estate, 47% is placed within the strict zone; 46% in the protected zone; and only 7% (or 1.2 million hectares) in the utilization zone, where commercial harvesting is permitted. At first sight, this might seem a robust defense of the forest estate, but there are other factors.
  - (a) **Rapid increases in illegal harvest.** The legal harvest in 2002 was 40,000 cubic meters of roundwood and 580,000 cubic meters of fuelwood, about one fourth of actual consumption [World Bank 2003b].
  - (b) **Uneven use of the standing stock.** Most legal logs come from a relatively small but accessible area of about 300,000 hectares (mostly in the Selenge aimag). Even legal log production is very unevenly distributed in space, and depletion occurs in the utilization zone.
  - (c) **Ineffectiveness of reforestation in Mongolia.** With a possible exception of urban forestry, reforestation is unsuitable for Mongolia. Natural regeneration accompanied by protection is preferable.

Answers to the forestry crisis in Mongolia clearly do not lie in additional official protection accorded to forests and do not lie in afforestation.<sup>29</sup> Over 90% of forests already enjoy one or another kind of formal protection status. Neither is there a shortage of forest-related legislation. For example, the Mongolian Forest Law of 1995 provides for classification of forests; contains detailed provisions for their management within special protected areas and national parks; specifies the determination of disaggregated annual allowable cut, timber sale contracts, fuelwood harvest permits, and much more. Other complementary legislation, multitiered and relatively complex, deals with subjects such as prevention of forest and steppe fires. What is missing are viable management regimes, either community-based or commercial, containing incentives and environmental safeguards, and local capacity to regulate forest activities. The National Forestry Program and

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<sup>29</sup> This view is not popular within MNE, which allocates more of its own funds for afforestation than for any other natural resource management activities (a total of MNT626 million in 2003, to be precise, or 30.1% of the total).

the Forestry Action Plan have little to say about these vital topics. Furthermore, to return to comments made in the 2001 CEA, many practical aspects of forest management issues, such as forest taxation and funding of local forest administration, have not been addressed.<sup>30</sup> With the exception of Germany, development partners have stayed away from controversial production forestry, preferring to respond to their domestic constituencies' interest in conservation.

## Conservation of Biological Resources and Key Ecosystems

New developments in the area of conservation since the 2001 CEA have been mainly institutional, namely assignment of field responsibilities for all protected areas to MNE (and simultaneously removing MNE's oversight from the management of other land resources that are now solely local governments' responsibility). A further small increase has taken place in the protected realm, and about 20.9 million hectares (i.e., 13.2% of the territory of Mongolia) are under some form of protection at present (Appendix 8 lists strictly protected areas, national parks, and nature reserves<sup>31</sup>). Main conservation concerns have not changed since 2001. These are poaching, sometimes transboundary; inappropriate hunting quotas; loss of habitats, due to overgrazing; multitracking; lake sedimentation and different forms of pollution; and unsound management practices (e.g., crossbreeding domestic and wild species). Depletion of saxaul vegetation in the Gobi continues, but promising reversals of this situation have been realized under several development partner-funded projects. Concerns have been expressed about potential threats to the country's principal wetlands by planned hydropower developments, especially the Durgon hydropower plant on the Chono-Khairakh River, which is part of the Khar Us Lake National Park (Batnasan 2003).

The 2001 CEA mentions the strengthening of the buffer zone supported by the 1997 Law on Buffer Zones and the designation of twelve buffer zones around 10 strictly protected areas and two national parks,

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<sup>30</sup> Since 2003, with the separation of the Environmental Protection Agency from MNE, MNE's responsibilities have shifted significantly toward protected areas. This leaves forest utilization zones and forest protected zones outside strictly protected areas short of administrative oversight.

<sup>31</sup> Little was said in 2001 about wetlands. Mongolia joined the Ramsar Convention in 1998. At present, there are six Ramsar sites in Mongolia, with a total area of over 630,000 hectares. Great Lakes Basin, containing the main bodies of water (other than Khovsgol [Box 1]) are considered particularly vulnerable to overgrazing.

covering a total of about 10.5 million hectares. This further increases the total area enjoying some form of institutionalized protection in Mongolia. A new concern is the apparent conflict between the Law on Buffer Zones and the new Mining Law that allows, by default, mineral prospecting in buffer zones without requiring prior consultation with local authorities and populations.

Strictly protected areas and national parks are a focus of ecotourism, considered by many to represent a potential source of funding for these areas' sustainable management, despite Mongolia's relatively unfavorable location and short tourist season. There were 205,000 visitor arrivals in Mongolia in 2003, up from 158,000 in 2000. Of these, about 180,000 came as private visitors. The visitors were mainly from the People's Republic of China and Russia, which taken together accounted for 144,000 arrivals. Only 22,000 visitors stated that tourism was the main reason for entering the country, but many visitors are believed to mix tourism with other activities. Assuming the number of tourists and part-time tourists to be 50,000 and average local expenditure to be \$500 per visit, a respectable figure of \$25 million emerges, contrasting with a total 2003 budget allocation to MNE for protected areas' management of \$0.28 million equivalent. The category of trophy hunting, with small numbers of visitors but high local expenditure, continues to be incompletely documented, which makes correctly gauge its importance impossible. This topic is discussed in connection with local financing of environmental management.<sup>32</sup>

## Land Reform

The 2001 CEA's broad account stands. Private ownership of land is a very recent concept in Mongolia and one giving rise to fears of excessive foreign ownership, land concentration, and speculation. The constitution prohibits privatization of pastureland but not of urban and arable land.<sup>33</sup> The crux of the current debate has been the extent of the constitutional

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<sup>32</sup> Wildlife exports (meat, skins, antlers, etc.) to the People's Republic of China is an underresearched topic. A number of Mongolian and foreign specialists estimate illegal exports to be several times greater than the legal trade. The extent to which this knowledge is reflected in the determination of hunting quotas is not certain.

