Risk and Vulnerability Assessment

Background

Worldwide, annual economic losses associated with (natural) disasters averaged $75.5 billion in the 1960s, $138.4 billion in the 1970s, $213.9 billion in the 1980s, and $659.9 billion in the 1990s. Today, 85% of the people exposed to earthquakes, tropical cyclones, floods, and droughts live in countries having either medium or low human development (UNDP 2004).

For many economies, and Mongolia is a good example, natural hazards and their consequences are an important aspect of environmental management, as explained in several places in the beginning of this analysis. Their number and importance is such, however, that they deserve to be addressed in a CEA more systematically than usual. Natural risks and disaster management go well beyond the environment. Experience of recent years worldwide suggests that in a significant number of cases, Mongolia included, natural disasters threaten the sustainable development agenda. And, to make matters worse, they tend disproportionately to affect the already poor. In the words of the World Development Report 2000/2001, "natural hazards represent a main source of risk for the poor, and disasters are a downward trigger to poverty." While advanced industrialized countries may stand to lose more in absolute terms from a single catastrophic event, it is the poorer countries that are more likely to be seriously vulnerable to extreme and crippling losses.

The explosion of work on natural disasters during the last two decades[67] succeeded in driving home the important distinction between natural hazards (typically unpredictable and often beyond control) and disasters or vulnerability, both of which are affected by a number of factors that are unpredictable. Vulnerability assessments explore the degree to which communities and societies organize themselves to respond to natural hazards.

[67] In addition to Mongolia-specific material, the list of references attempts to guide the reader through key contributions to the subject, relevant policy documents, and information sources.

They are a necessary precondition of and inputs into disaster reduction strategies.[68]

Every year there are 20–30 hydrometeorological hazards in Mongolia, one third of which reach serious levels. Furthermore, Mongolia suffers from fires, earthquakes, outbreaks of human disease, livestock and plant diseases, and technological accidents. In some recent years (e.g., 1999–2000) the direct damage caused by disasters reached $80–100 million, a very large sum by any, but especially Mongolian, standards.[69] Here the intention is not mainly to dwell on the description of natural hazards but to describe the policy and institutional and administrative responses to natural hazards in place or under consideration in Mongolia and the role ADB could play in its future assistance in reducing the country's vulnerability to natural risks.

Vulnerability Assessment and the Asian Development Bank

Over the years, ADB has gained considerable experience with emergencies and the management of natural disasters. In terms of policy, the modern view of disasters and vulnerability fits in rather well with the intent of ADB's environmental policy, which is to move beyond mitigating impacts toward preventing them in the first place. Although, in the case of natural hazards, prevention may not be always attainable, a significant reduction in the scale of subsequent disasters is possible. And if integrating environmental considerations into mainstream economic decisions has become another important objective of ADB's activities in DMCs, linking development- and disaster-related activities has emerged as a precondition for a steady reduction of communities and countries' vulnerability to natural risks.

The second area where natural hazards meet ADB's policy is in the relationship between natural hazards and poverty. Discussing poverty reduction solely in terms of short-term improvement of incomes is clearly incomplete. There is a general consensus, supported by the results of the Participatory Living Standard Assessment in Mongolia, that vulnerability to risk is one of the root causes of poverty in Mongolia. Natural disasters can instantly impoverish and undo livelihood advances of many years. If so, any strategy designed to target poverty in Mongolia cannot be formulated without explicit recognition of the role of natural disasters.

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[68] Appendix 11 reviews the principal methodological questions.

[69] The figures are equal to about one fourth of the entire government budget in those years and three times the amount annually spent on environmental management by the Government and foreign development partners.

Box 8

Global View of and Responses to Natural Disasters

An increase in human casualties and property damage in the 1980s and the disproportion between these and a wealth of scientific, engineering, and other know-how that could have been called upon to reduce them led the United Nations General Assembly in 1989 to declare the 1990s the International Decade for Natural Disaster Reduction (IDNDR). The aim of the IDNDR was to prevent or lessen disasters linked to a range of natural phenomena, including earthquakes, windstorms, tsunamis, floods, landslides, volcanic eruptions, wildfires, grasshopper and locust infestations, and drought and desertification. One of the initial outcomes of the IDNDR was the Yokohama Strategy and Plan of Action, adopted at the 1994 World Conference on Natural Disaster Reduction in Yokohama, Japan. It realistically assessed hazard, risk, and vulnerability, including early warning and response capabilities in developing countries as a priority. Other IDNDR's objectives related to the application of scientific and technical knowledge, prevention, and mitigation of natural disasters through programs of technical assistance and technology transfer, demonstration projects, and education and training. A later strategy, called A Safer World in the 21st Century: Disaster and Risk Reduction, was formulated in 1999 and known as the International Strategy for Disaster Reduction (ISDR). This strategy provides the basis for current and future endeavors related to disaster reduction. ISDR is supported by a Secretariat under the United Nations Directorate for Humanitarian Affairs, an interagency task force, and ad hoc working groups. The original expectation of IDNDR was for all countries to have in place comprehensive national assessments of risks from natural hazards by 2000, with these assessments taken into account in development plans and mitigation plans at national and/or local levels, involving long-term prevention and preparedness and community awareness and ready access to global, regional, national, and local warning systems and broad dissemination of warnings. To date, 120 national IDNDR committees and focal points have been established around the world to realize the decade's objectives. In Mongolia, the International Cooperation Department of the Ministry of Nature and Environment is the IDNDR national focal point.

