

# GLOBAL INVENTORY OF DDT STOCKPILES AND DDT IN LANDFILLS

Prepared by the  
Secretariat of the  
Stockholm  
Convention in  
collaboration with  
the UN Environment  
Programme's  
Chemicals and Health  
Branch



STOCKHOLM CONVENTION



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**Contact information**

Secretariat of the Basel, Rotterdam and Stockholm Conventions  
Office address: 11-13, Chemin des Anémones - 1219 Châtelaine, Switzerland  
Postal address: Avenue de la Paix 8-14, 1211 Genève 10, Switzerland  
Tel.: +41 (0)22 917 8271  
Fax: +41 (0)22 917 8098  
Email: [brs@brsmeas.org](mailto:brs@brsmeas.org)

# Table of Contents

Preface.....	1
1. Executive summary.....	2
2. Background.....	3
3. Methodology.....	4
4. Overview of baseline information on DDT stockpiles.....	6
4.1. Baseline information from National Implementation Plans.....	6
4.2. Supplementary information from other sources.....	7
5. Results from the survey on DDT stockpiles and DDT buried in landfills.....	11
6. Consolidated numbers on DDT stockpiles and DDT buried in landfills.....	15
7. Conclusions.....	16
8. Suggested priorities for follow-up actions.....	17
Reference list.....	18
Acronyms.....	20
Annex I - Survey on DDT in 2017.....	i
Annex II - DDT inventory by country according to the survey responses.....	iii
Annex III - Baseline of DDT stockpiles in the UN-regions.....	xvii
Annex IV - International best practices for the implementation of sound management of DDT stockpiles and their disposal.....	xxx

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## Preface

DDT is listed in Annex B to the Stockholm Convention with acceptable purpose for production and use for disease vector control. Each Party that produces and/or uses DDT, shall limit such production and/or use for disease vector control in accordance with the World Health Organization recommendations and guidelines on the use of DDT, and when locally safe, effective and affordable alternatives are not available to the Party in question. Consequently, it is important to ensure that DDT is managed throughout its life-cycle stages, if decided to be used for disease vector control, to ensure that the risks to human health and the environment are minimized.

The Conference of Parties to the Stockholm Convention evaluates the continued need for DDT for disease vector control during its regular meetings. At its seventh meeting held in May 2015, while noting that DDT is still needed, the Conference of the Parties noted the necessity of providing technical, financial and other assistance to developing countries, least developed countries, small island developing States and countries with economies in transition for a transition away from reliance on DDT for disease vector control. Due priority was accorded to the identification and disposal of obsolete DDT stockpiles towards the complete elimination of such stockpiles (Decision SC-7/2). At its ninth meeting held in May 2019, the Conference of the Parties further noted the necessity of providing technical, financial and other assistance to developing country Parties and Parties with economies in transition, to the sound disposal of obsolete DDT stockpiles, in particular where stockpiles pose immediate risks to human health and the environment (Decision SC-9/2).

The report of the DDT Expert Group on the assessment of the production and use of DDT and its alternatives for disease vector control (2019), concluded that; *“Efforts targeted towards sound disposal of obsolete DDT from various countries have shown results, but the amount of stockpiles remains substantive worldwide. Conservative estimates by UNEP point to a total global amount of 20,000 tonnes of DDT stockpiles, but the actual amount is expected to be much higher. There is a risk of expired stocks being misused and potentially leading to environmental contamination.”*

The data collection and analysis in this report has been conducted over the period 2016 - 2018. The baseline data shown in Annex II of in this report is drawn from the national implementation plans (NIPs) submitted to the Secretariat of the Stockholm Convention before 31 December 2016 and from the 2014 DDT questionnaire. Additional collection of information was done through a DDT survey sent out in 2017 (Annex I) and through private consultations conducted during 2017 - 2018.

Parties, that produce or use DDT for disease vector control, are required to register for that purpose and report to the Secretariat of the Stockholm Convention by filling in a questionnaire once every three years. The questionnaire is seeking information on the conditions of production and use of DDT at country level, and the availability of locally safe, effective and affordable alternatives to DDT. As DDT continues to be needed for disease vector control, it is prudent to make special effort to strengthen the management of DDT, until DDT has been fully eliminated. Furthermore, the amount of DDT existing globally, which is obsolete or considered as waste is still considerable. The following report tries to give a better understanding of the amount and distribution of obsolete stockpiles of DDT and waste containing DDT, in order to speed up the process of their disposal – nationally, regionally and globally.

# 1. Executive summary

The aim of this report is to produce a global overview of existing stockpiles containing DDT (either unused DDT stockpiles in store and/or obsolete DDT stockpiles in stores or landfills). Furthermore, it intends to provide a global overview and baseline for planning and implementing projects with the aim of identification and sound disposal of obsolete DDT stockpiles towards the complete elimination of such stockpiles. To estimate the amount of still existing DDT stockpiles globally, a phased approach was designed. In a first step, information available from documents such as initial and updated national implementation plans, the 2014 DDT questionnaire, and national reports from Parties to the Stockholm Convention, as well as studies available in the public domain were reviewed (Chapter 4). Based on this initial information, a survey was transmitted to 161 Parties to the Stockholm Convention. Fifty-seven countries responded, with seventeen countries indicating the presence of DDT stockpiles (Chapter 5).

As information on usable and obsolete stockpiles containing DDT is very often incomplete or partially outdated, it was decided during the evaluation of the 2017 DDT survey responses, to estimate a lower and a higher amount of DDT stockpiles present for each country. This resulted in an estimated global total of reported DDT stockpiles ranging from a low estimation of 4'727 Metric Tonnes (tonnes, MT) to a high estimation of 45'892 tonnes (Chapter 3). Not included in these numbers are DDT stocks for vector control still in use in various countries, contaminated equipment (e.g. for formulating, mixing, filling, spraying) as well as amounts of materials contaminated with DDT (soil, store structures, etc.), latter usually forming a far larger volume than the pure stockpiles themselves. Hence, together with the unreported stockpiles, it can be expected that the actual global total is significantly higher than the higher amounts estimates given in this report.

As a first step, to address this legacy of stockpiles containing DDT, concerted efforts would be needed to reduce immediate exposure risks to the population and the environment by implementing risk reduction measures, including awareness raising programmes for the surrounding populations. As individual disposal of relatively small DDT stocks available in different countries would not be cost-effective, concerted strategic approaches need to be considered. A key obstacle for disposing of obsolete pesticide stockpiles in an effective manner, is the absence of a waste industry able to handle hazardous wastes according to best international practices, in many areas of the world. To attract investments into the development of such an industry, comprehensive national/sub-regional strategies for the management of hazardous wastes would have to be developed. Such strategies need to be based on the total stream of hazardous wastes generated in a country/sub-region, as only this offers the volumes needed for achieving reasonable disposal costs. Obsolete pesticides including DDT would then become part of that larger hazardous waste stream to be disposed of.



## 2. Background

First synthesized in 1874, DDT's insecticidal action was discovered in 1939. It was used in the second half of World War II to control malaria and typhus among civilians and troops. After the war, DDT was also used as an agricultural insecticide and its production and use duly increased. As early as in the 1940s, scientists began expressing concerns over possible environmental and health hazards associated with DDT, and in the 1950s governments began tightening regulations governing its use. Its widespread use, its persistence (as much as 50 % can remain in the soil 10-15 years after application), and its global mobility has resulted in that DDT residues can be found everywhere. Residual DDT has even been detected in the Arctic, a region of the world where it has never been used. In the 1970s and 1980s, agricultural use of DDT was banned in most developed countries. By 1991, total bans, including for disease control, were in place in at least 26 countries.

In 2004, the Stockholm Convention listed DDT in Annex B, restricting the production and/or use of DDT for disease vector control when no locally safe, effective and affordable alternatives are available and in accordance with WHO recommendations and guidelines. In spite of continued efforts to introduce effective alternatives, several countries still rely on DDT as an indispensable option against malaria and, in the recent past, increasingly against, visceral leishmaniasis. The comparative ease of production, application, as well as efficacy of DDT, combined with a lack of capacity to introduce and manage often more complex and expensive (chemical or non-chemical) alternatives, pose major obstacles to the phase out of DDT.

Since the Stockholm Convention came into force, mechanisms are in place for reporting on information related to DDT stocks by the Parties to the Convention. However, information on DDT production prior to the Convention has not been recorded systematically. It is clear from available information that large amounts of DDT have been produced in the past and as of today, still substantial amounts are stored in many countries, often buried in landfills. Most of these stocks are not fit for use anymore, and the long-term storage in unmanaged landfills leads over time to an additional, continuously growing volume of contaminated soil in need of treatment and disposal. Moreover, private consultations and photographic evidence show ongoing illegal DDT excavation (waste-mining) from old landfills, and consecutive sale of the materials on local markets e.g. in the region of Central Asia. In addition, the transfer of DDT stockpiles between countries is not always documented or reported, and this poses a problem in tracking quantities of the chemical and establishing the quality of DDT being used (van den Berg, H., 2009). Finally, many countries that use DDT, lack specific legislation, struggle with the implementation or enforcing regulations on pesticide management, and lack available experts, laboratories and a waste management industry to analyse, store and/or dispose of stocks in an environmentally sound manner.

In response to an invitation by the sixth meeting of the Conference of the Parties to the Stockholm Convention (COP-6), UN Environment Programme's (UNEP) Chemicals and Health Branch, in collaboration with the Steering Committee of the Global Alliance for Alternatives to DDT and in close consultation with WHO and other stakeholders, developed a Road Map for the development of alternatives to DDT. The Road Map is an overarching and holistic framework for action, aiming to empower countries to use locally safe, effective, affordable and environmentally sound alternatives for a sustainable transition away from DDT and, furthermore, to manage and dispose of obsolete stockpiles of DDT in an environmentally sound manner (UNEP, 2015).

This report aims to contribute to a better understanding of the global situation of DDT stockpiles and DDT in landfills, quantify global amounts of DDT stockpiles remaining (unused or obsolete DDT stockpiles), and provide a basis to develop national or regional plans for their environmentally sound management and final disposal.



*Figure 1. The Vakhsh obsolete pesticides landfill site in southern Tajikistan, March 2015. Cows are seen drinking water from pits, which resulted from illegal excavation of buried pesticides (waste mining). Since summer 2015, the site is fenced off and controlled by the Committee for Environmental Protection under the Government of the Republic of Tajikistan.*

### 3. Methodology

Data in this report was compiled based on information provided by the national authorities of the Stockholm Convention responding to the 2014 DDT questionnaire and the 2017 DDT survey conducted by the Secretariat of the Stockholm Convention. In addition, data from respective country NIPs and NIP updates submitted to the Secretariat before 31 December 2016 was analysed. The amounts of DDT stockpiles reported by these official sources, were the figures primarily used in this report, except when there were substantial inconsistencies or missing data. In cases where information was missing, considered incomplete, or partially outdated, data from other reports (listed in chapter 4.2) or from private consultations were compiled and used.

To gather information of reported global DDT stockpiles data in a systematic way, a phased approach was designed. In a first step, all initial as well as updated NIPs submitted to the Secretariat of the Stockholm Convention before 31 December 2016 were reviewed for reporting of presence of DDT. To complement or update lacking or outdated information from the NIPs, additional information from various sources, such as reports and private consultations, were compiled. Based on this initial information, a DDT survey was sent to 161 countries, selected according to the following criteria:

- countries about which no information on DDT stockpiles was available (be it as part of submitted NIPs or other reports);
- countries which had reportedly produced or used DDT;
- countries which had reported the presence of DDT stockpiles in their NIPs;
- countries where contradictory numbers were quoted in submitted NIPs and other reports;
- countries which reported stockpiles or current use of DDT for disease vector control;

- countries belonging to the group of SIDS states (UNESCO, n.d.).

Data from the survey, completed with information from NIPs, reports and private consultations, was systematically compiled, crosschecks applied, and in case of ambiguities countries re-contacted.

As the compilation of the data was a desk study, it was not possible to check incomplete or inconsistent data through on-site visits. Often, different sources of information provided dissimilar amounts of DDT stockpiles. This challenge resulted from information being based on incomplete inventories, old data, or extrapolations. In addition, it was not always clear whether stocks had been disposed of in the meantime. Another challenge was that many inventories provide a total amount of obsolete stocks of pesticides, but a breakdown by specific chemicals, like DDT, was missing.

Further, while some of the returned surveys provided quite some details for stockpiles in stores, little is known about stocks buried in landfills. For assessing DDT quantities in landfills, archive data on historical use, as well as on types and amounts of obsolete pesticides delivered to landfills was researched, and/or the breakdown of chemicals excavated in the frame of landfill disposal projects were reviewed. Based on all these types of information sources, the average share of DDT in reported amounts of obsolete pesticides in e.g. countries of the former Soviet Union was estimated to 35 percent.

In view of all these uncertainties described above, it was decided to estimate a range with a lower and a higher amount of DDT stockpiles for each country rather than striving to come up with a single number. The estimation of a low and a high amount of DDT stockpiles in each country presented in this report, used the following approach:

- Data retrieved from NIPs and NIP updates submitted to the Secretariat before 31 December 2016 is presenting the baseline of this report;
- The data from the 2017 DDT survey, submitted by officials (from 57 countries) was considered as more recent and accurate than the data in the NIPs dating earlier;
- In cases where information was missing, considered incomplete, or partially outdated, data from other reports (listed under chapter 4.2) or from private consultation was compiled and used;
- For the low estimation, the assumption was made that all non-identified mixtures of obsolete pesticides and reported POPs stockpiles in stores and landfills do not contain DDT. Consequently, only the amounts of pure DDT stockpiles reported in the NIPs, the 2014 DDT questionnaire, the 2017 DDT survey, and eventually other reports were taken into account.
- For the high estimation, the assumption was made that the reported non-identified pesticide stockpiles in stores and landfills contain DDT as well as other pesticides. In these cases, the same principal was used as in a GEF/World Bank project (GEF-project ID 3281) that confirmed that assuming 35 percent of the reported (POPs-) pesticide stockpiles would be DDT, is reasonable. Hence, the upper amount was calculated by using 35 percent of the overall amount of reported non-identified pesticide stockpiles.

