PRINCIPAL ENVIRONMENTAL CONCERNS: AN UPDATE

17. 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

18. The official designation of lands --not synonymous with the actual use[13]-- is reproduced in Table 1. As to the area under each category, noticeable is the reduction of agricultural, especially pasture- and forest-, land, by about 10 % in each case since 1998. Although part of this decline is due to re-categorization of land, the remainder is the worrying element, namely the impact of land degradation.

Table 1: Classification of Land in Mongolia

Land classification	1998		2003	
	'000 ha	% of total	'000 ha	% of total
Agricultural land	129,132	82.6	115,580	73.9
Of which: pastureland	125,740	80.4	111,281	71.1

[13] Inconsistencies in Mongolian land classification and (especially) land use statistics are common but not exceptionally serious. The greatest gap between the official designation and actual use is under the categories of forest land and arable land. These are discussed in various places in the text.

hay production land	2,045		1,809	
arable land	953		706	
Other	394		1,784*	
Towns, villages, settlements	377	0.2	433	0.3
Roads	330	0.2	353	0.2
Forest	17,852	11.4	14,674	9.4
Water resources	1,665	1.1	943	0.6
Reserve land	7,056	4.5	0**	
State special purpose land	0		24,428***	15.6
Total	**156,412**	**100.0**	**156,412**	**100.0**

Source: MNE
*Includes 1.26 million hectares described as unsuitable for agriculture
** The category abolished in 2002
*** Includes, among others, protected areas

19. 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 the grasses, 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 to mining, roads, military installations, etc. and (iv) Forest degradation; In what follows, we summarize the situation under the first three headings reserving more room for forest degradation, described separately.

Pasture Degradation and Desertification

20. The late 1990s official data on pasture degradation are given in Table 2.

Table 2: Extent of pasture degradation, Mongolia, late 1990s

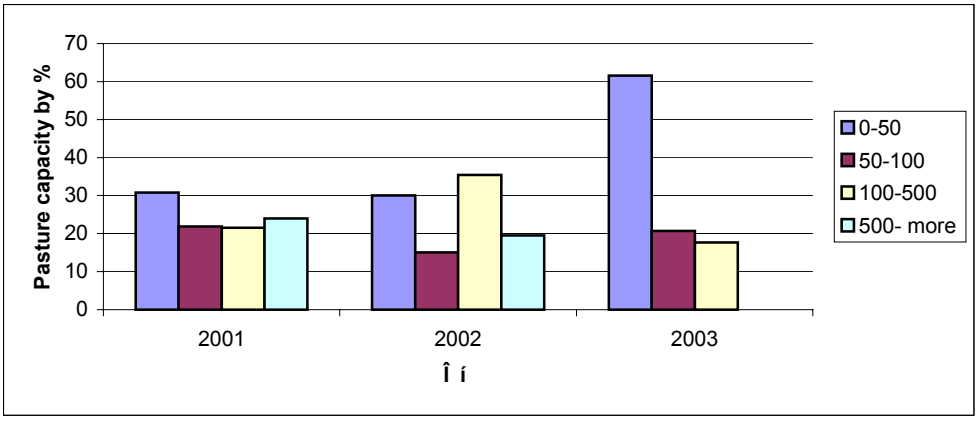
Extent of degradation	Slight	Moderate	Severe	Very severe	Total area
Per cent	76	20	3	1	100
Area (mil ha)	92.8	24.4	3.6	1.2	122.2

Source: ADB (2001) quoting Government of Mongolia data

21. The 2003 State of the Environment data (Figure 1 below) suggest that further degradation has taken place since 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 de-collectivization of herding was superimposed on a far greater fragility of the underlying eco-system, degradation and desertification pressures have been particularly severe in the steppe and Gobi areas[14]. In any event (and in a de-personalized world of resource allocation), it is not absolute degradation but the speed of deterioration that should guide remedial investments. ("Let desert be a desert and try to reverse deterioration in areas that are potentially much more productive").

Figure 1: Pattern of pasture degradation, 2001-2003 (in SEUs)

[14] Although official figures of areas occupied by sand have remained stable since 1940, amounting to about 4.3 million ha, there has been progressive drying up of lakes and tributary streams in Mongolia's south and damage cause to wells and other structures by moving sand dunes.



Source: MNE, State of the Environment 2003

22. The 2001 CEA made the dismantling of collectivized herding and subsequent search for alternatives the core of the analysis of pastureland degradation. The reader is referred to that document for a review of main arguments. By now, numerous projects are underway in Mongolia tackling the problem of pasture degradation (see Table C of Annex 6). Although approaches vary (and a much needed harmonization of approaches is being finally attempted) the remedial steps are well understood though by no means easy. Action has targeted one or several pre-conditions 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 "thanks" to 2000 and 2001 *dzuds*, animal stocking now is not historically high (see Table 3)[15] and that the number of small herders has declined from its peak in mid-1995 of over 200,000 herding families. Considerable efforts are directed towards new forms of community-based land use and herder cooperation (distinct from the discredited co-operatives of the past), the application to pastureland of the provisions of the Land Law among key challenges.

Table 3: Livestock and population in Mongolia, 1918-2003

Item	1918	1924	1940	1970	1990	2000	2003
Population ('000)	648	684	744	1265	2149	2407	2510
Camel ('000 head)	228	270	643	633	537	323	256
Horse	1150	1340	2358	2318	2262	2661	1958
Cattle	1078	1510	2723	2108	2849	3028	1784
Sheep	5700	8400	15384	13312	15083	13206	10706
Goats	1488	2100	5096	4204	5126	10077	10603
Total no. of animals	9,644	13,620	26,204	22,575	25,857	29,295	25,308
SEU equivalent**	22,263	29,574	55,653	48,801	54,668	58,719	44,324
Arable land (000 ha)	-	-	26	744	1347	1176*	706*
Pastureland (000 ha)	na	na	140151	139940	124285	129294	111281
SEU**/km2 pastureland			39.7	34.9	44.0	45.4	39.8

Sources: based on data for 1918-1990 based on Karamisheff, W. (1925), *Mongolia and Western China,* Tienstsin, and *National Economy of the MPR for 70 years 1921-1990*, cited in Humphrey and Sneath (1995) Vol 1, p.14. Data

[15] The statistical weakens of this estimate is important to acknowledge, nevertheless. A more accurate measure would require the use not only of SEU but also a "pastureland equivalent" (rather than gross area).

for 2000 and 2003 from *Mongolian Statistical Yearbook 2000* and *Monthly Bulletin of Statistics,* December 2003, respectively.