Virtually all specialized organizations of the United Nations system have had some involvement in disaster assistance. In some cases, their work predates that of IDNDR (e.g., the Pan-American Health Office), while in other cases it is neatly embedded into the IDNDR-ISDR framework. In Asia, involved United Nations organizations include the Asian Disaster Preparedness Center and the Asian Disaster Response Center. Other important global bodies emerged. The ProVention Consortium is a global coalition of governments, international

continued on next page

Box 8 (continued)

organizations, academic institutions, and private sector and civil society organizations dedicated to increasing the safety of vulnerable communities and reducing the impact of disasters in developing countries.

Most large countries have their own agencies specializing in disaster management, usually with a strong international dimension to their work. A significant number of centers of learning exist worldwide specializing in studies of vulnerability and natural risks (Colorado, Columbia, Karlsruhe, Kyoto, Louvain, Stanford, and Wisconsin are a few).Last, many international nongovernment organization have been created precisely to respond to natural disasters and emergencies and their aftermath.

Source: Asian Development Bank.

Principal Natural Risks in Mongolia and Their Management

A well-accepted nomenclature of hazard factors in Mongolia exists. Box 9 reproduces the classification developed and used by Mongolia's MNE.

Box 9

Classification of Hazards in Mongolia

Major Hazards: blizzard, heavy snow, dust storm, *dzud* (severe winter episode involving significant amounts of snow and posing a risk to livestock), flooding (three types), cold rain, hail, earthquake, wildfire, drought, and desertification

Minor Hazards: lightning, locust infestation, plague, epidemic disease, ecological hazards, industrial hazards, toxic chemicals, radiation, and transport accidents

Source: Ministry of Nature and Environment. 2002. *Mongolia Country Report to Asia Disaster Response Center 2002*. Ulaanbaatar.

The classifications in Box 9 are largely driven by the perception of the scope for economic damage the various risks present in Mongolia, rather than fundamental distinctions between natural hazards and those of partly or substantially anthropogenic origin. By now, it is recognized that such a boundary would be difficult to draw in any case. Both MNE categories, although to varying degrees, combine hazards of the force majeure kind (e.g., blizzards and locust infestation) with those that have an important human-caused dimension (desertification and possibly wildfires and dust-storms, as well as industrial hazards and others). Table 16 further illustrates this point.[70]

The emphasis in the remainder of this section is on the major hazards of MNE's classification, since several minor hazards (e.g., mercury contamination and toxic waste) are dealt with in other parts of this analysis which similar to ADB (2001a) is structured around the more predictable elements of environmental policy and impacts. Some regrouping of major

Table 16: Natural and Human-Caused Components of Natural Disasters in Mongolia

Disaster Type	Natural Components of Disasters	Human-Caused Components of Disaster
Dzud (severe winter episode involving significant amounts of snow and posing a risk to livestock)	Drought (summer) Severe weather (winter)	Lack of sustainable pasture management, adequate numbers and operation of pasture water points and wells, adequate reserves of hay and fodder, adequate winter protection for animals Too many animals
Flash Floods and River Floods	Short-term rapid snowmelt or heavy rains Long-term snowmelt or heavy rains	Allowing people to live in flash flood-prone areas or in river flood plains Lack of safety markings at the boundaries of areas prone to flash flooding or river flooding
Forest and Steppe Fires	Drought and lighting	Careless use of fire in fire-prone areas Lack of adequate training and safety equipment for firefighters

Source: United Nations Development Programme.

[70] Table 16 can be recast in terms of ADB's Disaster Management Cycle categories.

hazards into a smaller number of categories, according to the direction of impacts and scope for institutional synergy facilitates the analysis. If hazards are described mainly in terms of their impact on attributes of livelihood (e.g., livestock lost) rather than in socioeconomic terms (e.g., incomes lost) the link between the two is sufficiently clear in most cases. The label *socioeconomic impacts* then becomes redundant.

