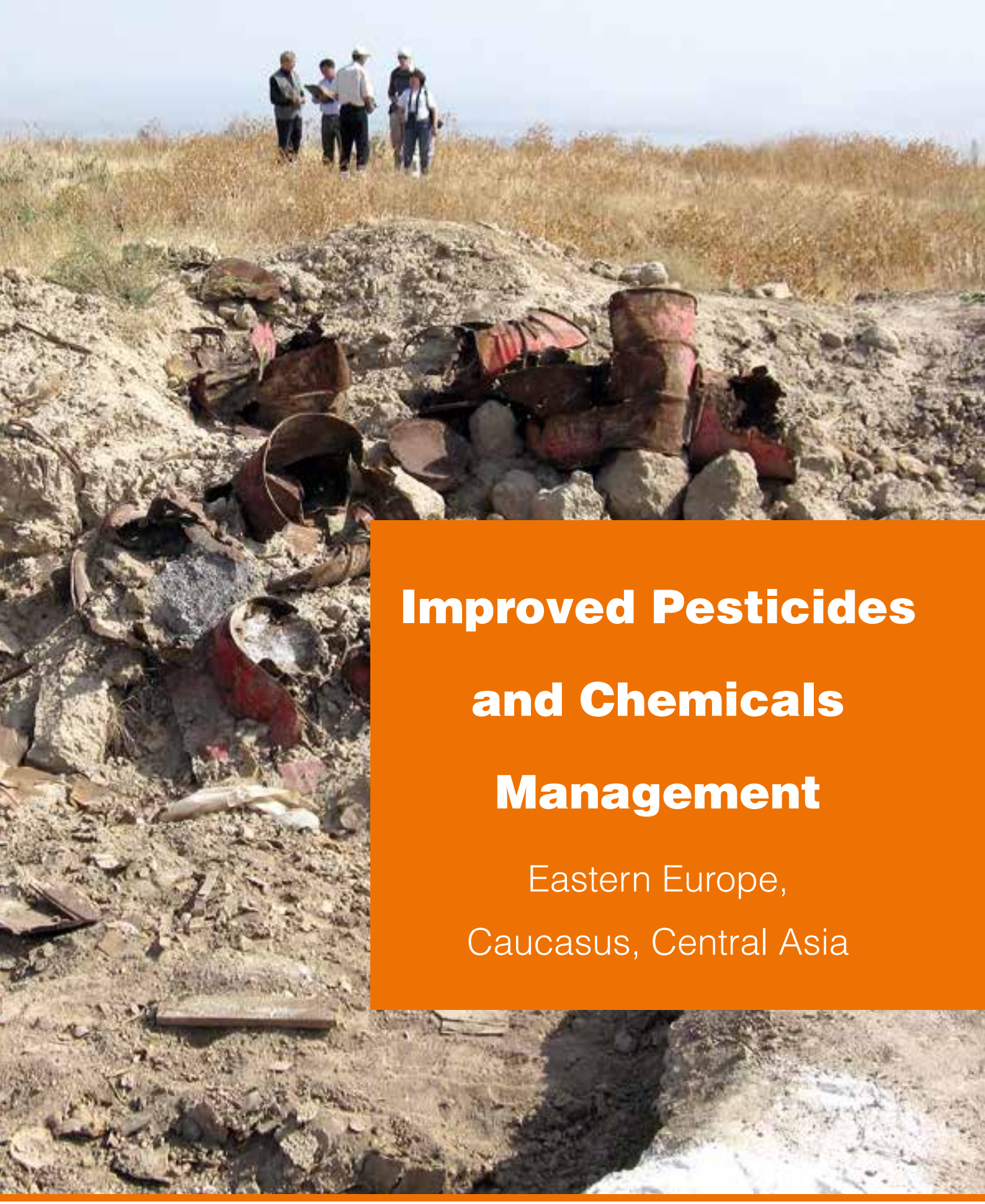


Improved Pesticides and Chemicals Management

Eastern Europe, Caucasus, Central Asia

This project is funded by the EU

IHPA
International HCH & Pesticides Association

Food and Agriculture Organisation of the United Nations

Foreword

For each country with a history of chemical use in agriculture and industry, it is hard not to find a legacy of polluted sites. This includes stockpiles of hazardous waste, abandoned disposal sites and contaminated soils. And for each country the experience is always the same: “pollute now, clean up later” turns out to be extremely expensive. Hundreds of examples show us that avoiding a bill of two thousand Euros for immediate destruction of a tonne of hazardous waste can easily lead in 20 years to million Euros remediation measures. It was a hard lesson for Western Europe and the US during the 1970s, in Germany during the 1990s in the process of reunification, around 2000 for Brazil and Japan, and nowadays for Eastern Europe, Caucasus, and Central Asia (EECCA).

The presence of hazardous pollutants is a major threat to human health, natural resources, environmental quality, and food production. Many of these, in particular obsolete pesticides, are categorized as persistent organic pollutants (POPs), and will not degrade, continuing to pose increasing threats for generations to come. Their effects on the economy cannot be ignored, as poor chemicals management will also create difficulties for trade and investment.

Based on important international support, chemicals management has seen noticeable improvements in several EECCA countries. In particular, risks from obsolete pesticides have been reduced and capacities for sustainable pest and pesticide management have been strengthened. A robust international legal framework is in place and most countries formally took commitments towards translating it into national legislation and making it work. Awareness of public health issues and of costs of inaction increases gradually.

In 2011, the EU has provided funds through a partnership project with the Food and Agriculture Organization of the United Nations (FAO) to help address the urgent agenda of hazardous waste management in EECCA. With support from the EU-FAO project, additional quantities of pesticides were safely packed and destroyed. The legal framework has seen further improvements. In order to guide future efforts, a Roadmap was developed.

The Roadmap, which is summarised in the current brochure, sets out the steps for the partner countries to develop sustainable capacity for the environmentally sound management of both historical pollution and current hazardous wastes. As countries develop the legislative framework that requires industry to manage their wastes responsibly, the competent government authorities will be best placed to play the main role as enablers of action. The role of international partners will change. The focus

will shift from providing funds to address legacy wastes towards support for the establishment of sustainable disposal capacity at national and regional level. Partnering with more experienced countries will also accelerate waste reduction by means of technology innovation, waste recycling and reuse, and adoption of sustainable production principles in industrial and agricultural sectors.

Together, we gained significant experience in addressing “black spots” of past pollution. These experiences will guide our further steps on the pathways towards creating “white spots”, areas relieved from the heritage of old chemicals and their wastes.

Christian Danielsson

Director General for European Neighbourhood Policy
and Enlargement Negotiations (DG NEAR)
European Commission

Overview

As part of the EU-FAO project “Improving capacities to eliminate and prevent recurrence of obsolete pesticides as a model for tackling unused hazardous chemicals in the former Soviet Union”, IHPA has performed the “Study on the Assessment of Capacity for Environmentally Sound Disposal of POPs and Obsolete Pesticides Wastes in Eastern Europe, Caucasus, and Central Asia (EECCA) countries”. The Study includes an assessment of the existing legal framework for waste management and the volumes of obsolete pesticides, persistent organic pollutants (POPs) and other hazardous wastes. Data on waste quantities, legacy wastes as well as current waste arisings, have been collected from the project countries by national consultants and supplemented by data from Ministries, national statistical institutions and international organisations. It is for the first time that such a detailed inventory of obsolete pesticides, POPs and other hazardous wastes has been carried out in these countries. Based on its results, a Roadmap has been developed to guide the required improvements in the coming years. This brochure describes the context for action and summarizes the Roadmap. Starting positions, progress and routes will differ between countries. Five out of nine countries have already endorsed the national Roadmaps.

Based on the experiences in other parts of the world, it will take at least 10 to 20 years to fully implement this Roadmap. The international organizations have initiated this process and will continue to support the countries. But it is the responsibility of the governments of the individual countries to make the necessary commitments, to allocate resources, to define principles, to create a firm legal basis, to implement effective enforcement and open communication in order to arrive at a well-managed operational hazardous waste management capacity.

Key findings

- Annual arisings of hazardous waste are high and there are enormous legacy quantities, especially in the larger economies in Belarus, Ukraine and Kazakhstan;
- Legacy volumes pose escalating risks for human health and the environment;
- Short term action for the development of proper hazardous waste management and destruction capacity to start up the elimination of obsolete pesticides and other POPs wastes is needed;
- There is a serious need to speed up the implementation of proper hazardous waste management;
- Proper management of both the annual arisings and the legacy quantities will lead to high, and for the three countries mentioned even excessive additional costs.

Ways forward

- Continue to improve policy planning and legal frameworks;
- Prevent arisings and build up destruction capacity;
- Strengthen the enforcement of legislation and programs for waste reduction and separation;
- Replicate experience from “frontrunner” countries;
- Discuss with international partners ways to speed up progress nationally and regionally, including the development of sustainable models that involve public-private partnerships.

