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MONGOLIA

A Review of Environmental and Social Impacts in the Mining Sector

May 2006

THE WORLD BANK

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This study was prepared by the Environment and Social Development Unit (EASES) of the East Asia and Pacific Region.

Environment and social development issues are an integral part of the development challenge in the East Asia and Pacific (EAP) Region. The World Bank's recently completed Environment and Social Development Strategies for the World Bank in the region have provided the conceptual framework for setting priorities, strengthening the policy and institutional frameworks for sustainable development, and addressing key environmental and social development challenges through projects, programs, policy dialogue, non-lending services, and partnerships. The EASES Discussion Paper series provides a forum for discussion on good practices and policy issues within the development community and with client countries.

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Acronyms

AMD	Acid Mine Drainage
ASM	Artisanal Small-scale Mining
BAT	Best Available Techniques
DGMC	Department of Geological and Mining Cadastre
EIA	Environmental Impact Assessment
EMP	Environmental Monitoring Plan
EPA	Environmental Protection Agency
EPP	Environmental Protection Plan
GDP	Gross Domestic Product
GIC	Geological Information Center
GMIA	Geological and Mining Inspection Agency
MGS	Mining Office, and the Office of Geology/ Mongolian Geological Survey
MIT	Ministry of Industry and Trade
MNE	Ministry of Nature and the Environment
MRPAM	Mineral Resources and Petroleum Authority of Mongolia
SDC	Swiss Agency for Development Cooperation
SME	Small and Medium Enterprise
SPA	Special Protected Area
TMF	Tailing Mine Repositories

Notes:
Unless otherwise notes, all dollars are U.S. dollars

Aimag (= province) is the largest sub-national admi-nistrative unit; below the aimag is the soum (= district), which is divided into bag (= sub-district). In the capital city districts are called duureg and sub-districts khoroo.

Dzud is the collective term for a range of winter weather-related conditions that prevent domestic animals from foraging in open grazing. Dzud is a fact of life for Mongolian herders, who have developed strategies for coping with and adapting to their harsh environment. Heavy accumulations of snow or ice crusts covering pastures are the most common form of dzud (white dzud). In situations where this precipitation is the primary source of drinking water for livestock, the absence of snow or ice at winter pastures is also a type of dzud (black dzud). Since forage production on natural pastures is almost entirely dependent on rainfall during the short summer growing period, dzud conditions are exacerbated by drought in the preceding summer, so that there is less forage available for over-wintering animals. Historically, major dzud have occurred roughly every seven years, but more experienced herders are not surprised when they occur in consecutive years as has happened recently.

Ninja is the nickname given to most small-scale miners engaged in placer gold mining; their use of a green plastic bowl for panning, carried strapped to their back, triggered the nickname "ninja" by analogy with the ninja turtles television series. (Grayson and Murray, 2003).

Ger simply means home in Mongolian. Gers are traditional dwellings, well adapted to the nomadic life of Mongolia's herders, and consist of a wooden framework and a felt cover. The wooden framework includes the walls, long poles, a round smoke escape and its supports. Inside the ger, felt is laid either on a wooden floor or straight on the ground. The number of walls and poles determines the size of the ger. Most herders' gers have five walls, which make a living area of 16-18 sqm^2. Each ger has a hearth, which is of great symbolic and functional importance. In the winter the hearth heats the ger and also serves as a stove for cooking. Gers weigh approximately 224 kg. It takes about half an hour to collapse an average ger and slightly longer to rebuild it (World Bank, 2004).

Executive Summary

Background

The mining sector is a major contributor to the Mongolian economy, accounting for about 17 percent of GDP, 65 percent of industrial value added, and 58 percent of export earnings. The formal mining sector employs over 12,000 people and the informal (artisanal) mining sector involves many times this number. Over the past five years, there has been a rapid rise in mineral exploration, mostly due to the 1997 Minerals Law, the abolition of a 10 percent gold tax, and the widely publicized discovery of the Oyu Tolgoi copper/gold deposit in 2001.

The mining industry's output is largely based on copper and gold. Mongolia has only one copper mine (Erdenet), which earns about half of all foreign exchange and provides almost 25 percent of government revenues. Gold production comes mainly from placer operations (shallow alluvial concentrations of gold).

Artisanal and small-scale mining (ASM) is not a longstanding traditional activity in Mongolia. Yet it escalated from insignificance to being the main livelihood for tens of thousands of people (estimates range between 30,000 and 100,000 participants) during difficult economic times, and became a social safety net for herders who lost their herds in natural disasters (dzuds). Commercial miners and local government authorities have been critical of these operations, stressing their environmental health hazards and the fact that they operate largely outside the existing legal framework for mining. In 2001 and 2002, the government attempted to accommodate ASM by enacting interim regulations for this informal activity. Those regulations proved largely ineffective and were not renewed. The government then decided to create a legal framework for ASM and drafted an Artisanal Mining Law, which failed to gain parliamentary approval, and was abandoned in August 2005. A completely new Artisanal Mining Law is currently being drafted.

Environmental Impacts

The environmental record of the Mongolia mining sector is mixed at best. Many ongoing operations are managed in a sub-optimal way leading to significant environmental damage and production losses. In addition, despite the fact that the sector's financial contribution to the economy is substantial, little has been done to systematically assess and address the costs of possible environmental damage from the sector's ongoing and planned activities. This is mostly due to a paucity of available data and to uncertainty about the long-term impacts of mining activities. The following summary offers a brief review of the key environmental impacts of mining in Mongolia.

Changes in Hydrological Regimes. Changes in hydrological regimes remain a significant problem, particularly for placer gold. On balance, current mining practices are inefficient and use excessive process water, thus overtaxing surface waters and underground

supplies, and also generate excessive effluent, which is difficult to manage and poses a threat of uncontrolled discharges of slurry. In addition, where rivers are illegally dredged and where tailings are discharged into surface waters, turbidity of surface waters is a major concern. The water pumped from mines of all types and discharged into open surface water bodies may also cause flooding, leading to the formation of new, transient wetlands, which generally fall dry once the mine ceases to operate. If adequately managed, these wetlands may serve as water treatment plants dedicated to polishing seepage water from waste rock piles or mine water.

Deterioration of Water Quality. Increasing ASM activities are impacting water quality in several rivers across the country. An increased risk exists of water-related infectious diseases due to unsanitary conditions of thousands of artisanal miners living by the rivers and streams, as well as toxic poisoning from gross pollution of surface and underground water by the uncontrolled burning of dung and rubber tires in order to melt the permafrost.

Waste-Rock Piles and Tailing Repositories. Waste-rock piles and tailing repositories are a significant concern at large- to medium-scale mining operations. In Mongolia, most waste-rock piles from industrial mining are unstable and prone to erosion. Rainfall washes gravel and soil down into valleys, where valuable grazing land can become polluted. In some cases, waste-rock piles and tailings are reworked by private miners under unsafe conditions and risk injury or loss of life. In the case of Erdenet, the huge TMF is an inherent environmental risk. When current plans are completed, the TMF will contain over 1 billion metric tons of tailings material, thus making it one of the largest TMFs existing today. The dyke needs to be monitored for seepage and stability; however, limited human and financial resources could be a serious constraint for the continuation of this activity. In addition, a*cid mine drainage (AMD)* is becoming a growing concern in relation to TMF, particularly in Erdenet. There are ongoing discussions regarding the possibility of limiting the generation of AMD to controllable areas by directing the waste rocks to different dumps as a function of their acid-generating potential. Yet the timeline for these plans to become operational remains unclear.

Mercury Pollution. Mercury pollution is a mounting problem. Mercury was banned from gold mines in the former Soviet Union in 1982 and today is used illegally in only a few placer and hard-rock mines in Mongolia. However, illegal mercury usage is ubiquitous amongst artisanal hard-rock gold miners in Mongolia and has begun to spread to artisanal placer gold miners. The advantages of using mercury can often be eliminated by proper use of low-cost gravitational methods.

Air Pollution. Lower air quality from ASM is posing a growing health threat. Dust generated by placer ASM—by shoveling, scraping, chiseling, bagging, and spillages in a confined space with poor ventilation—causes eye injuries, bronchial complaints, and silicosis. Even more dangerous is the smoke from fires to melt permafrost, particularly black smoke from tires, which contains carbon particles, carbon monoxide, polyaromatic hydrocarbons, benzene, phenol, and cyanide.

Mining Exploration in Protected Areas. Issues related to the possibility of some protected areas being declassified for mining purposes remain unresolved. The Ministry of Nature and Environment has twice considered the declassification of several protected areas, partially on request of MRPAM of the Ministry of Industry and Trade. Yet no regulations or legal procedures currently exist to adequately govern and time the declassification procedure.

The Regulatory and Institutional Framework

In the past decade, the Government of Mongolia has evolved from being predominantly the owner and operator of mines to being a manager and regulator. This transformation required setting in place a legal framework adequate to guarantee an environmentally sustainable growth of the sector. The cornerstones of this framework are the laws on environmental protection and environmental impact assessment. These laws include the application of the polluter-pays principle and the right of access to environmental information. They also address the promotional roles of governmental, nongovernmental, and international entities in raising environmental awareness through environmental education and technical training programs. Yet these

laws contain no provisions for a socioeconomic impact assessment. The 1997 Mineral Law was designed to accommodate the government's limited institutional and financial capacity. While it provides a simple framework that takes into account some of the key environmental and social impacts of mining, it fails to formalize public involvement in the permitting process and lacks provisions to ensure sufficient funding for ongoing and future rehabilitation.

The government is committed to strengthening the stability of the mining institutional setting and improving the overall performance of the sector. It is working on updating policy guidelines outlining mineral development and sector promotional goals for 2000–10. It has established a mandated autonomous lead agency—the Mineral Resources and Petroleum Authority of Mongolia (MRPAM)—to facilitate the implementation of the new mineral law. In spite of these efforts, the overall institutional framework remains weak due to (a) lack of an appropriate structure to ensure the timely enforcement of rules and procedures for local government and land user permissions/contracts, governors' approval of environmental submissions, and notifications and enforcement of sanctions for license violations; (b) poor coordination among the Ministries of Nature and Environment, Finance, the State Professional Supervision Agency, and local administrative bodies; and (c) weak and/or nonexistent compensation schemes for land acquisition due to mining expansion and social programs to benefit communities living near mining areas

Social Issues

Mining companies should be a valuable component of a diversified livelihood economy. Yet, because small industrial cities built to serve the needs of large mining enterprises were set up as new urban centers with no appreciable local rural recruitment, rural people tend to see mining activities as being destructive of nature, and contributing little to the local economy. This perception is reinforced by the fact that the current regulatory and institutional framework does not particularly safeguard communities living near mining development areas. Development programs are undertaken as "add-on" measures by the mining company, with the view to establishing a positive relationship with the local communities. Socioeconomic expenditure by the mining companies remains minimal. As a result, important social topics that are largely unresolved include the complex issues of land use, financial contributions to the local community, and the role of informal mining.

