

Joint Pilot Studies between Korea and Mongolia on Assessment of Environmental Management System in Gold Mining Industry of Mongolia I

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Publisher: Suh Sung Yoon

Published by: Korea Environment Institute

613-2 Bulgwang-Dong, Eunpyeong-Gu,

Seoul, 122-706, Republic of Korea

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<http://www.kei.re.kr>

Published and printed on: Dec. 2004

ISBN 89-8464-120-0 93530

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Foreword

In last ten years, there have been numerous industrial, academic, and political exchanging activities between Korea and Mongolia to exploit the mineral resources and develop the mining industries of Mongolia. Mining industries is responsible for remarkable portion of the gross domestic product and for the fundamental financial source of economic growth in Mongolia, and their national importance will increasingly be greater than present situation. However, it is inevitable that the economic growth can subordinate negative impacts to natural environment, and that this situation can be advent to various communities in Mongolia.

Since environment protection is a significant priority for most of developed countries, it is important that government, industry and community organizations are working increasingly as partners in protecting our environment for present and future generations. I think that this collaborative research between Korea and Mongolia will help future sustainable development and operation of mineral mines in Mongolia, considering reciprocal balance between development project and environmental conservation.

By contributing to enhancement of environmental conservation and sustainable development through multilateral cooperation, this study will help understand the differences and similarities of the frameworks of environmental assessment and environmental management systems (EMSs) between Korea and Mongolia with the case studies of gold and metal mining industry within each country.

I hope this first cooperative research between Korea and Mongolia will result in a reinforced technical network of experts of EMS about operated or abandoned gold mine areas in both countries. Furthermore, these experts and institutions are expected to communicate continuously each other for the development of harmonized analytical methods and algorithms incorporatable into an implementation of environmental policy and plan for mining industry.

The view expressed herein is those of the authors and not necessarily of KEI and Mongolian Nature and Environmental Consortium.

December 2004

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Abstract

The mining industries such as the operation of mine and the extraction of precious metals have played a major industrial role in preparing fundamental capital for national economic growth in developing countries. Same situation occurs in Mongolia. Gold mining industries in Mongolia generate 70% of total foreign currency. In spite of great economic importance, it may causes negative impacts that lead to destruction of the natural environment and hardship of the local people adjacent to gold mine areas, especially for herders who lose natural pasture land and water resources. For a sustainable development of gold mining industry in Mongolia, national policy or regulation is indispensable to control the environmental problems.

This research focuses on the environmental issues during gold mine development in Mongolia. It also suggests the best outline of environmental policy and management system for sustainable gold mine plan and operation, joining the implementing environmental management system of abandoned metal mines in Korea and gold mining industries of Australia.

A total of 11,000kg/year of pure gold is produced from more than 200 of both placer- and hard rock- type gold mines in Mongolia. Most of gold deposits are concentrated in central and southeastern parts of Mongolia. These gold deposits are highly associated with magmatic activities occurred from Cretaceous to Recent in geologic time scale. Two placer gold mines were investigated for their environmental status in this research. Shijir Alt Ltd. gold mine company is located near the Tuul River flood-plain area and is one of the largest placer gold mining companies in the Zamaar placer gold district of Central Mongolia. Large-scale mechanical separation of gold is performed with a bucket-line dredge and at least two water washing tools with pressurized water spraying. Due to heavy dredging of soil and water for gold extraction, the area near the gold mine company suffers from various environmental problems such as turbidity increase of river water, pastureland destruction, shortage of drinking and industrial water, and dust spray by used soil dumping. Gurvan Dokhon Ltd. gold mine company is located in the southeast of Ulaanbaatar and one of the major placer gold mines in the Dzuunmod region of Central Mongolia. Comparatively small-scale soil excavation for gold extraction is performed in this mine. Groundwater from three wells is used for soil washing. The used soils after gold extraction are dumped to the place where the

soils have been first excavated. Therefore, the area in which gold mining is ended is rapidly being rehabilitated.

The environmental management systems (EMSs) of Korea and Australia for abandoned or operated metal mining areas were reviewed for suggesting better establishment of EMS in gold mining industry of Mongolia. In case of Korea, it is noticed that three relevant governmental authorities (Ministry of Environment, Ministry of Commerce, Industry and Energy, and Ministry of Agriculture and Forestry) have the responsibilities for investigating, assessing, and promoting the restoration projects of abandoned hard rock metal mine areas. All companies related to the mineral industry of Australia must follow the 12 components of EMS based on "Best Practice Environmental Management (BPEM) in Mining" in order to protect the environment by reducing the adverse impacts caused by mining activities.

Environmental protection should incorporate with the concept of sustainable development to assess potential impacts of a proposed mining development. Governments, mining industry and relevant community organizations also have to work as partners to protect our environment for present and future generations.

In mining industry, EMS principles must also be integrated through all phases of mine development from pre-exploration planning, through construction, operation, closure and post-mining monitoring and maintenance, because mining extraction and associated processing have the potential to cause severe environmental problems if projects are not properly planned and managed, judging from the case studies of Korea. Mining companies in Mongolia should include the environmental programs in the company strategy.

An establishment of comprehensive environmental management system of placer gold mining in Mongolia needs to be essential, which will finally be set up in subsequent research in next year.

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Chapter 1. Introduction

1. Background

Sustainable and successful mine planning and operation for environment protection can avoid or minimize potentially adverse environmental impacts over the life of the mine and into the future by carefully considering the layout and design of the various components of a mine. In this regard, it is important to establish an effective environmental management system and environmental protection plan for better harmonization between mine development and environmental conservation.

Since environmental issues were not considered as an important factor in design and layout of precious metal mines, few early operations of the mine were planned in ways that would now be regarded as environmentally appropriate. Therefore, more recently the mining industry extracting precious metals has developed environmental management expertise to ensure environment protection in planning and operation of development projects.

A wide range of environmental impacts and their environmental management system of gold mining have been well documented with respect to hard rock and placer mining deposits (Hilson and Murck, 2001; Hilson and Nayee, 2002; Tarras-Wahlberg, 2002; Aryee et al., 2003). From the extraction of gold-aggregated ore bodies to the panning, crushing, dredging, and refining processes of mineral, large amounts of pollutants are directly or indirectly generated. If mismanaged, these facts can cause serious threats to ecosystems and quality of human life, and can also deteriorate a number of important natural resources, particularly soil and water. To minimize or avoid potentially serious environmental problems in the industry, a series of preventative measures and state-of-the-art environmental management practices must be integrated into pollution modes of operation (Hilson and Murck, 2001). More specifically, it is required to implement a number of highly efficient pollution prevention and waste minimization technologies and strategies to collectively reduce the released contaminants from gold mines with small amounts, and to effectively treat toxic chemicals discharged into the natural environment.

Mongolia is situated over a large mineralized tectonic zone composed of two major geologic provinces, the Siberian and the Chinese Platforms. Mining activities in the country produce significant amount of gold, cop-

per/molybdenum, fluorite, and coal, in addition to minor amounts of silver and uranium. In Mongolia, the operation of mine and the extraction of precious metals such as gold, have played a major industrial role in preparing fundamental capital for national economic development. Gold mining generates 70% of total foreign currency. Although of great economic importance, it may cause negative impacts that lead to destruction of the natural environment as well as that directly harm local people, especially herders who lose natural pasture land and water resources. For a sustainability of future gold mining industry in Mongolia, national policy or regulation is indispensable to control the environmental problems. Establishing appropriate environmental management system for mining industries can be one of important alternatives.

2. Objectives of Research

This research focuses on the environmental issues during gold mine development in Mongolia. It suggests the environmental policy and management system for sustainable gold mine plan and operation, joining the implementing environmental management system of precious metal mines in Korea.

The ultimate goal of this research is to establish best Environmental management System in gold mining of Mongolia through two-stages;

- Stage 1: August, 2004 ~ December, 2004
- Stage 2: January 2005 ~ July 2005

In 2004, a preliminary framework is set up to develop best environmental management system for the sustainable development and operation of gold mine in Mongolia. Korea has already experienced a lot of environmentally adverse impacts caused by closed gold mines such as acid wastewater drainage and soil contamination by toxic metals, and the systematic restoration processes of the soil and water bodies are in progress. It is suggested that the environmental management system and technologies obtained from several mine restoration projects can be successfully applied to the case of Mongolia.

Through this research, lucrative results can be derived as follows:

- Comprehensive understanding of environmental policies and management processes of mine development and operation in Mongolia and Korea
- Analysis of current status of the environmental concerns of gold mining

deposits in Mongolia

- Review of the Environmental Management System (EMS) in developed countries such as Korea and Australia
- Finally, suggestion of fundamental outlines for establishing best EMS in gold mining of Mongolia.

Chapter. 2. Socio-economic Setting of Mongolia

1. Mongolia in Transition

Mongolia began in 1990 the difficult change process of democratizing its governance and decision-making and transforming its economy from one directed by central planning to one guided by the open market. As awareness grows of development issues and their relationship to Natural Resource and Environment (NRE) sustainability, the country's leaders perceive the opportunity and importance to integrate development with long-term natural resources conservation and environmental protection but, to date, they have not understood the key role that the market itself can play in guiding investment and development decisions.

The ecological vulnerabilities related to climate are well known and have received a lot of attention via external support. Less well known are the vulnerabilities induced by the rapidly increasing urbanization of a historically pastoralist society and the changing socio-economy now in its second transition in 9 decades. It has changed from one based on independent, family-based pastoralism, to collectivized, heavily subsidized agriculture and industry under the Soviet Union, to a very nascent "open market" economy adopted since the Soviet collapse in 1989.

The present population of about 2.5 million people is four times the 650,000 it was in 1921 when Mongolians regained their independence from China. Whereas previously most of the population lived as semi-nomads in balance with the sparse and fragile steppe vegetation, this is no longer possible. With the current population increasing at 1.4% annually, the country will probably have almost 5 million people by 2050.

Similar to other peoples in developing countries, Mongolians have been migrating to urban areas for some time but this was interrupted briefly when many people returned to the land for sustenance as the economy stumbled after the collapse of the Soviet Union and cessation of its support. Many urban unemployed and poor families remembering the pastoralist tradition tried to make a living by returning to the stressed grassland.

Spending in incremental steps the little capital that the family had, finally exhausted the family exchequer and decreased ability to live in the city to which the family returned. The cycle of deprivation and poverty was repeated over and over, resulting in increasing degradation of the

already degraded pasturelands and an increasing number of people in the classic low-level equilibrium trap. Something different has to be done. Return to the land, particularly in the absence of fertilizer, better seeds and plants, improved “pasture” management, improved animal health, increased post-harvest processing etc., simultaneously aggravates poverty and diminishes land quality.

Pastoralism now provides a way of life and livelihood for less than 30% of the population. The official relative shares of the economy in 2000 were 36% agriculture, 22% industry and 42% services. Mining, the fastest growing industry, can support economic growth, but with major implications for natural resources sustainability and environmental quality.

The country seeks a new path. A return to reliance on pastoralism is not possible because the carrying capacity of the dry and fragile land cannot support the population. In contrast and possible, is a future based on knowledge and individual enterprise, the high educational level of Mongolia’s youth, increased technical education and applied science and the adoption of competitive technologies appropriate for a vast, land-locked country of few people. However, international assistance is needed to strengthen capacities and assist the country to learn rational, participatory decision-making, to understand how an open market really operates, and to adopt appropriate technologies and management practices.

2. Socio-economic Trends

A number of socio-economic trends affect behavior with respect to consumption, conservation, waste management and health and they affect the use, misuse, management and mismanagement of natural resources and the environment. When average per capita income dropped through the 1990s it caused many people to try to exist outside the main economy by illegal forest harvesting, illegal mining, and illegal hunting. These “black” activities seriously inhibit resource sustainability.

The pressure of poverty bears down on the society and its ability to administer itself. It bears down on the natural resources of land, pasture, forest and wildlife, and on the ability of people to look ahead and carefully reflect on the paths to be followed into the future. Thus, Mongolia is vulnerable not only to climate change and all of its attendant features (receding forest, desertification, dust storms, insect invasions) but also to

the downward spiral of poverty and its attendant features (fear, indecision, ineptitude and incapacity) that bear on the ability of the country to identify and select priorities and so manage its natural resources and environment for posterity.

From 1990 to 1998, the population of the country grew at an average rate of 1.4%/year. Ulaanbaatar grew at an average rate of 2.5%/year (20.3% over the 8 years) but the total population of the seven other urban centers decreased 2.2%/year (17.6% over the 8 years). Thus, not only is the proportion of the country's population living in urban areas increasing, it is also becoming more concentrated in Ulaanbaatar. For two major reasons this trend can be expected to continue: the tendency towards urbanization as an economy changes from one based on agriculture to one based on primary product processing, manufacturing, transport and services, and the high cost of internal transport.

The cost of land transport was previously subsidized by Mongolian and Soviet society as a whole. Land transport costs in the absence of subsidies are now borne entirely by the users. As the value of hides, meat and wool are low in Mongolia (commensurate with their low quality) it is difficult for herders to afford the cost of transport to market. Also, supportive social, health and educational services were previously distributed fairly evenly across the steppes. But this no longer applies. Hence, people are moving to or close to urban areas. One result is the concentration of livestock around urban centers, transport nodes and water sources, with concomitant destruction of the fragile soil and plant ecosystems that become very severely overgrazed at these locations.

3. Government Administration

Public service instability (public servants are replaced when the ruling party changes), inadequate pay, and inadequate understanding of the role of the public servant severely undermine continuity of administration and the ability to implement important government programs, particularly in natural resources and technology fields requiring a high level of education, training and continuity.

The Central Government has delegated responsibility for NRE administration to the Aimags (provinces) and soums (counties). They have responsibility to implement the programs and actions for NRE management, but the funds and knowledge to fulfill these responsibilities are held at

the center. For example, local administrations are supposed to receive 20% of hunting fees and 30% of mining license fees, but they do not. Also, local experience and understanding are insufficient to cope with the large number of issues and actions bearing on the use, conservation and rehabilitation of land, pasture, water and forest, not to mention impact mitigation, waste management, energy use and socio-economic concerns. Massive institutional strengthening is required at the local level. The entire administration of NRE would be assisted by adopting a transparent management process defining responsibilities, budgets and expenditure reporting.

Chapter 3. Environmental Status of Gold Deposits in Mongolia

1. Status of industrial importance of gold mining industries in Mongolia

After the 1921 communism revolution, the development of the mining industry started as an independent sector of the national economy. The size of the resource, its importance to Mongolia's economy, and associated impacts on human health and environment all conspire to make mining the largest and most contentious environmental management issue today. Mongolia boasts of significant mineral resources including gold, copper/molybdenum, acid- and metallurgical grade fluorspar, uranium, iron, and other minerals. In 2004, Mongolia's gold reserves are 4.5 tons, copper 8 million tons, molybdenum 240 thousand tons, plus abundant coal deposits – the Tavan Tolgoi reserve alone is estimated at 5 billion tons. By 2004, more than 500 deposits and 6,000 mineral occurrences of 80 different mineral commodities (including uranium and rare earth) have been identified, and many of which have been investigated and put into production. Today, the mining sector is Mongolia's single largest industry, accounting for 55% of industrial output and more than 40% of export earnings (Fig. 1).

The mining sector represents a substantial percentage of Mongolia's economy. Fully 11% of the entire territory of Mongolia is under some form of mining exploration or exploitation agreement. The formal mining sector alone employs almost 17,000 people and accounts for 30% of the total industrial output and 65.5% of export revenue. Conservative estimates calculate another 42,000 people employed by the informal mining sector with more than 150,000 informal miners projected by EcoMinex International, Ltd. by the summer of 2004. Experts expect the informal gold mining to continue to grow substantially limited only by the amount of waste gold available. Informal gold miners (ninjas) focus predominantly on the waste gold left behind by placer gold mining operations – roughly calculated to be around 48 tons, increasing by 7.8 tons annually.

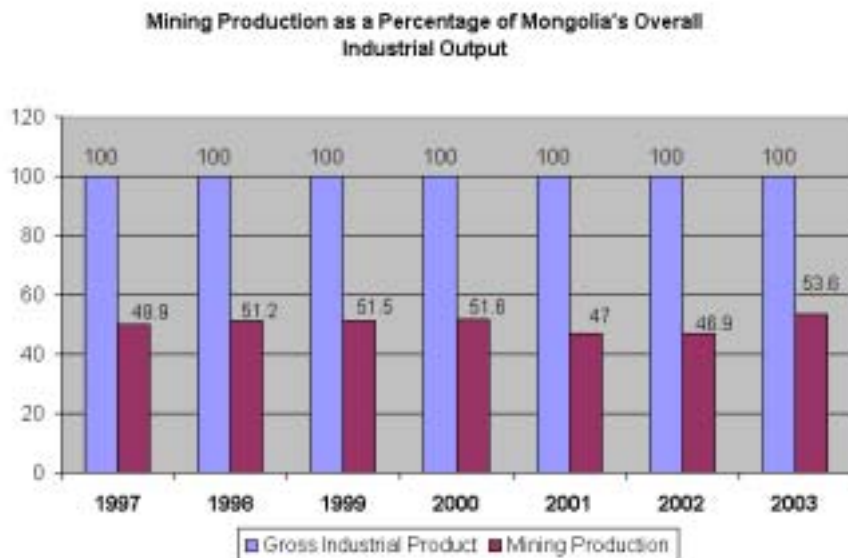


Fig. 1. Mining production of Mongolia

(Source: <http://www.mram.mn/Mpstatis.htm>)

2. Geological features of gold deposits

A. Regional geology and mineral occurrences of Mongolia

a. Geological and metallogenical outline of Mongolia

The geology of Mongolia shows a characteristic of metamorphic, igneous, and sedimentary complexes compositions representing all geological period from Early Archean to Late Cenozoic. Several plutonic and volcanic activities arose within this geological period, and these igneous activities have been observed until Recent (Fig. 2).

The tectonic setting of Mongolia corresponds to Paleozoic Ural-Mongol geosyncline belt and Mediterranean-Central Asian part of Tethys Sea. The main structural feature shows a series of stratified lineaments and faults which are curved to southward. The mountain areas, northern and western part of Mongolia, were built with geologic formation corresponding to Pre-Cambrian and Paleozoic metamorphic rocks, which were conspicuous of their variation of metamorphic facies, while the areas of

lower altitude between mountain range of southern part and Gobi Desert are composed of Mesozoic and Cenozoic sedimentary formation.

As a result of radiogenic isotope measurement, the oldest geological formations are Archean and Early Proterozoic metamorphic complexes which show 2.65 billion year in absolute age. These complexes are composed of ultrabasite, felsite, gneiss, crystallized shale, amphibolite, marble, quartzite, granitic gneiss, and enderite.

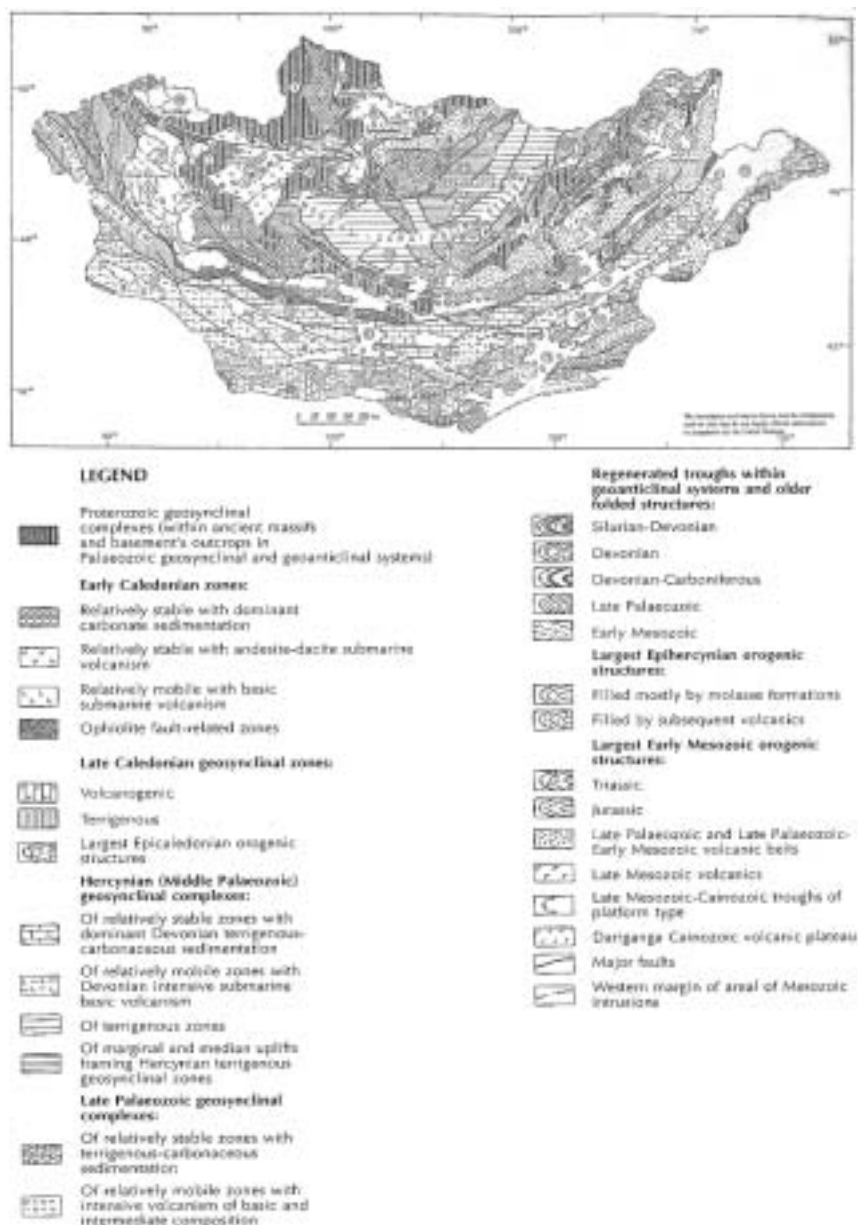


Fig. 2. Scheme of the tectonic setting of the territory of Mongolia (Source: Hasin, R. A., Y. A. Borzakovsky, and L. P. Zonenshain (1973))

Various types of metamorphic rocks were distributed in the overall area of Late Proterozoic formation. Paleozoic formations are composed of sedimentary rocks including diverse fossil species, showing little evidence of regional metamorphism.