Notes:

* of which only 209,000 ha were sown in 2000 and 225,500 in 2003
** SEU: sheep=1, cattle, horse=6, camel=8.4, goat=0.86 (following the Mongolian *bod* concept instead of the international sheep=1, cattle=5, horse=6, camel=7, goat=0.9)
*** figures of 2003 population figure extrapolated from official 2,475 in 2002 at 1.4 % growth rate.

23. If the essential requirement of reduced pastureland degradation is greater livestock mobility, this has not always been clearly translated into policy. Instead, recent policy calling for more intensive animal husbandry (Resolution #29 of *Ikh Hural* 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, the 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[16]. More than anything else, a non-dogmatic and market-backed solutions to animal husbandry are needed with a parallel vigorous action on facilitating livestock mobility.

24. Pasture degradation and desertification are now more readily recognized as a cross-cutting theme with linkages to an evolving framework of land ownership and management (see para.0) and the pattern of alternative employment opportunities. Other important linkages exist to global climatic trends. Since the last review of the topic in 2001, more work has been done in Mongolia on the subject both under the aegis of the UNCCD and UNFCCC[17]. The results give more substance to concerns about the impact of global 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 northwards[18], further forest degradation and reduction of suitable habitats within protected areas [Batnasan 2003]. These are important findings. Nonetheless the balance of causes of land degradation and desertification continues to lean towards anthropogenic factors, not climatic (or indirectly anthropogenic, to be more precise) ones. In any case, Mongolia may be risking too much by waiting for a reversal of climatic trends. The emphasis on adaptive strategies in recent round of UNFCCC-related work [Batima (2003)] is therefore appropriate.

25. Given the importance of the topic for Mongolia, a brief summary of the institutional setting is needed. Mongolia ratified UNCDD in1996, and is host to Asian Regional Thematic Program Network 5 of that Convention (Strengthening capacity for mitigating drought impact and desertification control)[19]. National Committee to Combat Desertification was set up in 1997, National Research Center to Combat Desertification within the Mongolian Academy of Sciences

[16] 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 optimize processing schedules.
[17] See Adyasuren (2002) and Batima et al (eds) (2003), respectively.
[18] ADB (2001) points out that when such shifts are described in terms of forest boundary, them may unwittingly reinforce a rather narrow view of forests and trees in Mongolian landscape for they draw a sharp line between forests and non-forests leaving many vital forms of tree and shrub vegetation (tree shelters in pastures, desert shrubs, etc) out of consideration.
[19] The links with other TPNs, i.e. TPN1: Desertification Monitoring and Assessment (PRC as host), TPN2: Agroforestry and soil conservation (India), TPN3 Rangeland management and sand-dune fixation in arid areas, and TPN4: Water Management (Syria), are weak.

was created in 1998. National Action Plan to Combat Desertification was first drafted in 1998. An extensive monitoring network exists structured around the National Agency for Hydrology and Meteorology (NAMHEM[20]) within MNE, and the Central Environmental Monitoring Network. A disaster management- and early warning systems are in place, and a revised Civil Defense Law provides another element of Mongolia's response. Taken together, these give a good indication of the importance attached to the topic by the Mongolians. Recent assessment [EERI and MNE (2002)] identified insufficient integration of data on drought and desertification, tendency to see desertification is only an environmental problem, and insufficient public involvement as principal areas of weakness.

Loss of Productive Land

26. The 2001 CEA put the area of pastureland lost to "multi-tracking"[21] in the last decade at about 300,000 hectares, i.e. averaging about 30,000 ha p.a. This is admittedly less than 0.025 % of Mongolia's total land area, but more than 0.5 % of the total area of productive land and an even higher percentage of best land (that "attracts" vehicles). Two new elements need to be added to these figures. First, multi-tracking is not necessarily a problem caused only or mainly by outsiders. Much of it is due to herders who own a significant percentage of registered vehicles (see Table 4 below). To that extent, some of the damage is "internalized" and could be argued to demand no remedial action.

Table 4: Pattern of Vehicle Ownership by Herder Households, 2003

	Number of Households		
	1995	**1997**	**2002**
Motorcycles	26,700	26,226	32,641
Vehicles (incl. cars & jeeps)	4,900	7,348	18,447
Households with vehicles	31,600	43,574	51,088
Total households	**169,308**	**183,636**	**175,911**

Source: Mongolian Statistical Yearbooks for 1997 and 2002

27. Second, the rate of land lost to multi-tracking increased in 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.

28. Similar lack of reliable figures makes it difficult to estimate losses caused by mineral exploration and mining activities in Mongolia[22]. Here, the impacts are different, mine tailings and handling of overburden often creating special risks absent in "multi-tracking" where simple compaction is the chief or only culprit. More recently, the emergence of small-scale ("ninja")

[20] In 2003, NAMHEM consisted of 120 meteorological stations, 183 meteorological points, 7 upper atmosphere stations, and 118 hydraulic observation points.

[21] Multiplication of tracks caused by vehicles traveling off-road, many carving a new track. (see Photo 1 in the Annex).

[22] The 2001 CEA found vastly different estimates ranging from just over 1000 ha 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 sq km, or 4,000 ha. (see Photo 2). MNE put the area affected by gold mining between 1992 and 2001 at 5,500 ha, not counting damage due to exploration activities. Adding other forms of mining, a figure of perhaps 50,000 ha affected so far would seem reasonable not counting a multiple of that figure affected moderately by exploration activities.

mining has produced new forms of land degradation whose overall impact is nevertheless overshadowed by large-scale removal of overburden by industrial mining operators (see Photo 2). Similar concerns, supplemented by potential risks to water quality, accompany losses of land to waste disposal sites said somewhat arbitrarily [UNDP (2000)] to have occupied 30,000 ha of land.[23]

Soil Degradation

29. Wind erosion affects almost all cultivated lands in Mongolia and steadily reduces their organic content. The area cultivated in Mongolia has declined from the peak of about 1.2 million hectares in 1980's to about 400,000 ha now. That which is a grave concern for the relevant "production ministry" (MFA) 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[24]. It is unlikely that a rapid change in technology away from deep plowing towards environmentally more benign cultivation methods (low tillage etc.) will take place in the short to medium run. The problem has both a local and trans-boundary dimension. The phenomenon of duststorms affecting the whole of Easter Asia has its origins in part in inappropriate land management practices in large segments of Central Asia including Mongolia and Inner Mongolia. Through RETA 6068 (Prevention and Control of Dust Storms in North-East Asia) ADB was among the first specifically to respond to this challenge.