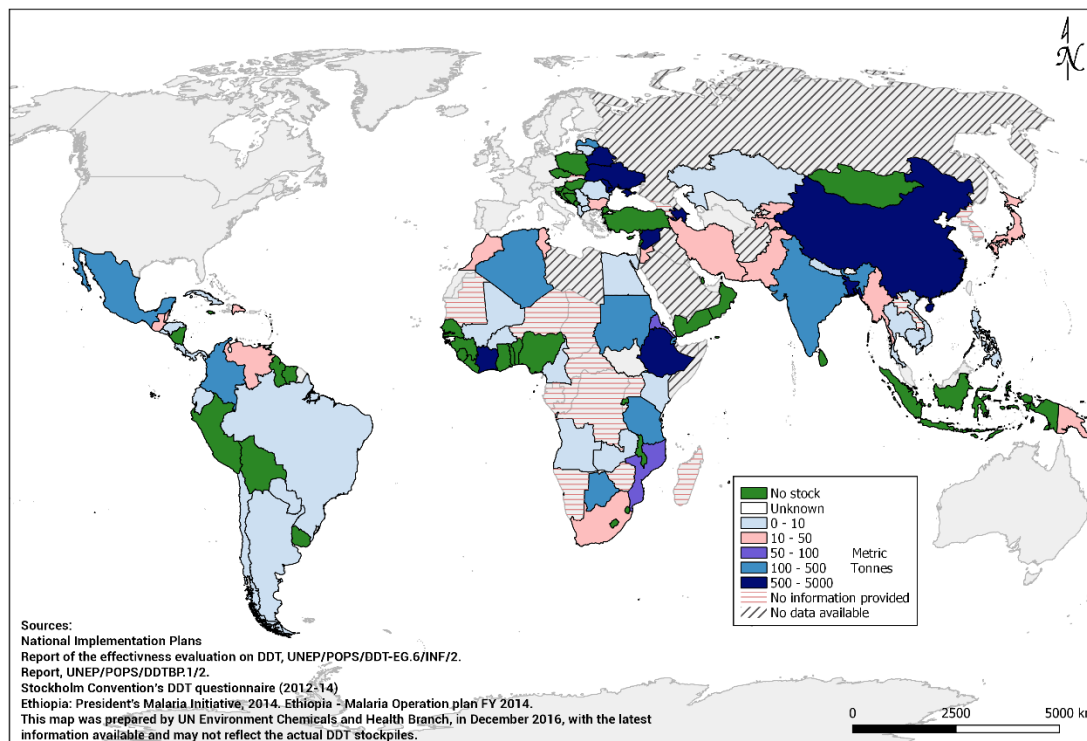
The sum of the reported amounts finally resulted in an estimate ranging from a low estimate to a high estimate of the global total of reported DDT stockpiles (for more details, see Annex II).

Finally, it should be noted that the calculations in this report give an estimation of the order of magnitude rather than precise amounts of DDT stockpiles. Experience from numerous inventories and safeguarding projects show that the actual amount of stockpiles can be a factor 2-3 higher than the officially reported amounts.

## 4. Overview of baseline information on DDT stockpiles

This chapter presents the findings from the compilation of baseline information on DDT from initial and updated NIPs as well as other sources as of 31 December 2016.

Figure 2: Stockpiles of DDT (as of 31 December 2016).



### 4.1. Baseline information from National Implementation Plans

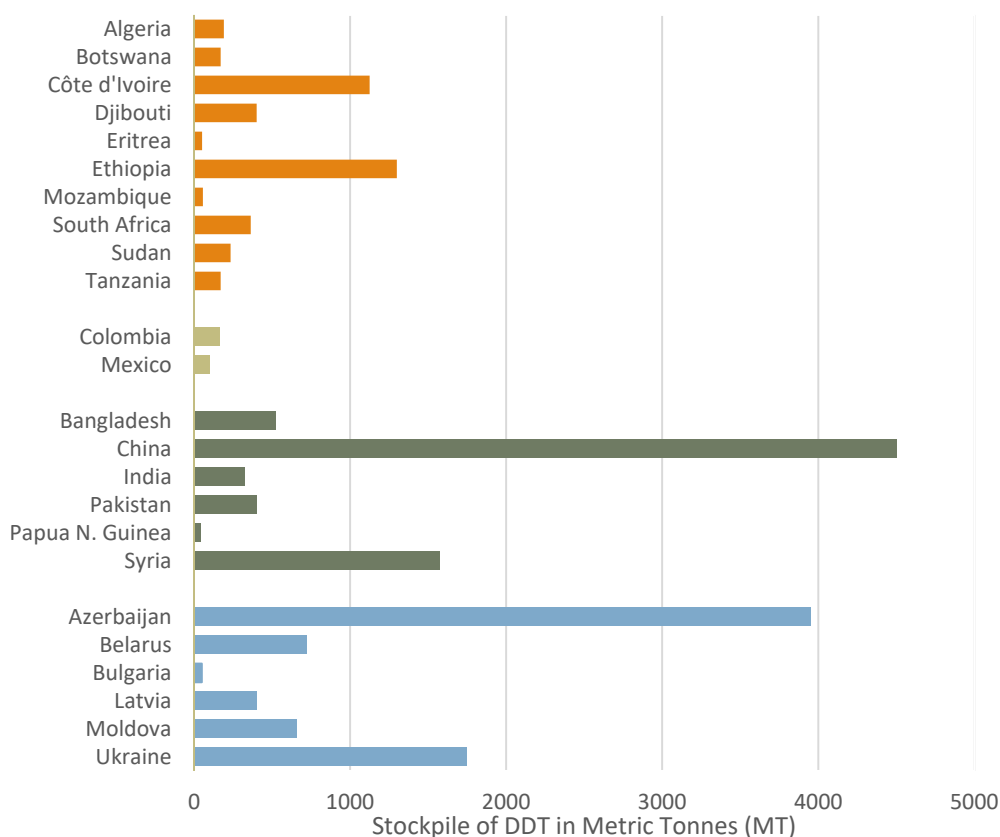
The main documents providing official information about existing stockpiles are the national implementation plans, national reports, and the Stockholm Convention's DDT questionnaire in 2014. In addition, following reports were considered when developing the baseline of DDT stockpiles (as of 31 December 2016).

- UNEP, 2008: Global status of DDT and its alternatives for use in vector control to prevent disease;
- UNEP, 2016: Report of the effectiveness evaluation on DDT pursuant to the Article 16 of the Stockholm convention;
- DDT questionnaire 2014: DDT questionnaire 2012-14 of the Stockholm Convention;
- Ethiopia, 2014 (1): Ethiopia President's Malaria Initiative 2014;
- Ethiopia, 2014 (2): Ethiopia Malaria Operation Plan FY 2014.

All above sources of information were reviewed and summarized in tables with available figures and an overview map prepared (figure 2). In Annex III, a full overview of information on stockpiles reported in the national implementation plans submitted to the Secretariat of the Stockholm Convention as of 31 December 2016 is provided. Figure 3 shows countries having DDT stockpiles of more than 40 tonnes according to their NIPs.

It should, however, be noted that many NIPs are already several years old and thus changes related to newly found or stockpiles disposed of are not included in this study. In addition, figures 2 and 3, only refer to amounts reported in NIPs and additional reports listed above. As not all NIPs contain recent information on stockpiles, and as not all countries have developed or submitted NIPs to the Secretariat, there are several countries that reported (Chapter 4.2) to have or possibly have obsolete stockpiles of DDT, which are not included in figures 2 and 3 in this chapter.

**Figure 3: Stockpiles of more than 40 MT of DDT by UN-Region (December 2016).**



## 4.2. Supplementary information from other sources

To complement or update lacking or outdated information from the NIPs, additional information from various sources like reports and private consultations were gathered. There are numerous reports that contain information about past production and use of DDT as well as on obsolete stockpiles of DDT. Following reports were reviewed to complement the NIP baseline provided in sub-chapter 4.1.

- ACAP, 2013: ACAP (Arctic Contaminants Action Program), Environmentally Sound Management of Obsolete Pesticides in the Russian Federation, Final Report for Phases I and II, Inventory and Safe Storage activities, 2001 – 2012 (September 2013);
- FAO, 2016: Obsolete Pesticides Safeguarding and Disposal Environmental Assessment (EA) and Environmental Management Plan (EMP) Armenia;



- PAN Germany, 2009: DDT and the Stockholm Convention States on the edge of non-compliance (Published in cooperation with PAN Africa and PAN North America).
- Tauw, 2009/1: Technical services for pesticides inventories, feasibility study and materials disposal for Azerbaijan;
- Tauw, 2009/2: Worldbank project, Inception report Obsolete Pesticides Technical Study in the Republic of Tajikistan;
- Tauw, 2013: Executive Summary, Site assessment and Feasibility Study of the Obsolete Pesticides and Persistent Organic Pollutants Burial Site in Nubarashen, Armenia;
- IHP Forum 2011: Tajikistan: The Poisons, Descending Of Ecology and Biodiversity, Kurbonali Partoev, Asomidin Jumahmadov, Kurbonali Melikov, Proceedings of the 11th International HCH & Pesticides Forum Gabala, Azerbaijan, page 333;
- Cobban, R., 2011: Site Visit Report of the Former Pesticide Distribution Facility Salyan, Azerbaijan: A Brief Assessment of Contaminated Land and Obsolete Pesticide Stock.

It should be noted that data in the reports listed above, often refer to obsolete pesticides stocks in general and not specifically to DDT. Nevertheless, an estimation of the share of DDT included in these amounts can be done as presented in chapter 3.

Further, private consultations in several countries were done to complete the information. These private consultations have been taken into consideration when calculating DDT amounts in several countries.



**Figure 4.** 77.81 MT of DDT and contaminated materials repacked at Anarzor-1 and Anarzor-3 agricultural stores are brought to the newly built intermediate store at the Vakhsh landfill (Tajikistan 2015, GEF project-ID 3614).

## Country-specific information

Specific for the area of the former Soviet Union, many countries – like **Belarus, Ukraine, Moldova, Georgia, Azerbaijan, Armenia, Kyrgyzstan, Tajikistan and the Russian Federation** – have landfills with substantial amounts (thousands of tonnes) of obsolete pesticides buried, sometimes in carefully designed concrete bunkers, sometimes simply in excavated trenches. Different studies have made estimates of the amount of obsolete pesticides buried at these landfills, but it is often difficult to assess whether these estimates are still correct in view of reported waste mining, and, furthermore, what the share of DDT in these amounts of obsolete pesticides is.

**Belarus**<sup>1</sup> provided information that it currently has 5.5 tonnes of DDT-containing pesticide mixtures in warehouses and in addition four landfills with an estimated 8'000-15'000 tonnes of obsolete pesticides. Based on Belarus' previous experience in disposing of the Slonim obsolete pesticides landfill (in the frame of the Global Environment Facility (GEF) project, ID 3281<sup>2</sup>) the proportion of DDT in landfilled obsolete pesticides seems to be about 30 – 40 %. Based on these estimations there could potentially still be between 2'400 to 6'000 tonnes of DDT (probably mixed with related wastes) in Belarusian landfills.

**Kyrgyzstan**<sup>3</sup> provided information indicating that there are 35.5 tonnes of DDT in warehouses and an estimated additional 950 tonnes in landfills. Moreover, there is a GEF-project ongoing aiming at disposing two out of the three Kyrgyz landfills by 2022 (GEF-project ID 9421).

**Tajikistan** has two large landfills (Vakhsh and Kanibadam) dating from former Soviet Union times and several dozens of unregulated "mini-landfills" resulting from the privatisation of pesticide stores in the 1990s (private consultation). From available reports, the following information has been reported for Tajikistan.

Since the establishment in 1973 of the Vakhsh landfill (South-West Tajikistan) more than 7'000 tonnes of pesticides were buried at the site, of which about 3'000 tonnes comprised of DDT (so-called "dust") (Tauw, World Bank, 2009). However, the site has been subject to massive waste mining (IHP Forum 2011). Currently, a GEF-project to dispose of the landfill is ongoing (GEF-project ID 9421). Figure 1 in this report shows the Vakhsh obsolete pesticides landfill site in March 2015 where cows are seen drinking water from pits, which are results of illegal excavation of buried pesticides. Since summer 2015, the site is fenced off and controlled by the Committee for Environmental Protection under the Government of the Republic of Tajikistan. The Second Global Monitoring Report (2016) reported the second-highest observed levels of DDT in human milk samples taken from Tajikistan in 2009, indicative to the widespread exposure risks and need for remediation to stop exposure.

In the Kanibadam landfill (Northern Tajikistan), the amount of buried pesticides according to archive data is 2'658 tonnes, of which an estimated 94 tonnes is DDT (ToxCare project, 2013). Moreover, in the 1990s, many pesticide stores have been privatised. The new owners often disposed of remaining pesticides in superficial trenches dug nearby, so-called "mini-landfills" (private consultation). In the Rasht valley (Tadjikabad area) it is suspected that there are about 5 tonnes of pesticides buried, of which ~3 tonnes are DDT (IHP Forum 2011). In 2017, a Green Cross / Fonds Suisse de Deminage-project has

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<sup>1</sup> *Ministry of Natural Resources and Environmental Protection of the Republic of Belarus, 30 January 2017*

<sup>2</sup> *Details on the GEF projects are accessible at [thegef.org](http://thegef.org)*

<sup>3</sup> *State Agency for Environment Protection and Forestry under the Government of the Kyrgyz Republic, 2 February 2017*

investigated two mini-landfills located at Village #1 and Oykamar. Results show massive spread of DDT within the community.

**The Russian Federation** has large stocks of obsolete pesticides. Stocks amounting to about 6'800 tonnes of obsolete pesticides were reported by the Arctic Contaminants Action Program (ACAP) as the outcome of an inventory in ten northern regions of the Russian Federation (Altai Krai, Arkhangelsk Region, Komi Republic, Magadan Region, Omsk Region, Tyumen Region, Altai Republic, Republic of Sakha, Tomsk Region, and Krasnoyarsk Krai) (ACAP, 2013). Based on the results of the inventory, the ACAP estimated a country-wide inventory of at least 40'000 tonnes of obsolete pesticides including DDT. In order to reduce exposure to humans and the environment, most of the 6'800 tonnes of pesticide stocks inventoried by the ACAP have been repackaged and transported to interim storage facilities while awaiting environmentally sound destruction. Additional research will be needed to find out the amounts of DDT more accurately.

In **Armenia**, there are 250 tonnes of obsolete pesticides in warehouses and an additional 115 tonnes of contaminated soil and building materials (FAO, 2016). As DDT is on the list of pesticides commonly used in the past in Armenia, it can be expected that these volumes include amongst other DDT. At the Nubarashen landfill, 512 tonnes of obsolete pesticides have been buried and DDT concentrations have been found (Tauw, 2013). The total amount of DDT in warehouses and at Nubarashen is unknown.

