



Final Report

Consultant: VA_2012_78317_009
Pollution Hotspot Analysis - Russia

Surface waters pollution in the hot spots in the Russian territory in the basin of Lake Baikal

An elevated content level of some heavy metals, such as copper, zinc, lead and iron connected with the specificities of Transbaikalian geological province is characteristic of the basin of Lake Baikal. In regionally mined coals there are also elevated contents of heavy metals and rare-earth elements. Therefore, slags, cinder dumps of thermal stations and boiler-houses of the region are dangerous for surface and underground waters. Emissions of the same thermal stations and boiler-houses also contaminate the environment since pollution of soils with heavy metals takes place.

Thus it is extremely difficult to separate natural anomalies from an anthropogenic heavy metals contamination.

According to the methodology – [1,2,3] the following “hot spots” are singled out

On a map:

Title: The Territory of Catchment Area of the River Selenga

1:5000000

Descriptive text:

Conventional signs

Populated areas

Nation's capital

Subject of the Russian Federation's capital

Cities

Boundaries

State

Of the Selenga basin

Railroads

Sources of technogeneous pollution

Contaminated territories

Source: Preliminary TDA, Moscow, 2008

The town of Baikalsk, Baikalsk Pulp and Paper Mill

Sources – [4-5]

In Lake Baikal basin there currently functions the Baikalsk Pulp and Paper Mill (BPPM) located right on the shore of Lake Baikal in a town of Baikalsk. Discharge of industrial effluents, after insufficient treatment, is produced right into Lake Baikal. The Baikalsk Pulp and Paper Mill resumed operation in 2010. However, even when the pulp and paper mill was out of operation it still produced discharges of drainage into the lake since the waste treatment facilities of the Baikal Pulp and Paper Mill also treat sewage water from the town of Baikalsk.

In 2011 defects in water quality of Lake Baikal were registered according to the content of sulphate-ions in August and October up to 1.2 maximum permissible concentrations (MPC); chloride-ions in April and August up to 1.7 – 1.9 MPC and up to 2.6 MPC in October, volatile phenols up to 2 MPC during the entire observation period, and in February and June – up to 3 MPC. Elevated concentrations of a mineral substances sum were detected only in October. In 2011 in all surveys violations in lake water quality in the monitoring section were detected. In 2010 violations were detected only in five out of nine conducted surveys. Lake water was most polluted in October 2011. At the same period in 50 selected water samples the content of non-sulphate sulphur was within 0.3-0.4 mg/l.

In comparison with the period when the mill was closed down (2009), in 2011 maximal concentrations of the sum of mineral substances, including sulphates and chlorides increased. Frequency of volatile phenols detection also increased. In 2009 when the mill was closed down violations of lake water quality were conditioned only by the discharge of ordinary sewage water, which sometimes was detected based on an increase of volatile phenols concentration in the lake water to 2-3 MPC. In this way, resumption of discharge of industrial effluents of the Baikalsk Pulp and Paper Mill caused a decrease in water quality of Lake Baikal by the monitoring section located in 100 meters from the deep-water scattering discharge of the mill's industrial effluents.

It seems obvious that the Baikalsk Pulp and Paper Mill remains the most serious pollution threat for surface and underground waters of Baikal ecosystem in the Central Ecological Zone of the Baikal Natural Territory. The Baikalsk Pulp and Paper Mill will be taken into account, but will not be a focus of attention due to the current efforts of the government to finance a closed system of re-circulating water

and a considerable public pressure aimed at a closure or at least a significant improvement of environmental management at the enterprise.

Slyudyanka industrial hub – the town of Slyudyanka, Kultuk and Vydrino villages, village of Bol'shoe Goloustnoe

These towns are situated right on the shore of Lake Baikal and their sewage waters get immediately into the lake. Here cargo ports are concentrated increasing chances of petrochemical pollution. Besides, railroad works (repair depots and terminals) function, there is also a concentration of warehouses and transportation facilities of many enterprises operating in this region, and fuel storage depots. Marble, mica, break-stone and sand and gravel mix extraction is underway too. In the town of Slyudyanka there are industrial enterprises producing cement and they remain major sources of environmental pollution. There are also a large railway station and small boiler-houses. The area of pollution distribution from the town of Slyudyanka approximately equals 20 sq km while a considerable part of polluting fallout takes place over the water area of Lake Baikal.

