

Mongolia – Mercury information

1. References to key information resources relating to mercury, such as national reviews or assessments, scientific publications or other material which has been considered in taking action on mercury
2. Descriptions of assessment tools which have proved used taking risk management decisions relating to mercury or in assessing the mercury challenges faced nationally.
3. Details of national or regional actions taken to control mercury, such as legislative or regulatory action either directly on mercury or designed to control industries which use mercury in products or processes, industry initiatives (for example, best practice initiatives), awareness raising trainings or other actions relevant to the upcoming negotiations for a global legally binding instrument on mercury.
4. Summaries of national assessments of the costs of inaction on mercury, including in relation to environmental and health effects.
5. Data on mercury releases to water bodies and the health effects of such release;

In Mongolia, many sites have been contaminated by mercury, because of illegal activities of artisanal mining. Improper use of mercury led to environmental pollution and cause serious health problems to the miners, as well as public health. Several investigations had been done for the determination of health exposure level of mercury and evaluation of risk assessment.

1. References:

- I. Assessment on mercury contaminated sites in Boroo river basin. JICA 2003
- II. Preliminary results. Baseline survey for listing mercury containing equipments used in hospitals in Mongolia. WHO 2009
- III. Assessment of Environmental risks of mercury pollution during the exploitation of gold deposits in Selenge catchment area of Mongolia, Geomin druzstvo, Ministry of Environment, Czech Republic, 2006-2007
- IV. Reports of the UN experts' mission to Khongor soum, Darkhan-Uul aimag
 - a. WHO field mission to study health effects related to an Environmental emergency in Khongor soum, Mongolia, WHO 2008
 - b. Preliminary Agriculture Impact Assessment from Chemical Contamination in Khongor soum, Mongolia
 - c. Chemicals contamination assessment – Final report, UNEP, Post-conflict and Disaster Management Branch
- V. Fact-finding mission - Sodium cyanide and mercury pollution and mining related environmental emergencies in Mongolia, Joint UNEP/OCHA Environment Unit, July 2007
- VI. "Baseline survey for listing mercury containing equipments used in hospitals" Ministry of Health Mongolia, WHO

2. Descriptions of assessment tools which have proved used taking risk management decisions relating to mercury or in assessing the mercury challenges faced nationally.

In 2007 and 2008, the Government of Mongolia conducted National Inspection on Illegal Usage of Chemicals in Business Entities and Organizations. As the result of inspection, it is revealed mercury and cyanide contamination caused by illegal gold mining activities in northern, southern and south-western areas in Mongolia, shown on map /see figure 1/.

