Ministry of Environment

POPs Sustainable Management PMT

INVENTORY OF POP PESTICIDES POLLUTED AREAS IN MOLDOVA

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The problem

- By the early 1990s, about 1000 warehouses for pesticide storage had been built in the collective farms;
- During the period 1991-2003 most warehouses were destroyed or dismantled and only about 20% were maintained in a satisfactory condition;
- Significant amounts of obsolete pesticides were stored in the open or in inadequate conditions;
- As many storage facilities are situated close to residential areas and water courses, the risk of harmful effects on the environment and people's health is thereby greatly increased;
- In November 2003, the Moldovan authorities began repackaging and centralized temporary storage of obsolete pesticide stockpiles scattered across the country to a limited number of warehouses;
- Upon the finalization of these activities in 2008, about 340 warehouses have been fully emptied from obsolete pesticides, ensuring the elimination of the most direct threats to human health and the environment.

The problem

- At the same time, emptied warehouses remain a significant pollution source because their walls, floors, and adjacent territories are contaminated.
- The available information on their exact location, status and – most important – associated risks was scarce. This did not allow for setting priorities, selecting proper management options and policy planning;
- Thus this problem required a detailed inventory and risk assessment of all potentially contaminated sites, along with development of appropriate remediation measures.
- Such studies were conducted in parallel in 2008-2010 by the Ministry of Environment within two projects supported by the World Bank.
- This assignment was conducted within the *GEF/WB "POPs stockpiles management and destruction project"*, during the period of 2008-2010 years by the *Center for Strategic Environmental Studies ECOS* in cooperation with *Trimetrica SRL*, and managed by *POPs Sustainable Management Office* (www.moldovapops.md).

Inventory approach

The overall objective of the study was:

- to identify the POPs polluted areas posing the highest environmental and health risks and mapping of those areas using the GIS tool.

The more specific objectives were:

- development of the methodology of the POPs pollution study and risk assessment;
- development of the sampling program and field trial;
- analyses of POPs contents in the collected samples;
- identification of environmental and health risk zones;
- Design and filling the POPs contaminated areas database and mapping polluted areas using the GIS technology.

Inventory approach

Methodology

- There was no a study methodology to achieve the objectives set;
- An original methodology of POPs pollution study and hazard assessment was developed aiming at:

(i)identification and assessment of potentially POPs contaminated sites all over the country;

(ii) creation and filling of the POPs database as well as mapping and visualization of acquired data; and

(iii) setting the reporting formats and assuring the database support.

Inventory approach

Identification and assessment of potentially contaminated sites (1)

Information for identifying the potentially contaminated sites was basically collected from two sources: the mayoralties and local operators:

- Mayoralties indicated on the map the location of former facilities related to pesticides use;
- The field teams:

–visited and described all identified potentially contaminated sites, based on a unified questionnaire;
–determined the coordinates of the POPs sites using GPS devices;
–took photo images and composite soil samples at each site (the soil samples were further analyzed for POPs in a certified laboratory);

- The information obtained was processed and incorporated in the database.

Inventory approach

Identification and assessment of potentially contaminated sites (2)

The general approach to assessing the hazards associated with the sites potentially contaminated with obsolete pesticides (POPs residuals, in particular) included:

- gaining the information on-site concerning the status of pollution sources, the nearest risk receptors and the potential for contamination spreading;
- establishing the degree of environmental pollution with POPs;
- integration of data gathered on-site with relevant digital map layers, information from topographical maps, aero-photo images; and
- calculation of “hazard indexes”.

Inventory approach

POPs database, data mapping and visualization (1)

- A POPs environmental pollution database has been developed in order to ensure a structured management of POPs information to support effective decision making process at the Ministry of Environment.
- The proposed integrated GIS system for POPs data mapping and analysis allows effectively storing, managing and presenting POPs information such as geographic locations of the POPs sites, concentrations and other related parameters as well as distribution of health and environmental hazards.
- The POPs Database and its fields were designed in a way to allow the ability to make changes in existing configuration and add more data sets later on;
- The database allows smooth compatibility with any standardized databases defined for integration into the Information Management and Reporting System (IM&RS).

Inventory approach

POPs database, data mapping and visualization (2)

- Data incorporated in the database are fully based on the Reporting Format requirements (the field questionnaire completed by the operators on-site);
- In the same time, the data on POPs sites are linked with other types of information obtained in the field, including:

–electronic form of questionnaire, ensuring the access to the original information obtained during the field investigations;

–electronic form of sites general layout drawn by the field operators on-site;

–photo-gallery providing a visual of the status of major infrastructure on POPs sites and surrounding neighborhood areas;

–data on soil contamination on POPs sites provided by GEOLAB and presented under the Reporting Format requirements.

–the site's unique code was used for linking all available information per POPs site.