In the Central part of Mongolia, inland sedimentation and consequent accumulation of dense sediments have been continued from Middle Triassic to Recent, resulting in inclusion of abundant amounts of plant fossils.

The geologic formation pertaining to Late Cretaceous or Early Tertiary show predominance of psammitic or argillaceous rocks, and flood basalt accompanying with several volcanisms occurred from Late Tertiary to Recent developing a wide range of plateau. The geologic formations composed of volcanoclastic sedimentary rocks are predominant in the eastern part of Mongolia, while they are not reported in the southern and southwestern part of Mongolia.

The intrusive rocks showing igneous origin occupy more than 20% of the overall land of Mongolia, and their compositions have a wide range from ultramafic to highly felsic rocks. Ultramafic igneous rocks such as ultrabasite and gabbro are distributed as intrusive phase in Pre-Cambrian rocks and ophiolite aggregates, and rarely developed as stratified form. The alkali intrusives of Devonian and Permian had developed alkali rock belt connecting northern, western, and southern part of Mongolia. On the whole, the degree of orogenic activity in the western part of Mongolia is comparatively stronger than that in the southern part. Frequent seismic activity in Western Mongolia proves that fact.

More than 60% of the country's territory has been covered by geological mapping at differing scales, supported by a range of geophysical and geochemical exploration. Mongolia is located in the southern part of Siberia Shield, and it can be divided as four tectonic zone related to Baikalian (Late Proterozoic), Caledonian (Early to Middle Paleozoic), and Hercynian (Late Carboniferous to Permian) orogenic activity. Also, Mongolia is located in the Central Asian mineralized zone, and three metallogenic provinces having abundant mineral resources are developed.

The first province, the Altai-Saian or North Mongolian province in the north-west of Mongolia includes tungsten, molybdenum, and copper deposits related to the Caledonian age intrusion. The vein gold and iron deposits also occur in this province. The second province, the Mongol-Transbaikalian province or East Mongolian in the north-east of Mongolia, is the most prolific mineral province of the country and includes numerous deposits of copper, molybdenum, tungsten, zinc, fluorite, gold and iron

occurring in a variety of geologic settings. The third province is the South Mongolian province in the Hercynian terrain of southern Mongolia and contains deposits of copper, polymetallic occurrences, gold, lead, molybdenum, tungsten, arsenic, zinc and rare-earth elements (Fig. 3). More recently, potentially important discoveries include gold (mostly detritic), zinc-lead and polymetallic mineralization, including silver and sometimes gold.

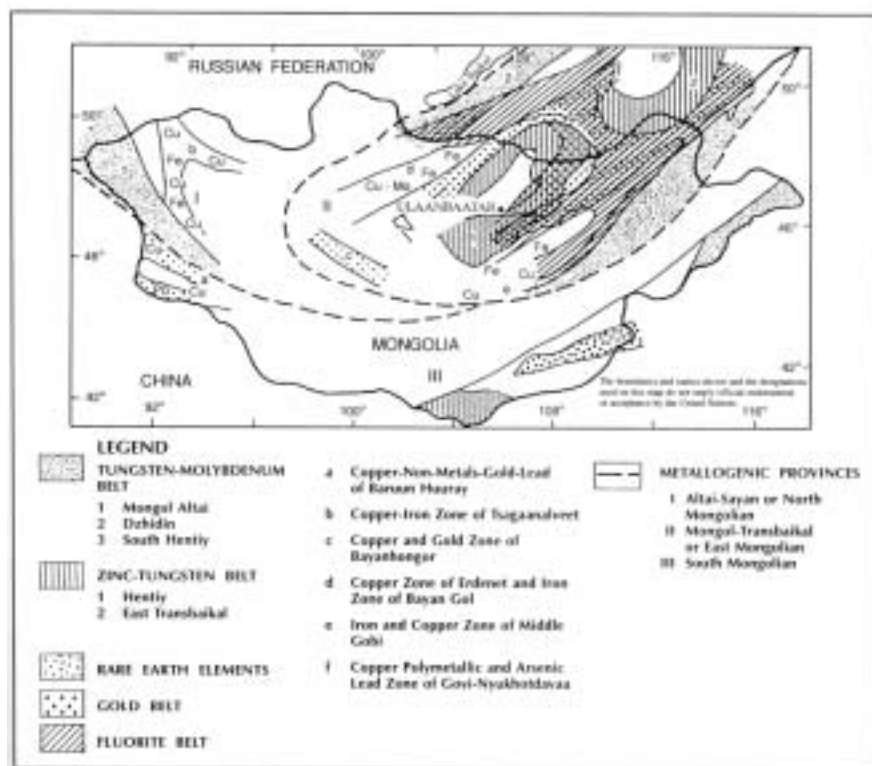


Fig. 3. Metallogenic divisions of Mongolia (Source: United Nations (1999))

b. Gold occurrences in Mongolia

Gold mineralization on Mongolian territory has occurred with varying intensity during the late Precambrian, early Cambrian, Paleozoic, Mesozoic and Cenozoic time periods. However the most significant gold mineralization is associated with magnetic activity during Permian, Trias-

sic, and Jurassic time periods. Placer gold deposits were formed during the Cretaceous, Neogene, Pliocene, and Holocene time periods.

The known economically significant gold mineralizations in Mongolia occur in three deposit types: veins, mineralized zones, and placers. Although vein occurrences are the most widespread all gold deposit types, the bulk of proven recoverable gold reserves are associated with mineralized zones and placer deposits (Fig. 4).

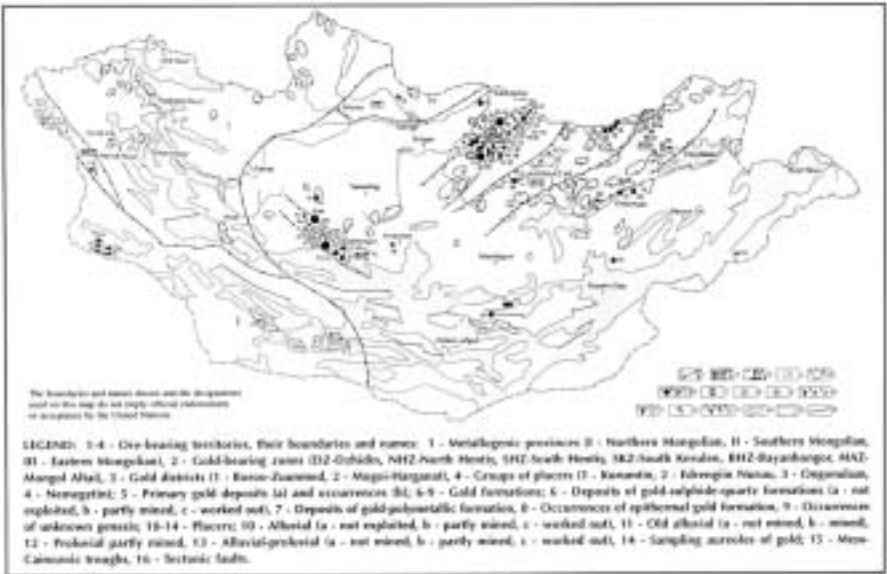


Fig. 4. Schematic metallogenic zoning and distribution of gold deposits and occurrences in Mongolia (Source: Marinov, N. A., R. A. Hasin, and Ch. Hurz (1977))

On the basis of geological data ten main gold metallogenic provinces have been delineated within Mongolia. However true gold potential of the western and southern regions of Mongolia is largely conjectural due to the fact that to date little detailed geological exploration has been conducted in these regions. Emphasis of geological exploration in these areas has only focused on placer deposits and quartz vein mineralization.

Nevertheless, the number of occurrences determined based on limited data clearly suggests a high gold potential overall for the region (Fig. 5).

Additionally, available geologic data indicate that as yet undiscovered

occurrences gold will likely be found in the following geological formations:

- (a) Gold-bearing conglomerates of Cretaceous and Tertiary age expected in southern and western Mongolia.
- (b) Gold mineralization associated with ancient volcano-sedimentary areas in Central Mongolia.
- (c) Ancient epithermal gold occurrences (island arc associations) expected in the Kharkhira, Ulzeet, and Southern Mongolian gold provinces.

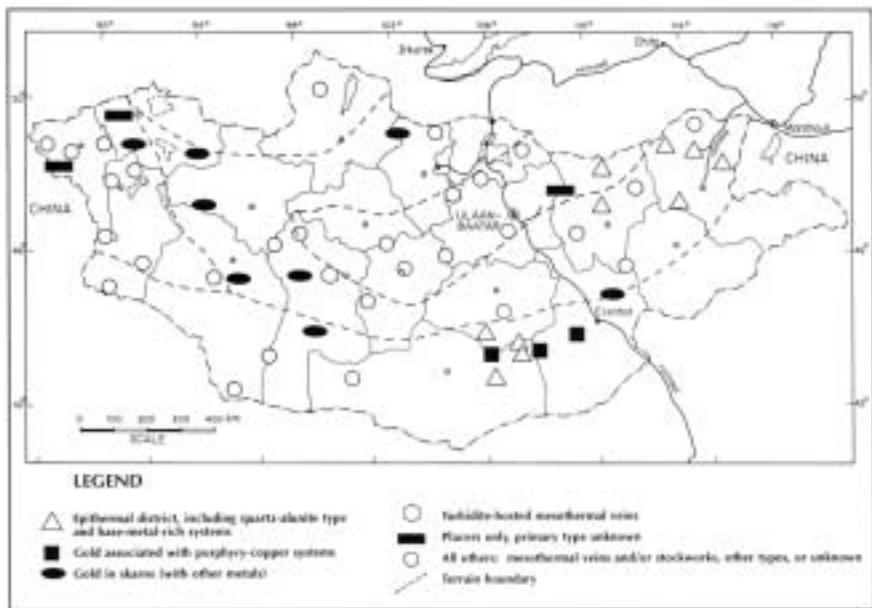


Fig. 5. Gold metallogeny of Mongolia (Source: Dejidmaa, G. (1996))

c. Main gold deposits in Mongolia

Hailast placer gold deposit: The Hailast placer gold deposit is located in the Boroo-Zuunmod and Zaamar gold district, 220 km west of Ulaanbaatar, and is the largest and most studied placer deposit in the district (Fig. 6). The deposit lies in a tributary drainage of the Tuul River Valley, which drains the northwestern slopes of the Zaamar-Nuruu range. The drainage has a total length of 14 km and an average width of 300 to 500 m. Fill in the drainage varies from 15 to 30 m in thickness, and is composed

of alluvial and colluvial rubble-clay deposits 1 to 10 m thick, which are underlain by 5 to 20 m of yellow and red Quaternary gravels interbedded with sand, loam, and clay (website of Mineral Resources Authority of Mongolia, 2004).

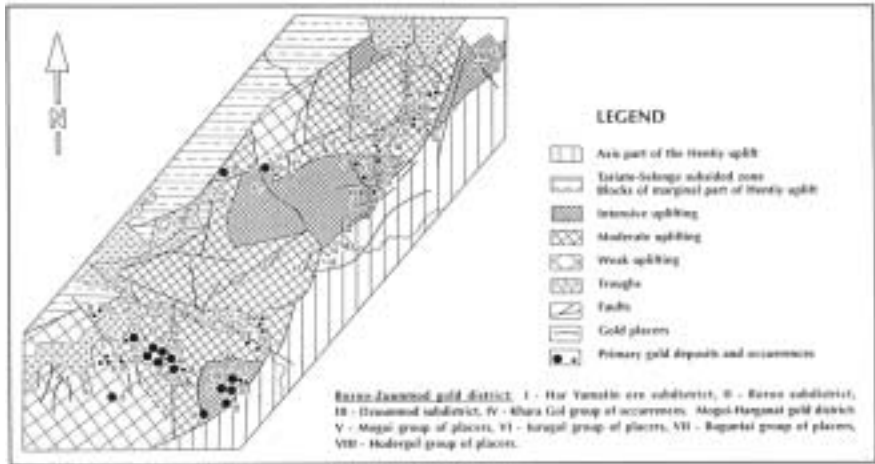
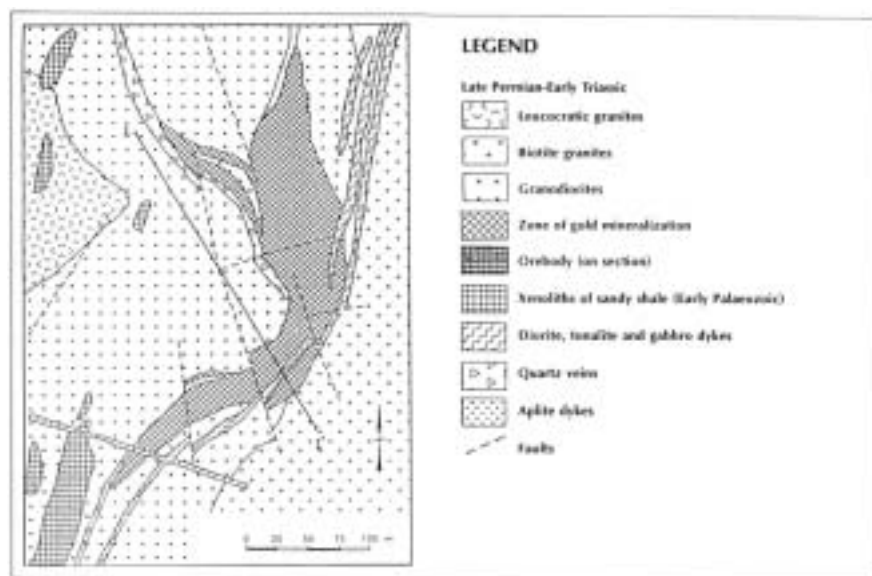


Fig. 6. Distribution of primary and placer gold deposits and occurrences within morpho-structures of the northern Hentii gold-bearing zone (Source: Marinov, N. A., R. A. Hasin, and Ch. Hurz (1977))

Two paystreaks are defined in the vertical cross-section of the Hailast valley. The lower pay-streak occurs in the near-bedrock portion of the valley, is persistent in thickness, extent and width, and is the main placer gold bearing zone. This streak has an average grade of 1-1.5 g/m³ and approximately 10 metric tons of reserves. The upper "suspended" pay-streak occurs in grey-colored alluvium and has no economic value due to its discontinuity. The placer gold is coarse to medium in size with tabular and sheet-like particles prevailing. This deposit has been mined continuously since 1994 by the state owned company (website of Mineral Resources Authority of Mongolia, 2004).

Boroo hard rock gold deposit: The Boroo hard rock gold deposit is located 150 km north of Ulaanbaatar and 24 km from the railroad station at Baruun-Haraa. Gold mineralization in this deposited is associated with zones of intense hydrothermal alteration (chloritization, albitization and

beresitization) occurring at the contacts of late Permian to early Triassic leucocratic and biotite granites and the sandy-flysch sequences of the lower Paleozoic Kharin Group (Fig. 7).



ivers and 1.5 million hectares of standing water bodies. The majority of all water resources are found within 30% of Mongolia's territory. Mongolians depend on surface and ground water for drinking water (Fig. 8).

Mongolia's rivers and lakes are popular destinations for both national and international tourists. Water pollution from industries such as tanneries and mining are increasing at an alarming rate. Wastewater treatment plants are not sufficient to treat all the anticipated increases in polluted water. Logging and grazing also continue to negatively impact water resources contributing to land degradation and desertification.



Fig. 8. Administrative units map of Mongolia.

The most pressing challenge to which Mongolia faces is 1) how to control damages to watershed values (surface and ground water) caused by polluting industries (i.e., mining and tanneries), and 2) how to ensure that water supplies will last into the foreseeable future. A brief look at the salient issues follows:

Mining: Open-cast gold mining, especially the increased use of mercury for hard rock mining, presents a growing problem for Mongolia's water-courses. Among the list of negative impacts are 1) deforestation and decrease of available grazing areas; 2) drying up of waterways; 3) increased sediment loads that impact drinking water, water for livestock and agricultural as well as a number of impacts on river ecology; and 4) polluted waters no longer suitable for any use. The increasing use of mercury has

brought the threat of Minamata disease to Mongolia's doorstep.

Grazing: Rural area grazing patterns are in part affected by the loss of engineered and deep-water wells. From 1990 to 2000, estimates show that about two-thirds of all engineered wells ceased to operate (Table 1). Agricultural, rural residential and industrial uses of groundwater in Gobi, western and eastern Mongolia are contributing to low water table levels and increasing salinization. Of the approximately 35,000 wells constructed before 1990, it was estimated that at least 60% were no longer functioning by 2000. Since then, several donor-funded projects have been attempting to restore wells, combined with pasture management regimes, and thereby ensure a degree of sustainable use. In 2002, a total of 307 wells were rehabilitated and in 2003, a total of 468 wells.

Table 1. Well Status in Rural Mongolia

Well Type	Year	
	1990	2000
Engineered Wells	24,600	8,200
Simple Sunk Wells	17,000	22,700
Total	41,600	30,000
Watering Troughs	4,100	1,000
Well Capacity (m ³)	39,400	14,900
Wells on Pastureland	38,300	21,700
Unused wells	1,100	5,800
Wells on other land	2,200	2,500

Water supply: The rapid decline in water supply infrastructure remains a significant problem which has been only partially offset by international assistance (JICA and France). Wastage of water is chronic throughout the system. In the absence of adequate pricing mechanisms, city dwellers simply do not have the incentive to conserve water or repair failing plumbing systems. Ulaanbaatar's apartment dwellers account for approximately half of the entire population and consume the better part of the daily supply (Table 2) with an average daily consumption of 0.4 m³ per capita. This is almost double the daily usage in the U.S. and 40 times the estimated daily per capita consumption in the *ger* districts – 0.01m³.

It is estimated that in Ulaanbaatar, water wastage in apartments rises

amounts to 60 percent of the total used. In addition to loss of the water resources, this waste also overloads the sewage system and more than doubles the electricity requirements for operating the water supply pumps.

Table 2. Water Consumption, Tariffs, and Revenue in Ulaanbaatar, 2001.

Water Consumers	Water Volume Consumed		Waste Water		Fresh Water	
	$10^3 m^3$	(%) of total	Tariff (tg/m ³)	Revenue (tg mil.)	Tariff (tg/m ³)	Revenue (tg mil.)
Apartments	47,888.0	79.7	110	5,268	186	8,907
State Organizations	4,588.2	7.6	115	528	200	9,189
Private Organizations	4,403.6	7.3	115	506	200	881
Factories	2,715.7	4.5	115	312	200	543
Ger districts	454.3	0.8	0	0	400	182
Total	60,049.8	100.0		6,614	190	11,431
Others/Losses	2,013.5					
Grand Total	62,063.3					

Not captured by these statistics is water use by large companies in Ulaanbaatar that have drilled their own wells and thereby circumnavigated the requirement to pay water tariffs.

Prior international donor support for water management (WASH-21) directed attention at decentralized clean water supply and sanitation needs of families in low income *Soums* (70) and peri-urban areas in eleven *Aimags* in the Gobi region.

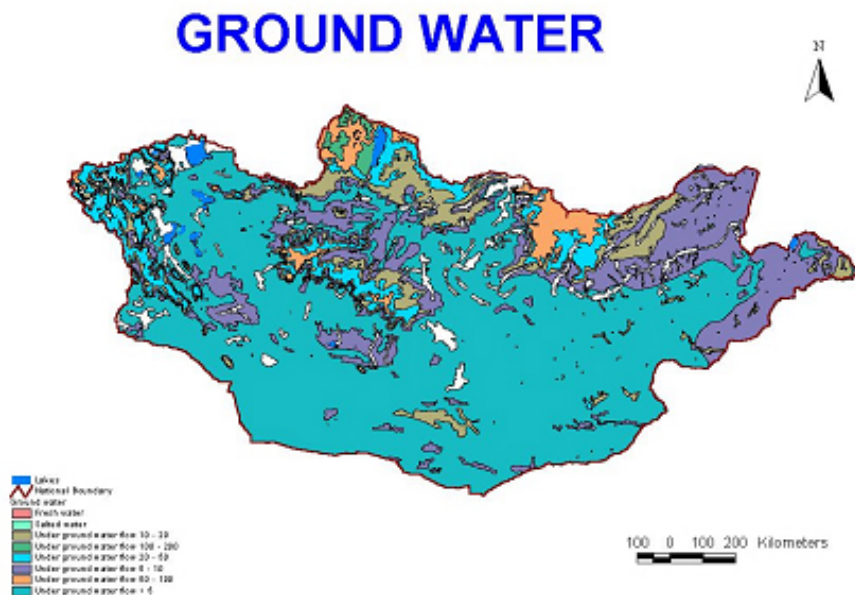


Fig. 9. Groundwater map of Mongolia

b. Regulatory and institutional analysis

Recognizing that water plays the vital role in Mongolia's environment and economy, the Cabinet Ministry has declared the year 2004 as the Year of Water. Much is being done as a result. Mongolia's National Water Program sets the overall tone for water management. It is an interesting document, one main goal being to increase the use of surface water and reduce "wasted" outflow from Mongolia (referred to by some as "unpatriotic water"). The implication is a shift in focus to the development of the country's water storage infrastructure, dams and reservoirs. The impact of such development on water quality has not yet been fully analyzed. Other areas of concern include transboundary water management, water supply and conservation, water legislation, and management structures.

