



# Management and disposal of Obsolete Pesticide Stock Case Studies: Romania and the Republic of Moldova

**Mihaela Claudia Păun**, Ministry of Environment and Climate Change, Bucharest, Romania

**Valentin Plesca**, POPs Sustainable Management Office, Chisinau, Moldova

**John Vijgen**, International HCH & Pesticides Association, Holte, Denmark

**Roland Weber**, POPs Environmental Consulting, D-73527 Schwäbisch Gmünd, Germany

## 1 Background and Objectives

Obsolete Pesticides (OPs) are defined as stocked pesticides that can no longer be used for their original purpose or any other purpose because they are banned because of their persistent negative impact on the environment, and/or because they cannot be used any more due to age, deterioration or a change of specification of currently applied pesticides and therefore require disposal [1]. The unsustainable life-cycle management of pesticides in the last 60 years has created large pesticide stockpiles, in particular in developing countries and countries with transition economies (Table 1).

Obsolete Pesticide with Persistent Organic Pollutant (POP) properties are addressed by the Stockholm Convention on POPs, which has been ratified by most EU member states and many though not all non-EU countries from Central and Eastern Europe and the former Soviet Union. In the frame of the Convention, National Implementation Plans (NIPs) are to be developed to address the problems to some extent. However, the slow progress of removal of pesticide stockpiles in Africa and East European and Caucasus and Central Asian countries (EECCA) demonstrate the challenges of their management [2], [3].

Stockpiles of Obsolete Pesticides are often in a severely deteriorated condition, poorly stored and located close to agricultural storages, housing or water supplies, and thus can represent a serious risk to human health, ground and surface water, land use, and the environment. The impact is often greatest on disadvantaged people who scavenge for “recyclables” with no or little awareness of the dangers involved.

There are considerable risks if no action is taken. Unprotected sites – estimated to range in the tens of thousands (Table 1) – pose a lethal danger to humans and animals alike. In addition, and in close geographical proximity to the EU, problems continue to exist, especially in South-East Europe and the former Soviet Union countries. OPs and related pollution can seriously risk agricultural trade between the EU and non-EU countries and the former Soviet Union [4].

The Stockholm Convention only deals with 15 specific OPs (POP pesticides), which represent a small propor-

tion of the total number. Therefore, the implementation of the provisions of the Stockholm Convention alone is hardly sufficient to effectively address the risks associated with the large total quantities of OPs.

Within the EU, producers have been legally obliged to manage Obsolete Pesticides including organizing the collection and destruction of these pesticides in accordance with EU regulations, applicable to hazardous waste management. With EU enlargement, EU law has consequently become applicable to the new member states as well. The process has been accelerated by EU programmes such as PHARE or national programmes established by some member states.

Most developing countries and countries with economies in transition lack adequate technical, institutional and financial capacity to develop the necessary policy and regulatory conditions to properly manage pesticides, and in particular clean up contaminated wastes/sites, including the destruction of obsolete stocks of pesticides.

The challenges of pesticide stockpile management of developing countries can be seen in the African Stockpiles Programme. According to the World Bank’s report from August 2013, 3,310 tonnes have been removed from 897 sites under the Africa Stockpiles Programme (ASP), since 2005, when the Global Environment Facility (GEF) committed US\$25 million to clean up stocks. in Ethiopia, Mali, Tanzania, Tunisia and South Africa [5]. Against the background of the estimated 50,000 tonnes of stocks, this shows there is still a long journey ahead. The World Bank has so far issued only an interim Implementation, Completion and Results Report [6], in which outcomes were rated as moderately unsatisfactory and a number of lessons are listed [7].

However some countries such as Romania and the Republic of Moldova have demonstrated that the management of Obsolete Pesticides stocks is feasible if an integrated approach involving relevant stakeholders can be established with an appropriate set of priorities and coordinated activities. Furthermore, in the implementation phase in both these countries, preventive measures were put in place avoid re-occurrence of Obsolete Pesticides.



Region	Estimated Tonnes	Sources of information
EU-25	30,000 - 32,000	IHPA update [8] and POPs Convention (NIPs) [9]
South-East Europe	30,000 - 32,000	IHPA update [8] and POPs Convention (NIPs) [9]
Former Soviet Union area	118,000 - 225,000	IHPA update [8] and POPs Convention (NIPs) [9]
Africa	27,394	FAO [10]
Asia	6,462	FAO [11]
Latin America and the Caribbean	11,2830	FAO [12]

**Table 1:** Global estimates of Obsolete Pesticides

The numbers in this list reflect the situation when the data was being collected, but it has to be noted that in the last few years progress has been made in vari-

ous countries, such as Moldova, Ukraine and Belarus, where substantial amounts have been repacked and/or destroyed.

## 2 Approach, Achievements and Results

### 2.1. Case study Romania

Over the last few decades, **Romania** has been dealing with the legacy of Obsolete Pesticide stocks due to the extensive production and use especially of organochlorine pesticides. In Romania, OCPs have been used since 1948. Products were mainly based on aldrin, chlordane, dieldrin, endrin, heptachlor and toxafene as active ingredients. All these products were imported, except those based on DDT and heptachlor, which were produced at the integrated petrochemical plant in Borzesti. The respective substances were produced as powders, in granular or liquid forms. They were used on large agricultural areas, on meadows and alpha-alpha cultures (also called lucern) [13]. For seed treatments in particular, Dieldrin-based pesticides were used in Romania between 1965 and 1970. Beside the persistent chlorinated pesticides, some of the most frequently used products were the ones based on heptachlor. After 1988, the use of these types of products has been stopped in Romania [6]. In Romania, significant quantities of lindane were produced and used as an insecticide on a wide range of plants, for foliage treatment, for trees and wood treatment and against ecto-parasites in human and veterinary treatment [6]. After 2006, the production and use of lindane was banned in Romania according to the provisions of EU Regulation (EC) No. 850/2004 on persistent organic pollutants [14].