Finally, public awareness of the costs and benefits of different types of mining and processing techniques is low. The public and the media are often unaware or misinformed about the potential environmental impacts of mining—whether it is heavily sophisticated, large-scale mining, or "pick-and-shovel" artisanal mining. In a limited way, the government is working to ensure that stakeholders are informed with respect to both the positive and negative consequences of new mining developments, as well as empowered to be part of the decision-making process.

Priorities for the Short-term

Based on the field observations and a review of background materials, the following short–term priorities should be addressed to improve the existing record of the mining sector environmental and social practices.

- *Support and facilitate the introduction of Best Available Techniques into placer gold mining* to address the considerable environmental impacts and damage to livelihoods of rural people that ensue. For land-based placer gold mining, the following goals of BAT are now achievable in Mongolia: gold recovery mostly by gravitational methods, retorts and closed ovens vented to the outside of dwelling/work areas; rear-casting of all materials; minimum mining footprint; creation of final contours, complete with topsoil cover, the same day as the material was excavated; no double-handling of materials and no "temporary" waste mounds; minimum abstraction of process water from surface or underground sources; recycling of semi-cleaned effluent as process water; and zero discharge of effluent.
- *Enable full public participation in decision-making process pertaining to the development of mining operations*, including allowing access to and discussion of relevant environmental information and documents.

- *Improve employment opportunities for local people in mining*. At the national level, ensure that more employees are Mongolian citizens, especially in long-established mining operations. Of these, a small number should be reserved for residents of the area in which the mining operation is based.
- *Address the fate of mine-dependent communities*. Local governments should be encouraged to diversify into alternate industries in order to prevent social upheaval in the event of mine closure. Where no alternatives can be found, government could become involved jointly with the mining company to forecast and mitigate the socioeconomic effects of eventual mine closure.

Introduction

This report is based mainly on extensive field work undertaken in 2003, as well as follow-up research carried out between July and September 2005. It complements the recently completed study entitled "Mongolia Mining Sector: Managing the Future" (Husband et al, 2004), which did not specifically deal with issues related to the environmental and social impacts of mining.

The main objectives of this work include: *(a) presenting an overview of the current environmental and social practices of the mining sector in Mongolia, including artisanal mining; (b) reviewing the current environmental, social, regulatory, and institutional frameworks of the mining sector, as well as identifying their strengths and weaknesses and suggesting options for improvement; and (c) proposing short-term strategic priorities for a more efficient, environmentally friendly use of mining resources.*

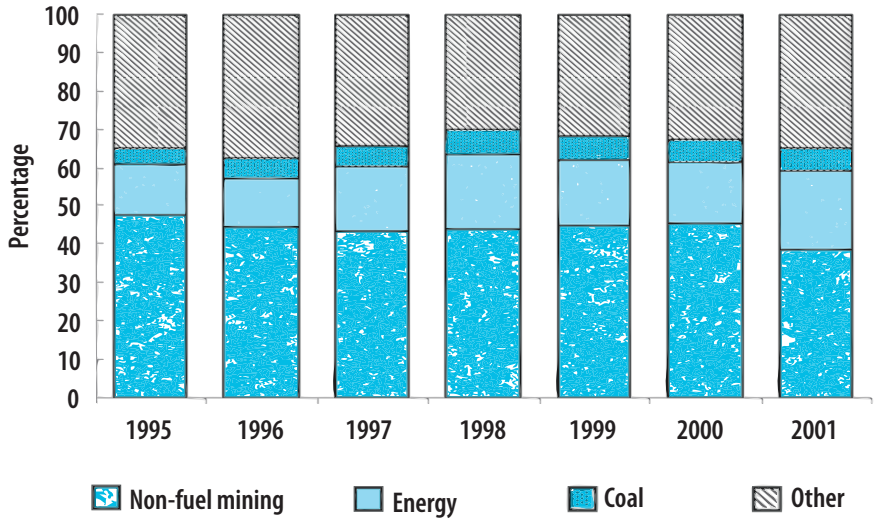
The report is divided into four sections. The first section is a short introduction to the mining sector in Mongolia. The second section provides an overview of key environmental and social issues in the mining sector. The third outlines the key strengths and weaknesses of regulatory and institutional frameworks to address eventual environmental and social issues in mining. The fourth section identifies short-term priorities to improve the existing record of the mining sector's environmental and social practices.

The data and information contained in this report comes from central and local government agencies, international development agencies, local research institutions, and nongovernmental organizations. The findings of this report were informally shared with key counterparts—within and outside the Government of Mongolia—at the national and local level during the two phases of the field work. The results of those informal consultations have also been incorporated into this report.

1. The Mining Sector—A Brief Overview

Mongolia's mining sector is a major contributor to the economy, accounting for about 17 percent of GDP, 65 percent of industrial value added, and 58 percent of export earnings. Major export-related minerals include copper, molybdenum, gold, coal, and fluorspar concentrates. Copper mining alone earns some 25 percent of all foreign exchange, and provides almost one-quarter of government revenues. In addition, Mongolia in 2004 rose to the third largest producer of fluorspar worldwide. The formal mining industry sector employs over 12,000 people, and the informal (artisanal) mining sector involves many times this number. Prior to 1992 and the shift to a market economy, the mining industry was dominated by state-owned, Mongolian-Soviet joint ventures with Russia, Bulgaria, Czechoslovakia, East Germany and Hungary. These ventures focused mostly on coal, fluorspar, gold, tin, copper, and molybdenum. Since 1992, the number of local Mongolian companies—sometimes partnering with Canadian, British, Australian, Russian, and Chinese companies—involved in exploration and mining has increased.

Figure 1. Mining Contribution to Gross Industrial Output



Source: Husband, Charles, and Vera Songwe. 2004. "Mongolia Mining Sector: Managing the Future". Country Economic Memorandum on the Sources of Growth in Mongolia. Washington, DC: World Bank.

The past focus of government-led work was on discovering and categorizing all mineral deposits and occurrences regardless of their type, size, or viability. More recently, private investors, responding to an improved investment climate, have concentrated almost exclusively on six high-value export metals: gold, copper, zinc and uranium, plus fluorspar and coal. Gold production mainly comes from placer operations, but output is stagnating as large readily accessible rich deposits are depleted. Exploration by an estimated 200-plus placer drilling rigs is now compensating for the decline with new discoveries.

There is a wide range of opinions about the number of artisanal and small-scale miners in Mongolia, stemming from the large size of the country, the lack of a full survey, the practical difficulties of counting ASM at any given site, and the substantial seasonal fluctuations in numbers and geographical distribution. According to government estimates, there are about 30,000 informal gold miners, but an independent survey suggests there are at least 100,000. Regarding coal, the general consensus is that about 1,100 artisanal and small-scale operations are active in coal mining in the winter, virtually all in Nalaikh. For fluorspar, there

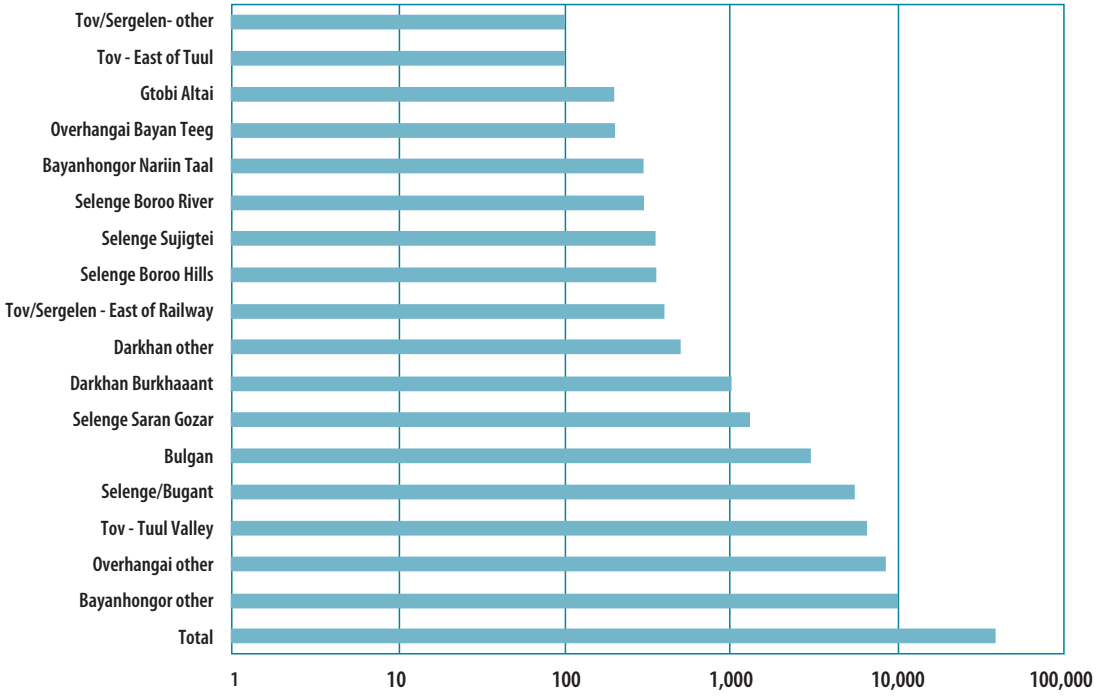
Figure 2. Major Operating Mines and Mineral Deposits in Mongolia

Source: Rheinbraun Engineering und Wasser GMBH. 2003. "Review of the Environmental and Social Policies and Practices for Mining in Mongolia." Rheinbraun Engineering Background Papers. Cologne.

Unlike many other developing countries, ASM is not part of traditional subsistence economy in Mongolia. The initiation of ASM and its dramatic growth over the past decade, particularly in terms of organizational structure, is a manifestation of poverty-driven self-help efforts to counter some of the more pernicious effects of the transition to a market economy, including job loss, declining real incomes, decline in rural services, and lack of a social safety net particularly in the face of natural disasters (dzuds).

is consensus that several thousand ASM operations have become active in fluorspar mining and processing in the last four years. In addition, there are perhaps no more than about 1,000 informal miners engaged in mining of materials serving local needs, such as salt, clay, and sand. Possibly another 500 informal miners are engaged in illegal mining and export of fossils, semi-precious stones, meteorites, and mineral specimens.

Figure 3. Estimated Informal Gold Miners in principal Aimags



Source: Husband, Charles, and Vera Songwe. 2004. "Mongolia Mining Sector: Managing the Future". Country Economic Memorandum on the Sources of Growth in Mongolia. Washington, DC: World Bank.

2. Environmental and Social Impacts

Environmental Impacts

To date, the environmental record of the Mongolia mining sector is mixed at best. Many of the ongoing operations, including large-scale mining, and especially in domestically owned mines, are managed in a sub-optimal way, leading to production losses and significant environmental damage. In addition, despite the fact that the sector's financial contribution to the economy is substantial, very minimal effort has been made to assess and address the costs of possible environmental damage deriving from the sector's activities (Rheinbraun Engineering und Wasser GMBH, 2003). This is mostly due to limited data, uncertainty about the long-term impacts of mining activities, and general lack of awareness of the fact that many of these negative impacts could be rectified for minimal cost and/or through better production methods. The following discussion provide an overview of key environmental issues in some of the key mining areas in Mongolia.