The Government of Mongolia has also started a legislative initiative to restructure water policy on a watershed basis. Not the first look at watershed management, such programming began as early 1974 for the nation and was supplemented by six watershed management plans from

1980 to 1990. The 1995 Water Law made only cursory reference to these plans, focusing primarily on the establishment of three water zones (protected, sanitary, and community), determination of the maximum quantity that may be used, and the establishment of a contract mechanism to approve uses.

By all accounts, water zones were unsuccessful as a regulatory mechanism first and foremost because they were never mapped or introduced at the community level. Officials interviewed by the authors were vaguely familiar with the existence of zoning, but were not certain what zones were in their area and had never seen a map showing such zones. The Computer and Information Department within Hydrometeorological and Environmental Monitoring Agency (HMEMA) has the GIS capacity to perform much of the mapping prescribed by the law without significant field work, but has never received a budget for this type of activity.

The new Water Law no longer references water zones and instead relies upon environmental impact assessments and basic protection requirements within the law to describe any mitigation or environmental constraints.

Contracting for industrial water uses remains a significant feature in the proposed amendments with some substantive and procedural changes. Both versions of the law require the project proponent to first conduct an environmental impact assessment and then submit their proposal to the local Soum or Duureg (county) governor. This procedure has the advantage of providing full information to the local governor, however may place an unnecessary burden on project proponents by requiring a full EIA before an initial assessment has been conducted. Some projects may not have sufficient size or potential impacts to warrant a full EIA.

As of 2002, the MNE's Nature, Forest and Water Resources Agency assumed the role of national coordination and monitoring of the water resources, while governor's offices at the local level continue to be responsible for water supply and waste water discharge and treatment. In addition, the new law will establish a Watershed Board with several important management and enforcement functions including 1) monitor compliance with contractual, legal, and EIA requirements, 2) prepare and submit watershed plans covering use, protection, and rehabilitation for approval by local *Khurals*, 3) ensure compliance with protection and sanitary zone requirements, 4) participate in local protection efforts, 5) enjoin any activity in violation of established requirements or causing negative impacts, 6) seek additional remedies in consultation with local *Khurals* and Gover-

nors, and 7) provide professional assistance to end users.

The Ikh Khural is currently considering a draft Wastewater Discharge Fee Law that attempts to establish pollution charges based on the quantity of discharges by different classes of users. This law represents a step in the right direction, but assessments indicate that effective introduction of such charges will be hampered by insufficient and unreliable monitoring mechanisms.

3. Environmental status related to gold deposits

A. Environmental roles of relevant authorities for gold mining industries

It is noticed that in Mongolia, all of the affairs related to environmental problems are directly controlled by Prime Minister. The Prime Minister designates a director for the environment-specialized inspection agency, and the director inclusively manages all kinds of environmental affairs in the domestic industries. The director of the agency allots the environmental works to each Aimag and Soum inspectors, and the EMS and EIA of local development project, including gold mine deposits, should be reviewed by corresponding Aimag or Soum inspectors.

Fig. 10 shows the organization schemes for governmental authorities that are concerned with the environmental affairs of Mongolia.

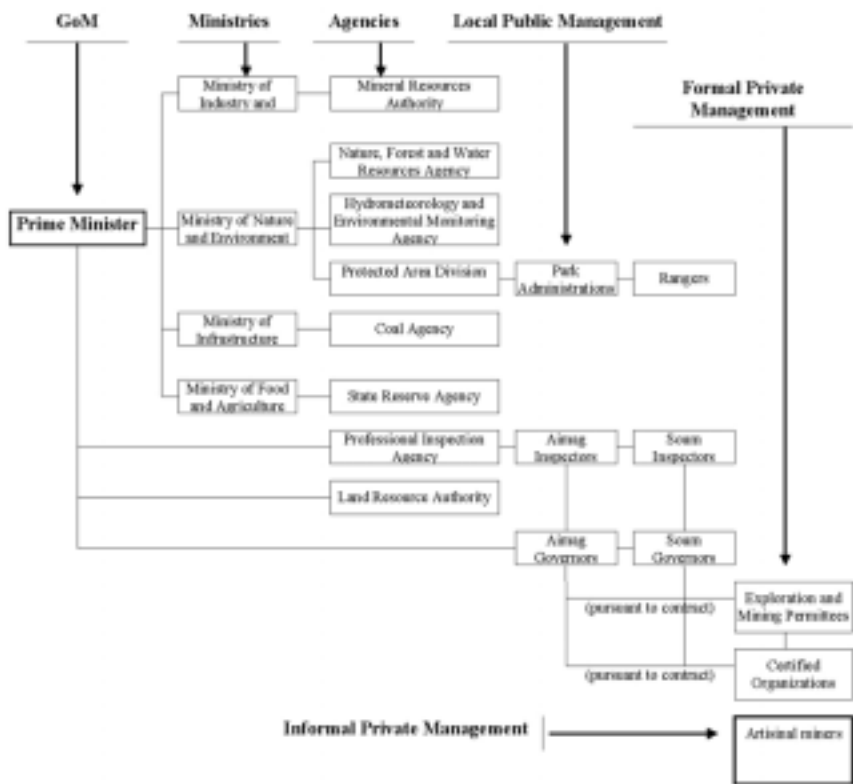


Fig. 10. Institutional framework for mining and environment of Mongolia.

Since the new Minerals Law of Mongolia has been adopted in 1997, the mineral sector has recorded a significant increase in mineral exploration, and presently more 29.9% of the Mongolia's territory has been licensed for exploration and mining. The entire article of the new Minerals Law is shown in Appendix 4. In the Minerals Law, there are some articles related to the environmental protection during exploration or mining development, which are as follows:

- Mineral license application can be rejected if the requested area entirely or partially overlaps with a special protected area (e.g. national parks, national reserves, and monuments) and special needs land (e.g. areas protected by local or provincial government)

- Mineral license holders are required to submit their operational plans and work reports solely for the purposes of informational reporting and environmental oversight.

B. Main environmental issues in placer gold mining deposits

The full spectrum of environmental impacts associated with mining have only lately found their way into internal management discourse. According to previous studies, EIA is focusing on more conventional concerns such as land disturbance, compliance with rehabilitation provisions, and conditions of mine tailings and tailing dams in principal production facilities.

Specialized reports document different classes of environmental impacts based on mining type. Generally, most of Mongolia's mines are surface (placer, open-cast, open pit), requiring excavation and/or washing of metal-bearing sands, and resulting in major disturbance of the landscape.

Because placer and open-cast mines cannot operate in water deficient areas, these are restricted mostly in the northern sections of the country and in the absence of methods to melt water and unfreeze the ground, are usually closed for the winter months.

Placer gold mining involves some disturbance of the surface and underlying strata, including groundwater aquifers. It differs from most other forms of mining in the scale, intensity and speed of its environmental impacts. This is due to most placers in Mongolia being long, thin and narrow, and deposited along the axis of valleys. Accordingly, even a small placer mine in terms of gold production may swiftly destroy several kilometres of valley floor, including the most important pasture for livestock and wildlife, by a combination of open pits, spoil mounds and haul roads.

Exploration impacts for placer mining in Mongolia can sometimes be severe and long-term. This is because of the requirement to disturb thousands of kilometres of valley floors, including floodplains and terraces by exploration activity. Even riverbeds are drilled as a matter of routine, sufficient to disrupt perched aquifers and contribute to a general drying out of terraces and marginal wetlands, and a loss of surface streams. Drilling in the beds of rivers in winter may have some impact on the river fauna and flora and on water quality but no studies have been done. Of more concern is the tendency to leave drill-holes and prospect shafts open after exploration has ceased, and these constitute a long-term threat to fauna, large and small, being pitfall traps. Examples are known of pros-

pect pits remaining open for several decades.

Placer gold mining destroys large areas of ground surface, due to its large requirement for large areas of land for open pit excavation, dumping of waste materials outside the pit, tailings ponds, water reservoirs, river diversions, and mine-camp facilities. Destruction of valley floor grazing important for pastoral nomads, and destruction of valley floor wetlands important for biodiversity are among the main risks.

a. Mineral resource impact

Placer gold mining causes environmental impacts to consume a finite mineral resource. Very few of the placer gold miners achieve more than 50% gold recovery. Therefore, an environmentalist might argue that the destruction of so much land, and such large impacts, is too high a price for recovering so little gold. Yet if more gold was recovered then rather than destruction of land decreasing, the company may increase its gold production. But it is generally true that high % gold recovery will stimulate better reclamation. A mine operator might argue that the company cannot afford the technology to recovery a higher percentage of the gold, and that the placer mining companies are proving additional placer gold resources by their drilling efforts. The national total of known placer gold reserves is dropping and expected to drop further. This fall is due to very large placer reserves proved by the soviet command economy that have still not yet been fully consumed, and the reluctance of placer gold companies to incur heavy expenditure to prove reserves for more than a few years ahead of their needs. The continuing fall in the State Balance of placer gold reserves is not regarded as being a serious issue, but clearly at some point in the future the placer gold industry must contract in size and ultimately disappear.

b. Archaeological and cultural impact

Losses of archeological remains are considerable, but undocumented. Large amounts of archeological remains are destroyed, disturbed or buried by placer mining. Archeological surveys by field-walking are rarely undertaken as part of EIAs. No 'rescue' archeology is undertaken before archeological sites are destroyed. Mining does not stop if archeological remains are encountered. Sites of cultural significance are occasionally destroyed.

c. Nature conservation impact

Impacts on sites of nature conservation value are substantial, including destruction of land surfaces of valley floors (floodplains), valley sides (terraces) and side valleys from placer mining along many hundreds of kilometres of valleys, with loss or severe degradation of scarce wetlands, riverside forests, lush grasslands, wildlife corridors, and forest margins. Sites of local or regional wildlife importance have no statutory protection and are lost. Ecological surveys for EIAs are incomplete and generalized. Translocation of important plants and animals is not attempted. Topsoil is rarely stored and re-spread. Surface waters muddied, eliminating some fish and invertebrates. Streams and rivers channeled, destroying naturalness and geomorphological interest. Permafrost is damaged posing long-term impacts to local forest cover and hydrology. Widespread disturbance to wildlife occurs due to:

- cutting of access roads and haul roads plus multi-tracking;
- light pollution;
- noise and vibration;
- dust;
- increased risk of fires;
- miners engaging in collection of berries, nuts and herbs;
- miners engaged in hunting and fishing.

Some Red Book species are at special risk of local extinction. If the mine-site is rehabilitated, then net land-raising occurs, encouraging loss of wildlife interest by increased aridity and wind erosion. Some 37 Red Data species are at risk of local extinction from placer mining.

d. Livestock impact

Livestock and traditional semi-nomadic animal husbandry are badly affected. Lush grasslands along many hundreds of kilometres of valley floor have been destroyed or damaged by placer mining, due to placers typically being below the wettest grasslands. Livestock access to rivers and streams for drinking or cooling is difficult due to the physical barriers posed by waste mounds, pits, mine camps, river diversion channels etc. The presence of large numbers of miners disturbs the herds/flocks. The presence of large numbers of miners and vehicles makes livestock security difficult. Placer mining has contributed to loss of permanent streams and rivers due to punctured permafrost permitting surface water to disappear underground, water loss by evaporation from the spray of water cannons, and losses from tailings ponds by evaporation and leakage. Some traditional watering places have been destroyed due to drying up

and/or the streams becoming very muddy with suspended sediment. Livestock in some areas is threatened by toxic mercury poisoning due to historical use of mercury in mining and by mercury being re-mined illegally by ninjas – and in a few instances used illegally by placer mining companies.

e. Farming impact

Arable land is rarely required for placer mining, but is still affected locally. When arable land is destroyed, topsoil is not conserved and the site is not properly reclaimed - but it is noteworthy that Mongolia has a very large surplus of arable land. Arable farming in some areas is threatened by toxic mercury in crop irrigation waters due to historical use of mercury in mining and by mercury being re-mined illegally by ninjas – and in a few instances used illegally by placer mining companies. Unreclaimed placer mines are a source of 'weeds' that may invade arable land.

f. Forestry impact

Forests are under pressure from placer gold mines by:

- Roads and haul roads open up new regions to logging activity and pine nut collection;
- Destruction of forests directly above the pay-gravel;
- Rehabilitation of the forests is undertaken poorly, or not at all;
- Destruction of permafrost beneath valley floors, creating a risk of loss of surface streams;
- Increased risk of forest fires due to the increase in human disturbance, accidental fires and the temptation the casting aside of large volumes of unsellable brushwood.

g. Water general impact

Major degradation of water resources is possible due to contamination of surface water and/or groundwater by uncontrolled discharges, draw-down of groundwater levels leading to the drying up of wells, and diversion or damming of surface watercourses. Placer mines use artificial ponds for storage of process water and disposal of tailings. Such ponds are often poorly engineered, with a high risk of collapse once the tailings pond is full of water and the dam materials and dam foundations have become wet and soft. Then dams may leak slurry and contaminated water, or suddenly collapse and disgorge their contents into the nearest river

or stream.

Groundwater can be seriously affected by placer mining. Lowering of groundwater is a typical impact of placer mining, posing a serious environmental threat to wetlands of high wildlife value and good pasture for livestock and large fauna. Excavating a pit may cause the dewatering of perched aquifers and a general lowering of the water table beneath the pit and for a considerable distance behind the pit faces. Groundwater may flood a pit, stimulating the mine operator to dewater the pit by cutting a drainage channel to allow accumulated water to be released to a water-course, lowering the water table accordingly. Active pumping of water from a pit has essentially the same effect, but only during pumping, followed by rebound of the water table. Active pumping causes a draw-down of the water table as a cone-of-exhaustion. All wetlands and shallow wells in the cone-of-exhaustion are at risk of drying up. This may have an impact on villages and areas of importance for livestock rearing, arable crops and biodiversity. Deep groundwater of complex chemistry may be drawn upwards by pumping from the water abstraction well with immediate negative impact on water quality, and possible long-term or permanent damage to the aquifer. In semi-arid to arid regions of Mongolia, intensive pumping for placer gold mines is alleged to have caused a fall in the general water-table sufficient to cause the drying up of surface streams and rivers.

h. Impact of heavy metals

Waste rock and tailings should not normally contain heavy metals, but if they do, then the effects may be severe. Probability of heavy metals is increased if the placer mine is on or near to bedrock rich in hard-rock metals, especially if the pay-gravel is colluvial close to the gold source. If abundant heavy minerals are present, then any runoff or leakage from the tailings dam may contain high concentrations of these elements and be of extreme pH and pose a particular threat to the aquatic environment and soil as a result.

i. Process reagents impact

Usually, no process reagents such as cyanide or mercury are required in placer gold mining. However, disturbance of old process reagents is now significant. Placer gold mines are increasing active in areas of historical gold mining (open-pit placer, underground placer, open-pit hard-rock, underground hard-rock, hard-rock crushing sites, hard-rock milling

sites, placer sluicing and amalgamation sites, hard-rock sluicing and amalgamation sites, gold smelting sites etc). In northern Mongolia, several active placer gold mines are encountering, knowingly or unknowingly, tailings, waste and water with high mercury content posing a risk to the environment and to human health. In these locations, any runoff or leakage from the tailings dam may contain high concentrations of remobilised mercury and pose a particular threat to the aquatic environment and soil as a result. Some placer mines in Mongolia have recently had enforcement action against them for using mercury to assist gold recovery, and these mine sites are contaminated with mercury in the soil, tailings and in effluent discharges. Surfactant reagents are not necessary and are not used, but some foreign mines use surfactants to disaggregate clays in sluices, and this may become an environmental issue in Mongolia. If process reagents were to be used, then any runoff or leakage from the tailings dam may contain high concentrations of these reagents and pose a particular threat to the aquatic environment and soil as a result.

j. Visual impact

Visual intrusion by placer gold mines is considerable and increasing. The area of loss of visual amenity is not only the hundreds of kilometres of valleys dominated by pits, mounds and ponds, but also by the mine camps, haul roads, access roads, overhead electricity lines and river diversions. The importance of loss of visual amenity is aggravated as the original landforms possessed a high degree of naturalness, with intact terraces and floodplains dominated by unmodified unconstrained meandering rivers and streams. The scale of loss of visual amenity is most severe in the steppe zone, whose grasslands provide no visual screening of placer mines, whereas in the forest zone placer mines may be effectively concealed by steep hillsides clothed in forests.

k. Health impact by artisanal mining

An additional concern of cumulative environmental impact of placer gold mining is raised, pointing to the health and environmental threats posed by artisanal miners called *ninjas* (Fig. 11). The possible use of mercury may present an extreme environmental hazard and prolonged exposure causes Minamata disease, a serious and potentially fatal neurological disorder. The “upside” of ninja mining and an only nascent understanding of the impacts of mercury may explain at least in part the reason small-scale mining has not yet been incorporated into the existing

regulatory framework, having already been identified several years earlier. Because artisanal mining focuses primarily on already damaged areas, the incremental impacts of this activity are considered relatively minor, more concern being given to health and welfare aspects.

(a)



(b)



Fig. 11. Artisanal illegal miners working near a dry channel.

C. Field studies in the placer gold deposits

a. Zamaar placer gold mining

General information: The Zamaar gold placer district is located nearly 240 km west of Ulaanbaatar on the border of the Tuv and Bulgan Aimags. The mining district is situated in grassy pastureland on banks of the Tuul River and its tributaries. Presently, 36 companies operate gold placer mines in the Zamaar district along a zone approximately 20 km long. Gold at Zamaar occurs as particles in sands and gravels in widespread placer deposits.

One of the largest placer gold mining companies in the Hailast placer gold deposit area is Shijiir Alt Ltd. (= 'Fine Gold') which is located by the Tuul River (Fig. 12). It belongs to the Bayankhongor metallogenic Province (Fig. 13). Shijiir Alt Ltd. was established on September 1995 as a joint venture between Mongolia and Russia. The company began its operations in the Zamaar Goldfield on October 1995 and has estimated reserves until year 2019. Over 1 ton of gold is produced yearly, and is eventually exported to Japan for refining. The mining operations include mechanical separation of gold with a bucket-line dredge and at least two water washing tools with pressurized water spraying. The Shijiir Alt Ltd. Company has previously conducted an Environmental Impact Assessment (EIA) for its operations, which was approved by the Ministry of Nature and Environment. However, due to changes in the mining methods at the site, the company has been requested to conduct a new EIA.

The company currently operates two large dredges to mine placer gold from the floodplain and lowermost terraces of the Tuul River in the Baikal watershed (Fig. 14). A dredge was expected to produce an additional 500-600 kg of gold in 2001, and probably more in 2002 and onwards. From 1995 to present, the company produced a total of about 11 tons of gold and is currently extracting about 3 tons per year. It will continue operation of excavating about 4 million tons of gold-bearing soils and 1.5 million tons of the soils is being washed for extraction of gold.



Fig. 12. Administrative unit map of central Mongolia. The locations of the Shijir Alt Ltd. and Gurvan Dokhon Ltd. gold mining companies are indicated by arrows A and B, respectively.

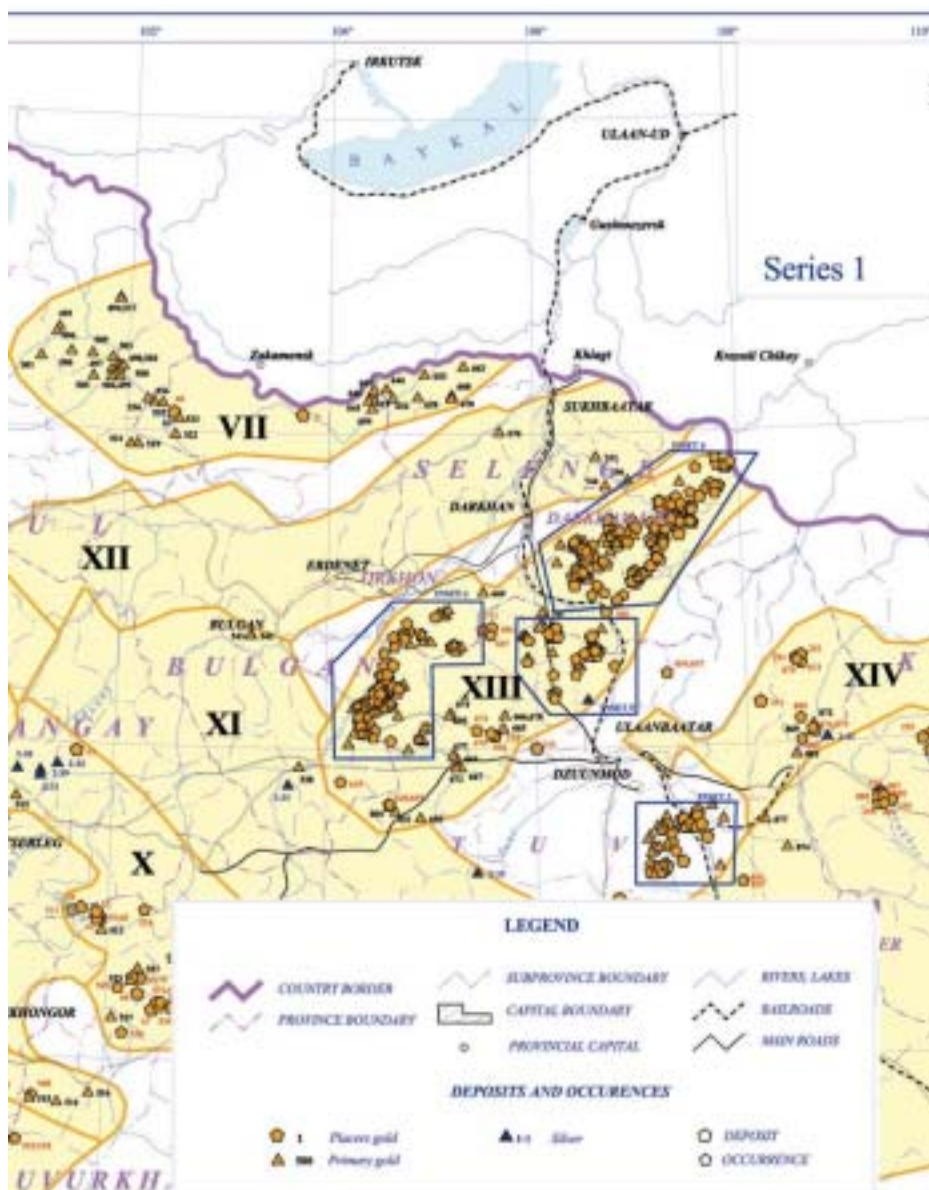


Fig. 13. Location of gold and silver deposits and occurrences in central Mongolia (after Geological Information Center, 2002).