In 2011 the Baikalsk Center for meteorology and monitoring of environment conducted a research in the south Baikal area encompassing the village of Kultuk and town of Slyudyanka. In comparison with the water of open Baikal and the Selenga shallow waters in the area of Kultuk and Slyudyanka a relatively elevated content of biogeneous elements was found. Their average content in the water was as follows: total nitrogen – 0.186 mg/l; organic nitrogen – 0.176 mg/l; nitrate nitrogen – 0.03 mg/l; ammonium nitrogen – 0.01 mg/l; total phosphorus: organic phosphorus – 0.008 mg/l; phosphates – 0.006 mg/l. In the water of this region the nitrite nitrogen was detected within the limits from 0.000 -0.003 mg/l. Number of water samples containing nitrite nitrogen equal to 0.002 – 0.003 mg/l figured up to 19 per cent. In water sampling points located closer to Kultuk village nitrite nitrogen was found more often.

An average petrochemicals concentration in 2011 equaled 0.01 mg/l and a maximum one was 0.03 mg/l (June, village Bol'shoe Goloustnoe). Maximum concentrations of volatile phenols were equal to 0.002 mg/l in 2011. Elevated concentrations of volatile phenols were detected in the area of Vydrino and Kultuk villages in April.

There is a great influence of these settlements located on the shore of Lake Baikal on the quality of surface and underground waters. The available waste treatment facilities are old and in bad condition, waste treatment technologies are obsolete

and unable to provide standard treatment of sewage waters discharged directly into Lake Baikal, creeks and small rivers flowing into the lake.

The town of Babushkin

According to [5] waste treatment facilities of the town of Babushkin are in an advanced state of disrepair. They are unable to provide a proper purification of sewage coming jointly to these waste treatment facilities. Frequency of MPC excesses by phenols in the Mysovka river flowing through the town made up 52 per cent in 2011 (45.4 per cent in 2010). Industrial enterprises of Babushkin mainly servicing the Trans-Siberian railroad together with the local population discharge petrochemicals, heavy metals, phenols and sulphates into Lake Baikal.

The town of Zakamensk

In ecological respect the territories of Zakamensk and of the former Dzhida tungsten and molybdenum plant are the most troubled parts of the Baikal Natural Territory.

The Dzhida plant was in operation for over 60 years and ceased its activity in 1996 due to unprofitability of production under the new economic conditions. With discontinuation of the plant's activities the negative impact of its wastes on the environment and the population not only did not decrease, but significantly grew. The tungsten and molybdenum ores processed by the plant contain dangerous elements of the second and third classes, such as lead, zinc, fluorine, molybdenum, beryllium, tungsten, ruthenium, and cesium. The technology of extraction of the tungsten concentrate presupposed the use of sulphuric acid, xanthate and kerosene.

During the operation period of the plant 44.5 million tons of tailings were formed. For many years they have been a source of pollution of the town of Zakamensk.

At present inoperative objects of the plant, such as rock dumps, drainage mine waters, tailings dump, etc. continue to create high technogenic pressures on the environment. A pollutants complex and the intensity of contamination of the surface waters of the Gudzhirka creek (a left-hand tributary of the Myrgenshena) in the influence zone of "Pervomaiskii" mine are determined by the following indicators: sulphate-ion, sodium-ion, lead, fluorine – up to 6 MPC; zinc, cobalt, nickel – up to 20 MPC; copper – up to 60 MPC; manganese and cadmium – up to 500 MPC and more. Water reaction is acidic (pH 4.5-5.4). Surface waters in the estuary of the Inkur river (a right-hand tribute of the Modonkul) where mine waters drain contain cobalt, copper, and lead within the MPC, cadmium and chrome in concentrations from 3 to 5 MPC.