Box 10
Dzud

Dzud is a Mongolian term for a severe winter episode that poses a risk to livestock. Physically, there are different types of dzuds, each classified by their effects. The types of dzuds are white dzuds, which are characterized by deep snowdrifts; black dzuds, which are a combination of low temperatures and lack of precipitation and hence no water; and iron dzuds, which are the formation of impenetrable ice cover, etc. All of these can kill livestock by undermining food security. Summer droughts followed by unusually cold temperatures in autumn and then very heavy snowfalls and extremely low temperatures in autumn and very heavy snowfalls and extremely low temperatures in winter have given rise to the term multiple dzud. While some localized losses of livestock occur during most Mongolian winters, a dzud year is one during which the losses affect significant parts of the entire country.

Different types of dzud may require different types of emergency response (e.g., mainly sheltering animals, moving them to a different area, or providing hay or fodder supplements). A dzud's impact depends on the interaction of the climatic episode, the physical condition of livestock at the time, and socioeconomic factors. The physical condition of livestock is affected by a number of factors, ranging from the conditions of summer pastures in some areas and inadequate winter fodder preparation are the most common indirect contributing causes of livestock losses during winter.

Rather usually, Mongolia was struck by two consecutive dzuds (in 1999/2000 and 200/2001). The 1999/2000 dzud affected 450,000 herder family members (one fifth of the total population) directly and killed about 3 million animals–approximately 10% of all livestock, with the majority of deaths occurring in the spring, when animals were at their weakest, before pastures could regenerate.

On top of its impact on wealth and incomes, other human repercussions of dzuds can be no less worrying. These repercussions can extend to malnutrition, greater morbidity and mortality among vulnerable groups, and school absenteeism.

Source: Asian Development Bank

Group I: Extreme Seasonal Weather Changes Impacting Livestock and Livelihoods

Much has been said and written about losses of livestock and hardship to herding communities caused by winter weather emergencies in Mongolia,[71] especially *dzuds* (Box 10). The scale of *dzud* calamities can be magnified by other seasonal extremes, droughts the most prominent among them. Though seemingly separate events, droughts and *dzuds* are best discussed jointly for reasons that will be explained.

Despite the reduction of the livestock sector's traditional dominance of the country's gross national product in recent years, the sector remains of vital importance to rural livelihoods and beyond. The number of herder families in Mongolia increased from 75,000 in 1990 to over 190,000 in 2000. Livestock are essential to every aspect of herders' life and are usually the only source of food, transport, fuel for heating and cooking, and purchasing power as well as the main means of access to education and healthcare. Alternative agricultural activities (e.g., cropping and vegetable gardening) are very few and short, given the country's climate. Herder families with fewer than 100 animals are close to the poverty line, and most vulnerable to further loss of animals. Even those with close to 200 animals may easily drop below the subsistence threshold if their herds are depleted by dzuds. The Government recognizes that dealing with risk is the main problem of the Mongolian pastoral economy, and that failure to deal with it could jeopardize all progress in rural development and poverty alleviation. The recent losses of livestock are given in Table 17.

The privatization of the national herd in Mongolia in 1991–1992 has been extensively described (ADB 2001a and ADB 2001b). It is generally accepted (Food and Agriculture Organization 2001) that the vulnerability of rural households to risk has increased in its wake. In the past, pastoral societies had a range of mechanisms, based on customary institutions before and on state institutions during the socialist period, to limit dzud damage and reinsert affected individuals into a viable production process. Automatic resupply of collectively owned animals to khot ails with insufficient herds and subsidized emergency fodder supply were the hallmarks of the emergency response during the socialist period, further supported by employment guarantees and price control of basic foodstuffs. With the older

[71] The best introduction is probably Food and Agriculture Organization (2001). Detailed facts are available on ReliefWeb, a United Nations-assisted website dealing with emergencies and disaster relief worldwide. The attention paid to livestock in this section reflects the order of importance. It does not mean that crops are immune to climatic shocks.

Table 17: Estimates of Losses of Livestock to Winter Calamities
(1944–2001)

Years	Type of disaster	Losses Adult Livestock (head)	Losses Young Livestock (head)
1944–1945	Drought and dzud	8,100,000	1,100,000
1954–1955	Dzud	1,900,000	300,000
1956–1957	Dzud	1,500,000	900,000
1967–1968	Drought and dzud	2,700,000	1,700,000
1976–1977	Dzud	2,000,000	1,600,000
1986–1987	Dzud	800,000	900,000
1993	Dzud	1,600,000	1,200,000
1996–1997	Dzud	600,000	500,000
1999–2000	Drought and dzud	3,000,000	1,200,000
2000–2001	Drought and dzud	3,400,000	

Note: Dzuds are severe winter episodes that pose a risk to livestock.
Source: Suttie, J.M. 2001, *Herding Risk in Mongolia*. Summary of a presentation to the Tropical Agriculture Association, Scottish & Borders Branch, November 2001. Available at www.taa.org.uk.