<sup>33</sup> In all, not more than 0.8% of Mongolia's territory is thus in principle open to private ownership. The exemption of pastureland from private ownership does not necessarily remove it from the ambit of taxation. To many, the de facto exemption of pastureland from taxation until now has deprived the Government of a potentially powerful economic instrument for discouraging excessive use of pastureland near settlements and water points, which is a major economic and environmental problem today.

right of Mongolia's people to own land and the manner in which this right is to be exercised. The 1994 Law on Land established different classes of land and land rights (ownership, possession, and use and limited use), some of which apply also to pastureland. The Law on Land spells out the responsibilities of land users and the procedures for land assessment, land use contracts, and land conservation. A 1997 amendment requires registration of land rights with the State Register for Immovable Property. The Law on Land Cadastre of 1999 added the methods and procedures for mapping and registering various land classifications established by the Law on Land. The primary responsibility for implementing the Law on Land rests with aimags and soums that have interpreted the law, including its applicability to pastureland, in a number of different ways. In some cases, possession rights have been allocated to winter camps. In other cases, these rights have been allocated to winter camps and winter pastures. The size of the recipient group (individuals or *khot ails* [groups of herding households]) and length of possession rights have varied.<sup>34</sup>

The Law on the Allocation of Land to Mongolian Citizens for Ownership of 2002, which is called the land privatization law; a 2003 revision of the 1994 Land Law; and the Property Rights Registration Law of 2003 represent the latest additions to the land legislation edifice. This framework clearly distinguishes between ownership (possession) and use rights and allows for transferability of these rights. The land privatization law goes beyond land possession (let alone land use) licenses and provides for the possibility of full land ownership of residential land parcels. It gives every Mongolian citizen the right to own specified areas of urban land (0.07 hectares in Ulaanbaatar, 0.35 hectares in aimags, and 0.5 hectares in soums), to be received without payment if the option is exercised before 2005. Pastureland remains state property. Some 8,500 parcels had been allocated by October 2003, another 30,000 or so are pending. Registration of property deeds has been marked by delays.

On the institutional side, the most important and positive change has been the merger in 2002 of three erstwhile organizations: State Administration of Geology and Cartography (under the Ministry of Infrastructure), Land Administration Authority (under MNE), and State Immovable Property Register (under the Ministry of Justice). These three organizations have become the Administration of Land Affairs, Geodesy and Cartography (ALAGaC), under the Prime Minister's Office. The work

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<sup>34</sup> The work of ADB's Capacity Building in Agriculture (Technical Assistance 3606) has begun generating information about the early impact of these and more recent legislative changes on the management of pastureland and associated assets (e.g., water wells).

of ALAGaC is complemented by 21 land management offices at the provincial level and the Urban Development and Land Management Department, within the Ulaanbaatar municipal government.

The primary concern now is how to work out the implementation details of the Law on Land that demand the further strengthening of the capacity of local governments to allocate and protect land rights in ways most suitable to local conditions.

## **Mining**

Mining, especially that of gold, has a long history in Mongolia. Russia's and the People's Republic of China's operations began in the 19<sup>th</sup> century. The economic importance of mining and its further expansion in today's Mongolia was underlined earlier in this analysis. Mongolia is a major producer and exporter of copper/molybdenum, gold, coal, and acid- and metallurgical-grade fluorspar. By 2000, 500 deposits (including uranium and rare earths) had been identified, of these about 200 were exploited, including 35 of construction materials. Since then, more deposits have been identified, and some are of global importance.

The following factors have been relevant for environmental management: The vast majority of existing mines, mostly gold, in Mongolia are surface (placer) rather than deep mines. Their operation results in significant disturbances of the landscape and normally requires excavation and washing of metal-bearing sands in dredges and other water washing devices. They cannot operate in water deficient areas and, in Mongolia, are normally closed in winter. Main environmental challenges relating to copper/molybdenum mines in Mongolia are high energy consumption and tailings storage, which result in dust and contaminated water. The operations involve large quantities of acid, which is spread on old unlined overburden. Monitoring of chemicals' use, facilities, and groundwater is essential. In coal mining, air quality, reclamation and mine closures (e.g., metal leaching after mine closure), dust from operations and rock overburden piles, and concentrations of carbon monoxide within the mines are the main problems.

Until recently, environmental concerns and the focus of the sector agencies responsible for protecting the environment were of the traditional kind and included targeting land disturbance, compliance with rehabilitation provisions, and conditions of mine tailings and tailing dams in principal production facilities (such as the Erdenet complex). A 1999 World Bank-commissioned study of the environmental impact of gold mining around Zaamar added other observations, such as the absence of a single authority

to regulate the activities and environmental impacts of several dozen gold concessions and operations located in close proximity to one another.

While official policy not unreasonably had large operators and the burgeoning prospecting activities in its sights, a trickle and soon a wave of a new type of mining appeared in Mongolia from the mid-1990s, namely informal small-scale (ninja<sup>35</sup>) gold mining. Responding to a loss of rural employment opportunities and led by redundant employees of old struggling mining companies, the new miners have worked illegally on the fringes of industrial operations or in abandoned areas. Low rates of gold recovery by industrial operators have widened the scope for profitable activities by ninjas. These miners have been exploiting both placer (alluvial) and hard-rock deposits. The difference between the two deposits is crucial from the environmental point of view. While the impact of the former on the physical environment and river ecology is relatively benign (Ibish, et al. 2003), the latter relies on the use of mercury for amalgamation and extraction of gold and presents a massive environmental hazard (Box 3). Prolonged exposure to above-the-limits mercury is known to cause serious (and potentially fatal) neurological disorders (e.g., Minamata disease<sup>36</sup>)

The experience elsewhere (e.g., Minamata and mercury mining in Brazil) suggests that the rapid growth of ninja hard-rock mining in Mongolia should be a major public health concern. Human health problems are only now surfacing, as mercury usage is recent. Because mercury enters the soils of soum centers, virtually all residents are starting to be affected. Mercury cleanup would almost certainly be more expensive than relocating towns, but that may well become the only realistic option once the problem is fully acknowledged.