Waters filter out from the tailings dump contain fluorine with about 20 mg/l concentration, iron – over 8 mg/l, Cd, Mo, Li, Pb within the frameworks of 1 to 5 MPC. They pollute surface and underground waters in the estuary of the Modonkul river. The Modonkul is a small tributary of the Dzhida. It carries the heaviest man-induced impact on the territory of Buryatia. Disorderly discharges of mine waters and drainage of the inactive JSC “Dzhidakombinat” are carried out into the Modonkul. Mines waters, drainage waters and stormwater runoffs from the tailings dumps contain large amounts of metals, fluorine, and sulphates and considerably influence the quality of water in the river Modonkul in both cross sections (2 km above the town of Zakamensk and down the river from Zakamensk, in 1 km lower the discharge point of sewage waters of water treatment facilities). In the estuarial cross section there is also influence of sewage waters of the municipal waste treatment facilities belonging to the Municipal Unitary Enterprise for Housing and Communal Services (hereinafter – MUE HCS) “Zakamensk”. Copper, zinc, total iron and fluorine are the critical indicators of pollution.

Observations were carried out in two cross sections, 2 km up the river from Zakamensk and 1.3 km down the river from the town, 1 km above the estuary. Water mineralization changed from low (176 mg/cubic decimeter) to elevated (864 mg/cubic decimeter). In this period (**what year**) the concentration of sulphates was 2.1 MPC. Medium reaction changed from neutral (7.01 points pH) to slightly alkaline (7.97 pH). Excess of MPC was observed according to 9 ingredients of chemical water composition out of 14 considered. Fluorides and total iron brought in the largest share into a general evaluation of water pollution. Four cases of high pollution were registered (over 10 MPC). The water contamination rate in the cross section up the river from the city with copper, zinc, total iron, fluorides and easily oxidable organic substances is estimated as characteristic. The water contamination rate with phenols is estimated as persistent. The maximum concentration reached the following values: copper – 7.4 MPC, zinc – 1.3 MPC, total iron – 21.5 MPC, phenols – 2 MPC, easily oxidable organic substances – 1.3 MPC.

Water contamination rate in the river at the cross section down the town with copper, zinc, total iron, fluorides, phenol, resistant to oxidation organics and sulphates is estimated as characteristic, while that with easily oxidable organic substances and nitrogen of the nitrites – as unstable. The maximum concentrations reached the following values: copper – 4.0 MPC, zinc – 1.4 MPC, total iron – 13.4 MPC, phenols 0.2 MPC, resistant to oxidization organics – 1.7 MPC, easily oxidable organics – 1.2 MPC, nitrite nitrogen – 1.5 MPC.

Contamination of the Modonkul river flowing through Zakamensk is particularly dangerous because it directly affects drinking water intake from wells and drill holes. Underground waters on the territory of Zakamensk and its vicinity are polluted with iron, fluorine and metals (Cd, Mn, Fe) up to 10 MPC, lead is detected at the level of 10 MPC, concentrations of sulphate-ion (300-330 mg/cubic decimeter) and calcium-ion (100-120 mg/cubic decimeter) are elevated. Pollution of drinking water with heavy metals negatively affects population's health.

The area of the ecologically troubled territory is 867 hectares, including 452 hectares in Zakamensk (68.53 per cent of the total town area).

Water passageways of the Dzhida river basin (the rivers Inkur, Barun-Naryn, Zun-Naryn, Modonkul, Gudzhirka and Myrgen-Sheno are the most polluted in the basin of Lake Baikal.

At present at the Kholtoson and Inkur deposits in the basins of right tributaries of the Dzhida (the Modonkul and Myrgenshena rivers) a restoration of the earlier operational mining objects of the Dzhida tungsten and molybdenum plant of JSC "Dzhidakombinat" is underway as well as a construction of new plant sites, a modern ore mill and hydrometallurgical facility for processing of tungsten headings.

