




International POPs Elimination Project

Fostering Active and Efficient Civil Society Participation in Preparation for Implementation of the Stockholm Convention

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PCB Contamination in East Kazakhstan Oblast and other Regions of the Republic of Kazakhstan: Territory Monitoring and Inventories of PCBs Sources as Options to Address the Problem

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About the International POPs Elimination Project

On May 1, 2004, the International POPs Elimination Network (IPEN http://www.ipen.org) began a global NGO project called the International POPs Elimination Project (IPEP) in partnership with the United Nations Industrial Development Organization (UNIDO) and the United Nations Environment Program (UNEP). The Global Environment Facility (GEF) provided core funding for the project.

IPEP has three principal objectives:

- Encourage and enable NGOs in 40 developing and transitional countries to engage in activities that provide concrete and immediate contributions to country efforts in preparing for the implementation of the Stockholm Convention;

- Enhance the skills and knowledge of NGOs to help build their capacity as effective stakeholders in the Convention implementation process;

- Help establish regional and national NGO coordination and capacity in all regions of the world in support of longer term efforts to achieve chemical safety.

IPEP will support preparation of reports on country situation, hotspots, policy briefs, and regional activities. Three principal types of activities will be supported by IPEP: participation in the National Implementation Plan, training and awareness workshops, and public information and awareness campaigns.

For more information, please see http://www.ipen.org

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PCB Contamination in East Kazakhstan Oblast and other Regions of the Republic of Kazakhstan: Territory Monitoring and Inventories of PCBs Sources as Options to Address the Problem

The project was implemented with involvement of representatives of:

Governmental agencies: the Ministry of Environment (MoE) of the Republic of Kazakhstan; the Territorial Directorate of the MoE in East Kazakhstan Oblast, the Territorial Directorate of the MoE in Almaty Oblast, the Sanitary and Epidemiological Facility of East Kazakhstan Oblast and the Sanitary and Epidemiological Facility of Ust-Kamenogorsk

The Parliament of the Republic of Kazakhstan;
The Institute of Chemistry of the Republic of Kazakhstan. "Sintez" R&D Centre (the Russian Federation)

NGOs: of East Kazakhstan Oblast, Kustanai Oblast, Pavlograd Oblast

Mass media outlets

In the course of the project implementation we collected information on PCBs levels in different regions of the republic; adverse health and environmental impacts of PCBs, results of POPs inventories, etc.

In the course of gathering information on PCBs we encountered some difficulties, as the MoE had insufficient information on PCBs. Certain information was collected in the course of PCBs inventories in the framework of UNDP/GEF project "Initial Assistance to the Republic of Kazakhstan for Fulfilment of Its Commitments under the Stockholm Convention on POPs", however, such information was not easily accessible to all NGOs. For example, the response to our request to the MoE on provision of information on PCBs was inadequate. In its response letter of December 9,.2005, signed by Mr. Kesikbaev - the first deputy PM - the MoE provided no information on PCBs and referred instead to different activities in connection with PCBs. We may conclude that even governmental agencies do not control the situation and do not have information on projects/activities under way in the country. Moreover, they are not interested in provision of such information. Web-sites of POPs-related projects, implemented in Kazakhstan, are not regularly updated, in particular the site of UNDP/GEF project "Initial Assistance to the Republic of Kazakhstan for Fulfilment of Its Commitments under the Stockholm Convention on POPs". POPs-related information at the site of the Ministry of Environment also is not regularly updated. We may conclude that members of the general public can hardly access information on PCBs and POPs in general.

In the course of the project implementation we developed an analytical publication on PCBs in Kazakhstan, relying on information we collected by means of our information requests. The publication was positively assessed by experts, including Professor Yu.A. Treger, Doctor of Sciences (Chemistry), the Director-General of "Sintez" R&D Centre and V.N.Rozanov, Candidate of Sciences (Chemistry), a Sector Chief of "Sintez" R&D Centre (the Russian Federation). Russian experts developed recommendations on improvement of PCBs-related situation in Kazakhstan and additional PCBs inventories.

The publication was submitted to the Parliament of the Republic of Kazakhstan, the Ministry of Environment, territorial MoE directorates, representatives of industrial facilities, mass media outlets, NGOs, "Bumerang" R&D Association of Eastern Kazakhstan Oblast (for further dissemination among local residents of PCBs-contaminated areas) and KAPUR (Kazakhstan Association of Natural Resources Users) for further dissemination among industrial facilities.