30. It is important to question rehabilitation/development policies for the crop sector that use past acreages as a desirable target for the future. The relatively weak strategic case for greater self-sufficiency in grains was mentioned earlier (para. 8)[25].

Forest Resources and Their Management

31. The 2001 CEA contains a summary of the situation as it existed around the year 2000, characterizing the sector then as both neglected and crisis-ridden. Much of that summary remains intact. A recent World Bank-commissioned assessment [Crisp et al. (2003)] -the only analytical look at the sector so far --has added to our understanding and introduced new elements. Elevated within the new MNE organization structure (see para. 88), the sector nevertheless remains crisis-ridden. To quote from the report's summary:

"*The forestry sector in Mongolia is rapidly approaching a crisis for which it seems largely unprepared:*

(i) *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;*

(ii) *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;*

(iii) *Between 36 and 80% of total harvest is illegal; Government of Mongolia receives*

[23] Much more ought to be said about landscape scarring caused by uncontrolled dumping of waste, found on the outskirts of most Mongolian settlements. A positive new development has been rapid disappearance of scrap metal from these areas as Chinese demand has created a market for the commodity, eagerly seized by the Mongolians.

[24] The process could be accompanied by increased production in more suitable sub-areas, e.g. those once irrigated

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

no royalties or taxes on this and it severely distorts domestic prices for both construction wood and fuelwood;

(iv) *Market forces and prices are not reflected in the allocation of cutting quotas or in the setting of stumpage fees;*

(v) *Fuelwood currently constitutes between 65 and 80% of total wood harvest and is used by many poor rural and urban households for both cooking and residential heating;*

(vi) *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;*

(vii) *Instead of dealing constructively with the primary problem of unsustainable resource exploitation, Government of Mongolia 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.*

(viii) *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"*

32. The facts behind these conclusions are the following: In Mongolia, about 7 % of land area was under closed forest at the turn of the century representing nonetheless a vast area of over 10 million ha[26]. This figure excludes saxaul (*Haloxylon ammodendron*) shrubs[27] scattered on further 2 million ha or so in the southern portion of the country and the Gobi fringes[28]. The average standing volume of the northern closed forest is estimated to be 103 m^3 per ha, giving a total standing volume of around 1,300 million m^3. (See Table 5).

Table 5: Estimate of Area and Standing Volume of Mongolian Forests, 2000

	Area ('000 ha)	St. volume (mil $m^{3)}$
Larch (*Larix siberica*)	7,527	1,030
Pine (*Pinus silvestris*)	662	71
Cedar (*Pinus cembra*)	985	161
Other conifers	29	4
Broadleaf species (*Betula, Populus, Salix*)	1,199	86
Saxaul (*Haloxylon a*.)	2,029	1
Total	12,431	1,335

Sources: White Book of Mongolian Environmental Situation 2000, Crisp et al. (2003)

33. Under a mean annual increment of 1.4 m^3/ha considered typical of the larch/pine/cedar forests of Mongolia's north, the total increment is in excess of 2 million m^3 p.a., seemingly a comforting figure when compared with the allowable cut, now around 600,000 m^3. p.a. However, to relate these estimates to the situation on the ground, the following elements are important:

(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.

[26] It is estimated that Mongolia lost about 2.2 million of closed forest since 1950 (Crisp et al. 2003).

[27] A shrub, normally less than 2 meters tall, considered vital to erosion and desertification control in the southern part of the county.

[28] Careful reader of CEA 2001 will notice a more guarded statement of forest totals in this CEA. This reflects uncertainty about the rate of forest depletion in recent years and incompleteness of recent forest inventories.

(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 ha designated as forest estate, 47 % is placed within the strict zone, 46 % in the protection zone and only 7% (or 1.2 million ha) in the utilization zone where commercial harvesting is permitted. At first sight, this might seem a robust defense of the forest estate. Alas, there are other factors:

(iii) Rapid increases in illegal harvest. The legal harvest in 2002 was 40,000 m^3 of roundwood and 580,000 m^3 of fuelwood, about one fourth of actual consumption [Crisp et al 2003].

(iv) Uneven utilization of the standing stock. Most "legal" logs come from a relatively small but accessible area of about 300,000 ha (mostly in the Selenge *aimag*). Even the legal log production is very unevenly distributed in space, and depletion occurs in the utilization zone.

(v) Ineffectiveness of reforestation in Mongolia. With a possible exception of urban forestry, man-made reforestation is unsuitable for Mongolia. Natural regeneration accompanied by protection is preferable.

34. Answers to the forestry crisis in Mongolia clearly do not lie in additional official protection accorded to forests and do not lie in afforestation[29]. Over 90 % of forests already enjoy one or another kind of formal protection status. Neither is there a shortage of forest-related legislation: Mongolian Forest Law of 1995 provides for classification of forests, contains detailed provisions for their management within Special Protected Areas and National Parks, and specifies the determination of disaggregated annual allowable cut, timber sale contracts, fuelwood harvest permits, and much more. Other complementary legislation, multi-tiered and relatively complex, exists dealing 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. National Forestry Program and 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.[30]. With the exception of Germany, donors have stayed away from the "controversial" production forestry preferring to respond to their domestic constituencies' interest in conservation.

Conservation of Biological Resources and the Key Ecosystems

35. 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 ha (i.e. 13.2 % of the territory of Mongolia) are under some form of protection at present (see Annex 8 for the listing of SPAs, NPs, and NRs[31]). Main

[29] This view is not popular within MNE that allocates more own funds for afforestation than for any other NRM activities (a total of Tg 626 million in 2003, to be precise, or 30.1% of the total).