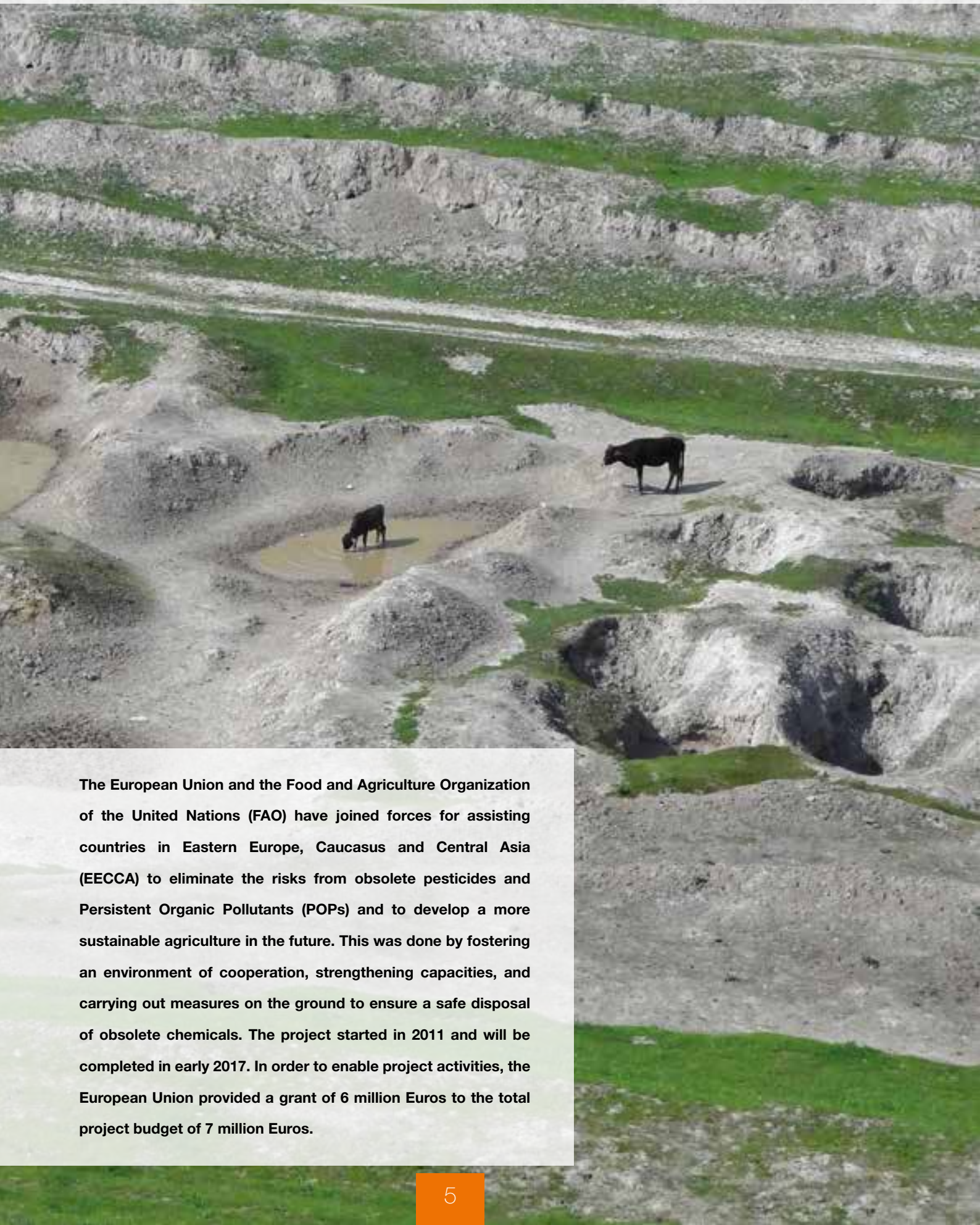
More information about the joint EU-FAO project ‘Improved Pesticides and Chemicals Management in the Former Soviet Union’ can be found on the project website http://www.fao.org/in-action/pesticides-fsu/home/

Table of Content

This publication has been produced with the assistance of the European Union. The contents of this publication are the sole responsibility of IHPA and can in no way be taken to reflect the views of the European Union.

All IHPA reports can be found in the library of IHPA at http://www.ihpa.info.resources/library

1. Introduction



The European Union and the Food and Agriculture Organization of the United Nations (FAO) have joined forces for assisting countries in Eastern Europe, Caucasus and Central Asia (EECCA) to eliminate the risks from obsolete pesticides and Persistent Organic Pollutants (POPs) and to develop a more sustainable agriculture in the future. This was done by fostering an environment of cooperation, strengthening capacities, and carrying out measures on the ground to ensure a safe disposal of obsolete chemicals. The project started in 2011 and will be completed in early 2017. In order to enable project activities, the European Union provided a grant of 6 million Euros to the total project budget of 7 million Euros.

Under the EU-FAO project "Improving capacities to eliminate and prevent recurrence of obsolete pesticides as a model for tackling unused hazardous chemicals in the former Soviet Union", the International HCH and Pesticides Association (IHPA) has undertaken work to support evidence-based decision making. This included a comprehensive assessment of the situation and development of a Roadmap.

1.1 Assessment studies

For each of the 12 EECCA countries a Country report summarizes the main outcomes of the assessment of the existing legal framework for waste management and the main conclusions and recommendations. The basic data, as collected during the assessment on national level of the legal framework and the volumes of obsolete pesticides, POPs and other hazardous wastes, are presented in a Working Document per country. These documents also contain the references to the sources of information used for these assessments.

All reports can be found in the library of IHPA at http://www.ihpa.info.resources/library

1.2 Roadmap

A generic Roadmap was developed based on the knowledge acquired as part of the assessment study. It sets out the steps to establish sustainable capacity for the environmentally sound management of hazardous waste. The Roadmap addressed:

- the roles and responsibilities of the national governments, regional bodies, waste producers, waste disposal contractors and technology providers, donors and other international actors; and
- the main and common elements of environmentally sound hazardous waste management.

The latter elements include:

- inventories;
- regulatory frameworks;
- organization;
- destruction capacity;
- innovation and prevention

While the Roadmap is designed to be generic, the starting positions, progress and routes will differ between countries.

The Roadmap report contains also data on the expected future hazardous waste market structure, a short summary of the development of the EU hazardous waste market in the past, an assessment of waste management options and data on technology assessment.

1.3 Costs of inaction

The waste volumes as found are large and pose serious risks for human health, food production and the environment. The cost impacts of proper hazardous waste management are high and even excessive in the large and industrialized economies in Belarus, Ukraine and Kazakhstan. Non-action will lead to further increases of risks, volumes and costs. There is an imperative for fast and concerted actions in all project countries.

Based on worldwide experiences with quantification of soil contamination the potential large increase of the cost of soil contamination can be illustrated in the figure below. The indications as given in this figure are related to liquid sources or mobile contaminants in solid sources. These figures underline the importance of fast action to prevent excessive additional costs for soil remediation.

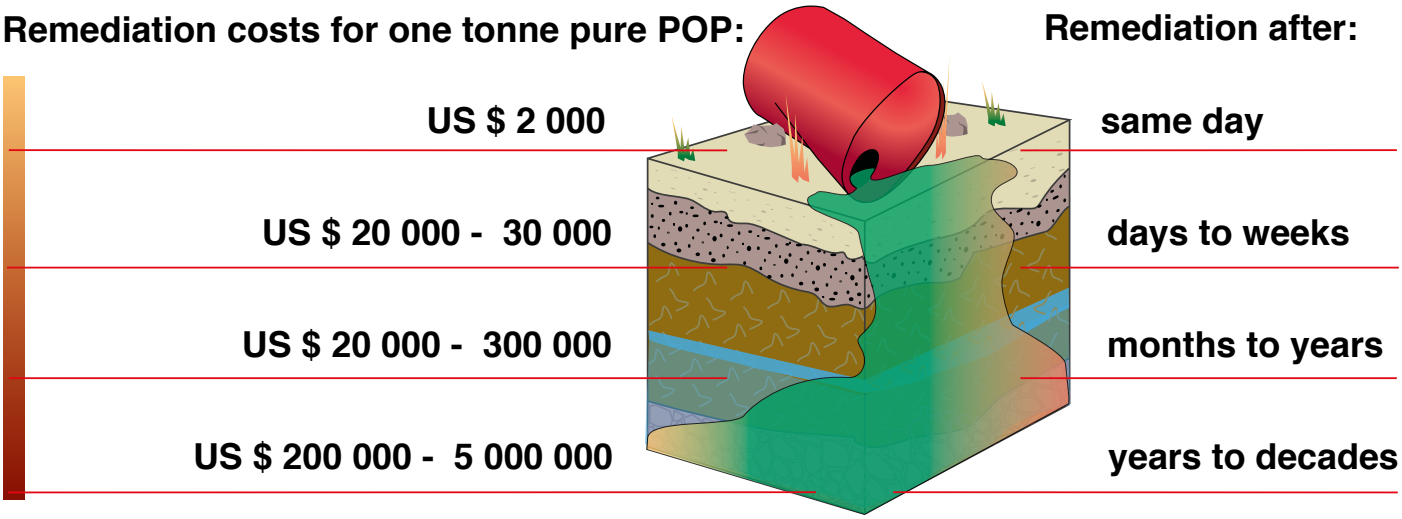
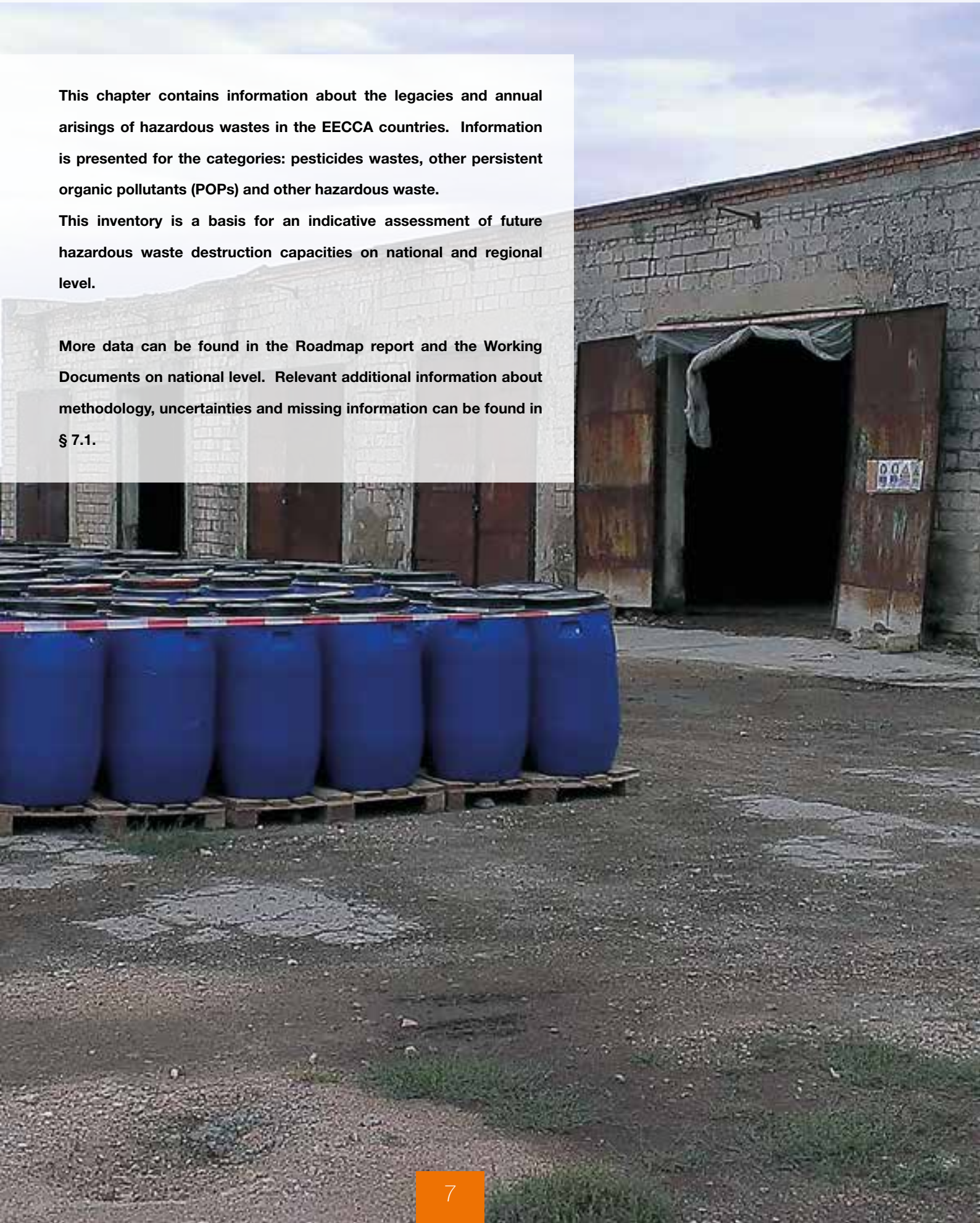


