International POPs Elimination Project

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

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Identification of Potential Sources of Dioxins/Furans and Development of Recommendations for Reduction of their Adverse Health and Environmental Impacts in Armenia

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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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This report is available in the following languages: English, Russian

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Implementing the project

The Steering Council was established for the project implementation. Members of the Steering Council included representatives of R&D institutions (the R&D Institute of General Hygiene and Occupational Health of the Public Health Ministry of Armenia, the R&D Institute of Health, Environment and Preventive Toxicology of the Public Health Ministry of Armenia, the Institute of Hydrology and Ichthyology of the National Academy of Sciences, the Waste Study Centre), industrial facilities (Research and Production Association "Nairit-2"), NGOs ("Ecotox", the Centre of Environmental Studies, etc.)

Members of the Steering Council discussed aims and objectives of the project. The project's aim is associated with facilitation of fulfilment of Armenia's international commitments under the Stockholm Convention on POPs by identification and quantification of sources of releases of dioxins/furans and by development of proposals for prevention and reduction of their potential adverse health and environmental impacts in Armenia.

Project objectives

Correspondingly, the project objectives included the following ones:

- identification of potential sources of releases of dioxins/furans: in chemical industry and metallurgy, waste incineration (including burning of agricultural waste), landfill and forest fires, etc.;
- quantification and assessment of release intensities of the sources of dioxins/furans identified;
- development of proposals for prevention and reduction of potential adverse health and environmental impacts of dioxins/furans;
- enhancement of public roles in addressing problems of potential adverse health and environmental impacts of dioxins/furans,
- strengthening partnerships between the general public, the academic community, industries and authorities for decision-making on reduction of adverse health and environmental impacts of dioxins/furans.

Potential sources list

At the initial stage of the project implementation, we compiled the list of operating industrial facilities (including private and state-run ones), including organisations that operated in the period from 1985 to 2002 at the territory of the Republic of Armenia. We collected and processed information on different economic/industrial activities on Armenia in order to identify potential sources of dioxins.

We analysed the above information on industrial facilities of the country to identify/assess industries and processes that may be associated with potential releases of dioxins and furans.

Now, in the Republic of Armenia, the range of sources of environmental releases of dioxins and furans incorporates metallurgy, chemical industry, fossil fuel burning, production of construction materials (lime and cement), as well as uncontrolled landfill fires, open burning of agricultural residues, burning of household waste, forest fires, etc.

Armenia always had a well developed industry, particularly engineering, metal processing, chemical and petrochemical industries, ferrous and non-ferrous metallurgy, and production of construction materials. In the territory of Armenia, large industrial facilities operated that produced calcium carbide, sodium hydroxide, chlorine, hydrochloric, sulphuric and nitrous acids, chloroprene rubber, latex, glass, synthetic fibres and polymers.

Besides that, it is a well known fact, that in 1980s, Armenia was the key supplier of chloroprene rubber in the former USSR. In addition, now, there are major operational mining and ore-processing facilities in Armenia that might release dioxins and furans to the environment.

Besides the above industrial facilities, there are other sources of releases of dioxins and furans that are scattered around the whole territory of the country, including sources such as waste dumps and landfills. These latter sources are particularly hazardous as they are prone to waste self-ignition and low-temperature smouldering, accompanied by environmental releases of dioxins and furans. These sources cause serious concerns among members of the academic community, environmentalists and NGOs.

There are no waste-recycling facilities at the territory of the country, while the waste recycling system of the former USSR that operated earlier in Armenia (including recycling of waste paper, glass, textiles, etc.) was liquidated due to disruption of economic co-operation links with other former Soviet republics.

The practice of disposal of hazardous waste to municipal landfills is fairly common. As municipal landfills are scattered around the whole territory of Armenia, they might be considered as pollution hot spots of anthropogenous origin and as potential sources of releases of dioxins and furans.

In addition, it is necessary to note that problems of organised removal of municipal waste and specialised sanitary landfills for these purposes have not yet been resolved. There are no waste dumps in the country that meet applicable sanitary requirements. According to the Public Health Ministry of Armenia, now there are 45 urban and 429 rural landfills in the country. The majority of them do not meet requirements of sanitary standards and rules (all urban landfills and 368 rural ones). Landfills are located at distances of 2 - 18 km from human settlements and these landfills are mainly disorganised and poorly managed. About 106.3 hectares of land, allocated for landfills in the country are contaminated by wastes to a lesser or greater extent.

In Yerevan, municipal waste is disposed in the Nubarashen landfill - one of sources of environmental releases of dioxins and furans. Nubarashen landfill has been operating since 1961 and covers a land area of about 60 hectares. Some estimates suggest that the landfill contains 6.5 - 7.0 million tons of waste. Waste management practices at the landfill are based on "sandwich" waste disposal technology, when layers of waste are separated by layers of soil. However, at

some parts of the landfill, the layers of waste are 50 m thick (instead of 20 m as recommended by applicable standards). In addition, layers of waste often are not covered by soil (a soil layer should reach 20 - 30 cm).