Determined to avoid further negative effects of overusage of pesticides, Romania joined the Stockholm Convention in 2001, which included nine POPs pesticides at that time. The Convention became effective from 17th of May 2004. The National Implementation Plan and its strategy of implementation was one of the first policies dealing with Obsolete Pesticide stockpile management and elimination in Romania.

In supporting the elimination of Obsolete Pesticide stocks, the EU provided Romania with a grant of 3.5 million Euros through the PHARE-program for the implementation of a project aimed at disposing large pesticides stocks. The total project cost was set at 4.8 million euros, the 1.3 million euros differential between the EU-grant and the total project cost being provided by the Romanian Ministry of Agriculture and Rural Development.

The project “*Disposal of pesticides (re-packing, collection and elimination of pesticide residues on the Romanian territory) EUROPEAID/115815/D/SV/RO – Obsolete Pesticides*” consisted of two distinct components:

- supervision of Obsolete Pesticides clean-up action; and
- technical assistance to the Government in policy and strategy development in order to prevent new pesticide stocks from developing.

The project was also linked to the elimination of pesticides stockpiles and wastes which was identified as Key Objective 1 in the Romanian National Implementation Plan. The project implementation happened following the three steps described below.

#### **Step 1 – updating the pesticide inventory**

As international experience shows, inventories often underestimate the size of stocks or other chemicals – that are present at a site. This also proved to be the case in Romania, where the reassessment provided up-date information and additional amounts of Obsolete Pesticides were identified (1107 tonnes) that needed to be disposed of.



## Step 2 – remediation of the pesticide stockpiles

Initially, the contract covered the elimination of 1409 tonnes of Obsolete Pesticides as it was listed in the existent national inventory. After the reassessment of the inventory, due to the additional amounts identified, an extra 1107 tonnes were disposed of.

Therefore, the PHARE Project, which was carried out over the period December 2004 to November 2005, collected about 2516 tonnes of Obsolete Pesticides spread over 227 locations in Romania and transported them to Germany for destruction. It was one of the largest clean-up projects of its kind in Europe to date, supervised by a professional project team and high-quality implementation routines.

The project team comprised:

- a) Ministry of Agriculture, Forest and Rural Development, as PHARE Project Implementation Unit;
- b) Ministry of Agriculture, Forest and Rural Development, Phytosanitary Units and local branch offices;
- c) Ministry of Finance, as Central Finance & Contracts Unit;
- d) European Commission Delegation to Romania;
- e) SAVA hazardous waste incinerator Brunsbüttel (Germany), as contractor;
- f) Ramboll (Denmark) in a consortium with Tauw (Netherlands) and Environment Agency Austria (UBA Austria), as Supervisor, with International HCH and Pesticides Association (IHPA) as sub-consultant.

Sound project management and supervision was guaranteed on the basis of a good contracting framework, as well as a good partnership and cooperation between the contractors, the supervisors, and the implementing and contracting authorities.

The routine which contributed to a large extent to the successful implementation of the project, consisted of:

**1. Re-assessment of the inventory:** The re-assessment provided updated information for the contractor's take-over of the site (logistics, contents) and presented a clear picture of the situation at the point of take-over, enabling the contractor to improve the planning and the supervision of the cost control. The new inventory results were included in the Waste Information Management (WIM) System operated by Tauw (Netherlands). The site take-over from authority to contractor (with a site takeover document) required agreement on re-as-

sessed amounts, agreement on contractor's liability, signature of parties involved (legal representative of Ministry of Agriculture – local phyto-sanitary director, contractor – site manager, supervision – engineer).

## 2. Repackaging, weighing, temporary storage:

The project ensured that the pesticide waste was repackaged in UN-approved packaging materials, and under strict occupational health and safety measures. An on-site laboratory for identification of waste composition was set up. The transport of the waste was done according to European Agreement concerning the International Carriage of Dangerous Goods by Road and the disposal was performed in a licensed incineration facility (SAVA in Brunsbüttel, Germany). The final proof of destruction was issued by SAVA to the Romanian Ministry of Agriculture and Rural Development.

## 3. Site hand-over from contractor to authority/

**owner:** The hand-over document required that there was a signed agreement on the repackaged amounts, returning into authority's liability, signature of parties involved (legal representative of Ministry of Agriculture – local Phyto-sanitary director, contractor site manager, supervision – engineer). The contractor's payment is generally based on site take-over and hand-over forms (Euro/tonnes), as well as on the export lists.

These implementation routines allowed deducing some best practices and lesson learned such as:

- a) Inventories should be re-assessed just before the clean-up activities take place, in order to have control of the project execution.
- b) Local authorities should commit to and participate in facilitating the execution of activities.
- c) The contract should be focused, having clear definitions of liabilities and responsibilities.
- d) Sufficient administrative back-up is necessary (contractor and supervisor).
- e) Having quality-oriented working contractors is a must.
- f) The project management is not effective without preliminary field visits and hands-on experience.
- g) Flexibility and sensitivity towards work planning and external factors should exist (e.g. weather: winter stop and possible start in the springtime as an important factor in the planning for, accessibility).