Mining operation currently seems to result in a severe surface water contamination as well as destruction of land, which may ultimately affect the habitats for flora and fauna in downstream areas (Fig. 14). In mining areas along the Tuul River of tens of km long, most of river terraces were completely deteriorated to lose its original stream topographic shape. Piles-up of dumped soils are scattered everywhere and even the original channel direction was artificially changed because of haphazard excavation of soils during mining. The stream is so turbid by sediments and suspended soils that it may affect fish and benthic organisms (Fig. 14).

(a)



(b)



(c)



(d)



Fig. 14. Photographs of the Zamaar gold placer district. (a) A dredge operated by the Shijir Alt Ltd. along the Tuul River. (b) Destruction of the land by dumping soils after gold extraction. (c) A turbid stream caused by sediments and suspended solids produced during gold mining. (d) A downstream region away from the active mining area showing a relatively well persevered riparian environment. Compare with (b).

Water use, release and monitoring: The Zamaar area is in a semi-arid region with an average precipitation of 260 mm/year. The mining operations are on the banks of the Tuul River that drains into the Orkhon and Selenge Rivers, and eventually drains into Lake Baikal. Water for dredging and washing is taken from the Tuul River, ground water and from precipitation. The water consumption is not known or monitored. Reservoir ponds are constructed to insure a constant water supply for the mining operation. Because water is essential for gold mining operations, the mine is closed during the winter months due to ice. Water in the area is taken from groundwater wells.

During the dredging and washing process clay and silt sized particles are

suspended producing turbid, brown waters. These waters are detained in settling with filtration dams and are reused in the mining process. Direct release of water to the Tuul River is not allowed due to the risk of negative impacts on drinking water quality. The Tuul River has relatively high background turbidity and so turbidity is periodically monitored above and below the Zamaar mining operation by the Shijir Alt Ltd. Company. During periods of higher turbidity, as is often found during the summer months, the frequency of monitoring is increased although no action is implemented to reduce turbid water release. The impacts on aquatic or terrestrial wildlife due to higher turbidity of water releases are not known.

The total water consumption of the mining operation is not known, but water is lost both of the Tuul River and by direct evaporation from settling ponds, reservoir ponds exposed in unreclaimed areas. No regular monitoring of the ground is conducted at the Zamaar operation. The Hydrological Institute in Ulaanbaatar has conducted one groundwater study, although the conclusions of this report are not yet produced.

Land use and reclamation: The area of the Zamaar mining district is known as a fertile grazing area, most likely due to the significant water resources. Both mining and animal husbandry are the main occupations in the area.

Previously, the Tuul River area has been proposed as a "Protected River System". Only some minor areas in the Zamaar district have been reclaimed and replanted after mining. However, the re-establishment of vegetation appears to progress slowly.

Without reclamation the land has a limited potential for use. Non-reclaimed areas are inhospitable for animal husbandry and have geotechnical unstable slopes. In addition, non-grass weeds were found to flourish in unreclaimed areas further rendering the area inhospitable for animal husbandry. The reclamation of pits and ponds is also important to limit evaporation so that the groundwater resources may be protected. Overburden and soils, which are stripped during the mining operation, could be beneficially used during reclamation to provide more fertile soils to the washed sands and gravels. The riparian habitat along the banks of the Tuul River is destroyed during placer mining operations. This ecological zone is important for supporting aquatic and terrestrial wildlife, flood control and water storage especially during dry years. Reclamation efforts should also include restoring this zone.

Socio-economic impacts in Zamaar: The Shijir Alt Ltd. Company employs 500 people. The employees live within a permanent company settlement (population ca. 15 basic services such as schooling and health care are available). The mine company said that some local residents complain that the mining takes important pastureland and that they don't earn anything from the mining activity. However, the company argues that the mining company employs around 100 local people.

b. Placer gold deposits near South Khentii Metallogenic Province

At about 50km southeast of Ulaanbaatar in the Dzuunmod region of Central Mongolia, two or three sets of dry channels run sub-parallel to the NW-SE highway connected from Ulaanbaatar. The channels are accompanied by wide distribution of alluvial and colluvial deposits bearing placer gold. Lots of small- to medium-sized placer gold mines are located along those dry channels. It belongs to the South Khentii Metallogenic Province (Fig. 13). Gurvan Dokhon Ltd. is one of the major gold mines in that region and operates a placer gold mine near Arkhust (Figs. 12 and 13). The mine has been operating since 1993 covering an area of over 8 hectares so far. In 2000, the company had nationally been ranked as the 29th in gold production which was 66kg of gold per year (Eco Minex International, 2003). The area covers 3.5km long and 250-300m wide along a dried channel. The water needed for washing soils is supplied from 3 groundwater wells.

In this mine, a rehabilitation process for disturbed land has been conducting contemporaneous with gold-extracting work. A total of 6 hectares of land disturbed by removal of topsoil and excavation of gold-bearing sediments for extraction has been rehabilitated (Fig. 15). As gold is extracted from a sediment strata located 0.6 – 1.5m below topsoil, about 1m thick of the topsoil is removed first and stored in nearby place temporarily in order to rehabilitate mined area later. The topsoil has an important role, particularly in maximizing the return of original species because it contains the same seed resources with surrounding natural area.

(a)



(b)



(c)



(d)



Fig. 15. Photographs of a placer gold mine operated by the Gurvan Dokhon Ltd. (a) Area currently being excavated. (b) Soils are being washed mechanically using groundwater. (c) Rehabilitated area after 3 years. The density of grass is getting increased. (d) Topsoil removed by shovel machine. Placer gold is mainly included in the yellow sediment layer below topsoil.

4. Case studies on the environmental management systems (EMSs) of developed countries

A. Cases of EMSs in abandoned metal mines in Korea

a. Background and status of the abandoned mines problems in Korea

Mining had been a major activity in Korea during early 20th century. When minerals and energy resources were being developed and exploited over forty years ago, environmental issues were not a major consideration for the resources sector or the community. Examples of environmental damage from the old mining activities are numerous.

In central and southwestern part of Korea, scattered mine tailing, drained water from mine gallery, and dumped debris from metal mines which were abandoned before 1970 have caused the pollution of adjacent agricultural lands, stream and river water, groundwater, and even crops which were produced in that contaminated soil. That fact raised one of the biggest environmental problems in the rural areas of Korea. Ministry of Environment is conducting ongoing programs to rehabilitate these abandoned mines since 1990s. Especially, most of the abandoned metal mines in Korea show common characteristic of underground hard rock gallery mining type associated with hydrothermal precipitation of Jurassic or Cretaceous plutonic activities. Toxic elements such as cadmium, arsenic, lead and zinc are apt to be leached from galley wall or dumped gangue, and drained into natural water system.

Therefore, relevant authorities of Korean government such as Ministry of Environment (MOE), Ministry of Commerce, Industry and Energy (MOCIE) and Ministry of Agriculture and Forestry (MOAF) began to perform the accurate investigation of the soil environment near the areas of abandoned mines from 1992 and decided to carry out the soil remediation in which the pollution degree was comparatively serious.

In 1996, MOCIE transferred the situation of 906 abandoned metal mines

to MOE, and MOE experts analyzed the situation data to grasp the actual environmental soil contamination near abandoned metal mines. In 1997, MOE experts performed the actual environmental inspection of these abandoned mines located on corresponding provinces and selected 145 metal mines out of total 906 mines seriously apprehended in view of soil contamination. MOE established a detailed soil investigation plan for those metal mines. This investigation has been continuously progressed until 2003. As a result of the investigation of 145 metal mines, 92 abandoned metal mines, which exceed soil environment standards, were required to establish an appropriate remediation plan for the polluted soil environments of the metal mines. In addition, extra 64 abandoned mines plan to be investigated till 2006. Detailed distribution status about the investigated abandoned metal mines is shown in Table 3.



Fig. 16. Map of Korean peninsula.

Table 3. Status of the abandoned metal mines in Korea (# of mines).

Province	investi gated	stan- dard ex- ceeded	prevention project performed			re- main- ed
			MOE	MOCIE	Local Prov.	
Kangwon-Do	24	17	3	6	1	7
Kyonggi-Do	8	6	1	3		2
Kyongsangnam-Do	24	16	6	3		7
Kyongsangbuk-Do	33	24	11	4		9
Daegu	2	1	1			
Busan	2	1	1			
Chollanam-Do	11	7		4		3
Chollabuk-Do	10	6		1		5
Chungchongnam-Do	2	2	1	1		
Chungchongbuk-Do	29	12	1			11
Total	145	92	25	22	1	44
Expenses for Prevention Project (billion Won)			17.8	20.6	0.3	

According to the investigation results, 52%(48 sites) of 92 abandoned metal mines had been applied to the soil pollution prevention project until 2003, and the rest 48% still remain contaminated.

b. Main pollution sources of abandoned mines

The mining hazards causing various type of environmental pollutions are derived from different types of contamination sources. In Korea, since all the abandoned metal mines are highly associated with hard rock mining operation types showing oblique or horizontal gallery excavation features, most of environmental problems have been derived from mining drainage water. These problems commonly occur in the same types of the abandoned mines of North America (Hilson and Murck, 2001; Warhurst and Mitchell; 2000) and England (Younger et al., 2004). The abandoned metal mines in Korea show various geologic and geographical characteristics which is as follows:

- Most of the abandoned mines showed small-scale or artisanal operation type, in which the operation started during World War II and the mineral extraction were intensified within 10 years.
- Most of the abandoned mines are widely scattered throughout Korea, and their mineral occurrences show polymetallic (complex of high-quality gold, silver, lead, and zinc ore), and hydrothermal vein type deposits that are originated from Cretaceous plutonic magmatism.
- The degree of pollution is considered to be very serious at most of the metal mines, because they have been left contaminated more than 30 to 50 years without any ex post facto management.

The groundwater infiltrated from land surface and reached to the metal mine gallery has interacted with gallery wallrock or dumped gangue for a long time, and the dissolved toxic metallic or non-metallic elements from wallrock are consequently contained in the groundwater. This groundwater has continuously flown out to adjacent stream networks or soil as drainage water type, and plays the main role of soil and water pollution.

Since the closing period of the abandoned mines are mostly more than 30 years, detailed information and design data about the underground gallery networks are still unknown in many mines. This can be another sources of environmental problems by abandoned mines, because the vacant space below surface such as mine gallery can cause the instability of the ground near the mine area and resulting land subsidence or loss of polluted mine tailing.

The dumped gangue debris or contained mine tailing can also be sources

of the environmental pollution of the abandoned metal mine areas. Since gangue and tailing are produced as a kind of waste during metal extraction, toxic elements are included with considerable amounts. If mismanaged, contained toxic chemicals can be dissolved by rainfall and leached out to nearby soil and water bodies. The mismanagement of tailing can cause the spray of tailing dust by wind, and this can extend the range of pollution and induce more serious environmental problems.

c. EMSs for the abandoned mine areas in Korea

The strategy and plan for environmental management about abandoned metal mines are mainly designed and controlled by relevant government authorities, and the roles of each authorities for implementing the environmental management plans and systems are strictly allotted to three Ministries (MOE, MOCIE, and MOAF).

MOE establishes and promotes the overall plan for scientific investigation of pollution status about the abandoned metal mines distributed throughout whole provinces of Korea. The plan includes details about the required range of the countermeasure such as excess of environmental standards and analysis of the priority rank of the contaminated areas for the management system implementation. MOE must notify the investigation results of pollution status, opinions about the countermeasure establishment for soil pollution, and the present condition of performance of the soil contamination prevention project to the relevant authorities such as MOCIE and MOAF.

MOCIE designs the plan of mining hazard prevention project (mainly mine tailing containment and gallery backfilling) and actually carries out the project at selected mine areas showing serious pollution condition. In the contents of the mining hazard prevention project, MOCIE must reflect all the results of investigation and analysis which MOE has performed to the prevention project, and also include all the facts to cut off the environmental risks in terms of the abandoned mines. MOCIE must also notify the plan of mining hazard prevention project and the performance results of the projects (including completed projects) to MOE and MOAF.

MOAF is taking charge of the establishment of soil improvement project at the farmland near the abandoned mines. MOAF must reflect all the results of investigation and analysis which MOE has performed to the farmland improvement project, and promote this project with considering the progress condition of the mining hazard prevention project carried

out by MOCIE. MOAF must also notify the results of soil stability examination and the improvement performance such as spray of soil amendment agent and farmland soil mixing process to MOCIE and MOE. The organization and the role for EMS of the abandoned metal mine areas can be summarized in Fig. 17.

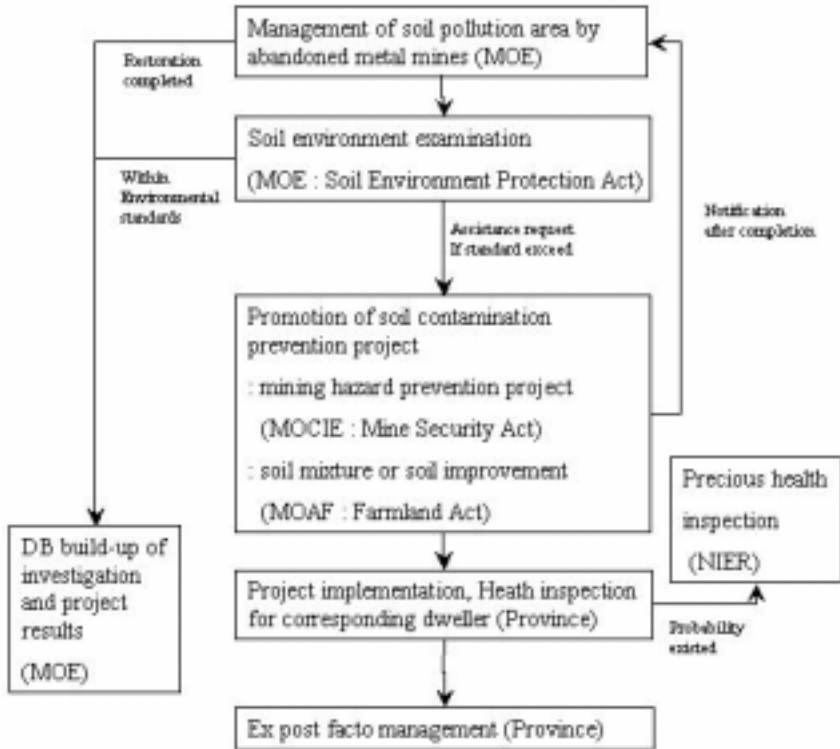


Fig. 17. Framework for EMS of the abandoned metal mines in Korea

d. Future improvement of Korea's EMS in mining

In spite of the implementation of EMS in abandoned mine area led by governmental authorities, a few problems to be solved in near future still exist. If these problems are revised within a short period of time, the EMS plan will be functioned more effectively.

- Inadequate grasp of precious condition of soil pollution about the whole abandoned metal mine areas
 - : Since unexpectedly more budget and time have been required during

the soil investigation, MOE has completed or plan to complete the detailed soil investigation at only 219 of total 906 mines, and rest 687 mines are remain unexamined.

- Excessive expenses for the mining hazard prevention project and consequent delay of the project progress
 - : The total expenses for the prevention project per one abandoned mine is 2.0 ~ 4.0 billion Korean Won (about US\$ 190,000 ~ 380,000). Therefore, this fact is regarded as main obstacle for stable guarantee of the project budget and depression for progressing the prevention project.
- Lack of special inspection about crop contamination and health risk assessment of dweller near the abandoned mine area
 - : The crops produced in the contaminated soil farmland may have accumulated toxic heavy metals in them, which can eventually threaten the health of corresponding dweller.
- Lack of ex post facto EMS plans responsible to local or provincial governments

B. Environmental Management System in Australia's mining industry

As the environment has been a major issue through the whole processes during mining including the exploration, development, operation, closure, and reclamation of the mine site, a proficiently prepared environmental management system (EMS) can be a useful tool for assisting mine management. It can meet both current and future environmental requirements and challenges as well. In this section, the EMS in Australia's mining industry, which is considered as one of the best EMSs in the world, is introduced. The main characteristics of Australia's EMS can be explained by Best Practice Environmental Management in Mining (BPEM) developed by Environment Australia (Environment Australia, 2002).

Australia is extensively dependent upon mining for its economics. Currently, a total of 47% of Australia's merchandise exports are related to mineral and energy, which has contributed more than SA 500 billion to the national wealth during last 20 years (Environment Australia, 2002). Mining has been a major resource for development of infrastructures such as roads, railways, ports and etc. However, with increasing mining activities together with development of infrastructures, a variety of adverse environmental impacts have become recognized. The well-known envi-

ronmental damages caused by mining activities are direct discharge of tailings into rivers, periodic flooding and escape of acid mine water, collapse of tailings and waste rock piles, and contamination of soils and the food chain from heavy metals and so on. Such impacts from mining in the early to mid twenties century are apparent not only for Australia but also all around the world.

a. Best Practice Environmental Management in Mining (BPEM)

Both the minerals industry in Australia and Environment Australia are co-working to share information on a variety of topics on best practice environmental management in Australia's minerals industry. They are publishing a series of booklets aimed at helping all parties of the minerals industry in order to protect the environment by reducing the adverse impacts caused by mineral production activities, to reach the principles of ecologically sustainable development. The Australian Government continues to develop the booklets on Best Practice Environmental Management in Mining to improve the level of understanding of how these concepts can be applied to the mining industry. BPEM also provides practical advice on management and operational methods to reduce the level of environmental harm from mining to acceptable levels. The topics include mine planning, operations and closure, dealing with management policies, objectives and systems, design principles, operational systems and technologies, monitoring, staff training and stakeholder interaction (Environment Australia, 2002).

BPEM in Mining programme, which currently has changed its name to Presently Sustainable Minerals Programme, helps to build the environmental management capacity of industry and regulators through its publication series. The series includes booklets, a training kit and checklists. BPEM or the Sustainable Minerals programme is a world-renowned partnership between the mining industry, stakeholder organizations and the Australian Government. It aims to help minerals industry to protect the environment and to reduce adverse impacts caused during producing minerals.

b. Environmental impacts in mining

Australia's BPEM in mining suggests detailed examples of possible environmental problems (Environmental Protection Agency, 1995). Potential impacts suggested from mining in Australia can probably be applicable to cases of Mongolia's gold deposits. Some of the most important impacts

are:

- Wind and water erosion (erosion may increase sediment loads and decrease water quality in streams, reduce the productivity of the soil and create a dust nuisance);
- Contamination of surface or ground water by sediment, mobilization of salt, release of toxic elements from overburden, tailings or wastes, or spills of oil, chemicals or fuel as surface runoff or as underground seepage;
- Changes to surface and ground water flows and levels;
- Damage to soils including salinization, acidification, pollution and compaction or loss of soil structure;
- Dust or noise nuisance, vibration and a reduction of visual landscape values;
- Generation of tailings and other wastes that may release toxic elements or be mobilized by erosive forces;
- Possible sudden failure of engineered containment structures such as tailings dam embankments, settling and holding ponds, resulting in release of high concentration/high volume contaminants;
- Acid mine drainage generated from tailings, ore and waste dumps, and old mining areas, which may be finally released into the environment;
- Loss of flora and fauna due to artificial changes in natural habitat;
- Damage to heritage sites; and
- Destruction of adjacent habitats arising from the development of camps, towns and services stimulated by the mining project.

c. Establishing Environmental Management System (EMS)

Mining may have substantial social impacts as well as the environmental impacts described above. For example, it causes land use conflicts with neighbors and local communities and debate on resource use issues. The potential for these impacts can be reduced by establishing properly designed environmental planning, management and rehabilitation processes. EMS can also help mining companies to reach its environmental objectives and targets, which is to protect the environment and to reduce the impacts of mining as well as to achieve the principles of ecologically sustainable development.