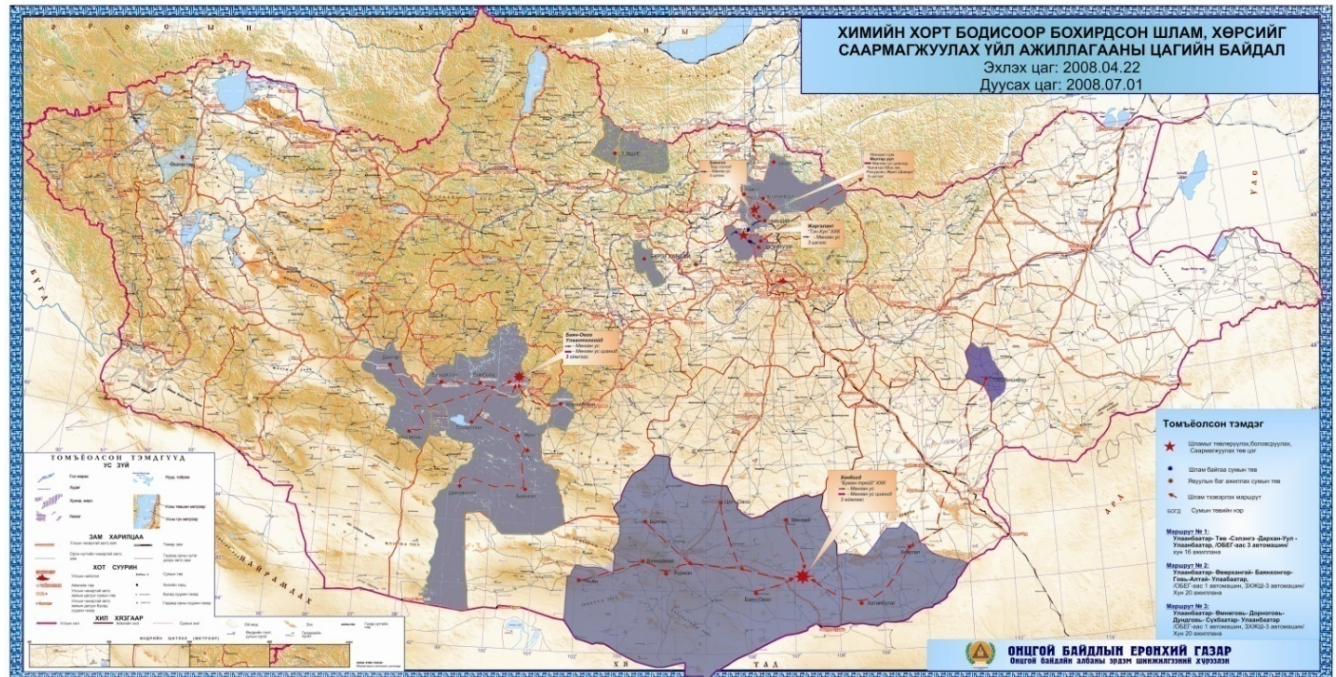


Figure 1. Mercury and cyanide contaminated areas in Mongolia

Legend

- Areas contaminated by mercury and cyanide
- Red dots and paths show the contamination (small) and disposal (star) points and their transport routes (dotted lines)

Participating Governmental Organizations

- Ministry of Nature and Environment and Tourism
- Ministry of Health
- Ministry of Mineral Resources and Energy
- National Emergency Management Agency (NEMA)
- General Specialized Inspection Agency (GSIA)

Inspection followed Government resolution no. 2007/201 *Implementing activities following on National Inspection* and Government Resolution no. 2008/127 *Actions on neutralization and landfilling of mercury and cyanide contaminated hazardous tailings* which is including following management decisions, which are:

- Improving capacity building of laboratories in customs and border point controls.
- Limiting mining licenses on deposit which are inefficient or areas which are reclaimed license areas.
- Improving law enforcement, prevention, investigation, intelligence and punishment of activities of illegal trafficking, trade and use of toxic and hazardous chemicals, such as mercury.
- Development of appropriate disposal method of 145 mercury mills which are seized from the inspection.
- Capacity building of permanent monitoring of sites which are contaminated by chemicals.
- Conduct baseline study and Human health risk assessment in mercury and cyanide affected community. Implementation of creating financial resources for medication, awareness raising and other relevant activities.
- Capacity building of chemical analysis laboratories.
- Development and update of internationally accredited national standards on soil, water, drinking water and air quality.
- Development of methodology, planning for environmentally sound disposal of mercury and cyanide contaminated tailings.
- To develop human health monitoring plan for local community and NEMA officers and other workers working on disposal of hazardous tailing.

1. Joint inspection on activities of individuals and companies, using chemicals, was organized twice in 2007-2008 by the Ministry of Environment, Ministry of Industry and Trade, Emergency Authority, Specialized Inspection Agency and the Police Authority. As results of the concerted effort revealed was over 120 sites contaminated with mercury and cyanide, leaving about 200,000 tons of shlams and mercury contaminated tailings. The contaminated area aggregated at 53 hectares, polluting dozens of wells and other water bodies. Actions taken were discontinuation of 145 mills operation, which used mercury for processing gold ore, and confiscated 35 kg mercury and 1,200 kg cyanide.

2. In a bid to clean up the contamination from illicit activities, involving mercury for processing gold, and ward off new contamination, resolution 135 by the Minister of Environment was passed in 2008 prohibiting usage of mercury in mining and processing of natural mineral resources.

3. Paid information month was announced together with Police Authority in 2008 in an effort to collect information from individuals on illegal storage and usage of chemicals, as result of which 17 kg mercury was confiscated against the information.