The Erdenet Copper Deposit

The Erdenetyn-Ovoo copper ore deposit is located close to the town of Erdenet in the Bulgan province, approximately 250 kilometers northwest of Ulaanbaatar. The deposit was discovered and explored between 1960 and 1972. In 1973, the Government of Mongolia—together with the former Soviet Union—set up the Erdenet Mining Corporation.

Waste Rock and Tailings Repositories. Truck and shovel open-pit mining are the most common mining methods at Erdenet. Production capacity is 24 million tons of ore per year. Each year, 10 to 12 million tons of subgrade ore are added to the existing stockpile. The waste from ore processing is pumped to a TMF, which is located approximately 4 km away from the plant. The TMF is basically a 5 km-long dyke of standard design, of which 3 km are covered with water and 2 km are exposed tailing beaches. It contains 400 million tons of mine tailings, as well as 15 million m^3 of supernatant water. To make room for more tailings, the dyke is periodically increased in lifts of 6 to 10 meters; current plans call for the dyke to reach its final height in 2010, by which time two more lifts will have been placed. There is a critical need to strengthen the routine maintenance and monitoring of the dyke's stability according to international standards to avoid and/or manage any seepage contamination problems resulting from the tailings turning acidic, as the ore contains copper-sulfide minerals and pyrite, which cannot entirely be removed in the beneficiation process. To date, only some $30,000 is being spent to put topsoil on the tailings. Since a possible date for the decommissioning of the operation is still to be set, there is no plan for environmental remediation after the mining operations cease, nor have funds been set aside from operating income for this purpose.

Blowing tailing dust is also one of the most serious environmental issues. With an open area of approximately 500 hectares of dry tailing beaches and a very fine-grained tailing material (80 percent < 0.74 µm), the wind has no trouble picking up dust. There is not much that can be done to mitigate the problem;

Figure 4. Waste Rock Piles, Tailing Discharges, and Dry Tailing Beaches in Erdenet

Source: Rheinbraun Engineering und Wasser GMBH. 2003. "Review of the Environmental and Social Policies and Practices for Mining in Mongolia." Rheinbraun Engineering Background Papers. Cologne.

stabilizing the surface with surfactants would probably help, but it is considered too costly since it has to be done on a regular basis due to new waste material continuously being pumped into the TMF.

Changes in Hydrological Regimes. In spite of the fact that 95 percent of process water used in the beneficiation plant is being recycled from the TMF, freshwater consumption and waste from mining operations represent a concern, particularly considering the semi-arid climate of the region. Some 800 m^3/h of freshwater are needed in the process for concentrate washing. This water is pumped from the Selenge River, 64 km north of Erdenet, which is also the major source of drinking water for the town of Erdenet.

The Zaamar Gold Mining District

The Zaamar gold mining district is located some 180 km northwest of Ulaanbaatar in the Tov aimag, along the banks of the Tuul River. Gold is present as primary ore and placer. The mining of primary ore started in 1998 at the Bumbat mine; following joint-venture problems, the operation ceased and the equipment was abandoned. Recently, the mill has been redesigned and refurbished by Mongolyn Alt Corporation with the assistance of a Chinese company (Dallas, 1999).

Changes in Hydrological Regimes. Most of the smaller industrial mines are open-cast operations using free digging shovels or hydraulic excavators and haul trucks that dump the ore near the wash plants. Oversize material remains on the screen and is blasted out via a tailgate by high pressure water from the water cannon. To provide process water for the placer wash plants, water is pumped from the Tuul River. No chemicals are added, gravitation methods being sufficient to recover the gold. The resulting effluent is directed to tailings ponds to settle out the coarsest material down to fine sand, and the still-turbid water is then recycled back to the wash plant or illegally discharged to the Tuul River. Water cannons consume large amounts of water, and the pumps are often left running even when the wash plant is idle. The settling ponds are unusually large and accordingly vulnerable to uncontrolled discharge by overtopping of the earth dam or its collapse. At least two mines discharge all effluent directly onto the floodplain, with frequent discharge of dirty water into the Tuul River. Overall, water use is very inefficient and is taxing surface water supplies and generating excessive volume of effluent that is more and more difficult to manage.

Waste Rock and Tailing Repositories. The long-term stability of the tailings dams in the Zaamar area is a concern, since the settled deposits are fine grained, particularly in the second and third settling ponds. As a result, the material does not drain quickly but remains behind as slimes with low shear strength; this poses a dangerous area for people and animals.

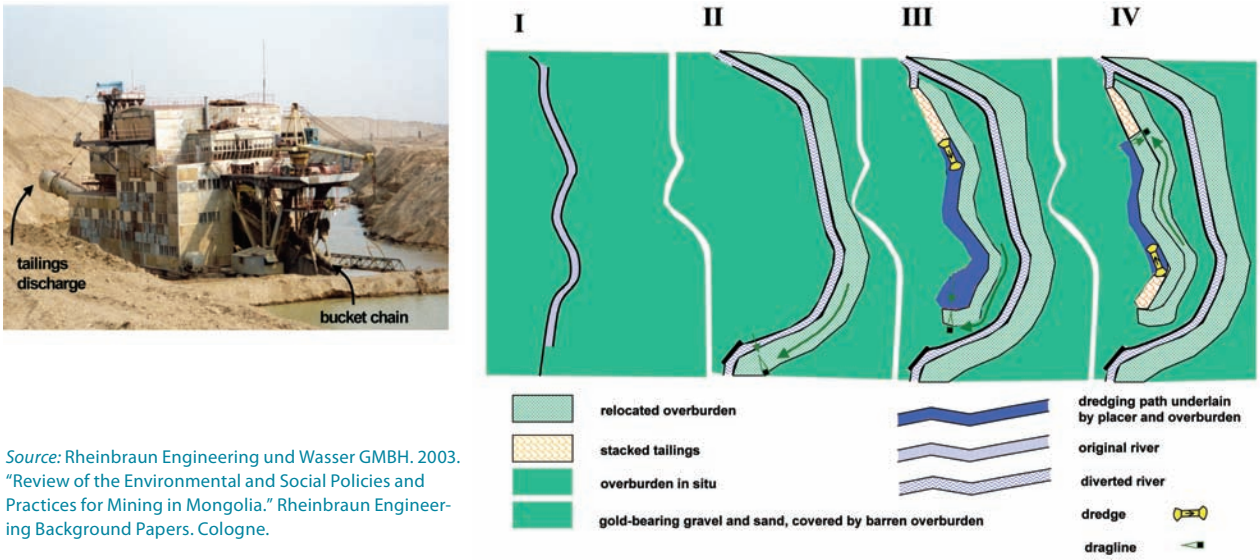
Waste-rock piles from open pits and reject piles from the dredges left behind with their initial natural angle of repose may become unstable in the rainy season and thus pose a risk to people and grazing animals if not properly secured. Unlike north Mongolia, the Zaamar goldfield is too arid for forest cover, and the steppe is characterized by thin soils prone to wind erosion. The steep-sided waste mounds and the extensive bare areas are aggravating this problem and contributing to desertification.

Until 2003, there was scant evidence of even rudimentary reclamation of derelict abandoned mine sites at Zaamar. Following considerable local and national pressure—and enforcement of environmental regulations by the Professional Inspectorate, MRPAM, and MNE—rehabilitation is now much in evidence. The pressure includes a series of joint regulations by the MNE and the Ministry of Agriculture, and a set of mandatory Mongolian National Standards (MNS) that have full legal force, unlike western voluntary ISO, DIN, and BS codes (Nelle and Hoffman, 2001). The Mongolian regulations and standards include the stripping, storage, and reuse of topsoil; maximum permissible angles of final slopes; and a procedure for revegetation and aftercare.

As yet, remedial work is basic and crude, relying on earthmoving machinery to lower waste mounds, and push down pit faces, and reduce the steepness of slopes. In 2004, the Mongolian enterprise Monpolymet Ltd became the first Zaamar placer company to replace topsoil and attempt proper revegetation, albeit importing the soil, as the original topsoil had been lost by failure to strip and store it. In 2005, both Shijir Alt Ltd and Altan Dornod Mongol Ltd embarked on basic recontouring of two of the worst derelict mining sites in the Zaamar goldfield, namely the south dredge area and the ruined Hailaast Valley.

Changes in Hydrological Regimes. Along a 50-km stretch of floodplain of the Tuul River, large-scale placer mining is done by dredging, which seem to be a major source of sediment contaminating the river. Silt, sand, and gravel are released, particularly when river water is diverted into the artificial new water course. This release is temporary, because mining is proceeding subsequently into zones that are removed from the new river channel. All of the larger commercial operations have constructed tailings ponds in order to allow the recycling of water for ore processing. This reduces the overall discharge of sediment-laden water into the Tuul River; however, there is little evidence of plans for stabilizing and reclaiming the tailings and settling ponds, although in this semi-arid climate they tend to dry out to firm ground if shallow. The quality of surface water downstream from the open-pit mines that do not maintain tailings ponds is affected by turbidity caused by uncontrolled discharge of dirty effluent.

Figure 5. Schematic Plan and View of Dredging Sequence at Zaamar



Source: Rheinbraun Engineering und Wasser GMBH. 2003. "Review of the Environmental and Social Policies and Practices for Mining in Mongolia." Rheinbraun Engineering Background Papers. Cologne.

Gold Mining in the Turgen River Basin

In the Turgen River area of northeast Mongolia, mining started in 1993. The activities are targeting colluvial and alluvial gold placers along small tributaries of the Turgen River. Total production is estimated to be around 300 kg per year.

Changes in Hydrological Regimes. Water for washing the ore is either pumped from wells, dammed off streams, or taken from the open pits. The water is discharged with the tailings into ponds, where most of it evaporates. As more water is removed than discharged back into the stream and groundwater system, the water table in the side valleys has declined and streams have dried up.

Waste Rock and Tailing Repositories. Stripped zones and corresponding dumps of topsoil, waste rock, and tailings were left behind without any mitigation after mining was terminated. Presently, there are three abandoned sites awaiting rehabilitation; to date, however, there are no plans to rehabilitate these areas. As a result, the long-term stability of the tailings dams in the Turgen River area remains a concern, since the settled deposits are fine grained, particularly in the second and third settling ponds. As a result, the material does not drain quickly but remains behind as slimes with low shear strength; this poses a dangerous area for people and animals. Waste-rock piles from open pits and reject piles from the dredges left behind with their initial natural angle of repose may become unstable in the rainy season and thus pose a risk to people and grazing animals if not properly secured.

The Shariin Gol Coal Deposit

The Shariin Gol coal deposit is located 240 kilometers north of Ulaanbaatar and 75 km southeast of Darkhan. It is an open-pit mine, which began operations on an industrial scale in 1965. The mine occupies an area of 580 hectares, comprises one open pit and one large and several smaller waste-rock piles, and has a current production of about 0.8 million t/a. The coal is crushed at the plant and shipped via railway to Erdenet and Ulaanbaatar.