So far, NGOs of Kazakhstan play rather modest roles in addressing problems of identification, storage and elimination of PCBs stockpiles, their adverse health and environmental impacts. In the course of the project implementation, we found that NGOs are rarely involved in PCBs inventories and other practical activities for identification of PCBs stockpiles. Only a few NGOs realise their roles in addressing POPs-related problems and have necessary trained personnel for these purposes.

The project promoted understanding that NGOs may independently participate in identification of PCBs and other POPs, however, they need to resolve some problems such as development of co-operation with representatives of research facilities, that have necessary instruments and methodologies for identification of PCBs and other POPs, and development of recommendations for members of the general public on identification of PCBs and other POPs.

Research facilities are also interested in contacts with NGOs to lobby for their own interests, including, in particular, supply of necessary laboratory equipment and issuance of necessary licenses and certificates, granting them legislatively set rights to conduct analytical works, including *inter alia* analytical works in response to requests of NGOs and local residents.

Industrial facilities are not interested in provision of information to the public and research studies at their sites. At the same time, they need contacts with NGOs in order to represent their interest more efficiently and lobby the legislative branch for reduction of their burden of reclamation of past pollution, for approval of programs for elimination of PCBs.

Governmental environmental authorities (MoE, sanitary and epidemiological facilities) also need to strengthen their co-operation with the public in the sphere of addressing the problem of POPs, as NGOs often are more mobile in their efforts to collect and disseminate information, they study international experience, participate in implementation of network projects (e.g. IPEP) and may offer a different vision of PCBs, and POPs-related problems.

In the course of the project implementation, the following activities were conducted:

1. Identification of the necessary number of samples and locations of soil sampling points in different districts of Almaty Oblast, where facilities of Almaty Power Distribution Company (Almaty Power Consolidated) operate (sources of PCBs).
2. Field visits to 3 equipment supply and storage facilities of Yesikskiy RES and 2 facilities of Talgarskiy RES to collect soil samples.
3. Chemical analysis to measure PCBs levels in soil samples (specialists of the Institute of Chemistry).
4. Development of the analytical survey at the base of responses to information requests on PCBs-related developments in the Republic of Kazakhstan, mailed to different environmental bodies.
5. Discussions on the data obtained, with participation of NGOs, the Institute of Chemistry of the Republic of Kazakhstan; a request on expert assessment of the results by specialists of "Sintez" R&D Centre (the Russian Federation).
6. Development of proposals for the Parliament of the Republic of Kazakhstan on promotion of the Stockholm Convention on POPs, accounting for recommendations of "Sintez" R&D Centre (the Russian Federation).

7. Development and publishing of the booklet on contemporary PCBs-related situation, including recommendations on activities of governmental bodies for promotion of the Stockholm Convention on POPs.
8. Dissemination of the booklet to inform the general public, the academic community, environmental bodies and authorities on results of the project implementation.
9. Development of the final report with description of the actual PCBs-related situation in Kazakhstan for its submission to Eco-Accord Centre.

Project results

- A survey of situation in Kazakhstan in connection with PCBs pollution;
- Development of recommendations on addressing the problem of environmental contamination by PCBs for regional authorities and environmental services;
- Development and publishing of the information booklet on PCBs-related situation, including recommendations on activities of governmental bodies for promotion of the Stockholm Convention on POPs, as well as recommendations on additional PCBs inventories, proposed by Russian experts;
- Development of the information leaflet for residents of the region, with recommendations on mitigation of adverse health and environmental PCBs impacts and with general information on PCBs and POPs that cause heaviest adverse impacts on the regional environment;
- Higher awareness of residents of East Kazakhstan Oblast and the whole Kazakhstan of national and regional PCBs pollution hot spots and facilities, that operate/have PCBs-containing equipment;
- NGOs "Bumerang" (Ust-Kamenogorsk), "Naurzum" (Kustanai) and "Greenwomen" (Almaty) provide comprehensive information on regional hot spots (sources of PCBs releases) to members of the general public.

Dissemination of the project results:

With involvement of mass media outlets of East Kazakhstan Oblast, local residents, NGOs, governmental bodies and environmental services of the region were informed on the project results.