While rightly alarmed by the use of mercury, experts remind us that mercury is not used anywhere in Mongolia by placer ninja miners (unlike, for instance, in Brazil<sup>37</sup>) and argue that placer mining could on balance play a strongly positive role in economic development, provided the activities are suitably regulated (Mongolian Business Development Agency 2003b).

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<sup>35</sup> The term *ninja* refers to the miners' resemblance (when carrying a typical plastic pan on their backs) to characters in a popular children's television series.

<sup>36</sup> See Takizawa and Sekikawa (2004) for an epidemiological and policy review of Minamata disease. The Minamata episode became a key event in the development of Japan's environmental regulation. For the sake of comparison with the totals in Box 3, the total amount of mercury deposited into the Minamata Bay during the 1950s was between 70 and 140 tons.

<sup>37</sup> *Garimpeiros* are Brazil's ninjas. Brazil's experience is not encouraging. The political pressures place poverty alleviation (access to land by *garimpeiros*) ahead of environmental considerations (widespread use of mercury by the *garimpeiros*). It is vital that Mongolian authorities support placer ninjas in ways that remove any temptation to use mercury and facilitate the movement of hard-rock operators toward placer areas.

Field work and analysis of exceptional quality has been generated on artisanal mining in the last several years by the Mongolian Business Development Agency and Eco-Minex International Inc.

### Box 3

#### **Use of Mercury in Gold Mining in Mongolia**

Mercury use goes back to 1912 in the Boroo river area (within the Selenge watershed). Major leaks of mercury occurred in 1956 and several tons of mercury remain in the river to this day. Recent extensive field investigations revealed the existence of hotspots of mercury pollution in Bayangol, Bornuur, and Sumber *soums* (districts) of the Boroo basin and suggested that the problem is more widespread. Seventy-six percent of the households in three studied soum centers are hard-rock informal gold miners (called ninjas) using mercury for gold recovery. These miners and the three soum centers currently consume about 500 kilograms of mercury each year, or 2.4 tons over the last 5 years. Of this, 56.0% goes to the atmosphere and 44.0% to the soil. Of the mercury waste, 83.3% of miners dump it in the open air in their fenced yards. Household yard soil has peak mercury content that is 230 times the permitted amount. Vegetable farmland near to the Boroo river has twice the permitted maximum of mercury. Two to three tons of mercury have accumulated in the bottom sediments on 40 kilometers of the Boroo and Kharaa rivers. Individuals pan the bed and banks of both rivers for mercury, which they sell to hard-rock ninja gold miners. This recovered mercury is insufficient to satisfy the rapidly rising demand, and more than 1 ton a year is imported illegally from the People's Republic of China and sold in villages by traders and gold shops.

The technology of mining, crushing, milling, sluicing, and amalgamating vary, but final mineral processing is not done at mine sites but in soum centers. Hence, each soum center is now a mercury hotspot. All ninja miner households in turn are severe mercury hotspots within the broader soum hotspots. Most illegal mining remains primitive and is within 20–50 kilometers of home, but several ninja groups in the study area commenced in 2004 to truck mined quartz gold ore from the South Gobi Protected Area to the north for processing using mercury. Ecological damage to the Gobi by illegal mining and to the Selenge watershed by mercury are therefore linked.

Sources: Mongolian Business Development Agency. 2003. *Ninja Gold Miners of Mongolia: Assistance to Policy Formulation for the Informal Gold Mining Sub-sector in Mongolia*. Ulaanbaatar.

Tumenbayar, B., Batbayar M., and R. Grayson. 2001. Mercury Pollution in North Mongolia. Paper presented at the 6<sup>th</sup> International Conference on Mercury as Global Pollutant, Minamata 15–19 October. Japan International Cooperation Agency. 2003. *Action Research on Mercury Pollution in Boroo Area of Mongolia*. Tokyo.

The attention to the new threat of mercury contamination should not lead to less vigilance concerning the mining activities of industrial producers. Here, the greatest potential threat is the condition of accumulated tailings and tailing dams (Dick and Grayson 2004).

## **Urban Environmental Management**

The 2001 CEA described the broad pattern of urbanization in Mongolia, including the resumption of the pre-1990 urbanization trend, fast growth of Ulaanbaatar, and expansion of suburban habitats.

## **Solid and Hazardous Waste Disposal**

The assessment made in 2001 requires few modifications: Despite some improvements in the regularity of service in recent years in Ulaanbaatar, incomplete and sometimes haphazard disposal of household and industrial wastes, absence of any provisions for separating hazardous and toxic wastes, underfinancing, and insufficient cost-recovery continue to mark the service in the capital (Box 4). On a smaller scale, the situation is similar in other towns. Transport of solid wastes, including sewage sludge in some cases, from urban areas to dumping sites and the conditions of these sites are in general unsatisfactory. Management of coal ash in large cities, open low-temperature burning of wastes, increasing proportion of nondegradable wastes in the waste streams, and littering are ubiquitous problems. No inventory and overview of industrial and hazardous waste has been attempted in Mongolia.<sup>38</sup>