Waste Rock and Tailing Repositories. Waste rock is produced at a rate of 4.5 million m^3 per year. It is dumped in the immediate vicinity of the open pit. The waste-rock piles contain 210 million m^3 of overburden. Reclamation has not started yet. The mine plans include flattening the waste-rock piles. Revegetation is not planned. At the current production rate, the estimated remaining lifetime of the mine is 20 years. The mine employs 1,000 workers and supports a small town in the immediate vicinity. In October 2003, the Russian company KRASO purchased 80 percent of the state-owned shares in the Shariin Gol Joint Stock Company and plans to implement measures aimed at reducing the environmental impacts of this mining operation. Rehabilitation of the waste rock has been under discussion for two years; however, no action has been taken yet. According to the mining inspector of the Darkhan Aimag, the Shariin Gol mine is run without a proper environmental monitoring program, despite pertinent legislation that has been in place since 2002.

AMD from waste-rock piles may pose a long-term risk at Shariin Gol. An overall decommissioning plan—showing the final topography after waste-rock pile reclamation and restoration of the hydrological regime—has yet to be established. Apparently the Shariin Gol operating license does not contain discharge and effluent limits. Up to 2000, the mine has advanced without the need for consultation with local authorities. Only since 2000, after the introduction of new regulations, has the mine been obliged to coordinate its activities with the aimag and soum authorities.

The Bor Undur Fluorspar Deposit

The Bor Undur fluorspar mine is located in Khentii aimag, approximately 380 km southeast of Ulaanbaatar. Access is by steppe trails and a spur rail line that connects to the Trans-Mongolian railway about 40 km south of the complex. The area contains a large number of fluorspar deposits and occurrences, with five ore bodies presently mined. In addition, the Bor Undur mill processes ore from the Urgen mine, which is located about 450 km southeast of Ulaanbaatar, near the Trans-Mongolian railway in Sainshand aimag.

Waste Rock and Tailing Repositories. The tailings slurry is pumped through an insulated pipeline over to a settling pond, which sits in a shallow valley, closed off by a dam with a length of 1.8 km made of rocks and clay-rich soil. Most of the mill tailings have been discharged from various spigots that are located along

the crown of the dam. Supernatant has accumulated over an area of around 0.46 km^2, which is a small portion of the total tailings area. The present method of tailings discharge results in an area of well-drained and consolidated tailings near the spigots in a zone of slimes around the overflow collector, which is likely to remain unconsolidated for some time after the processing plant ceases to operate, thus posing hazards to the public in the absence of a mine closing plan and measures to promote drainage and consolidation.

The Baganuur Coal Deposit

The state-owned Baganuur coal mine is located approximately 110 km east of Ulaanbaatar in Tov aimag. It covers an area of 1,700 hectares, with an additional annual disturbance of 25 to 30 ha, and supplies 80 percent of the coal used by Ulaanbaatar's power plants. Until the start-up of the Nariin Sukhait mine, it represented 60 percent of Mongolia's coal production. Processing of coal consists of crushing only; no washing is involved.

Changes in Hydrological Regime. Groundwater is removed at a rate of approximately 3.5 million m^3 per year through wells located along the pits in order to lower the groundwater table to a level of about 20 meters below the bottom of the pits. These extend presently to an average depth of 70 meters below surface. A portion of the water is used for industrial purposes at the mine. To date, no hydrogeological modeling has been undertaken to address these issues. In addition, to facilitate access to the mining area, the Khutsaa River (which was draining through a series of surface water bodies into Kherlen River) was diverted over a distance of 12 kilometers. The diversion of the Khutsaa River has become redundant, however, as the river has dried out, possibly also due to the drought condition in recent years. Water monitoring started in 1995, and covers 29 chemical and physical parameters that are measured in quarterly intervals at 11 sites. Initially, it encompassed 13 sample sites, two of which were lost due to drought conditions in recent years.

Waste Rock and Tailing Repositories. From 1978 to 2001, approximately 162 million m^3 of waste rock were removed from the pits. Some 103 million m^3 were used as backfill in mined-out areas, and 59 million m^3 were deposited outside the pits. As a result of the 1995 EIA's recommendations, in 2000 the mine started the rehabilitation of waste-rock piles. The rehabilitation of waste-rock piles entails the flattening of the slopes from the steep natural angle of repose to approximately 1:2 (25°) and revegetation by seeding grass. Presently, close to 61 hectares of waste-rock area have been contoured and 46 hectares have been seeded. In addition, in 2002, a 15-year plan for reclamation, which also include revegetation was developed. The proposed project, however, does not include plans for the final reclamation and post-decommissioning monitoring of the mining site. In 2005, the government included Baganuur in its privatization program for 2006-8 for discussion by Parliament.

Figure 6. Unreclaimed Land in Tolgoit

Source: Rheinbraun Engineering und Wasser GMBH. 2003. "Review of the Environmental and Social Policies and Practices for Mining in Mongolia." Rheinbraun Engineering Background Papers. Cologne.

The Aduun Chuluun Coal Deposit

The Aduun Chuluun coal mine is located 6.5 km north of the town of Choibalsan in Dornod aimag. Originally conceived as an underground operation, it was converted into

an open-pit mining operation occupying approximately 40 ha in 1969.

Waste Rock and Tailing Repositories. Surface disturbance appears to be one of the most significant issues. Waste rock is partially filled back into the pit or stored in piles. Some of the dumps reach 30 meters in height and rise above the natural topography. Locally, the waste-rock piles show signs of erosion; however, stabilization of the material takes place by natural plant succession on the slopes of the older piles.

Figure 8. Abandoned Mining Equipment at Mardai

Source: Rheinbraun Engineering und Wasser GMBH. 2003. "Review of the Environmental and Social Policies and Practices for Mining in Mongolia." Rheinbraun Engineering Background Papers. Cologne

The original environmental assessment addresses these issues in a 2002 mine reclamation project document. The company has started to rehabilitate one of the waste-rock piles by spreading topsoil and planting trees that appear to be alien for the region. It is unclear whether or not the revegetation is successful without regular watering and constant protection. In the meantime, the underground excavation has collapsed; the ground above has subsided and is presently stable. The pit is expanded each year, triggering a new environmental assessment. Although the law requires a deposit of 50 percent of the annual reclamation cost, no such payments are made. The company believes its revegetation efforts are sufficient.

Changes in Hydrological Regimes. Groundwater is removed at a rate of approximately 3.5 million m^3 per year through wells located along the pits in order to lower the groundwater table to a level of about 20 meters below the bottom of the pits. These extend presently to an average depth of 70 meters below surface. With mining progressing toward the west, the depth of the pits will increase.

Figure 7. Tree Planting for Land Reclamation at Aduun Chulun

Source: Rheinbraun Engineering und Wasser GMBH. 2003. "Review of the Environmental and Social Policies and Practices for Mining in Mongolia." Rheinbraun Engineering Background Papers. Cologne.

Artisanal and Small-scale (ASM) Gold Mining

Informal ASM gold mining can and often does degrade or destroy placer reserves, notably by removing pay gravel before and during formal placer mining. This renders full-scale mining more complicated, more risky, and less profitable (and sometimes unprofitable). The environmental impacts of ASM are also significant and represent a growing concern in Mongolia (Grayson and Murray, 2003).

Air Pollution. Lower air quality from ASM is posing a growing health threat. Dust generated by placer ASM—from shoveling, scraping chiseling, bagging, and spillages in a confined space with poor ventilation—causes eye injury, bronchial complaints, and silicosis. Even more dangerous is the smoke from fires to melt permafrost, particularly black smoke from tires. The sheer volume of smoke is known to be exerting a strong negative impact on the health of the miners, livestock,

and sensitive vegetation. Finally, anecdotal evidence indicates that low air quality in ASM ger settlements aggravates respiratory conditions of ASM miners. The main fuel of the ger stoves is wood, but some ninjas burn low-grade brown coal (if available) and others burn dried animal dung (Grayson and Murray, 2003). A faint pall of grayish smoke is a feature of ASM ger settlements, particularly in the winter. Carbon monoxide levels are believed to be significant, but no systematic testing has been undertaken.

Water Pollution. ASM is considered the main cause of substantial deterioration in water quality in several rivers across the country. An increased risk exists of (a) water-related infectious diseases due to unsanitary conditions at thousands of placer ASM miners living by rivers and streams, and (b) toxic poisoning from gross pollution of surface and underground water by the uncontrolled burning of wood, dung, and rubber tires in order to melt the permafrost. For example, the Ongiin River supplies drinking water for more than 50,000 people and 740,000 livestock. It drains south for 435 kilometers and terminates in Ulaan Nuur (Red Lake) in Omnogovi Aimag, and has been dry in places since 1999. This has caused an ecological crash, including extinction of many plant species, natural resource depletion, rangeland degradation, and increased desertification. Impacts in the Ongiin Valley are severe, and led to the emergence of a local NGO, the Ongiin River Movement, which is petitioning for placer mining to be curbed to limit water abstraction and compel rehabilitation of mined land. Thousands of placer **ninjas** are aggravating the situation by using fire to melt the permafrost. Local loss of permafrost prevents the spring thaw getting to the main river, the water now pouring through gaps in the once continuous permafrost seal.

Mercury Pollution. Pollution from mercury is a substantial problem, particularly in the Boroo River due to informal mercury panning; the overall resulting health impacts are believed to be serious; however, to date no systematic testing has been done, and no specific measures have been put in place to address this problem. Not only is mercury polluting rivers, but it is also found in high quantity in the soil. A 2002 study by JICA documented high mercury levels in contaminated soils at the site of the disused Boroo gold recovery factory. Mercury-contaminated soil is used for grazing by sheep, goats, horses, and cattle, and for production of cereals and vegetables. Soil mercury pollution represents a new and urgent risk to human health, yet little has been done to adequately deal with it.

The Mining–Protected Areas Nexus

Mining typically uses land more extensively than other industries. Conflicts of interest are become more and more frequent in areas that are protected under the regulations of the Mongolian Law on Special Protected Areas.

The Mongolian government has a long-term objective of giving statutory protection to 30 percent of the country by designating them as protected areas. A challenge to this occurred in mid-2002 when MIT, via MRPAM, proposed removing protected status from 1.9 million ha in 18 protected areas, almost 10 percent of Mongolia's protected-area system. In response and under pressure, MNE proposed dropping protection status from a somewhat smaller area, 434,000 ha in 10 protected areas. The rationale of the MIT proposal and the MNE's partial acquiescence was aiming at stimulating investments in exploration and mining. Both proposals were rejected by Parliament in late 2002.