**Azerbaijan** hosted in Sumgait one of the most important former Soviet Union DDT plants, producing in the years from 1958 – 1980 a total of 480'549 tonnes of 5.5 % DDT formulation. 284'986 tonnes were used domestically on cotton and vineyards over the period 1965 – 1982, the rest was exported (Aliyeva et al, 2012). In the city of Salyan, a former storage site with massive DDT contamination was found. An inventory prepared by Dutch engineering company Tauw in 2009 showed that 500 to 600 drums (both 100 and 200 litres in size) containing "polidophen" (a DDT (20 %) - toxaphene - diesel mix) were present on the remains of the former pesticide store 'A' (Tauw, 2009/1). In 2011, UN consultant Russell Cobban has conservatively estimated a 60 percent leakage factor thus giving an estimated quantity that has possibly seeped into the ground of 39'000 litres (calculated using the Tauw figure of 600 drums). An estimated 10'000 litres of polidophen could still remain in the drums (Cobban, R., 2011).



*Figure 5. A repackaging team preparing POPs pesticide waste in a Kharkiv store in Ukraine for export abroad for final disposal in 2013.*



## 5. Results from the survey on DDT stockpiles and DDT buried in landfills

Following the initial review of available data, a survey was sent to the Stockholm Convention Official Contact Points of 161 countries in March 2017 (in English, French and Spanish, see Annex I). The fifty-seven countries that responded are listed in table 1 and an overview of the responses is provided in Annex II.

*Table 1. Overview of responding countries*

Algeria	Cyprus	Namibia
Azerbaijan	Czechia	North Macedonia
Bahrain	El Salvador	Panama
Belarus	Estonia	Peru
Belize	Guatemala	Philippines
Benin	Guyana	Poland
Bosnia and Herzegovina	Honduras	Republic of Moldova
Brazil	India	Romania
Burundi	Iraq	Sao Tomé et Príncipe
Cameroon	Japan	Senegal
Central African Republic	Lao People's Democratic Republic	Serbia
China	Latvia	Slovakia
Colombia	Madagascar	Spain
Comoros	Malawi	Syrian Arab Republic
Congo	Maldives	Trinidad and Tobago
Costa Rica	Marshall Islands	Ukraine
Cote d'Ivoire	Mexico	Yemen
Croatia	Mauritius	Zambia
Cuba	Mozambique	Zimbabwe

Most of the fifty-seven responding countries reported that they do not know of current stockpiles containing DDT (be it unused DDT stockpiles in store and/or obsolete DDT in stores/landfills). Seventeen countries reported stockpiles containing DDT or suspected to contain DDT (see table 2).

The evaluation of the survey shows, that there is still a lot to do, to achieve global disposal of obsolete DDT stockpiles. While some countries have disposed of its DDT stockpiles over the last years, many countries still have considerable stockpiles in stores and landfills. Also important to note is that, DDT will still have a role for vector control in the near future. Finally, most countries have very little information on existing volumes of contaminated soils and structures - a challenge that will have to be addressed in the future.

### Country-specific information

Data from the survey responses by **Algeria, Costa Rica, Cameroon, Cuba, Republic of Moldova** and the **Philippines** are in line with what the countries reported in their most recent NIP. **Japan** reported 15 tonnes of DDT stocks in its NIP submitted in 2006, the survey response yielded a slightly lower amount of 13.6 tonnes ten years later.

DDT amounts reported by **Azerbaijan** in its 2010 NIP (3'950 tonnes) and in the survey largely correspond. The survey gives, however, a more granular breakdown. Liquid pesticides contain substantial amounts of polydophen, a 20 percent DDT-formulation. Azerbaijan has a central store in Janji where all these amounts are intermittently stored in a controlled manner<sup>4</sup>.

Additional inventory and disposal work have led to substantially changed numbers for **Belarus** as compared with the NIP submission in 2007. Besides 5.5 tonnes of DDT in three stores, substantial amounts of DDT are held in four landfills<sup>5</sup>. Based on the experience with the disposal of the Slonim landfill within a GEF/World Bank project (GEF-project ID 3281) one can expect that 30 – 40 percent of the obsolete pesticides in the remaining landfills is DDT (information from private consultation).

**Ukraine** reports 1'744 tonnes of DDT stocks in its 2016 NIP<sup>6</sup>. In response to the survey the amounts of DDT are changed to the much lower amount of 147 tonnes, probably as a result of the several large-scale repackaging campaigns with ensuing disposal abroad which took place during 2010 - 2013. Many more stockpiles of obsolete pesticides are present in Ukraine, many of them consisting of mixed POPs pesticides possibly containing unquantifiable fractions of DDT.

**Belize** reported in its NIP submitted in 2011 of 14 tonnes of DDT. A recent GEF-funded inventory, repackaging and disposal project (GEF-project ID 5094), however, identified 23.930 tonnes of DDT. These stocks were subsequently disposed of in summer 2017 (DoE Belize, 2017). The example from Belize, but also experience from other countries shows that reported stocks often are a factor 2-3 lower than the real stocks.

In the NIP submitted in 2015, **Brazil** reported 0.6 tonnes of DDT stocks. The survey provided more details and a higher number of obsolete stockpiles of DDT present (see Table 2 above). **El Salvador** did not report DDT stocks in its NIP submitted in 2013, but in the survey a quantity of 5.4 tonnes is listed. For **Mexico** the reported amount of DDT stocks was 102 tonnes in its NIP submitted in 2008. In response to the survey, Mexico reported that an amount of 89.512 tonnes of DDT had been held by the health services in 2008, and that in 2012 remaining vector control stocks of 87.312 tonnes DDT had been disposed of<sup>7</sup>.

**Peru** reported 3 kg of DDT in its NIP from 2007. In response to the survey the amount reported was 210 kg that had been found in seven old bags in a storage of the Ministry of Health.

**Benin** did not report DDT stocks in its NIP submitted in 2008. However, in response to the survey the country mentions that a site contaminated with POPs including DDT has been recently discovered. Amounts of POPs or specific chemicals was not provided. In its NIP submitted in 2010, **Congo** did not report DDT stocks. In the two survey responses received, one mentions vector control stocks although a tonnage is not provided and additional clarification was not available. **Mozambique** reported 350 tonnes of DDT stocks in its NIP from 2008 and in the survey there was a more detailed breakdown of different types of stocks (see Table 2). However, the total amount presented in the survey does not

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<sup>4</sup> Disposal of the materials at the Janji central store is currently being discussed as an option under GEF-project ID: 5000.

<sup>5</sup> Direct communication with the Belarus Ministry of Natural Resources and Environmental Protection

<sup>6</sup> Note: Though only submitted in 2016, the NIP is based on data from 2004, and therefore does not consider amounts disposed of later on.

<sup>7</sup> Mexico is not listed in Table 2, as although it reported stocks in the NIP, those stocks have been disposed of by the time of the survey.

provide numbers that would correspond with the amount reported in the NIP. **Sao Tomé and Príncipe** reported 0.5 tonnes of DDT in its NIP submitted in 2007 while the survey lists an updated amount of 5.274 tonnes.

**Table 2.** Summary of survey responses of the seventeen countries that reported current stockpiles of DDT and/or stockpiles suspected to contain DDT (in metric tonnes, MT) compared to information from the NIPs submitted before 31 December 2016.

Country	Data in survey responses from 2017	Data from the NIP
1. Algeria	- 191 MT of DDT	- 191 MT of DDT (reported in NIP dating 06/10/2007)
2. Azerbaijan	- 1'520 MT of DDT-containing pesticides ("dust"); - 1'064 m3 of buried, unknown pesticides; - 1'000 barrels of liquid pesticides. (Note: The percentage of DDT in the stocks is unknown.)	- 3'950 MT of DDT (15/01/2010)
3. Belarus	- 5.5 MT of DDT-containing mixtures; - In early 2017, 40 kg (1 drum) of DDT was stored in the village Novodvorski; - In Belarus, about 10'600 MT of obsolete pesticides exist: about 1'860 MT in stores, 4'300 MT in a special landfill and about 4'500 MT buried in landfills. These quantities are non-identified mixtures containing POPs including DDT.	- 718 MT (17/01/2007)
4. Benin	- A site contaminated with POPs including DDT has been recently discovered. Amounts of stocks have not been established.	- No stocks reported (17/05/2006)
5. Brazil	- Crates with about 300 bottles of DDT; - 75 drums, containing a mixture of soil and DDT, all together about 15 MT; - Buried DDT, estimation is between 400 kg and 1 MT; - 170 MT and 3'279 liter unidentified obsolete pesticides, possibly including DDT.	- 0.6 MT (23/04/2015)
6. Cameroon	- 151 kg	- 151 kg (06/05/2013)
7. Congo	- Vector control stocks, no tonnage provided.	- No stocks reported (07/06/2010)
8. Costa Rica	- 8.6 MT	- 8.6 MT (04/05/2009)
9. Cuba	- 7.7 MT	- 7.7 MT (05/01/2011)
10. El Salvador	- 5.4 MT	- No stocks reported (08/03/2013)
11. Japan	- 13.6 MT	- 15 MT (13/03/2006)
12. Moldova	- 650 MT POPs pesticides and hazardous wastes.	- 654 MT (25/08/2005)
13. Mozambique	- 40 liters of liquid waste; - 147'871 empty sachets; - 52 drums with liquid waste; - 20 kg of solid waste; - Several unquantified amounts in evaporation tanks (solid and liquid waste).	- 350 MT (12/08/2008)
14. Peru	- 210 kg	- 3 kg (19/12/2007)
15. Philippines	- 1.1 MT	- 1.1 MT (19/06/2006)
16. Sao Tomé and Príncipe	- 5.2 MT suspected stocks, possibly more.	- 0.5 MT (12/04/2007)
17. Ukraine	- 147 MT, and many more stocks of mixed POPs pesticides possibly containing DDT.	- 1'744 MT (21/01/2016)

Looking specifically at the group of SIDS countries, there are only a few that reported having stockpiles of DDT: **Cuba** (7.7 tonnes), **Dominican Republic** (20.5 tonnes), **Papua New Guinea** (44 tonnes) and **Sao Tomé and Príncipe** (5.2 tonnes). **Mauritius** reported 127 tonnes, however, in a call with the Greece-based waste handling contractor Polyeco on 20 June 2017, the company mentioned it had disposed of 130 tonnes of DDT and small amounts of PCB in 2010-2012 from Mauritius.

The above numbers represent in many cases a modest assessment of existing DDT stockpiles. As already discussed in sub-chapter 4.2, information from private consultations indicates that a far larger amount of stocks exists in many countries.



*Figure 6. Excavation of buried DDT (yellow traces) at Anarzor (Tajikistan, June 2015).*

## 6. Consolidated numbers on DDT stockpiles and DDT buried in landfills

The data from the NIPs, the 2014 DDT questionnaire and the 2017 DDT survey, completed with information from private consultations, were systematically compiled, crosschecks applied and in case of ambiguities, country representatives re-contacted.

To account for related uncertainties, it was decided to estimate a lower and a higher amount of DDT stockpiles for each country. This resulted in a global total of reported DDT stockpiles ranging from 4'727 tonnes (low estimate) to 45'892 tonnes (high estimate) For a more detailed, country-by-country breakdown and discussion of the methodology, see Annex II. By regions, the amounts of reported DDT stockpiles are presented in table 3.

*Table 3. Cumulative amounts of reported DDT stockpiles per UN-region.*

Region	Lower estimate (MT)	Higher estimate (MT)
Africa	236.59	2'526.98
GRULAC	44.48	354.72
Asia-Pacific	1'569.82	10'708.89
CEE	2'875.79	32'301.13
<b>Global total</b>	<b>4'726.68</b>	<b>45'891.72</b>

These estimates have to be considered with care. Various countries still have DDT stocks in active use for vector control. These amounts are not included in the estimation in table 3. Also, not included in table 3 are the estimates of materials (soil, store structures) contaminated with DDT, which in general form a considerable larger volume than the pure stocks themselves, as well as contaminated equipment (e.g. for formulating, mixing, filling, spraying). Together with unreported stocks, it can be expected that the real global total is significantly higher than the numbers stated in table 3.

## 7. Conclusions

When assessing the stockpiles reported in the national implementation plans, 2014 DDT questionnaire, and the 2017 DDT survey and in other reports, as well as information received through private consultations, it can be concluded that the global amount of reported unused and obsolete stockpiles of DDT is at least 4'727 tonnes. However, it can be assumed that this amount is only a low estimate, as only a limited number of field investigations has been made globally, and information from many countries is still missing or incomplete. A breakdown per region and per country is provided in Annex II.

During this study, information received through different channels was often inconsistent, making it difficult to assess the exact amounts of DDT stockpiles in some countries. A concerted effort would be needed to quantify DDT stockpiles especially in those countries which report to have large stockpiles, and to reduce the related risks.

Efforts could include undertaking country focussed inventories of stockpiles, landfills and contaminated sites; implementing immediate risk reduction measures to contain possible further contamination of the environment, as well as preventing exposure of people and animals; conducting risk education and awareness raising activities with the surrounding populations; developing and implementing sub-regional or regional strategies for environmentally sound disposal of obsolete stockpiles of DDT; and promoting sound chemicals management policies and practices to minimize generation of hazardous wastes.

Estimation of the exact tonnage of DDT stockpiles is challenging. Often obsolete stockpiles of DDT are mixed with other obsolete (POPs)-pesticides because either packaging materials have deteriorated, or different types of obsolete pesticides have been indiscriminately mixed in historic repackaging campaigns. Therefore, any DDT disposal programme will have to allow for the disposal of obsolete pesticides in general, where those stocks may contain substantial amounts of DDT and other POPs.

## 8. Suggested priorities for follow-up actions

When formulating a project addressing DDT stockpiles and DDT buried in landfills, information from lessons-learned from former projects can assist in the project development phase. Based on experiences from several DDT projects, the following groups of activities could be considered when planning to address DDT stockpiles (for a more detailed discussion, see Annex IV).