Generalised results of our research studies were published in the brochure and information leaflets on the problem of PCBs and dioxin pollution at the territory of East Kazakhstan Oblast. The brochure was mailed to all interested persons and organisations (NGOs, higher education facilities, governmental bodies and industrial facilities).

The project report and electronic version of the brochure were posted at web-sites of environmental NGOs, including Eco-Accord Centre.

Production and use of PCBs in Kazakhstan

In industry, PCBs are used in:

- Electric equipment (transformers, capacitors, etc.), heat exchangers and hydraulic equipment (heat exchangers, transport hydraulic fluids).
- Paints and polymers (paints, glues, sealants, plasticizers, etc.).

In the territory of Kazakhstan, there are no facilities that produce polychlorinated biphenyls and other organochlorine compounds (PVC, pesticides, etc) that might generate PCBs as by-products.

Until 1990-91, at Ust-Kamenogorsk Capacitors Plant, capacitors were filled by trichlorobiphenyl. In 1989, the republican commission of the Public Health Ministry of Kazakhstan inspected the plant, the commission banned application of trichlorobiphenyl and developed the action plan for reclamation of the plant site. Residual amounts of trichlorobiphenyl (about 6 - 9 tons, according to the plant employees) and the upper layer of soil were removed for final disposal in a waste pond, while relevant production technologies were modified. However, there are no documents on the commission's decisions and works implemented at the plant site.

According to PCBs inventory works in the Russian Federation, in the period from 1968 to 1990, about 26,600 tons of PCBs were used in Ust-Kamenogorsk. Almost all manufactured products (industrial capacitors) were returned to Russia and other republics of the former USSR. Now, the main problem is associated with residual contamination of the plant site and, potentially, with stored unusable equipment and obsolete capacitors.

In 2004, independent environmentalists of Ust-Kamenogorsk asked Kanat Musaparbekov, the deputy Chief of the Environmental Directorate of East Kazakhstan Oblast, to comment on contemporary PCBs--related situation. Here is his response:

> "Polychlorinated biphenyls have not been ever produced in Ust-Kamenogorsk. At the Capacitors Plant, a technical grade product was used as a dielectric liquid (the product contained TCB - trichlorobiphenyl). In 1989, application of TCB was cancelled and the plant switched to other technical products - oil derivatives. Application of these products is not associated with adverse effects. In 1989, the Capacitors Plant implemented measures to reduce TCB contamination as the compound belongs to the class of persistent organic pollutants (POPs). Contamination of bottom sediments in the Irtysh River downstream of the Capacitors Plant was caused by discharges of the plant's wastewater, polluted rainfall and melt water. Due to the persistence of PCBs, the contamination is still measurable. However, such contamination is not associated with infiltration of TCB from the plant's waste pond, as the pond is located nearby the plant, i.e. far away from the Irtysh. In 2003, river water samples taken downstream of the Capacitors Plant did not reveal presence of TCB. However, these hazardous substances are still found in soil and bottom sediments."

> "There are no state programs of POPs management in Kazakhstan so far. The Environmental Directorate of East Kazakhstan Oblast intends to apply to the UN Mission in Kazakhstan in order to incorporate some activities into the National Plant of Implementation of the Stockholm Convention (area survey works at TCB-contaminated territories in Ust-Kamenogorsk and subsequent cleaning and rehabilitation of contaminated areas)."

However, independent environmentalists would like to rely on more comprehensive studies. They believe that PCBs evaporate, pollute air, infiltrate to groundwater and reach the Irtysh River.

In 1998, i.e. almost ten years after cancellation of PCBs application at the Capacitors Plant, independent environmentalists from Ust-Kamenogorsk studied the quality of river water downstream of the Capacitors Plant and found that PCBs levels in water exceed the relevant MAC by 3.6-fold.

The environmentalists concluded that PCBs from the plant site infiltrate to groundwater and then enter the Irtysh River. They argue that their conclusions are well substantiated, because they involved research scientists from the Department of Surface Water Bodies of the Hydrometeorological Committee of Kazakhstan in their studies. Moreover, chemical analysis

works were conducted by experts of the Institute of Organic Chemistry of the Siberian Academy of Sciences of the Russian Federation.