4. As part of the Government resolution 127 on "Measures for Neutralization of Tailings and Soils Contaminated with Toxic Chemicals" passed in 2008, contaminated tailings and soils have been removed, neutralized and landfilled, as well as the sites decontaminated by the Ministry of Environment, National Emergency Management Agency and Specialized Inspection Agency in 2008-2009. Total of 197,687 tons shlams accumulated in 230 sites, covering territories of 9 provinces in the country, were neutralized and landfilled, and 128,444 m² contaminated areas have been cleaned up, i.e. completed decontaminating the entire areas nationwide polluted with mercury and cyanide.

3. **Details of national or regional actions taken to control mercury, such as legislative or regulatory action either directly on mercury or designed to control industries which use mercury in products or processes, industry initiatives (for example, best practice initiatives), awareness raising trainings or other actions relevant to the upcoming negotiations for a global legally binding instrument on mercury.**

Mercury had listed in "List of severely restricted chemicals in Mongolia" by Government resolution no.2007/95.

Due to negative impacts from illegal gold mining in Mongolia, use of mercury in mining sector had been prohibited by the Ministerial order of the Minister of Nature and Environment.

Public awareness raising

1. Training workshop for multi-level governmental officials on Mercury contamination, Ministry of Nature, Environment and Tourism, National Emergency Management Agency, April 2008
2. Short TV program (15 min)
3. TV Short advertisements (20 sec)
4. "Mercury spill response and clean-up guidance document" OSPPERA 2002
5. Protecting our health and environment from the contamination of Mercury, Fact book album

5. Data on mercury releases to water bodies and the health effects of such release;

Please find relevant information of releases of mercury to the health effects in attached document.

Attached document:

1. **Reports of the UN experts' mission to Khongor sum, Darkhan-Uul aimag**



**UNITED NATIONS
OFFICE OF THE UN RESIDENT CO-ORDINATOR
IN MONGOLIA**

Letter No.: 257

Reference: ORG/130/1/RC

15 August 2008

Excellency,

**Subject: Reports of the UN experts' mission to Khongor sum,
Darkhan-Uul aimag**

Upon the request of Government of Mongolia's Ministry of Foreign Affairs to the UN Resident Coordinator/UNDP Resident Representative in Mongolia, a team of UN external experts conducted field investigations in Khongor sum of Darkhan -Uul aimag in February-March 2008, to assess the environmental contamination caused by the illegal use of mercury and cyanide in gold processing operations and its impact on human health, livestock and agriculture.

Herewith, I am pleased to share with you the executive summary and reports prepared by FAO, UNEP and WHO.

Please accept, Excellency, the assurances of my highest consideration.

A handwritten signature in black ink, appearing to read 'Debora Comini'.

Debora Comini
UN Resident Coordinator

Enclosure:

1. Chemical Contamination Assessment Final Report, Field Work and Assessment of Soil and Water Samples in Khongor sum, Mongolia
2. Preliminary Agriculture Impact Assessment from Chemical Contamination in Khongor sum, Mongolia
3. WHO Field Mission to Study Health Effects related to an environmental Emergency in Khongor sum, Mission Report

H.E. Mr. Bayar Sanj
Prime Minister of Mongolia

H.E. Ms. Oyun Sanjaasuren
Minister
Minister of Foreign Affairs of Mongolia



United Nations Environment Programme

برنامج الأمم المتحدة للبيئة • 联合国环境规划署
PROGRAMME DES NATIONS UNIES POUR L'ENVIRONNEMENT • PROGRAMA DE LAS NACIONES UNIDAS PARA EL MEDIO AMBIENTE
ПРОГРАММА ОРГАНИЗАЦИИ ОБЪЕДИНЕННЫХ НАЦИЙ ПО ОКРУЖАЮЩЕЙ СРЕДЕ

EXECUTIVE SUMMARY

The following report represents an environmental assessment undertaken by UNEP for contamination issues associated with the operation known as the Mongolian Industrial Chemical Company (MICH) located in Khongor soum, approximately 200km north of Ulaanbaatar. The report details results from additional testing undertaken and discusses the findings of this work. It focuses on the aspects of environmental pollution and whether there is any ongoing contamination from a chemical spill reported at the site in April 2007.