- a) Additional inventories as needed, also of landfills and contaminated structures and soil volumes. This is needed because inventory numbers are often changing because of new findings or because quantities have been disposed of since the last inventory. Also, the better the understanding of materials present is, the better one can plan for cost-saving measures;
- b) Measures to reduce the immediate exposure risks to humans and the environment. Often, dilapidated stores contain volumes with deteriorated, leaking packaging and are publicly accessible and form attractive playgrounds for children;
- c) Development of comprehensive national/sub-regional strategies for the management of hazardous wastes, including stockpiles of obsolete pesticides, including DDT. A comprehensive strategy, which includes all hazardous waste streams, sets the framework needed to generate sufficient volumes of materials to be disposed of, in order to attract investments into the development of a hazardous waste management industry offering reasonable disposal costs;
- d) Promotion of the development and introduction of chemical and non-chemical alternatives to the use of DDT for vector control. Only with proven alternatives in place, Ministries of Health will be ready to release their DDT vector control stocks for final disposal;
- e) Development of national expertise and capacity on hazardous wastes management; sound life-cycle management of chemicals (including DDT stockpiles) and contaminated sites. Institutionalising chemicals management is key not only for disposing of hazardous chemicals (including, but not limited to DDT) but also for preventing chemical accidents and the accumulation of new stocks of legacy stocks;
- f) Public awareness and information. Local communities and administrations, farming associations, NGOs, media, etc., are all key stakeholder groups to be addressed when managing a safeguarding and disposal project. If no information is provided, local communities could be affected by not considering safeguarding activities with health and environmental impacts, which can stall projects. Also, the local communities often needs a better understanding of the risks related to the use of pesticides, hazards from obsolete pesticides stocks in their communities as well as how to improve agricultural or pest control practices.



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# Acronyms

<b>ACAP</b>	Arctic Contaminants Action Program
<b>BRS Secretariat</b>	Secretariat of the Basel, Rotterdam and Stockholm Conventions
<b>CEE</b>	Central Eastern Europe
<b>COP</b>	Conference of the Parties
<b>DDT</b>	Dichlorodiphenyltrichloroethane
<b>EMTK</b>	FAO Environmental Management Tool Kit
<b>EU</b>	European Union
<b>FAO</b>	Food and Agriculture Organization of the United Nations
<b>GEF</b>	Global Environment Facility
<b>GRULAC</b>	Group of Latin American and Caribbean Countries
<b>IHPA</b>	International HCH and Pesticides Association
<b>IVM</b>	Integrated Vector Management
<b>MT</b>	Metric Tonne
<b>NFP</b>	Stockholm Convention National Focal Point
<b>NGO</b>	Non-Governmental Organisation
<b>NIP</b>	National Implementation Plan under the Stockholm Convention
<b>PAN</b>	Pesticide Action Network
<b>POP</b>	Persistent Organic Pollutant
<b>PSMS</b>	Pesticide Stock Management System (developed by FAO)
<b>SIDS</b>	Small Island Developing States
<b>UNECE</b>	United Nations Economic Commission for Europe
<b>UNEP</b>	United Nations Environment Programme
<b>WHO</b>	World Health Organization

# Annex I Survey on DDT in 2017

Dear Madam, dear Sir,

This survey is to help the Secretariat of the Basel, Rotterdam and Stockholm Conventions in cooperation with the UN Environment's Chemicals and Health Branch in Geneva (Switzerland) to better understand the still existing DDT stockpiles and contaminated sites, thereby providing information needed towards developing projects for their future disposal. The questions below are aiming at collecting the necessary baseline information, receiving additional information to already provided National Implementation Plans, and clarifying conflicting information.

We would be grateful if you could fill out this survey and mail it back by 20 April 2017 latest.

With many thanks in advance for your assistance  
The Survey Team  
(March 2017)

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Name, first name:  
Function:  
Responsibility of your institution with regard to DDT regulation/management:  
Contacts (e.g. email, skype, telephone):

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## Questions regarding DDT use and production

1. Has your country ever used DDT in the past?
  - a) If so, during what years?
  - b) For vector control (yes/no)?
  - c) For agricultural use (yes/no)?
2. Has your country *produced* any DDT after 2004 (**yes/no**)? If **yes**, when and what annual amounts (in metric tonnes)?

Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Amount (t)													

3. Has your country *exported* DDT after 2004 (**yes/no**)? If **yes**, when and what annual amounts (in metric tonnes), to which countries (if known)?

Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Amount (t)													
Countries													

4. Is your country currently using DDT for vector control (yes/no)?

## Questions regarding obsolete DDT stocks

5. Have any inventories been undertaken in your country of DDT (pure stocks **for vector control, obsolete stocks**, DDT-containing wastes) and of contaminated sites (**e.g. when developing your country's NIP or later on**)? If yes, when, under which project?
6. Do you know of current stockpiles containing DDT (either unused DDT stocks in store and/or **obsolete** DDT in stores/landfills) in your country? If yes, can you state:
  7.
    - a) Number, estimated amount (**in metric tonnes**) and location of sites with *known* DDT stockpiles (stores and/or landfills):
    - b) Number, amount (**in metric tonnes**) and location of sites with *suspected* DDT stockpiles (stores and/or landfills) (provide, if possible, an estimate of the percentage of DDT contained in the stockpile):
8. Have there been any repackaging and disposal activities for POPs (**DDT and others**) in your country? If so, what was the total amount of POPs repacked and disposed of? And what was the amount of DDT repacked and disposed of? Please mention name and donor of these projects.

Project			
Year(s)			
Total amount of repacked POPs (metric tonnes)			
Of which DDT (metric tonnes)			
Total amount of disposed POPs (metric tonnes)			
Of which DDT (metric tonnes)			

9. If your country has existing DDT stocks (**for vector control or obsolete**) or contaminated sites: are there any current plans/projects to dispose of resp. clean up those sites? If yes, please mention name and donor of these projects.
10. If your country has DDT stocks (**for vector control or obsolete**) or contaminated sites and there are *no* concrete plans for disposal resp. clean-up: what are the main obstacles for eliminating these stockpiles (e.g. lack of finances, legislative frameworks, trained experts, etc.)?

## Annex II **DDT inventory by country according to the survey responses**

Data in this report was compiled based on information provided by the national authorities responding to the 2014 DDT questionnaire and the 2017 DDT survey conducted by the Secretariat of the Stockholm Convention, and from their respective NIPs and NIP updates submitted to the Secretariat of the Stockholm Convention before 31 December 2016. The amounts of DDT stockpiles reported by these official sources, were the figures primarily used in this report, except when there was substantial inconsistencies or data missing. In cases where information was missing, considered incomplete, or partially outdated, data information from other reports (listed in chapter 4.2) or from private consultation was compiled and used.

One challenge with this desk study, was that many inventories provide a total amount of obsolete stocks of pesticides, but a breakdown by specific chemicals, like DDT, was missing. Nonetheless, an estimation of the share of DDT included in these amounts was done by researching archive data on historical use, as well as on types and amounts of obsolete pesticides delivered to landfills, or by reviewing the breakdown of chemicals excavated in the frame of landfill disposal projects. Based on all these types of information sources, the average share of DDT in reported amounts of obsolete pesticides in e.g. countries of the former Soviet Union was estimated to approximately 35 percent.

To show how numbers in the following tables were developed, the case of Belarus is taken as an example:

- The NIP from 2007 reported 718 MT of POPs;
- The 2017 survey response stated "5.5 MT of DDT-containing mixtures; 40 kg (1 drum) of DDT; about 10'600 MT of non-identified mixtures containing POPs including DDT in stores and landfills";
- The 2017 data is official and considered as being more actual than the data in the NIP from 2007. At the same time, the two official reports indicate that substantial amounts of obsolete pesticides do exist;
- Assuming the extreme case that all non-identified mixtures in stores/landfills do not contain DDT, then the minimum DDT-containing amount is calculated using the amounts of 5.5 MT and 40 kg drum = 5.54 MT;
- Assuming that the stores/landfills contain some amount of DDT, then the experience from the excavation of the Slonim landfill within a GEF/World Bank project (GEF-project ID 3281) shows that assuming 35 percent of DDT is reasonable. Hence the upper amount was calculated as  $10'600 \text{ MT} \times 0.35 + 5.5 \text{ MT} + 40 \text{ kg} = 3'715.54 \text{ MT}$ .

As demonstrated in the example above, the calculations in this report give an estimation of the order of magnitude rather than precise amounts of DDT stockpiles. Experience from numerous inventories and safeguarding projects show that the actual amount of stockpiles can be a factor 2-3 higher than the reported amounts. Often, DDT stockpiles are also mixed with other obsolete pesticides, which makes "stock-picking" of only DDT impossible during safeguarding.

## 1. Tables with compiled survey results

The main tables in this annex (tables 1 and 3-6) display the survey data analysed and used in this report. All other comments are compiled in chapter 2 following the tables. Each comment has been marked with a number in tables 3-6 for easy reference.

Table 2 is displaying information assisting the main tables to avoid unnecessary repetition of information.

*Table 1. Summary table of the estimated low and high values for the global and regional DDT stockpiles as presented in tables 3-6.*

	Estimated lower value (MT)	Estimated higher value (MT)
<b>Grand total</b>	<b>4'726.68</b>	<b>45'891.72</b>
<b>By region</b>		
<b>Africa</b>	236.59	2'526.98
<b>GRULAC</b>	44.48	354.72
<b>Asia-Pacific</b>	1'569.82	10'708.89
<b>CEE</b>	2'875.79	32'301.13

*Table 2. Assisting table for the information shown in tables 3-6.*

	Reported information
<b>A</b>	No reported DDT stocks.
<b>B</b>	No information provided.
<b>C</b>	No information available.
<b>D</b>	Unknown.
<b>E</b>	Unclear.
<b>F</b>	Transmission pending.

## 1.1. African region

Table 3. Information on DDT stockpiles collected from NIPs and other sources of information for the African region.

#	Country	DDT Stockpiles (MT) reported in the NIP	Year of latest NIP submission	DDT Stockpiles (MT) reported (other sources)	Source of information	Responded to survey	Survey results	Estimated lower value (MT)	Estimated higher value (MT)	DDT in use for vector control as of:	Sites contaminated with DDT*	Remarks
1	Algeria	191	2007			yes	(20)	191.00	192.35		yes	
2	Angola	F		5	(1)			0.00	5.00			
3	Benin					yes	(21)	0.00	1.00		yes	
4	Botswana	171	2011					0.00	171.00	29/09/2004		
5	Burkina Faso	1	2007					0.00	1.00			
6	Burundi	0.006	2006 and 2015 (NIP update)			yes	A	0.00	0.00		yes	
7	Cameroon	0.15	2013			yes	(22)	0.00	0.00		C	
8	Central African Republic	D	2008			yes	A	0.00	0.00		C	(39)
9	Chad	D	2006					D	D			
10	Comoros					yes	A	0.00	0.00		C	
11	Congo	B	2007			yes	B	E	E		E	
12	Cote d'Ivoire	1125	2006	1,125	(1)	yes	A	0.00	0.00		no	
13	Democratic Republic of the Congo	10 cartons of DDT	2010					0.20	1.00			
14	Djibouti		2007	402	(1)			0.00	402.00			
15	Egypt	10	2006					0.00	10.00			
16	Eritrea	52.1	2013					0.00	52.10	31/05/2010		
17	Ethiopia			1'300	(2)			0.00	1'300.00	12/09/2006		
18	Gabon	B	2008					D	D			
19	Gambia		2009	14	(3)			0.00	14.00			
20	Ghana	A	2008					0.00	0.00			
21	Guinea	A	2010					0.00	0.00			
22	Guinea-Bissau	D	2013					D	D			
23	Kenya	1.14	2014					0.00	1.14			
24	Lesotho	A	2009					0.00	0.00			
25	Liberia	A	2008					0.00	0.00			
26	Libya	F						D	D			

#	Country	DDT Stockpiles (MT) reported in the NIP	Year of latest NIP submission	DDT Stockpiles (MT) reported (other sources)	Source of information	Responded to survey	Survey results	Estimated lower value (MT)	Estimated higher value (MT)	DDT in use for vector control as of:	Sites contaminated with DDT*	Remarks
27	Madagascar	B	2008			yes	A	0.00	0.00	27/08/2007	yes	
28	Malawi	0.01	2010			yes	A	0.00	0.00		C	
29	Mali		2006	5.8	(1)			0.00	5.80			
30	Mauritania	D	2010					D	D			
31	Mauritius		2006			yes	(23)	0.00	0.00	27/09/2007 (5 MT)	C	
32	Morocco	39	2006					0.00	39.00	14/04/2005 <sup>1</sup>		
33	Mozambique	350	2008	56.69	(4)	yes	(24)	44.89	45.89	13/09/2007	C	
34	Namibia	B	2015			yes	(25)	0.00	0.00	28/01/2009 (2.75 MT)	E	
35	Niger	B	2013					D	D			
36	Nigeria	A	2009					0.00	0.00			
37	Rwanda	A	2007					0.00	0.00			
38	Sao Tomé and Príncipe	0.5	2007			yes	(26)	0.50	5.274		yes	
39	Senegal	A	2007			yes	A	0.00	0.00	09/07/2006	C	
40	Seychelles	A	2011					0.00	0.00			
41	Sierra Leone	A	2009					0.00	0.00			
42	Somalia	F						D	D			
43	South Africa		2012	10.7	(4)			0.00	10.70	24/11/2004		
44	Sudan		2007	234	(4)			0.00	234.00			
45	Swaziland	A	2011					0.00	0.00	28/06/2006		
46	United Republic of Tanzania	170.6	2006	0	(5)			0.00	0.00			(40)
47	Togo	A	2006					0.00	0.00			
48	Tunisia	41	2007					0.00	41.00			
49	Uganda	B	2009					D	D	20/07/2008		
50	Zambia	B	2009			yes	A	0.00	0.00	20/10/2008	E	
51	Zimbabwe	B	2014			yes	(27)	0.00	0.00	12/01/2018	no	

\* information from survey only

<sup>1</sup>Morocco withdrew from the register as of 28.12.2015



## 1.2. GRULAC region

Table 4. Information on DDT stockpiles collected from NIPs and other sources of information for the GRULAC region.