customary risk-coping mechanisms difficult to recreate and the extent and durability of state assistance in the new circumstances difficult to judge, the new private livestock owners of the post-1991 era relied on (i) increasing the size of the herd (even after the two dzuds of 1999–2001) to a total herd of almost 30 million animals or 10 million *bod* (unit of counting animals), which is above the levels of socialist times; (ii) changing the composition of individual herd toward more sturdy and saleable animals (mainly goats); and (iii) moving animals closer to population centers, to compensate for the loss of subsidized transport. To varying degrees, these developments resulted in the degradation and poorer use of existing pasture resource and a bigger but weakened herd. The near-automatic supply of emergency fodder to herders and activities associated with it (e.g., production of hay for winter use) and the size of the State Emergency Fodder Fund were severely scaled down and their future remains uncertain. The deteriorating state of public infrastructure and the logistical demands of winter supply made any emergency assistance more difficult.

Box 11

Asian Development Bank and Emergency Fodder Supplies

In 2002, Asian Development Bank (ADB) consultants reviewed the experience of the Agricultural Sector Program Loan (ADB's Agricultural Sector Program Loan). According to the authors, the emergency fodder policy developed in the following way.

In January 1995, the Government changed the status of the State Emergency Fodder Fund into, first, the Food and Fodder Corporation, established to operate on a cost-recovery basis, and in 1996, merged it with a newly created State Reserve Agency. In addition to fodder, the new agency keeps emergency and strategic reserves of seeds and food items (e.g., rice; sugar; and, since 1999, petroleum products). From over 100 state units producing and storing emergency fodder before 1990, the number was slashed to nine storage centers in 1996, keeping no more than a total 20,000 metric tons of hay. All disposals from and replenishments of the fodder reserve are said to be at market prices, and the reserve is run on a revolving fund principle. The authority to release the reserves is given by the Prime Minister.

As a result of several severe winters in a row (1999–2002), the number of state reserve agency fodder storage facilities has recently been brought back to 22 (i.e., one in each *aimag* (province) center. The fodder emergency supplies now have three tiers: (i) State Reserve Agency stocks, (ii) reserves held by aimag and *soum* (district) governments (not counted as part of State Reserve Agency reserves), and (iii) reserves kept by individual herders or *khot ails* (groups of herding households). The information on the size of the reserves is now classified. However, unofficially and broadly, the size of the fodder reserve fund is estimated at no more than 3 days' requirements of the national herd, or about 50,000 metric tons.

The Agriculture Sector Program was right to aim for a removal of subsidy in the State Emergency Fodder Fund's functioning but was unduly influenced by short-term climate data in estimating what real emergency needs were. Inadvertently, however, by exposing herders to the harsh reality of nonexisting or inadequate state emergency assistance, the Agriculture Sector Program may have achieved a lasting change of risk perception among the herders and the beginning of a trend away from increasing herd size and instead ensuring the herd's adequate nutrition.

Source: ADB. 2002. *Agricultural Sector Program: An Evaluation.* Manila

The experience of the 1990s soon revealed that preparation of own winter and spring food reserves (e.g., frozen and dried meat) and the collection of dung for heating was easier than adequate preparation of winter food for animals. The reasons for this were at least three: drought-induced shortages of grass in some areas and years; insufficient finance to purchase animal feed in the market; and, most important perhaps, a lingering notion that (regardless of privatization) winter fodder remains a government responsibility.

The Government's initial responses to dzuds suggested that it was willing to bear a part of that responsibility. Some of the steps taken in response to 1999/2000 and 2000/2001 dzuds included traditional elements, such as

(i) increasing SEC activism and prioritization of assistance by the severity of impact (severely affected, moderately affected, and potentially affected aimags and soums);

(ii) establishing working groups in key ministries to assess drought conditions for the entire country and better organize preparations for winter;

(iii) increasing the state hay and fodder fund;

(iv) offering loans to selected *aimags* for winter reserve stocks and purchasing fodder from other provinces less affected by previous calamities;

(v) ensuring emergency allocation of funds for (a) renovation of water points and wells in selected provinces; (b) transport of hay and fodder and veterinary medicine to seven provinces; and (c) provision of ambulances;

(vi) apportioning responsibilities better among ministries for approaching development partners for assistance and the distribution of various relief items;

(vii) placing greater emphasis on improved drought and dzud forecasting, mainly through NAMHEM; and

(viii) targeting hay and fodder reserves by the State Reserve Agency.[72]

[72] During the winter, the State Reserve Agency is to be responsible for the planning, coordination, and distribution of aid as far as aimag centers, while aimag authorities are responsible for the delivery of aid to affected communities.

Moving to places with relatively better grass, water, and weather conditions remained the most natural form of adjustment[73] and one facilitated by SEC and local governments. The increased movements of people and livestock outside their traditional winter grazing areas, however, increases pressure on limited existing water resources and congestion on pastures reserved for other seasons, degrading them further. Access to pastures and policies governing this emerged as a major policy preoccupation, rightly claiming much legislative and other attention.