Figure 1: Pesticide store and repacking in Romanian PHARE project (Source: John Vijgen, IHPA [5])

### Step 3 – prevention of the build-up of new pesticide stocks

Beside stockpile disposal, another important outcome of the project was setting up a National Strategy and Action Plan for preventing the creation of new pesticides waste stocks in the future. This included 5 dedicated tiers:

1. Tier 1 – Further development of the legal framework in terms of the government's role in the sustainable use of pesticides and in hazardous waste management;
2. Tier 2 – Establishment of a national stakeholders' platform and ensuring maximum participation;
3. Tier 3 – Awareness raising campaigns and training for farmers;
4. Tier 4 – Empty Container Management System;
5. Tier 5 – Follow-up activities for good agricultural practices among Romanian farmers.

Romania's accession to the EU, starting in 2007, made an outstanding contribution to the implementation of the measures and actions included in the National Strategy and Action Plan developed under the above-mentioned project.

The stakeholders involved in the development and implementation of the National Strategy and Action Plan implementation were the following: the Ministry of Environment and its subsidiary bodies (such as National Environmental Protection Agency and National Environmental Guard), the Ministry of Agriculture and its Phyto-sanitary Units, the National Agency for Agricultural Consultancy, the Ministry of Health, plant protection industry, farmers and Romanian Crop Protection Association (AIPROM).

### Tier 1 – Further development of a legal framework

One of the most important steps was the consolidation of the legal framework in terms of the government's role in the sustainable use of pesticides and in hazardous waste management (e.g. approximation of the EU Directive on plant protection products, the Directive on sustainable use of pesticides, the Waste Framework Directive, the Hazardous Waste Directive, Directive on the incineration of waste, the National Strategy and National Action Plan for Waste Management etc.).

### Tier 2 – National stakeholders' platform

National stakeholders' platforms/working groups were developed to ensure maximum participation in the field of pesticides (National Committee on Plant Protection Products Permitting, national working groups on wastes etc.).

### Tier 3 – Campaigns for awareness raising and trainings for farmers

In order to prevent the re-occurrence of Obsolete Pesticides, the Ministry of Agriculture and Rural Development together with Romanian Crop Protection Association periodically runs awareness raising campaigns and trains farmers on how to use the pesticides that are currently on the market in a sustainable and safe way.

For example, the European Crop Protection Association (ECPA) began implementing the safe use of crop protection products initiative in 2002 (so-called "SUI"). In Romania, the project started in September 2010 with the support of ECPA, at the initiative of the AIPROM and the relevant authorities and in consultation with other key partners in the industry.

The project aims at protecting the health of farmers and the environment by improving knowledge of the prin-



principles of appropriate use of plant protection products, the use of certified protective equipment and by complying with the rules of transportation, storage and application.

One of the first actions was the development of a study of marketing at farm level in Romania, followed by a site visits to observe the in detail situation. Taking into account differences between farms in Romania regarding their technological status, it could be determined where the critical points and farming segments were and what the action plan of the project thus had to be focused on. The project established key messages related to the whole product life-cycle including.

- labelling,
- using only approved products from reliable sources,
- adequate storage and transport of products,
- application equipment,
- protective equipment and,
- triple rinsing and sound delivery of used packaging.

This can be considered the „backbone“ of communication with manufacturers, distributors and users of plant protection products.

The Romanian Crop Protection Association then took the initiative to combat counterfeit products used for plant protection in the form of a 3-year project, supported by the European Crop Protection Association (ECPA). The project aims to address the distributors and users of plant protection products in particular, but also farmers and authorities. The project was named „SCUT“ (eng. SHIELD) referring to the hoped-for effect of protection against the spread of the trade and usage of counterfeit plant protection products.

Among the objectives of the project are the followings:

1. Changing attitudes regarding counterfeit of plant protection products among both distributors and farmers and the authorities, under the slogan „Toward zero tolerance for plant protection counterfeit products“;
2. Sustainable development of agriculture by reducing adverse effects of pesticides on human health and the environment;
3. Improving national phytosanitary legislation by proposing specific anti-counterfeiting measures.

In order to achieve these objectives, several activities took place at national level, such as:

- a) Running sustained campaigns to inform and educate the public, particularly distributors and farmers;
- b) Providing customized anti-counterfeiting trainings to control agencies, distributors and farmers;

- c) Providing expertise and training materials on anti-counterfeiting practices with attention being paid to parallel trade and repackaging;
- d) Changing the relevant national legislation in this field;
- e) Preventing and reducing illegal trade of counterfeit plant protection products with the help of educational projects and by developing an open market alert system.

#### **Tier 4 – Empty Container Management System**

Concerning the management of empty packages and containers, actions have been taken as proposed by the National Strategy. The Romanian Crop Protection Association (AIPROM) took the lead and developed the currently ongoing empty container management programme, so called „SCAPA“. All services provided by the SCAPA, such as collection of the empty containers and packages from farmers as well as distributors, are free of charge. Implementation of SCAPA is organized and fully financially supported by AIPROM member companies and other companies participating in the system.