Development partner assistance to solid waste management has been relatively modest, possibly reflecting the view that apart from trucks, improvements in this domain depend as much on political will as on equipment or special technical expertise. ADB's 1997 Provincial Towns Basic Urban Services project, World Bank's Ulaanbaatar Urban Service Project (1997), and the anticipated Second Ulaanbaatar Urban Services

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<sup>38</sup> Before 1990, Mongolia imported more than 1,000 different chemicals (or 3,000, if medicines are included). That number increased to about 7,300 by 1994 and is probably much higher now. About 1,300 different companies and organizations use chemicals. According to Deutsche Gesellschaft für Technische Zusammenarbeit (2001), some 600 tons of chemicals per year were indiscriminately dumped in the mid-1990s, some 70 tons were discharged into the air, and 800 tons ended up in surface waters (if not groundwater). Mongolia has received requests from other countries to establish hazardous and toxic waste landfills in the Gobi desert.

#### Box 4

### **Organization of Solid and Hazardous Waste Management in the Capital**

The responsibility for waste management is decentralized to districts. Within the city government, there is a working group on waste management. Under the group, the City Reconstruction Company and nine district construction and service companies (of which six are in the city area) are responsible for waste management, street cleaning, public construction, parks, etc., as well as three central dumpsites managed by a separate entity NUUTS. Despite their names, the companies operate entirely on the city government's budget. The district companies collect fees for waste disposal from private households, communal entities, and institutions. The fees are set by the city government. The rates, set in 1997, are MNT50 per person per month in apartment blocks and MNT400–500 per family per month in *gher* (tent dwellings) areas. A general disposal fee of MNT50 per cubic meter of waste of all categories is charged by district companies, but contracts can be negotiated individually with industrial and commercial entities.

Source: Asian Development Bank.

Improvement Project target mainly water, even if the second project contained two subprojects of interest (i.e., waste collection in *gher* areas and a study on the establishment of a new sanitary landfill. The Government of the Netherlands and the Government of Japan, through equipment provision, have been responsible for some improvements during the most recent period. Waste management in *gher* areas has been repeatedly mentioned as a high priority of Ulaanbaatar's city government.

Recycling of waste was slow in coming but has now arrived. The 2001 CEA mentioned only the Blue Bag Campaign run by the Mongolian Women's Federation. This campaign supports the sorting of waste into blue bags and sending it for commercial recycling. As a result of recent World Health Organization-commissioned work (World Health Organization. 2002a), a much more favorable picture emerges, because substantial and relatively well organized recycling of metals, paper, plastic, and animal bones takes place.<sup>39</sup> This is supported in some cases by strong demand from the People's Republic of China. Some 5,000–7,000 people were employed in materials recycling in 2000.

<sup>39</sup> The emergence of markets for scrap has improved the economics of truck use in some cases.

The Law on Protection from Toxic Chemicals was adopted in 1995, assigning varying responsibilities to MNE and local governments. The law provides for permits for use and disposal of toxic substances and for compensation for any harm caused by the use or disposal of toxic substances. No systematic survey of existing practices has been made, but anecdotal evidence suggests that they lag significantly behind legislative developments. MOH is increasingly concerned about the nonexistence of a specialized facility to treat hospital waste.

## **Air Pollution in Mongolia's Urban Areas**

Air pollution in Mongolia's urban areas, especially Ulaanbaatar, is considered a serious problem, especially in winter. The 2001 CEA provides a summary of the situation at the time. This remains valid to this day, and only minor updating of the main measurements is required.

### **Box 5**

#### **Ulaanbaatar Statistics**

The Ulaanbaatar municipality (1,360 square kilometers) is divided into nine districts and 119 *khoroos* (urban subdistricts). The capital's population has increased from an official 787,000 in 2000 to about 900,000 today. The planned population of (only) 1 million by 2010 looks increasingly untenable in the face of continuing population inflow. Of the total, about half of all residents live in apartment blocks, some 80% of which are supplied with central heating and hot water from three combined heat and power plants; 7% by heating boilers (275 of them in the city, with the majority connected to a centralized heating network); and 13% by individual stoves. The rest of the residents live in individual dwellings, in *gher* (traditional tent dwelling) areas on the outskirts of the city, where coal and fuelwood are used for heating. The three combined heat and power plants consume about 3 million tons of coal per year, the individual boilers about 1 million tons, and the households in *gher* areas another 300–400,000 tons (in addition to fuelwood). The high coal consumption and energy inefficiency of individual stoves are factors contributing to the relatively high air pollution in the city during winter. Adoption of compressed natural gas has been promoted by the private sector in the last 2 years.

Source: Asian Development Bank.

In all major cities (Choibalsan, Darkhan, Erdenet, and Ulaanbaatar) the broad pattern of air emissions has been similar. Air pollution has a strong seasonal pattern, with the sulfur dioxide and dust concentrations in winter being a multiple of those in the summer. (In Ulaanbaatar at the turn of the last decade, a daily average of 0.20–0.30 milligrams of sulfur dioxide per cubic meter was recorded in the winter against a daily average of 0.02–0.06 milligrams per cubic meter in the summer, and a daily average of 0.150–0.250 milligrams of dust per cubic meter was recorded in the winter against a daily average of 0.050–0.150 milligrams per cubic meter in the summer.) Improvements in the emission performance of the power sector (especially in Ulaanbaatar) have been partly offset by increased emissions by the expanding gher areas and by continuing land degradation in the vicinity of the cities contributing to dust formation.<sup>40</sup>

In all main towns, but in Ulaanbaatar in particular, nitrogen dioxide emissions have been going up as a result of an increased number of vehicles (from 36,723 vehicles in 1998 to 60,768 in 2003<sup>41</sup>). Ulaanbaatar now accounts for almost 60% of the country's vehicle registrations (Table 6). This translates into an increasingly complex mix of public and private transport and