[30] Since 2003, with the separation of EPA from MNE, MNE 's responsibilities have shifted significantly towards protected areas. This leaves forest utilization zones and forest protection zone outside SPAs short of administrative oversight.

[31] Little was said in 2001 about wetlands: Mongolia joined RAMSAR Convention in 1998. At present, there are six

conservation concerns have not changed since 2001: poaching, sometimes trans-boundary, inappropriate hunting quotas, loss of habitats due to overgrazing, multi-tracking, as well lake sedimentation and different forms of pollution, and unsound management practices (e.g. cross-breeding of domestic and wild species). Depletion of saxaul vegetation in the Gobi continues but promising reversals of this situation have been realized under several donor-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, part of the Khar Us Lake National Park. [Batnasan, (2003)]

36. 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 SPAs and two National Parks, 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 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 population[32].

37. SPAs and National Parks are a focus of eco-tourism, considered by many to represent a potential source of funding for these areas' sustainable management, despite Mongolia's relatively unfavorable location and shortness of the 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 arrivals were dominated by China and Russia that, taken together, accounted for 144,000 arrivals. Only 22,000 gave tourism as the main reason for the visit 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 $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 to make it possible to correctly gauge its importance. We return to this topic further below (para. 84) in connection with local financing of environmental management[33].

Land Reform

38. The 2001CEA'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[34]. The crux of the current debate has been the extent of the constitutional right of the Mongolians to own land and the manner in which this right is to be exercised. The 1994 Law on Land (LL) established different classes of land and land rights (ownership, possession, use and limited use) some of which apply also to pastureland. The Law spells out the responsibilities of land users, and the procedures for land assessment, land use contracts

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RAMSAR sites in Mongolia with a total area of over 630,000 ha. Great Lakes Basin containing the main bodies of water (other than Khovsgol – see Box 1) are considered particularly vulnerable to overgrazing.

[32] S. Schmidt, *personal communication.*

[33] Wildlife exports (meat, skins, antlers, etc.) to China is an under-researched topic. A number of Mongolian and foreign specialists estimate illegal exports to be several times greater than legal trade. The extent to which this knowledge is reflected in the determination of hunting quotas is not certain.

[34] 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 (see Section III.4 below). 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 pastureland near settlements and water points, a major economic and environmental problem today.

and land conservation. A 1997 amendment requires registration of land rights with the State Register for Immovable Property (SRIP). Law on Land Cadastre of 1999 added the methods and procedures for mapping and registration of the various land classifications established by LL. The primary responsibility for implementing the Law 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 to both winter camps and winter pastures. The size of the recipient group (individuals or *khot ails*) and length of possession rights have varied[35].

39. The Law on the Allocation of Land to Mongolian Citizens for Ownership ("Land Privatization Law") of 2002, 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 (0.07ha in Ulaanbaatar, 0.35ha in aimags, 0.5 ha 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.

40. On the institutional side, the most important and positive has been the merger in 2002 of the erstwhile (1) State Administration of Geology and Cartography under the Ministry of Infrastructure; (2) the Land Administration Authority under MNE and (3) the State Immovable Property Register under the Ministry of Justice into a single Agency of Land Administration, Geodesy and Cartography (ALAGaC) under the Prime Minister's Office. The work of ALAGaC is complemented by 21 Land Management Offices at a provincial level and the Urban Development and Land Management Department within the Ulaanbaatar municipal government.

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

Mining

42. Mining, especially that of gold, has a long history in Mongolia. Russian and Chinese operations began in the 19th century. The economic importance of mining and its further expansion in today's Mongolia was underlined earlier on (para 8).[36] 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 exploited, including 35 of construction materials. Since then, more deposits have been identified, some of global importance.

43. Relevant for environmental management have been the following factors: 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

[35] The work of ADB's TA 3606 (Capacity Building in Agriculture) has begun generating information about the early impact of these and more recent legislative changes on the management of pastureland and associated assets (water wells).

[36] Extensive information exists on mining, including the promising petroleum exploration, in Mongolia [see, Trifonov and Krouchkin (2000)].

excavation and washing of metal-bearing sands in dredges and other water washing devices (see Photo 3). 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 (dust, contamination of water). The operations involve large quantities of acid, spread on old unlined overburden. Monitoring of chemicals' use, facilities and groundwater is essential. In coal mining, air quality, reclamation/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.

44. Until recently, environmental concerns and the focus of EIAs in the sector were of the above, "traditional", kind 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 [Dallas (1999)] added other considerations such as absence of a single authority to regulate the activities -and environmental impacts-of several dozens gold concessions and operations located in close proximity to one another.

45. While official policy not unreasonably had large operators and the burgeoning prospecting activities in its sights, a trickle and soon a wave of new type of mining appeared in Mongolia from the mid-1990s, namely informal small-scale ("ninja"[37]) 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 the "ninjas". The "ninjas" have been exploiting both placer (alluvial) and hard-rock deposits. The difference between the two is crucial from the environmental point of view. While the impact of the former on 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 (See Box 3). Prolonged exposure to above-the-limits mercury is known to cause serious (and potentially fatal) neurological disorders ("Minamata disease" [38])

46. The experience elsewhere (Minamata, 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 the 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 relocation of the towns that may well become the only realistic option once the problem is fully acknowledged.

47. While rightly alarmed by the use of mercury, experts remind us that mercury is not used anywhere in Mongolia by placer "ninjas" miners (unlike, for instance, in Brazil[39]) and argue that placer mining could on balance play a strongly positive role in economic development provided

[37] So called because of the miners' resemblance –when carrying a typical plastic pan on their backs – to "ninja turtles" of a popular children television series.

[38] See Takizawa and Sekikawa (2004) for an epidemiological and policy review of the 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 t.

[39] "*Garimpeiros*" are Brazil's "ninjas". Brazil's experience is not encouraging, the political pressures placing 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 removes any temptation to use mercury and facilitates movement of hard-rock operators towards placer areas.

the activities are suitably regulated. (Grayson et al 2003). 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 Ecominex International Inc.