Lake Gusinoe. The town of Gusinozersk

Before the 1990s the Gusinozersk basin was an area of intense brown coal mining in the Republic of Buryatia. The development of the deposit was carried out by "Kholboldzhinskii" coal strip mine and "Gusinozerskaya" mine along the shore of Lake Gusinoe. Nowadays the mine is closed down. However, on the "Kholboldzhinskii" coal strip mine there are still 1596 hectares of lands spoiled by mining operations and over 400 hectares are under spoil dumps of overburden rocks with the volumes of dump sites over 260 million cubic meters, which represents the biggest threat of lake contamination.

Pollutants get into the lake, which is a source of water supply for the town of Gusinozersk, from the area of former coal mining during the filtration of atmospheric precipitation through rock dumps and with drainage (mine) waters. Mineralization of these waters reaches 2 g/cubic dm and more (2 MPC according to Sanitary Regulations and Standards (SanPiN 2.1.4.1074-01 for drinkable waters), total hardness of water – 17-53 mM/cubic dm (2-7 MPC), content of sulphate-ion and sodium-ion – up to 1-3 MPC, manganese – 21 MPC, strontium – 3-4 MPC, aluminum and iron – up to 1,2 MPC. Concentrations of ammoniacal nitrogen were elevated to the MPC level.

In the south-western part of Gusinoozersk a ground subsidence section is formed above the former mine of "Gusinoozerskaya" mine. This causes deformations of apartment houses, cracks in the walls and foundations, sinkholes, deep fractures in the ground. Here also a process of restoration of a cone of depression may take place after a cessation of mine drainage and a chance of flooding of the built-up area cannot be excluded.

The man-induced impact on Lake Gusinoe is very intense: the largest regional power station the Gusinoozerskaya GRES consumes 83.8 per cent of the total surface water abstraction in the Republic of Buryatia. In 2011 a discharge without treatment of warm normative clean waters after cooling of the equipment made up 334.1 million cubic m (in 2010 – 367.9 million cubic m, in 2009 – 288.94 million cubic m, in 2008 – 442.0 million cubic m, in 2006 – 284 million cubic m, in 2005 – 261.1 million cubic m.)

There are other sources of anthropogenic influence on the shores of the lake, such as the town of Gusinoozersk, a railroad station and the village Gusinoe Ozero. Besides thermal discharge of the power station, industrial and storm sewage waters treated to standard quality at waste treatment facilities from the industrial site OJSC "Gusinoozerskaya GRES" as well as sewage waters of the "Baikal Pribor 1" LLC and "ZHEU Gusinoe Ozero" LLC (from the latter the sewage waters get to the lake through the river Tsagan-Gol).

According to the observation data of Buryat Center for hydrometeorology and monitoring of environment in 2011 average annual concentrations of suspended substances amounted to 1.6 MPC in the air of Gusinoozersk. Total emissions of pollutants by stationary sources amounted to 28.172 thousand tons in 2011 (40.272 thousand tons in 2010). Partially getting into the lake, the emissions increase the man-induced impact on the reservoir.

Water quality in Lake Gusinoe in 2011. Water mineralization throughout the year was average. The highest value (358 mg/cubic dm) was observed during the period of closed channel. The pH values varied from 8.20 pH (slightly alkaline) to 8.70 pH (alkaline). Dissolved oxygen level during all hydrological periods was within the standard norm. During the year excess of MPC was registered according to 6 indicators (7 indicators in 2010). Concentration of copper was 5 MPC, total iron – 1.7 MPC, phenols – 2 MPC, easily oxidable organic substances (BOD₅) – 1.6 MPC, oxidization resistant organic substances (COD) – 1.8 MPC. Pollution by organic substances was characteristic (according to the BOD and COD indicators); steady pollution by copper and phenols and unstable – by total iron and zinc.

In 2011 according to 2-TP (water supply organization) sewage waters discharge by the industrial enterprises of Gusinoozersk into Lake Gusinoe ("Vodokanal" of Gusinoozersk, a subsidiary of "Baikal Pribor – 1" and OJSC "Gusinoozerskaya GRES") amounted to 336.5 million cubic m (in 2010 – 367.9 million m). The reduction of sewage water discharge volumes is connected with the reduction of electricity generation by the branch of JSC "OGK-3" "Gusinoozerskaya GRES".