**Table 6: Motor Vehicle Registrations in Mongolia**  
(1990–2002)

<b>Vehicle</b>	<b>1990</b>	<b>1997</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>Ulaanbaatar</b>
Passenger Cars (including jeeps)	7,962	35,578	39,921	44,051	53,198	63,224	42,509
Trucks	24,400	26,473	25,049	24,671	24,747	24,610	8,663
Buses	2,591	3,982	6,012	8,548	10,187	10,841	6,956
Road Tankers (including fuel tankers)	4,754	1,868	1,615	1,683	1,613	1,709	993
Special Purpose Vehicles	4,085	2,187	2,243	2,740	3,326	3,421	1,547
<b>Total</b>	<b>43,792</b>	<b>70,088</b>	<b>74,840</b>	<b>81,693</b>	<b>93,071</b>	<b>103,805</b>	<b>60,768</b>

Note: Motorcycles are not included.

Sources: *Mongolian Statistical Yearbook 1997* and *Mongolian Statistical Yearbook 2002*.

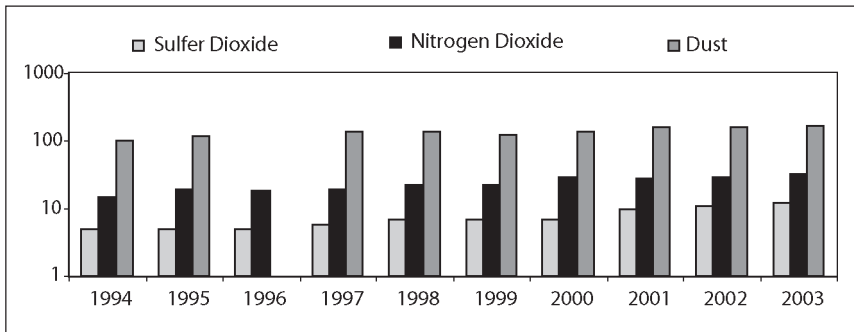
<sup>40</sup> The frequent instances of disruption of air traffic on account of dust at Ulaanbaatar's airport is a good illustration of one category of the economic cost of the city's air pollution.

<sup>41</sup> Registrations of private cars in Mongolia rose from 7,962 in 1990 to 63,224 in 2002 (Table 6).

emerging traffic congestion in the capital. Eighty percent of vehicles are believed not to meet antipollution requirements. Very little has been said in Mongolia, so far, about the scope that may exist for using vehicle excise and registration fees as an indirect tool for environmental management. Leaded gasoline is used in Mongolia. There is insufficient awareness of the health risks posed and no strategy on the lead phaseout.

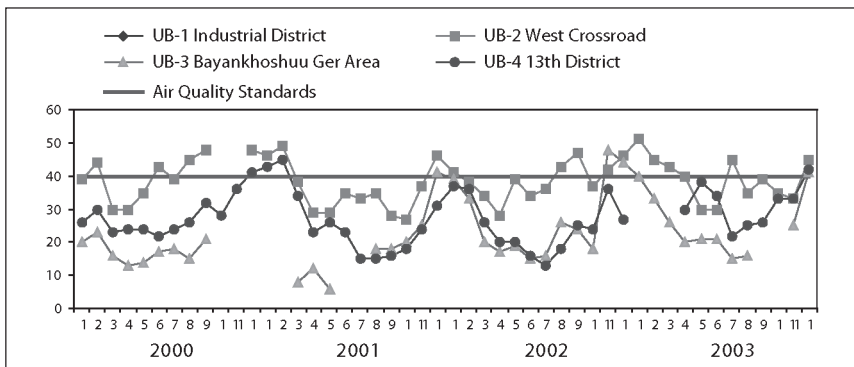
The pattern of air pollution in Ulaanbaatar is summarized in figures 2 and 3 and Table 7.

**Figure 2: Annual Average Concentrations of Selected Air Pollutants in Ulaanbaatar**  
(micrograms per cubic meter)



Source: Ministry of Nature and Environment.

**Figure 3: Monthly Fluctuation in Sulfur Dioxide Concentrations in Selected Areas of Ulaanbaatar**  
(micrograms per cubic meter)



Source: Ministry of Nature and Environment.

**Table 7: Annual Variations in the Concentration of Selected Air Pollutants in Ulaanbaatar**  
(2000)

	<b>Summer Daily Averages</b> (micrograms per cubic meter)		<b>Winter Daily Averages</b> (micrograms per cubic meter)	
	<b>Maximum</b>	<b>Minimum</b>	<b>Maximum</b>	<b>Minimum</b>
Sulfur Dioxide	10	0	41	10
Nitrogen Dioxide	64	15	60	14

Source: Ministry of Nature and Environment.

These figures compare with the existing air quality standards that are shown in Table 8.

**Table 8: Air Quality Ambient Standards in Mongolia**  
(2000)

<b>Parameter</b>	<b>At Maximum</b> (micrograms per cubic meter)	<b>Daily Mean</b> (micrograms per cubic meter)
Carbon Monoxide	3,000	1,000
Sulfur Dioxide	500	50
Nitrogen Oxide	600	60
Nitrogen Dioxide	85	40
Dust	500	150

Source: Ministry of Nature and Environment.

The figures indicate that the concentrations of pollutants exceed national standards during winter. Sulfur dioxide and nitrogen dioxide concentrations have been gradually increasing. Although the figures do not justify the frequent blanket assertion of persistent excess of pollutant concentrations over national standards, they are not reassuring. A much-improved 2003 State of the Environment report (MNE 2004) provides further details on the pattern of air pollution in Mongolia.