Livelihoods near to Khongor soum are mostly agrarian based on livestock and crop production. In the area however, since 1997, there has been a sharp increase in the number of illegal and small scale mining activity. Approximately 88% of small scale mining in Mongolia is focused on hard rock and placer mining for gold with an estimated 100,000 employed in this activity. Mercury for refining the gold ore and sodium cyanide for processing gold tailings are widely used in illegal mining activities.

MICH is reported to have undertaken gold purification in Khongor soum since 2004 (this is not confirmed and it is possible that it operated prior this). It is presumed that both gold ore from mining and tailings from primary refining at small scale mines, was imported to the site and this would then either be heated or washed to separate gold from the ore.

There is a primary and secondary school in the administrative centre of Khongor soum, close to the MICH Co works. A small, and rudimentary, power plant also operates in this area, powered by coal, which provides both heat and power to the community. Within the administrative centre are also located the waste water treatment plant and a number of groundwater abstraction wells. Underground pipework feeds the municipal buildings, as well as MICH. Wastes are then drained to the waste water treatment plant where it undergoes treatment prior to discharge to a lagoon, located some 0.5km west of the plant. The town is serviced by a number of public and private water supply wells. Domestic properties are in many instances, likely to have constructed their own hand dug wells to provide on site water.

UNEP team collected 18 soil samples, 8 groundwater samples, 2 river water samples, 1 river sediment sample and 1 wastewater sample. These samples were sent to an internationally accredited testing laboratory in the UK for a range of chemical analyses. The analytical schedule was chosen to reflect the potential presence of a number of commonly occurring contaminants in addition to those specifically associated with the refining of gold ore.

The soil and water analysis undertaken by UNEP revealed the following:

- There is no methyl-mercury or cyanide detected in any of the water samples collected.
- Total mercury was detected in soil at one location within the MICH Co compound.

- There is a presence of heavy metals, boron, chromium and lead in the wastewater coming from the wastewater treatment plant.
- There is the presence of heavy metals, arsenic and cadmium in the soils of MICH Co premises.
- Arsenic was detected in one location nearby to MICH and the waste water treatment plant.

From the study undertaken by UNEP the following conclusions can be drawn:

- Overall there is a lack of significant contamination levels for cyanide and mercury in samples collected. Therefore there is no evidence from UNEP testing of a link between mercury and cyanide and possible health effects being observed within the population of Khongor soum.
- The MICH Co site can be considered as a general industrial site that has a level of contamination from some heavy metals. This would be related to past activities and practices and given the proximity of this facility within the town site some remediation and/or protection to more sensitive residential land uses should be considered.
- The practices related to wastewater treatment and the presence of heavy metals in wastewater is a risk to groundwater contamination.
- There are other sources of contamination (eg coal burning and wastes) that will continue to affect general environmental quality in the location of Khongor soum.

In relation to ongoing recommendations the following should be considered for Khongor soum:

1. The wastewater treatment plant should be managed appropriately and regularly serviced.
2. The wastewater treatment lagoon should be fenced and all public access to the site restricted.
3. There should be some concerted effort to undertake community awareness raising that the wastewater collection system should not be used for disposal of unwanted chemicals.
4. A detailed water quality monitoring regime for wastewater outfall should be implemented.
5. Ongoing monitoring of shallow private groundwater bores and deeper drinking water supply wells should be undertaken on a 6 monthly basis. Parameters tested should include heavy metals. Particular focus on those wells between the community and river.
6. An environmental audit of the power plant and MICH site should be conducted to determine the extent of environmental contamination and ongoing threats from these facilities.

Executive summary

Khongor soum, Darkhan-Uul aimag, is situated about 200 km north of Ulaanbaatar. On 23 April 2007 an incident occurred when the waste treatment plant in the soum center flowed over creating a pond of contaminated waste water of approximately 560 m², polluting soil, air and a well for drinking water. Following the spill, health symptoms were reported by the local population and in livestock.