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

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 t of it remains in the river to this day. Recent extensive field investigations revealed existence of hotspots of mercury pollution in Sumber, Bayangol and Bornuur *soums* of the Borooo basin and suggested that the problem is more widespread. Seventy-six % of the households in three studied *soum*-centers are hard-rock gold miners ('ninjas') using mercury for gold recovery, and between them, the 3 *soum* centers currently consume about 500kg of mercury each year, or 2.4 t over the last 5 years. Of this, 56% goes to the atmosphere and 44% to the soil. Of the mercury waste, 83.3% of miners dump it in the open air in their fenced-off yards. Household yards soils have peak mercury content 230 times the permitted amount. Vegetable farmland near to the Boroo River has twice the permitted maximum of mercury. Two to three t of mercury have accumulated in the bottom sediments on 40 km of the Boroo and Kharaa rivers. Individuals pan the bed and banks of both rivers for mercury to sell it to the hard-rock gold “ninjas”. This recovered mercury is insufficient to satisfy the rapidly rising demand and more than a ton a year is imported illegally from 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 the mine-sites but in the *soum* centers, and hence each *soum* center is now a mercury hotspot. All “ninja-households” in turn are severe mercury hotspots within the broader *soum* hotspot. Most illegal mining remains primitive and is within 20-50 km 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: Grayson et al. (2003), Tumenbayar et al (2001), Tumenbayar (2003b]

Urban Environmental Management

49. 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 the expansion of suburban habitats.

Solid and Hazardous Waste Disposal

50. 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. 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 non-degradable wastes in the waste streams, and littering are ubiquitous problems. No inventory and overview of industrial and hazardous waste has been attempted in Mongolia so far[40].

[40] 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 organization use chemicals. According to Wingard (2001), some 600 t of chemicals p.a. were indiscriminately dumped in mid-1990s, some 70 t discharged into the air, and 800 t 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.

51. Donor assistance to solid waste management has been relatively modest possibly reflecting the view that trucks apart, 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, World Bank's similar 1997 loan [Ulaanbaatar Urban Service Project (1997)] and anticipated 2004 loan [Second Ulaanbaatar Urban Services Improvement Project] target mainly water, even if the second-mentioned project contained two subprojects of interest, i.e. waste collection in *gher* areas and a study on the establishment of a new sanitary landfill. Dutch and Japanese governments, 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 the Ulaanbaatar City Government.

52. Re-cycling 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 that supports sorting out of waste into blue bags, and sending it off for commercial re-cycling. Thanks to recent WHO-commissioned work [Eggerth and Diaz (2002)] a much more favorable picture emerges for it turns out that a substantial and relatively well organized re-cycling of metals, paper, plastic and animal bones takes place[41], supported in some cases by strong demand from China. Some 5-7,000 people were employed in materials recycling in 2000.

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 (CRC) and 9 District Construction and Service Companies (DCSC) (of which 6 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[1]. Despite their name[1], the "Companies" operate entirely on the city government budget. The DCSCs collect fees for waste disposal from private households, communal entities and institutions. The fees are set by the Government. The rates, set in 1997, are Tg 50 per person per month in apartment blocks, and Tg 400-500 per family per month in *gher* areas. A general disposal fee of Tg 50 per m^3 of the waste of all categories is charged by DCSCs but contracts can be negotiated individually with industrial and commercial entities.

53. 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 the toxic substance. No systematic survey of existing practices has been made but anecdotal evidence suggests that they lag significantly behind legislative developments. Ministry of Health is increasingly concerned about non-existence of a specialized facility to treat hospital waste.

Air Pollution in Mongolia's Urban Areas

54. Air pollution in Mongolia's towns, especially Ulaanbaatar, is considered to be 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.

55. In all major cities (Ulaanbaatar, Erdenet, Darkhan and Choibalsan), the broad pattern of air emissions has been similar: The air pollution has a strong seasonal pattern, the SO2 and dust concentrations in winter being a multiple of those in the summer (in Ulaanbaatar at the turn of the last decade, 0.20-0.30 mg daily averages of $SO2/m^3$ in winter against 0.02-0.06 mg/m^3 in

[41] The emergence of markets for scrap has improved the economics of truck utilization in some cases.

the summer, and 0.150-0.250 mg of dust/m^3 in winter against 0.050-0.150 mg/m^3 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[42].

Box 5: Ulaanbaatar: Some Statistics

The UB municipality of 1360 sq km is divided into 9 districts and 119 *khoroos*. The capital's population has increased from the 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 the population live in apartment blocks some 80 % of supplied by central heating and hot water from three CHPs, 7 % by heating boilers (275 of them in the city, majority connected to centralized heating network) and 13 % by individual stoves. The rest of the population live in individual dwellings in "*gher* areas" on the outskirts of the city where coal and fuelwood are used for heating. The three CHP plants consume about 3 million t of coal p.a., the individual boilers about 1 million t, and households in the *gher* area another 300-400,000 t (in addition to fuelwood). The high coal consumption and energy inefficiency of individual stoves are behind relatively high air pollution in the city during winter. Adoption of CNG has been promoted by the private sector in the last two years.

56. In all main towns, but in Ulaanbaatar in particular, NO2 emissions have been going up as a result of increased number of vehicles (from 36,723 vehicles of all kinds in 1998 to 60,768 in 2003[43]). Ulaanbaatar now accounts for almost 60 % of the country's vehicle registrations. This translates in an increasingly complex mix of public and private transport and emerging traffic congestion in the capital. Eighty per cent of vehicles are believed not to meet anti-pollution requirements. Very little has been said in Mongolia so far about the scope that may exist for making vehicle excise and registration fees as an indirect tool of environmental management. Gasoline used in Mongolia is of the leaded kind. There is insufficient awareness of the health risks posed and no strategy on the lead phase-out.