Research by MOH (Bulanchimeg 2003) has used 2001–2002 survey data of the incidence of respiratory diseases and correlated these with air pollution levels in different parts of Ulaanbaatar. This correlation is not particularly pronounced. Nevertheless, respiratory problems remain the principal cause of morbidity (but not mortality) in the capital. A sentiment expressed in 2001 is still relevant: While perhaps the problem is not as serious as previously assumed, it would be wrong to minimize the potential

risks posed. This is so mainly in view of the population and land-use dynamics of Ulaanbaatar and a likely further growth of the number of vehicles in the capital. Everything suggests that the rapid growth of Ulaanbaatar will continue and that most of this growth will take place on the city's fringes. It also seems likely that in the absence of vigorous countermeasures and the process of land degradation in the capital's vicinity will continue unabated, adding to the pollution problem.

Recent initiatives to introduce improved stoves in Ulaanbaatar's gher areas are important, because the improvement of small-scale heating stations is probably an area that has a well-defined physical focus and offers tangible and fast-accruing benefits.<sup>42</sup> The promotion of more efficient stoves is now well advanced in Ulaanbaatar but has yet to start in other cities and towns. The approach to air pollution continues to suffer from insufficient coordination that would make it possible to sequence available pollution-reducing options (such as coal beneficiation, briquette making, relocation of polluting facilities, and installation of insulation in buildings) in the most cost-efficient manner. A substantial amount of work along these lines, carried out under ADB- and GEF-funded projects on climate change, have yet to be fully used.

## **Water Supply and Water Quality**

Despite low precipitation, particularly in Mongolia's southern region, water supplies are in principle adequate to meet the needs of most of the country's 2.5 million people, even if serious problems of groundwater quality (high natural mineral content and presence of arsenic) and local shortages are found in most of the Gobi area and the eastern steppes (Bolormaa, et al. 2003).<sup>43</sup>

The revised Water Law was approved in April 2004. It clarifies the institutional division of the sector-related responsibilities of the Ministry of Infrastructure, MNE, and MOH, and it introduces the principle of water basin management and its broad management structure. The law sets out broad principles of charging different classes of water users. It institutionalizes

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<sup>42</sup> Nevertheless, all indications are that the economic profitability of improving household stoves is well above that of improving small-scale heating stations.

<sup>43</sup> To a significant degree, existing patterns of population distribution in traditional (pastoral) societies are responses to natural endowment, with water availability among the key determinants. In the fragile environment of the Gobi region, people are few and management of groundwater resources is particularly demanding. The expected growth of mining, especially water-demanding gold mining, in this area raises serious concerns about sustainable water management.

water conservation policies and calls for environmental impact assessments for specified classes of water use projects. For now, the revised Water Law coexists with the Water Use Taxation Law of 1996. Overall, the revised Water Law is a distinct improvement and an invitation to Mongolia's development partners to match its intent (United Nations Economic and Social Commission for Asia and the Pacific and National Water Commission 2002). That intent, judging by the National Water Program, is almost as far-reaching as that of the Regional Policy and no less in need of a thorough policy review. Also like the Regional Policy, much of the hard work needed to convert the general principles into a functioning reality is yet to come. The broad direction of the policy is to increase the use of surface water vis-à-vis groundwater and reduce wasted outflow from Mongolia, implicitly calling for an expansion of water storage infrastructure. The Government declared that 2004 was the year of water.

#### Box 6

### **Water Supply and Wastewater Physical Infrastructure in Ulaanbaatar**

One hundred and sixty boreholes and four surface water sources supply Ulaanbaatar. Four transmission stations, more than 300 kilometers of water distribution network, and over 200 kilometers of wastewater collection piping exist in the capital. Rainwater drainage and flood protection facilities are in disrepair. Some 155,000 cubic meters of water is supplied to the centralized network and 1,500 cubic meters for *gher* (tent dwelling) area needs. A central wastewater treatment plant was built in 1963 and expanded in 1979. In 1986, the capacity was 230,000 cubic meters per day. Ulaanbaatar as a whole has other 14 wastewater treatment plants, most of which work in part or not at all. About 50% of the water supply network has been rehabilitated with development partner assistance. A centralized wastewater treatment plant is being upgraded with Spain's technical and financial assistance. World Bank, Danish, and other assistance has been directed at improving water supply to *gher* areas. In 2003, over 90% of *gher* area dwellings had electricity connections, but hardly any were connected to a central water supply.

Source: Asian Development Bank.

## Urban Water Supply

The central challenges facing authorities are to (i) ensure that water supplies last well into the future and (ii) safeguard the quality of surface water and groundwater. In line with the first challenge, some improvement of Ulaanbaatar's rapidly deteriorating water supply infrastructure has been achieved with foreign assistance (Japan International Cooperation Agency and France), but the problem has not been truly solved, not least in terms of sustainable financing. Water is effectively underpriced and mispriced, and significant waste occurs throughout the system. In Ulaanbaatar, apartment building residents (who account for about half of the capital's population) using unmetered supplies, consume the bulk of the available supplies (Box 6 and Table 9). Apartment dwellers' average daily consumption of around 0.4 cubic meters per capita (almost double that of the United States or Germany) contrasts with the gher district dwellers' figure of less than 10 liters per capita per day.<sup>44</sup> The situation is similar in other Mongolian towns. Whatever doubts existed about the scale of the difference in 2001 have disappeared by now. The extent of the cost recovery shortfall has not been adequately documented, but nobody questions its existence.