Results of the inventory of transformers in Kazakhstan

Results from the Ministry of Environment, UNDP. Project: "Initial Support for the Republic of Kazakhstan for Fulfilment of its Commitments under the Stockholm Convention on POPs"

116 transformers, including:

- 105 transformers - "Ispat Karmet" Co.;
- 8 transformers - "ANPZ" Co.;
- 2 transformers - "Ferrokhrom" Co.;
- 1 transformer - "Oskemen Vodokanal" Utility.

More than 38 thousand capacitors, including:

- 15 thousand capacitors are buried at Semipalatinsk nuclear test site;
- 16 thousand capacitors are used by "Aksuiskiy Ferroalloys Plant" Co.;
- 1450 capacitors are used by "Kazthsink" Co.;
- 811 are stored at power substations of "KEGOC" Co.;
- 557 capacitors are registered in reporting documents of "Kazakhstan Temir Zholy" Co., etc.

Capacitors by industrial sectors

- power industry - more than 2500 capacitors
- mining industry and metallurgy - about 20 thousand capacitors
- railways - about 600 capacitors
- chemical industry - about 400 capacitors

Capacitors, capacitors installations and transformers by oblasts and regions of the country

- 14,865 capacitors are buried at Semipalatinsk nuclear test site.
- Pavlodar Oblast - 31,244 capacitors.
- East Kazakhstan Oblast - 1 transformer, 1,977 capacitors and 34 capacitor banks.
- Karaganda Oblast - 105 transformers, 1,262 capacitors and 6 capacitor banks.
- Aktiubinsk Oblast - 520 capacitors.
- West Kazakhstan Oblast - 351 capacitors and 2 capacitor banks.
- Mangystau Oblast - 323 capacitors.
- Zhambyl Oblast - 290 capacitors.

Replies to requests for information

In reply to the request of the “Greenwomen” Environmental News Agency on PCBs in oblasts of Kazakhstan, "Merkuriy Plus" Co. (Karaganda) provided information that, at the territory of one of the company's sites, in the course of demolition works, some capacitors were identified. These capacitors were produced by Ust-Kamenogorsk Capacitors Plant and may contain trichlorobiphenyl. Now, the company faces the urgent problem of utilisation of these capacitors.

In reply to the request of “Greenwomen”, the Environmental Directorate of East Kazakhstan Oblast informed us that in 2003, in the framework of a joint MoE-UNDP project, a working group of experts was established including staff members of territorial MoE directorates. The working group organised an inventory of PCBs and collected information materials at the territory of the Republic of Kazakhstan.

Manual on Inventory of PCBs-containing Equipment, Materials and Waste

This manual was developed by the Environmental Directorate of East Kazakhstan Oblast in the framework of a joint MoE-UNDP project The Manual contains information on key physical, chemical and toxic properties of PCBs, brand names of PCBs-containing products, that were manufactured in the former USSR, and PCBs production and spheres of application. The manual was intended for use of experts, involved in inventories of PCBs-containing equipment, materials and waste.

Overall, inventory works covered 4 national companies and about 78 large and medium-sized facilities that may use/store PCBs or PCBs-containing equipment.

According to the reply of the Environmental Directorate of East Kazakhstan Oblast, "As the inventory results suggest, in East Kazakhstan Oblast, PCBs-containing equipment was found at facilities of "Kaztsink" Co., "Oskemen Vodokanal", "Kazakhmys", etc. Overall, according to results of UNDP inventory works, there are: 1 transformer, 1977 capacitors and 34 capacitor banks in the territory of East Kazakhstan Oblast."

"The waste pond and the area around Ust-Kamenogorsk Capacitors Plant belong to key sources of POPs environmental releases. At the plant, trichlorobiphelyl (TCB) was used as a dielectric liquid for capacitors' production. TCB contains up to 2.5% PCBs with high chlorine contents (chlophen A-5 and A-60).”This is the reply of the Environmental Directorate of East Kazakhstan Oblast.

Notwithstanding area rehabilitation works, conducted in 1990-91, according to analysis of soil samples, taken at the territory of the plant and in Ablaketka district nearby, PCBs levels in soils still remain high 10 years after the rehabilitation works. Levels reached 1730 mg/kg at the territory of the plant and 7-4 mg/kg at the bank of the Irtysh River, compared to the relevant regulatory maximal acceptable concentration (MAC) of 0.06 mg/kg.