Figure 1 Consequences of non-action

2. Waste quantities



This chapter contains information about the legacies and annual arisings of hazardous wastes in the EECCA countries. Information is presented for the categories: pesticides wastes, other persistent organic pollutants (POPs) and other hazardous waste.

This inventory is a basis for an indicative assessment of future hazardous waste destruction capacities on national and regional level.

More data can be found in the Roadmap report and the Working Documents on national level. Relevant additional information about methodology, uncertainties and missing information can be found in § 7.1.

2.1 Quantities

Table 1 presents the main results of the waste inventory. The left side of the table presents the legacies of pesticides and other POPs (inventory for these two categories under the Stockholm Convention) and the legacies of 'other' hazardous waste. The right side of the table presents only the estimation of the annual arisings of 'other' hazardous waste.

	Legacy Waste			Annual Arisings
Waste cat	**Σ Pesticide waste**	**Σ other POPs waste**	**Σ Hazardous waste**	**Σ Hazardous waste**
Country				
Armenia	750	1 700		60 500
Belarus	8 000	750	970 000 000	33 300 000
Georgia	6 600	550	1 000 000	
Moldova	5 000	1 200		750
Ukraine	24 500	43 000	12 500 000 000	587 300 000
Azerbaijan	11 000	500	1 800 000	160 500
Kazakhstan	57 000	240 400	9 970 000 000	337 400 000
Kyrgyzstan	5 200	2 300	103 000 000	10 000 000
Tajikistan	13 900	300		
Sum	**131 950**	**290 700**	**23 545 800 000**	**968 221 750**

■ No data on volumes, need to be collected

Table 1 Data on waste volumes as collected in 2013 and 2014 and updates in 2015 (data in tonnes)

2.2 Data on obsolete and POPs pesticides and other POPs

The total legacy for pesticide waste amounts to more than 130 000 tonnes. The large differences in pesticides quantities between the countries can be explained by the differences in the size of the agricultural production.

The volumes for other POPs show large differences as well, but these cannot be explained by macro-economic figures (as relation with industrial production or other parameters). The figures for Kazakhstan are relatively very high and for Belarus and Azerbaijan very low. When specific destruction technologies for these POPs will be planned, a more detailed inventory will be necessary.

2.3 Data for total hazardous waste

The legacies of hazardous waste are high, even if it should turn out that only 4% of these volumes are relevant for destruction (see § 7.1.1). Also in that case the legacies represent a high future cost.

The destruction costs for the legacies in Ukraine and Kazakhstan amount to even more than the annual GDP (calculation based on US$ 1 000 per tonne).

Looking at the annual arisings, the costs for hazardous waste destruction in Belarus, Ukraine, Kazakhstan and Kyrgyzstan are expected to be more than 1% of the GDP. In Western European countries this percentage is the upper range for hazardous waste management costs. This underlines the urgent need for waste prevention, reduction and recycling, especially in the countries mentioned.

Compared with the volumes for the annual arisings, the legacies correspond with 10 until 30 times the actual annual arisings.

2.4 Soil contamination

Storage of (agro-)chemicals and waste handling can cause substantial soil contamination. The main events identified during the project are:

- spills of chemicals (leaking from bags or containers with liquids etc.)
- store calamities (e.g. fire and leaking of chemicals with firewater)
- mixing of waste material with soil at landfills (covering, leveling etc.)
- also illegal waste mining activities at several burial sites (polygons) have made significant contributions to the growth of soil contamination at the these sites
- mixing of waste and soil at demolition activities at storage sites and excavations at landfills
- leaking of chemicals in case of (uncontrolled) demolition activities (see example for Kazakhstan PCB sites in § 7.1.3)

Although a systematic inventory of soil contamination caused by wastes was not part of the task of IHPA, some first indications have been collected. This amounts already to 500 000 tonnes. It can be expected that the outcomes of a complete inventory will be at least 10 times more.

Most of the data collected are related to so-called burial sites, places where obsolete pesticides have been buried.

Only for a limited number of former pesticide storage sites assessments of soil contamination have been made.

2.5 Counterfeit pesticides

According to the introduction text of a recent (2015) Organization for Security and Cooperation in Europe (OSCE) report, titled "Counteraction to counterfeit and contraband pesticides", 'counterfeit pesticides are roughly estimated to be as high as 25% of the global pesticide market. The profitability of the illegal trade in counterfeit pesticides makes it one of the top ten most lucrative organized crime businesses (Europol, 2012; Fishel, 2015). Counterfeit pesticides pose a threat to farmers' lives as, even when slightly changed, their properties can surge toxicity, which can seriously affect human health. All countries in Eastern Europe, South Caucasus and Central Asia import pesticides. Part of them are imported illegally. Such contraband pesticides quite often turn out to be counterfeit. Additionally to the counterfeit-related risks and threats outlined above, illegal trafficking of pesticides contributes to the social pressure caused by cuts in revenues to the state budget due to the undervaluation of these goods'.

For a number of EECCA countries, the annual volume of counterfeit pesticides is more than the elimination of obsolete pesticides. Many international organisations among others the World Customs Organization (WCO), OECD, FAO, UNEP, EUROPOL, the Office for Harmonisation in the Internal Market, the European Anti-fraud Office (OLAF) and the United Nations Inter-regional Crime and Justice Research Institute (UNICRI) have identified this issue as an alarming tendency and a priority for action.

3. Legal framework

The legal framework for environmentally sound hazardous waste management finds its basis in three global conventions: the Basel, Rotterdam and Stockholm Convention. The main tasks on national level are to translate these conventions into national legislation and to define all instruments required for proper implementation and enforcement. This creates the conditions for waste producers to dispose of hazardous waste in an environmentally sound manner and protects the society for negative effects on human health and the environment.

3.1 Global Conventions on chemicals and waste

The most relevant international conventions on chemicals and waste are the Basel, Rotterdam and Stockholm Convention. Most of the 193 United Nations member states are party to these three Global Conventions. This underlines the broad consent about the importance of these Global Conventions.

Six out of nine project countries have ratified all three Global Conventions: Armenia, Georgia, Moldova, Ukraine, Kazakhstan and Kyrgyzstan.

Tajikistan is not a party to the Basel Convention.
Belarus, Azerbaijan and Tajikistan are not a party to the Rotterdam Convention.

Basel Convention
The provisions of the Basel Convention centre around the following principal aims:
the reduction of hazardous waste generation and the promotion of environmentally sound management of hazardous wastes, wherever the place of disposal;
the restriction of transboundary movements of hazardous wastes except where it is perceived to be in accordance with the principles of environmentally sound management; and a regulatory system applying to cases where transboundary movements are permissible.

Rotterdam Convention
The objectives of the Rotterdam Convention are:
to promote shared responsibility and cooperative efforts among Parties in the international trade of certain hazardous chemicals in order to protect human health and the environment from potential harm to contribute to the environmentally sound use of those hazardous chemicals, by facilitating information exchange about their characteristics, by providing for a national decision-making process on their import and export and by disseminating these decisions to Parties.

Stockholm Convention
The objective of the Stockholm Convention is to protect human health and the environment from persistent organic pollutants (POPs). These (at the moment 23) POPs are defined under the Stockholm Convention

3.2 National legislation

For all project countries assessments have been made of national legislation for pesticides management and other hazardous wastes. These assessments included definitions, disposal requirements and the level of enforcement. Per country the findings are described in a consistent structure in a Working Document. The Country reports contain the analytical report, the main conclusions and recommendations.

3.2.1 History

Looking with the eyes of today at the old Soviet legislation that all EECCA countries have shared until 25 years ago, the main problems for an effective and environmentally sound hazardous waste management can be summarized as:

- Legislation has a long history of inconsistent repairs
- Lack of modern principles (e.g. polluter pays, protection of human health and environment, Extended Producer's Responsibility) as a basis for legislation
- No clear definitions of hazardous waste (not based on concentrations; most relevant are three categories (see § 7.1.1) representing 4-10% of the total hazardous waste quantities and the application of these categories is inconsistent)
- For enforcement of legislation penalties are missing and/or insufficiently defined, officers in charge for enforcement are not well trained and have a lack of: mandate and equipment
- Statistical data are not collected in a systematic way and data quality is insufficiently defined and managed
- It is unclear when pesticides applied are considered as waste material

3.2.2 Drivers for modernization of national legislation

But in most countries this situation no longer exists. Modernization is in progress or planned. Looking at the project countries different drivers for these developments can be identified:

- Countries where the investment support of the international financial institutions and multinational industry has provided guidance and support for modernization of the legal framework: examples are Azerbaijan and Kazakhstan and to less extend Belarus

- EU Eastern Partnership countries: Armenia, Azerbaijan, Belarus, Georgia, Moldova and Ukraine. Existing Association Agreement with the EC (strong driver): Georgia (in force) and Moldova and Ukraine (signed).