The 2001 CEA discussed the experience of the National Water, Sanitation, and Hygiene Education Program, which addressed decentralized clean water provision and the sanitation needs of families in low-income soums and periurban areas in eight aimags in the Gobi region. The absence, until now, of water end users in the decision making regarding the management and pricing of water resources emerged as one of the obstacles to sustainable water supply and sanitation practices in Mongolia's settlements. The willingness of local communities to take charge of their water and sanitation needs was found weak. The program was instrumental in the establishment of the National Water Committee, a multiagency body that has helped in part to overcome the fragmentation of responsibilities for water and sanitation in Mongolia.

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<sup>44</sup> Apartment dwellers are connected to a centralized supply network, while residents of gher areas purchase water from water kiosks that are supplied by trucks.

**Table 9: Water Consumption, Tariffs, and Total Revenue in Ulaanbaatar**  
(2000)

Water Consumers	Water Volume Consumed (2000)		Wastewater		Fresh Water	
	'000 cubic meters	Percent of Total	Tariff <sup>a</sup> (MNT per cubic meter)	Revenue <sup>b</sup> (MNT million)	Tariff <sup>a</sup> (MNT per cubic meter)	Revenue <sup>b</sup> (MNT million)
Apartments	47,888.0	79.7	110	5,268	186 <sup>c</sup>	8,907
State Organizations	4,588.2	7.6	115	528	200	9,189
Private Organizations	4,403.6	7.3	115	506	200	881
Factories	2,715.7	4.5	115	312	200	543
<i>Gher</i> (Tent Dwelling)						
Areas	454.3	0.8	0	0	400	182
<b>Subtotal</b>	<b>60,049.8</b>	<b>100.0</b>		<b>6,614</b>	<b>190<sup>d</sup></b>	<b>11,431</b>
Others or Losses	2,013.5					
<b>Total</b>	<b>62,063.3</b>					

<sup>a</sup> The tariffs are those valid in 2001.

<sup>b</sup> Revenue is presumptive and incompletely collected. Figures of actual revenue are crucial but difficult to obtain.

<sup>c</sup> Corresponds to about \$0.17 per cubic meter. This compares with the 1996 range of residential water tariffs in the People's Republic of China, which ranged from CNY0.20 to CNY3.00 per cubic meter (average of CNY0.68 or about \$0.10) and industrial water tariffs averaging CNY1.03 (about \$0.13 at the time) or \$1.0–1.8 per cubic meter in France. The Ulaanbaatar wastewater tariff corresponding to \$0.10 per cubic meter is well above the rates prevalent in the People's Republic of China, even if even this level is no more than about 50% of the full unit cost of operating a modern centralized wastewater treatment plant. Rather than mainly low levels of tariffs, it is mainly at the level of collection that underpricing of water and wastewater treatment occurs.

<sup>d</sup> Weighted average

Source: Ministry of Nature and Environment.

## Wastewater Treatment

Only limited progress has been made since 2001 in restoring (or replacing) some of the 120 poorly functioning or nonfunctioning wastewater treatment plants and their more modest variants in Mongolia's urban centers. With the expansion of Ulaanbaatar and the future growth of other urban centers likely to occur on the city's fringes, connection and sewage treatment problems are likely to become more, not less, serious. Until now, this has been a relatively low-priority issue. A 1997 study of wastewater pollution in the Tuul River explored the feasibility of introducing wastewater pollution charges, but it appears that some of the prerequisites of applying such a mechanism (reliable monitoring of discharges, for instance) are still not in

place. Work since then conducted under the Netherlands-financed Tuul-21 Project has generated a more complete picture of the situation (Figure 4), apart from linking the wastewater issue to the broader area of clean production. Box 7 examines tanneries in and around Ulaanbaatar.

A draft wastewater discharge fee law, based on the experience of 25 case studies under the Tuul-21 Project, is now ready for submission to the Standing Committee of *Ikh Khural* (the Parliament). The draft establishes the principle of payment for the quantity of discharges by different classes of users, even if it currently skirts the issue of tariff changes.

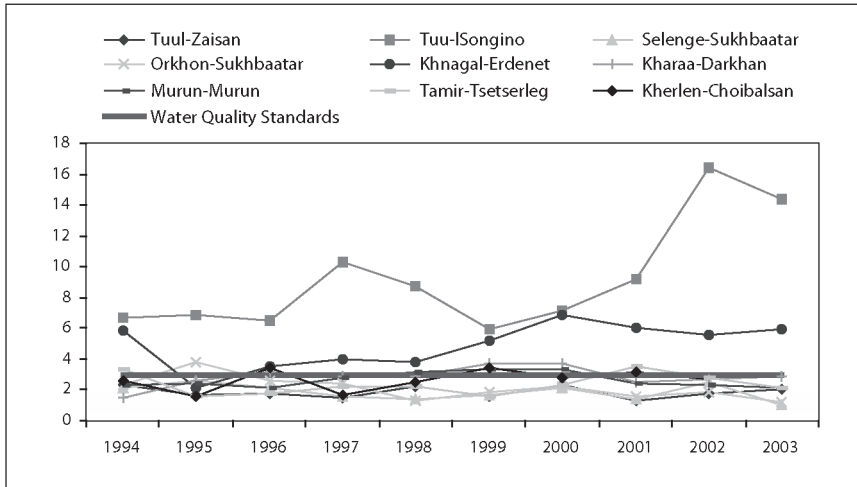
#### Box 7

#### **Tanneries In and Around Ulaanbaatar**

There has been an increase in the number of tanneries in Ulaanbaatar, following the industry's virtual collapse in the 1990s. Some tanneries are located in the Leather Association Industrial Park (centered around Khargia Co.), most of the rest in the city's Tolgoit area. The latter group is unconnected to any pretreatment facility discharging either directly into a central wastewater treatment plant, causing its serious malfunctioning or waste dumping, which causes serious soil and groundwater contamination. Almost none of the tanneries satisfy centralized wastewater treatment plant inflow standards. Concentrations that are 5–20 times the permitted norm are not unusual (for example, 50.0 milligrams per liter of chromium against a maximum permitted concentration of 2.5–5.0.) Unsafe storage of chemicals and use of outdated People's Republic of China technology are common, and enforcement of environmental impact assessment provisions have been ineffective. The pretreatment plant of the Khargia Company is fast becoming inoperable. The processing of animal skins in central Ulaanbaatar is in violation of current sanitary restrictions on the movement of animal products into the city.