#### **Tier 5 – Follow up activities for good agriculture practices among Romanian farmers**

All three initiatives („SCAPA“, „SUI“ and „SCUT“) support the implementation of EU Directive 2009/128/EC on sustainable use of plant protection products. The most important measures taken were to certify sustainable users of plant protection products, defining the professional user of plant protection products, verification and certification of protective equipment, disseminating best practices in the application of plant protection products, empty container management system establishment and combating counterfeit plant protection products.

Moreover, to support the farmers, the Ministry of Agriculture and Rural Development has developed the Code of Best Agricultural Practices, which is periodically updated.

All this together ensures that pesticide stocks are not built up again and that overall pesticide management is as advanced as possible, including container management. However, pesticide use is still associated with the threat posed to human health and the environment while trying to balance external costs and benefits.

The best way to ensure that pesticide stocks are not built up and human and animal life are not exposed to pesticides is organic farming [15]. Within the last ten years, organic farming has gained momentum in Romania. According to data of Eurostat and the Romanian Ministry of Agriculture and Rural Development, the



amount of organic farms in Romania have increased from 50 farms in 2000 to 9691 farms in 2011 with a total area of approx. 250,000 hectares [16]. The National Sustainable Development Strategy Romania 2013-

2020-2030 highlights the potential of organic farming of Romania with regard to increased agricultural production.

## 2.2. Case study Republic of Moldova: Obsolete Pesticides stockpiles management and destruction

Moldova has never produced pesticides, including POP pesticides, but has a long tradition in agricultural production and hence used large amounts of pesticides in the past. It is estimated that between the 1950s and 1990s about 560,000 tons of pesticides were used in the Moldovan agricultural sector, including 22,000 tons of organochlorine pesticides. In the absence of an adequate pesticide management strategy, like the prevention of new stockpiles, approximately 3,000 tons of now banned and useless pesticides have been accumulated in storage facilities all over the country over the years. The number of those facilities stood at about 1,000 in 1990. Subsequently, the warehouses have been dilapidated in many cases. The passage of time and exposure has resulted in the deterioration of the packaging material. Studies have shown conclusively that these materials have contaminated the sites and surrounding soils and nearby surface waters. When Obsolete Pesticides were placed in storage they were generally indiscriminately mixed with each other in bags and drums. This resulted in a mixture of POPs pesticides and non-POPs pesticides and there is no economically viable way of determining the compositions of all the resultant mixtures in the repackaged plastic and steel drums. Representative sampling/analysis indicated that the average amount of POP pesticides in the Obsolete Pesticide stock in Moldova was about 20-30 %.

The Moldovan Government initiated a strategy to address POPs issues in 2002 based on its own financial and human resources by approving a special decision on additional measures for centralized storage and neutralization of Obsolete Pesticides [17]. Having signed the Stockholm Convention on Persistent Organic Pollutants on May 23, 2001, the Republic of Moldova became eligible for international support in solving these problems. In the following period, all the actions in this area were based on cooperation with international institutions and experts, financed from the national budget, but with strong support from the international organizations. Over the last 12 years more than 20 projects in the area of management and elimination of POPs and other dangerous chemicals and wastes have been or are currently being implemented.

The *main objectives* of the implemented projects were to protect human health and the environment by safely managing and disposing of POPs contaminated pesticides and PCB stockpiles, establishing sustainable

POPs stockpiles management and strengthening the regulatory and institutional arrangements for long term control of POPs and other toxic substances in line with the requirements of the Stockholm Convention and related other conventions and protocols ratified by Moldova. The amount of funds used for these purposes up to now is approximately US\$18 million [18].

The Ministry of Ecology and Natural Resources (at present: Ministry of Environment) was the central national environmental authority designated as the Stockholm Convention competent authority and as such is responsible for coordinating the POPs-related activities of all the government bodies involved in chemicals management issues: the Ministry of Agriculture and Food Industry (MAFI), the Ministry of Economy, the Ministry of Defense (MoD), the Ministry of Health, the Department of Emergency Situations (DES), the Customs Service and other central public authorities. In this area, have also responsibilities the Ministry of Agriculture and Food Industry (MAFI), the Ministry of Economy, the Ministry of Defense (MoD), the Ministry of Health, the Department of Emergency Situations (DES), the Customs Service other central public authorities, as well as the local authorities. A National Coordination Committee (NCC) for the implementation of the Stockholm Convention, bringing together senior officials from the key ministries and led by the Ministry of Environment (MoE), was established in July 2002 to provide overall guidance and coordination for NIP development and implementation. An inter-ministerial group for the repackaging, collection and centralized storage of Obsolete Pesticides, led by the MAFI, has been in action since November 2002 [19].

All actions taken in the area of management and destruction of Obsolete Pesticide (OP) stockpiles can be divided into the following stages:

### **Stage 1 – Inventory of Obsolete Pesticide stockpiles and development of National Implementation Plan (NIP) for the Stockholm Convention**

The first inventory of OP stocks in Moldova was compiled between 2002 and 2004 with the support of a GEF/WB grant for enabling activities regarding the implementation of the Stockholm Convention and was based on the documents available at that time to the Ministry of Agriculture and Food Industry. The inventory results revealed 1,700 tons in 350 poorly equipped



warehouses, and approx. 4,000 tons that were buried in a landfill in the South of the country, most of them mixed or of unknown composition. After the completion of the repackaging and storage measures of OP, it was found that the amount collected from the various warehouses was twice as large as expected because of their inadvertent mixing with fertilizers due to inadequate storage conditions and damaged packaging materials.