Table 6 : Motor Vehicle Registrations, Mongolia, 1990-2002

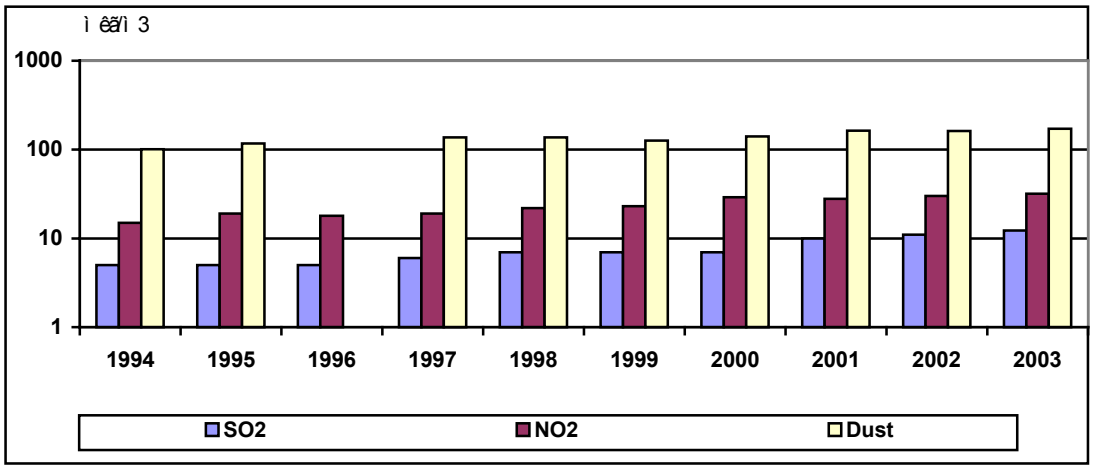
	1990	1997	1999	2000	2001	2002	Ulaan baatar
Passenger Cars (incl. jeeps)	7,962	35,578	39,921	44,051	53,198	63,224	42,509
Trucks	24,400	26,473	25,049	24,671	24,747	24,610	8,663
Buses	2,591	3,982	6,012	8,548	10,187	10,841	6,956
Road Tankers (inc. fuel)	4,754	1,868	1,615	1,683	1,613	1,709	993
Special Purpose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

Source: Mongolian Statistical Yearbooks for 1997 and 2002
Note: Motorcycles are not included

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

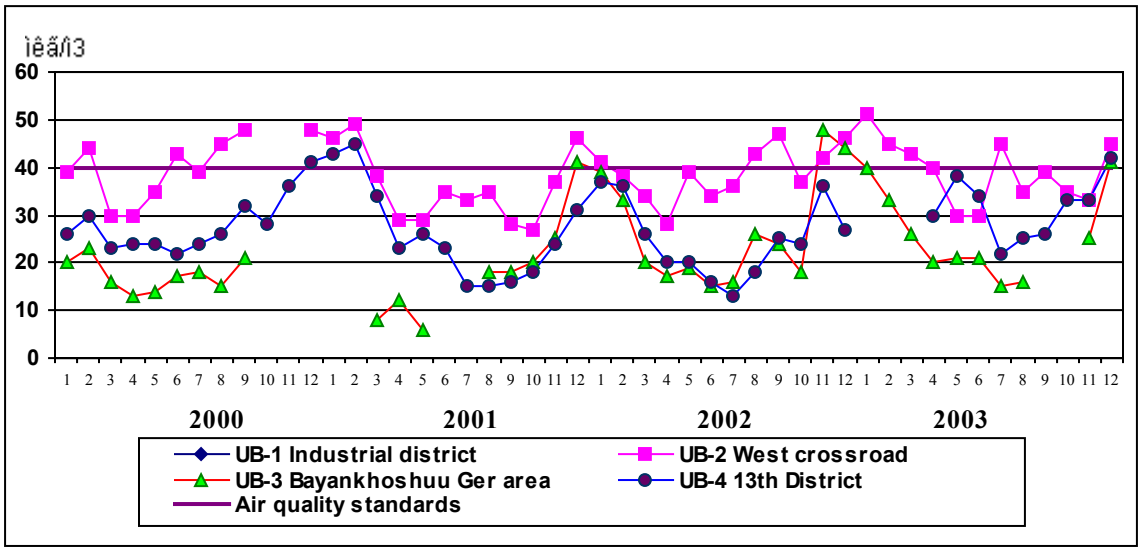
[42] The frequent instances of disruption of air traffic on account of dust at Ulaanbaatar airport is a good illustration of one category of the economic cost of the city's air pollution.
[43] Registrations of *private* cars in Mongolia rose from 7,962 in 1990 to 63,224 in 2002 (see Table 6).

Figure 2: Annual Average Concentrations of Selected Air Pollutants in Ulaanbaatar (ug/m^3)



Source: MNE, State of the Environment 2003

Figure 3: Monthly Fluctuation in SO2 Concentrations, Selected Areas of Ulaanbaatar (ug/m^3)



Source: MNE: State of the Environment, 2003

Table 7: Annual Variations in the Concentration of Selected Air Pollutants, Ulaanbaatar, 2000

	Summer daily averages		Winter daily averages	
	max (ug/m^3)	Min	max	min
SO2	10	0	41	10
NO2	64	15	60	14

These figures compare with the existing air quality standards that are as follows:

Table 8: Air Quality Ambient Standards, Mongolia, 2000

Parameter	Once-upon maximum (ug/m^3)	Daily mean (ug/m^3)
CO	3000.0	1000.0
SO2	500.0	50.0
NO	600.0	60.0
NO2	85.0	40.0
Dust	500.0	150.0

The figures indicate that the concentrations of pollutants exceed the national standards during winter. Both SO2 and NO2 concentrations have been gradually increasing. Although the figures do not justify the frequent blanket assertion of persistent excess of pollutant concentrations over the national standards they are not reassuring. A much improved 2003 State of the Environment report [MNE (2003)] provides further details on the pattern of air pollution in Mongolia.

58. Research by the Ministry of Health [Bulanchimeg (2003)] has used new (2001-2002) survey data of the incidence of respiratory diseases and correlated them 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 city. To echo the sentiment expressed in 2001: “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 fringes. It also seems likely that in the absence of vigorous countermeasures, the process of land degradation in the capital’s vicinity will continue unabated, adding to the pollution problem”.

59. Recent initiatives to introduce improved stoves into the *gher* areas of Ulaanbaatar are important for they, and improvement of small-scale heating stations, are probably the two areas that have a well defined physical focus and offer tangible and fast-accruing benefits[44]. 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, briquetting, re-location of polluting facilities, buildings’ insulation etc.) in the most cost-efficient manner. Substantial amount of work along these lines carried out under ADB- and GEF-funded projects on climate change have yet to be fully utilized.