An Australia's EMS is required to set targets and objectives, and periodic review of progress towards those targets with adopting the three-part strategy. They are performance review, setting targets and objectives, and the implementation plan. This process has been done on a cyclic

basis in order for mining companies to achieve continuous improvement in environmental performance. 12 components of a well-established EMS for the mining industry in Australia are introduced together with brief summaries (*Sourced from Environmental Management System in BPEM in Mining: Environmental Management System*, Environmental Protection Agency, 1995).

1. Organizational commitment

: All levels within the organization will need to be committed to the EMS process.

2. Environmental Policy

: The corporate environmental policy is a concise public statement of the company's intentions with respect to the environment, which includes the environmental goals and level of performance the organization intends to maintain.

3. Environmental Impact Assessment

: EIA is the first stage in managing environmental issues on a site and assesses the potential impacts of the mine on the community and the environment.

4. Community Consultation

: Community consultation should be undertaken before, during and after a mine's operational life, in order to ensure that community concerns are adequately addressed.

5. Objectives and targets

: The mining company should develop a series of targets and long-term objectives to achieve the requirements resulted from the EIA, environmental audits recommendation and regulation.

6. Environmental management plan

: The environmental management plan details the methods and procedures which the mining company will use in achieving the stated environmental targets and objectives.

7. Documentation

: All environmental strategies, policies, responsibilities and procedures should be clearly documented.

8. Operational and emergency procedures

: In order to ensure that site operational and emergency procedures are environmentally compatible, it is necessary to identify, review and document procedures which may have an impact on the environment.

9. Responsibilities and reporting structure

: It is necessary to formally assign responsibilities to personnel with the

necessary knowledge and abilities in order to carry out the procedures and requirements in a timely and appropriate fashion.

10. Training

: Staff and operational personnel should undergo an environmental awareness course, which is a key area in an EMS.

11. Environmental impact, compliance and review audits

: Environmental audits identify existing and potential problems, assess the impacts of waste discharges on the environment and the community to gauge the level of environmental management on the site, and determine what action is needed to comply with regulatory requirements and company targets.

12. Emission and performance monitoring

: Regular reviews of the mining company's environmental performance are necessary during the operation and post-operation phases of a project to ensure procedures are appropriate, to satisfy due diligence requirements and to ensure environmental outcomes are being achieved.

d. Environmental Impact Assessment (EIA)

BPME in mining of Australia focuses on the principles of environment impact assessment and environmental management. Environmental impact assessment (EIA) is perhaps the most widely used environmental management tool in mining industries in which environmental factors are integrated into project planning and decision making processes. In Australia, the mining industry now recognizes the benefits of integrating EIA in all stages of a project projects in order to minimize adverse environmental effects in project construction, operation and decommissioning. Social and economic factors are also key components of these assessment processes.

e. Fundamental principles for the mining sector

Australia's BPME in mining requires a continuing, integrated process through all phases of a resource project from the initial exploration to construction, operation and closure. Careful planning and commitment from all levels and groups within a mining company are necessary for the mining project to be successful. It is based on a comprehensive and integrated approach to recognizing, and avoiding or minimizing, environmental impacts. In order to be fully effective, Australia developed fundamental principles for the mining sector mainly derived from the Berlin

Guidelines. The Berlin Guidelines were first devised in 1991 at the International Round Table on Mining and the Environment in Berlin and revised in 1999. The guidelines include the technical and physical aspects of environmental management as well as reflect the greater understanding of social, community and gender issues.

Governments, mining companies and the minerals industries should as a minimum: (Berlin Guidelines 1991 revised 2000, *originally sourced from Overview of Best Practice Environmental Management in Mining*, Environment Australia, 2002)

1. Recognize environmental management as a high priority, notably during the licensing process and through the development and implementation of environmental management systems. These should include early and comprehensive environmental impact assessments, pollution control and other preventive and mitigation measures, monitoring and auditing activities, and emergency response procedures.
2. Recognize the importance of socio-economic impact assessments and social planning in mining operations. Social-economic impacts should be taken into account at the earliest stages of project development. Gender issues should also be considered at a policy and project level.
3. Establish environmental accountability in industry and government at the highest management and policy-making levels.
4. Encourage employees at all levels to recognize their responsibility for environmental management and ensure that adequate resources, staff and requisite training are available to implement environmental plans.
5. Ensure the participation of and dialogue with the affected community and other directly interested parties on the environmental and social aspects of all phases of mining activities and include the full participation of women and other marginalized groups.
6. Adopt best practices to minimize environmental degradation, notably in the absence of specific environmental regulations.
7. Adopt environmentally sound technologies in all phases of mining activities and increase the emphasis on the transfer of appropriate technologies that mitigate environmental impacts including those from small-scale mining operations.
8. Seek to provide additional funds and innovative financial arrangements to improve environmental performance of existing mining operations.
9. Adopt risk analysis and risk management in the development of regulation and in the design, operation, and decommissioning of mining activities, including the handling and disposal of hazardous mining and

other wastes.

10. Reinforce the infrastructure, information systems service, training and skills in environmental management in relation to mining activities.
11. Avoid the use of such environmental regulations that act as unnecessary barriers to trade and investment.
12. Recognize the linkages between ecology, socio-cultural conditions and human health and safety, the local community and the natural environment. (Revised)
13. Evaluate and adopt, wherever appropriate, economic and administrative instruments such as tax incentive policies to encourage the reduction of pollutant emissions and the introduction of innovative technology.
14. Explore the feasibility of reciprocal agreements to reduce trans-boundary pollution.
15. Encourage long term mining investment by having clear environmental standards with stable and predictable environmental criteria and procedures.

Chapter 4. Discussion and Summary

1. Summary of environmental problems in gold mining in industry of Mongolia

In the previous chapter, environmental management systems in both Korea and Australia have briefly been reviewed mainly based on their current activities (Korea) and characteristics (Australia). Although two systems are different due to their own circumstances, it is commonly implied that environmental protection should incorporate with the concept of sustainable development to assess potential impacts of a proposed mining development from the pre-mine planning stage to post-mine closing stage. Governments, industry and community organizations also have to work as partners to protect our environment for present and future generations. Governments need to be committed to achieving this goal by pursuing a number of strategic approaches and initiatives to ensure that sound environmental practices are used and promoted throughout all sections of the mining industry.

An efficiently designed EMS in Australia will usually increase about 5 per cent of the capital and operating costs for new mining projects. However, it is advocated that these costs can commonly be compensated by many benefits which the EMS brings. For example, as the cost of cleaning up a major spill can exceed the annual budget for good environmental practice at a site, a pre-cautious environmental management can eventually result in significant financial savings.

The community expects and demands that the mining industry integrates environmental considerations into every development, even at sites remote from settlement. Increasingly, mining industry is, therefore, accepting responsibility for and demonstrating that it can protect the environment during and after mining operations. Sustainable mining development encourages society to take a long-term, multi-generational view. Although at any one site, mining activity has a finite lifespan related to the finite size of the deposit, the revegetation and management of waste materials on the site may continue for decades. The sustainability challenge is to ensure that economically viable mining activities have a net positive impact on society and ecosystems over the long term. Therefore, the mining industry is expanding its focus to include greater emphasis on society, communities, and the environment. Currently, efforts are being

made to ensure projects are sustainable by engaging local communities.

It has been also known that environmental assessment (EA) be the most widely used environmental management tool in the mining industries. Assessments are mandatory for most large-scale development projects in developed countries. EAs are usually conducted through legislations processes based on the environmental assessment act or mines act with considering social and economic factors as well.

The type of mining and the characteristics of the particular mineral deposit both affect the degree to which mining disturbs the landscape. The field observations in Mongolia clearly show that surface mining results in the destruction of the existing vegetation and soil profile. Removal of overburden and waste rock and its replacement in waste dumps or the mined-out pit can significantly change the topography and stability of the landscape. Therefore, they may require special rehabilitation treatments.

Mines must be required to develop a closure plan at the beginning of operations. Mine closure planning focuses primarily on the environmental aspects. However, it is also suggested that more emphasis should be placed on integrating social and economic aspects into the mine closure plan. For example, reclamation of mine sites often requires the need for comprehensive and long-term remediation plans for land that has been disturbed by mining operations as well as the concerns and future of local community.

2. Best EMS for gold mining industries in Mongolia

Based on field study and literature reviews together with a recent report on the Environmental and Social Policies and Practices for Mining in Mongolia, it is listed that the following environmental, health, and safety issues are the major concerns with gold mining in Mongolia (World Bank, 2003):

- siltation and turbidity of surface waters in areas where river sediments are dredged and where ore processing residues are discharged into surface water bodies;
- potential acid mine drainage at waste rock pile from coal, base metal, uranium and gold mining and sulfide-bearing tailings from the processing of base metal and gold mining;
- changes to the hydrogeological regime and ground water quality by the dewatering of large open pits resulting in dry water wells, reduced

stream flows, and lowering of lake levels

- conversely, water pumped from mines and discharged into open surface water bodies are causing flooding and a general rise of ground water levels elsewhere;
- negative effects to air quality due to dust generation by intensive traffic at mine sites;
- geomechanically unstable waste rock and tailings masses that pose immediate risks to artisanal miners who rework the waste;
- use of non-standard safety equipment significantly increasing risks to workers.

The case studies of EMS in mining industry of developed countries demonstrates how each EMS principles can be integrated through all phases of mine development from pre-exploration planning, through construction, operation, closure and post-mining monitoring and maintenance. It is also demonstrating how mining can be undertaken without causing unacceptable levels of environmental and social impacts. Based on Korea's experiences, it is suggested that mining extraction and associated processing have the potential to cause severe environmental problems if projects are not properly planned and managed. Therefore, mining companies in Mongolia should recognize that it is necessary to include environmental programs in the company strategy. Environmental management must be integrated into site and project operations to protect the natural environment.

For example, an pressing mitigation measure, especially for the Tuul River environment in the Zamaar gold district related to placer gold mining introduced in this study, is that the mining companies should design a project to capture and recycle all the water on the site deposits to minimize the effects of water quality as well as ecosystem on riparian environment. One of the best ways is to build a series of substantial interconnected water storages (precipitation ponds) along the stream line. As such, an establishment of comprehensive environmental management system of placer gold mining in Mongolia needs to be essential, in which a systematic EMS model will finally be suggested in subsequent research in next year.

In summary, Mongolian mining companies need to develop EMS progressively to provide an integrated framework for action throughout the life of a mining operation. Successful mine planning for environment protection can avoid or minimize potentially adverse environmental impacts over the life of the mine and into the future by carefully considering

the layout and design of the various components of a mine.

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<Appendix 1>

Name and location of rivers polluted by placer mining

#	Province	Soum	River
1	Arkhangai	Tsenkher	Bodont
2	Uvs	Turgen	Nogoon Usnii Bulag
3	Uvs	Turgen	Burgastai
4	Uvs	Ulaangom	Gashuun
5	Tuv	Zaamar	Khailaast
6	Tuv	Zaamar	Tuul, Bayangol
7	Tuv	Zaamar	Burgaltai
8	Tuv	Zaamar	Urd denjiin bulag
9	Tuv	Mungunmort	Kherlen
10	Tuv	Mungunmort	Terelj
11	Tuv	Mungunmort	Jambal
12	Selenge	Bayangol	Tariat
13	Selenge	Eroo	Buhlee
14	Selenge	Eroo	Eroo
15	Selenge	Eroo	Mogoin
16	Selenge	Mandal	Baljiin gol
17	Selenge	Orkhon	Har nudengiin bulag
18	Selenge	Saikhan	Khondoloin bulag
19	Selenge	Orkhon	Turliahiin bulag
20	Selenge	Eroo	Kharganat
21	Selenge	Bat-Olziit	Zuun sottein
22	Selenge	Bat-Olziit	Khongilt
23	Bayanhongor	Gurbanbulag	Olziit
24	Bayanhongor	Bombogor	Shirhenii
25	Khentii	Tsenhermandal	Bayan modn
26	Khentii	Batshireet	Gutain
27	Khentii	Tsenhermandal	Khadagtain bulag
28	Darkhan Uul	Orkhon	Kharaa

<Appendix 2>

State land classification changes 2002-2003

	Land classification	1998	2002	2003	Changes
I	Agricultural Land Total	129,132	130170.4	115580.5	-14589.9
1	Pasture	125,740	126964.2	111280.8	-15683.4
2	Hay land	2,045	1972.9	1809.1	-163.8
3	Crop land	953	756.0	705.7	-50.3
4	Vegetable plant land		1.5	0	-1.5
5	Abandoned Land	394	436.5	475.8	39.3
6	Agriculture building		39.3	42.2	2.9
7	Land not suitable for agriculture		0	1266.9	1266.9
II	City and other settlements	377	433.6	432.9	-0.7
8	Building areas		49.1	37.6	-11.5
9	Public land		297.3	303.5	6.2
10	Industrial area		4.1	4.1	0.0
11	Mining areas		53.7	63.7	10.0
12	Ger community land		21.6	24	2.4
13	Other land		7.8	0	-7.8
III	Road, piping network	330	357.2	353.0	-4.2
14	Rail road		18.9	18.9	0.0
15	Road		283.1	277.4	-5.7
16	Airport		3.4	7.9	4.5
17	Ports		0	0	0.0
18	Piping network		51.8	48.8	-3.0
19	Other				0.0
IV	Forest land	17,852	18632.7	14673.8	-3958.9
20	Forest covered areas		14174.8	12200.2	-1974.6
21	Tree nursery area		0.7	6.6	5.9
22	Logged areas		195.2	105.2	-90.0
23	Other forest area		4262.0	2361.8	-1900.2
V	Water Resources	1,665	1668.1	943.4	-724.7
24	River, springs		247.6	231.2	-16.4
25	Lakes		1408.0	712.1	-695.9

26	Snow and ice rivers		8.2	0.1	-8.1
27	Other water body		4.3	0	-4.3
VI	Reserve area	7,056	5149.6	0	-5149.6
28	Land for not leasing or contract		3033.0	0	-3033.0
29	Land not suitable for use		2116.6	0	-2116.6
30	Other reserve areas				0
VII	State special purpose land	0	0	24428.0	24428.0
31	Protected areas			20864.8	20864.8
32	State border areas			3104.4	3104.4
33	Land for state defense purpose			117.1	117.1
34	Foreign diplomats, consul areas			0.02	0.2
35	Land for scientific experimentation and meteorological stations			3	3.0
36	Trans-provincial Pasture land			199.2	199.2
37	Hay land for state purpose			113.6	113.6
38	Oil land under contract			24.5	24.5
39	Free zone land			1.4	1.4
Total		156411.6	156411.6	156411.6	

<Appendix 3>

Mongolian Sectoral Policies. Regulation and Standards

1. Sectoral Policies

Agenda 21 Action Programme

Mongolia's Agenda 21 Action Programme (MAP-21) states that two main objectives for sustainable structural change in the industrial sector are to:

- develop value-added production of chemical products from domestic natural mineral resources; and
- develop certain metal and metal processing based on domestic mineral resources, in order to meet internal demand and reduce import costs.

Strategies to achieve these objectives of MAP-21 are to:

- correlate mining and mineral processing with environmental protection and rehabilitation priorities;
- delineate and quantify the country's mineral resources through selected exploration and sampling programmes; and
- develop new mineral resource production, focusing on gold, copper, molybdenum, uranium, zinc, lead, silver, fluor spar and precious metals.

2. Government's Minerals Policy Statement¹

A. Introduction

Placer gold mining is a sub-sector of the mining sector. In May 2002 the Government of Mongolia issued a Mineral Policy Statement focussed on development of the mining sector in the 2002-2010 interval, and recognition that mining is a priority sector that could contribute to the Mongolian economy up to 30% of Gross National Product (GNP).

¹ Much of the following account on Mining Policy has been adapted from the '*Mining and Petroleum Sector Profile*' prepared by John Gowen and Baatar Batbold on behalf of the International Finance Corporation, for the September 2002 'Mongolia - Investors' Forum'. IFC:Ulaanbaatar 33pp.

B. Ministries Responsible

The Mining Policy Statement sketched out the Government's medium and long-term strategy for the mining sector, and indicated that 3 Ministries – Industry & Trade, Finance & Economy and Nature & Environment – are responsible for implementation of the Mining Policy, and responsible for integrating the Mining Policy into the State Budget and Annual Plan for the Socio-economic Development of Mongolia (IFC 2002 page 20).

C. Upgrading of MRAM

The Mining Policy Statement made a commitment to allocate budget resources to improve the technology and processing techniques of the Minerals Resources Authority of Mongolia (MRAM).

D. Geological Mapping Programme

The Mining Policy Statement indicates that the Government is committed to allocate State Budget to permit a doubling the previous annual level of public expenditure for general geological mapping and prospecting, with the intention that that by 2010 the entire country shall be geologically mapped at a scale of 1:200,000, and the most prospective areas shall be geologically mapped at a scale of 1:50,000 (30% of Mongolia's territory). The programme is underway, focused on areas with potential for the discovery of high-value minerals that can be exported (Cu and Au) and in areas with adequate infrastructure (roads and railways). The programme will, inevitably, assist and encourage private sector exploration for placer gold, including remote regions.

E. Commitment to Allowing Prospecting in Protected Areas

The Mining Policy Statement made a commitment to initiate changes in the Mineral Law and Law on Protected Areas to allow geological prospecting in previously restricted areas. At present large areas of Mongolia are 'off-limits' to placer exploration or mining, having been given a degree of protection by the Government and regional governments for a variety of purposes that renders the land sterile for mining and oil exploration and exploitation:

National Parks: Covering a land area of 181,004 km², these are located throughout the country in areas which the central government has determined are of significant natural beauty and of importance to the country's natural heritage;

Reserved Areas: Currently occupying 68,805 km², these are areas demarcated by central government, for a specific time period, to allow the Mineral Resource Authority to conduct geological mapping and collect related geoscientific data aimed at increasing the overall knowledge of Mongolia's geology and mineral potential;

Special Areas: Determined by regional governments at Aimag or Soum level, these are areas, currently 199,776 km², where restricted economic activity can take place.

Placer mining activities are not allowed in these areas, although a special request can be made to the relevant authority and if deemed to be of national or regional importance, exploration and exploitation may be allowed.

The commitment in the Mining Policy Statement was hoped to encourage hard-rock gold and copper exploration and attract additional foreign investment, but many of these areas also have substantial potential for placer gold, placer platinum and other placer minerals. If enacted, it would also lead to an uptake in Exploration Licenses and Mining Licenses for placer gold and platinum, and put considerable and immediate pressure on the integrity and viability of many Protected Areas.

On the other hand, as from 2002, and increasingly so in 2003, the Protected Areas started to come under pressure from artisanal (illegal) miners who ignore licensing requirements and have little hesitation in mining in Protected Areas. This trend is expected to intensify.

3. Government's Policy Objectives for 2002-2004

The Government's Policy Objectives for 2002-2004 regarding the Mining Sector included some statements relevant to the placer gold sub-sector:

To increase export income from mining production;

To increase gold mining production, as much as 1.5 times;

To put into production the placer mines of Bayangol² and Toson³.

Protection of the environment has also been listed as a priority with the specific policy goal of mitigating the influences of mining on the natural environment.

A. Minerals Law

The present Law on Mineral Resources of Mongolia ('the Minerals Law') was drafted in 1997 with help from the World Bank Group, and enacted in July 1997. The law is regarded by mining investors, both inside and outside of Mongolia, as being one of the best in the mining world.

Minerals in Mongolia are administered by the Mineral Resources Authority of Mongolia (MRAM) in accordance with the Law on Subsoil (1989) and the Minerals Law (1997). The law provides for the granting of time-limited Exploration Licenses and Mining Licenses with established rights and obligations.

The Minerals Law confirms that the State owns all mineral resources, and has the right to grant exploration and mining licenses. The Minerals Law restricts the Government to part participate in exploration and mining only through registered business entities, and with no distinction made between private and State owned enterprises.

For 'open areas', Exploration Licenses and Mining Licenses are granted on a first come, first served basis. There is no limit put on the number of licenses that can be held by one entity.

Exploration Licenses

The license holder of an Exploration License can freely transfer, sell or use as collateral the Exploration License or any part of it. The license holder has the exclusive right to convert all or part of it into a Mining License. An Exploration License can be held for seven years, with no requirement for an annual work plan and no requirement for exploration to take place. Exploration License fees are based only on the size of the li-

² The large placer in the Tuul Valley at Zaamar known as the Bayangol Alluvials commenced gold production in 2000 by Altan Dornod Mongol Ltd, a subsidiary of Russian-owned Alrosa Ltd, using a new bucket-line dredge.

³ The large placer in the Tuul Valley at Zaamar known as the Toson Alluvials commenced gold production in Summer 2003 by Monpolymet Ltd using a large rebuilt bucket-line dredge, with funding from Japanese financiers.

cense area, not on its perceived value, and the annual fees rise in stages from 0.50 USD per hectare to 1.50 USD per hectare.

Amongst the obligations under the Minerals Law, an Exploration License Holder must submit an Environmental Protection Plan (EPP) covering pollution control and site rehabilitation, and specify the estimated EPP budget. The EPP has to be submitted not less than thirty days after receiving the Exploration License. A sum equal to 50% of the estimated EPP budget must be paid into account in the form of a bond to ensure performance. This bond is refunded to the operator upon successful completion of the EPP.

An Exploration License is issued initially for a period of 3 years and a new EPP is required as a condition of license extension.