- Countries where the Eurasian Economic Union offers or can offer a framework for legal revisions: Armenia, Belarus, Kazakhstan and Kyrgystan

From this overview it is clear that for individual countries different drivers can play a role. The progress in implementing an effective legal framework for environmentally sound hazardous waste management in the project countries is presented in Chapter 4.

4. Progress with implementation

Implementation of environmentally sound management of hazardous waste starts with the adherence to global and other multilateral conventions, followed by the translation thereof into national legislation. The subsequent strict enforcement of legislation is the final prerequisite for investments in adequate disposal and destruction capacities and the operationalization thereof

4.1 Implementation of Global Conventions

Apart from signing and ratification, the key issue is of course the implementation of conventions. The requirements for successful implementation of the three conventions: Basel, Rotterdam and Stockholm are different.

4.1.1 Basel Convention implementation

Implementation of the Basel convention on national level requires a careful translation into the national legislation of the objectives. For some countries this requires a substantial modernization or even restructuring of the national legislation.

An effective implementation of the Basel requirements in national legislation, combined with a strict and visible enforcement in all countries is very important. It is the basis for elimination of illicit waste practices and prevention of waste transport to countries with the weakest regulations and / or enforcement, ending up in uncontrolled landfilling or dumping.

Only Azerbaijan and Moldova have achieved a good level of full implementation of the Basel Convention. Georgia still has to define the regulations governing the export of hazardous waste, Belarus has developed transboundary regulations with a strong focus on the Eurasian Economic Union.
For Kazakhstan it is recommended to assess and update the existing regulations, dating from 2008.

Larger efforts in Basel implementation are required in Armenia, Kyrgyzstan and Ukraine. Tajikistan is not a party to the Basel Convention and is recommended to start as soon as possible the process for adherence.

4.1.2 Rotterdam Convention implementation

The implementation of the Rotterdam Convention has not been part of the study performed by IHPA. But within the broader scope of this EU-FAO project GCP/RER/040/EC "Improving capacities to eliminate and prevent recurrence of obsolete pesticides as a model for tackling unused hazardous chemicals in the former Soviet Union", one project component has been performed by FAO on the implementation of the Rotterdam Convention.

4.1.3 Stockholm Convention implementation

The objective of the Stockholm Convention is to protect human health and the environment from the 23 persistent organic pollutants (POPs) as defined under the Stockholm Convention. The approach is to identify, collect and eliminate these most dangerous chemicals, most of these already banned for use since many years.

Stockholm implementation starts with an inventory of these POPs. Based on the outcomes of the inventory a National Implementation Plan is to be drafted. This NIP includes proposed actions, required regulatory conditions, capacity building (organization and expertise, training and education) and the planning of financial resources and the location of sites for temporary storage. Temporary storage is essential to enable a fast removal from the original site, controlled and safe storage and to create a larger volume which makes destruction more effective. Also the policy for application or investments in own in-country destruction capacity versus destruction abroad should be part of this planning.
The progress in Stockholm implementation in the different project countries is visualized in figure 2 below.

The countries that have arrived in the implementation phase are able and willing to give their assistance to other countries.

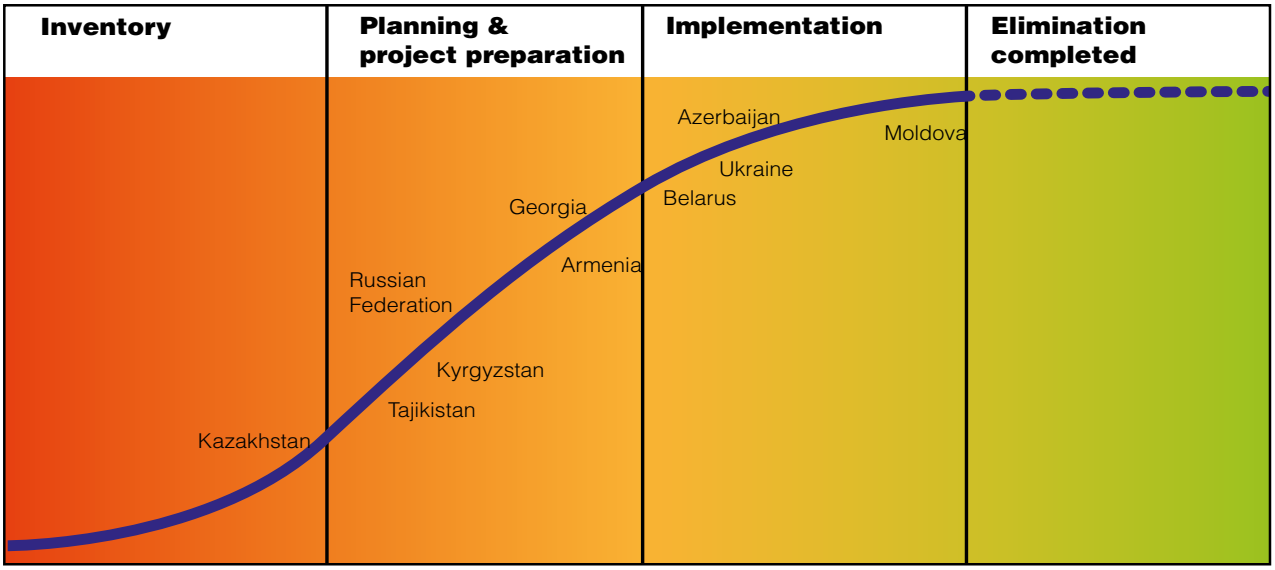


Figure 2. EECCA countries in the different phases of implementation of the Stockholm Convention, status 2014. Uzbekistan and Turkmenistan are not a party to the Stockholm Convention. Nevertheless these two countries have made an inventory and disposed all obsolete pesticides in central landfills.

Elimination of POPs stockpiles in Moldova: own commitment and perseverance

Elimination of POPs stockpiles in Moldova began in 2006. The removal and destruction of over 3 000 tons of obsolete pesticides from 37 central district warehouses was the first priority. In previous years the obsolete pesticides in these warehouses had been identified, collected and repackaged. From 2006 on, the elimination was carried out in a series of projects implemented or coordinated by the Ministry of Environment (MoE), Ministry of Defence (MoD) and Ministry of Agriculture and Food Industry (MAFI) with financial support from the national budget and from various international organizations as mentioned in the table below.

Project	Financing Agency	Implementing/ coordinating Agency	Period of elimination works	OP eliminated, tons	Present status (Aug. 2016)
POPs stockpiles management and destruction	GEF/WB MD Gov NEF	MoE (POPs PMT)	2006-2008	1 293	Finished
Remediation of environ-mental burdens caused by pesticides in Moldova	CzDA	CzDA MoE (POPs PMT)	2011-2015	451	Finished
Elimination of obsolete pesticides stocks with major risks (liquid obsolete pesticides)	NEF	MoE (POPs PMT)	2013-2014	200	Finished
Disposal of dangerous pesticides from the Transdniestrian Region of Moldova	OSCE	OSCE Mission to Moldova MoE (POPs PMT)	2013-2014	105	Finished
Destruction of pesticides and hazardous chemicals in the Republic of Moldova	NATO/ OSCE NEF	NATO MoD	2013-	717	Ongoing
Improving capacities to eliminate and prevent recurrence of obsolete pesticides as a model for tackling unused hazardous chemicals in the former Soviet Union	EC/FAO	FAO MAFI MoE (POPs PMT)	2013-	120	Ongoing
Total			2007-2016	2 886	

Tabel 2. Different projects in the past nine years for the elimination of obsolete pesticides in Moldova

Main success factors for the removal of pesticides in Moldova are: a committed team with special focus on pesticides elimination, keeping good relations in the different Ministries, commitment demonstrated by own governmental funds, trustful relations with international organizations and donors and the perseverance to arrive at a full elimination.

At the moment uncertainties still exist about the Cismichioi landfill where pesticide wastes have been stored in the years 1975-1987. Volume estimates vary between 4 000 and 20 000 tons of obsolete pesticides. In 2016-2017 a detailed assessment will be carried out supported by the Czech Development Agency.

4.2 Modernization of national legislation

For the EECCA countries modernization of waste legislation is not a project, but a choice, commitment and investment to start a process of continuous improvement in waste management.

Almost all countries have a Law on Wastes as a legal basis. For most countries this law is old-fashioned.
In all countries no effective definitions of hazardous waste are present. Specific laws on hazardous waste are lacking in all countries.
Good examples of temporary regulations are the State Strategy 2004 in Azerbaijan and the Strategic Plan 2010 in Kazakhstan. These documents have been defined with assistance of international organizations in the frame of World Bank financing programs. It is recommended to convert in both countries these regulations in robust and consistent waste legislation.
For Georgia a mid term planning for legislation reform (roadmap defined in 2015) exists, in consequence of the EU Association Agreement. The coming years the focus will be on municipal waste, the years after regulations will be introduced for hazardous waste management. Moldova is following a similar process of modernization of legislation as Georgia.

4.3 Enforcement of law

Legislation proves its value for the society in the implementation. Best enforcement of waste legislation is found in Belarus and Azerbaijan.

Belarus shows a good implementation of the separation of waste and has excellent facilities for the temporary storage of specific waste streams. Enforcement of waste legislation is strict and costs are charged for waste disposal. Incorporation of penalties and fines in Criminal Code is under preparation. Final destruction capacity is not yet available. Investments in destruction facilities could also be of interest for serving neighbouring countries. Main question for the moment seems to be how to create the right setting (as international cooperation, private party involvement and capacity for financing) for these investments.

Looking at waste destruction facilities other than landfilling, only Azerbaijan has built up a substantial capacity, although mainly for municipal waste and specific industrial waste streams.

The investments in waste destruction capacity in Azerbaijan have been developed along two lines. At the one hand joint developments with large multinational industries: example of a thermal desorption plant of BP operational since 2001, additional investment in 2014. On the other hand investments facilitated by international donors and financing institutions: example of the redevelopment of a 120 ha area on the Balakhani landfill for an eco-industrial park. Facilities present: Material Recovery Facility (200 000 tonnes per year), Waste to Energy Plant (500 000 tonnes per year) and an incinerator for 10 000 tonnes per year for medical waste.