Restocking of the herd in the aftermath of the relatively mild 1993 dzud, as a response to livestock losses,[74] turned out to be a short-lived remedy, as dramatically illustrated in the more severe winters at the end of the decade. Restocking cannot be a solution unless the factors contributing to emergencies (pasture degradation, condition of the livestock, approach to winter hay production, livestock mobility) are dealt with. This was recognized in the Government's Pastoral Policy for Emergencies, which was drafted in 2001, in part building on the work of the Food and Agriculture Organization in Mongolia.[75] The policy increases local responsibilities. At the aimag level, it favors the establishment of aimag emergency fodder funds to support the aimag herd for at least 3 days. It calls for (i) demarcating and estimating the carrying capacity of interaimag and intersoum *otor* (movement of livestock to winter, summer, or other pastures) areas and protecting such areas from unauthorized grazing; (ii) ensuring cooperation between aimag administrations concerning migration and otor; (iii) developing a pasture water supply improvement plan; (iv) disseminating the experience and skills of senior herders concerning protection of livestock from natural events; and (v) prepositioning of means of transport, fuel, drugs, and other vital items. In a more general way, it calls for improved herders' control over use of pastures. At the soum level, the plan envisages an emergency fodder

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[73] The viability of such a move depends on the distances involved. Long winter moves weaken animals and people. Increasing winter food reserves by slaughtering weak and young animals is the option exercised by those unable to move animals to better areas.

[74] Most notably the International Fund for Agriculture and Development's and the Government's $5 million project in Arkhangay and Khuvsgul provinces and similar restocking programs in other provinces (e.g., the project financed by the Save the Children Fund).

[75] The Food and Agriculture Organization's Pastoral Risk Management Strategy project was to contribute to the development of a coordinated national pastoral risk management strategy linked to national poverty alleviation efforts. Risk management plans at lower institutional levels were to be pilot tested in three provinces and serve as building blocks for the national strategy. Selected key strategies pilot tested included improved hay making; decentralized emergency fodder reserves and funds; weather forecasting with better outreach to pastoral households; and improved mechanisms of collaboration among herders, herder's groups, and local governments regarding risk management related tasks. Improved access and modalities of insurance were also explored and later developed further by the World Bank (Box 5).

fund to safeguard a soum herd for not less than 3 days. It calls for (i) certification of herders' possession rights over pastures and their seasonal use; (ii) schedules for use of winter and spring campsite areas; (iii) estimate of current carrying capacity of district pastures in August of each year; (iv) plan for livestock overwintering; (v) rodent control, haymaking, and fodder preparation to be carried out as unofficial military service; (vi) hay and pasture irrigation through snow and rain water harvesting; and (vii) creation of small fodder making units. As for the herders themselves, the policy puts emphasis on disciplined seasonal pasture use, especially an end to out-of-season grazing of winter and spring pastures; attention to ensuring the animals' good weight ahead of winter; and generalized call for good practices (i.e., repair and maintenance of wells, water points, and shelters and preparation of hay).

The plan rightly recognizes that the scale of any dzud-initiated disaster depends on the overall health of the livestock sector at least as much as the quantity and speed of emergency assistance. The technicians have since questioned the emphasis on hay as emergency fodder, because it is a low quality feed that is expensive to transport per unit of weight and it is unsuitable for longer term storage. In addition, most pf Mongolia's people, as well as outside specialists, agree that a key to strengthening the sector in the new circumstances is allocating grazing rights (i.e., provision of incentives necessary for the herders to invest in repair of infrastructure and better pasture management) and some means of protection from trespass.[76] As Suttie remarked in 2001, "the legal, logistic and political problems connected with allocating rights are complex. The old system only had to deal with 250 cooperatives, each with its technical staff. There is no extension organization in place to deal with thousands of individual households." The 2001 policy merely assumes that allocation and certification of grazing rights will take place. The experience of the last few years suggests that it may well but that the process will not be smooth and fast. It is not made easier by the separation of government responsibilities for land allocation (ALAGaC) and livestock industry (Ministry of Food and Agriculture).

[76] As noted in 2002 and 2004 CEAs, pastureland (as opposed to, for example, urban land) throughout Mongolia is regarded as common land, although tenure rights can be granted. As a result, pasture must be managed on a community rather than an individual basis. Development of well functioning community-based grazing mechanisms has been the goal of numerous projects under way in the country during recent years.