Mining Licenses

Within a Mining License area, the license holder has the exclusive right to mine any minerals within. The license holder can freely transfer, sell or use as collateral the Mining License or any part of it. A Mining License can be held for 100 years. Mining License fees are based only on the size of the license area, not on its perceived value, and the annual fees rise in stages from 5 USD per hectare to 10 USD per hectare.

License holders are free to market and sell minerals (except for sale of precious metals and stones). For mining investments greater than 2m USD, a Mining License holder may choose to enter into a stability agreement with the Ministry of Finance.

An Environmental Impact Assessment (EIA) and Environmental Protection Plan (EPP) must be submitted by the license holder 'as soon as possible' before or after receiving the Mining License.

Mining license holders are obliged to prepare an EIA and EPP.

The EIA identifies possible adverse environmental impacts of mining on land, water, air, vegetation, animals and humans and includes measures to avoid or mitigate identified impacts.

The EPP summarizes environmental impact management commitments and provides an estimated budget for environmental protection, particularly in the following areas:

- control (transport, storage, use and disposal) of hazardous substances;
- protection, utilization and conservation of surface water and groundwater;
- construction, utilization and safe operation of tailings impoundments and dams;

- other measures (such as air quality protection) that may be appropriate to a particular operation, and
- progressive site rehabilitation and reclamation to a safe and productive condition.

A sum shall be deposited to a Government account in amount equal to 50% of the EPP budget for a particular year to form a bond to ensure performance. The bond will be refunded in full to the operator upon successful implementation of the EPP.

A Mining License is issued for 10 or 15-year periods, depending on the level of investment, and a new EIA and EPP are required as a condition of license extension.

Role of Local Government

In the first few years of the new Minerals Law (1997-2002) the application procedure for Exploration Licenses and Mining Licenses was fast and efficient, via the Cadastral Office at MRAM in Ulaanbaatar. The processing time was typically 20 days (IFC 2002).

Since 1st January 2002, the application procedure has become more bureaucratic for Exploration Licenses and Mining Licenses with the enacting of the Licensing Law of Mongolia. An extra processing step is now required and the processing time is now typically 50 days. The Aimag Government Administration must now also approve the granting of a license if the license territory is inside their jurisdiction. According to IFC (2002), it has introduced “*a certain level of ambiguity into the licensing process, weakened the MRAM's key central role as exploration and mining license administrator and opened the licensing system to corruption at local government level.*”

Proposed Amendments to the Minerals Law 2001

The Minerals Law has changed very little since its inception in 1997. Amendments were proposed in mid 2001 by the Ministry of Industry and Trade, the government body that administers the mining sector, but withdrawn following representation by local and foreign mining investors.

Proposed Amendments to the Minerals Law 2002

Another set of amendments were published in July 2002, mainly concerning Article 6 on *State Regulation*, Article 7 on *Reserved Areas* and Article 18 on: *Procedure for Granting a Mining License*. These amendments if passed, would:

More closely link the Mineral Law with the Licensing Law, tightening the requirement for local governments (Aimag) to approve issuing an Exploration License or Mining License, even though the applicant already has the approval of the MRAM;

Require compensation to be paid to the Government from a company whose Mining License covers a mineral deposit discovered using State funds, if that deposit is brought into production. This would also apply retrospectively to soviet exploration activity that resulted in the discovery of many placer gold deposits;

Give the right to the Government to issue regulations related to the 'utilisation' of minerals within a license area. This is related to the State's wish for holders of Mining Licenses to achieve higher recovery of a mineral. For example, the State considers that many of the existing placer gold mining operations are engaged in a form of high-grading. The State wishes to see higher percentages of the ore to be processed.

These 2002 amendments were not approved, following strong representation from the mining community. However they do indicate the Government's

<Appendix 4>

MINERALS LAW OF MONGOLIA

CHAPTER ONE

General Provisions

Article 1. Purpose of the law

The purpose of this law is to regulate relations with respect to exploration, mining and related activities within the territory of Mongolia.

Article 2. Legislation on minerals

1. Mineral related legislation consists of the Constitution of Mongolia, the Subsoil Law, this law and other relevant legislation, which is consistent with those laws.
2. If an international treaty to which Mongolia is a signatory is inconsistent with this law, then the provisions of the international treaty shall prevail.

Article 3. Scope of this law

This law shall regulate relations with respect to exploration and mining of all types of mineral resources except water, petroleum and natural gas.

Article 4. Definitions

In this law the following terms shall have the following meaning:

1. "mineral" means any usable naturally occurring mineral concentration that has been formed on the surface or in the subsoil as the result of geological evolutionary processes;
2. "mining" means the entire range of activities that include separating and extracting minerals from the earth, course of water, ore stockpile or tailings, increasing the concentration of their usable contents, transforming these usable contents into marketable products, and marketing and selling those products;
3. "mining license" means the right to conduct mining granted by the Office of Geological and Mining Cadaster (OGMC) in accordance with this law;
4. "exploration license" means the right to conduct exploration granted by the OGMC in accordance with this law;
5. "registration of an application" means the official recording in the register maintained by the OGMC of applications for exploration or mining licenses and the transfer of such licenses;
6. "license cartographic register" means the official cartographic register maintained by the OGMC showing the boundaries of areas subject to mining and exploration licenses and any changes thereto;

7. "prospecting" means investigation to identify mineral concentration without disturbing the subsoil through physical observation, rock sampling, airborne surveys, and reviewing related geological and minerals information;

8. "exploration" means activities carried out on and under the earth's surface for the purpose of identifying the existence, location and quantity of mineral concentration and determining the technical and commercial feasibility of mining such mineral concentration. Exploration includes trenching, digging, opening and closing pits, drilling, removal and assaying of samples, pilot testing, geophysical surveys, and remote sensing;

9. "license fee" means the payment that a license holder makes as provided in this law in order to maintain the license effective;

10. "license holder" means the person to whom an exploration or mining license has been granted or transferred in accordance with this law;

11. "reserved area" means an area which has been rendered temporarily unavailable for grants of licenses pursuant to Article 7 of this law;

12. "special needs land" means land taken by authorized government entities pursuant to the Land Law for special public needs where exploration and mining are restricted or precluded;

13. "mining area" means the area granted under a mining license;

14. "mining claim" means a part of the earth in the form of an inverted pyramid whose apex is the center of the earth and whose base is a mining area;

15. "exploration area" means the area granted under an exploration license;

16. "exploration claim" means a part of the earth in the form of an inverted pyramid whose apex is the center of the earth and whose base is an exploration area.

Article 5. Ownership of minerals

1. The mineral resources naturally occurring on and under the earth's surface and in natural water courses in Mongolia are the property of the State.

2. The State, as owner of all mineral resources in Mongolia, has the right to grant exploration and mining licenses to other persons in accordance with the terms and conditions of this law.

Article 6. State regulation

1. The State Ih Hural shall have full authority with respect to the following matters:

1. establishing a special regulatory regime for utilizing, storing and transporting radioactive materials;
2. establishing State policy with respect to geology and mining;
3. oversight of the implementation by the Government of legislation with respect to exploration and mining;

4. deciding whether to permit mineral exploration and mining on State specially protected land.
2. The Government shall have the following rights and duties:
 1. enforcing implementation of legislation with respect to exploration and mining of minerals;
 2. implementing State policy with respect to the development of the geology and mining sectors;
 3. granting of exploration and mining rights on State special needs land, except State specially protected land;
 4. establishing and maintaining a Geological and Mining Inspection Agency (GMIA) responsible for monitoring the mineral legislation;
 5. establishing and maintaining a Geological and Mining Development Agency (GMDA) responsible for conducting basic geological and mining surveys and research, and the issuing and registering of licenses.
3. The State central administrative body in charge of geology and mining shall have the following rights and duties:
 1. to develop and implement State policy with respect to the development of the geology and mining sectors;
 2. to reserve certain areas for limited periods of time.
4. Local administrative body shall have the following rights and duties:
 1. to organize and ensure the implementation of this law and regulations of higher administrative bodies in their respective territories;
 2. to permit the use of licensed areas for the purposes specified in the licenses, except where exploration or mining is prohibited or restricted by applicable legislation;
 3. to ensure and monitor compliance by license holders of their obligations with respect to environmental protection, health and safety regulations for workers and local residents, and payment of their obligations to the treasuries of local administrative bodies. Local administrative bodies shall also have the right to request from license holders information and reports with respect to the above matters.
5. The Government may participate in exploration and mining of mineral resources only through business entities in which the State holds interests. Such entities shall have the same rights, and be subject to the same obligations, as any other person under this law.
6. State administrative bodies or officials, in their dealings with a holder of a license issued under this law, may only establish conditions and terms and request information and reports as authorized by applicable legislation.

Article 7. Reserved areas

1. The Government member in charge of geology and mining may decide to establish reserved areas for periods of up to three (3) years solely for the following purposes:
 - 1) to bring order and accuracy to the Register of licenses;

- 2) to resolve boundary disputes among license holders.
2. Within three (3) business days following a decision by the Government member to establish a reserved area, the Government member shall advise the OGMC of the decision and publish an official public notice containing the following information:
 1. the name of the aimag or capital city and soum or district where the reserved area is located;
 2. the coordinates of the reserved area;
 3. the purpose for which the area has been reserved;
 4. the time period for which the area has been reserved.
3. The OGMC shall record the reserved area in the exploration license register, mining license register and cartographic register.
4. Reserved areas shall be released for the following reasons:
 1. a decision by the Government member to release the reserved area prior to expiration of the original term for specified reasons; or
 2. expiration of the term for which the reserved area had been reserved.

Article 8. Special needs land with restrictions on exploration and mining

1. In the event that the Government, or a local administration body, establishes a special needs land in accordance with the Land law, a written notice containing the following information shall be delivered to the OGMC within ten (10) business days:
 1. the name of the area where the special needs land is established, the name of the aimag or capital city and soum or district where the land is located;
 2. the coordinates of the land;
 3. the purpose for which the land has been taken for special needs;
 4. the time period for which the land shall be used for special needs.
2. The OGMC shall record the coordinates of special needs land in the exploration license register, mining license register and cartographic register.
3. If a special needs land overlaps entirely or in part with a territory covered by a valid license, thus precluding further exploration or mining in such overlapping area, the State administrative body that decided to establish the special needs land shall assume an obligation to compensate the license holder.
4. The amount of such compensation, and the time for payment, shall be negotiated and agreed to by the State administrative body that decided to establish the special needs land and the affected license holder. If the parties fail to reach agreement, then the amount of compensation and time for payment shall be determined by a neutral party in accordance with internationally recognized methods. The license holder shall have the right to resume its activities if the compensation is not timely paid in full.
5. Disputes with respect to compensation shall be decided by a

court.

CHAPTER TWO

Legal requirements for conducting exploration and mining

Article 9. Prospecting

1. Any individual or legal entity shall have the right to conduct prospecting for minerals within the territory of Mongolia, except within special needs land areas, without a license. However, any person proposing to conduct prospecting must notify the OGMCA and local administrative body and register its name and address and a description and location of the area in which it proposes to conduct prospecting.
2. Disturbing the subsoil while prospecting is prohibited.
3. Any person proposing to conduct prospecting shall obtain permission of landowners or land-possessors or land-users to enter their land.

Article 10. Eligibility for holding a license

1. Any Mongolian citizen, foreign citizen, or legal person shall be entitled to hold an exploration license (hereinafter referred to as “exploration license”).
2. A mining license may only be held by a legal person formed and operating under the laws of Mongolia.
3. A license may only be granted to one person.

Article 11. Prohibition on exploration and mining without a license

1. No person shall conduct exploration for minerals covered by this law within the territory of Mongolia without a valid license.
2. No person shall conduct mining of minerals covered by this law within the territory of Mongolia without a valid mining license.
3. The provisions of this Article shall not apply to landowners or land-possessors who utilize common minerals from their land for private and noncommercial purposes. A list of common minerals that can be mined without a license shall be approved by the Government.
4. Exploration license holders shall disclose to the GMIA the quantity and quality of all minerals recovered as a result of preliminary work done during exploration activities, and upon approval by the GMIA, exploration license holders may sell such minerals for commercial purposes. In such case, the exploration license holders shall pay royalties and other relevant taxes as if they were mining license holders.
In all other cases, exploration license holders shall have the right to sell samples and other products recovered during exploration activities only after obtaining a mining license or surrendering the entire exploration claim.

Article 12. Rights of exploration license holders

An exploration license holder shall have the following rights:

1. the exclusive right to conduct exploration for minerals within the boundaries of an exploration claim in accordance with this law;
2. the exclusive right to obtain a mining license for any part of an exploration area upon fulfilling the terms and conditions of this law;
3. the right to transfer or pledge all or part of an exploration license in accordance with the terms and conditions of this law;
4. the right to obtain two extensions of the term of an exploration license for two (2) years each, upon fulfilling the terms and conditions of this law;
5. the right to have access to, entry on, and transit through, the exploration area and a right to construct temporary structures necessary for conducting exploration activities;
6. the right of entry to and transit through the land adjacent to the exploration area for the purpose of gaining access and entry to the exploration area;
7. the right of entry to and transit through land owned or used by other persons in order to exercise the rights described in this Article. This right shall be determined by a contract between the license holder and the landowner or land-user in accordance with the provisions of the Civil law.

Article 13. Requirements for obtaining an exploration license

1. A person seeking an exploration license shall submit an application for the license to the OGMC in accordance with the requirements of this Article.
2. The applicant must be eligible to hold an exploration license in accordance with paragraph 1 of Article 10 of this law.
3. Coordinates of all corners of a requested exploration area shall be marked in degrees, minutes and seconds on an official standard map prepared by the OGMC and the map shall be attached to the application.
4. The requested exploration area shall meet the following requirements:
 1. the borders of the exploration area must be straight lines oriented north-south and east-west;
 2. no part of the requested exploration area may overlap with a reserved area or a special needs land area;
 3. at the time of submission of the application no part of the requested exploration area may overlap with an existing licensed area or an area covered by a previously filed pending application for a license.
5. Notwithstanding the provisions of this Article, the borders of an exploration area may deviate from straight lines in order to avoid overlapping with:
 1. national borders;
 2. a reserved area;
 3. a special needs land area;

4. an exploration or mining license area granted before this law became effective having a shape and orientation other than as provided under this law;
5. lakes, ponds and other natural geographic features that may be excluded from the exploration area.
6. The size of an exploration area shall be not less than twenty-five (25) hectares and may not exceed four hundred thousand (400 000) hectares.
7. A person may hold any number of exploration licenses.

Article 14. Granting an exploration license

1. An exploration license shall be granted to the first applicant who registers and files an application for an exploration area in accordance with the provisions of this law.
2. A person seeking an exploration license shall submit an application to the OGMCM in the standard form approved by the OGMCM. The following documents shall be attached to the application:
 1. the applicant's name, mailing address for official correspondence, phone and fax numbers and, in case of foreign citizens or legal persons, the name, address, phone and fax numbers of the authorized representative of the applicant in Mongolia;
 2. in the case of an individual applicant, a copy of the applicant's passport and, as applicable, visa;
 3. in case of a legal person, a certificate of valid existence and good standing issued by the jurisdiction under the laws of which the entity was established. If the certificate is in a foreign language, it must be accompanied by a translation into Mongolian.
 4. an exploration area map prepared in accordance with the requirements of Article 13 of this law. The map shall contain the name of the aimag or capital city and soum or district in which the exploration area is located.
 5. a document showing that the applicant has paid the application processing fee established by the Government member in charge of geology and mining.
3. Any application that does not meet the requirements of paragraph 2 of this Article shall not be accepted by the OGMCM.
4. Upon the receipt of a complete application, together with the attachments specified in paragraph 2 of this Article, the OGMCM official responsible for the application register shall register the application in the application register, specify the record number, date, hour and minute of filing on each page, and issue the applicant a receipt acknowledging the filing of the application and payment of the applicable fee.
5. At the end of each business day, the OGMCM official responsible for recording applications shall make a written indication of the last recorded application in the application register book and sign the page.
6. Immediately following the recording of the filing of an application, the OGMCM shall determine by a preliminary screening whether the application meets the requirements specified in paragraphs 2, 3 and subparagraph 1 and 5 of paragraph 4 and paragraph 6 of Article

subparagraph 1 and 5 of paragraph 4 and paragraph 6 of Article 13, and paragraph 2 of this Article.

7. If an application fails to meet the requirements of paragraph 6 of this Article, the OGMC shall, within two (2) business days, notify the applicant of the defects in the application and record the notice in the application register book, whereupon the application shall be deemed to be deleted from the application register.

8. As promptly as possible following the preliminary screening, the OGMC shall determine whether the requested exploration area overlaps with any reserved area, special needs land, or any area covered by a previously issued valid license or previously filed pending application for a license.

9. Within ten (10) business days following the registration of an application for an exploration license, the head of the OGMC shall take one of the following decisions and notify the applicant accordingly:

1) If the requested area does not overlap with any part of a reserved area, special needs land, or any area subject to a valid exploration license, or any area requested in a pending application for an exploration license filed and registered prior to the application, that the requested exploration claim is granted to the applicant, and the applicant is required to pay the first year's license fee within the time period specified in paragraph 1 of Article 25 of this law.

2) The application is rejected and deemed to be removed from the register because of a complete or partial overlap with one of the following areas:

- a) a special needs land;
- b) a reserved area; or
- c) an area subject to a valid license.

3) The application is rejected and deemed to be removed from the register because of a complete overlap with an area requested in a pending application for a license filed prior to the application.

4) If the requested area partially overlaps with an area requested in a pending application for a license filed and registered prior to the application, then an exploration license may be granted for the part of the requested area which does not overlap.

10. If an applicant receives a notice pursuant to subparagraph 4 of paragraph 9 of this Article, such applicant may, within three (3) business days following receipt of such notice, divide the available area into several areas of the shape, location and size as specified in this law and file a separate additional application for each such area. Upon registration of each such application with the OGMC, each such application shall be deemed approved as provided in subparagraph 1 of paragraph 9 of this Article.

11. If an applicant who has received an exploration license approval notice in accordance with paragraphs 9 and 10 of this Article fails to pay the first year's exploration license fee on a timely basis, the application shall be removed from the register book and the notice granting the requested exploration area shall be deemed rescinded.

12. Within three (3) business days after payment by the applicant of the first year's exploration license fee, the OGMC shall issue an exploration license for a period of three (3) years and record the license and

the exploration area in the license register and license cartographic register.

13. A license certificate shall contain the date of issuance, the license holder's name, the coordinates of the area covered by the license, and an attachment in which all subsequent changes with respect to the license shall be recorded.

14. Immediately following the grant of an exploration license, the OGMC shall notify the GMDA and publish an official notice informing the public of the granting of the license.

Article 15. Extension of the term of an exploration license

1. Not less than thirty (30) days prior to the expiration of an exploration license, the license holder may apply for an extension of the term of the license by filing with the OGMC an application for such extension on the standard form published by the OGMC. The following documents shall be attached to the application:

1. the exploration license certificate;
2. receipts for license fee payments made by the license holder;
3. a certificate of inspection evidencing implementation of the license holder's environmental protection plan in accordance with Article 31 of this law.

2. Within ten (10) business days following the receipt of an application for extension, the OGMC shall verify whether the license holder has complied with conditions for maintaining its eligibility to hold a license and shall record this fact in the license register book.

3. Within ten (10) business days following the receipt of an application for extension, the OGMC shall extend the term of the exploration license and record the extension in the license register book. The license that has been extended shall then be returned to the license holder.

4. Immediately following the grant of an extension of an exploration license, the OGMC shall notify the GMDA and publish an official notice informing the public of the granting of the extension.

Article 16. Rights of mining license holders

A mining license holder shall have the following rights:

1. the exclusive right to engage in mining of minerals within the mining claim in accordance with the provisions of this law;
2. the right to manage its operations and market its products, subject to compliance with the requirements of Chapter 4 of this law;
3. the right to sell mineral products from the mining claim at market prices on domestic and foreign markets, subject to compliance with the requirements of Chapter 4 of this law;
4. the exclusive right to conduct exploration for minerals within the mining claim;
5. the right to transfer and pledge all or part of the mining license in accordance with provisions of this law;
6. the right to extend the term of the mining license once for a period of forty (40) years;

7. the right of entry to and transit through the mining area, use of the mining area, the right to construct necessary structures, and the right to conduct other activities related to mining and exploration;

8. the right of entry to and transit through the land adjacent to the mining area;

9. the right of entry to and transit through land owned or used by other persons in order to exercise the rights described in this Article. This right shall be determined by a contract between the license holder and the landowner or land-user in accordance with the provisions of the Civil law;

10. the right to use water, subject to compliance with applicable laws.

Article 17. Requirements for obtaining a mining license

1. An applicant for a mining license must be eligible to hold a mining license in accordance with paragraph 2 of Article 10 of this law.

2. In the case of areas covered by a valid exploration license, only the exploration license holder may apply for a mining license. In other cases, a mining license shall be granted to the first applicant whose application meets the requirements under this law and is registered with the OGMC.

3. The applicant shall set forth the coordinates of all corners of the requested mining area in degrees, minutes and seconds on a standard map approved by the OGMC and attach the map to the application.

4. A requested mining area shall meet the following requirements:

1. a requested mining area shall have the shape of a polygon with borders that are straight lines, not less than 500 meters in length, oriented north-south and east-west;

2. a requested mining area may not overlap with a reserved area or special needs land;

3. at the time of submission of the application a requested mining area shall not overlap with an area covered by a valid license or an area requested in a pending application for a license.