At industrial enterprises of Gusinoozersk in 2011 there formed 399.035 thousand tons of waste (overburden dumps being the 5th class dangerous wastes, i.e. safe, were not considered in the volume of wastes that formed in Gusinoozersk. 395.785 thousand tons of wastes are placed in ash dumps of Phase 1 and 2 of the Gusinoozerskaya GRES. Pollution of Lake Gusinoe led to its degradation swiftly taking place. A direct proof of it is the extinction in 2010-2011 of a clam *Colletopterum sedakovi* sensitive to water quality degradation as well as other clams.

The city of Ulan-Ude

The industrial hub of Ulan-Ude hosts many enterprises, such as the aviation plant, locomotive-repair plant, instrument-making plant, etc., and energy enterprises (CHPP 1 and CHPP 2), food, consumer goods industry, timber manufacturing industry, small furniture production facilities, petroleum depots and numerous gas filling stations.

In 2011 on the territory of Ulan-Ude industrial hub near the sections belonging to the locomotive repair plant there was an excess of MPC by phenols (up to 52.6 mg/cubic dm), fluorine (up to 9.9 mg/cubic dm). Underwater oxidizability exceeded 240.0 mg/cubic dm, the hydrogen indicator reached 9.6 units.

Over the recent several decades the river Selenga is badly polluted by petrochemicals in the area of the glass factory "Steklozavod". The discharge zone length along the bank of the river is over one kilometer. Each year, according to the study results, during the groundwater decrement up to 22 tons of petroleum products get into the river Selenga. Man-made petroleum product plumes had formed as a result of a long-term dissipation of petroleum products from the petroleum bases of the Ministry of the Defense of the USSR and the State Committee of Petroleum Products located in 500 m from the river bank and operational since the 1930s. The object for environmental rehabilitation on the "Steklozavod" zone of Ulan-Ude occupies an area of about 143 hectares and the area of film on the water surface of the Selenga river is about 3 hectares (see photo).

Photo



Pollution of the Selenga by petroleum products near Steklozavod suburb.

The pollutant is predominantly diesel fuel. Voluminous deposits of petroleum hydrocarbons on the level of underground waters on the territory of “Buryatterminal” LLC are estimated at 5682 cubic meters. On the territory of petroleum base of the Ministry of the Defense of the Russian Federation the volumes are estimated at 12844 cubic meters.

Intensity of underground water pollution with heavy and toxic metals is, at the moment, insufficiently controlled. Probability of such pollution is high at many industrial objects. In the area of the main water intake of Ulan-Ude (in the upper part of river-borne aquifer) in the samples from certain drill-holes an elevated concentration of chlorides is observed and this leads to an increase of mineralization to 0.5 g/cubic dm (while the background mineralization should be within 0.11-0.15 g/cubic dm).

Over the recent years in all observation bore holes an elevation of oxidization of underground waters has been traced. In some bore holes petrochemicals pollution is detected within the concentrations 0.88-1.41 mg/cubic dm. At abstraction intakes over certain periods of time some increase of sulphate, chloride and fluorine concentrations is observed, iron and nitrates appear and the mineralization of underground waters in summer is somehow higher than in the winter-spring drought period.

According to the 2-TP data (water supply organization) in 2011 the volume of sewage waters discharge amounted to 30.2 million cubic meters (34.1 million cubic m). Reduction of discharge volumes took place due to a decrease of volumes

of manufactured produce of industrial enterprises. "Vodokanal" has two discharge outlets. One is located near Divizionnaya railway station, another – on the left bank of the river Selenga. Effluent is classified as "insufficiently purified".

In 2012 in Ulan-Ude 282 thousand tons of wastes were produced (not counting businesses producing less than 50 tons of wastes per year). In 2010 this figure was 399.000 (including businesses producing less than 50 tons of wastes per year). In 2011 54.2 thousand tons of wastes were recovered. 452.3 thousand tons of wastes were placed at waste disposal facilities (including wastes accumulated earlier) while 73.8 thousand tons were transferred to other organizations for storing and burial. As of late 2011 144.58 thousand tons of wastes were accumulated at the industrial enterprises of Ulan-Ude.