Inventory approach

Setting the reporting formats and assuring the database support (1)

- A special Reporting Format to secure the uniformity of data and have a homogenous and standardized dataset coming from the local sources has been developed;
- The Reporting Format is regarded as a uniform platform for sites assessment and consists of the following elements:

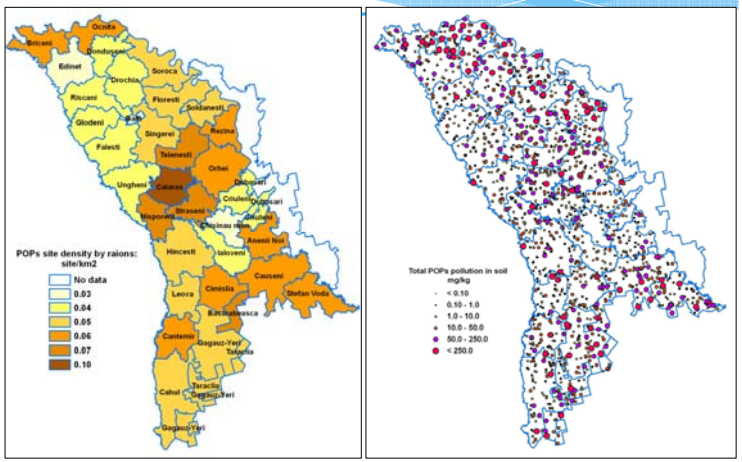
–coordinates of the site;
–the field questionnaire, to be filled during site investigation;
–technical instructions treating in detail the field operations;
–photo and sampling protocols;
–laboratory standard form; and
–procedures for collecting, transferring, checking data and filling the database.

INVENTORY FINDINGS

Distribution of sites potentially contaminated with POP

- Altogether, 1588 sites potentially contaminated with POP pesticides and 16 sites contaminated with PCB were identified and described.
- The territorial distribution of POPs sites indicate the national average figure of 0.05 sites/km^2 or one site per 20 square kilometers.
- Altogether, the 1588 investigated sites hosted 2326 major pesticide related infrastructure elements: storehouses, blending stations, helicopter platforms, evaporation reservoirs, as well as illegal pesticide dumps;
- The main type of pesticide infrastructure was represented by storage facilities (45% of the total number of installations), followed by blending stations (34%), evaporation reservoirs (13%), helicopter platforms (5%), and illegal pesticide dumps (3%).

INVENTORY FINDINGS



INVENTORY FINDINGS

Level of POPs contamination of sites (1)

- In total, 1651 composite samples from investigated sites were analyzed by the laboratory, including 1590 soil samples and 61 waste samples from the debris found at some old storage facilities;
- The information about their pollution level and spectrum was used for the evaluation of additional risks for the environmental and public health;
- Five POPs (groups of) compounds namely ∑ **DDT**, ∑ **HCH**, **chlordane**, **heptachlor** and **toxaphene** have been found in soil samples, in concentrations exceeding the national standard for organochlorinated substances in soil (0.1 mg/kg).
- **Aldrine**, **dieldrine**, **endrine**, **HCB** and **mirex** were not detected in the investigated samples.

INVENTORY FINDINGS

Level of POPs contamination of sites (2)

- The pollution of POPs sites with DDT and HCH can be defined as widespread.
- The number of sites contaminated with chlordane (31%) and heptachlor (22%) is also significant.
- Less number of sites are polluted with toxaphene (about 10%), but very often this is a severe level of pollution.
- The concentrations of the five mentioned POPs pesticides varied in the interval from detection limit to 616 mg/kg for chlordane, 4838 mg/kg for toxaphene, 505 mg/kg for heptachlor, 3148 mg/kg for sum of DDT metabolites, and 4216 mg/kg for sum of HCH isomers.
- Many of the sites have been polluted by several POPs compounds, which pose the problem of potential synergistic effects on the humans and the environment.
- The pesticide construction waste samples were studied separately from soil samples on 42 sites. The waste samples showed a high level of contamination and have an irregular statistical distribution.

HAZARD ASSESSMENT

Prioritizing of POPs contaminated sites

The assessment of contaminated sites is an important precondition for ranking them in view of developing site specific remediation strategies.

- A hazard assessment methodology for POPs contaminated sites was developed and tested. It forms the basis for a developed POPs database computerized module calculating the respective risk indexes and so-called **Site Hazard Total Score (SHTS**) and for respective ranking of sites by their hazards.
- The proposed site hazard assessment is based on three pillars, similar to the classical risk assessment elements:

–Level of Contamination,

–Risk Receptors, and

–Pollutants Distribution Potential.

- The integration of these three conceptual elements into the total site score system is providing an integral approach for site classification.

HAZARD ASSESSMENT

Prioritizing of POPs contaminated sites

The Site Hazard Total Score was used for ranking the site hazard according to the five generic groups. The full set of investigated POPs sites were prioritized as follow:

Site Hazard Total Score	Site hazard rank	Site priority for remediation strategy	Action needs	Number of contaminated sites	
> 95 %	I	Very high	Urgent	76	4.8 %
65 – 95 %	II	High	In short-term perspective	467	29.7 %
35 – 65 %	III	Medium	In medium-term perspective	513	32.7 %
5 – 35 %	IV	Low	In long-term perspective	440	28,0 %
< 5 %	V	Negligible	General protective / low cost measures required	76	4.8 %

Inventory of POP pesticides polluted areas

http://pops.mediu.gov.md

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