A further challenge to selected protected areas arose in late 2003, when the government proposed to Parliament to remove protected status from an even greater area—some 3.1 million ha, about 15 percent of the protected-area system—in four protected areas: the Small Gobi, Great Gobi Special Protected Area, Mongol Daguur Special Protected Area, and Onon Balj National Park. The rationale behind this proposal is that illegal mining activities have become widespread in these areas; therefore, removing protection to allow formal mineral exploration and mining to take place would restore legal control and regulation of these activities. This proposal was rejected in January 2004 by the Standing Committees on Economic Protection and Environment and Rural Development.

Since January 2004, no further effort has been made to change the status of any protected areas, and for the moment the government's effort is devoted to introducing an effective ASM law and making amendments to the Minerals Law to strengthen environmental protection. In 2005, some practical recommendations

were made to GoM that could help Mongolia balance the existing system of protected areas and the needs of mineral exploration. These recommendations included:

- Prohibition of, according to the Mineral Law, of issuing new mineral licenses in protected areas and areas proposed for protection, and increased patrols to prevent unlicensed mineral activities in these areas.
- Holding mineral exploration and extraction activities legally operating within protected areas or their buffer zones to higher environmental standards than mines operating outside protected areas. Costs of intensive monitoring and inspection of these sites should be paid for by the licensed mining entity involved.
- Preserving the protected status to all expired mineral licenses within existing and proposed protected areas.
- Promoting land trades for mineral licenses on unprotected lands in combination with special dispensations, such as tax breaks, as the ideal way of eliminating mineral licenses within existing and proposed protected areas.

The potential for discovering new mineral deposits inside protected areas could be significant. A way to measure the probability that a particular mineral deposit or occurrence exists in or near protected land is the intensity of exploration activity, which can be assessed by the density of exploration activities; the development pressures these areas varies, and potential environmental stress is assessed as low to medium. What follows are illustrations of typical exploration scenarios in the Small Gobi Strictly Protected Area, the Onon-Balj Sav National Conservation Park, and the Khan Khentii Special Protected Area, plus the adjoining Gorkhi-Terelj National Conservation Park and a smaller SPA, nature reserve, and national conservation park located south, southeast, and southwest of Ulaanbaatar.

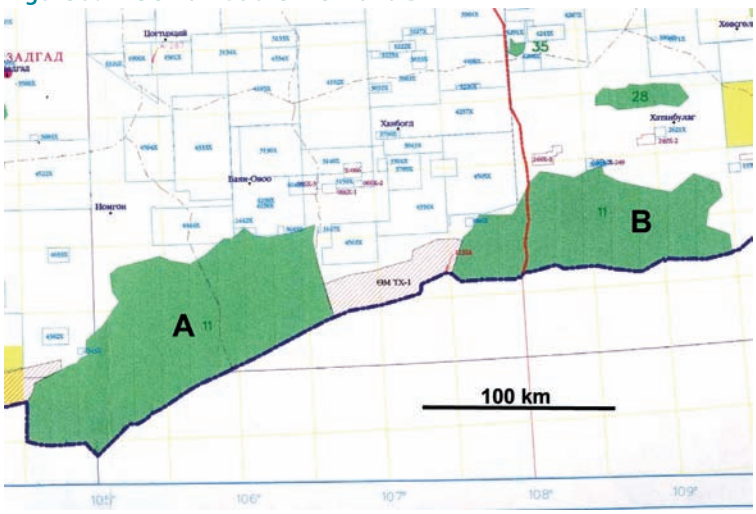
The Small Gobi Strictly Protected Area (SPA)

The Small Gobi SPA was established in 1993 and occupies more than 1.8 million hectares of land in two discrete areas (A and B) in the South Gobi aimag and Dornogobi aimag. The SPA is the main habitat for the Khulan wild ass, black-tailed gazelle, the argali mountain sheep, and ibex. Figure 39 illustrates exploration licenses in blue and mining licenses in red as of September 1, 2002. The exploration licenses are encroaching on both areas A and B, with large gaps in between. The pressure on the SPA appears to be light. However, the development at Oyu Tolgoi may add to the stress. As of June 2003, the concession map of the Mineral Resources and Petroleum Authority of Mongolia (MRPAM) showed an increase in activity along the northwest edge of area A, and the need for greater monitoring and enforcement of the licensing regulations.

The Onon-Balji Sav National Conservation Park

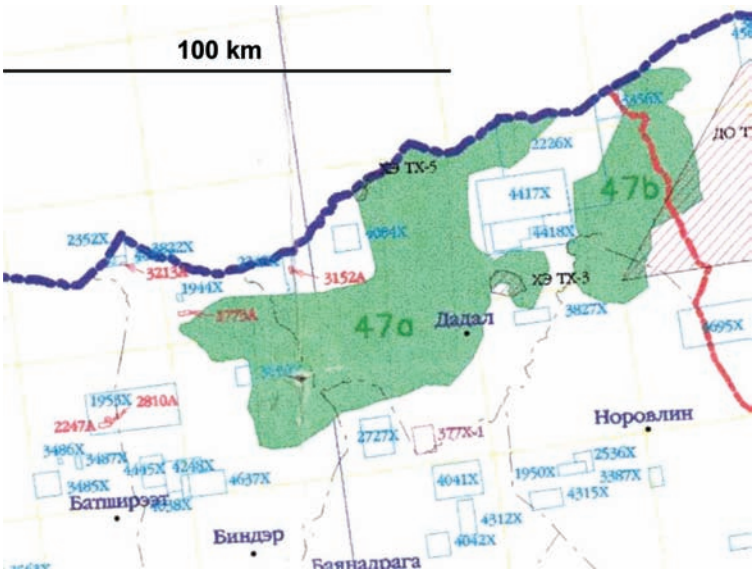
The Onon-Balji Sav National Conservation Park consists of a larger western area (A) in Khentii aimag and a smaller eastern part straddling the Khentii-Dornod aimag boundary. The park covers more than 400,000 hectares. It encompasses Siberian forest taiga and arid steppe environment. Exploration and mining licenses are scattered throughout the area. As the park is located in an auriferous northeast trending structural zone extending to the Baley gold deposit in the Russian Federation, exploration may focus on the area in the future. The June 2003 concession map of the MRPAM shows an increase in activity between area A and the border to the Russian Federation.

Figure 9. The Small Gobi SPAs A and B



Source: Rheinbraun Engineering und Wasser GMBH. 2003. "Review of the Environmental and Social Policies and Practices for Mining in Mongolia." Rheinbraun Engineering Background Papers. Cologne.

Figure 10. Onon Baljin Sav National Conservation



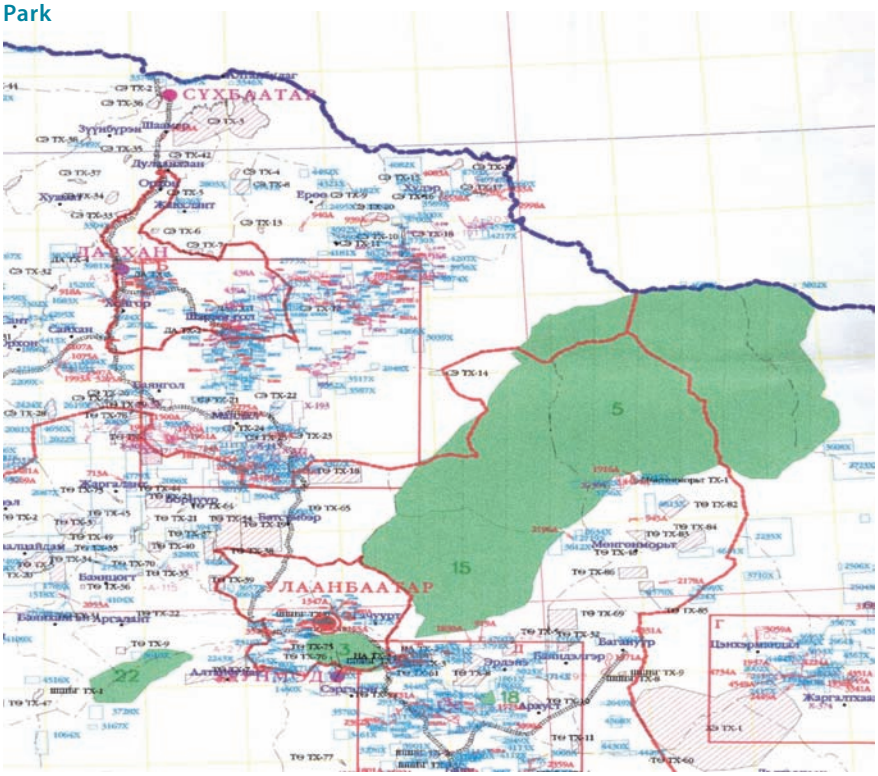
Source: Rheinbraun Engineering und Wasser GMBH. 2003. "Review of the Environmental and Social Policies and Practices for Mining in Mongolia." Rheinbraun Engineering Background Papers. Cologne.

The Khan Khentii Strictly Protected Area (SPA)

The Khan Khentii SPA, with the adjoining Gorkhi-Terelj National Conservation Park, stretches from just northeast of Ulaanbaatar to the Russian border. The SPA was placed under special protection in 1992 and gained the status of a strictly protected area in 1995. The national park was also established in 1995. The area is located in Tov and Selenge aimags. The SPA and the national park cover more than 1.2 million hectares and almost 300,000 hectares respectively.

The SPA and the national park encompass the Khan Kentii Mountains, which extend from arid steppe in the south to coniferous forest taiga in the north. It is the headwater region of the Tuul River, which flows to Lake Baikal and on into the Arctic Ocean, and of the Onon and Kherlen Rivers, which drain via the Amur into the Pacific Ocean. There is little pressure from exploration and mining activities. Concessions are located only along portions of the SPA's eastern boundary. Intensive exploration and mining is centered on the Zaamar region, which is 50 to 60 kilometers west of the protected areas. The Gorkhi-Terelj National Conservation Park is one of the most visited protected areas in the country. Another SPA is located south of the capital city. In 1995, it was declared a strictly protected area under the name of Bogd Uul. It encompasses about 41,000 hectares of land around Bogdkhaan Mountain, a landmark of historical and cultural heritage. Mining concessions are located mostly along its northwestern and southeastern borders. We expect the city population to exert more stress on the protected land, since the small-scale mining is in its vicinity.

Figure 11. The Khan Khentii SPA and the Gorhki-Terelj National Conservation Park



Source: Rheinbraun Engineering und Wasser GMBH. 2003. "Review of the Environmental and Social Policies and Practices for Mining in Mongolia." Rheinbraun Engineering Background Papers. Cologne.

On the basis of the number, density, and distance of mining concessions near protected areas, we have classified the stress derived from mining activity in three categories: "weak," "medium," and "strong." Table 1 lists the protected areas and the estimated potential stress from mining.