Upon request of the Mongolian government, WHO conducted a field mission to further investigate the health impacts associated with the chemical incident of April 2007 with special attention given to mercury and cyanide exposure.

Investigations were conducted in randomly selected women of child bearing age in Khongor soum and Khusaat soum, which was chosen as the control population. Urine, blood and hair samples were collected and analysed for mercury. Intensive neurological and neuro-psychological examinations and testing were conducted with a focus on the health effects associated with mercury and acute cyanide exposure. Skin patch tests were applied for allergic skin reactions to mercury. Furthermore, all participants underwent questionnaire supported interviews concerning, for example, residential, occupational and medical history as well as consumption patterns.

In addition to the randomly selected women, the team examined persons in Khongor soum who self-reported health problems, either because they associated them with the incident or they had a history of handling mercury.

Finally, the team studied populations reported to be engaged in gold mining activities in Jargalant and Bornuur soum (both areas are away from Khongor soum) which are both typical small scale gold mining areas.

The results show that out of 109 urine samples measured in Khongor soum, 105 were below the limit of detection. The remaining 4 showed measurable concentrations of mercury that were far below levels representing a health concern if compared to the German Human bio-monitoring (HBM I) level for urine of 7 µg/l. Similarly, the mercury levels in blood were very low. Out of 47 blood samples, 33 samples were below the limit

of detection. Levels of the remaining 14 samples were not of health concern when compared to the German Human bio-monitoring (HBM I) level for blood of 5 µg/l. Furthermore, mercury concentrations in hair were also found to be very low with most of the concentrations below 0.1 µg/g. The results of the urine, blood and hair samples strongly suggest that recent exposure to mercury is extremely unlikely and findings do not indicate any health concern related to mercury.

The clinical, neurological and neuropsychological tests performed in Khongor soum were in line with the findings of the human samples and did not reveal any health effects that could be attributed to mercury and cyanide exposure. In addition, these tests did not reveal any significant difference between the two groups of randomly selected women in Khongor soum and Khushaat soum. However, participants in Khongor soum self-reported significantly more effects that they associated with mercury and cyanide exposure in the interviews. While participants in Khongor soum reported symptoms that they relate to the spill, the medical investigations did not reveal any effects that could be related to cyanide and mercury exposure.

In addition, there was no difference in allergic reactions to mercury between the soums. 2 out of 109 skin patch tests were positive in Khongor soum compared to 1 out of 43 observed in Khushaat soum.

On the other hand, the prevalence of skin diseases was significantly higher in Khongor soum. Actually, 75% of the participants in Khongor soum showed dermatological symptoms compared to only 5% in the reference group. However, these skin diseases could not be attributed to mercury exposure because they did not correspond to typical skin symptoms expected for mercury intoxication. The high prevalence of dermatological problems had been observed in prior missions as well, similar to the prior missions contagious and non-contagious skin problems were observed. Contagious dermatological diseases observed included bacterial, fungal and parasitic skin diseases, including scabies.

In contrast to Khongor soum and Khushaat soum, mercury levels in urine were found to be high in typical gold mining areas of Bornuur soum and Jargalant soum and are of health concern if compared to the German bio-monitoring levels (HBM I of 7 µg/l and HBM II of 25 µg/l). Of the 51 samples from Bornuur, 11 were found to be above the HBM I and 2 samples above HBM II. In Jargalant, 9 out of 45 samples were found to be above HBM I and one sample above HBM II.

Major recommendations:

- Due to past use of mercury and cyanide in Khongor soum, it is recommended to establish a monitoring system for mercury in drinking water, food and air, using internationally accepted protocols and quality standards.
- The skin problems in Khongor soum need special attention, a community approach to treat skin diseases after proper diagnosis with adequate medication is recommended.
- The situation in active gold mining areas is different. It is strongly recommended to immediately assess the environment and health situation in Jargalant soum, Bornuur soum and certainly in many other mercury exposed gold mining soums throughout Mongolia as well.