The most comprehensive studies of the area contamination were conducted in 1985, by Academician V. Fedorov Institute of Applied Geophysics. In the course of these studies, samples of snow, water, bottom sediments, aquatic and terrestrial vegetation, fish, etc. were taken. In addition, breast milk samples were analysed (women without occupational exposure to PCBs vs. women - workers of Ust-Kamenogorsk Capacitors Plant with occupational exposure to PCBs).

The study results allowed indicated that the plant is the source of PCBs contamination of the environment and human PCBs body burden.

In 2000 - 2001, studies were conducted in Ust-Kamenogorsk, in the framework of technical co-operation between Germany and Kazakhstan. The studies focused on development of proposals for reduction of groundwater pollution and environmental risks of industrial waste.

In 2005, in the framework of environmental certification of Ust-Kamenogorsk, samples of soil, bottom sediments and water were taken to measure TCB levels. These samples were analysed by the Institute of Chemistry of the Ministry of Education of Kazakhstan. Results of these analytical works will be accessible after December 2005, after completion of development of the environmental certificate of Ust-Kamenogorsk.

The National Plan of Kazakhstan on the Stockholm Convention will be completed by December 2005".

Description of industries of Kazakhstan that use PCBs-containing equipment

5.1 Power industry

The power industry of Kazakhstan incorporates generating, power transmission and power distribution facilities. The first group incorporates thermal power plants, hydropower plants and geothermal power plants. The national company "KEGOC" operates power transmission lines from generating facilities to regions, while power distribution functions are fulfilled by regional power distribution companies. All these facilities use step-up and step-down transformers and other oil-filled electric installations (oil-filled circuit breakers, reactors and cables). In the majority of cases, these installations are filled by transformer oil (state standard GOST 982-68). However, there are many electric installations filled by PCBs.

Industry

The industrial sector of Kazakhstan incorporates oil and gas, mining, metallurgy, engineering, chemical, light and food processing industries. The majority of industrial facilities of Kazakhstan were commissioned in the Soviet period and were designed to meet demands of the whole USSR, as a result, the majority of these facilities have major production capacity. These facilities are extremely energy- and resource intensive. Many of them operate their own generating facilities, electric substations with large amounts of oil-filled equipment. In addition, production facilities are served by auxiliary electric equipment to supply electric power to technological equipment, such as electric furnaces of metallurgy plants, rolling mills of engineering plants (e.g. "Ispat Karmet" Co., "Aksuiskiy Ferroalloys Plant" of "Kazkhrom" Co., etc.)

Utilities

Municipal utilities and social services (public health, education and cultural facilities) are managed and financed by local executive bodies. Transformers that serve residential houses and social services facilities in cities and townships, are filled by transformer oil. Due to high toxicity of PCBs, PCBs-containing transformers were not used for these purposes.

Small to medium-sized enterprises (SMES)

Production-oriented SMES were discussed in the "Industry" section. Services-oriented SMES generally do not operate power supply equipment of their own and use power supply services of other providers (industrial facilities or municipal power supply utilities).

Power distribution: technological system

6.1 Transformers

The majority of facilities operate transformers, filled by transformer oil and dry-type transformers. However, several facilities operate transformers of Chirchik Plant filled by Sovtol. For example 105 TNZ transformers are installed at rolling mills of "Ispat Karmet" Co.

Sovtol-filed transformers are generally used if high requirements are applied to fire and explosion resistance of technological equipment. At the same time, many facilities of the country operate

imported transformers with unknown dielectric liquids. The majority of them were manufactured before 1990.

Capacitors

Capacitors are widely used by facilities that operate DC equipment. For example, there are 820 capacitors at electric substations of "KEGOC" Co., with the overall capacity of 7,626 litres of PCBs. "Aksuiskiy Ferroalloys Plant" operates 16,379 capacitors, filled by trichlorobiphenyl and produced by Ust-Kamenogorsk Capacitors Plant.

Management and control

Now, the country lacks laws and regulations on safe management of PCBs-containing equipment and materials. Management and control of such equipment relies on available regulations on management of toxic substances (state standards, manuals and instructions).

It is necessary to develop specialised regulations on POPs in the near future, accounting for available documents developed by UN agencies.

It is necessary to establish a specialised centre in the country in charge of management and control of PCBs-containing equipment, the centre should develop draft regulations on safe management of already operating equipment, its decommissioning and utilisation in a specialised POPs elimination facility.