The landfill is not equipped with a drainage system for collection of landfill leachate. There are numerous deep and surface fires at the landfill due to accidents or deliberate burning. Inadequate management of the landfill site, lack of equipment, necessary for waste disposal operations - all these factors result in infiltration of hazardous chemicals to soil and groundwater and in releases of dioxins/furans to air.

According to the National Statistical Service of Armenia, in 2004, 17,659,970.8 tons of waste was generated in the country, including 10,037.9 of household waste. In 2004, 1,000.8 tons of waste was burned in iron garbage containers and at bonfires (including mainly street garbage, plastics, glass, textile, leather, paper beverages packs, tin and aluminium cans, paper, cardboard, plastic packaging, food waste, etc.).

Estimating dioxin releases

It is necessary to note that we estimated dioxin releases with use of release factors of the draft Toolkit for Identification and Quantification of Dioxin and Furan Releases (January 2001, referred hereinafter to as the Draft) and the Assessment of Releases and Main Sources of Dioxins in the Context of the Stockholm Convention (Mexico, 2005. referred hereinafter to as the Assessment). Release estimates are shown in the Table.

Table 1. Estimated releases of dioxins

Source categories	Media	Releases at the base of release factors of the Draft	Releases at the base of release factors of the Assessment
Open burning of household waste	releases to air, g TEQ/year	0.3	0.017
	releases to residues, g TEQ/year	0.6	0.0003
Landfill fires	releases to air, g TEQ/year	8.82	0.304
	releases to soil, g TEQ/year	-	1.28
Forest fires	releases to air, mg TEQ/year	0.37	0.037
	releases to soil, mg TEQ/year	0.296	0.0037
Open burning of agricultural residues	releases to air, g TEQ/year	2.76	0.074
	releases to soil, g TEQ/year	0.92	0.0046

In the course of estimating dioxin releases from open burning of household waste we used release factors of the Draft (300 µg TEQ/t for releases to air and 600 µg TEQ/t for releases to soil); and release factors of the Assessment (17.0 µg TEQ/t and 0.3 µg TEQ/t, respectively).

Dioxin release estimates for releases to air and residues reached 0.3 and 0.6 g TEQ/year, when we used release factors of the Draft and 0.017 and 0.0003 g TEQ/year, when we used release factors of the Assessment.

In the course of estimating dioxin releases from landfill fires we used release factors of the Draft (1000 µg TEQ/t for releases to air) and release factors of the Assessment (34.5 µg TEQ/t for releases to air and 145 µg TEQ/t for releases to soil). In 2004, a major part of waste (8,819.7 tons) was disposed to landfills (including 5,299.6 tons of household waste).

Estimated releases of dioxins to air from landfill fires reached 8.82 g TEQ/year with application of release factors of the Draft; when we applied release factors of the Assessment, estimated dioxin releases to air and to soil reached 0.304 and 1.28 g TEQ/year, respectively.

It is necessary to note, that forest fires also contribute to environmental contamination by dioxins and furans. In the course of estimation of dioxin releases from forest fires we used release factors of the Draft (5 µg TEQ/t for releases to air and 4 µg TEQ/t for releases to soil); as well as release factors of the Assessment (0.5 µg TEQ/t and 0.05 µg TEQ/t, respectively).

In 2003, in Armenia, 4 forest fires were registered. As a result of these forest fires, 0.4 hectare of forests and 3.5 hectares of bushes were burnt out. Estimated releases of dioxins to air and soil from forest fires reached 0.37 and 0.296 mg TEQ/year, respectively, with application of release factors of the Draft. Estimated dioxin releases with application of release factors of the Assessment reached 0.037 and 0.0037 mg TEQ/year, respectively.

In addition, we estimated dioxin releases, associated with open burning of agricultural residues. We used release factors of the Draft (30 µg TEQ/t for releases to air and 10 µg TEQ/t for releases to soil); as well as release factors of the Assessment (0.8 µg TEQ/t and 0.05 µg TEQ/t, respectively). With application of release factors of the Draft, estimated dioxin releases reached 2.76 g TEQ to air and 0.92 g TEQ/year to soil; while with application of release factors of the Assessment, relevant figures reached 0.074 and 0.0046 g TEQ/year, respectively.

It is necessary to note that the above results suggest that estimated dioxin releases differ substantially in the case of application of release factors of the Draft and the Assessment for forest fires, open burning of agricultural residues, open burning of household waste and landfill fires. Moreover, release estimates for these sources based on release factors in the Draft are much higher compared to release estimates based on release factors of the Assessment (by 10 – 2000-fold).

The project implementation activities will be continued. Project results will be used to raise awareness of the general public and governmental agencies of dioxin/furan releases to environmental media, on their potential adverse health and environmental impacts in order to facilitate decision-making on matters of reduction of their adverse health and environmental impacts in Armenia, and on reduction and elimination of POPs releases in the country.