Also, under this grant the National Strategy on the reduction and elimination of POPs and National Implementation Plan for the Stockholm Convention on POPs have been developed and approved by the Government on October 20th, 2004 after the Moldovan Parliament ratified the Convention on February 19th, 2004.

### **Stage 2 – Repackaging and temporary storage of OP stockpiles**

In November 2003, the Ministry of Defense (MoD) and the Department of Emergency Situations started the repackaging and transportation of the Obsolete Pesticide stocks from some 350 warehouses scattered across the country to the newly selected centralized district storage facilities, one in each of the administrative district. These warehouses were chosen based on a number of criteria to ensure safe storage. The warehouses were each examined during the environmental assessment of the project to evaluate their integrity. While this system of centralizing the storage of obsolete stockpiles is an improvement, it is not a long term solution. Centralizing the hazardous matter allows for improved security and monitoring and will facilitate ultimate disposal, which has to remain the goal.

The expenditures for these measures were covered initially by the National Environmental Fund (NEF) and the national budget. Starting from 2005, they have been funded within the NATO/OSCE “Project for the destruction of pesticides and dangerous chemicals” implemented by MoD. In one district, these activities have been carried out within the Regional Project “Elimination of Acute Risks of Obsolete Pesticides in Moldova, Georgia and Kyrgyzstan”, implemented by Milieucontact International.

As a result, by the end of 2008, approx. 3,350 tons of Obsolete Pesticides had been relocated to the 37 guarded central district warehouses.

### **Stage 3 – Strengthening the regulatory framework and capacity building for POPs management**

Between 2006 and 2010, a GEF/WB “Persistent Organic Pollutants Stockpiles Management and Destruction Project” was implemented by the Ministry of Environment in Moldova, based on a GEF grant of \$6.35 million and a counterpart contribution of \$3.72 million from the Moldovan state budget and National Ecological Fund,

including \$ 1.6 million allocated for disposal of Obsolete Pesticides. To facilitate project implementation, a special team, the POPs Sustainable Management Office, was established under the MoE. This was based on a team which had worked with POPs since 2002, ensuring that use is being made of capacity once it's built.

This project was the cornerstone in strengthening the policy and regulatory framework for POPs management and control in the Republic of Moldova. The main objectives of the NIP have been achieved through this project. The project assisted the Government of Moldova in confining stockpiles of pesticides in such a way that harm to the environment or human health was largely prevented. Furthermore, the regulatory framework and institutional capacity to address POPs related issues has been strengthened.

The major results achieved in these activities are as follows:

- New or revised national policies and regulations, like the *National Programme on Sound Chemicals Management*, *Law on Environmental Protection*, *Law Regarding the Regime of Harmful Substances and Products*, *Law on Plant Protection*, *Law on Production and Domestic Waste*, *Law on Payment for Environmental Pollution* as well as guidelines have been developed. Among the materials published are the *Handbook on Inventory and Mapping of POPs Contaminated Sites* and the *Handbook on*



**Figure 2:** Practical Guidance on ESM of PCBs  
(Source: POPs Sustainable Management Office, Moldova [21])



*Remediation of POPs Contaminated Sites.* Over 12 packages of draft legal and regulatory documents, including a Law on Environmental Protection, a Law on Chemicals and a Law on Waste, have been completed and are in the process of coordination and approval;

- A National Concept of the Information Management and Reporting System on POPs has been developed;
- Two modern laboratories have been equipped with high resolution equipment used for monitoring and identification of POPs in environment components;
- Environmental, plant protection and energetic inspectors have been trained in enforcement and compliance with the POPs convention requirements based on the new legal documents on POPs management;
- Organic farming has increased after the introduction of a regulation on organic farming in 2005. While in 2003 there were only 11 certified farms practicing organic farming, this number has increased to 253 farms and 35,000 hectares in 2010, thus avoiding the pesticide use on this land [20]. The National Strategy for Sustainable Development highlighted organic farming as one of the priorities for R&D of the Moldova.

- A public awareness and information campaign has been conducted through local, regional and national seminars and conferences, radio and TV programs, documentary movies and TV ads, articles in local and national newspapers, project website [www.moldovapops.md](http://www.moldovapops.md) etc. The special surveys showed a significant increase of public awareness in the field of POPs;
- Results obtained have been presented within more than 70 local, national and international workshops and conferences, including the last six International HCH and Pesticides Forums.

#### **Stage 4 – Elimination of OP stockpiles**

Elimination and destruction of OP in Moldova began in 2007 under the POPs Stockpiles Management and Destruction Project. In the following two years, 1292 tonnes of pesticides and contaminated packaging from 11 districts were exported to France and incinerated. These activities were taken up again in 2011 within the projects implemented or coordinated by the MoE, MoD and MAFI, with financial support from the national budget and from international organizations such as Czech Development Agency (CzDA), NATO, OSCE, the European Commission (EC) and FAO. At the moment, the amount of pesticides destroyed stands at about 1500 tons. The details can be found in Table 2.

