



a toxics-free future

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## International SAICM Implementation Project (ISIP)

In 2010, in an effort to demonstrate SAICM implementation via IPEN Participating Organizations, IPEN launched an International SAICM Implementation Project, also known as ISIP. ISIP aims to mobilize resources for initial enabling activities pertaining to national priorities, in keeping with the work areas set out in the strategic objectives of section IV of the SAICM Overarching Policy Strategy.

In particular, the ISIP supports the Governance objective of SAICM's Overarching Policy Strategy paragraph 26, which calls for enhanced "cooperation on the sound management of chemicals between Governments, the private sector and civil society at the national, regional and global levels."

In addition, ISIP builds on the 2008-2009 Global SAICM Outreach Campaign to raise awareness about SAICM and strengthen collaboration among the public interest, health and labor sectors.

### ISIP Objectives

ISIP's four objectives include:

- Promoting the need for sound chemicals management
- Advancing National SAICM Implementation
- Promoting global SAICM implementation by global civil society
- Building capacity among NGOs developing countries and countries with economies in transition

**Title of activity:** Toxic contamination of surface water reservoirs and small farms located in the vicinity of chemical enterprises which are sources of POPs and heavy metal pollution in Dzerjinsk

**NGO:** Eco-SPES

**Country:** Russia

**Date:** February, 2013

### Elements of SAICM Covered:

Identify, explain problem, make initial recommendations on how to address the problem, may be linked to public awareness-raising about the issue; Facilitate the identification and disposal of obsolete stocks of pesticides and other chemicals (47, 68)

### Provide a physical description of the site

Dzerjinsk is located in the centre of Nizhegorodskaya oblast, on the left bank of Oka River. The city borders Balakhninskiy and Volodarskiy districts at the North-West, Nizhniy Novgorod at the East and Bogorodskiy district at the South (along Oka River). The distance to the oblast centre

reaches 40 km. The city area covers over 60 km<sup>2</sup> (or 130 km<sup>2</sup> including the industrial sites' area), and incorporates territories of 15 settlements under a common territorial self-governance body.

The city was founded in 1930, at the territory of former Rastyapino township. Nearby villages and townships are known since the XVII century (Zhelnino, Igumnovo, Babino, Pyra).

Climate in the area is of a moderate continental pattern. Terrain in the area is plains. West and South-west winds prevail. East and North-west winds are rare. Annual incidence of still weather periods reaches 17%; in summer seasons it increases up to 25%. Air temperature inversions are observed in all seasons. Coincidence of ground inversions and weak winds (under 1 m/s) - i.e. unfavourable conditions for dispersion of pollutants in the air - are observed on average in 25% of all ground inversion cases. The lowest incidence of ground inversions with weak winds is observed in autumn (17%), while the highest incidence is observed in summer (about 40%).

Large land areas nearby Pyra and Severniy townships are covered by moors. Karst phenomena manifestations are observed. Soils are sandy. At the Eastern outskirts of the city, deposits of silicate sand of industrial significance are located. Surrounding forested area around the city covers 15070 ha. Water supply of the city relies on Teplovskiy Groundwater Intake with a capacity of 140 thousand m<sup>3</sup>/day, and Zhelninskiy River Water Intake with a capacity of 108 thousand m<sup>3</sup>/day. Power supply in the city is provided by 4 thermal power plants with the overall electric generation capacity of 450 MW and heat capacity of 930 Gcal/hour.

### **Give a history of the site**

Historic development of Dzerjinsk, its industrial facilities and associated environmental problems is typical to industrial centres in Russia and elsewhere. Dzerjinsk belongs to the main chemical industry centres of Russia - within the city area, 43 major and medium-sized chemical facilities operate. These facilities include JS companies "Sibur-Neftekhim", "Zarya", "Sintez", "Orgsteklo", "Plastik", "Aviabor", "Dzerjinskkhimmash", "Korund", "Kapella", "Tosol-Sintez", "Sverdlova Plant" and other producers of chemicals, rubber and plastic products.

### **Description of the chemical characterization**

Dzerjinsk is the second largest city of Nizhegorodskaya oblast in terms of population and industrial significance. As of 01.01.2011, the city population reached 285.4 thousand residents, including 10.1 thousand residents of townships located within the city area.

Industrial facilities of the city produce several hundred different chemical products, including fertilisers, plant protection chemicals, synthetic resins and synthetic corundum, plastic films, ethylene oxide and ethylene glycol, plexiglas, linoleum, gas and liquid chromatographs, iron powders, polycarbonates, acrylic emulsions, organic and inorganic acids, acetone, hydrogen peroxide, plasticisers, activated carbon, explosives, chlorine and alkali, high capacity containers, equipment, etc. Some city facilities are sole Russian producers of some products: synthetic corundum, plexiglas, ethanolamines, carbonyl iron, boron hydrides, etc.