6.2 PCBs contents

In the Soviet period, PCBs levels were analysed only at Ust-Kamenogorsk Capacitors Plant. Now, trichlorobiphenyl measurements are made by the Institute of Chemistry of the Ministry of Education and Science of Kazakhstan.

PCBs and PCBs-containing equipment (results of the primary inventory)

7.1 PCBs stockpiles

There are no storages of pure PCBs and PCBs-containing oils (Sovol, Sovtol) at the territory of the country. Residual amounts of trichlorobiphenyl and production waste of Ust-Kamenogorsk Capacitors Plant were buried in 1990 in the waste pond of the plant.

Sovtol-10 was primarily used by Chirchik Transformers Plant in Tashkent Oblast of Uzbekistan. Transformers that were manufactured at the plant are still used by many production facilities, including some facilities in Kazakhstan (e.g. Ust-Kamenogorsk Titanium and Magnesium Plant).

PCBs-containing equipment

Transformers

Results of the primary inventory suggest that there are 104 operational Sovtol-filled transformers at the territory of the country (manufactured by Chirchik Transformers Plant), in addition, 4 other transformers have been already booked off.

105 transformers are used by "Ispat Karmet" Co., 2 transformers are used by "Ferrokhrom" Co, and 1 transformer is used by Ust-Kamenogorsk water utility.

However, many facilities of the country still operate large numbers of imported transformers, manufactured in the USA, Germany, Bulgaria, Romania, Poland and other countries since 1930s and filled by unknown dielectric liquids.

7.2.2. Capacitors

According to preliminary inventory results, there are more than 38,000 capacitors in the country, including 15,000 capacitors buried at the Semipalatinsk nuclear test site. More than 23,000 capacitors and 78 capacitor banks are in use now (capacitor banks contain unknown numbers of capacitors, mainly filled by trichlorobiphenyl and manufactured by Ust-Kamenogorsk Capacitors Plant before 1990). These capacitors and capacitor banks are located as follows:

- 16,379 capacitors - "Aksuiskiy Ferroalloys Plant" (a subsidiary of "Kazkhrom" Co.);
- 4 capacitor banks and 1,450 trichlorobiphenyl-filled capacitors - "Kaztsink" Co. (498 capacitors were booked off and prepared for utilisation);
- 811 TCB-filed capacitors were booked off and are stored now in storages of electric substations of "KEGOC" Co.; 9 capacitors are still in operation;
- 7 capacitor banks and 70 capacitors - facilities of "Kazatomprom" Co..
- 557 capacitors - "Kazakhstan Temir Zholy" Co.
- 1024 capacitors and 105 transformers with PCBs are used by "Ispat Karmet" Co.;
- 211 capacitors - "AZHS" Co.;
- 23 capacitors with unknown dielectric liquids - "Oskemen Vodokanal" utility of Ust-Kamenogorsk, 3 capacitors (manufactured by Ust-Kamenogorsk Capacitors Plant) - "Kazakhmys" Co.; 80 capacitors - "Altreid" Co. of Ust-Kamenogorsk Oblast;
- Many facilities of Karaganda and West Kazakhstan Oblast operate a few capacitors or 2-4 capacitor banks each.
- In 2002, about 15 thousand TCB-filled capacitors (manufactured by Ust-Kamenogorsk Capacitors Plant) were dismantled at the electric substation in Ekibastuz and buried at Semipalatinsk nuclear test site.

Other equipment

Other types of oil-filled equipment are also broadly used in the country (e.g. oil-filled circuit breakers, reactors, lead-ins, cables, rectifiers, etc.). According to information, provided by the Russian Federation, in the former USSR, PCBs were not applied for the above types of equipment. Potentially, PCBs might be found in similar imported equipment items that are also broadly used in the country. It is necessary to make spot-checking of such equipment items for presence of PCBs.

At the same time, Pavlodar Chemical Plant produced flexible PVC for cables and footwear applications. The relevant production line was idle since early 1990s. According to technological requirements, PCBs were used as a heat exchange liquid in the system of heating of the flexible PVC production reactor. The installation used about 6 m^3 of PCBs, now, available stockpiles do not exceed 1 - 1.5 m^3.