5. The borders of a mining license area may deviate from straight lines in the case of borders with following areas:

1. national borders;

2. a reserved area;

3. a special needs land area;

4. a mining license area granted under the prior minerals law having a shape and location that do not conform with the requirements of this law and natural geographic features, such as lakes and ponds, that may be excluded from the mining area.

Article 18. Procedure for granting a mining license

1. An applicant for a mining license shall submit an application to the OGMC on the standard form approved by the OGMC. The following documents shall be attached to the application:

1. the applicant's name, mailing address for official correspondence, phone and fax numbers and a certificate containing the name of its officer authorized to make decisions;
2. if the applicant is a business entity, a certificate of valid existence as a business entity in Mongolia issued by the appropriate registration agency;
3. a map of the area prepared in accordance with the requirements of paragraph 3 of Article 17 of this law. The map shall contain the name of the aimag or capital city and soum or district in which the area is located.
4. a document showing that the applicant has paid the application processing fee established by the Government member in charge of geology and mining.

2. The OGMC shall reject any application that fails to meet the requirements set forth in paragraph 1 of this Article.

3. Upon the receipt of a complete application, together with the attachments specified in paragraph 1 of this Article, the OGMC official responsible for the application register shall register the application in the application register and specify the record number, date, hour and minute of filing on each page, and issue the applicant a receipt acknowledging the filing of the application and payment of the applicable fee. At the end of each business day, the OGMC official responsible for recording applications shall make a written indication of the last recorded application in the application register book and sign the page.

4. Immediately following the recording of an application, the OGMC shall determine by a preliminary screening whether the application and attached documents meet the requirements specified in paragraph 1 of this Article and paragraphs 1 and 3 of Article 17. If an application fails to meet the above-noted requirements, the OGMC shall notify the applicant of the defects in the application and record the notice in the application register book, whereupon the application shall be deemed to be removed from the application register.

5. Within two (2) business days after the registration of an application for a mining license, the OGMC shall determine:

1. in the case of an application submitted by the exploration license holder covering the requested mining area, whether such area is located entirely within the boundaries of the area covered by the exploration license;
2. whether the requested mining area overlaps with any area already subject to a valid license or any area that is the subject of a pending license application;
3. whether the requested mining area overlaps with a reserved area or a special needs land.

6. Within twenty (20) business days following the registration of an application for a mining license, the head of the OGMC shall take one of the following decisions and notify the applicant accordingly:

1. in the case of an application submitted by the exploration license holder covering the requested area, that an exclu-

sive mining license has been granted to the applicant and require the applicant to timely pay the applicable fee for the first year of the license as provided in this law;

2. if the requested area does not overlap with any part of a special needs land with prohibition on mining, or any area subject to a valid license, or any area requested in a pending application for a license filed and registered prior to the application, that the requested mining area is granted and the applicant is required to pay the applicable fee for the first year of the license as provided in this law;

3. if the requested area overlaps in any way with a special needs land with prohibition on mining, or any area subject to a valid license, or any area requested in a pending application for a license filed and registered prior to the application, that the application is rejected and deemed to be removed from the register.

7. If the applicant who has received a mining license approval notice in accordance with subparagraphs 1 and 2 of paragraph 6 of this Article fails to pay the first year's license fee on a timely basis, that the application is rejected and removed from the application register, and that the decision granting the mining claim is rescinded.

8. Within three (3) business days following payment of the license fee for the first year, the OGMC shall issue a mining license to the applicant for a term of sixty (60) years and shall register the license and mining area in the license register and license cartographic register.

9. A license certificate shall contain date of issuance, the name of the license holder, the coordinates of the granted area, and an attachment in which all subsequent changes with respect to the license shall be recorded.

10. Within seven (7) business days following the decision to grant a mining license, the OGMC shall notify the GMIA and GMDA and publish an official notice informing the public of the granting of the license.

Article 19. Extension of the term of a mining license

1. Not less than two (2) years prior to the expiration of a mining license, the license holder may file an application with the OGMC on the standard form specified by the OGMC for an extension of the mining license. The following documents shall be attached to the application:

1. the mining license certificate;
2. receipts for license fee payments made by the license holder;
3. a certificate of inspection evidencing implementation of the environmental protection program in accordance with Article 31 of this law.

2. Upon filing of an application for an extension of a mining license, the applicant shall pay the processing fee established by the Government member in charge of geology and mining.

3. Within ten (10) business days following the receipt of an application for extension of a mining license, the OGMC shall verify

whether the license holder has complied with the conditions for maintaining its eligibility to hold the license.

4. Within ten (10) business days following the receipt of an application for extension of a mining license, the OGMG shall record the application in the application register. The license certificate that has been extended shall then be returned to the license holder.

5. Within seven (7) business days following the decision to extend the mining license, the OGMG shall notify the GMDA, publish an official notice informing the public of the granting of the extension.

Article 20. Stability agreements

1. If a mining license holder undertakes to invest in its mining project in Mongolia no less than two (2) million US Dollars for the first five (5) years of the project, and if the mining license holder submits an application to enter into a stability agreement, then the Government of Mongolia, acting through the Minister of Finance, shall enter into such a stability agreement providing guarantees for a long term stable environment for such mining license holder.

2. The form of the stability agreement shall be approved by the Government and shall contain provisions regarding the stability of tax rates for a definite time period, the right of the license holder to export and sell its products at international market prices, a guarantee that the license holder may receive and dispose of hard currency income derived from such sales, and provisions with respect to the purpose, amount, and term of the license holder's investment.

3. Within twenty (20) business days following the receipt by the Minister of Finance of the application and draft of the stability agreement, the Minister shall determine whether or not further clarification is required. If the Minister determines that no further clarification is required, the Minister shall enter into the stability agreement with the applicant.

4. If the amount of the initial investment in the Mongolian mining project is no less than two (2) million US Dollars, the term of the stability agreement may be ten (10) years. If such investment is no less than twenty (20) million US Dollars, the term of the stability agreement may be fifteen (15) years.

Article 21. Procedure for concluding a stability agreement

1. The license holder interested in concluding a stability agreement shall submit its application and draft agreement to the Ministry of Finance. An investment program, specifying the amounts to be invested within the first five (5) years, and the proposed term of the project, shall be attached to the application. If further clarification or amendment is required, the applicant shall be informed within seven (7) business days.

2. Upon signing the stability agreement by the Minister of Finance, notice of the terms and conditions of the agreement shall be delivered to the Mongolbank (Central Bank of Mongolia) and other relevant authorities.

Conditions for maintaining eligibility to hold exploration and mining licenses

Article 22. Maintaining the eligibility to hold exploration and mining licenses

A license holder must comply on a timely basis with the conditions set forth in this Chapter, and failure to comply with any of these conditions shall constitute grounds for cancellation of the holder's license pursuant to Article 47 of this law.

Article 23. Maintaining the legal status to hold exploration and mining licenses

Any license holder shall at all times during the terms of the license maintain its legal status to hold the license in accordance with Article 10 of this law.

Article 24. License fees

1. Holders of exploration and mining licenses shall pay license fees annually as set forth in this Article.
2. Exploration license fees shall be payable with respect to each hectare included within the exploration area at the following rates:
 1. US\$ 0.05 for the first year, and US\$ 0.1 for each of the second and third years of the term of the exploration license;
 2. US\$ 1.00 for each of the fourth and fifth years of the term of the exploration license;
 3. US\$ 1.50 for each of the sixth and seventh years of the term of the exploration license.
3. Mining license fees shall be payable with respect to each hectare included within the mining area at the following rates:
 1. US\$ 5.00 for each of the first three years of the term of the license;
 2. US\$ 7.50 for each of the fourth and fifth years of the term of the license;
 3. US\$ 10.00 for each year of the term of the license commencing from the sixth year.

Article 25. Payment of license fees

1. License fees for the first year shall be paid within ten (10) business days after the license holder receives the notice specified in subparagraph 1 of paragraph 9 of Article 14 and subparagraphs 1 and 2 of paragraph 6 of Article 18 of this law.
2. License fees for subsequent years shall be payable annually in advance, on or before the anniversary date of the issuance of the license.
3. The amount of the license fee shall be calculated on the basis of the measurements of the license area as registered in the register of licenses of the OGMCM and the amount of the fee shall not change for the particular year.
4. No exploration license fees shall be payable with respect to a mining area located within an exploration area.

5. The license fee shall be deemed paid upon receipt by the OGMC of documents certifying the payment of the fees.

6. A license holder shall have an obligation to pay applicable license fees within the term specified in paragraph 1 of this Article and no notice or invoice with respect to such fees shall be sent to the license holder.

CHAPTER FOUR

Obligations of license holders while carrying out their activities

Article 26. General obligations of license holders while carrying out their activities

While carrying out their activities a license holder shall comply with general obligations set forth in this Chapter. Failure to comply with the general obligations set forth in this Chapter will subject the license holder to the penalties set forth in Chapter 8 of this law.

Article 27. Establishing the boundaries and marking the area held under a mining license

1. Within 90 business days following the registration of the mining license in the register of licenses, the mining license holder shall establish the boundaries and mark the approved mining area by permanent markers in accordance with technical requirements specified by the GMIA. The establishment of the boundaries of the mining area shall be performed by a professional expert accredited by the OGMC, who shall file a report with the OGMC upon completion of the establishment of the boundaries.

2. A mining license holder shall preserve the markers and adjust and replace the markers upon extension of the license or any reorganization within the area in accordance with decisions of the OGMC.

Article 28. Environmental protection

1. An exploration license holder has an obligation to comply with environmental laws in effect and with the environmental protection provisions of this law.

2. A license holder may not commence exploration or mining operations without first obtaining written approvals from relevant environmental protection authorities pursuant to this law.

Article 29. Environmental protection obligations of exploration license holders

1. After consultation with the environmental inspection agency and local administrative bodies, exploration license holders shall prepare an environmental protection plan within thirty (30) days following the receipt of an exploration license.

2. The environmental protection plan shall provide for measures to ensure that pollution of the environment as a result of the exploration activity does not exceed maximum limits and that the exploration area will be rehabilitated by means of backfilling, plugging, and cultivation to allow future utilization of the disturbed land for public purposes.

3. The environmental protection plan shall be submitted to and approved by the Governor of the relevant soum or district where the exploration claim is located. The Governor of the soum or district shall make a decision with respect to the plan within ten (10) business days following receipt of the plan, and notify the license holder of the decision by an official letter.

4. Upon approval of the environmental protection plan, the license holder shall provide a copy of the plan to the local environmental inspection organization and GMIA.

5. The license holder shall record all instances of adverse environmental impact resulting from the exploration activity and submit annual reports with respect to the environmental protection plan to the Governor of the relevant aimag or capital city and soum or district. These reports shall contain information on measures taken to protect the environment and on the possible impact on the environment of new exploration machinery and technology, and proposed amendments to the environmental protection plan. All amendments to the environmental protection plan shall be approved by the Governor of the relevant soum or district.

6. A license holder shall provide officials in charge of monitoring implementation of the laws on environmental protection and local administrative body representatives with an opportunity to enter the exploration area to conduct monitoring activities on the site.

7. To ensure the discharge of its responsibilities with respect to environmental protection, an exploration license holder shall deposit an amount equal to 50 % of its environmental protection budget in a special bank account established by the Governor of the relevant soum or district. This deposit shall be refunded to the license holder upon full implementation of its environmental protection plan.

8. If a license holder fails to fully implement the measures provided for in the environmental protection plan, the Governor of the relevant soum or district shall use the deposit to enable the license holder to complete these measures, and if the deposit is not enough to cover the costs of environmental protection and rehabilitation activities, the license holder shall provide the required additional funds.

Article 30. Environmental protection obligations of mining license holders

1. An environmental impact assessment and an environmental protection plan shall be prepared by a mining license holder in accordance with applicable laws as soon as possible before or after receiving a mining license.

2. The environmental impact assessment shall identify the possible adverse environmental impact from the proposed mining operations on land, water, air, plant, animal, and human life and shall include preventive measures to avoid and minimize such adverse impact.

3. The environmental protection plan shall contain measures to ensure that mining operations are conducted in a least damaging way to the environment. The plan shall also identify preventive measures to protect air and water quality, and human, animal and plant life from the adverse effects of mining operations in accordance with the regulations adopted by the State central administrative body in charge of the environment.

4. An environmental protection plan must include measures with the respect to the following issues:

1) storage and control of toxic and potentially toxic substances and materials;

2) protection, utilization and conservation of surface water and ground-water;

3) if necessary, construction, utilization and safekeeping of tailings dams;

4) other measures as may be appropriate for the particular type of a mining operation.

5. The environmental protection plan shall also provide for post-mining rehabilitation measures through backfilling, plugging, and cultivation to allow future utilization of the disturbed land for public purposes.

6. The environmental impact assessment and environmental protection plan shall be submitted to the State central administrative body in charge of environment and to the Governor of the relevant soum or district. The State central administrative body in charge of environment shall review these documents and notify the license holder of its decision within thirty (30) days after receiving such documents.

7. Upon approval of the environmental impact assessment and the environmental protection plan, the license holder shall deliver the documents to the local environmental monitoring organization where the mineral deposit is located.

8. Mining license holders shall record all instances of adverse environmental impact resulting from mining activity, prepare and send a copy of annual reports on the implementation of the environment protection plan to the State central administrative body in charge of environment, the Governor of any relevant aimag or capital city and soum or district, and the GMIA, respectively. These reports shall contain information on measures taken to protect the environment and on the possible impact on the environment of new machinery and technology, or the expansion of mining operations, and proposed amendments to the environmental impact assessment and environmental protection plan.

9. Amendments to the environmental protection plan may be made only after the State central administrative body in charge of environment approves the amendments.

10. A mining license holder shall provide local and State central administrative bodies officials in charge of monitoring implementation of legislation on environmental protection, an opportunity to enter the mining claim area and to conduct monitoring activities on the site.

11. To ensure the discharge of its responsibilities with respect to environmental protection, a mining license holder shall deposit an amount equal to 50 % of its environmental protection budget for a par-

tical year in a special bank account established by the Governor of the relevant soum or district. This deposit shall be refunded to the license holder upon full implementation of the environmental protection plan .

12. If a mining license holder fails to fully implement the measures provided for in the environmental protection plan, the Governor of the relevant soum or district shall use the deposit to enable the license holder to complete these measures, and if the deposit is not enough to cover the costs of environmental protection and rehabilitation activities, the license holder shall provide the required additional funds.

Article 31. Review of environmental protection plan in connection with extensions of licenses

1. Exploration license holders applying for a license extension shall submit for approval to the Governor of the relevant soum or district, prior to the expiration of the exploration license, either their revised environmental protection plan or a new environmental protection plan .

2. Mining license holders applying for a license extension shall submit to the State central administrative body in charge of environment a new environmental impact assessment and a new environmental protection plan.

3. The State central administrative body in charge of environment may require the license holder to amend the environmental impact assessment and environmental protection plan to reflect impacts from the use of new machinery or technology or environmental impact not foreseen in the approved environmental impact assessment or environmental protection plan .

Article 32. Impact on local buildings and structures

License holders shall fully compensate owners and users of private and public residential dwellings, wells, winter huts, other structures, and historic and cultural landmarks, for damages caused to these structures by exploration or mining operations, including, if necessary, relocation costs.

Article 33. Relations with local administrative bodies

1. License holders shall consult and coordinate their activities with local administrative bodies in connection with environmental protection, infrastructure development and employment development in accordance with the provisions of this Article.

2. If a license holder deems it necessary, it may request the local administrative body to organize a public debate in furtherance of objectives referred to in paragraph 1 of this Article.

3. A license holder may select and employ a representative from among the local residents to coordinate all the matters involving the local administrative body.

Article 34. Employment requirements

License holders shall employ citizens of Mongolia in their exploration and mining operations on a priority basis.

Article 35. Health and safety standards

In conducting their operations license holders shall comply with applicable laws so as not to endanger the health and safety of workers and local residents.

Article 36. Requirements for closure of a mine

1. Before closure of a mine, mining license holders shall take preparatory measures pursuant to regulations of the GMIA to protect the health and safety of local residents. License holders shall inform the GMIA by an official letter that the mine shall be closed in whole or in part, at least one year prior to any such closure, and the following measures must be implemented during the preparatory period:
 1. to take all necessary measures to ensure safe use of the mining site and mining claim for non-mining purposes and to protect the environment;
 2. to seal safely and fence off the parts of the mining area that may be dangerous during the use of the area for other purposes;
 3. to remove all machinery, equipment and other property from the mining area except as permitted by local administrative bodies or the GMIA.
2. Mining license holders shall prepare a detailed map on an appropriate scale showing dangerous or potentially dangerous areas created by mining operations.

Article 37. Registration and sale of precious stones and metals

1. All precious stones and metals extracted by mining license holders shall be assayed and registered by the State assaying agency. Regulations on assaying and registration of precious stones and metals, and a list of minerals subject to assaying and registration, shall be published by the Government.
2. Mongolbank shall pay world market prices when purchasing precious stones and metals.
3. A mining license holder shall have a right to export precious stones and metals only through Mongolbank or authorized commercial banks.

Article 38. Royalties

1. A mining license holder shall pay royalties to the treasuries of local administrative bodies on the sales value of all products extracted from the mining claim that are sold, shipped for sale, or used.
2. The sales value shall be determined as follows:
 1. for exported products, the sales value shall be the average monthly prices of the products, or similar products, based on regularly published international market prices or on recognized principles of international trade;

2. for products sold or used on the domestic market, the sales value shall be based on the domestic market price for the particular or similar product;
3. for products sold on international or domestic markets, where it is impossible to determine market prices, the sales value shall be based on the revenue derived from the sale of the product as declared by the license holder.
3. Royalties shall be equal to 2.5 per cent of the sales value of all products extracted from the mining claim that are sold, shipped for sale, or used.
4. The license holder shall pay royalties with respect to all extracted products that are sold, shipped for sale or used during a calendar quarter before the end of the next quarter.
5. The mining license holder shall submit to the GMIA a quarterly report, in the form approved by the GMIA and verified by the license holder's signature, indicating the quantity of products extracted and sold, shipped for sale, or used during the relevant quarter, the total value of the sales, and the basis of evaluation.
6. The Government shall prepare, and periodically publish a list of commodity exchange prices and related information, which shall be used for the purpose of calculating the sales value of exported products.

Article 39. Submission of information and reports

1. A license holder shall prepare all information and reports specified in this Article on a timely and accurate basis and submit copies of the information and reports to the GMIA and OGMC, respectively.
2. An exploration license holder shall submit the following information and reports:
 1. a plan of exploration activities shall be submitted within thirty (30) days after the grant of the exploration license;
 2. annual reports on exploration activities for the previous year shall be submitted in the form approved by the Office of Geology within thirty (30) days after the expiration of the relevant period;

The report shall contain information on the amount of work completed and expenses incurred in prospecting, geophysical and geochemical work, drilling and other activities, information on the labor force, and the results of the exploration work. A map indicating the places where the work was done shall be attached to the report.

A copy of the final report on the results of the exploration work and original materials shall be submitted at no charge.

The GMDA shall accept the estimates of the ore reserves submitted in the report after receiving an opinion from a qualified expert and shall include the ore reserves into the national register of reserves.
3. the information reports on safe operations specified in Article 35 of this law.

3. The GMDA shall also have a right to demand information and reports from the license holder, even if such information or reports are incomplete.

4. A mining license holder shall submit the following information and reports:

1. a feasibility study on the exploitation of the deposit within sixty (60) days after obtaining the mining license;

2. estimated data with respect to the next year's production in the form approved by the Mining Office not later than September of every year;

3. a report on activities of the previous year, in the form approved by the Mining Office, shall be submitted by February 15 of the following year. The report must contain the following:

a. number of work days, number of employees, and all contracts affecting the license holder's right of ownership;

b. information on implementation of the mining plan, an estimate of changes in reserves, time periods of operation of the mine, a general overview of production facilities and any expansion or renovation of such facilities;

c. information on the quantity of ore mined, the quantity of products produced, shipped and sold, the price of the products sold, information with respect to the purchasers, information on investments made during the year, operating expenses, royalty payments and information with respect to the equipment and technology used in mining operations and information on other related properties.

4. a report on safe operations as specified in Article 35 of this law.

5. A license holder shall prepare a report on environmental protection as specified in Article 30 of this law and submit it to the Governor of any relevant aimag and soum or district.

CHAPTER FIVE

Transfer and mortgage of licenses

Article 40. Transfers of licenses.

1. A license holder may transfer the license to persons eligible to hold a license by a transfer agreement or through legal processes such as inheritance, merger of business entities, or bankruptcy. A transfer of a license shall be recorded with the OGMC in accordance with the provisions of this Article, and the transfer of a license shall become effective upon such recording.