From the 1930s to 1980s, chemical industries predominantly developed in the city- in that period of time, some major plants were commissioned: "Zarya" (1937), "Kaproaktam", "Orgsteklo", Igumnovskaya Power Plant (1939), "Sintez" (1941), and "Plastik" (1965).

### **Description of the environmental and health consequences**

A clear trend of population decrease is observed in the city due to ageing (every third resident of the city is a pensioner) and due to the fact that mortality rates exceed birth rates in the area.

In the territory of the city area, in addition to industrial waste disposal facilities that are known to environmental authorities (26 sludge ponds, landfills and clarification ponds), about the same number of unauthorised waste dumps exist. Besides that, there are several sources of releases

of arsenic, mercury, lead, tetraethyl lead and PCBs to the environment. It is worth noting that earlier, the PCB pollution zone covered Nizhniy Novgorod, the regional capital city.

Serious concerns are associated with some spots of toxic industrial contamination within the city area, as local residents pick mushrooms and berries there. In some cases they do it in close vicinity of chemical plants. Individual landowners and members of garden cooperatives use water from contaminated aquifers or surface water bodies that may be contaminated by chemicals infiltrating from nearby industrial wastewater collection ponds.

Groundwater aquifers in the area are associated with Upper Quaternary alluvial deposits. The aquifer is not protected from surface contamination by any overlying strata. Major sources of groundwater pollution that seriously affect groundwater quality are located upstream of the city townships: "Beloye More" sludge collector pond, open Volosyanikha collector, and industrial waste dumps of "Kaprolaktam" and "Sintez" facilities. According to survey results, groundwater of the local aquifer in Upper Quaternary alluvial deposits does not meet applicable standards and sanitary norms, and cannot be used for household and drinking water supply.

Wastewater flows of industrial facilities and residential areas are discharged into Volga River, after preliminary treatment at the municipal wastewater treatment facilities (ROS-350). Wastewater treatment facilities and sanitation networks are operated by "Istok" Municipal Company. There are two discharge points to Oka River: since the 1920s, Dzerjinskiy Power Plant and "Korund" Co. discharge their wastewater through a water channel of the power plant (2 discharge outlets), and, in addition, since the late 1930s, Igumnovo facility of Dzerjinskiy Power Plant discharges its wastewater through Volosyanikha channel and a series of settling ponds. Blow off water from the "Sverdlov Plant" and clarified water from a sludge collector pond of Teplovskiy water intake are discharged into Pyra River.

From 1999 to mid-2000s, "Comprehensive Dzerjinsk City Environmental Monitoring Program" was operational in the city area. According to facilities' own data (limited to chemicals in production inputs and in finished products), more than 200 chemical compounds are released to the city air, including more than 40% of chemicals of 1st and 2nd hazard classes, and 42% of substances without a definite hazard classification.

### **Description of who is responsible for the site**

At the territory of the city district, environmental monitoring functions are fulfilled by the following accredited analytical laboratories:

- the Regional Environmental Monitoring Centre (a Municipality-subordinated facility),
- the Comprehensive Environmental Contamination Monitoring Laboratory of the RF State Committee for Hydrometeorology (Upper Volga Regional Directorate),
- "Vulkangeologia" facility;
- the Hygiene and Epidemiological Centre in Nizhegorodskaya oblast, Dzerjinsk and Volodarskiy district;
- the Federal Facility for maintenance of engineering protection constructions of Cheboksary Water Reservoir in Nizhegorodskaya oblast.

The leading federal environmental authority of Russia - the Federal Supervision Service in the Sphere of Natural Resources Use - does not maintain its offices in Dzerjinsk and does not control pollution sources.

Another federal agency - the Federal Supervision Service in Environmental, Technological and Nuclear Sphere - also does not maintain its offices in Dzerjinsk and does not control pollution sources.

A federal service in charge of veterinary and phytosanitary supervision (a structural unit of the RF Ministry of Agriculture) supervises safe application of pesticides and other agricultural

chemicals, as well as protection of soil fertility. The latter authority participates in analytical identification of pesticides from illegal pesticide dumps, found at the territory of Dzerjinsk.