Both Belarus and Azerbaijan can take advantage from the availability of separation and treatment facilities. This demonstrates to waste producers, international waste sector, investors and the general public that (hazardous) waste management is taken seriously by the government. This 'leading by example' is the only way to convince and attract private parties to co-operate.

Making the balance:

Belarus and Azerbaijan can expand their investments in hazardous waste destruction capacity, have reached an appropriate level of enforcement and a sufficient legal basis. Challenges for both countries are in the optimization of the legal framework, international cooperation and partnering in the development of destruction capacity.

Sharing of the experiences in these two countries can be of significant help for Kazakhstan. For an enormous country as Kazakhstan there are still significant tasks to be done regarding inventories of the different waste streams, to motivate and line up all the regional authorities and to assess different scenario's for planning waste centres and destruction facilities. This implies that on all tracks of the Roadmap (see Chapter 5) concerted activities have to be developed in parallel. And amongst these activities the modernization of the legal framework should be a priority. Georgia and Moldova are recommended to put their focus on the development of the legal framework as an important part of the EU-Accession process. During these activities a periodical assessment of quick wins in communication, enforcement and waste reduction can help to advance the implementation in parallel with the legislation design. These recommendations also apply for Ukraine as soon as the Association Agreement has been ratified.

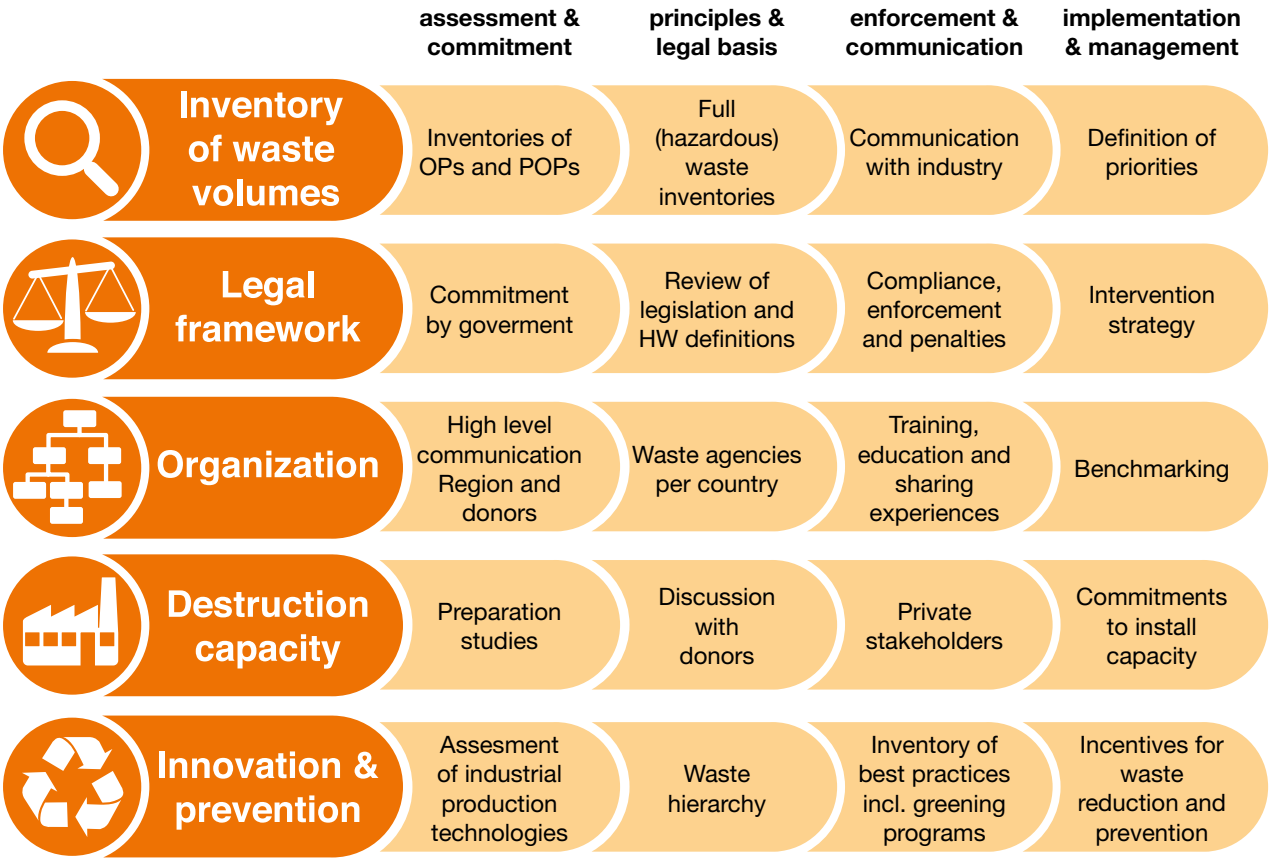
This brings us to the three countries, where the legal framework is still very similar to 25 years ago, Armenia, Kyrgyzstan and Tajikistan. Are the governments of these countries willing and able to make the commitments and investments needed? It will require modernization of legislation, substantial improvements in hazardous waste management and elimination of OP's and an adequate capacity for enforcement. Additionally there will be the challenges to start communication with the general public and to create the conditions and relations for sharing experiences with international organizations and neighbouring countries.

It is promising to conclude that from these last four countries, Kyrgyzstan and Tajikistan have endorsed the Roadmap and express their willingness to make the necessary commitments.

Other endorsement letters have been received from Belarus, Kazakhstan and Moldova.

5. Roadmap

In order to support EECCA countries to define the conditions for environmentally sound hazardous waste management a Roadmap has been developed. This Roadmap can also be used as a reference framework in the communication and co-operation between countries in the region and with supporting international organizations and donors.



5.1 Roadmap, a short explanation

In this Roadmap Summary a short explanation will be given of the elements of the Roadmap. For more detailed explanations is referred to the Roadmap report. The Roadmap contains five rows, representing the significant aspects, being: inventory of waste volumes, modernization of legal framework, organizational aspects, planning, design and financing of destruction capacity and the development of programmes for innovation and waste prevention.

For these developments concerted and consistent actions have to be defined and over a long period of time. Experiences in the EU countries show that even after about 45 years, optimizations for (hazardous) waste management can be achieved, mainly by means of recycling and prevention.

In order to arrive at a first implementation of environmentally sound hazardous waste management, four phases have been defined: assessment and commitment (what is the size of the task and are we willing to face this challenge), principles and legal basis (a task that needs large efforts and perseverance to define an effective legal framework), enforcement & communication (implementation of the legal provisions and persuading and convincing all stakeholders to make their commitment and change of attitude if necessary), implementation and management (how to arrive at full implementation and how to incorporate experiences and lessons for improvement)

The Roadmap scheme can be used in different ways. It can be used for defining generic issues on regional level, to define tasks for individual countries, but also to discuss with different stakeholders their contributions to these developments.
In the Roadmap report different views have been worked out as for international organizations, donors, NGOs, industry and waste sector.

5.2 Recommendations for individual countries

In this paragraph a summary for the individual project countries is given.
Five countries that have reacted on the invitation to endorse the Roadmap report: Moldova, Belarus, Kazakhstan, Kyrgyzstan and Tajikistan
Four countries that have not responded with an endorsement letter: Georgia, Ukraine, Armenia and Azerbaijan

As mentioned in the executive summary (page 4), Turkmenistan and Uzbekistan have not responded to the invitation to participate in this project, Russia has given notice of the decision not to participate.
The summaries are based on the recommendations as included in the Country Reports and the main statements (for the first five countries) from the endorsement letters are presented on the next three pages. For each country it is indicated in blue on which activity (which field of the Roadmap scheme) the focus should be in the coming year(s).
More detailed information can also be found in the Roadmap report.

Moldova

Inventory of waste volumes	Inventories of OPs and POPs	Full (hazardous) waste inventories	Communication with industry	Definition of priorities
Legal framework	Commitment by goverment	Review of legislation and HW definitions	Compliance, enforcement and penalties	Intervention strategy
Organization	High level communication Region and donors	Waste agencies per country	Training, education and sharing experiences	Benchmarking
Destruction capacity	Preparation studies	Discussion with donors	Private stakeholders	Commitments to install capacity
Innovation & prevention	Assesment of industrial production technologies	Waste hierarchy	Inventory of best practices incl. greening programs	Incentives for waste reduction and prevention

It is recommended to focus on a better implementation of the EU legal framework for management of chemicals and (hazardous) waste. Special attention should be given to the definition of clear responsibilities and specific legislation for hazardous waste and pesticides. A clear definition of the principles for environmental management can bring a better understanding of the necessary contributions of different stakeholders. Related to the activities under the Stockholm Convention the focus will be on the finalization of the safeguarding and removal of the last OPs and to prepare the start of the subsequent soil investigation and remediation activities. The Ministry of Environment has expressed to agree with the proposed actions.

Belarus

Inventory of waste volumes	Inventories of OPs and POPs	Full (hazardous) waste inventories	Communication with industry	Definition of priorities
Legal framework	Commitment by goverment	Review of legislation and HW definitions	Compliance, enforcement and penalties	Intervention strategy
Organization	High level communication Region and donors	Waste agencies per country	Training, education and sharing experiences	Benchmarking
Destruction capacity	Preparation studies	Discussion with donors	Private stakeholders	Commitments to install capacity
Innovation & prevention	Assesment of industrial production technologies	Waste hierarchy	Inventory of best practices incl. greening programs	Incentives for waste reduction and prevention

In Belarus most conditions for proper waste management are already in place. The endorsement letter confirms the approval of the Roadmap and points out the importance of evaluation of technologies on elements of sustainability. It is recommended that Belarus becomes party to the Rotterdam Convention and that for pesticides waste management the focus is put on prevention, empty containers, training and cooperation with other countries. Hazardous waste management can be enforced by introduction of economic drivers for waste reduction, definition of sanctions for violation of rules for transboundary transport and the development of legal provisions for waste incineration. The storage facility in the Gomel region is recommended as preferred location for the realization of destruction capacity.