#	Country	DDT Stockpiles (MT) reported in the NIP	Year of latest NIP submission	DDT Stockpiles (MT) reported (other sources)	Source of information	Responded to survey	Survey results	Estimated lower value (MT)	Estimated higher value (MT)	DDT in use for vector control as of:	Sites contaminated with DDT*	Remarks
51	Antigua y Barbuda	A	2008					0.00	0.00			
52	Argentina	9.3	2007					0.00	9.30			
53	Bahamas	F						D	D			
54	Barbados	D	2007					D	D			
55	Belize	14	2011			yes	(28)	0.00	23.93		E	(41)
56	Bolivia (Plurinational State of)	A	2005					0.00	0.00			
57	Brazil	0.6	2015			yes	(29)	15.94	190.21		yes	
58	Chile	0.8	2015					0.00	0.80			
59	Colombia	161	2010		(6)	yes	A	0.00	0.00		yes	
60	Costa Rica	8.6	2009			yes	8.6 MT	0.00	8.60		B	(42)
61	Cuba	7.7	2011			yes	7.7 MT	7.70	7.70		yes	
62	Dominica	A	2013					0.00	0.00			
63	Dominican Republic	20.5	2009	40	(7)			0.00	40.00			
64	Ecuador	1.6	2006					0.00	1.60			
65	Guatemala	15.1	2011			yes	15.23 MT**	15.23	15.23		E	
66	Guyana	A	2013			yes	A	0.00	0.00		no	
67	Honduras	3.5	2010			yes	(30)	0.00	22.00		C	
68	Jamaica	A	2011					0.00	0.00			
69	Mexico	102	2008			yes	A	0.00	0.02		yes	
70	Nicaragua	0.025	2006					0.00	0.025			
71	Panama	3.5	2009			yes	A	0.00	0.00		no	
72	Paraguay	0.8	2010					0.00	0.80			
73	Peru	0.003	2007		(8)	yes	0.21 MT	0.21	0.21		E	
74	Saint Kitts and Nevis	A	2014					0.00	0.00			
75	Saint Lucia	A	2007					0.00	0.00			
76	Saint Vincent and the Grenadines	D	2015					D	D			
77	El Salvador		2013	5.4	(4)	yes	5.4 MT	5.40	5.40		no	

#	Country	DDT Stockpiles (MT) reported in the NIP	Year of latest NIP submission	DDT Stockpiles (MT) reported (other sources)	Source of information	Responded to survey	Survey results	Estimated lower value (MT)	Estimated higher value (MT)	DDT in use for vector control as of:	Sites contaminated with DDT*	Remarks
78	Suriname	No stocks	2012					0.00	0.00			
79	Trinidad and Tobago	No stocks	2015			yes	A	0.00	0.00		C	
80	Uruguay	No stocks	2006					0.00	0.00			
81	Venezuela	28.9	2009					0.00	28.90	yes		

\* information from survey only

\*\* in 4 departments

### 1.3. Asia-Pacific region

Table 5. Information on DDT stockpiles collected from NIPs and other sources of information for the Asia-Pacific region.

#	Country	DDT Stockpiles (MT) reported in the NIP	Year of latest NIP submission	DDT Stockpiles (MT) reported (other sources)	Source of information	Responded to survey	Survey results	Estimated lower value (MT)	Estimated higher value (MT)	DDT in use for vector control as of:	Sites contaminated with DDT*	Remarks
82	Afghanistan	F						D	D			
83	Bahrain	F				yes	A	0.00	0.00		C	
84	Bangladesh	525	2009	602	(9)			0.00	602.00			
85	Cambodia	0.45	2007					0.00	0.45			
86	China	2'600-4'500	2007			yes	A	0.00	0.00	02/02/2005 <sup>2</sup>	E	
87	Cyprus	A	2007			yes	A	0.00	0.00		no	
88	Fiji	D	2006					D	D			
89	India			322 2'046	(4) (10)	yes	(31)	0.00	2'046.00	27/10/2006	C	(43)
90	Indonesia	A	2010					0.00	0.00			
91	Iran (Islamic Republic of)	18	2008					0.00	18.00			
92	Iraq	F				yes	A	0.00	0.00		no	
93	Japan	15	2006			yes	13.6 MT	13.60	13.60		unclear	
94	Jordan	22	2006					0.00	22.00			
95	Kazakhstan	0.5	2009		(11)			540.40	3'500.00		yes	
96	Kiribati	F						D	D			
97	Korea, Democratic People's Republic of	B	2008					D	D			
98	Korea (Republic of)	B	?					D	D			
99	Kuwait	F						D	D			
100	Kyrgyzstan	39	2009	982.7	(12)			982.70	982.70			(44)
101	Lao People's Democratic Republic	B	2010			yes	(32)	0.00	E		yes	
102	Lebanon	A	2006					0.00	0.00			
103	Maldives	D	2009			yes	A	0.00	0.00		C	
104	Marshall Islands	F				yes	A	0.00	0.00	22/05/2004	no	
105	Micronesia (Federated States of)	F						D	D			

#	Country	DDT Stockpiles (MT) reported in the NIP	Year of latest NIP submission	DDT Stockpiles (MT) reported (other sources)	Source of information	Responded to survey	Survey results	Estimated lower value (MT)	Estimated higher value (MT)	DDT in use for vector control as of:	Sites contaminated with DDT*	Remarks
106	Mongolia	A	2008					0.00	0.00			
107	Myanmar	F						D	D	08/08/2006 <sup>3</sup>		
108	Nauru	A	2012					0.00	0.00			
109	Nepal	3.3	2007					0.00	3.30			
110	Oman	A	2009					0.00	0.00			
111	Pakistan	>32	2009	400				32.00	400.00			
112	Palau	A	2014					0.00	0.00			
113	Philippines	1.1	2006			yes	(33)	1.116	1.116		yes	(45)
114	Papua New Guinea	44	2013	40	(13)			0.00	110.51			
115	Qatar	A	2010					0.00	0.00			
116	Samoa	A	2007					0.00	0.00			
117	Saudi Arabia	F						D	D			
118	Singapore	A	2007					0.00	0.00			
119	Solomon Islands	F		0.8	(1)			D	D			
120	Sri Lanka	0.01	2007					0.00	0.01			
121	Syrian Arab Republic	In Arab	2009	1'575	(1)	yes	A	0.00	0.00		yes	
122	Tajikistan	18	2007	3'000	(14)			0.00	3'000.00			(46)
123	Thailand	0.2	2008					0.00	0.20			
124	Tonga	D	2015					D	D			
125	Turkey	A	2016					0.00	0.00			
126	Tuvalu	D	2009					0.00	0.00			
127	United Arab Emirates	In Arab	2015					D	D			
128	Vanuatu	F						D	D			
129	Viet Nam	9	2007					0.00	9.00			
130	Yemen					yes	A	0.00	0.00	29/03/2005	yes	

\* information from survey only

<sup>2</sup>China withdrew from the DDT register as of 28.02.2014

<sup>3</sup>Myanmar withdrew from the DDT register as of 17.02.2012

## 1.4. Eastern European region and Spain

Table 6. Information on DDT stockpiles collected from NIPs and other sources of information for the Eastern European region.

#	Country	DDT Stockpiles (MT) reported in the NIP	Year of latest NIP submission	DDT Stockpiles (MT) reported (other sources)	Source of information	Responded to survey	Survey results	Estimated lower value (MT)	Estimated higher value (MT)	DDT in use for vector control as of:	Sites contaminated with DDT*	Remarks
131	Albania	2	2007					0.00	2.00			
132	Armenia	B	2006	250 605	(15)			299.25	299.25		yes	
133	Azerbaijan	3'950	2010		(16)	yes	(34)	1'720.00	3'294.16		yes	
134	Belarus	718	2007	up to 15'000MT	(17)	yes	(35)	5.54	3'715.54		yes	(47)
135	Bosnia and Herzegovina	A	2016			yes	A	0.00	0.00		no	
136	Bulgaria	50	2012		(18)			50.00	869.28		E	
137	Croatia	A	2009			yes	B	0.00	0.00		no	
138	Czechia	A	2006			yes	A	0.00	0.00		E	(48)
139	Estonia	in Estonian	2011			yes	A	0.00	0.00		no	
140	Georgia	B	2012					0.00	0.00		probably	(49)
141	Hungary	A	2010					0.00	0.00			
142	Latvia	400	2005			yes	A	0.00	0.00		no	
143	Lithuania	11	2007					0.00	11.00			
145	Moldova (Republic of)	654	2005			yes	(36)	654.00	5'600.00		yes	
146	Montenegro	A	2014					0.00	0.00			
144	North Macedonia	2.5	2005			yes	A	0.00	0.00		no	
147	Poland	A	2013	404	(1)	yes	(37)	0.00	1'600.00		yes	
148	Romania	6.6	2006			yes	A	0.00	unclear		E	(50)
149	Russian Federation	F		40'000	(19)			0.00	14'000.00			(51)
150	Serbia	0.45	2010			yes	A	0.00	0.00		no	
151	Slovakia	B	2006			yes	A	0.00	0.00		C	
152	Slovenia	0.075	2010					0.00	0.075			
153	Spain					yes	B	0.00	0.00		no	
154	Ukraine	1'744	2016			yes	(38)	147.00	2'909.82		yes	(52)

\* information from survey only

## 2. Additional survey responses (referenced in tables 3-6)

### 2.1. Column "Source of information"

- (1) UNEP/POPS/DDTBP.1/2
- (2) President's Malaria Initiative. (2014). Ethiopia – Malaria Operational Plan FY 2014 [http://www.pmi.gov/docs/default-source/default-document-library/malaria-operational-plans/fy14/ethiopia\\_mop\\_fy14.pdf?sfvrsn=14](http://www.pmi.gov/docs/default-source/default-document-library/malaria-operational-plans/fy14/ethiopia_mop_fy14.pdf?sfvrsn=14)
- (3) <http://chm.pops.int/TheConvention/ConferenceoftheParties/Meetings/COP6/tabid/3074/mctl/ViewDetails/EventModID/870/EventID/396/xmid/10240/Default.aspx>
- (4) DDT questionnaire 2012–2014 of the Stockholm Convention.
- (5) [http://ieg.worldbankgroup.org/sites/default/files/Data/reports/ppar\\_africa\\_102416\\_2.pdf](http://ieg.worldbankgroup.org/sites/default/files/Data/reports/ppar_africa_102416_2.pdf)
- (6) In the Report of the effectiveness evaluation on DDT pursuant to the Article 16 of the Stockholm Convention, export of DDT for final disposal is reported (167 MT to Finland, 2009).
- (7) i) Inception report Obsolete Pesticides Technical Study in the Republic of Tajikistan, Tauw (2009), Worldbank project, page 50; ii) Final Report on Hazardous Waste Site in Kanibadam (2013), ToxCare project, page 8.
- (8) In the NIP of Peru, 3 kg of DDT is reported. However, in the Report of the effectiveness evaluation on DDT pursuant to the Article 16 of the Stockholm convention, export of DDT for final disposal is reported (3 MT in 2004 and 3 MT in 2011 to Germany).
- (9) Road Map for the Development of Alternatives to DDT, UNEP/DTIE Chemicals Branch, February 2015. Original source: Rahman, M., Insecticide substitutes for DDT to control mosquitoes may be causes of several diseases, 2013; <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3608885/>
- (10) Road Map for the Development of Alternatives to DDT, UNEP/DTIE Chemicals Branch, February 2015, Reporting period 2009–2011.
- (11) At present time [2011], there are five operating landfills in Kazakhstan. From earlier revealed 1'544 MT of obsolete and unusable pesticides, 1'438 MT are buried at these landfills. However, it is necessary to consider that a detailed inventory of obsolete and unusable pesticides and their related containers were done only on 20 % of the country's territory. (Kazgen Orazalina, Gulnar Yusupova, [http://www.ihpa.info/docs/library/forumbooks/11th/11thHCH\\_FORUM\\_BOOK\\_part1.pdf](http://www.ihpa.info/docs/library/forumbooks/11th/11thHCH_FORUM_BOOK_part1.pdf)). 10'000 MT are estimated in [http://www.ihpa.info/docs/library/reports/timebomb\\_obsolete\\_pesticides.pdf](http://www.ihpa.info/docs/library/reports/timebomb_obsolete_pesticides.pdf)
- (12) Old inventory list (from 1978) received through Ministry of Agriculture. Information on landfills received from Environmental Agency on 3 Feb 2017 → DDT stored at two stores (34.5 MT) and two landfills (948.2 MT).
- (13) In 2017, two 22 ft containers with DDT have been found (email to UN Environment on 21 September 2017). The two containers contain a total of approximately 50 MT of DDT. Papua New Guinea started in autumn 2017 a NIP update, preliminary numbers are: Goroka, Eastern Highlands : 0.630 MT, Kokopo/ Rabaul, East New Britain: 15.880 MT.

- (14) i) Inception report *Obsolete Pesticides Technical Study in the Republic of Tajikistan*, Tauw (2009), Worldbank project, page 50; ii) *Final Report on Hazardous Waste Site in Kanibadam* (2013), ToxCare project, page 8.
- (15) According to the report "*Obsolete Pesticides Safeguarding and Disposal, Environmental Assessment (EA) and Environmental Management Plan (EMP)*", developed within the framework of the EU FAO Partnership Project "Improving capacities to eliminate and prevent recurrence of obsolete pesticides as a model for tackling unused hazardous chemicals in the former Soviet Union", there is up to 250 MT of obsolete pesticides in Armenia and an additional 115 MT of contaminated soil and building materials. In addition, it is estimated that there is 605 MT of obsolete pesticides buried at the Nubarashen landfill (see report "*Executive Summary Site Assessment and Feasibility Study of the Nubarashen Burial Site of Obsolete and Banned Pesticides in Nubarashen, Armenia*", prepared by engineering company Tauw within the framework of an OSCE investigation).
- (16) Salyan report by Russell Cobban: 10'000 litres of polydophen remaining in 600-800 drums; 64 m<sup>3</sup> of mixed and unidentified stocks incl. granosan; >4'600 m<sup>3</sup> of contaminated soils incl. DDT, toxaphene, asbestos, granosan and other unidentified chemicals.
- (17) Email by Ministry of Natural Resources and Environmental Protection of the Republic of Belarus, data reflect status as of 1 January 2017.
- (18) Tender document (2017) for obsolete pesticides repackaging mentions 1'811 MT of POPs. NIP of 2006, table 2, lists that 48 percent of POPs in the country are DDT. Tender document lists presence of contaminated sites.
- (19) ACAP (Arctic Contaminants Action Program) (September 2013), *Environmentally Sound Management of Obsolete Pesticides in the Russian Federation, Final Report for Phases I and II, Inventory and Safe Storage activities, 2001 – 2012*.

## 2.2. Column "Survey results"

- (20) The inventory realised in 2003 recorded 197.3 MT of POPs of which 191 MT consist of DDT (96.8 percent), mostly located in Wilaya de Mostaganem (180 MT); additional amounts have been found in Wilaya d'Alger (0.925 MT) and Tipaza (0.425 MT), however, the numbers have not been validated yet.
- (21) No information on stocks provided. Recently one site contaminated with POPs, including DDT, has been discovered (abandoned quarry). No further details are known.
- (22) 151 kg, disposed of in 2013.
- (23) No obsolete stocks anymore. 5 MT of specially packed DDT are stored as precautionary measure to contain vector-borne diseases.
- (24) 40 litres (Maputo city); 42 + 8 + 2 drums (Gaza, Sofala); 20 kg (Cabo Delgado) plus sediments in evaporation tanks.
- (25) DDT stocks of about 2.75 MT are present (75 % WP formulation), used for vector control purposes (one IRS cycle per year).
- (26) Stocks of (most likely) DDT: 5'274 kg. Total amount is unknown as DDT is often mixed with other obsolete pesticides.
- (27) There are no stockpiles in Zimbabwe; DDT is only purchased for immediate use for vector control (by IRS).