Box 12

Dealing with Covariant Herding Risks: World Bank Approach

Herding in a harsh and variable climate is inherently risky. Herding skill and mobility help mitigate risk, but it is always there. The collapse of the collective system shifted the herding risk from the state to individual households. Risks can be divided into two main categories. Individual risks strike individuals or households nearly randomly, such as individual illness, predation on livestock, accidental injury, old age, loss of a job, or crime and banditry. Covariant risks strike most or all individuals or households in one area. Droughts and *dzuds* (severe winter episodes that pose a risk to livestock) are classic covariant risks, as are some animal disease epidemics, market failures, or widespread conflicts. Many individual risks can be protected against within a community, often by customary self-help mechanisms. Yet, individual animal insurance would not be practicable in Mongolia, because of the high cost of abuse monitoring and a removal of incentives to protect livestock. By contrast, covariant risk could be insured against.

The World Bank's Mongolia Sustainable Livelihoods Project targets natural disaster risk, including drought and dzud through an integrated approach that includes

(i) local initiatives fund to be managed in a socially inclusive, community-driven way to diversify
incomes and improve local infrastructure;
(ii) community-based pastureland management based on improved grazing discipline and alternative conflict resolution mechanisms; and
(iii) risk forecasting and contingency planning, including an index-based livestock insurance scheme, meteorological monitoring, and an early warning system.

Many families began herding in the 1990s because of a lack of alternative income-generating opportunities. Exit strategies in the project are intended to present some of these new herders with other income-generating opportunities and simultaneously reduce pressure on grazing land. Access to microfinance credit is used for alternate employment.

Within the Mongolia Sustainable Livelihoods Project, communal land management is strengthened through the development of community-based grazing management systems that include conflict resolution mechanisms and sanctions for noncompliance. Reducing instances of poor land management is expected to allow herders to sustain productive livelihoods, thereby contributing to poverty reduction.

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Box 12 (continued)

The pastoral risk management component of the project is improving risk forecasting and contingency planning through better coverage of weather forecasting data, broadening the range of data used in semiannual early warning system bulletins, and increasing their dissemination to local authorities and herders and development of *soum* (district)-level contingency plans. A risk index-based livestock insurance scheme is being developed, under which eligible participating private insurance companies would offer livestock insurance to individual herders, herding households, or other juridical persons owning livestock, to cover covariant risk arising from dzuds, droughts, or other weather-related events. The index, based on third-party verifiable indicators, such as weather data, livestock mortality rates, or indices of range vegetation condition, would differentiate relative risk at an appropriate level (most likely at the rural district level), based on historical data. Indemnities under the scheme would be triggered once the index exceeded a given threshold level specific to that rural district. Insurance cover would be for productive activities, including the replacement value of livestock; the value of goods or services to support risk preparedness and/or enhance livestock productivity, such as hay and fodder production or purchase, acquisition of veterinary drugs and services, construction of livestock shelters, and breeding services; and/or the value of goods and services to allow policyholders to engage in alternative or supplementary livelihood strategies. Liability of insurance companies has an upper limit, and the Government covers claims beyond that amount. The scheme is expected to be launched during the second year of the project and is expected to become profitable by the end of the project.

Source: Asian Development Bank interpretation of World Bank information.

The principal challenge for the new civilian disaster management authority (the National Emergency Management Center) in dealing with livestock-related calamities lies in translating a general desire to integrate the policies and procedures of the most relevant agencies into reality. The Ministry of Food and Agriculture's pastoral risk strategy and programs need to be better coordinated with the National Poverty Alleviation Program and coordinated not only at the national level but also at the local level.

Group II: Nonseasonal Weather Changes or Occurrences Affecting Livestock, Management of Land Resources, and Livelihoods

Desertification features in MNE's classification of hazards and is perceived as a risk to livelihoods by most of Mongolia's people. The complex mix of local human-caused (and animal-assisted) desertification stresses and underlying climatic changes are increasingly recognized in Mongolia, as described earlier.

Unlike the phenomena just discussed, the impact of desertification on livelihoods is gradual but occurring at uneven speeds in different parts of the country, the Gobi and its fringes are suffering the greatest harm. Reducing vulnerability of population to the risk of desertification requires, first of all, a concerted approach to the principal human-caused contributing factors that are (unlike the global climate) within policy makers control in the short- to medium-term. Mongolia has prepared the National Action Plan of Combating Desertification, which contains extensive analysis of desired action. Indeed, addressing Mongolia's preparedness and ADB's possible role in alleviating desertification-related risks can be recast as an assessment of the strengths and weaknesses of the National Action Plan of Combating Desertification.

Climate change and desertification work are closely related and both benefit from improved early warning systems and climatic monitoring. Going one step further and linking climate change analysis and disaster risk management is not impossible. The probability that climate change will continue to modify risk patterns is high. If the Intergovernmental Panel on Climate Change is right in associating the frequency of extreme climatic events (such as a dzud) with even small rises in global temperatures, then climate change and disaster preparedness become more closely related than realized.

Group III: Other Phenomena Wholly or Partly Affected by Weather or Natural Forces

This somewhat unwieldy category groups several risks that may be less central to the lives of the people of Mongolia but that can create significant losses.