Table 1. Protected Areas and Potential Stress through Mining

Type	Name	Aimag(s)	Size (km^2)	Potential stress from mining activities
Strictly protected area	Great Gobi	Gobi Altai/Bayankhongor	53,117	low
	Khukh Serkhin	Bayan Olgii/Khovo	659	low
	Bogd Uul	Tov	417	low*
	Khasagt Kharkhain	Gobi Altai	275	medium
	Khan Khentii	Tov/Khentii	12,271	low
	Nomrog	Dornod	3,112	low
	Eastern Mongolia	Dornod/Sukhbataar	5,704	low
	Mongol Daguur	Dornod	1,030	low
	Otgontenger	Zavkhan	955	low
	Uvs Lake Basin	Uvs	7,125	low
	Small Gobi	Omnogovi/Dornogovi	18,392	medium
	Khoridol Saridag	Khovsgol	1,886	low
National conservation park	Khovsgol Lake	Khovsgol	8,381	low
	Khorgo-Tekhyn Tsagaan	Arkhangai	773	low
	Gobi Gurvansaikhan	Omnogovi	26,947	medium
	Gorkhi Terelj	Tov	2,932	low*
	Altai Tavan Bogd	Bayan-Olgii	6,362	medium
	Khangai Nuruu	Arkhangai/Ovorkhangai/Bayankhongor	8,885	high
	Khar Us Nuur	Khovd	8,503	low
	Noyon Khangai	Arkhangai	591	medium
	Hustain Nuruu	Tov	506	low
	Khan Khokhi Khyargas	Uvs	5,534	low
	Sylkhemyn Mountain	Bayan Olgy	1,401	medium
	Tsambagarav Mountain	Khovd/Bayan-Olgy	1,110	low
	Tarvagatain Mountain	Arkhangai/Zavkhan	5,254	low
	Onon-Balj	Khentii/Dornod	4,158	medium

* stress from recreational activities high

Type	Name	Aimag(s)	Size (km^2)	Potential stress from mining activities
Nature reserve	Nagalkhaan Mountain	Tov	31	Medium
	Batkhaan	Ondorkhaan/Tov	2,185	Low
	Lkhachinvandad	Sukhbataar	588	Low
	Bulgan River	Khovd	77	Low
	Ugtam	Dornod	462	Medium
	Sharga Mankhan	Khovd/Gobi-Altai	3,901	Medium
	Zagyn Us	Dundgobi/Dornogobi/South Gobi	2,736	High
	Alag Khairkhan	Gobi Altai	364	Low
	Burkhan Buudai	Gobi Altai	521	Medium
	Ergelyn Zoo	Dornogobi	609	Low
	Ikh Nart	Dornogobi	437	Medium
	Kgogno Khaan	Bulgan	470	Low
	Toson Khulstai	Khentii/Dornod	4,699	Low
	Khar Yamaat	Khentii/Sukhbaatar	506	low
	Yakhi Lake	Dornod	2,514	medium
	Develyn Aral	Bayan Olgii	103	low

Source: Rheinbraun Engineering and Wasser GMBH. Cologne 2003.

Social Impacts

Formal Mining

Mining companies could be a valuable component of a diversified rural livelihood economy. This is arguably true of the small industrial cities built to serve the needs of large mining enterprises—notably Nalaikh, Shariin Gol, and Baganuur for coal; Bor Undor for fluorspar, and Erdenet for copper/molybdenum. These cities were set up as new urban centers with no appreciable local rural recruitment. Today this trend has become severe, with virtually no rural employment

in soums in which 200 placer gold mines are operated by 128 companies. Instead, these companies strongly prefer to recruit in the capital city and sometimes in Darkhan and Erdenet, or even in China and Russia if the companies are Chinese or Russian-owned, but almost never recruit in rural soums. When asked, company managers claim it makes management much easier, as it stifles emergence of local networks around the mines, and ensures simpler discipline and better work ethics. Rural people see the placer mines as being destructive of nature, grazing, and winter shelters and contributing little to the local economy.

Nearly all of the placer companies have their headquarters in Ulaanbaatar, plus a few in other cities. While the soums get scant revenue, merely land use tax and water use fees, Ulaanbaatar gains the gold (Mongol Bank), royalties (government), jobs, stronger banks (seasonal loans), mine engineering support, and so forth. Eco-Minex estimates that for tax efficiency the 128 placer mining companies have over 1,000 wholly owned subsidiary companies in Ulaanbaatar spanning all sectors. For instance, Erel Ltd left dereliction behind in Zaamar but in Ulaanbaatar created a business empire, including education, banking, insurance, construction, engineering, and brick production.

Contrary to initial expectations, placer mining companies do little to support the rural economy and instead encourage a drift to the cities of people and wealth. The same negative phenomenon is now being seen with small hard-rock gold mines and most brickworks, and some of the new coal mines. Even when rural monocities are created to meet the needs of the development and operation of large mines, there are special economic risks. The mines may support nearby towns and render them largely dependent on the economic performance of the mines. Secondary service and supply industries have formed towns like Baganuur and Bor Undur, which generate jobs that also depend to a large extent on the mines. The community may gain in the development of new professional and technical skills brought along by mining, and an improved infrastructure may facilitate the generation of new industries. Unless the town can diversify into a broadly based economy, however, it remains vulnerable to the rollercoaster of commodity prices and sharp economic decline, with the ultimate closure of the mine as the former main employer and sole engine of economic prosperity. As yet, only Nalaikh (coal), Mardai (uranium), and Bugant (gold) are severely depressed towns due to closure of large mines in Mongolia.

Meanwhile, the current institutional and legal framework does not particularly safeguard communities living near mining development areas. Development programs are undertaken as "add-on" measures by the mining company, with the view to establishing a positive relationship with the local communities. By any standard, socioeconomic expenditure by the mining companies remains minimal. As a result, important social issues remain largely unresolved, including the complex issues of land use, financial contributions to the local community, and the role of informal mining.

Artisanal and Small-scale Mining

Three very different triggers have fuelled the upsurge in ASM (Grayson and Murray, 2003). The initial trigger was the transition from a command economy to a market economy, which resulted in a large pool of unemployed technical, semi-skilled, and unskilled workers in the cities and farming villages of north-central Mongolia. Lacking marketable skills or job opportunities, during the 1997–99 period an estimated 20,000 turned to informal mining as a cash-earning survival strategy, generally in hard-rock and placer gold. A special case arose at Nalaikh, where

Figure 12. Intensive Small-scale Underground Coal Mining at Nalaikh

Source: Rheinbraun Engineering und Wasser GMBH. 2003. "Review of the Environmental and Social Policies and Practices for Mining in Mongolia." Rheinbraun Engineering Background Papers. Cologne.

the closure of the large state-owned coal mine and the consequent collapse of associated industries led to 1,100 local people becoming informal coal miners. Resorting to informal mining was, and remains, a strong social safety net in response to closure or downsizing of large manufacturing, mining, and farming enterprises.

The next trigger was the widespread winter natural disaster (dzud) of 2001–02, which caused catastrophic loss of livestock to most of the traditional pastoral livestock herder households that dominate the steppe and Gobi zones. Tens of thousands of households lost their only sources of food and income. Some migrated into the urban centers, but most remained in the rural areas and resorted to informal placer gold mining, which generated a daily cash income.

A large group of ninjas, mostly women and teenagers, using green plastic kitchen bowls for "bowling" pay-gravel in a pool of spring meltwater. The pay gravel is defrosted "permafrost." The pay gravel is carried here in old flour sacks and several handfuls are put in a bowl for bowling. All are wearing warm clothing and rubber kitchen gloves. (Image: William Murray of Murray Harrison Ltd.)

The latest trigger is fundamentally different from the first two, although still poverty-driven. Mongolia is rapidly increasing its production of fluorspar concentrate for export, both chemical grade and metallurgical grade. This has been triggered by increased world demand stemming from the capping of fluorspar exports from China, the world's biggest producer, through imposition of export quotas by the Chinese government, followed in May 2005 by the final elimination of export rebates. Over the last three years, the number of companies in Mongolia mining fluorspar has increased tenfold to about 40, mostly SMEs. However, most of the new mining is labor-intensive, since the ore bodies are numerous but thin and irregular and unsuited to industrial-scale extraction. The SMEs have contractual relationships with large numbers of small-scale miners, loosely organized as artels. Small-scale miners are again vital in the processing stage, as visual sorting is the only practical means of upgrading the ore, and visual inspection and hammering is the most efficient procedure for producing the "lump" metallurgical concentrate.

Placer Gold ASM

Most small-scale miners are engaged in placer gold mining. Their use of a green plastic bowl for panning—carried strapped to their back—triggering the nickname "ninja" by analogy with the ninja turtles television series. Today the term ninja is widely applied to all categories of ASM in Mongolia (Grayson and Murray, 2003). In the north, placer small-scale miners are a complex mix of ex-herders, ex-farm workers, urban poor, elderly, and students, albeit in separate informal groups. But to the south in the Gobi and steppe zones, the situation in simpler: a clear majority of placer gold miners are herder households who lost their livestock in a natural disaster (dzud). Overall, tens of thousands of small-scale miners are engaged in placer gold mining and represent a major source of conflict with placer mining companies. For a period, this enabled effective resource partitioning with minimum conflict between the two parties, and the presence of informal miners was tolerated if their activities were confined to the waste tailings. Rather quickly, this tacit understanding broke down, triggered by a number of factors. Some inefficient companies, such as Mongol Gazar Ltd, reclassified their waste tailings as valuable future reserves.

The placer gold is sold generally the same day to ger shops or to roving dealers. The bulk is exported illegally to China, and some to South Korea. As a consequence, revenue is escaping the government and future costs for social, health, and environmental mitigation is accumulating. To stem the smuggling

and channel the ASM gold into the formal sector, in 2002 the Mongol Bank (the central bank) commenced purchasing gold at the world price from ASM directly and from gold buyers as private individuals; in 2005, the amount is expected to reach or exceed one ton of gold.

Some ASM groups specialize in rewashing the fresh tailings of other ASM groups. If the placer is under only one or two meters of overburden, then elaborate and ingenious arched vaulting may be excavated to remove the placer while removing the minimum of overburden. Wet processing generally progresses from ninja bowls and rubber mats to hand-bailed hoppers with static screen bases feeding simple sluices lined with ribbed rubber matting or sometimes tufted carpet. Further economy of scale is gained by abandoning hand-baling in favor of manually operated homemade water cannons fed by water from petrol-driven water pumps via a flexible hose. Wet processing was once the only option, but is now being rapidly replaced in arid and semi-arid regions by drywashers, thereby liberating placer gold ASM to spread far from surface waters, often to virgin placers in semi-pristine areas, including many protected areas. Until recently, only gravitational separation was used, but now mercury has started to be added by an as-yet limited number of placer gold small-scale miners.

Although almost entirely illegal, informal placer gold mining has proved to be a major and effective stimulus to rural livelihoods and rural economies, with a strong emphasis on poverty alleviation. Informal mining gives seasonal or regular employment and additional cash income for rural people, reduces migration to urban centers, and dampens the effects of catastrophic climatic events.