Water Supply and Water Quality

60. Despite low precipitation in the south in particular, Mongolia’s water supplies are in principle adequate to supply most of its 2.5 million people even if serious problems of groundwater quality (high natural mineral content presence of arsenic) and local shortages are found in most of the Gobi area and the eastern steppes [Bolormaa et al. (2003)][45].

[44] All indications are nevertheless that the economic profitability of improving household stoves is well above that of improving small-scale heating stations.

[45] 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.

61. A revised Water Law was approved in April 2004. It clarifies the institutional division of responsibilities MNE, MOI and MOH in the sector, and it introduces the principle of water basin management and its broad management structure. It sets out broad principles of charging different classes of water users. It institutionalizes water conservation policies and calls for EIAs for specified classes of water use projects. For now, the revised Water Law co-exists with the Water Use Taxation Law of 1996. All in all, the Water Law is a distinct improvement and an invitation to Mongolia's development partners to match its intent [See UN ESCAP and NWC (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. Like the Regional Policy also, 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 the Mongolian territory, implicitly calling for an expansion of water storage infrastructure. 2004 has been declared by the Government "The Year of the Water".

Urban Water Supply

62. The central challenge facing the authorities is (1) to ensure that water supplies last well into the future; and (2) to safeguard the quality of both surface and groundwater. As to the former, some improvement of the rapidly deteriorating water supply infrastructure in Ulaanbaatar has been achieved with foreign assistance (JICA, France) but the problem has not been truly solved, not least in terms of sustainable financing. Water is effectively under- and mis-priced and significant waste occurs throughout the system. In Ulaanbaatar, the apartment building dwellers (who account for about half of the capital's population) using un-metered supplies, consume the bulk of the available supplies (see Box 6 and Table 9 below). Apartment dwellers' average daily consumption of around 0.4 m^3 per capita (almost double that of the U.S. or Germany) contrasts with the *gher* district dwellers' figure of less than 10 liters per capita per day[46]. 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.

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 km of water km water distribution network, and over 200 km of wastewater wastewater collection piping exists in the capital. Rainwater drainage and flood protection facilities are in disrepair. Some 155,000 m^3 of water is supplied to the centralized network and 1,500 m^3 for *gher* area needs. A central wastewater treatment plant was built in 1963, expanded in 1979 and 1986 with a capacity 230,000 m^3 per day. UB as a whole has other 14 WWT plants, most of which work in part or not at all. About 50 % of the water supply network has been rehabilitated with donors' assistance. The CWWT plant is being upgraded with Spanish technical and financial assistance. World Bank, Danish and other donor assistance has been directed at improving water supply to *gher* areas. In 2003, over 90 % of *gher* dwelling had electricity connection but hardly any were connected to central water supply.

[46] Apartment dwellers are connected to a centralized supply network while residents of gher areas purchase water from "water kiosks", to which water is supplied by trucks.

Table 9: Water Consumption, Tariffs and Total Revenue, Ulaanbaatar, 2000

Water consumers	Water volume consumed (2000)		Waste water		Fresh water	
	000 m^3	(%)	Tariff (Tg/m^3*)	Revenue** (Tg mil)	Tariff (Tg/m^3*)	Revenue** (Tg mil)
Apartments	47,888.0	79.7	110	5,268	186***	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
Gher areas	454.3	0.8	0	0	400	182
Total	60,049.8	100.0		6,614	190****	11,431
Others/ Losses	2,013.5					
Grand total	**62,063.3**					

Source: MNE

* The tariffs are those valid in 2001

** Presumptive revenue, incompletely collected. Figures of actual revenue are crucial but difficult to obtain.

*** Corresponds to about \$0.17/m^3. This compares with the 1996 range of residential water tariffs in PRC ranging from 0.20 to 3.0 yuan/m^3 (average 0.68 yuan or about \$0.10) and industrial water tariffs averaging 1.03 yuan (about \$0.13 at the time), or \$1.0-1.8/m^3 in France. The Ulaanbaatar wastewater tariff corresponding to \$0.10/m^3 is well above the rates prevalent in PRC even if even this level is no more than about 50 % of the full unit cost of operating a modern CWWT plant. Rather than mainly low levels of tariffs, it is mainly at the level of collection that under-pricing of water and wastewater treatment occurs.

**** Weighted average

63. The 2001 CEA discussed the experience of the National Water, Sanitation and Hygiene Education Program ("WASH-21") that addressed decentralized clean water provision and the sanitation needs of families in low-income *soums* and peri-urban 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. WASH-21 was instrumental in the establishment of the National Water Committee, a multi-agency body that has helped in part to overcome the fragmentation of responsibilities for water and sanitation in Mongolia. Its work and major changes in the government policy on water that have taken place in the last two years are discussed in para. 61 below.