EXECUTIVE SUMMARY

At the request of Government of Mongolia, Ministry of Foreign Affairs (requested FAO assistance on Jan. 28, 2008 to the UN Resident Coordinator in Mongolia/UNDP Resident Office) and the Ministry of Food and Agriculture (request to the FAO on Feb. 21, 2008), a team of UN external experts was fielded to assess the environmental contamination in Khongor soum of Darkhan-Uul aimag caused by the illegal use of mercury and cyanide in gold mining extraction. The government of Mongolia requested FAO expert professional assistance in assessing and mitigating the contamination, and to determine the situation of the environmental pollution and its impact on human and livestock health and to recommend future measures. The FAO Mission composed of four multidisciplinary experts in natural resources, food, animal/livestock, and laboratory analyses, and worked in close collaboration with national counterpart partners and laboratories as well as the other UN Agencies of WHO and UNEP. The major components of the FAO Mission on food and agricultural impacts included field sampling and analyses, from Mar. 1-20, 2008, on contaminant identification and characterization (magnitude and risks) in the soil and water media and pathways to agricultural crops and livestock. This involved preliminary sampling of the soil (surface and subsurface), sediment, surface water, groundwater, and crops/vegetables and fodder. Additionally, animal blood and tissue sampling, animal health surveying, and various veterinary-, geological- and food-related laboratory assessments were conducted.

The preliminary results of the Mongolian analyses to-date (as some are currently under analyses in Korea) indicate that, in general, the water and soil samples are free of heavy metal contamination and are consistent with the UNEP and WHO findings. Exceptions were found in a sample point where the residents identified historical rock crushing and mercury extraction process, and the data indicated high levels of mercury, 102.08 mg/kg in surface soil and 86.28 mg/kg in subsurface soil in comparison to 0.1-1.5 mg/kg U.S. and E.U. standards. The same sample also indicated elevated levels of arsenic, chromium and lead, 38, 102, 129 mg/kg, respectively. One additional ash-like sample that was collected near the wheat storage facility also indicated elevated levels of arsenic and chromium.

The tests carried out at the veterinary labs indicated that 9 of the 40 animals tested were positive for brucellosis. Five of the 6 reported abortions or deaths of new-born calves (3 aborted, 2 deaths immediately after birth) were from brucella-positive animals. Three of the 9 brucella positive

animals have had healthy calves since Dec 2007. These results would suggest that brucella is a possible risk and confounding factor in the animal health observed by the Khongor Soum herders.

The vegetable and milk samples analyzed were not remarkable, and there are no data for the other matrices as the samples have been destroyed when shipped to a foreign laboratory for data validation. The Qingdao Customs in China, Department of Animal and Plant Quarantine, General Administration of Quality Supervision, Inspection and Quarantine, stated that Mongolia is a "Foot and Mouth Disease Epidemic Area and the requested quarantine objects are strictly prohibited from entering into China (Article 5 & 46 under the law)." The Special Permission with the FAO Note Verbal was not authorized by the quarantine authority. Thus, the only remaining stored cattle blood samples in Ulaan Baatar that had not been destroyed were sent to the National Veterinary Research and Quarantine Service (NVRQS) laboratories in Korea, and the results will be available around mid-August 2008.

In summary, the low levels of detection of the various chemicals analyzed could be due to the fact that the immediate clean up by the Canadian Boro company in May 2007 had removed most of the chemical contamination. However, there is likely to be pollution from mining, power plant waste and various other industrial operations observed in Khongor Soum, which may have a bearing on the reported symptoms. In the long term sustainability of the agricultural sector and for sustaining Mongolia's herders and crop farmers, protection of the natural resources and the pastoral landscape are central to the extensive livestock and cropping sub-sectors as they are under threat by the potential uncontrolled releases of heavy metals into the environment from undefined pockets of illegal mining activities. Chemicals' impact on agriculture and livestock are recommended to be enveloped within Mongolia's National Plan of Action for Food Security, Safety and Nutrition with a multi-dimensional view and an integrated national policy in which FAO, as the lead technical UN Agency in food and agriculture safety and security, can assist the Government of Mongolia to achieve these various above-mentioned challenges.