Contrary to expectation, rather than children being school drop-outs the informal miners have the cash and commitment to ensure all their children attend school, helping with the mining throughout the school vacations and every weekend. Although a few informal miners have resumed full-time herding, the great majority has persisted with informal gold mining, and some are gaining skills in mining and will stay in this new industry indefinitely. Given the persistent threats to the herder lifestyle—overgrazing, desertification, fire, and dzuds— and desire for a better life, the hard life of being an artisanal miner is more attractive in generating a cash income every day, and has no perceived risk of sudden loss of livelihood. For the foreseeable future, there is no indication of any exhaustion of gold obtainable by informal means.

3. The Regulatory and Institutional Framework

The Regulatory Framework

The 1992 Mongolian Constitution refers to the nation's mineral wealth. It states that natural resources are subject to national sovereignty and state protection, and contains a number of more specific provisions related to mining and environment. The state owns all land, except that in citizen's private ownership, as well as the subsoil with its mineral wealth, forests, water resources, and game (Article 6). Landowners are held responsible for the way the land is used, and the land can be confiscated by the state if it is used in a manner adverse to the interests of environmental protection.

The present Mongolian Law on Mineral Resources came into force on July 1, 1997 (Husband et al, 2004). The purpose of the law is the regulation of exploration, mining, and related activities within the territory of Mongolia. It also addresses the promotional role of governmental, nongovernmental, and international entities in raising environmental awareness through environmental education, technical training programs, capacity building efforts, and specialized seminars. The law confers equal rights to investors, regardless of their nationality. License holders have the exclusive right to explore and mine all minerals. The government may participate in exploration and mining only through business entities that are subject to the same obligations as any other person under the law. The law requires exploration license holders to comply with environmental laws and with its environmental protection provisions. In Articles 29 and 30, it stipulates that exploration and mining activities may not commence without written approvals; formulates the permitting procedure for exploration and mining projects; and illustrates the process for exploration and mining projects. According to the Law of Mongolia on Land, the decision to grant land for use or possession is made at the local level, by the soum governors.

The permitting procedures under the Mongolian Law of Environmental Impact Assessment require that exploration license holders prepare environmental protection plans, which provide for measures to ensure that pollution of the environment does not exceed prescribed maximum limits, and also an environmental impact assessment (Articles 29 and 30). The environmental impact assessment needs to include environmental baseline data and indices, an appropriate project alternative, recommendations for mitigating measures that minimize or eliminate potential adverse impacts, a risk assessment, and an environmental monitoring program. The draft assessment is sent to the proponent for comments. The final report is not available to the general public for review, although it is a public document. During operations, all instances of adverse environmental impacts resulting from exploration or mining activities are to be recorded in annual reports, and amendments to the environmental protection plan are to be proposed accordingly. Public hearings are not compulsory, and license holders may request the local administrative body to organize a public debate (Article 33). Both exploration and mining license holders are obliged to deposit an amount equal to 50 percent of their environmental protection

budget in a special bank account established by the governor of the relevant soum or district (Articles 29 and 30 respectively). The deposits are to be refunded upon implementation of the environmental protection plan.

The rights and obligations of a license holder expire upon the termination of the license, except for their obligations regarding environmental restoration and mine closure (Article 44); in addition, the post-mining rehabilitation measures need to be described in a separate environmental protection plan. Yet, the Minerals Law does not require the license holder to rehabilitate the area affected by mining to an extent that eliminates dangers completely. Where licenses are to be extended, exploration-holders have to submit to the governor of the soum or the district a revised or new environmental protection plan prior to expiration of the existing license term (Article 31). Similarly, the holders of mining licenses who apply for an extension are required to submit both a new environmental impact assessment and a new environmental protection plan. Finally, license holders who apply for surrendering part of a licensed area or the entire license area are required to attach a certificate from the governor of the soum or district to the application stating that they have complied with the environmental protection plan for the surrendered area (Articles 45 and 46).

The Minerals Law does not refer specifically to artisanal mining and/or to arbitration procedures in case of rejection of a proposal by the regulatory agencies. Land access and land disputes are to be resolved in accordance with the provisions of the land law, the civil law, and other relevant laws (Article 49). However, this law calls for full compensation of damages caused by exploration or mining activities to owners of private and public residential dwellings, wells, and winter huts, as well as historic and cultural landmarks (Article 32). License holders are also required to cover relocation costs, and consult and coordinate their activities with local administrative bodies in connection with infrastructure development and employment development (Article 33). The Mining Office, as one of the agencies responsible for the implementation of mineral-related legislation, carries out the research, evaluation, and formulation of recommendations with respect to the mining industry's impact on the social and economic development of Mongolia (Article 57).

The Law on Environmental Protection guarantees the right to live in a healthy and safe environment, ensure that social and economic development is ecologically balanced, and that natural resources are properly used. The polluter-pays-principle is expressed in Article 4; it awards citizens the right to present a claim against violators for compensation of damages to their property and health resulting from adverse impacts on the environment caused by the violator. Article 34 provides for fees and payments for environmental pollution and adverse environmental impacts. Specifically, fees and payments are required for discharging permissible levels of wastes and pollutants. Compensation is required for the discharge of wastes and pollutants in amounts exceeding permitted limits, and for damage caused to the environment.

The new Law on Land regulates the ownership, use, and protection of state-owned land (Tumenbayar, 2002). Of significance to mining is the establishment of "special needs" lands; that is, land under special government protection, reserve rangelands, and hay land for government fodder reserves—by aimags, the Capital City, soums or duuregs, where mining is not allowed. In many instances, exploration licenses, mining licenses, and active mines are within special needs lands. Typically, these mineral properties were granted before the designation of he special needs area, but this is by no means uniformly so. In many soums, the local administration strongly resists any new mineral licenses being granted in the special needs areas. Other administrations are more flexible and allow mineral licenses provided there are either special conditions negotiated or social offsets for the local community.

The new Law on Land also requires that land that has been damaged from digging for mining purposes is to be restored (Article 52.1.2). Accordingly, annual land protection and rehabilitation plans need to be developed and assessed by the citizens' representatives of the soums and bags, who may take measures to stop the development and/or enforce compliance (Article 57). Penalties are to be imposed on officials infringing on decisions of environmental inspectors to suspend or fully terminate activities of plants and companies, depending on the nature and extent of the violation and the volume of damage (Article 66).

The existing regulatory framework is, however, weak in the areas of public participation, sanctions, and

Box 1. The Extractive Industries Transparency Initiative

The Extractive Industries Transparency Initiative (EITI) was announced by UK Prime Minister Tony Blair at the World Summit on Sustainable Development in Johannesburg, in September 2002. Its aim is to increase transparency over payments by companies to governments and to government-linked entities, as well as transparency over revenues by those host country governments. Revenues from oil, gas and mining companies, in the form of taxes, royalties, signature bonuses and other payments should be an important engine for economic growth and social development in developing and transition countries. However, the lack of accountability and transparency in these revenues can exacerbate poor governance and lead to corruption, conflict and poverty. EITI has issued a set of reporting guidelines and a Statement of Principles, available on its official website. EITI received official endorsement from the World Bank Group, announced December 9, 2003.

Nearly 20 countries have committed to EITI principles and criteria since the Lancaster House Conference in 2003. Some countries are only beginning to launch the process, while others have published revenue and payments data. The Governments's of Azerbaijan, Republic of Congo, Ghana, Kyrgyz Republic, Nigeria, Sao Tome and Principe, Timor Leste and Trinidad & Tobago have made an unequivocal public statement outlining how they intended to implement EITI, and are now at different stages of implementation. Angola, Bolivia, Cameroon, Chad, the Democratic Republic of Congo, Equatorial Guinea, Gabon, Guinea, Kazakhstan, Mauritania, Niger, Peru, and Sierra Leone have endorsed EITI and are presently considering how they will implement the initiative.

On 2 December 2005 the Government of Mongolia committed to EITI when it held a conference on EITI in Ulaanbaatar. Almost a hundred attendees from Government, Parliament, local and international companies, local civil society groups, international financial institutions, foreign governments, and the media attended the conference. Prime Minister Elbegdorj attended and stated that the Mongolian Government was keen to move quickly to implement EITI. Prime Minister Elbegdorj subsequently wrote to the World Bank and to the EITI Secretariat on 20 December to confirm the Government of Mongolia's commitment to the Initiative. On 4 January 2006 a government order was issued establishing a National EITI Council charged with implementing EITI.

Source: Authors.

funds for rehabilitation, informal mining, protected areas, and compensation for land use (International Institute for Environment and Development and World Business Council for Sustainable Development, 2002).

Public input into the permitting procedure is not formalized and is primarily up to the discretion of the proponent. A procedure for the solicitation of questions, input, and assessment of individuals, as well as an arbitration process in the case of contradictory appraisals, is missing. The transparency of the permitting processes could also be improved by introducing obligatory public involvement in the scoping and discussion of EIAs. All EIAs should be published, together with the associated Environmental Protection Plan (EPP) and Environmental Monitoring Plan (EMP), to enable the public to voice any concerns, to render transparent the low quality of some, and as a teaching and research resources to drive up standards. Once mining has commenced, the secrecy shrouding EIAs, EPPs, and EMPs is a deterrent to public participation and the source of much complacency and deliberate breaches of regulations in the absence of vigilant locals and NGOs empowered by access to such documents.

Mongolia should consider becoming a signatory to the Aarhus Convention in order to formalize public participation in environmental decision-making, ensure freedom of public access to environmental information, and access to legal redress if public access is unreasonably barred. This would bring Mongolia into line with the majority of states in Eurasia and North America, which attain the Aarhus objectives regardless of whether they are a signatory of not. In addition, Mongolia should also consider becoming a signatory to the Espoo Convention in order to grant equality of public participation in environmental decision making for projects with cross-border impacts, equality being bestowed to the public in both states. This matter has become relevant with the substantial increase in proposed mining and mining-related infrastructure in the Gobi regions on both sides of the Mongolia-China border. For example, a new 400-km railroad is to open shortly in China terminating at the Mongolian border immediately south of the new Nariin Sukhait coal mine in Omnogovi Aimag, but there has been no public debate on the Mongolian side regarding the justification for this railroad or its route selection.

Sanctions are foreseen in case of violations of the law that range from fines up to 250,000 MNT ($220) to suspension of the operation or even its termination, but enforcement of the environmental provisions has been problematic. The Professional Inspectorate refused to circulate a list of fines imposed on mines, on the questionable grounds that publicity would damage the reputation of respected companies.

The legal provision for depositing 50 percent of the funds required for rehabilitation on an annual basis has not resulted in the expected higher level and quality of environmental protection. This is mostly due to lack of institutional capacity to ensure the implementation of rehabilitation measures, and also the lack of willingness and capacity of mining operators to come up with the remaining 50 percent of the funding necessary to complete the environmental protection work once mining has ceased. There is a need to ensure sufficient funding through bonds or similar guarantees. This would force the mining operators to internalize the total reclamation cost. Combined with an annual review of reclamation performed and future reclamation activities expected, financial guarantees to cover the total reclamation costs could be fitted to the actual progress in the field and to technological innovation.