Kazakhstan

Inventory of waste volumes	Inventories of OPs and POPs	Full (hazardous) waste inventories	Communication with industry	Definition of priorities
Legal framework	Commitment by goverment	Review of legislation and HW definitions	Compliance, enforcement and penalties	Intervention strategy
Organization	High level communication Region and donors	Waste agencies per country	Training, education and sharing experiences	Benchmarking
Destruction capacity	Preparation studies	Discussion with donors	Private stakeholders	Commitments to install capacity
Innovation & prevention	Assesment of industrial production technologies	Waste hierarchy	Inventory of best practices incl. greening programs	Incentives for waste reduction and prevention

Priority for Kazakhstan is an inventory of OPs in all regions to gain an overview of the national problem and its priorities, as a basis for action plans and an awareness campaign for local authorities and NGOs. Parallel assessments can be made for a good implementation of the global conventions and the enforcement of present and future legislation. Permanent action is needed to keep cooperation, exchange of experiences and communication on hazardous waste active between the different authorities. Private sector parties should be made better aware of risks for health and environment and their (extended producers) responsibilities. In the endorsement letter of the Ministry of Energy consent is given to the proposed actions. In the meantime a specific Roadmap for Kazakhstan has been presented.

Kyrgyzstan

Inventory of waste volumes	Inventories of OPs and POPs	Full (hazardous) waste inventories	Communication with industry	Definition of priorities
Legal framework	Commitment by goverment	Review of legislation and HW definitions	Compliance, enforcement and penalties	Intervention strategy
Organization	High level communication Region and donors	Waste agencies per country	Training, education and sharing experiences	Benchmarking
Destruction capacity	Preparation studies	Discussion with donors	Private stakeholders	Commitments to install capacity
Innovation & prevention	Assesment of industrial production technologies	Waste hierarchy	Inventory of best practices incl. greening programs	Incentives for waste reduction and prevention

In Kyrgyzstan a lot of actions are still to be taken. This is also acknowledged in the endorsement letter of the Minister of Agriculture. Important tasks are the revision of the legal framework, based on the Global Conventions and the completion of waste inventories. Priority should be given to regulations for the transboundary transport of waste combined with a powerful enforcement of existing regulations introducing penalties and fines. For OPs a plan for repackaging and central storage should be developed. The Ministry acknowledges the need for assistance of international organizations and other countries. Existing contacts should be further developed for this purpose.

Tajikistan

Inventory of waste volumes	Inventories of OPs and POPs	Full (hazardous) waste inventories	Communication with industry	Definition of priorities
Legal framework	Commitment by goverment	Review of legislation and HW definitions	Compliance, enforcement and penalties	Intervention strategy
Organization	High level communication Region and donors	Waste agencies per country	Training, education and sharing experiences	Benchmarking
Destruction capacity	Preparation studies	Discussion with donors	Private stakeholders	Commitments to install capacity
Innovation & prevention	Assesment of industrial production technologies	Waste hierarchy	Inventory of best practices incl. greening programs	Incentives for waste reduction and prevention

It is recommended that Tajikistan becomes party to both the Basel and Rotterdam convention. Together with the provisions of the Stockholm Convention this should be the basis for the modernization of the legislation. This should start with the definition of environmental principles. The revision of the legislation should include the whole waste chain, the required infrastructure and the systems for practical enforcement. The EU regulations can be used as a good reference. In this whole process an active communication with all stakeholders and the general public is extremely important. In the endorsement letter the Road Map is approved, the need for international assistance is addressed and specific suggestions for improvements are included.

Georgia

Inventory of waste volumes	Inventories of OPs and POPs	Full (hazardous) waste inventories	Communication with industry	Definition of priorities
Legal framework	Commitment by goverment	Review of legislation and HW definitions	Compliance, enforcement and penalties	Intervention strategy
Organization	High level communication Region and donors	Waste agencies per country	Training, education and sharing experiences	Benchmarking
Destruction capacity	Preparation studies	Discussion with donors	Private stakeholders	Commitments to install capacity
Innovation & prevention	Assesment of industrial production technologies	Waste hierarchy	Inventory of best practices incl. greening programs	Incentives for waste reduction and prevention

In the frame of the Association Agreement with the EU, Georgia has developed for the coming years a plan for the modernization of the legislation. It is recommended to pay special attention to the transboundary transport of hazardous waste, the proper enforcement of the whole waste chain and waste prevention and recycling. This new legislation should also facilitate the development of future waste disposal and destruction facilities. These developments are excellent opportunities to improve the communication with the general public. Regarding the implementation of the Stockholm convention, plans should be developed for repackaging and disposal of OPs and POPs, to train more people in POPs management and update the NIP.

Ukraine

Inventory of waste volumes	Inventories of OPs and POPs	Full (hazardous) waste inventories	Communication with industry	Definition of priorities
Legal framework	Commitment by goverment	Review of legislation and HW definitions	Compliance, enforcement and penalties	Intervention strategy
Organization	High level communication Region and donors	Waste agencies per country	Training, education and sharing experiences	Benchmarking
Destruction capacity	Preparation studies	Discussion with donors	Private stakeholders	Commitments to install capacity
Innovation & prevention	Assesment of industrial production technologies	Waste hierarchy	Inventory of best practices incl. greening programs	Incentives for waste reduction and prevention

For Ukraine, the modernization of the legislation should be primarily focused on the right implementation of the Basel Convention and addressing the responsibilities of producers. Besides, programs should be developed to stimulate short term improvements in waste reduction, waste recycling and useful application of recycled materials. Regarding the implementation of the Stockholm Convention it is recommended to develop a planning for the disposal of OPs and POPs, the management of empty containers, the building up of destruction capacity and a plan how to assess, contain and remediate soil contamination related to waste.

Armenia

Inventory of waste volumes	Inventories of OPs and POPs	Full (hazardous) waste inventories	Communication with industry	Definition of priorities
Legal framework	Commitment by goverment	Review of legislation and HW definitions	Compliance, enforcement and penalties	Intervention strategy
Organization	High level communication Region and donors	Waste agencies per country	Training, education and sharing experiences	Benchmarking
Destruction capacity	Preparation studies	Discussion with donors	Private stakeholders	Commitments to install capacity
Innovation & prevention	Assesment of industrial production technologies	Waste hierarchy	Inventory of best practices incl. greening programs	Incentives for waste reduction and prevention

Armenia is recommended to work on a thorough revision of the legal framework in order to realize a good alignment with Global Conventions. Special attention is to be given to definition of hazardous waste, regulations for transboundary transport and the requirements for future destruction facilities. In parallel, more attention should be paid to the inventories of hazardous wastes and to create storage facilities for specific waste streams. For the OPs and POPs present in storage facilities, plans for final destruction should be developed. Therefore the co-operation with international organizations and donors is to be strengthened.

Azerbaijan

Inventory of waste volumes	Inventories of OPs and POPs	Full (hazardous) waste inventories	Communication with industry	Definition of priorities
Legal framework	Commitment by goverment	Review of legislation and HW definitions	Compliance, enforcement and penalties	Intervention strategy
Organization	High level communication Region and donors	Waste agencies per country	Training, education and sharing experiences	Benchmarking
Destruction capacity	Preparation studies	Discussion with donors	Private stakeholders	Commitments to install capacity
Innovation & prevention	Assesment of industrial production technologies	Waste hierarchy	Inventory of best practices incl. greening programs	Incentives for waste reduction and prevention

Azerbaijan is recommended to become party to the Rotterdam Convention and to include the regulations thereof in the national legislation. Important is also a regular evaluation of the existing national legislation leading to permanent improvement. Strengthening of the international contacts and co-operation could lead to mutual benefits. With regard to the Stockholm Convention, plans should be made for the elimination of OPs and POPs and management of empty containers. In these studies for waste elimination also the advanced use of the present facilities should be evaluated.

5.3 Destruction capacity

For the initial development of hazardous waste destruction capacity, the three main waste streams are:

- the annual arisings of hazardous waste
- the highly contaminated stream of OPs and POPs
- soil contaminated with OPs and POPs

Annual arisings of pesticides wastes will become part of the 'normal' hazardous waste streams and the legacy volumes of hazardous waste will be step by step treated once the capacity has increased.

Figure 3 shows the basic scheme for the treatment of these three waste streams.

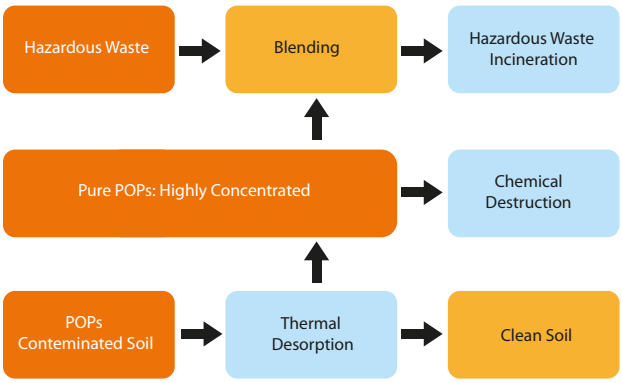


Figure 3: Scheme treatment options for POPs waste

For the highly concentrated stream of pure OPs and POPs, two options are applicable: either specific chemical destruction or blending with other hazardous waste followed by incineration in a hazardous waste incineration plant.

For chemical destruction technologies like Gas Phase Reduction (GPR), Base-Catalyzed Decomposition (BCD), Super Critical Water Oxidation (SCWO) but also the various Plasma technologies can be applied.

Over the past decades a lot of experiences have been developed in these specific technologies. In general the capacity is low (typically ranging from 100 to 5 000 of tonnes per year). From an investment perspective the risks are relatively low, as these facilities are often mobile and have low standstill costs. Given these characteristics, these technologies are well suited for the specific destruction OPs and POPs.

The capacity of regular hazardous waste incinerators is much higher than the capacity of chemical destruction plants (typically ranging from 10 000 to 100 000 tonnes per year). Hazardous waste Incinerators have high fixed costs and thus high standstill costs when not running and are highly dependent on large quantities of calorific waste to ensure its economy. Public private enterprises that include the extensive experience and management capacity of for example the international waste management companies can secure quality and control and the necessary capacity-building in the future.

Hazardous waste incinerators can also be used for the destruction of OPs and POPs. Therefore blending of the highly concentrated POPs waste with other waste with high calorific value is necessary. For this approach a sufficient high quantity of this waste must be secured.
Cement kilns are designed to produce cement and are present in all EECCA countries. In Central Asia recently many new plants have been established. As cement kilns can also be used with minor modifications for the co-incineration of certain types of hazardous waste, it is recommended to evaluate these options as they require relatively low additional investments.