With no recent history of damaging earthquakes, it is easy to forget that parts of Mongolia are located in an active tectonic zone. While low population density and the lightness of ghers are good safeguards, further concentration of population in Ulaanbaatar and uncertain building standards

there raise the possibility of a serious earthquake disaster. Interestingly, the 2004 report of a disaster preparedness evaluation mission to Mongolia (United Nations Disaster Assessment and Coordination 2004) rates an earthquake occurring in Ulaanbaatar during winter as the worst-case disaster scenario for that country.

Like all major cities, Ulaanbaatar faces other potential hazards. Flooding, temporary breakdowns of heating supplies in winter, wildfires on the edges of the capital city,[77] and dust storms are among these. Like all cities undergoing rapid growth, zoning becomes essential not only for maintaining environmental quality but also for limiting exposure to potential natural risks. Ulaanbaatar has its own Emergency Management Department, and the city government credits it with several successes, such as a good management of flood waters in July 2003. The long-term city plan (to 2020) is said to contain several risk-reducing elements. Their quality could not be verified.

Inside and outside Ulaanbaatar and larger towns, dust storms and sandstorms are common occurrences interfering with pasture use and transport. The windy conditions are sometimes associated with an increase in the locust infestation that severely affects hay and crop harvests and with the spread of Siberian Gypsy Moths, which seriously affect Mongolia's natural forests. The same forests are affected by wildfires, some caused by nature and others by people. Surges in rodent population are a constant threat to pasturelands and herders' livelihood. Outbreaks of animal disease epidemics with varying degrees of risk of transmission to humans (e.g., plague and brucellosis) are common, and considerable experience exists in dealing with them, but it must be remembered that the veterinary service is much weakened and still being resized and made to fit the new pattern of livestock ownership and management.[78]

These points are not intended to be an exhaustive list of second-tier risks or to suggest that Mongolia is unique in its exposure to natural hazards. It does, however, illustrate the diversity of risk factors and the considerable challenge facing Mongolia in responding to all of these adequately.

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[77] Some 5,000 people are said [*ReliefWeb*, 19 Sept 2002] to have worked for 18 days before extinguishing 24 fires burning around the edges of Ulaanbaatar in the summer of 2002.

[78] This report does not deal with human epidemics and their management in Mongolia but considers them a part of secure livelihoods. Extensive material exists on the readiness of Mongolian health authorities to deal (or not) with them. Partial information is also available on the health repercussions of nature calamities (nutrition, morbidity, and mortality patterns).

Group IV: Toxicity-Related Risks

The large quantities of toxic materials used or generated in Mongolia were mentioned earlier as well as the principal risk factors: unsafe handling, poor inventory and tracking, inadequate disposal facilities, and no special facilities to deal with hospital waste. The account of rodent control practices (Box 13) illustrates also the (rather frequent) possibility of risk-substitution (i.e., reduced vulnerability of herders can be possible [within limits] by rodent control, but the benefits can be offset by greater exposure to toxic materials by herders and others and collateral damage to desirable wild animal species).

Two other types of risks have been consistently mentioned in Mongolia with, however, only partial evidence to adequately judge their seriousness. The high mineralization and possible contamination of groundwater in the Gobi region and eastern steppes were said to be a constant source of health problems in these areas. To this could be added periodic contamination of the Tuul River by heavy metals, as well a major risk of mercury contamination described. Management of each of these requires a set of interlinked responses. The degree to which existing policies and institutional arrangements have been developed varies from case to case, getting better in the case of water pollution safeguards but still to be formulated in the other two cases. Obvious, but perhaps useful to recall, is that water quality is only one dimension of vulnerability linked to water. In semidesert or desert environments, especially, but elsewhere in Mongolia also, access to water and its more efficient use are essential determinants of vulnerability. For this reason also, some large-scale water-dependent developments (e.g., gold mining in the Gobi region) become a legitimate subject for vulnerability analysis. More generally, management of water resources anywhere is rarely far from the center of vulnerability analysis, and it is mainly analytical or presentational convenience that will determine whether water is taken for granted or discussed explicitly. It seems clear, for instance, that losses of livestock to natural events in Mongolia are almost as much about water management (e.g., water wells for animals and irrigation to grow fodder for storage) as they are about emergency transport of fodder to animals. The already demanding call for integrating natural disasters into development policy will become even more demanding once management of water resources (a huge subject at the best of times) is added.

The dangers of radiation exposure have been raised informally, from time to time, in connection with Ulaanbaatar's heavy dependence on coal. Coal contains C-14 and K-40 uranium and thorium and, when burned, the fly ash released to the atmosphere carries some of this radioactivity with it.