In most instances, informal mining for gold and coal is in violation of environmental and mineral regulation, mostly because of the large number of illegal miners, which makes the enforcement of existing regulations difficult. A law on artisanal mining was drafted several years ago, but in late August 2005 the draft was officially abandoned by the government. A completely new draft is being prepared for submission by the government to Parliament during the fall 2005 or Spring 2006 session. It is expected that key elements of the new ASM Law will include the opening of communication channels by the formation of miners' associations, the generation of a cadastre system at the soum level, restriction of informal mining to specific areas, and the limitation of the size of artisanal mining concessions.

In 2001, the Ministry of Trade and Industry approved Regulation No.33 regarding artisanal miners, and in 2002 approved Regulation No.53 (Husband et al, 2004). These granted power to soum governments to conclude agreements with mining license holders allowing individual miners to rework tailings and waste rock. The license holder may buy the miners' product at a relatively low price, and would in turn ensure safe working conditions. Only about 10 mining companies accepted the scheme. A problem arose from the sheer number of small-scale miners, which put considerable strain on the slender human resources of the soum administrations regardless of the income generated in permit fees. Miners without permits worked alongside the permitted miners, leading permitted miners to question the point of obtaining permits. It proved virtually impossible to administer the permitted miners, who often still relocated themselves much as they pleased. Few of the thousands of small-scale miners that stay only for part of the short summer season bothered to request permits. Later, the regulations expired and the small-scale activities reverted to being illegal. Nevertheless, the regulations proved to be helpful in some conflict-prone goldfields such as Zaamar, and valuable experience was gained by the central government, local governments, mining companies, and small-scale miners.

Although no further regulations were enacted, ad hoc arrangements emerged in many areas, notably in the Gobi and steppe zones whereby soum administrations, generally with support of their aimag administration, sought to gather a small monthly local tax from each informal miner, often with success. These ad hoc local taxes are perceived by the soum administrations and the informal miners to bestow a degree of legality on the mining activity. In reality, the local taxes are not fees for mining activity—as that would be a breach of the Minerals Law—but are fees for land use. Nevertheless, it is by such Byzantine paths that in other countries small-scale miners have incrementally gained partial or full legal rights for mining as well as land use.

Recognizing the seriousness and complexity of the issue, MIT in mid-2005 set up a new ASM Unit in the MRPAM with the assistance of the Swiss Agency for Development and Cooperation (SDC). The SDC recently commenced with MRPAM a long-term ASM project focused on policy formulation, drafting of legislation and regulations, mediation and conflict resolution, technology transfer, training and minimizing of risks to health, and safety and environment. The overall objective is to assist in poverty alleviation in rural areas.

The Mongolian Law on Protected Areas prohibits mineral exploration and extraction activities in protected areas; it also states that MNE should compensate any rightful mineral license holders, who are deprived of their rights to explore and mine if their area is incorporated into a new protected area. In reality, the MNE is grossly under-funded and has no special funds available to make such compensation.

The compensation for land use in mining is not regulated. The reason is that mining, with its regulated activities like licensing, a land contract, and taxes, is considered an element of a modern, sedentary social arrangement applied to a pastoralist social setting that is unaware of the intangible property, and where regulation of the use of natural resources was traditionally done by common management. The new Law on Mongolian Citizens Ownership of Land stipulates that every Mongolian citizen has the right to receive a certain amount of land free of charge, and grants special privileges to those farmers who worked the land for many years. This provision may put them in a more advantageous position when it comes to the issue of privatization of farmland and compensation for any land development, including mining. The timing of the privatization is yet to be completely determined. In addition, since the users of a particular pasture may vary with the seasons, more clarity is needed on who should be compensated.

The provision of lease agreements between mining companies and suitable local governments could legitimize the use of land certificates as already practiced by some local governments. In addition, the conclusion of individual or collective land agreements might improve the management of a complicated development issue for Mongolia.

The Institutional Framework

MIT focuses on supporting development of national industries; increasing employment through SMEs and consumer goods production and protection; determining, collecting, and evaluating regional surveys of minerals and oil; increasing exports by improving international competitiveness of products and services through regional networks; developing foreign trade and promoting foreign investment; and introducing advanced administration management, improved technology, and structural reforms. An independent regulatory agency—the Geological and Mining Inspection Agency (GMIA)—and an independent implementing agency (now MRPAM) were created in 1997 when the current Minerals Law was approved. An internal MIT Department of Geology, Minerals Policy, and Coordination was subsequently formed to more directly link these autonomous agencies to MIT's minerals sector development mandate.

GMIA has now become a division of a new consolidated inspection agency, the State Professional Supervision Administration. Its 12 officers are now linked to aimag mine inspection agencies reporting directly to the prime minister's office. The rationale for this consolidation was to establish inspection and enforcement independence by separating this regulatory function from potentially conflicting ministry mandates, and to reduce overlapping site inspections through improved coordination. MIT's MRPAM is the key external implementing agency for minerals. It is responsible for issuing mineral licenses, compiling mineral industry information, archiving geological data, and conducting geological surveys and research. It has three divisions: the Department of Geological and Mining Cadastre (DGMC), the Mining Office, and the Office of Geology/Mongolian Geological Survey (MGS). DGMC is both a one-stop initial entry point for all applicants and the sole processing and granting office for exploration and mining licenses. It fulfils the basic requirements of an effective mining cadastre. It has 12 officers who implement first-come/first-served procedures. There remain, however, some ambiguities and potentially adverse implications inherent to the division of labor across these agencies. These include the assignment of extensive exploration rights to MRPAM; and insistence on production in accordance with the estimated production levels and deadlines.

The Mining Office, with a small staff of eight professionals, is responsible for monitoring and conducting research on the technological and socioeconomic impacts of the mining industry. An important current focus is the regulatory administration of the mining license agreements resulting from the 1997 Implementation Law.

The Office of Geology was originally designed to consolidate the functions of the former State Geological Center and the State Geological Informational Fund. This MRPAM division, also known as the Mongolian Geological Survey (MGS), comprises four functional units: Geological Research Team, Mineral Resources Evaluation Team, Geological Information Center (GIC), and the Budget Planning Team. The largest of these, the GIC, has 34 officers and is responsible for archiving all geological information, maps, and records concerning geological research in Mongolia. The other three units have a total of 12 officers who

are responsible for regional geological, geophysical, and geo-environmental mapping and research. MRPAM/MGS geological survey and tendering activities at times overlap with functions assigned to the internal Department of Geology, Minerals Policy, and Coordination. MIT is assessing this overlap. One option under serious consideration is to strengthen the regional mapping capability of MRPAM/MGS to undertake this research and obviate the need for contractors. A major recipient of MIT budgeted funding for regional mapping projects has been the state-owned Geological Research Center, which reports to the State Property Committee. Its research mandate is broadly based and increasingly focused on capturing more lucrative private sector contracts for its professional services.

MNE is responsible for developing and enforcing environmental and natural resources policies. MNE is divided into five departments and two agencies. Since February 2003, the Environmental Protection Agency (EPA) has been integrated into the State Professional Inspection Agency. Aimag and Capital City governors are responsible for developing and implementing measures for environmental protection, monitoring any activities of local business entities (and prohibiting those with adverse effects), and coordinating activities at the local level. In particular, the Minerals Law gives the local administrative body the responsibility to "ensure and monitor compliance by (exploration and mining) license holders of their obligations with respect to environmental protection, health and safety regulations" (Article 4). Since February 2003, the inspectors report to the aimag inspection office. The soum governor has retained the responsibility of organizing and implementing legislation and issuing permits.

State chief inspectors are assigned to the aimags as well as the Capital City, while state inspectors/rangers are appointed at the soum and duureg level. The basic duties of state inspectors are monitoring, inspection, information collection, supervision, and instruction of rangers. They can require the elimination of adverse impacts or the suspension of activities with adverse impacts on the environment, and impose administrative penalties on environmental legislation violators.

Mongolia's institutional framework for managing its mineral resources continue to be weak in the enforcement of regulations relating to the procedures for local governments to issue land user permissions/contracts, for governors to approve of environmental notifications, and for enforcement of sanctions for license violations. Coordination between the Ministries of Nature and Environment, Finance, and the State Professional Supervision Administration, as well as between inter-governmental regulatory and information management activities and local administrative bodies, is inherently poor. Finally, the government still needs to ensure an appropriate level of public participation, public education, and information disclosure, particularly at the local level.

4. Priorities for the Short-Term

Based on field observations and a review of background materials, this report identifies the following short-term priorities that should be addressed:

- *Support and stimulate the introduction of Best Available Techniques into placer gold mining*, in order to address the considerable but largely unnecessary environmental impacts and damage to livelihoods of rural people. For land-based placer gold mining, the following goals of BAT are now achievable in Mongolia: gold recovery mostly by gravitational methods; an average of more than 90 percent gold recovery achieved; rear-casting of all materials (i.e. no dumping to the sides); minimum mining footprint; creation of final contours, complete with topsoil cover, the same day as the material was excavated; no double-handling of materials and no "temporary" mounds of waste; minimum abstraction of process water from surface or underground sources; recycling of semi-cleaned effluent as process water; and zero discharge of effluent. Implementation would require dissemination of global know-how to government and industry, and regulations by the MNE on BAT for general environmental matters; a joint regulation of MNE and Ministry of Agriculture on BAT for topsoil reuse, revegetation, and aftercare; a regulation from the MIT for BAT for wash plants, in particular a requirement to be fully mobile and capable of achieving at least 90 percent gold recovery.
- *Enable full prior informed consultation in the development of mining operations*, particularly allowing access to and discussion of relevant environmental information and documents such as EIAs and EMPs, community development and revenue management plans. The existing legal and procedural basis for public participation can be strengthened by Mongolia becoming a signatory of the Aarhus Convention and the Espoo Convention.
- *Improve employment opportunities for local people in mining*. At the national level, it is important to ensure that more employees are Mongolian citizens, especially in long-established mining operations. Under existing regulations, all foreign citizens have to obtain a permit from the Ministry of Employment; permission need not be granted if there is no shortage of available Mongolians qualified for the post, but there is little sign of this power being used in a meaningful manner in the mining sector. The alternative approach is to make employment of a minimum quota of Mongolian citizens a condition of a company holding a mining license. Of these, a small number should be reserved for residents of the soum and aimag in which the mining operation is based, as the overriding majority of Mongolians employed in mining were recruited in the cities. Implementation would require amendment to either the Minerals Law by Parliament or by amendment to an associated regulation by MIT.
- *Address the fate of mine-dependent communities*. Local governments in partnerships with investors

should be encouraged to diversify into alternate industries in order to prevent social upheaval in the event of mine closure. Depending on the location, some areas may be suitable for activities such as tourism, mineral water production, other mining activities, farming, or the production of solar energy. Where no alternatives can be found, government could become involved jointly with the mining company to forecast and mitigate the socioeconomic effects of eventual mine closure.

- *Adopt a law on artisanal mining* which includes the establishments of miners' associations, the generation of a cadastre system at the soum level, restriction of informal mining to specific areas, and the limitation of the size of artisanal mining concessions.

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