The considerable quantities of contaminated soils (see § 7.1.3 and § 7.1.4) can be easily dealt with by for example thermal desorption. Thermal desorption produces clean soil that can be re-used at the original location and a concentrate of contaminants that can be treated in the same way as the highly concentrated streams of OPs and POPs.

Detailed information on technologies can be found in the Roadmap report (Chapter 9 and Appendix 5).

Based on the waste quantities as presented in chapter 2 of this Roadmap summary, it is recommended to focus investments in hazardous waste incinerators in the countries with the high annual arisings of hazardous waste: Belarus, Ukraine and Kazakhstan. In these three countries, the quantities of collected OPs and POPs can be used for the initial period to feed this capacity (under the condition that sufficent high calorific material for blending is present).
As Azerbaijan has already certain destruction capacity available, further optimization, including options for serving other countries should be evaluated.

Given the characteristics of the specific chemical destruction technologies (relatively small facilities, low investment risk, low or no emissions and transportable), these technologies can be applied in each country where the OPs and POPs have been inventoried, repackaged and centrally stored.

5.4 Social acceptance and communication

In the preparation of the decision for destruction capacity three elements are significant: the technology assessment, the financial engineering and the acceptance of the population. It is a shared experience in all countries where destruction capacity has been developed that the

acceptance of the population is often underestimated. In general the following sentiments are playing a role:

- people mostly feel to be informed too late ('the decision has already been taken')
- people often experience to lag behind in information, especially when experts present a lot of technical and complex information ('how to understand this tsunami of information?')
- people tend to distrust that they are taken seriously ('does our opinion count?')
- conflicting expert opinions can easily lead to confusion
- insufficient trust in authorities (often based on either previous experiences or experiences in other fields)
- what does it mean for me? (health risks, nuisance, financial damage, what do we get in return etc.)

It is therefore of importance that in the whole development of environmentally sound hazardous waste management, authorities create an atmosphere of openness and transparency, access to and sharing of information, sharing of dilemma's in balancing of interests, broad communication to the society and providing access to experiences from other regions and countries.

6. Change management

In this chapter an overview of changes that can be expected is presented. Change management is often difficult and complex. It has to do with different aspects like vision, definition of merits, recognition of obstacles, perseverance and the creation of coalitions. And in the end it has to do with human behaviour.

Using experiences in change management of other countries can help to find more effective ways for making the change

6.1 Introduction

From the previous chapters the main issues for change can be identified as:

- adherence to global conventions
- translations of global conventions into national legislation
  - o definition of Environmental principles
  - o definition of hazardous waste
  - o waste inventories
- enforcement of law
  - o penalties and fines
  - o capacity building for monitoring, control and sanctions
  - o programmes for waste prevention and waste reduction
  - o sufficient and sustainable funding for enforcement
- establishing measures that encourage investments in destruction capacity
- other issues
  - o waste hierarchy
  - o technological innovation
  - o circular economy
  - o information and communication

Some main aspects for these changes are discussed in this chapter.

6.1 Global conventions

The ratification of the global conventions is only an issue for three countries. The most important step is that Tajikistan should ratify the Basel convention. This will ensure the conditions for reduction of waste tourism (see § 4.1.1). The other issue is the ratification of the Rotterdam convention by Belarus, Azerbaijan and Tajikistan.

6.2 Translation of global conventions into national legislation

International cooperation and exchange of experiences between countries and with donors and international organizations can have a significant added value for the definition of an Environmental Code / Environmental principles (such as polluter pays and extended producer responsibility) and for the methodology for the definition of hazardous waste. This will also contribute to the definition of regulations for transboundary transport of hazardous waste.

Regarding waste inventories there is an important task for Kazakhstan to make a good inventory of obsolete pesticides, other POPs and other hazardous waste. Regarding hazardous waste additional inventories are recommended for Ukraine, Moldova and Georgia.

6.4 Enforcement

In each society the proper enforcement of law is needed to enjoy the benefits. In this case the enforcement of hazardous waste management legislation will contribute to protection of human health and the environment. Enforcement is also the main driver to encourage investment in sustainable hazardous waste management facilities. Based on the assessment of the actual situation it can be concluded that in most project countries there is a need for improvements in enforcement of legislation. Main aspects that require attention are:

- control of waste transport (transboundary as well as in country)
- licenses and permits
- regular and unannounced controls
- penalties and fines
- well trained officers for controls, audits and assessments with adequate mandate and proper equipment
- data collection as a basis for systematic improvement
- publications and communication to the general public
- cooperation and exchange of information with neighbouring countries and international organizations sustainable funding mechanisms for enforcement activities

At the moment best enforced practices in (hazardous) waste management are found in Belarus and Azerbaijan. Looking at the more specific level of enforcement related to the implementation of the Stockholm Convention,

Moldova and Belarus can be seen as front-runners. International cooperation can make the task for defining these instruments much easier.

International experience on enforcement shows that the change from low cost landfilling of hazardous waste to professionally regulated waste handling and destruction leads to substantially higher costs. These costs will be charged to producers and will initially lead to increase of production costs. This cost increase will force producers to focus on waste prevention, waste reduction and technological innovation.

For the more industrialized countries (Kazakhstan, Ukraine, Azerbaijan and Belarus), it is the challenge to create governmental programmes and public private partnerships that will support waste prevention and innovation as well as investment in hazardous waste management facilities.

6.5 Investments in destruction capacity

Proper enforcement of law is also a significant condition for investments in the waste sector, the encouragement of international waste management companies to consider investments in destruction capacity and the willingness of responsible industries to invest in production capacity and to enter into long term contracts for waste destruction.
Attractive financing mechanisms (fiscal advantages or special conditions for loans) can also stimulate investments in destruction capacity.

6.6 Making use of developments in other countries

International cooperation can also be beneficial for transfer of knowledge and experiences in other fields and in innovations. As examples can be mentioned the introduction of the so-called waste hierarchy and the development of concepts as the EU initiative on Circular Economy.
Also experiences in the soft tools of communication and information technology can be of help.

All these issues are mentioned here in this chapter to demonstrate that already a lot of information is available and that good international cooperation can lead to more effective, cheaper and faster implementation of environmentally sound hazardous waste management. Other, more specific issues for international cooperation can be found in the list below.

- planning and evaluation schemes for modernization of legislation
- economic incentives, fee structures, penalties and fines
- planning of destruction capacities
- statistics and reporting
- communication to the general public

Regarding the implementation of the Stockholm Convention:

- methodologies for POPs inventories
- NIP update schemes
- assessment when pesticides waste has to be qualified as hazardous waste
- definition and implementation of action plans
- international support and funding
- solutions for the sustainable management of empty pesticide containers

7. Further reading

This chapter contains explanatory text related to the different chapters of this brochure

7.1 Explanations for Chapter 2: Waste quantities

7.1.1 Methodology and uncertainties

Apart from the assessment of the legal framework, a second result of this project is the quantification of both the legacy volumes and the annual arisings of obsolete pesticides and total hazardous waste quantities. For pesticides wastes and other POPs the figures are mainly based on inventories as performed in the frame of the Stockholm Convention. Where possible and available, also additional data from national authorities and international organisations have been added with registration of the sources of information. Also hazardous waste figures have been collected based on statistical information, studies performed in recent years or information from national authorities and other international organisations. All this information has been collected by national waste experts under the project management of IHPA.

It is for the first time that on this level of detail a quantification of these waste figures has been carried out.
The main objective for collecting this information has been to assess the capacity to be installed for the destruction of obsolete pesticides waste (short term, smaller scale objective, one time event) could be used in the medium and long term for the destruction of the regular quantities (annual arisings) of hazardous waste. In this way the thresholds for investments in destruction capacity in the EECCA countries could be lowered and high costs for transportation to destruction facilities elsewhere outside the EECCA countries be eliminated. In return this could accelerate the elimination of obsolete pesticides and other POPs. In § 5.3 the different options are presented.

The waste quantities as found are presented in table 1, page 7. In this table no data are included for Turkmenistan and Uzbekistan (see § 7.4 below). In the national reports (Country Report and Working Document) some first indications of volumes have been made for these countries. In all country reports and the Roadmap report also data for pesticides contaminated soils and specific categories of hazardous waste are presented.

There are a lot of uncertainties in the volumes as presented in table 1:

- the legacy volumes for pesticides include both POPs pesticides (as named in the POPs list of the Stockholm Convention) and other obsolete pesticides.
- the case description of Moldova in § 4.1.3 (a country with the best progress in elimination of obsolete pesticides) shows clearly that until the end significant uncertainties in the volumes as inventoried will remain. The experience shows that the final volumes are always higher. This implies that the figures for pesticides as given have to be seen as a 'lowest estimate'.
- For the presented hazardous waste figures the uncertainties are even higher as a consequence of several factors:
  1) the definition of hazardous waste is in most countries vague or depending on interpretation (no lists with concentrations),
  2) under the old Soviet definition (which still exists in many countries) there are five classes of hazardous waste: I abnormally hazardous, II high hazard, III medium hazard, IV low hazard, V practically non-hazard. In Table 1, § 2.1, the sum of these five classes is presented. In reality it can be assumed that only the sum of classes I-III, representing about 4 - 10% of the total amount is really relevant in comparison with EU definitions
  3) in most countries a good registration of hazardous waste volumes is not in place or
  4) the collected data are not centrally stored and/ or not accessible from one point.

  The effects of 2) will lead to an overestimation, 3) and 4) to an underestimation and 1) can have an effect in both directions. As the sources of information are documented, data of future inventories can be compared and extrapolated.

The uncertainties as listed above underline the urgency to start working on (hazardous) waste definitions, waste separation, separate storage and waste reduction, especially in those countries where these uncertainties are large. These measures will show their value during the process of modernization of legislation and enforcement thereof.

7.1.2 Missing data

The red marked fields in table 1 indicate that for that item no estimates are available. These lacking data are found for Armenia, Georgia, Moldova and Tajikistan.
For Armenia no reliable historical data are available. In the meantime, there is a definition of hazardous waste in place, reason why there is an estimate for the annual arisings of hazardous waste.
For Georgia the waste legislation is at the moment in progress also in view of the Association Agreement with the EU. Definitions for hazardous waste are not yet available and in force, waste separation is not operational yet. This explains the missing figures.