- (28) 23.83 MT of DDT reported. This DDT was repacked and is awaiting final disposal.
- (29) Overview by States:
- São Paulo State (particular farm): 555 kg;
  - Bahia State (old warehouses used to store products for vector control campaigns in the past):
    - Barra Municipality: Several jars of DDT paste in the yard, amounts of DDT/lindane buried;
    - Caravelas Municipality: Some crates with about 300 bottles of DDT paste left behind in the warehouse;
    - Salvador Municipality: Large open area with DDT buried at a depth of approximately three meters, being estimated at 40 kg of DDT.
  - Mato Grosso State (old warehouses used to store products for vector control campaigns in the past):
    - Cáceres Municipality: Approximately 75 drums totalling 15 MT and containing a mixture of soil and DDT stored in a yard for approximately 7 years;
    - Sinop Municipality: DDT buried at a depth of 2 – 3 meters in sandy soil, estimated amount 0.4-1.0 MT. DDT was buried in bulk in paper bags, which could have been disrupted during transport from the shed to the point of burial, or at the time of burial.
  - Paraná State (old warehouse used to store products for vector control campaigns in the past):
    - Guaíra Municipality: Approximately 200 kg of DDT buried in an area of about 80 m<sup>2</sup>. At this site, quick lime was added for remediation reasons that may have formed by-products during the chemical reaction with DDT as well as lindane residues.
  - Tocantins State (current Municipal Health Secretariat):
    - Porto Nacional Municipality: estimated amount of 3 kg of DDT is dispersed across the floor of the warehouse, visible contamination of walls, ceilings and nearby facilities. The roof of the building was eventually sprayed with DDT to combat termites that deteriorated the building's wooden structures.
  - The states of São Paulo, Paraná and Minas Gerais have identified 170 kg, 341.3 kg and 3'268.9 litres of non-identified obsolete products, which could include DDT.
- (30) The import of 22 MT of DDT in 2013 is under investigation.
- (31) No reports of obsolete stocks available.
- (32) Illegal trade in DDT is ongoing. No inventory has been undertaken to date and it might well be that DDT is present in the country.
- (33) The 2006 NIP reports 1'116 kg of DDT. In the 2014 updated NIP, this 1'116 kg stockpile was mentioned in an unverified report as being under the jurisdiction of the Administrative Region in Muslim Mindanao (ARMM). To date, there is no available information if this stockpile has already been disposed of.
- (34) Section 5 of the received survey lists:
- 1'520 MT of "dust" pesticides ("dust", Soviet name for widely accessible DDT-formulations);
  - 1'064 m<sup>3</sup> of buried unknown pesticides;
  - 1'000 barrels of liquid pesticides.
- Section 7 mentions:



- 3'084 MT of obsolete, highly toxic, prohibited pesticides ("dust") have been repacked and brought to the pesticide landfill in the Janji region;
  - In Ganja city, liquid pesticides (1'180 barrels and 200 contaminated pallets) were repacked and brought to the pesticide landfill in the Janji region.
- (35) 5.54 MT in three stores + 10'600 MT in four landfills + unknown amount of mixed pesticides which might contain DDT.
- (36) An estimated 650 MT buried at the Cismichioi landfill (as well as other POPs and hazardous waste). There are also 1'600 sites contaminated with POPs, including DDT. After the disposal of POPs stored in central warehouses, the problem of POPs stockpiles stored at Cismichioi landfill remains to be resolved. According to available, incomplete documents, about 4'000 MT of POPs (including 650 MT of DDT) collected during the period 1975-1987 are buried at this landfill. But a study from 2014 within a project financed by the National Ecological Fund, and according to information presented by plant protection specialists who participated in the construction of the landfill, shows that the total volume of the 14 bunkers is about 26'000 m<sup>3</sup>, which indicates a much higher amount of waste, estimated at over 16'000 MT.
- (37) No stockpiles. Information on stockpiles totalling 404 MT is old and both survey as well as updated NIP say there are no stocks in Poland. One landfill contains 1'600 MT of DDT metabolites. Data on contaminated volumes should become available in 2019, as an inventory is currently underway.
- (38) See table in the survey with details on stockpiles (per 01.01.2017) per Oblast (total 724 stockpiles and 8'313.78 MT of obsolete pesticides). Among all the stockpiles containing obsolete pesticides, only one store contains 100 percent DDT, total amount 147 MT. However, many obsolete pesticides at other sites are mixed and it is unclear how many of them contain DDT.

### 2.3. Column "Remarks"

- (39) No data available as all existing records have been lost during internal armed conflicts.
- (40) Stocks eliminated by 2013 in frame of African Stockpile Program.
- (41) Belize is currently implementing a GEF funded project titled "Belize Chemicals and Waste Management Project." Through this project, the Department of the Environment conducted a nationwide inventory of all POPs and obsolete chemicals. This survey identified a total of 23.930 MT of DDT located at one site. The site however, has not been tested to confirm its presence. Stocks may have been disposed of in September 2017.
- (42) Stocks have maybe been disposed in 2017 under a GEF project.
- (43) DDT is still used for vector control; amounts are planned such that the stocks are used up at the end of the season.
- (44) There are three landfills. In the Suzak B and Naryn landfills, there is an estimated 950 MT of obsolete pesticides with varying DDT mixtures buried (according to old inventory lists). For Suzak A landfill, it is not clear how much DDT is buried but DDT was found in soil and surface water samples, in total 2'000 MT of OPs are estimated to have been buried here. In May 2018, an investigation has taken place at Suzak A and Suzak B landfills within the framework of a GEF/UN Environment project (GEF ID 9421). Results will be available in July 2018, based on which amounts might have to be adjusted.

- (45) Potential illicit use of DDT ongoing.
- (46) i) There is an estimated 3'000 MT of DDT having been buried at the Vakhsh landfill. However, over time illegal excavations (waste mining) have taken place, so the total amount today is unknown and the amounts may well be mixed with other OPs. ii) Kanibadam landfill has a total of 2'657.736 MT of OP, of which 93.136 MT are DDT, 52.512 MT are Dicofol (chemically related to DDT), and 28.896 MT polidophen (20 % DDT). iii) There are other burial sites in Tajikistan, so further research might reveal additional amounts of DDT.
- (47) Four landfills with an estimated 8'000-15'000 MT of obsolete pesticides are left. Based on the experience when disposing of the Slonim landfill, one can expect that 30-40 percent of the obsolete pesticides are DDT.
- (48) Contaminated sites exist, but it is not clear whether those are contaminated with DDT.
- (49) All stockpiles have been disposed of in 2015/2016 within the framework of the EU FAO Partnership Project "Improving capacities to eliminate and prevent recurrence of obsolete pesticides as a model for tackling unused hazardous chemicals in the former Soviet Union". Now, there is only one burial site remaining in Georgia (Iagluja site).
- (50) Stocks were eliminated in the frame of the PHARE project "Elimination of pesticides (repackaging, collection and disposal the pesticide residues) from Romania" 2004-2006. There are no existing DDT stocks (for vector control or obsolete stocks) in Romania. Regarding obsolete pesticides contaminated sites, the National Strategy and Action Plan for Management of Contaminated Sites was developed in 2012-2014. In 2015, the Government approved the Strategy and Action Plan by Government Decision no. 683/2015 (strategic document for EU funds accession during the EU financial framework 2014 - 2020), which also includes actions and measures for the remediation of POPs contaminates sites.
- (51) No survey received from Russia, however, an email stating that no reported stocks exist (email received on 08.06.2017).
- (52) The NIP was submitted only in 2016, however, based on data from 2004. NIP update is planned to start in 2018.

## **Annex III      Baseline of DDT stockpiles in the UN-regions Africa, GRULAC, Asia-Pacific and CEE as of 31 December 2016**

DDT has been used in the past as an insecticide in both agriculture and public-health sectors. With the advent of more efficient and effective new molecules, particularly for agriculture pest control and, due to increasing concerns of adverse health and environmental effects of POPs pesticide, some countries have started shifting to alternatives even before the Stockholm Convention came into force. Considering the limited number of public health insecticides available for disease vector control, mainly for malaria, the Convention has listed elimination of both production and use of DDT, though with an exception for use in disease vector control in accordance with the World Health Organization recommendations and guidelines and when locally safe, effective and affordable alternatives are not available.

The main source of information available at the Secretariat of the Basel, Rotterdam, and Stockholm Conventions (BRS Secretariat) on the stockpiles of POPs pesticides including DDT, is the national implementation plans (NIPs) developed and transmitted by countries in accordance with Article 7 to the Stockholm Convention. The NIPs are developed during the ratification process and are updated when the Convention is amended to include new POPs. As many NIPs were submitted to the Secretariat several years ago, it means that some information might be outdated.

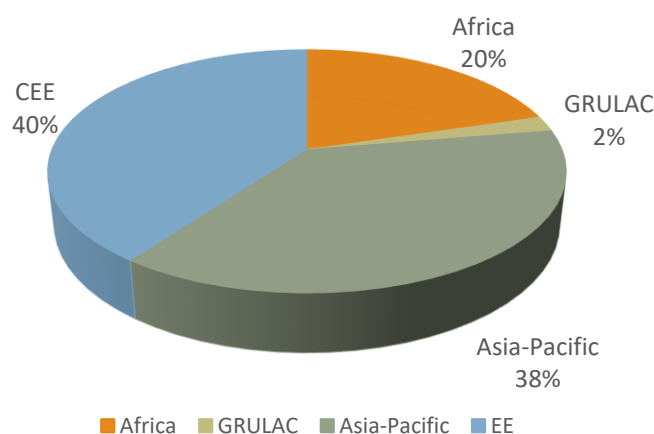
Thus, to complete the information on stockpiles reported in the NIPs, additional information available in a report titled "Global status of DDT and its alternatives for use in vector control to prevent disease" (UNEP/POPS/DDTBP.1/2), prepared by the BRS Secretariat in 2008, and from the "Report of the effectiveness evaluation on DDT pursuant to the Article 16 of the Stockholm Convention" (UNEP/POPS/DDT-EG.6/INF/2) were also considered in compiling this report.

The years of stockpile-information reported by the UN-regions provided in the tables below, reflects the year of transmission of NIPs by respective Parties to the Secretariat of the Stockholm Convention.

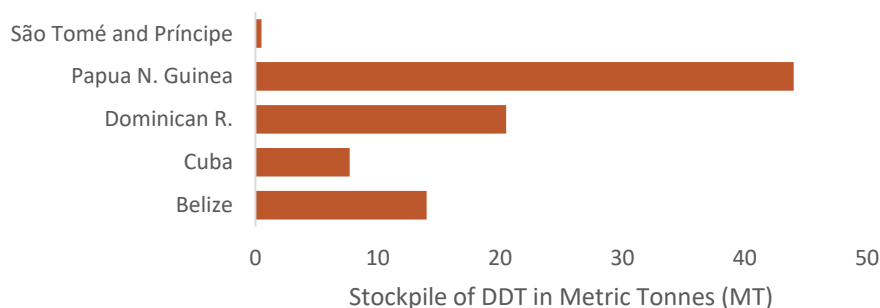
## 1. Global overview of DDT stockpiles

*Table 1. Global amount of DDT stockpiles in metric tonnes (MT) by UN Region according to the national implementation plans (NIPs) submitted by each party to the Stockholm Convention (as of 31 December 2016).*

UN Region	N° of Parties reporting DDT stockpiles	DDT stockpiles (MT) reported in the NIP	DDT stockpiles (MT) from other sources
<b>Africa</b>	22	1'803	2'384
<b>GRULAC</b>	17	378	5
<b>Asia-Pacific</b>	19	5'189	1'918
<b>CEE</b>	12	7'539	-
<b>Total</b>	70	14'909	4'307
<b>Total amount of DDT stockpiles</b>		<b>19'216</b>	



*Figure 1. Cumulative DDT stockpiles by UN Region (as of 31 December 2016).*



*Figure 2. SIDS countries having stockpiles of DDT according to their NIPs, the DDT questionnaire and national reports to the Stockholm Convention (as of 31 December 2016).*

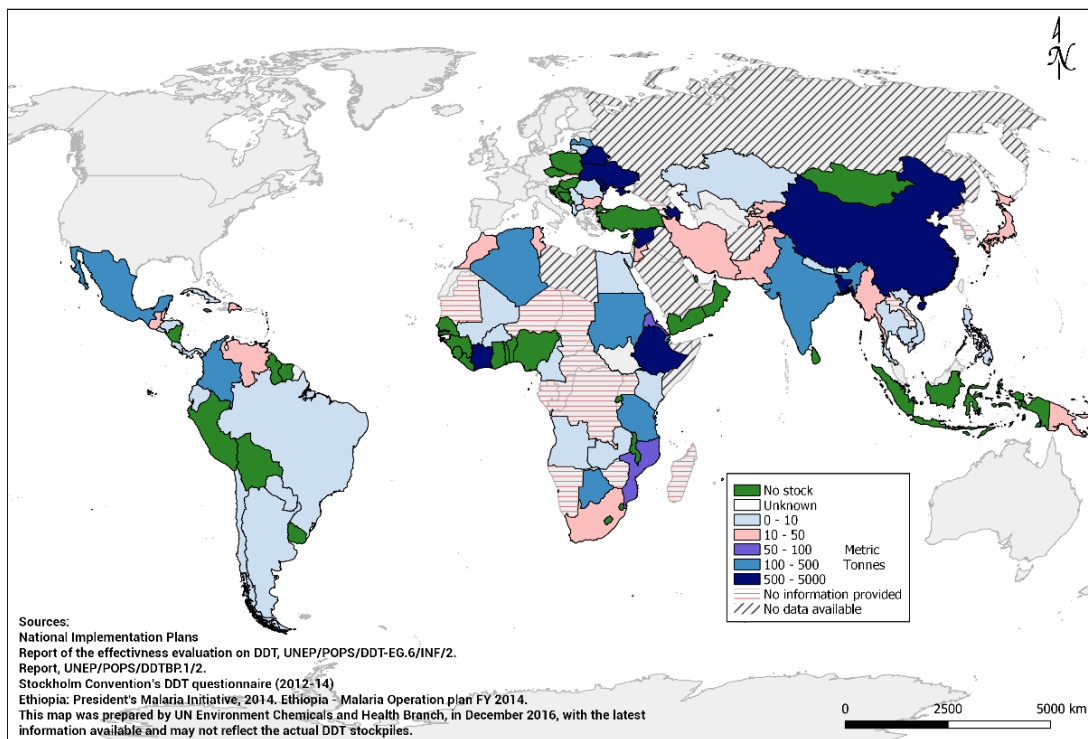


Figure 3. DDT stockpiles in the world in December 2016.