Project	Financing Agency	Implementing/coordinating Agency	Period of elimination works	Amount of OP eliminated, tons	Present status (Oct. 2013)
POPs stockpiles management and destruction	<ul style="list-style-type: none"> <li>• GEF/WB</li> <li>• MD Gov</li> <li>• NEF</li> </ul>	<ul style="list-style-type: none"> <li>• MoE (POPs PMT)</li> </ul>	2007-2008	1293	Finished
Remediation of environmental burdens caused by pesticides in Moldova:	<ul style="list-style-type: none"> <li>• CzDA</li> </ul>	<ul style="list-style-type: none"> <li>• CzDA</li> <li>• MoE (POPs PMT)</li> </ul>	2011-2013 2013-2015	202 250	Finished Ongoing
Elimination of Obsolete Pesticides stocks with major risks (liquid OP)	<ul style="list-style-type: none"> <li>• NEF</li> </ul>	<ul style="list-style-type: none"> <li>• MoE (POPs PMT)</li> </ul>	2013-2014	200	Ongoing
Disposal of dangerous pesticides from the Transdnistrian Region of Moldova	<ul style="list-style-type: none"> <li>• OSCE</li> </ul>	<ul style="list-style-type: none"> <li>• OSCE Mission to Moldova</li> <li>• MoE (POPs PMT)</li> </ul>	2013-2014	150	Ongoing
Destruction of pesticides and hazardous chemicals in the Republic of Moldova	<ul style="list-style-type: none"> <li>• NATO/OSCE</li> <li>• NEF</li> </ul>	<ul style="list-style-type: none"> <li>• NATO</li> <li>• MoD</li> </ul>	2013-	1269	Ongoing
Improving capacities to eliminate and prevent recurrence of Obsolete pesticides as a model for tackling unused hazardous chemicals in the former Soviet Union	<ul style="list-style-type: none"> <li>• EC/FAO</li> </ul>	<ul style="list-style-type: none"> <li>• FAO</li> <li>• MAFI</li> </ul>	2013-2015	250	Ongoing

**Table 2:** Elimination of OP stocks in Moldova

Thus, presuming a successful completion of all projects that are now under implementation, all stocks of pesticides stored in warehouses will be eliminated by the end of 2015.



**Figure 3:** Elimination of OP stocks in Moldova (Source: POPs Sustainable Management Office, Moldova [21])

### **Stage 5 – Inventory and mapping of POP pesticide polluted areas**

One of the tasks of the POPs Stockpiles Management and Destruction Project consisted of a national inventory and mapping of POPs polluted sites. The objective of this study was to identify the POPs polluted areas posing the highest environmental and health risks, as well as mapping those areas using a GIS tool. These activities were carried out in 2008-2010.

An original methodology of POPs pollution study and hazards assessment was developed aiming at: (i) identification and assessment of potentially POPs contaminated sites all over the country; (ii) creation and completing of the POPs database as well as mapping and visualization of acquired data; and (iii) establishing common reporting formats and assuring database support.

All potentially contaminated sites identified were described based on a unified questionnaire; the coordinates of the POPs sites were determined using GPS; photo images and composite soil samples were taken

at each site before being further analyzed for POPs in a certified laboratory. About 1600 contaminated sites were identified and described.

An integrated GIS system for POPs data mapping and analysis has been developed allowing effective storing, managing and presenting of POPs-related information, such as the geographic locations of the sites, concentrations and other related parameters, as well as distribution of health and environmental hazards. The database is available on the Ministry of Environment website: <http://pops.mediu.gov.md>. The information on POPs-polluted sites gets periodically updated by environmental authorities.

With the POPs database, the central and local authorities got a new tool which significantly improved the management of contaminated sites. It effectively supports the policy and decision making process in the field of contaminated sites management [22].

### **Stage 6 – Remediation of POPs polluted sites**

In parallel with the inventory of contaminated sites, in 2008-2009, within the CIDA/WB Project “Remediation of POP pesticide polluted areas and inventory of PCB contaminated oil in power equipment”, several pilot remediation activities have been carried out.

This study on the remediation of POP-pesticide-polluted areas was carried out as a complementary measure to the actions undertaken in the field of sustainable POPs management. It has three specific objectives: (1) the identification of Best Available Technologies (BAT) for POP-pesticide-polluted areas, taking into account technical and financial and ecological aspects; (2) the assessment of their potential environmental/health benefits and impacts; and (3) the implementation of the appropriate remediation techniques at a few selected sites.

An assessment of remediation techniques including aspects of practical and economic feasibility of implementation, taking into account costs, expected performance, efficiency and potential impacts on the environment and human health was done.

Based on this assessment, two techniques, namely isolation in controlled soil stockpiles and biological treatment with the Daramend technique were selected and tested/validated at three pilot demonstration sites.

This testing was performed in order to identify the most appropriate methods for Moldova with a view to recommendation of remediation strategies for other OP sites throughout the country pending the availability of financial resources.

Based on practical experiences, Guidelines for local environmental authorities were compiled on how and when to carry out remediation measures on areas polluted with POP pesticides [23].



### Regional cooperation

Concerning the **cooperation** between Romania and Moldova, both countries collaborate intensively on different levels. The experience of Romania was used and applied in the Moldovan integration process into the European Union. The Ministries of Environment and further project implementation teams in Moldova and Romania have ongoing collaboration in their respective fields, including the management of POPs and other hazardous chemicals and chemical waste.

Based on the experience gained during the implementation of activities and projects in the field of POPs, **regional cooperation** with other countries has already been established, with trained Moldovan specialists on POPs Sustainable Management Office hired as experts:

- in the development of Stockholm Convention NIP on POPs in Ukraine (2004-2005);
- in consulting the Kazakh National Project Team on PCB inventory compilation (2011); and
- in supervising of the process of repackaging, shipment and incineration, in France and Germany, of capacitors containing PCBs and OP stockpiles from Belarus (2012), within the GEF/WB POPs Project

**Moldovan POPs experts now serve in the whole region with practical knowledge about regional pollution and ways to move forward. This is a consequence of building the long-term capacity of experts in Moldova.**

From 2009 to 2012 both Romania and Republic of Moldova participated in the GEF/FAO regional project “Capacity Building on Obsolete and POPs Pesticides in Eastern European Caucuses and Central Asian (EECA) Countries”.