Moldova has shown a pro-active attitude in the elimination of pesticides under the Stockholm Convention (see also § 4.1.3). Nevertheless there is still a lot to be done to modernize the hazardous waste legislation. These activities are for Moldova part of the Association Agreement with the EU.

In Tajikistan legislation and enforcement are still dating from the old Soviet times. This explains the missing hazardous waste figures. Promising is the fact that Tajikistan started first inventories of pesticides and other POPs under the Stockholm Convention. These data are presented in table 1.

7.1.3 Soil investigation for other POPs, examples from Kazakhstan

For other POPs no figures for soil contamination are collected. But in the frame of a World Bank financed study on PCB removal for Kazakhstan two cases are described on the next page that make clear that also for such sites soil contamination is not to be neglected.

Soil contamination in Kazakhstan caused by PCBs. Two examples

In an inventory project of PCB contaminated sites, for the two sites below also a soil investigation has been carried out. The results show in both cases that the soil has been contaminated, due to different causes. The site characteristics of the Ekubastuz site (table 3) are: large sub-station for power supply with about 15 000 capacitors. During the crisis in the nineties of the last century, the site was abandoned. This has led to theft of capacitors, demolition and emptying of capacitors and theft of copper. These (illegal) activities have caused a large soil contamination with high concentrations in the soil. The other site, the Daryal-U site (table 4) is a remote site of a former radio station of the army that stayed untouched for many years. Here only two small hotspots (probably related to refilling of capacitors in the past) were found.

Table 3: Ekibastuz Site: Estimate of area and volume of contaminated soil

Category	Total site estimates		Data from FCG Report 2010*	
	Area (sq. m)	Volume (cub. m)	Volume (cub. m.)	
			Min estimate	Max estimate
Hazardous Waste	3 700	2 800	6 000	24 000
Heavily Contaminated Soil	7 000	5 200	60 000	180 000
Slightly Contaminated Soil	16 600	12 500	36 000	110 000

Table 4: Daryal-U Site: Estimate of area and volume of contaminated soil

Category	Total site estimates		Data from FCG Report 2010*	
	Area (sq. m)	Volume (cub. m)	Volume (cub. m.)	
			Min estimate	Max estimate
Hazardous Waste			12 000	48 000
Heavily Contaminated Soil			120 000	360 000
Slightly Contaminated Soil	63 700	47 800	130 000	400 000

Source of information: “Project on the proposed containment and removal PCBs and obsolete pesticides. Consulting services for additional geological survey and laboratory analysis. World Bank, Washington, SNC-Lavalin International Inc. (SLII)”

7.1.4 Recommendation for assessment of soil contamination

Therefore it is recommended to make an (at least indicative) assessment of soil quality an integral part of hazardous (including pesticides) waste inventories.

When a soil investigation is not feasible, it is at least of importance

- to maintain records of the location of the sites where the waste is located and
- to forbid any future use of the site (by fencing and placing danger signs when possible) until the site has been assessed and risk reduction measures have been undertaken.

7.2 Explanations for Chapter 3: Legal Framework

7.2.1 Global conventions, position of Russia, Turkmenistan and Uzbekistan

Regarding the signing of the three global conventions, Basel, Rotterdam and Stockholm, the following additional information can be relevant.

The Russian Federation is party to all three conventions. Turkmenistan and Uzbekistan are still in the phase of accession and therefore no party to the Basel convention. For Turkmenistan and Uzbekistan the question is becoming relevant how these countries can become parties to the Global conventions and how they can be convinced to participate in international cooperation.

7.3 Explanations for Chapter 6: Change management

In § 6.6 the importance of international cooperation is mentioned. Most of the EECCA countries have experiences in international cooperation as party to regional conventions. The experiences of these regional conventions can also be used for the design of future international cooperation mechanisms. It is recommended to make an assessment of the experiences from former and existing regional conventions for the design of future cooperation in improving conditions and creating capacity for hazardous waste management. In the project area the following regional conventions can be used for this assessment:

- Convention on the Protection of the Black Sea Against Pollution (in force since 1994). The six signatories: Bulgaria, Georgia, Romania, Russian Federation, Turkey and Ukraine entered into obligations regarding: the control of land-based sources of pollution, dumping of waste and joint action in the case of accidents.

- Danube River Basin Protection Convention as legal instrument for co-operation and transboundary water management in the Danube River Basin. This Convention is signed by the Danube Riparian States – Austria, Bulgaria, Croatia, Czech Republic, Germany, Hungary, Moldova, Romania, Slovakia, Slovenia, Ukraine and the European Community (in force since 1998).

- Convention on the Protection of the Marine Environment of the Baltic Sea Area, known as the Helsinki Convention (since 2000 in force). Contracting parties are Denmark, Estonia, the European Union, Finland, Germany, Latvia, Lithuania, Poland, Russia and Sweden.

- Framework Convention for the Protection of the Marine Environment of the Caspian Sea, the Tehran Convention (since 2006 in force). The five parties Azerbaijan, Iran, Kazakhstan, Russia and Turkmenistan signed for sustainable development and to take environmental concerns into account in their development planning.

Especially the achievements under the Helsinki Convention are interesting for further assessment: inventory of hot spots, assessment of priorities and elimination have led to elimination of 60% of the hot spots.

7.4 Closing remarks about Russian, Turkmenistan and Uzbekisten

In 2013, Russia has decided not to participate in this project. Turkmenistan and Uzbekistan have never reacted to the official invitations to join the project. The governments of Turkmenistan and Uzbekistan have not provided any information and not commented on draft versions of this report.

Therefore, information concerning these three countries included in the national reports and the Roadmap report is based on data as published and/or found on Internet and other publicly available sources.

8. Photos and illustrations

- Cover photo: Results of illegal waste mining at Suzak polygon in Kyrgyzstan, Milieukontakt International
- Photo page 2: Children playimg in the field on obsolete pesticides contaminated ground, Tajikistan, Berto Collet
- Photo page 3: Children playing with their hands in DDT and DDT packaging in Tajikistan village, Berto Collet
- Photo page 4 bottom: Gorlovka mononitrochloro-benzene (MNCB) plant in Ukraine. Dismantling and remediation works, SI-Group

- Photo page 5: Cows grazing and drinking contaminated water on top of waste hills at the Vakshk polygon in Tajikistan, Maurice Jutz
- Photo page 7: Repacked drums outside central store in Pascani, Moldova, Valentin Plesca
- Photo page 9, top: Laboratory control of counterfeit pesticides, presentation by Tamara Kutunova 'OCSE activities on prevention environmental crimes at borders', July 2014, Tblisi
- Photo collage bottles of counterfeit pesticides, bottom of page 9, Svetlana Slatina, Bayer

- Photo page 10: COP meeting for three Combined Conventions: Basel, Rotterdam and Stockholm, from POPs website http://www.iisd.ca
- Photo page 11: Ilegal waste mining, transport and open pit burning of pesticide wastes at the Vakshk polygon in Tajikistan, National Center on Implementation of Stockholm Convention on POPs, Republic of Tajikistan
- Page 12, Map top left: Country reports and working documents Azerbaijan, Belarus and Kazakhstan; Roadmap report, http://www.ihpa.info/resources/library >
- Page 12, Map bottom left: http://ec.europa.eu/dgs/home-affairs/what-we-do/policies/international-affairs/eastern-partnership/index_en.htm
- Page 12, Map right column: http://www.eaeunion.org/?lang=en#about-countries
- Photo bottom page 12: work around the renovated Jangi polygon for the temporary storage of all obsolete pesticides in Azerbaijan, Khatuna Akhalaia
- Photo page 13: inventory works taking place in a store in Armenia, Khatuna Akhalaia
- Photo page 16: Obsolete pesticides and other hazardous waste stored in concrete cellars of the storage facility in the Gomel region in Belarus, John Vijgen
- Photo page 17: Road going into the mountains, shutterstock images
- Photo page 19: Uncovered waste at WHO Class II landfill, Chimprom, Pavlodar, Kazakhstan, Jan Betlem 2004, Tauw and IHPA
- Photo page 20: Sheep poisoned by contaminated water on top of polygon in Kyrgyzstan. Local herds of sheep and cattle passing by these site. Some years ago 98 people fell ill and 35 were hospitalised after the consumption of the meat of poisoned cows that reportedly drank standing water from pits on the site. Several years later a herd of 130 sheep died after drinking from the same pits, NGO Green Light
- Photo page 21: Site of Salyan Azerbaijan with 800 drums Polidophen– DDT / Toxaphene / Diesel in a residential area in Azerbaijan, Wolfgang Schimpf
- Photo page 22: Cardboard drum from Kanibadam polygon in Tajikistan,Matthijs Bouwknegt
- Photo page 23: Cattle grazing on pesticides waste piles, Georgia, Khatuna Akhalaia
- Photo page 25 top: Hazardous waste Incineration plant in Krasnoyarsk, Siberia, Russia, John Vijgen
- Photo page 25 bottom: Coaching activities in Moldova, Mileukontakt

- Photo page 26: Modern hazardous waste disposal site
- Photo page 27: Hazardous waste storage facility, Gomel region Belarus, Yuri Solovjev
- Photo page 28: Kharkiv storage place and preparation of waste for export, Ukraine, SI-Group

- Photo on page 29: Repacked drums from the Slonim polygon in Belarus, Yuri Soloviev
- Page 32, Map top left, The Bucharest Convention on the Protection of the Black Sea Against Pollution, see http://www.blacksea-commission.org/_convention.asp
- Page 32, Map bottom left, the Danube River Basin Protection Convention, see https://www.icpdr.org/main/
- Page 32, Map top right, the Convention on the Protection of the Marine Environment of the Baltic Sea Area, known as the Helsinki Convention, see http://ec.europa.eu/environment/marine/international-cooperation/regional-sea-conventions/helcom/index_en.htm
- Page 32, Map bottom right, the Framework Convention for the Protection of the Marine Environment of the Caspian Sea, the Tehran Convention, see http://www.tehranconvention.org

This project is funded by the EU

IHPA

International HCH & Pesticides Association

Food and Agriculture Organisation of the United Nations