Box 13

Brandt's Vole (Dealing with a Special Risk)

The Brandt's vole (*Microtus brandti*) is distributed throughout arid lands in Mongolia and is a key species of the Mongolian steppe. This rodent inhabits around 40 million hectares from the Khan-Khentii mountain range to the eastern Mongolian steppe and is estimated to heavily damage an average of 17–18 million hectares annually. The vole has a high reproduction ability. Infestation tends to reach its peak with the interval of 13–14 years, with smaller peaks occurring with the interval of 7–8 years. During high infestation periods, voles can destroy 90–95% of all pastures and cause herder families and livestock, as well some wild animals, to leave an area. Mongolia's Plant Protection and Research Agency was established in 1952, and one of its objectives was to substantially reduce the Brandt's vole infestation. Chemical poisons have been used in agricultural practice in Mongolia ever since (mostly by aerial spraying), and the quantities applied have started to increase again in recent years. Over 400,000 hectares of pasturelands were treated with rodenticides in 2001. Yet, despite more than 30 years of rodenticide use, vole numbers and the threat have not been significantly reduced, while collateral damage is regularly inflicted on other wild species. A change in vole control methods may be needed, based on biological and ecologically harmless methods, such as prohibiting hunting of predator species that feed on the Brandt's vole and building perch and nest sites for falcons and buzzards in the steppe. The Government seems to be listening to this advice (favored by ecologists). In 2000, for instance, the Government banned hunting of red and corsac foxes (vole predators) in 162 *soums* (districts) in 17 *aimags* (provinces) for 3 years. In the meantime, new research (from areas outside Mongolia that contain many similarities with the Mongolian case) questions the very basis of rodent control and instead argues that steppe rodents play a positive role in maintaining the pastureland ecosystem.

Sources: Natsagdorj T., and N. Batbayar. 2000. The Impact of Rodenticide Used to Control Rodents on Demoiselle Crane (*Anthropoides virgo*) and Other Animals in Mongolia. Report to International Crane Workshop, Beijing, China, August 8–10, 2002 (unpublished). Available at www.undpmongolia-biodiversity.

Smith, A.T., and J.M. Foggin. 1999. The Plateau Pika (*Ochotona curzoniae*) is a Keystone Species for Biodiversity on the Tibetan Plateau. *Animal Conservation* 2: 235–240.

However, few reliable data exist in Mongolia at present on the radiation potential of the coal used by Ulaanbaatar power plants and households (as well as background levels of radiation).

Policies Toward Disaster Prevention and Protection

In 1999, the Government adopted the National Program for Natural Disaster Reduction and a corresponding action plan, specifying the duties of the ministers of the Ministry of Defense and MNE and aimag governors. The program was considered an integral aspect of the social and economic development policy of the country, to be implemented from 2002. The program called for (i) disaster and analysis and evaluation and vulnerability analysis, (ii) short- and long-term prevention measures, and (iii) collection and dissemination of documentation and information to improve public awareness of natural disasters and how best to deal with them.

The 2003 change from the military organization of disaster management to a full civilian structure was underwritten by UNDP-administered assistance that facilitated also the drafting of the Government's *Policy on Disaster Protection* in 2003 and the *Strategy and Action Plan for Disaster Protection* in 2004. Both of these documents place emphasis on strengthening local government institutions and shifting the traditional focus on search and rescue to a more systematic disaster response and grassroots disaster preparedness training.

Other policy documents are prepared by line ministries. The most important among these is likely to be the *Pastoral Risk Management Policy* prepared by the Ministry of Food and Agriculture. As for MNE, besides its International Decade for Natural Disaster Reduction mandate (Box 8), its responsibility for policy development extends beyond that, to climate change and desertification, both of with interact with natural calamities in complex ways, as pointed out earlier. The key policy documents developed by MNE under UNFCCC and the United Nations CCD (national policies and action plans) therefore need to be read jointly with the recent *Strategy and Action Plan for Disaster Protection.*

No major changes of policy were announced by the new Government. The action plan for 2004–2008 simply calls for the strengthening of the operations of disaster protection agencies and taking measures to prevent disasters and famine and relieve and rehabilitate after these occur. The plan mentions the following actions, which will lead to meeting priorities:

(i) creating the legal environments for disaster preparedness and protection;
(ii) developing disaster research programs;
(iii) educating communities about disaster preparedness and creating a framework for educating disaster management professionals;

(iv) enhancing the disaster information and communication network and establishing a related information center;

(v) maintaining cooperation with international agencies to receive assistance in case of need and improving the national disaster protection capacity;

(vi) focusing on technical preparedness of specially trained civil defense teams;

(vii) developing efficient mechanisms for allocating funds for different stages of disaster management (prevention, mitigation, and rehabilitation); and

(viii) training and equipping special teams for search and rescue.

Besides being too general, the wording suggests that the civil defense to civilian transition in disaster management may be a good deal more difficult than is sometimes assumed.