Now, there are no contacts with specialists who operated the production line, nobody knows where the rest of PCBs ended up. As PVC was not produced in Kazakhstan and it is necessary to import all raw materials, its production is not economically viable. It is fairly possible that the production line will be liquidated, scrap metal will be utilised, while residual PCBs may be simply discharged to the sewer. It is necessary to prevent such developments and to utilise all residual PCBs and contaminated installations.

PCBs-containing waste

Now, there are 4 sources of PCBs-containing waste:

1. The site of Ust-Kamenogorsk Capacitors Plant.

Until 1989, capacitors were filled by trichlorobiphenyl at Ust-Kamenogorsk Capacitors Plant. In 1989, the republican commission of the Public Health Ministry of Kazakhstan inspected the plant. The commission banned application of trichlorobiphenyl and developed the action plan for reclamation of the plant site.

Residual amounts of trichlorobiphenyl (about 6 - 9 tons, according to the plant employees) and the upper layer of soil were removed for final disposal in the plant waste pond, while relevant production technologies were adjusted for application of DOF dielectric oil of Japanese production. However, there are no documents on the commission's decisions and implemented works at the plant site. Notwithstanding the area rehabilitation works, conducted in 1990-91, analysis of soil samples, taken at the territory of the plant and in Ablaketka district nearby suggests that PCBs levels in soils still remain high 10 years after completion of the works with levels reaching 1730 mg/kg at the territory of the plant and 7-4 mg/kg at the bank of the Irtysh River, compared to the relevant regulatory maximal acceptable concentration (MAC) of 0.06 mg/kg.

2. The waste pond of Ust-Kamenogorsk Capacitors Plant.

The waste pond of the plant is located on mountain slopes in another part of Ust-Kamenogorsk. The pond is continuously filled by new inflows from the plant wastewater treatment facilities and drainage pits.

The pond is filled by melt water (different sources suggest the water level from 2 to 6 metres). It is not fenced and its protection arrangements are purely nominal. There is a real threat of infiltration of PCBs to the Irtysh River via groundwater. There are wells around the pond, but nobody monitors pollutants there. The pond contains residual amounts of trichlorobiphenyl (about 6 - 9 tons, according to the plant employees) and the upper layer of soil, removed from the plant site in the course of reclamation works at the plant.

Analysis of samples of soil at the beach and water from the pond revealed that PCBs levels reach 12,438 mg/kg in soil and 0.19 mg/kg in water. Therefore, the pond poses a real threat of air pollution by PCBs in warm seasons due to evaporation and infiltration of PCBs to the Irtysh River with groundwater.

3. The site of Ekibastuz Electric Substation

Construction of the substation was launched in the Soviet period to transmit electric power from thermal power plants of Ekibastuz to European regions of the USSR and COMECON countries.

The substation was designed to rectify alternating current and required use of capacitor banks. By the moment of decay of the USSR, about 15,000 capacitors were installed at open air ground at the both sides of the rectifier facility.

In the period of economic crisis many capacitors were dismantled and depressurised. Local residents tried to remove copper rods from these capacitors and sell them as scrap metal.

In 2001, the emergency commission was established in Ekibastuz to eliminate health and environmental hazards, associated with evaporation of trichlorobiphenyl (summer houses and Irtysh-Karaganda water channel are located nearby the substation).

In the course of decommissioning works in 2002, new owners of the substation dismantled the capacitors and insulated them by sealing foam. Some part of soil, contaminated by trichlorobiphenyl in the course of dismantling works, was removed and packed into bags. Later, the capacitors and bags with contaminated soil were removed and buried at the Semipalatinsk nuclear test site.

However, these works were not completed. Soil was not removed under the capacitors' trestle. PCBs levels in soil under the trestle reach up to 26,200 mg/kg. It is necessary to dismantle the trestle, remove the soil and store the demolition waste temporarily in some closed facility or at the Semipalatinsk nuclear test site, pending a final decision on its final disposal.

4. The burial of capacitors at the Semipalatinsk nuclear test site

In 2002, capacitors were buried at the Test Field of Semipalatinsk nuclear test site, nearby Kurchatov. The burial looks like a small ground hill (about 2 m in height), surrounded by a barbed wire fence with warning signs.

In 1940s - 1950s, surface tests of nuclear weapons were conducted at the Test Field. The area is severely polluted by radioactive substances and it was excluded from the range of agricultural land in the recent past. There are many facilities there that might be adapted for temporary storage of POPs-containing waste.