2. Either the transferor or the transferee of a license shall submit an application for the recording of a license transfer to the OGMC, in the

form approved by the OGMG. The application shall contain the following:

1. the license number, date of issuance, and the name of the license holder as indicated in the records of the OGMG;
 2. a copy of the transfer agreement, or a court order with respect to the bankruptcy of the license holder, a certificate of inheritance from a deceased license holder, or a certificate of reorganization of legal entities, or other legally binding documents evidencing a valid transfer of the license;
 3. a document evidencing the transferee's eligibility as specified in subparagraphs 1 and 2 of Article 10 of this law;
 4. a confirmation of acceptance by the transferee of all rights and obligations under the license, in a form approved by the OGMG.
3. An applicant for the recording of a license transfer shall pay the processing fee established by the Government member in charge of geology and mining and attach a proof of payment to the application.
4. The OGMG shall immediately deliver to the applicant a document containing the name of the applicant, the date of the application, and the type and number of the license to be transferred.
5. Immediately following the receipt of an application for the recording of the transfer of a license, the OGMG shall record the application and verify the following:
1. that the application complies with the requirements of this Article;
 2. that the license to be transferred is valid;
 3. that the license transferee is eligible to hold the license.
6. Within fifteen (15) business days following the receipt of an application for recording of the transfer of a license, the head of the OGMG shall take one of the following decisions:
1. record the transfer of the license and make appropriate notations on the license certificate; or
 2. inform the applicant of defects in the application and request the applicant to submit the necessary additional information; or
 3. if the transferee is not eligible to hold a license, or the license to be transferred is invalid, then the application shall be returned and the applicant shall be notified accordingly.
- If the OGMG gives the applicant a notice of defects as provided in this paragraph, the applicant shall, within ten (10) business days following the receipt of such notice, submit additional information to the OGMG. Within five (5) business days, the head of the OGMG shall take a decision as specified either in subparagraphs 1 or 3 of paragraph 6 of this Article.
7. Following the recording of the transfer of the license, the OGMG shall notify the GMIA and the GMDA in writing of the recording of the transfer and, in case of the transfer of a mining license, it shall also notify the Ministry of Finance in writing, and shall publish an official notice informing the public of the license transfer.

Article 41. Transfer of parts of licensed areas

1. License holders may transfer parts of a licensed area to persons eligible to hold a particular type of license by a transfer agreement. The shape, size and orientation of the transferred and retained parts shall conform to the requirements of this law. The transfer of a part of a licensed area shall be recorded with the OGMC in accordance with the provisions of Article 40 and the provisions of this Article. The transfer agreement shall become effective upon such a registration.

2. The application for recording the transfer of a part of a licensed area shall contain a description of the land. This description shall contain the information required by this law to be included in the initial application for a mining license.

3. The applicant shall pay the application processing fee established by the Government member and include it with the application.

4. The OGMC shall verify and confirm that the transferred area lies entirely within the boundaries of the licensed area covered by the transferor's license.

5. Upon each transfer of a part of a licensed area covered by a valid license to an eligible transferee, the OGMC shall take the following actions :

1. record the location and coordinates of the transferred and retained parts of the licensed area in the register of licenses and in the cartographic license register;
2. make appropriate notation in the license certificate of the transferor;
3. issue the transferee a separate license.

Article 42. Pledges of licenses

1. To provide security for the financing of their investments and operations in Mongolia, license holders may pledge their licenses in accordance with the provisions of the Civil law. The pledge agreement shall become effective upon its registration with the OGMC in accordance with the provisions of Article 40 of this law.

2. The pledgor shall submit a copy of the pledge agreement, together with the license certificate, to the OGMC. The pledgee is not required to confirm its acceptance of rights and obligations under the license.

3. The OGMC shall verify whether the application for recording the pledge of the license complies with the terms and conditions specified in this law.

4. Upon verification that the application for recording the pledge of the license complies with the terms and conditions specified in this law, the OGMC shall record the pledge of the license and deliver the license certificate to the pledgee.

5. Upon termination of the pledge agreement, the license holder shall submit an application to the OGMC together with the following documents:

1. a statement signed by the pledgee to the effect that the license holder has fulfilled its obligations under the pledge agreement and that the pledge has been terminated;

2. the pledged license certificate.

Upon receipt of the foregoing documents, the OGMC shall record the termination of the pledge and return the license certificate to the license holder.

6. During the period of time in which the license is pledged, the license may not be transferred to another person unless authorized in writing by the pledgee or transferred to legal successors of the exploration license holder.

Article 43. Transfer of a license pursuant to a pledge agreement

1. If the pledgor fails to fulfill its obligations under the pledge agreement and the pledgee of a license wishes to transfer the license to a person eligible to hold such a license, the pledgee may, in conformity with Article 40 of this law and the present Article, submit an application to the OGMC to transfer the pledged license.

2. The pledgee shall attach the following documents to its application for recording the transfer of the license to a person eligible to hold such a license:

1. a document signed by the pledgor consenting to the transfer of the license and a statement by the pledgee confirming receipt of the license;

2. a certificate of the pledged license;

3. if the transferee is a person other than the pledgee, the documents specified in paragraph 2 of Article 40 of this law;

4. confirmation by the transferee of its acceptance of rights and obligations under the license.

CHAPTER SIX

Termination of exploration and mining licenses

Article 44. Termination of licenses

1. A license shall be terminated in the following cases:

1. expiration of the license term;

2. surrender by the license holder of the entire licensed area in accordance with the provisions of Article 46; or

3. revocation of the license by the OGMC.

2. A license shall terminate as to each and every part of a licensed area being surrendered by the license holder.

3. Upon termination of the license, the rights and obligations of the license holder under the license shall cease to exist, except the license holder's obligations with respect to environmental restoration and mine closure as provided for in Articles 29 and 30 of this law and other obligations pursuant to legislation on environmental protection.

4. Upon termination of the license, the license holder shall return the license certificate to the OGMC, and a new license may be issued for the area in accordance with the provisions of this law.

5. The ownership of buildings and structures, equipment and other property allowed to be left on the exploration or mining area in accordance with subparagraph 3 of paragraph 1 of Article 36 shall be determined in accordance with the provisions of the Civil law.

Article 45. Surrender of part of the licensed area

1. A license holder may surrender part of the licensed area in accordance with the provisions of this law.

2. A license holder shall submit to the OGMC an application for surrender of part of the licensed area together with the description of the surrendered part in the form approved by the OGMC. In the case of surrender of part of an exploration area, the description of the surrendered area shall conform with the requirements of paragraph 3 of Article 13 of this law. In the case of surrender of part of a mining area, the description of the surrendered area shall conform with the requirements of Article 17 of this law.

3. The following documents shall be attached to an application for surrender of part of a licensed area.

1. the license certificate;

2. a certificate from the Governor of the relevant soum or district stating that the license holder has complied with the environmental protection plan for the surrendered area;

3. a report described in subparagraph 2 of paragraph 2 of Article 39 of this law.

4. The area retained by the license holder after surrender of part of the licensed area shall conform with the requirements of paragraph 4 of Article 17 of this law.

5. Upon receipt of an application for surrender of part of a licensed area, the OGMC shall register the surrender of part of the licensed area and make appropriate notations on the license certificate.

6. The surrender of a part of a licensed area becomes effective upon the registering the application in accordance with paragraph 5 of this Article.

7. The surrender of a part of a licensed area shall not entitle the license holder to a refund of license fees previously paid.

Article 46. Surrender of the entire licensed area

1. A license holder may surrender the entire licensed area by submitting an application, on a form approved by the OGMC, and by registering the application in accordance with this Article.

2. The following documents shall be attached to the application for surrender of the entire licensed area:

1. a certificate of full compliance by the license holder with all environmental protection, mine closure, reporting and other requirements established by applicable laws;

2. if the particular license is pledged, an official docu-

ment signed by the pledgee consenting to the surrender.

3. Promptly upon receipt of an application for surrender of the entire licensed area, and upon verification that the application complies with the requirements of paragraph 2 of this Article, the OGMC shall record the surrender in the register of licenses and modify the cartographic register of mineral licenses accordingly.

4. Upon surrender of the entire licensed area, the license certificate shall be returned to the OGMC.

5. The OGMC shall notify the relevant authorities of the surrender of the entire licensed area, and publish an official notice informing the public of the surrender.

6. A license holder that surrenders a particular licensed area may not submit a new application for the same area for a period of two years following the surrender. If the person that surrenders the license is a legal entity, then this paragraph shall also apply to any third party that controls more than 50% of the voting rights in that legal entity or any third party in which such entity controls more than 50% of the voting rights.

Article 47. Revocation of licenses

1. The OGMC shall revoke any license, in accordance with this Article, if it determines that the license holder does not meet the requirements for maintaining eligibility to hold a license as specified in Chapter 3 of this law.

2. The OGMC, pursuant to a decision by the head of the OGMC, shall revoke a license on the following grounds:

1. that the license holder has lost its eligibility to hold a License in accordance with this law; or
2. that the license holder has failed to pay License Fees specified in Article 24 of this law in full on a timely basis; or
3. that an exploration or mining area has been designated as a special needs land and the license holder has been fully compensated.

3. Immediately upon determining the existence of grounds for revocation of a license, the OGMC shall notify the license holder, and any license pledgee, in accordance with the procedures established by this law. The notice shall specifically indicate the grounds for revocation of the license.

4. Within 30 days following the receipt of the notice specified in paragraph 3 of this Article, a license holder, or any license pledgee, may submit to the OGMC documentary evidence that the grounds for revocation of the license are not valid.

5. Upon review and analysis of the documentary evidence submitted by the license holder, if the OGMC agrees that the grounds for revocation of the license are not valid, it shall withdraw its notice of revocation and notify the license holder accordingly.

6. If the OGMC determines that the documentary evidence submitted by the license holder does not establish invalidity of the grounds for revocation of the license, the head of the OGMC shall revoke the license and notify the license holder and license pledgee accordingly.

7. The holder or license pledgee shall have a right to file a complaint with the court within 30 days following the date of issuance of the decision.

8. If the license holder or the license pledgee files a complaint with the court, no license shall be issued with respect the license area until a valid court ruling has been made.

9. The OGMC shall notify the GMIA and the GMDA of the revocation of a license, and in case of revocation of a mining license, the OGMC shall notify the Ministry of Finance, and publish an official notice informing the public of the revocation.

CHAPTER SEVEN

Resolution of disputes arising out of exploration and mining licenses

Article 48. Resolution of boundary disputes between or among license holders

1. Boundary disputes between or among license holders shall be resolved by the OGMC. Any party to a boundary dispute may request the OGMC to resolve the dispute.

2. The OGMC shall give all parties to the dispute an opportunity to present their positions and arguments in writing.

3. The OGMC shall verify if there is an overlap between disputed areas in the register of licenses and the cartographic register of licenses. If there is an overlap, the OGMC shall determine, based on the original applications and reports of field surveys, whether the coordinates and boundaries of the area were correctly recorded.

4. If, as a result of a field survey, an overlap is confirmed, the OGMC shall modify the area covered by the more recently granted license and eliminate the overlap.

5. The OGMC shall have disputed boundaries of a licensed area surveyed and established by an accredited professional geodesic surveyor and any costs and loss relating thereto shall be paid for by the party shown to be wrong.

6. The OGMC shall verify the disputed boundaries, make decisions on relevant modifications, and notify the parties to the dispute accordingly.

7. If the parties to the dispute disagree with the decision of the OGMC, they may file a complaint with the court.

Article 49. Resolution of disputes between license holders and land owners or users

Land access, rights of passage, and land use disputes between or among license holders and land owners or land users, shall be resolved in accordance with the provisions of the Land law, the Civil law and other relevant laws.

Article 50. Filing of complaints to State administrative bodies

Where any actions or failures to act by civil servants or State administrative bodies have prevented the exercise by citizens or legal persons of rights conferred upon them hereunder, such citizens or legal persons may file a complaint with respect thereto with relevant senior officials or State administrative bodies or the courts.

Article 51. Resolution of disputes arising out of a stability agreement

Any disputes arising out of a stability agreement concluded with the Government according to Articles 20 and 21 of this law shall be resolved in accordance with the Arbitration law and international treaties of Mongolia.

CHAPTER EIGHT

Sanctions

Article 52. Sanctions for breach of legislation

1. If a breach of the minerals legislation does not constitute a criminal offence, a geological and mining inspector, whilst taking into account the circumstances of the infringement, shall impose the following penalty on the guilty person:

1. If any person has conducted exploration or mining activities or sold minerals without holding a mineral license, all income or products derived from such activities shall be confiscated by the State and, a fine in an amount equal to the double of the value of the minerals in question shall be imposed on such person. In such case, the amount of the penalty shall not exceed the maximum penalty set forth in the law on Administrative responsibilities;

2. A penalty of from 10,000 to 60,000 togrogs shall be imposed in the case of the non-timely submission of statements set forth in Article 39 of this law or the submission of false statements;

3. Prevention of a license holder from exercising rights conferred by this law shall give rise to the imposition of fines as follows:

- a. with respect to citizens, from 10,000 to 40,000 togrogs;
- b. with respect to officials, from 20,000 to 60,000 togrogs;
- c. with respect to organizations and legal entities from 100,000 to 250,000 togrogs.

4. Failure of a license holder to comply with obligations with respect to the conduct of activities under a license as set forth in Chapter 4 of this law shall be fined as follows and, in addition, such license holder must pay for any damage resulting from such failure:

- a. with respect to citizens, from 10,000 to 50,000 togrogs;
- b. with respect to officials, from 20,000 to 60,000 togrogs;

- c. with respect to organizations and legal entities, from 50,000 to 250,000 togrogs.
5. Failure of a license holder to comply with legitimate requirements imposed by a geological and mining inspector with respect to the elimination of deficiencies discovered in the course of exploration or mining shall be fined as follows:
 - a. with respect to citizens, from 15,000 to 50,000 togrogs;
 - b. with respect to officials, from 10,000 to 60,000 togrogs;
 - c. with respect to organizations and business entities from 50,000 to 250,000 togrogs.
6. Where a license holder continues to violate laws with respect to environmental protection, mine operation safety regulations, or the provisions of its environmental protection plan, the exploration and mining activities of such a holder be suspended for up to 60 days, and if such deficiencies are not eliminated within this period, the exploration activities of the license holder shall be terminated or, in the case of an operating mine, the mine shall be closed.
7. A legal person who has intentionally decreased, or attempted to decrease, disclosures with respect to sales revenue shall be fined from 100,000 to 250,000 togrogs and be required to pay any unpaid royalties due with respect to the shortfall and, in addition, a penalty equal in amount to such unpaid royalties.
8. Any legal person who has failed to comply with the regulations with respect to the assaying and registration of precious metals and gemstones as provided by this law shall be fined from 100,000 to 250,000 togrogs.
9. Where a mining license holder has intentionally reduced the volume or amount of minerals extracted, or has intentionally reduced sales revenue by intentionally reducing the sales price by entering into a fictitious contract, or by selling the product at an unfair price, such license holder shall be fined 100,000 to 250,000 togrogs and the amount by which the revenue has been understated shall be paid by such license holder to the State treasury.
10. If the OGMC fails to make a decision within the time limit set forth in paragraph 9 of Article 14 of this law, it shall pay the applicant an amount equal to the processing fee for each ten (10) days such failure continues or, at the request of the applicant, such amount shall be deducted from the first year's license fee.
11. If the OGMC fails to make a decision within the time limit set forth in paragraph 6 of Article 17 of this law, it shall pay the applicant an amount equal to the processing fee for each day such failure continues or, at the request of the applicant, such amount shall be deducted from the first year's license fee.
12. Any other penalties provided for by law.

2. A court may impose a fine of up to 30,000 togrogs on any person who intentionally prevents an authorized official from performing his or her duties in the course of an inspection.

CHAPTER NINE

Structure and Composition of Agencies Responsible for Implementation of Mineral Related Legislation

Article 53. Geological and Mining Inspection Agency

The GMIA is the regulatory agency of the State central administrative body in charge of monitoring exploration and mining activities to ensure compliance with the provisions of this law.

Article 54. Geological and Mining Development Agency

The GMDA is the implementary agency of the State central administrative body in charge of geology and mining activities and includes three divisions: the Office of Geology, the Mining Office, and the OGMC.

The GMDA shall carry out its activities independently from the GMIA.

Article 55. Office of Geological and Mining Cadaster

The OGMC shall have the following functions:

1. to receive, register and make decisions with respect to applications for licenses;
2. to maintain the register of licenses;
3. to maintain the cartographic register of licenses;
4. to issue exploration and mining licenses;
5. to collect and distribute application processing and license fees in accordance with applicable laws and regulations;
6. to receive and register applications for prospecting;
7. to review and resolve boundary disputes between and among license holders;
8. to provide interested persons with access to the register of licenses and the cartographic register of licenses and to notify relevant government agencies of changes in these registers, and to publish official notices informing the public of such changes.

Article 56. Office of Geology

The Office of Geology is responsible for providing the State central administrative body in charge of geology and mining with information for the development of policies and programs with respect to geology and related research, the conducting of such research, and the following other activities:

1. regional geological and hydro-geological mapping of Mongolia and related geophysical research;

2. research on the patterns of distribution and types of occurrence of mineral resources within the territory of Mongolia and the evaluation of such resources;
3. geo-ecological research and recommendations with respect to natural and human factors that may have an impact on the social and economic development of Mongolia;
4. providing interested persons with all available geological and mining related information, including information provided by license holders in accordance with this law, except for information classified as confidential;
5. maintaining and up-dating the information fund with respect to national geological and related resources.

Article 57. Mining Office

The Mining Office is responsible for providing the State central administrative body in charge of geology and mining with information and research on the development of the mining sector and for conducting of research with respect to the following matters:

1. evaluations and recommendations with respect to technology and equipment used in the mining industry, and implementation of mining technology policy;
2. creation of a favorable investment environment for the mining sector and evaluations and recommendations with respect to the existing investment environment;
3. research, evaluations and recommendations with respect to the impact the mining industry has on the social and economic development of Mongolia;
4. research on the supply, demand and prices of mining products, and forecasting of long-term trends;
5. development of proposals with respect to State policies with regard to particular mining projects, and implementation of such a policies.

CHAPTER TEN

Other Provisions

Article 58. Notification of Interested Persons

1. The State administrative body in charge of the issuance of licenses, their registration, and the monitoring of activities of license holders, shall notify relevant persons of its decisions by means of an official letter.
2. Such notices may be delivered to relevant persons in writing or by means of an official publication. In the event of a dispute with respect to the timing of the delivery of the notice, the date of the official publication shall be deemed to be the date of delivery of the notice.

Article 59. Payment of fees

With respect to license fees specified in this law in US dollars, the official exchange rate for the particular day established by the Mongolbank shall be used.

Article 60. Access to minerals related information and reports

1. Any interested person shall have a right to have access to the file of license applications, the register of licenses, and the cartographic register of licenses during office hours in specially designated rooms.
2. Reports of exploration work prepared by a license holder, information with respect to mine operations, and feasibility studies shall be treated as the license holder's confidential information.
3. Information classified as confidential shall not be disclosed, published or disseminated except in accordance with provisions and procedures established in the Law on State secrets, the Law on Organization secrets, and the Law on Private secrets. An interested person shall have a right to have access to minerals related information not classified as confidential during office hours in specially designated rooms.

Article 61. Distribution of royalty revenues

All royalty payments shall be deposited in the treasury of local administrative bodies.

Article 62. Use of license fees

All license fee payments shall be deposited in the State central treasury.

Article 63. Specifics of mining industry finance and accounting

1. All costs incurred for exploration, and all expenses incurred in preparing a mine site for production, shall be amortized on a straight line basis over a period of five (5) years commencing with the tax year in which production from the mine commences.
2. The costs of acquisition of a license, either directly or by transfer, shall be amortized on a straight line basis over the term of the license.
3. Fixed assets used in mining operations shall be depreciated on a straight line basis over a period of five (5) years.
4. A loss incurred in any tax year may be deducted from taxable income during the three (3) tax years following the year in which the loss was incurred.
5. All costs incurred in developing industrial and social infrastructure shall be depreciated on a straight line basis over the useful lives of the facilities constructed. All costs of maintaining and operating such infrastructure facilities shall be expensed in the year in which such costs are incurred.
6. All maintenance costs in connection with mining operations shall be expensed in the year in which they are incurred.
7. The Ministry of Finance shall adopt regulations implementing paragraphs 1 through 6 of this Article.

Article 64. Processing Fees

An applicant shall pay the specified processing fee when submitting an application to obtain a license, transfer a license, extend the term of a license, pledge a license, transfer a license pursuant to a pledge, or to surrender all or part of a licensed area, and when requesting the resolution of a boundary dispute.

Article 65. Coming into force of the law

This Law shall come into force on 1 July 1997.

Chairman of the State Ih Hural of Mongolia

R. Gonchigdorj

Ulaanbaatar

June 5, 1997

<Appendix 5>

Agreement of Collaborative Research

It is agreed that the below research project is carried out in cooperation with Korea Environment Institute (KEI) and Mongolian Nature and Environment Consortium (MNEC).

Title: JOINT PILOT STUDIES BETWEEN KOREA AND MONGOLIA ON ASSESSMENT OF ENVIRONMENTAL MANAGEMENT SYSTEM IN GOLD MINING INDUSTRY OF MONGOLIA

Duration : Total 11 months (August 2004 – June 2005)

Part I. Establishment of environmental management system in gold mining industry of Mongolia (August 2004 – December 2004)

Part II. Collaborative workshop for environmental management system and policy in gold mining industry of Mongolia (January 2005 – June 2005)

Budget : Total US\$ 35,000

(KEI : US\$ 25,000 and MNEC : US\$10,000)

Main Contents of the Project:

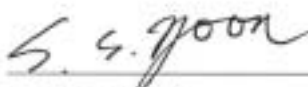
Part I.

1. Status of gold mining industry in Mongolia
2. Current EMS of gold mine sites in Korea
3. Comparative study of EMS and EIA in Korea and Mongolia
4. Establishment of EMS and EP for sustainable mining in Mongolia

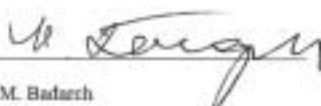
Part II. Collaborative Workshop in Mongolia

KEI

MNEC



Dr. Suh Sung YOON
President



Dr. M. Badarch
Director

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