The RF Ministry of Environment and Natural Resources is the only environmental authority that maintains its office in Dzerjinsk. The office employs 6 - 7 inspectors who fulfil regional environmental monitoring functions, including operations at the territory of neighbouring Volodarskiy district. The Ministry maintains its analytical laboratory - "Regional Ecology" - in Nizhniy Novgorod (the capital city of the region).

### **Description of the plans for cleanup**

Since January 1997, a Department of Environment and Rational Natural Resources Use did not exist in the structure of Dzerjinsk City Administration. In 2007 - 2008, the Environmental Sector was established there, under the Directorate of Investment policies, Foreign Economic and Inter-regional Relations.

The municipal laboratory and the federal one (the RF Hydrometeorological Committee) monitor toxic metals (mercury, lead, arsenic, cadmium, zinc, nickel) and PCBs irregularly, depending on availability of funds. For example, analytical measurements of POPs (dioxin, PCBs) at the territory of Dzerjinsk were made by the RF Hydrometeorological Committee only twice (!) - in 1992 and 2008.

In 2012, the municipal and federal laboratories collected soil samples and measured oil derivatives, DDT, zinc and lead, as well as analysed surface water samples (iron, COD, oil derivatives, chlorides, ammonia, nitrites and calcium) from some water bodies at the territory of Dzerjinsk. As a result, in the framework of the SAICM-related project, some additional sources of releases of heavy metals and POPs were identified, as well as areas contaminated by arsenic, PCBs, lead, mercury, cadmium, nickel, zinc and cyanides.

### **Project Outcomes:**

#### **Description of the activity conducted**

In the framework of the project, water and bottom deposits samples were collected in minor water bodies (lakes, rivers, channels), as well as soil samples to measure toxic metals (mercury, lead, arsenic, cadmium, zinc, nickel) and PCBs.

Taking into account that quality of surface water bodies and - particularly - bottom sediments of some water bodies at the territory of Dzerjinsk had not been ever studied (or studied only 20 to 30 years ago), such a study is unique. It is particularly relevant in connection with preparations to the planned raising of the water level in Cheboksary Water Reservoir at the Volga (from 63 m to 68 m). The project of raising the water level in the Water Reservoir (an environmentally risky and economically disputable project) would affect Chuvashia Republic, Mariy-El Republic and Nizhegorodskaya oblast. Moreover, the least explored aspect of the project is associated with a rise in groundwater levels in the area of existing chemical waste burials of the Dzerjinsk industrial zone (including already known and still unknown ones).

In November 2012 - January 2013, an independent research was conducted to study contamination of surface water bodies and soils at the territory of Dzerjinsk that falls into the underflooding area of Cheboksary Water Reservoir and adjacent land areas. The study of water bodies and soils was conducted in the framework of an international project under SAICM.

Samples of bottom sediments, soils and surface water were analysed in two accredited analytical laboratories for levels of polychlorinated biphenyls (PCBs - dioxin-like compounds, categorised as POPs under the Stockholm Convention), mercury, arsenic, lead, copper, zinc, nickel, cadmium, chlorides, and cyanides.

The research studies allowed us to identify high levels of arsenic, mercury and lead in bottom sediments of Telyatievo and Dolgoye lakes (lakes of Volosyanikha channel system). Besides that, PCBs were still present in both water bodies. For many years - from 1936 to 1995 - these toxic substances were discharged to Volosyanikha channel by industrial facilities: "Kaprolaktam" Plant (former "Zavodstroy"), "Sintez" Co. (former "Yava" and "Oka" plants), Igumnovo Power Plant, and "Aviabor" Co. (former "GNIHTEOS").

Arsenic and PCBs were found in bottom sediments of Gniloye lake. The pollutants were discharged through earlier operational collector of "CHZ" plant (now "Korund" Co.). Chloride levels in excess of applicable maximum acceptable concentrations (MACs) were found in water from "Beloye More" quarry, located downstream on groundwater flows from "Beloye More" sludge collector pond to townships.

Besides that, arsenic levels in excess of MACs were found in Srednee lake, within the annually flooded floodplain of Oka river. The lake is a popular recreation destination for city residents, including children from the nearby Rehabilitation Centre. Earlier, the lake was contaminated by wastewater discharges from the industrial zone, including wastewater flows from "Beloye More" sludge collector pond and from "Kaprolaktam" plant site.

Within the above area, pollution sources included: earlier operational mercury-based chlorine and alkali production unit at the territory of "Kaprolaktam" Plant (a facility of "Sibur" Co.), lewisite production (an arsenic-containing poison gas), and production of several organochlorine products. In a bog between Volosyanikha channel (downstream of "Kaprolaktam" plant) and 2nd production site of "Sintez" plant, elevated levels of mercury and arsenic were found.