The primary objective of the project was the reduction of pesticide releases into the environment and elimination of human health and environmental threat they pose in EECCA countries. The project facilitated the viable and environmentally sound measures for the identification, handling and disposal of pesticides stockpiles and wastes. It also facilitated the incorporation of strategies to prevent and manage Obsolete Pesticides in national policies with a strong emphasis on regional and sub-regional approaches.

Achievements included: (1) greater awareness concerning pesticides and persistent organic pollutant wastes within the participating countries; (2) increased capacity for Environmentally Sound Management of Obsolete Pesticides; (3) more systematic involvement of stakeholders in the area of obsolete pesticides stockpiles, persistent organic pollutant wastes and contaminated sites management; and (4) improved cooperation amongst participating countries and the EECCA region.

One of the tools countries were provided with was the FAO Pesticides Stock Management System (PSMS). This is an application that can be used by countries to record and monitor their inventories of pesticides and their usage, in order to assist them in managing the usage most efficiently. The application aims to help reduce the creation of Obsolete Pesticides and enable countries to plan strategies for responding more effectively to pest outbreaks. This system was created based on the example of the WIM System of Tauw (Netherlands), the same system used in the Romanian PHARE Project in 2005. For example, the Republic of Moldova has not implemented the FAO PSMS application, but it has already developed the POPs Information Management System.

### 3 Conclusions and Lessons Learnt

The conclusions and lessons learnt from the Romanian and Moldavian experience can be summarised as follows:

- A **comprehensive strategy and action plan at the national level** is the key for an efficient implementation of relevant policies and for providing the appropriate funding resources.
- A key to success is the **cooperation and communication among the relevant stakeholders** (ministries, agencies, producers, retailers, private owners, control bodies) involved in pesticide and Obsolete Pesticide management.
- The approaches and decisions that led to successful achievement of the objectives were based on the fact that all initiated projects and

measures carried out over **time by trained personal**. All parties have to respect their commitments and activities and complement each other and complete their tasks within the set time frame.

- A comprehensive assessment and establishment of a **detailed inventory** is essential to have a control over the pesticides stocks.
- **Streamlining of the existing policies** in the field of pesticides and POPs management and development of subsequent legislation is essential for ensuring the effectiveness of the implementation.
- **Awareness raising activities** are crucial both in the clean-up activities as well as in the preventi-



on of re-occurrence of Obsolete Pesticides. They can act as a driver for these change processes.

- During the clean-up activities, it is important to get the **local authorities' commitment** and participation in facilitating work execution.
- The establishment of a reliable cooperation with the donors at an early stage was important. Due to this fact, **transparency and better planning of project activities** in terms of finance and procurement have to be established.
- From a practical implementation point of view, one of the important decisions was the establishment and maintenance of the **project management team** (e.g. POPs Sustainable Management Office under the MoE in Moldova) that, once established, continued to work in order to ensure the sustainability and effectiveness of Convention implementation. This unit is responsible for fiduciary activities of POPs projects and additionally has been involved in the implementation of other environment projects.
- The selection and contracting of **qualified consultants, both local and international**, facilitated the successful implementation of planned activities and transferring knowledge to personnel.
- **Compliance** of and **contribution** from the government and the partners who have agreed to support projects are non-negotiable for the successful implementation of activities.
- Based on the results, international experts and institutions involved in POPs-management consider the Romanian and Moldovan projects a success in that most objectives were achieved as planned. As a result, the experience and the knowledge gained has been analysed and taken as a blueprint by other governments in the region, as they follow the approaches developed and partly hire the trained experts as consultants.
- It is necessary to establish an **empty-container management scheme/system** as part of the **“life-cycle concept”** to minimize the risks to both humans and the environment.
- The clean-up activities are only sustainable if they are combined with a **strategy for avoidance of the re-occurrence of Obsolete Pesticides**.
- The establishment of **organic farming** is the most comprehensive approach for reduction of pesticide exposure to humans and the environment as it also guarantees that no pesticide stocks are generated by these farms. At the same time, this approach is a cornerstone in

the development of sustainable production and consumption in Romania and Moldova.

In addition, there are lessons learned on the international perspective of obsolete pesticide management compiled in a recent review article on “Obsolete Pesticide Stocks – The Past 25 Years, Lessons Learned and Observations for the Future” it is important to consider these points in further pesticide management projects (Dollimore & Schimpf 2013 [Z]):

- Domestic and international “champions” are needed because external “push” is hopeless without internal “pull”. Domestic champions must be influential in either the Ministry of Agriculture or Environment. They require sufficient permanence in their positions to see projects through to completion. International champions should facilitate the technical expertise, financial support and key contacts with donor agencies.
- An international expert organization is essential to co-ordinate activities. We believe that FAO is the best fit, with its dedicated group, considerable experience, established database and website, and local missions with direct access to national governments.
- Inventories and disposal need to be undertaken within a short time-frame or stocks can disappear or increase by the time the collection and disposal team arrives. Potential donors for disposal need to be lined up from the beginning or a further inventory can become necessary if the lead time for funding is too long.
- In acute situations, safeguarding operations are necessary to stabilize the stock until the disposal operation can start.
- Surgical initiatives removing the most risky stocks are better than nothing and are appropriate for projects where an acute risk is presented to local communities.
- Good collaboration between local Ministries of Agriculture and Environment is essential as both ministries are needed.
- A local court order stimulated by representations from NGOs and the public can sometimes help generate the momentum needed to get a project started.