Industrial and housing and utility activity of industrial enterprises of Ulan-Ude considerably deteriorates the quality of both surface and underground waters. The reason is in an insufficient purification of both industrial and service-utility effluents. Hydrochemical indicators of Selenga water down the river from the city consistently deteriorate according to practically all indicators. In 2011 maximum concentrations of zinc compounds of 1.2 MPC were registered near Mostovoi passing loop (below Ulan-Ude); total iron – 17.2 MPC, copper compounds 4.9 MPC, manganese 11.7 MPC, nitrite nitrogen 1.8 MPC, fluorides 1.8 MPC and oxidization resistant organics – 2.5 MPC, phenols – 3 MPC, petrochemicals – 1>8 MPC. This sharp deterioration of water quality in the Selenga in a cross section down from Ulan-Ude provides grounds to relate it to "hot spots".

The Nizhneselenginskii industrial hub (the villages of Selenginsk, Kamensk, Timlyui)

The main ecological stress is produced by the following enterprises: the Selenginsk Pulp and Paper Mill (CKK), the Timlyui Central Heating and Power Plant, the Timlyui plant of asbestos-cement products, the Kamensk cement plant.

The Selenginsk Pulp and Paper Mill is located in 50 km from Lake Baikal. The production of the main produce (sulphate pulp and container board) is followed by the by-products manufacture of sulphate soap and sulphate turpentine. In its turn, tallow oil and clear turpentine are produced from them. Sulphate pulp is produced with the use of water solutions of NaOH and Na₂S. The wastes of the primary production are spent slurry-lignin and tallow oil. Hazardous substances resulting from the technological processes of production determine the complex of pollutants in the underground waters in the footprint of this object. The results of the monitoring of underground waters in a network of bored holes controlling the

territory of the Selenginsk Pulp and Paper Mill since 1984 show their steady sulphate contamination in concentrations from 50-100 to 1400 mg/cubic dm in various years. The sulphate contamination is followed by elevated concentrations of sodium chlorine and other macro-components with the increase of mineralization (by dry residues) up to 2 g/cubic dm and more. In underground waters lignin and tallow oil are detected. The petroleum products' contamination of the underground waters progresses and it is connected with the seepage of waste waters containing petrochemicals in concentrations up to 14.0 mg/cubic dm.

At the Selenginsk Pulp and Paper Mill there is a closed water cycle. That is why there is no discharge of industrial waste waters from the industrial site of the mill into natural reservoirs. According to the 2-TP (water-supply organization) in 2011 the waste waters discharge by the industrial enterprises of the villages of Selenginsk and Kamensk amounted to 1.29 million cubic m (1.34 million cubic m in 2010).

In 2011 in the village of Selenginsk 170 thousand tons of wastes were produced (in 2010 – 92 thousand tons). 0.942 thousand tons were placed at the village scrap heap.

In 2011 in the village of Kamensk 221.323 thousand tons of wastes were produced (not counting wastes of economic entities that produce less than 50 tons of wastes a year), 312.057 thousand tons of wastes were produced. 85.97 thousand tons of wastes were utilized. 357 tons were placed at the village scrap heap. As of the end of 2011 137.658 thousand tons of wastes were accumulated at the industrial enterprises of Kamensk.

The Nizhneselenginskii industrial hub is a big polluter of the Selenga river since such large industrial enterprises emit tons of pollutants into the atmospheric air, which then descend on the ground and get washed into the river. Huge amounts of accumulated industrial wastes also contaminate underground waters. Among the polluters the Selenginsk Pulp and Paper Mill should specifically be noted because, despite the closed water cycle, it continues to contaminate the underground waters with its wastes, which also get into the Selenga polluting it with sulphates and chlorine-ion.

The town of Petrovsk-Zabaikalskii

Petrovsk-Zabaikalskii is a large industrial hub with the population of 21.2 thousand people.

At present the metallurgical plant and the glass factory, formerly the main industrial enterprises in town, are inactive. However, ashes, sludge and industrial wastes, accumulated over many years of production still pollute the Balyaga river running further into the Khilok.