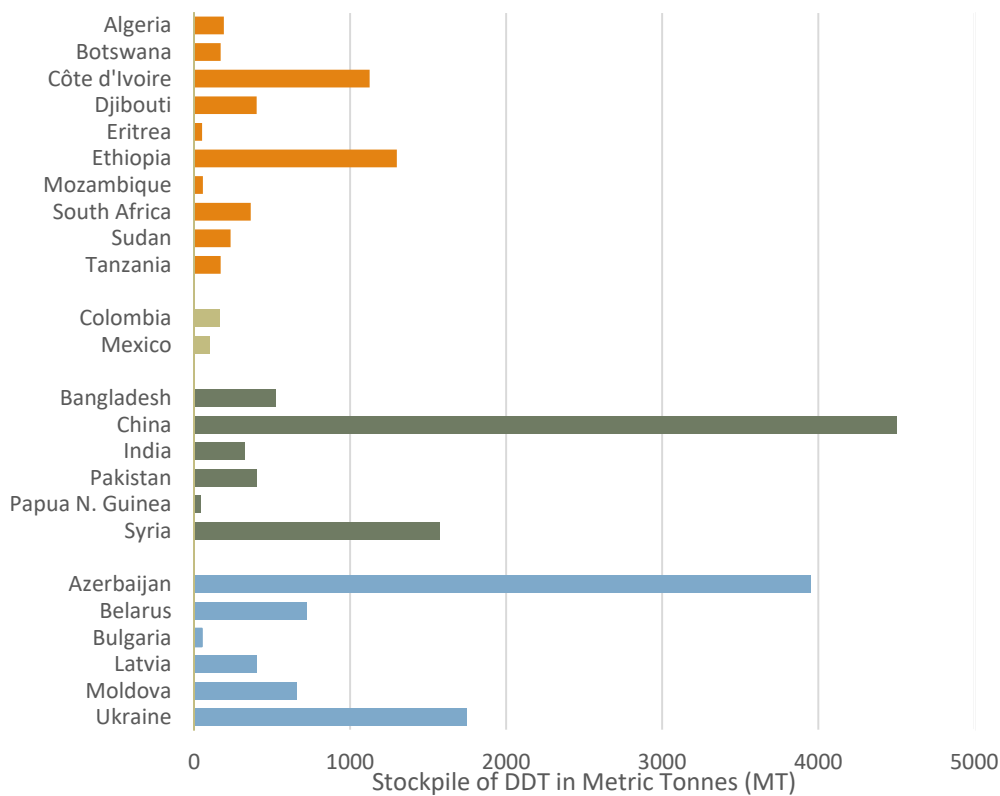


Figure 4. Countries that have stockpiles of DDT higher than 40 metric tonnes according to their NIPs and other sources (as of 31 December 2016).

## 2. DDT stockpiles by UN-Region

### 2.1. African Region

From the African region, following baseline information presented in figure 5 and tables 2-4 has been reported and/or obtained from other sources.

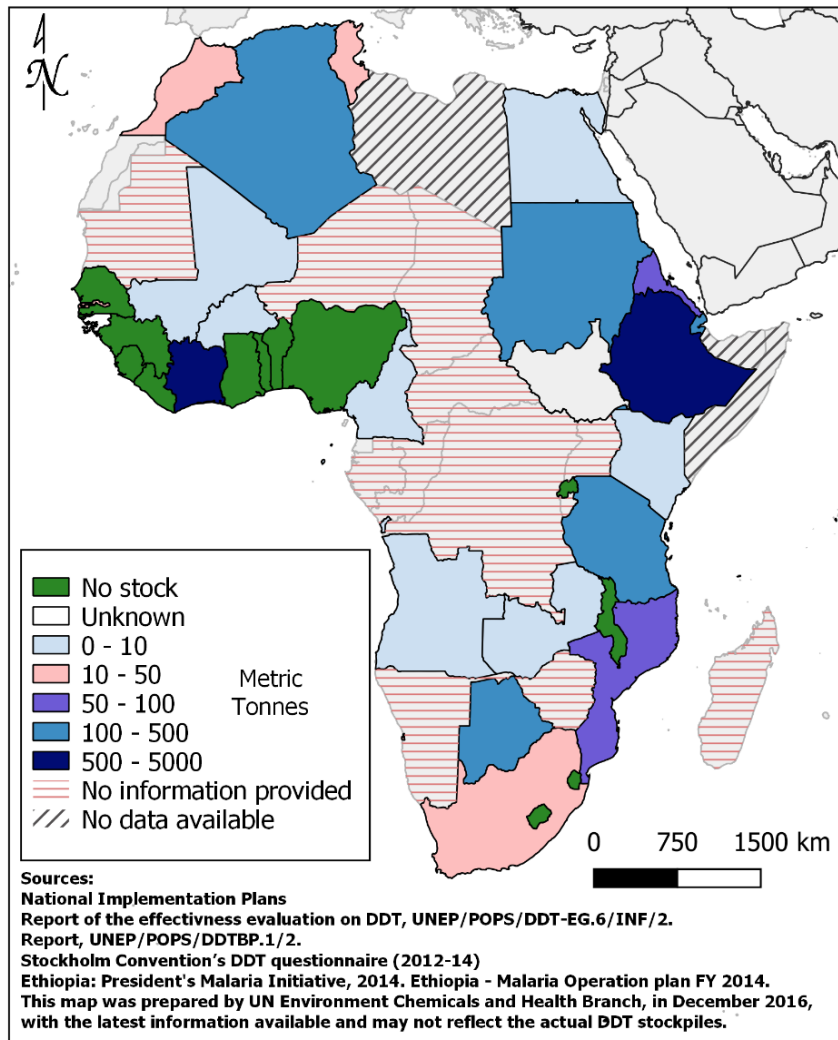


Figure 5. DDT stockpiles in countries in the African Region (as of 31 December 2016).

Table 2. Countries in the African-Region that have reported DDT stockpiles (as of 31 December 2016).

Party	DDT Stockpiles (MT) reported in the NIP	Year Reported	DDT Stockpiles (MT) (Other sources)
Algeria	191	6/10/2007	
Angola		Transmission pending	5 <sup>8</sup>
Botswana	171	6/7/2011	
Burkina Faso	1	2/4/2007	
Cameroon	0.15	6/5/2013	
Côte d'Ivoire	1'125	24/05/2006	1'125 <sup>1</sup>
Djibouti		1/6/2007	401 <sup>1</sup>
Egypt	10	16/03/2006	
Eritrea	52.1	6/4/2013	
Ethiopia		09/03/2007	1'300 <sup>9</sup>
Gambia		21/03/2009	14 <sup>10</sup>
Kenya	1.14	7/10/2014	
Malawi	0.01	15/02/2010	
Mali		9/8/2006	5.8 <sup>1</sup>
Mauritius		11/10/2006	5 <sup>11</sup>
Morocco	39	2/5/2006	
Mozambique		12/8/2008	56.69 <sup>4</sup>
São Tomé and Príncipe	0.5	12/4/2007	
South Africa		8/11/2012	10.7 <sup>4</sup>
Sudan		4/9/2007	234 <sup>4</sup>
Tunisia	41	30/01/2007	
Tanzania, U.R. of	170.6	12/6/2006	
<b>Total</b>	<b>1'803</b>		<b>2'384</b>

Comments:

- **Djibouti** has reported on a stock of Pesticides in its NIP. The so-called "Stocks Ethiopia" is stated as being over 3'000 MT, however, no further details are provided.
- In the NIP of **Kenya** the following has been reported: "Dispose all 100 tonnes stockpiles and waste of DDT".
- **Mauritius'** NIP from 2006 contains information on about 127 MT of DDT. However, in its third national report<sup>12</sup> (submitted 20/10/2014) and the DDT questionnaire 2012-14 of the Stockholm Convention, Mauritius declared having only 5 MT of DDT.
- **Mozambique's** NIP from 2008 reports a stockpile of 350 MT of DDT, however, the DDT 2012-2014 questionnaire of the Stockholm Convention mentions a total stored amount of DDT of 56.69 MT (75 % WP).
- In the Report of the effectiveness evaluation on DDT pursuant to the Article 16 of the Stockholm Convention (November 2016), the exportation of DDT for final

<sup>8</sup> UNEP/POPS/DDTBP.1/2

<sup>9</sup> President's Malaria Initiative. (2014). Ethiopia – Malaria Operational Plan FY 2014 [http://www.pmi.gov/docs/default-source/default-document-library/malaria-operational-plans/fy14/ethiopia\\_mop\\_fy14.pdf?sfvrsn=14](http://www.pmi.gov/docs/default-source/default-document-library/malaria-operational-plans/fy14/ethiopia_mop_fy14.pdf?sfvrsn=14)

<sup>10</sup> <http://chm.pops.int/TheConvention/ConferenceoftheParties/Meetings/COP7/tabid/4251/mctl/ViewDetails/EventModID/870/EventID/543/xmid/13075/Default.aspx>

<sup>11</sup> Stockholm Convention's DDT Questionnaire (2012-14)

<sup>12</sup> <http://ers.pops.int/ERS-Extended/FeedbackServer/fsadmin.aspx?fscontrol=respondentReport&surveyid=64&voterid=45762&readonly=1&nomenu=1>

disposal from **Morocco** (42.5 to France 2014) and from **Mauritius** (139 MT to France 2013) is reported.

**Table 3. African countries that have reported a lack of information on DDT stockpiles, have not provided information, or the transmission of the NIP is pending (as of 31 December 2016).**

Parties	DDT Stockpiles (MT) reported in NIP	Year Reported
Central African Republic	Unknown	8/10/2008
Chad	Unknown	28/04/2006
Congo	No information provided	26/02/2007
Democratic Republic of the Congo	10 cartons of DDT	7/6/2010
Gabon	No information provided	8/5/2008
Guinea-Bissau	Unknown	25/04/2013
Libya		Transmission pending
Madagascar	No information provided	25/09/2008
Mauritania	Unknown	19/03/2010
Namibia	No information provided	14/01/2015
Niger	No information provided	5/4/2013
Somalia		Transmission pending
Uganda	No information provided	13/01/2009
Zambia	No information provided	11/5/2009
Zimbabwe	No information provided	10/1/2014

Comments:

- The **Democratic Republic of the Congo** informed, in the NIP, having "10 cartons of DDT" without adding any further details.
- In the Report of the effectiveness evaluation on DDT pursuant to the Article 16 of the Stockholm convention, the exportation for final disposal of DDT from **Uganda** is reported (unknown amount to South Africa in 2010).

**Table 4. African countries that have reported absence of DDT stockpiles (as of 31 December 2016).**

Parties	DDT Stockpiles (MT) reported in NIP	Year Reported
Ghana	No stock	21/01/2008
Guinea	No stock	22/04/2010
Lesotho	No stock	26/02/2009
Liberia	No stock	20/03/2008
Nigeria	No stock	29/04/2009
Rwanda	No stock	30/05/2007
Seychelles	No stock	26/04/2011
Senegal	No stock	26/04/2007
Sierra Leone	No stock	3/11/2009
Swaziland	No stock	1/6/2011
Togo	No stock	13/10/2006



## 2.2. Latin American and Caribbean Region – GRULAC

From the GRULAC region, information reported and/or obtained from other sources is presented in figure 6 and tables 5-7. It also includes information on Haiti and Grenada, even though they are not Parties to the Stockholm Convention.

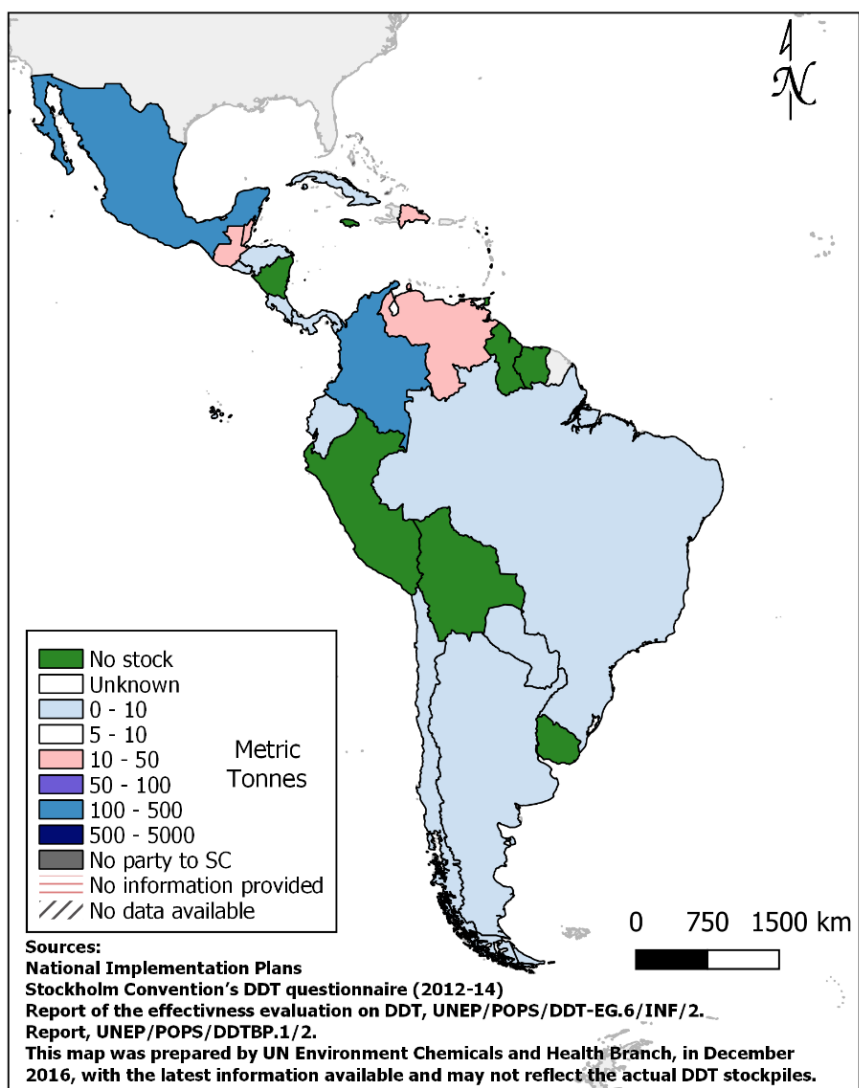


Figure 6. DDT stockpiles in GRULAC region countries (as of 31 December 2016).