Countries faced with no disposal project on the horizon have resorted to burying stocks in remote locations (Vijgen et al. 2013 [2]; [7]). Therefore the international community should take care that appropriate pesticide management projects are in place in each country having pesticide stockpiles. The Stockholm Convention process might serve here as an international frame for implementation considering the synergies with other Chemical Conventions and having an overall emphasize on an integrated approach [3].



## 4 Guidance and information materials available

### Strategies and plans

- Republic of Moldova (2013), [National Strategy for Sustainable Development](#)
- Romania (2007), [National Strategy and National Action Plan for Waste Management](#)
- Romania (2008), [National Sustainable Development Strategy Romania 2013-2020-2013](#)
- Republic of Moldova (2004), [National Strategy on the reduction and elimination of persistent organic pollutants and the National Implementation Plan for the Convention Stockholm Convention on persistent organic pollutants](#)
- Republic of Moldova (2010), [National Programme on Sustainable Chemicals Management](#)
- United Nation Environment Programme, [Stockholm Convention National Implementation Plans](#)

### Guidance documents

- Crop Life International (2011), [Trainee Manual: Introduction to integrated pest management, 2011](#)
- European Crop Protection Association (2005), [Container Management Guidelines](#)
- European Crop Protection Association (2000), [Guidelines on the sustainable use of crop protection products](#)
- Food and Agriculture Organization (2009), [Environmental Management Tool Kit for Obsolete Pesticides, Volume 1](#)
- Food and Agriculture Organization (2009), [Environmental Management Tool Kit for Obsolete Pesticides, Volume 2](#)
- Food and Agriculture Organization (2010), [The Preparation of Inventories of Pesticides and Contaminated Materials, Volume 1 Planning](#)
- Food and Agriculture Organization (2011), [Environmental Management Tool Kit for Obsolete Pesticides, Volume 3](#)
- Food and Agriculture Organization (2011), [Environmental Management Tool Kit for Obsolete Pesticides, Volume 4](#)
- Food and Agriculture Organization (1995), [Prevention of accumulation of obsolete pesticide stocks](#)
- Food and Agriculture Organization (1996), [Pesticide Storage and Stock Control Manual](#)
- Food and Agriculture Organization (1996), [Disposal of bulk quantities of obsolete pesticides in developing countries](#)
- Food and Agriculture Organization (1999), [Guidelines for the management of small quantities of unwanted and obsolete pesticides](#)
- Food and Agriculture Organization (2000), [Assessing soil contamination – A reference manual](#)
- Food and Agriculture Organization (2000), [Training Manual for inventory taking obsolete pesticides](#)
- IPEN (2009), [An NGO Guidance to managing Hazardous Pesticides & SAICM](#)
- Republic of Moldova (2008), [Guideline for farmers: Management of plant protection products. Personal safety and Environment Protection 2008](#), published under the GEF/WB Project “Persistent Organic Pollutants (POPs) Stockpiles Management and Destruction”
- UNEP (2002), [Guidance on alternative strategies for sustainable pest and vector management](#)

### Legislation

- European Commission (2004), [Regulation \(EC\) No 850/2004 of the European Parliament and of the Council of 29 April 2004 on persistent organic pollutants and amending Directive 79/117/EEC](#)
- European Commission (1991), [Council Directive 91/414/EEC of 15 July 1991 concerning the placing of plant protection products on the market](#)
- European Commission (2009), [Directive 2009/128/EC of the European Parliament and of the Council Of 21 October 2009 establishing a framework for community action to achieve the sustainable use of pesticides](#)
- European Commission (2008), [Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives](#)
- European Commission (1991), [Council Directive 91/689/EEC of 12 December 1991 on hazardous waste](#)
- European Commission (2000), [Directive 2000/76/EC of the European Parliament and of the Council of 4 December 2000 on the incineration of waste](#)
- Republic of Moldova (1993), [Law no 1515/1933 on environmental protection](#)
- Republic of Moldova (1997), [Law no 1236/1997 regarding the regime of harmful substances and products](#)
- Romania (2005), [Ministerial Order no 1182/1270/2005 for the approval of the Code of Good Agricultural Practices](#)
- Republic of Moldova (1999), [Law no 612/1999 on plant protection](#)
- Republic of Moldova (1997), [Law no 1374/1997 on production and domestic waste](#)
- Republic of Moldova (1998), [Law no 1540/1998 on payment for environmental pollution](#)
- Republic of Moldova (2002), [Government Decision no 1543/2002 on additional measures for centralized storage and disposal of obsolete pesticides](#)



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- [12] Food and Agriculture Organization, Latin America and Caribbean Obsolete Pesticides stocks [\[website\]](#)
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- [16] EkoConnect (2012) Organic agriculture moving East. Country Report Romania
- [17] Government Decision no 1543 from 29.11.2002 on additional measures for centralized storage and disposal of obsolete pesticides.
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- [22] Plesca, V et al, "Inventory of POP pesticides polluted areas in Moldova" //12th International HCH and Pesticides Forum. Proceedings. 6-8 November 2013, Kiev, Ukraine
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