Nowadays the town industry is represented by food processors and timber enterprises. Underground water pollution by petrochemicals was earlier detected in the area of petroleum depot in Petrovsk-Zabaikalskii. The content of petrochemicals varied within a wide range (from 0 to 9.2 MPC) and was periodical.

Waste treatment facilities of the industrial enterprises and their territories proper with all sewage systems and chemical substance storehouses continue to affect the quality of underground waters. This also applies to town suburbs lacking amenities. Most often the pollutants are nitrogen-containing substances, such as nitrates, nitrites, and ammonium nitrogen. A high content of nitrates is observed in drinking water in the town of Petrovsk-Zabaikalskii.

As a result of the 70 per cent physical deterioration of equipment of the water treatment facilities and system of sewers the technology of treatment of domestic and industrial waste waters is disregarded. Untreated waste waters are discharged on the terrain and then get into the river Khilok.

The water of the Balyaga was classified as highly polluted. An average annual content of suspended substances twice exceeded the background level. The maximum concentration was observed during spring flood in a cross section 0.5 km down the river from Petrovsk-Zabaikalskii and was 3 times higher than the background value (14.0 mg/cubic dm). Manganese compounds reached 6-17 MPC.

The Kholodninskoe deposit

The Kholodninskoe pyrite-base metal deposit is located in the Northern Cisbaikalia on the territory of the Severobaikalskii district of the Republic of Buryatia in 40 km to the north from the Baikal-Amur Mainline Railway.

According to the content analysis of pollutants carried out by the Baikal Institute of Nature Management of the Siberian Branch of the Russian Academy of Sciences in 2006, the Buryat Center for Hydrometeorology and Monitoring of Environment in 2005, the Institute of Geology of SB RAS in 2007 and a group of international experts "ERM" in the same year 2007 a high content of zinc in adit waters (up to 1700 MPC) was detected as well as high content of sulphates, manganese,

magnesium metal, sulphur, cobalt and arsenic. The total area of contaminated soils as a result of dump impact amounts to 15.3 hectares (see photo).



The Kholodninskoe deposit. Photo by Malashkevich.

According to the classification of wastes such soils are related to the 1st and 2nd class of danger for the environment. The water-surface area of the Kholodnaya river exposed to pollution is equal to 1.23 sq km.

Bibliography

1. Criteria for the Prioritization of Pollution Hot Spots In the Mediterranean (Part of GEF Project "Determination of Priority Actions for the Further Elaboration and Implementation of the Strategic Action Programme for the Mediterranean Sea" 2002
<http://195.97.36.231/dbases/PMS/pdfs/0202CriteriaPriorizatnPHS.pdf>
2. Identification and verification of "environmental hot spots" (Part of the UNEP Vienna coordinated ADA project: "Improving regional cooperation for risk management from pollution hotspots as well as transboundary management of shared natural resources") 2006
<http://www.envsec.org/publications/Identification%20and%20verification%20of%20environmental%20hot%20spots.pdf>
3. Methodology for Hot Spots Identification. (Part of UNDP Project "Strengthening Capacities in BiH to Address Environmental Problems through Remediation of High Priority Hot Spots") 2010
<http://www.undp.ba/index.aspx?PID=36&RID=98>

Государственный доклад «О состоянии и об охране окружающей среды Российской Федерации в 2010 году» -
<http://www.mnr.gov.ru/regulatory/detail.php?ID=128153> [State Report "On the Condition and On the Protection of Environment of the Russian Federation in 2010"]
4. Государственный доклад «О состоянии озера Байкал и мерах по его охране в 2011 году» - <http://www.mnr.gov.ru/regulatory/list.php?part=1335> [State Report "On the Condition of Lake Baikal and the Measures of its Protection in 2011"]
5. CO₂: в опасности наше будущее. М.: ЭКО-Согласие, 2003. – 144 с. [POPs: Our Future is in Danger]
6. Сайт комитета Стокгольмской конвенции - <http://chm.pops.int> [The Stockholm Convention Committee website]