Source: Asian Development Bank.

**Figure 4: Biological Oxygen Demand in Selected Mongolian Rivers**  
(annual averages [milligrams per liter])



Source: Ministry of Nature and Environment.

## Water Wells in Rural Areas

In rural areas, the key issue has been how to deal with large-scale abandonment of engineered and deepwater wells in the wake of *negdel* (collective farm) dismemberment. About two thirds of all engineered wells ceased to operate between 1990 and 2000 (Table 10). In 2000, at least 60% of the roughly 35,000 engineered wells constructed before 1990 to meet the needs of *negdels* were out of operation. Since then, major efforts have been under way under several development partner-funded projects to restore engineered wells and create sustainable management regimes involving herder groups and *soum* authorities. The process is intertwined with broader efforts to institute new sustainable pasture management regimes. In 2003, 307 wells were rehabilitated, out of a total of 468. These are modest achievements, but the pace of work is accelerating, and the policy is finally beginning to move in the right direction.

## Nonrenewable and Renewable Energy

Energy deregulation and associated reforms have been under way in Mongolia since the enactment of the 2001 Energy Law, and what has been

**Table 10: Number of Functioning Wells in Mongolia**  
(1990 and 2000)

Type	1990	2000
Wells and Troughs		
Engineered Wells	24,600	8,200
Simple Sunk Wells	17,000	22,700
<b>Total</b>	<b>41,600</b>	<b>30,900</b>
Watering Troughs	4,100	1,000
Capacity (cubic meters)	39,400	14,900
Distribution of Wells		
Pastureland	38,300	21,700
Unused	1,100	5,800
Areas Other Than Pastureland	2,200	2,500

Source: *Mongolian Statistical Yearbook 2000*.

said about deregulation (United States Agency for International Development 2002 and 2003b) should be mentioned. On the technical side, the state of the existing coal using power sector was extensively studied by various consultant teams in the late 1990s, as were individual facilities, their performance, and system losses. Substantial experience has been gained with heat transmission in Ulaanbaatar and obstacles to increasing its efficiency under a slowly disbursing ADB Loan No. 1548. Mongolia's position at the top of per capita consumption of commercial energy among ADB's DMCs is well known. Through its technical assistance (Capacity Building in Energy Planning), ADB has driven the formulation of the Mongolia Sustainable Energy Sector Strategy, which was formulated in 2001 but has since been overshadowed by the demands of energy sector deregulation. The managerial, financial, and political difficulties of that process, especially the continued nonsustainability of decentralized electricity provision are well known (Ministry of Infrastructure 2001). Slow progress has affected development partners' willingness to consider new initiatives.<sup>45</sup> The extensive work on energy undertaken within the framework developed during the UNFCCC (some with ADB's funding) remains poorly coordinated with and integrated into the planning and policy activities of the Ministry of Infrastructure.

<sup>45</sup> ADB's own strategic decision not to engage in the key thermal segment of the sector is in part a reflection of this and lingering doubts about the sustainability of the deregulated structure being put into place with the support of several other development partners. Instead, through Renewable Energy Development in Small Towns and Rural Areas (Technical Assistance 3965), ADB has shifted its support for energy development toward renewable energy options (especially of the hybrid kind) and rural areas settlements.

Further work on energy efficiency developed under the UNFCCC is being adversely affected by the Government's hesitation to ratify the Kyoto Protocol.

Among other things, the 2001 CEA mentioned the impact of the continuing growth of gher areas relative to apartment housing (i.e., having more households not connected to the combined heat and power plant network increases air pollution during winter). Although these areas consume less than 10% of the total coal used by combined heat and power plants and heat-only boilers in the city, they contribute disproportionately to the capital's air pollution, because of low stove efficiency and the areas' location in relation to prevailing winds. Apart from mainstream recommendations for dealing with air pollution in Ulaanbaatar (e.g., shifting attention to gher areas, developing emission standards for power plants, and adapting market-based approaches to compliance), the 2001 analysis also notes the absence from the policy debate of the possibility of exploiting the differences in coal quality and its polluting characteristics as a way of possibly minimizing the cost of environmental compliance by the coal users.

The 2001 CEA paid more attention to renewable energy and its environmental aspects, the importance of which had traditionally been overshadowed by the life-threatening crisis of the thermal energy subsector. By now, the case for renewable energy, especially the kind that fits the needs of Mongolia's highly mobile population, is well established and remains a government priority. The solid physical basis for pursuing the solar and wind power options is also an important factor.

The principal technical considerations relating to renewable energy are summarized in the 2001 CEA. The new elements are the (i) growing volume of work on renewable options (in which ADB plays a part through technical assistance) and (ii) continuing absence of any systematic attention to fuelwood as a potential source of renewable energy. This may reflect deforestation concerns, but it also flies in the face of the reality in which fuelwood is a major energy source in Mongolia, with 1–2 million cubic meters used annually. Forestry and energy policy have been discussed in complete isolation from one another, and this should not be the case.

The recommendation of the 2001 CEA for Mongolia to learn from regional experience on technical and management aspects of renewable energy sources remains topical. The large and growing renewable energy experience of the People's Republic of China, in particular, offers a number of lessons and opportunities, provided they are not adopted slavishly.