Wastewater Treatment

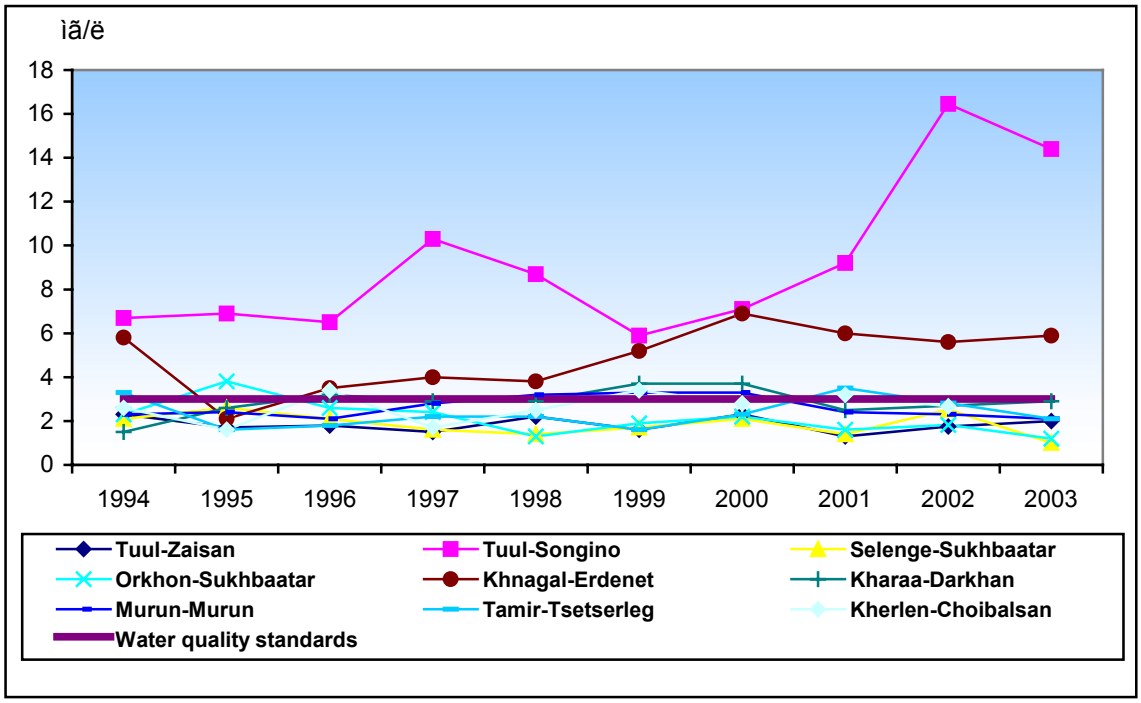
64. Only limited progress has been made since 2001 in restoring (or replacing) some of the 120 poorly functioning or non-functioning WWT plants and their more modest variants in Mongolia's urban centers. With the expansion of Ulaanbaatar and future growth of other urban centers likely to occur on the city fringes, the problem of connections and sewage treatment is likely to become more, not less, serious. Until now, the issue has received relatively low priority. A 1997 study of wastewater pollution of 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 Dutch-financed Tuul-21 Project has generated a more complete picture of the situation [See Fig. 4 below] besides linking the wastewater issue to the broader area of clean production.

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 Tolgoit area of the city. The latter group is unconnected to any pre-treatment facility discharging either directly into the central WWT plant, causing its serious malfunctioning, or dumping the waste, causing serious soil and groundwater contamination. Almost none of the tanneries satisfy CWWTP inflow standards (concentrations 5-20 times the permitted norm are not unusual, e.g. 50 mg/l of chromium against 2.5-5.0 permitted). Unsafe storage of chemicals and use of outdated Chinese technology are common and enforcement of EIA provisions has been ineffective. The pre-treatment 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.

65. A draft Wastewater Discharge Fee Law, based on the experience of 25 case studies under Tuul 21 Project, is now ready for submission to the Standing Committee of the *Ikh Khural*. It establishes the principle of payment for the quantity of discharges by different classes of users even if, for now, at least, it skirts the issue of tariff changes.

Figure 4: BOD in Selected Mongolian Rivers, Annual Averages (mg/l)



Source: MNE (2004)

Waterwells in Rural Areas

66. In rural areas, the key issue for some time now has been how to deal with large-scale abandonment of engineered and deep-water wells in the wake of *negdel* dismemberment. About two thirds of all engineered wells ceased to operate between 1990 and 2000 (see Table 10). In 2000, at least 60 % of the 35,000 or so of such wells constructed before 1990 to supply the needs of *negdels* were out of operation. Since then, major efforts have been underway under several donor-funded project to restore the 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, a total of 307 wells were rehabilitated and in 2003, a total of 468 wells. These are modest achievements but the pace of work is accelerating and the policy is finally beginning to move in the right direction.

Table 10: Number of functioning wells in Mongolia, 1990-2000 (000 units, unless otherwise stated)

Type of well	1990	2000
A. Number of wells and troughs		
Engineered wells	24.6	8.2
Simple sunk wells	17.0	22.7
Total	41.6	30.9
Watering troughs	4.1	1.0
B. Capacity (000 m^3)	39.4	14.9
C. Distribution of wells:		
Wells on pastureland	38.3	21.7
Unused wells	1.1	5.8
Wells in areas other than pastureland	2.2	2.5

Source: Mongolian Statistical Yearbook 2000

Energy, Non-renewable and Renewable

67. Energy deregulation and reforms associated with it have been underway in Mongolia since the enactment of the 2001 Energy Law and enough has been said about it [Rizer and Vollans (2002), Teleki (2003)] to repeat it here. 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 the system's 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 Mongolia Sustainable Energy Sector Strategy, formulated in 2001 but since then overshadowed by the demands of energy sector de-regulation. The managerial, financial and political difficulties of that process, especially the continued non-sustainability of decentralized electricity provision are well known [see MOI (2001)]. Slow progress has affected the donors' willingness to consider new initiatives. The extensive work on energy undertaken within the UNFCCC framework (some with ADB's own funding) remains poorly co-ordinated with, and integrated into, the planning and policy activities of MOI. Further work on energy efficiency under UNFCCC is being adversely affected by hesitations of Government of Mongolia to ratify the Kyoto Protocol.

68. Among other things, the 2001 CEA mentioned the impact of continuing growth of the *gher* areas relative to apartment housing: more households unconnected to the CHP network increases air pollution by these areas in winter. Although these areas consume less than 10 % of the total coal used by CHPs and HOBs in the city, they contribute disproportionately to the capital's air pollution because of low stove efficiency and the areas' "wrong" location in relation to prevailing winds. Apart from mainstream recommendations for dealing with air pollution in Ulaanbaatar (e.g. to shift attention to the *gher* areas, develop emission standards for power plants, adapt market-based approaches to compliance) the 2001 report also notes the absence from the policy debate 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.

69. 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.

70. The principal technical considerations relating to renewable energy are summarized in the 2001 CEA. The new elements are (i) the growing volume of work on renewable options (in which ADB plays a part through technical assistance); and (ii) continued absence of any systematic attention to fuelwood as a potential source of renewable energy. This may reflect deforestation concerns but it does fly in the face of reality in which fuelwood is a major energy source (between 1 and 2 million m^3 used annually) in Mongolia. Forestry and energy policy have been discussed in complete isolation from one another and they should not be.

71. 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 PRC, in particular, offers a number of lessons and opportunities, provided they are not adopted slavishly.