Semipalatinsk nuclear test site was selected for burial of capacitors because it is located far away from human settlements (the nearest settlement - Kurchatov town - is located 70 km away), local groundwater does not discharge to rivers or other surface water bodies, and the site area is excluded from human use for several hundred years. For burial purposes, two most suitable facilities were selected at the site. Capacitors were transported from Ekibastuz to Kurchatov along a specially designed route, agreed with relevant services of MoE and the Ministry for Emergency Response.

Approximately 14,865 capacitors were piled in 7-8 layers, separated by wood, impregnated with antiseptics and flame retardants. The upper layer of capacitors is 0.6 - 1 m under the floor slab. Capacitors were filled 52% of the overall storage volume. Remaining cavities were filled by bags with contaminated soil from Ekibastuz substation (50 tons in total).

The construction floor slabs were covered by additional layer of pavement slabs (150 mm thick) with some inclination to one side, the upper layer was covered by asphalt concrete hydro isolation (80 mm) with bituminous coating (4 mm). Then, the construction was covered by pressed clay (500 mm). The burial site was banked, fenced by a barbed wire fence and equipped with drainage channels and monitoring wells along the perimeter.

The centralised database on PCBs

Now, the database on PCBs-containing equipment in the country is being developed. The database will contain information on numbers and types of capacitors and transformers, places of installation, equipment owners, dimensions, weighs, volumes and types of PCBs-containing liquids, manufacturers, dates of manufacture, service life and other necessary data entries.

The database will operate in the ACCESS environment and will allow swift data retrieval and update.

Health status of residents of PCBs contaminated areas

Ust-Kamenogorsk Capacitors Plant operated in East Kazakhstan Oblast. From 1959 to 1990, the plant produced capacitors filled by PCBs as dielectric liquids. Reporting documents suggest that from 188 to 127 tons of TCB were released annually to the environment with the plant waste alone. Ventilation systems released 12 - 14 tons TCB/year, (6 - 7%), the rest - more than 85% (mass) was released with liquid waste and sludge.

The plant operations resulted in PCBs contamination of the plant site and the nearby area. In 1990s, decontamination works were implemented at the plant. Some contaminated soil was removed, but waste in the waste ponds of the plant still remains. The plant is located in close proximity to residential district Ablaketka on the bank of the Irtysh River. Main problems are associated with residual contamination of the plant site and storage of old equipment and obsolete capacitors. Now, the plant has no plans on any further decontamination work.

Health effects associated with PCB exposure in humans include damage to the liver, thyroid, and immune system along with reduced birth weight, reproductive toxicity, alteration of neurodevelopment, and cancer. The International Agency for Research of Cancer (IARC) classifies PCBs as probable human carcinogens.

Existence of carcinogenic effects of organochlorine compounds may be further supported by results of epidemiological studies on malignant tumours of residents of Ablaketka township of East Kazakhstan Oblast. In 1999 - 2003, 165 cases of cancer were registered there.

Among men, a relatively high incidence of skin cancer (32%), malignant tumours of gastro-intestinal tract (22%) and bladder (12%) were found.

Among women, a higher incidence of tumours of reproductive organs (27%), skin cancer, including melanoma (21%) and breast cancer (17%) was registered.

In the range of the most common malignant tumours of reproductive organs, cervical carcinoma prevailed (15%), followed by uterine carcinoma (7%) and ovarian carcinoma (5%) (N. Dyusembaeva, the national technical expert on eco-toxicology, health and environment).

Options to address the problem of PCBs-containing equipment:

It is necessary to have/implement:

- technologies for elimination of PCBs-containing equipment
- storage facilities for temporary storage of dismantled and decommissioned PCBs-containing equipment
- reclamation works at PCBs-contaminated sites in Ust-Kamenogorsk, Ekibastuz, Pavlodar

According to recommendations of Russian scientists (Yu.A. Treger, Doctor of Sciences (Chemistry), the Director-General of "Sintez" R&D Centre and V.N.Rozanov, Candidate of Sciences (Chemistry), a Sector Chief of "Sintez" R&D Centre), in order to ensure a comprehensive inventory of PCBs in the country and address associated problem, it is necessary to implement an additional inventory of equipment items (including imported equipment), filled by unknown dielectric liquids, that potentially might contain PCBs. Types of dielectric liquids may be identified by simple tests, recommended in the Manual of UNEP Chemicals