In bottom sediments of Borovoye lake and Viunitsa river (bordering Nizhniy Novgorod), arsenic and zinc levels in excess of MACs were identified. Cadmium, lead, nickel and zinc were found in Schelokovo lake and in a quarry nearby Sverdlova township.

All the water bodies surveyed (e.g. Borovoye lake and some other water bodies that were not surveyed earlier) are used by local fishermen and hunters, many of whom eat their trophies.

Bottom sediments were studied as key indicators for assessing the scale, composition and intensity of industrial contamination. Bottom sediments contaminate water and adversely affect living organisms.

Such effects are particularly relevant in impact zones of industrial centres or major cities. As a result, in receiving rivers, channels and lakes of industrial wastewater and contaminated rainwater or even solid industrial waste (e.g. in the case of a lake nearby Sverdlova township and Schelokovo lake in Dzerjinsk), technogenic silt is formed - a new type of bottom sediment. Moreover, technogenic silt is the main accumulator of industrial pollutants.

All the contaminants identified in the course of the project implementation at the territory of Dzerjinsk, belong to 1st and 2nd hazard class substances (extremely hazardous and very hazardous substances).

Table 1. Levels of pollutants in bottom sediments of water bodies (in MACs).

#	Water body	Zn	Ni	d	Hg	Pb	As	PCBs
1.	B. Telyatievo lake				2.4	2.3	34	1.5
2.	2 quarries southwards of Igumnovo township						0.9	
3.	Schelokovo lake	1.7	3.9	7.8		1		
4.	A lake in Sverdlova township			1				
5.	Dolgoye lake				1.5	1.7	15.8	4.8
6.	Gniloye lake						2.5	1

7.	Viunitsa river	1.1				2.2	
8.	Borovoe lake					4	
9.	A bog southwards of 2nd site of "Sintez" Co. site					*	
10.	Srednee lake					6	

\* - a major excess.

Table 2. Levels of pollutants in water of surface water bodies (in MACs).

	Sampling location	Hg	As	I
1.	Water, "Beloje More" quarry	0.8		1
2.	Water, a point southwards of C-350 collector "Kaprolaktam" plant	6	1	
3.	Water, bog southwards of 2nd site of "Sintez" Co. site	20	1	

In soil samples, in the water collection area nearby ROS-350 collector, extremely high concentrations of naphthalene derivatives were found, as well as high concentrations of toluene, benzene, styrene and xylene. In the same location, mercury and arsenic were found in meltwater samples.

Implementing organisations:

1. Accredited Analytical Centre of Chemical R&D Institute of N.I. Lobachevskiy Nizhegorodskiy State University. Address: Nizhniy Novgorod, 23 Gagarina Pr., block 5. phone (831) 465-81-66. Accreditation certificate # RU.0001.513063.
2. "Regional Environmental Monitoring Centre" Municipal Facility. Address: Nizhegorodskaya oblast, Dzerjinsk, 74 Gaidara St., phone (8313) 34-53-68, fax: 34-01-93. Accreditation certificate # .000961.

The research results were submitted to federal and regional mass media outlets.

### Impact on target groups:

The target groups include environmental NGO and mass media outlets of Nizhegorodskaya oblast and Povolzhie region. Local target groups include local residents, particularly fishermen and hunters who use fish and waterfowl from the water bodies surveyed.

### Impact on target policies:

The project results will be processed and submitted to the Regional Government of Nizhegorodskaya oblast and to a federal authority (the Federal Supervision Service in the Sphere of Natural Resources Use).

### Deliverables, outputs and/or products:

The following information materials were produced to inform the public on the project results:

- a press-release for local and regional mass media outlets, as well as federal news agencies;;
- a radio broadcast;
- a web publication;
- information on the protect and its outcomes was disseminated via Eco Accord information service;
- the outline map was produced of the contaminated areas surveyed, with pollution sources mapped (particularly sources of HMs and POPs); and
- recommendations were developed for improvement of HMs and POPs monitoring (and monitoring of other priority pollutants).

**Communication Efforts:**

A press-release for local and regional mass media outlets, as well as federal news agencies was disseminated, and a radio broadcast was undertaken.

Eco-SPES NGO plans to conduct a roundtable on the project results, in connection with the problem of historic environmental impacts and associated environmental contamination.

**SAICM National Focal Point:**

There is no National SAICM Focal Point in Russia.

**NGO Recommendations for next steps:**

Instead of a press-conference in Nizhniy Novgorod (the regional capital city) or in Dzerjinsk, a round-table for presentation of the project results has been planned.