**Table 5. GRULAC countries that have reported DDT stockpiles (as of 31 December 2016).**

Parties	DDT Stockpiles (MT) reported in the NIP	NIP Submission	DDT Stockpiles (MT) (Other sources)
Argentina	9.3	25/04/2007	
Belize	14	3/2/2011	
Brazil	0.6	23/04/2015	
Chile	0.8	30/05/2006	
Costa Rica	8.6	4/5/2009	
Colombia	161	11/8/2010	
Cuba	7.7	5/1/2011	
Dominican Republic	20.5	7/5/2009	40 <sup>13</sup>
Ecuador	1.6	6/9/2006	
Guatemala	15.1	9/12/2011	
Honduras	3.5	13/01/2010	
Mexico	102	12/2/2008	
Nicaragua	0.025	29/04/2006	
Panama	3.5	10/2/2009	
Paraguay	0.8	21/06/2010	
El Salvador		8/3/2013	5.4 <sup>14</sup>
Venezuela	28.9	8/12/2009	
<b>Total</b>	<b>378</b>		<b>5</b>

Comments:

- In the Report of the effectiveness evaluation on DDT pursuant to the Article 16 of the Stockholm convention, the exportation of DDT for final disposal from **Colombia** (167 MT to Finland 2009) and from **Honduras** (60 MT to UK in 2014) is reported.
- **Peru** reports in its NIP 0.003 MT of DDT. However, in the Report of the effectiveness evaluation on DDT pursuant to the Article 16 of the Stockholm convention, the exportation of DDT for final disposal is reported (3 MT in 2004 and 3 MT in 2011 to Germany).

**Table 6. GRULAC countries that have reported a lack of information on DDT stockpiles, have not provided information, or the transmission of the NIP is pending (as of 31 December 2016).**

Parties	DDT Stockpiles (MT) reported in NIP	NIP Submission
Bahamas		Transmission pending
Barbados	Unknown	10/12/2007
Peru	0.003	19/12/2007
Saint Vincent and the Grenadines	Unknown	20/05/2015

<sup>13</sup> UNEP/POPS/DDTBP.1/2

<sup>14</sup> Stockholm Convention's DDT Questionnaire (2012-14)

Table 7. GRULAC Region countries that have reported absence of DDT stockpiles (as of 31 December 2016).

Parties	DDT Stockpiles MT reported in NIP	NIP Submission
Antigua y Barbuda	No stock	26/11/2008
Bolivia (Plurinational State of)	No stock	19/09/2005
Dominica	No stock	13/03/2013
Guyana	No stock	7/6/2013
Jamaica	No stock	7/8/2011
Saint Kitts and Nevis	No stock	30/09/2014
Saint Lucia	No stock	10/7/2007
Suriname	No stock	2/4/2012
Trinidad and Tobago	No stock	22/01/2015
Uruguay	No stock	1/6/2006

### 2.3. Asia-Pacific Region

From the Asia-Pacific region, information reported and/or obtained from other sources is presented in figure 7 and tables 8-10. Brunei Darussalam, Bhutan and Malaysia are not Parties to the Stockholm Convention.

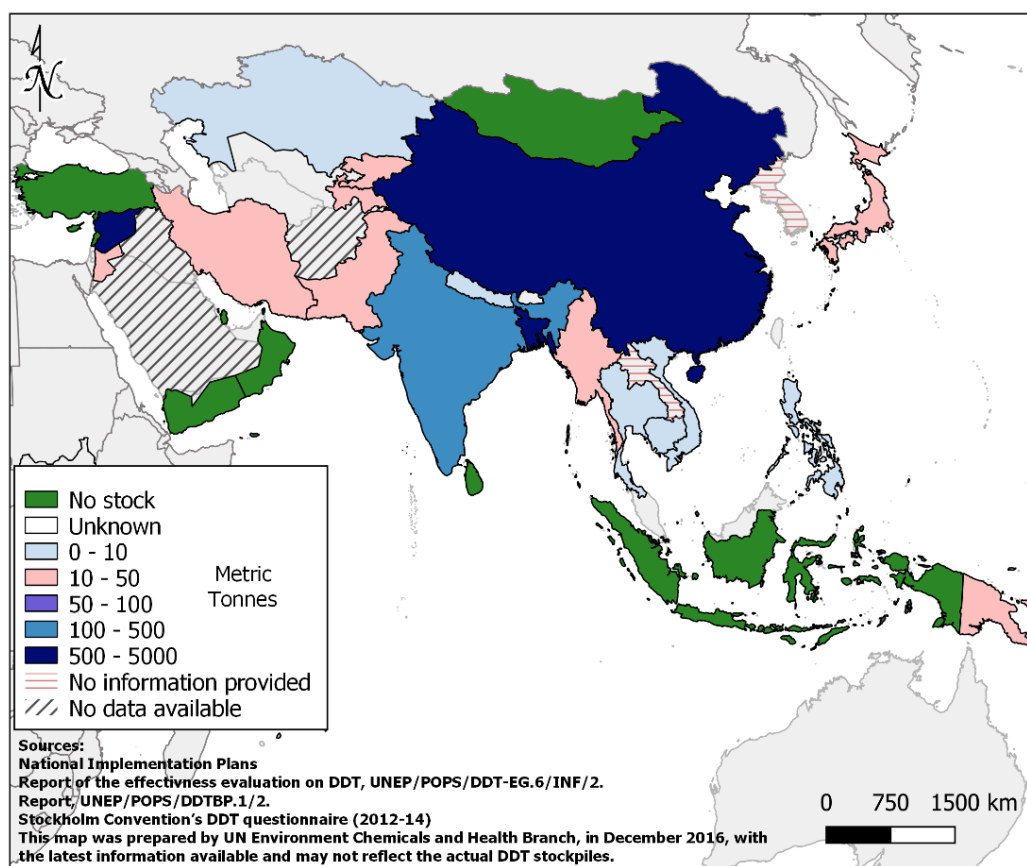


Figure 7. DDT stockpiles in Asia-Pacific region countries (as of 31 December 2016).

Table 8. Asia-Pacific countries that have reported DDT stockpiles (as of 31 December 2016).

Parties	DDT Stockpiles (MT) reported in the NIP	NIP Submission	DDT Stockpiles (MT) (Other sources)
Bangladesh	525	8/5/2009	
China	2'600-4'500	18/04/2007	
India		21/04/2011	322 <sup>15</sup>
Iran (Islamic Republic of)	18	2/8/2008	
Japan	15	13/03/2006	
Jordan	22	26/12/2006	
Kazakhstan	0.5	8/12/2009	
Kyrgyzstan	32	2/4/2009	
Cambodia	0.45	3/5/2007	
Myanmar		Transmission pending	21 <sup>16</sup>
Nepal	3.3	25/09/2007	
Pakistan	>32	15/12/2009	400
Philippines	1.1	19/06/2006	
Papua New Guinea	44	9/9/2013	
Solomon Islands		Transmission pending	0.8 <sup>9</sup>
Syrian Arab R.	In Arab	23/03/2009	1'575 <sup>9</sup>
Thailand	0.2	7/8/2008	
Tajikistan	18	14/11/2007	
Viet Nam	9	11/9/2007	
<b>Total</b>	<b>5'189</b>		<b>1'918</b>

Table 9. Asia-Pacific countries that have reported a lack of information on DDT stockpiles, have not provided information, or the transmission of the NIP is pending (as of 31 December 2016).

Parties	DDT Stockpiles (MT) reported in the NIP	NIP Submission
Afghanistan		Transmission pending
Bahrain		Transmission pending
Fiji	Unknown	21/06/2006
Micronesia (Federated States of)		Transmission pending
Iraq		Transmission pending
Kiribati		Transmission pending
Korea, Republic of	No information provided	
Kuwait		Transmission pending
Lao People's Democratic Republic	No information provided	8/11/2010
Maldives	Unknown	11/8/2009
Marshall Islands		Transmission pending
Korea, Democratic People's Republic of	No information provided	25/11/2008
Saudi Arabia		Transmission pending
Sri Lanka	0.01	28/09/2007
Tonga	Unknown	11/8/2015
Tuvalu	Unknown	5/3/2009
United Arab Emirates	In Arab	30/04/2015
Vanuatu		Transmission pending

<sup>15</sup> Stockholm Convention's DDT Questionnaire (2012-14)

<sup>16</sup> UNEP/POPS/DDTBP.1/2

Comments:

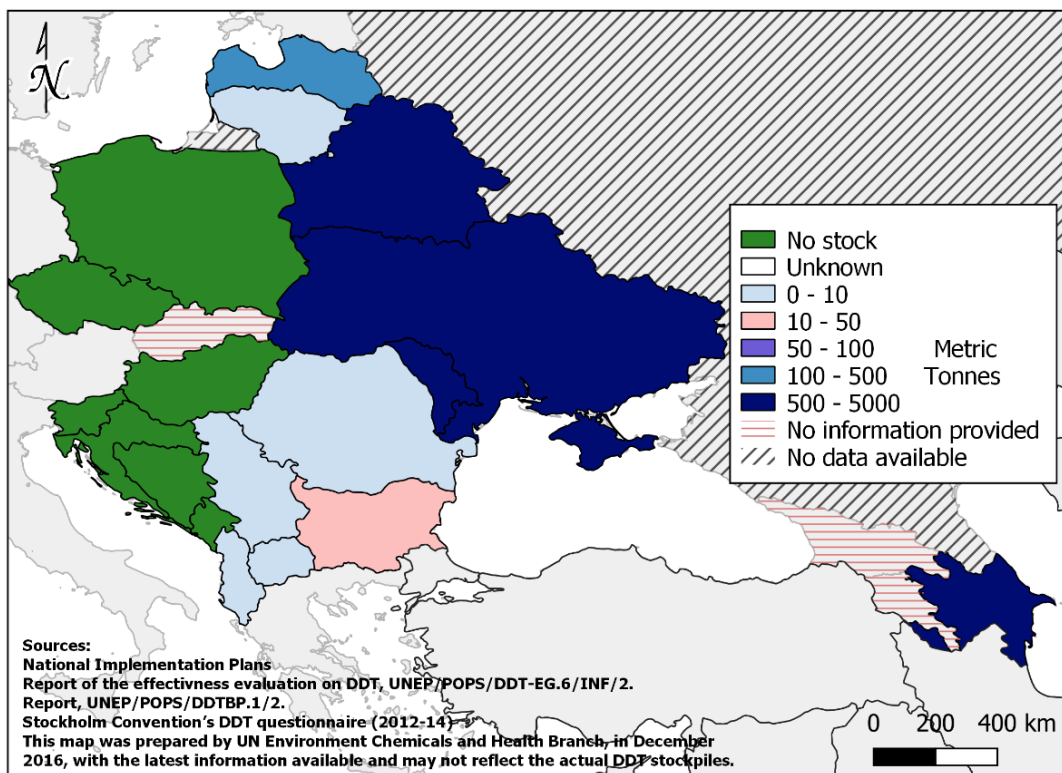
- In the Report of the effectiveness evaluation on DDT pursuant to the Article 16 of the Stockholm convention, the exportation of DDT for final disposal from **Iran** (28.7 MT to France 2015), from **Jordan** (24 MT to France in 2013) and from **Nepal** (2.3 MT to France in 2011) is reported.

**Table 10. Asia-Pacific region countries that have reported absence of DDT stockpiles (as of 31 December 2016).**

Parties	DDT Stockpiles (MT) reported in the NIP	NIP Submission
Cyprus	No stock	16/10/2007
Indonesia	No stock	15/04/2010
Lebanon	No stock	17/05/2006
Mongolia	No stock	8/1/2008
Nauru	No stock	5/10/2012
Oman	No stock	3/2/2009
Palau	No stock	14/10/2014
Qatar	No stock	2/11/2010
Singapore	No stock	22/08/2007
Samoa	No stock	21/06/2007
Turkey	No stock	19/12/2016
Yemen	No stock	26/01/2016

## 2.4. Central Eastern European Region – CEE

From the Central Eastern European region, following information presented in figure 8 and tables 11-13 has been reported or obtained from other sources.



**Figure 8. DDT stockpiles in CEE region countries (as of 31 December 2016).**

*Table 11. CEE countries that have reported DDT stockpiles (as of 31 December 2016).*

Parties	DDT Stockpiles (MT) reported in the NIP	NIP Submission	DDT Stockpiles (MT) (Other sources)
Albania	2	12/2/2007	
Azerbaijan	3'950	15/01/2010	
Belarus	718	17/01/2007	
Bulgaria	50	19/09/2012	
Latvia	400	7/6/2005	
Lithuania	11	6/4/2007	
North Macedonia	2.5	2/9/2005	
Republic of Moldova	654	25/08/2005	
Rumania	6.6	12/4/2006	
Serbia	0.45	29/06/2010	
Ukraine	1'744	21/01/2016	
<b>Total</b>	<b>7'539</b>		

Comments:

- In the updated NIP from **Romania** (09/10/2012) an unknown stockpile of DDT is reported.
- **North Macedonia** reported having 2.5 MT, however, in the Report of the effectiveness evaluation on DDT pursuant to the Article 16 of the Stockholm Convention, the exportation of DDT for final disposal from **North Macedonia** (6.6 MT to Switzerland 2006-2011) is reported.

*Table 12. CEE countries that have reported a lack of information on DDT stockpiles, have not provided information, or the transmission of the NIP is pending (as of 31 December 2016).*

Parties	DDT Stockpiles (MT) reported in the NIP	NIP Submission
Armenia	No information provided	29/04/2006
Estonia	In Estonian	24/05/2011
Georgia	No information provided	10/12/2012
Russian Federation		Transmission pending
Slovakia	No information provided	12/12/2006
Slovenia	0.075	2/2/2010

*Table 13. CEE countries that have reported absence of DDT stockpiles (as of 31 December 2016).*

Parties	DDT Stockpiles (MT) reported in the NIP	NIP Submission
Bosnia and Herzegovina	No stock	15/04/2016
Croatia	No stock	12/3/2009
Czechia	No stock	8/5/2006
Hungary	No stock	21/06/2010
Montenegro	No stock	20/01/2014
Poland	No stock	28/05/2013

### 3. Global use of DDT from the entry into force of the Stockholm Convention until 2014

Figure 9 presents the global use of DDT from the entry into force of the Stockholm convention (2004) until 2014 according to the report of the effectiveness evaluation on DDT.

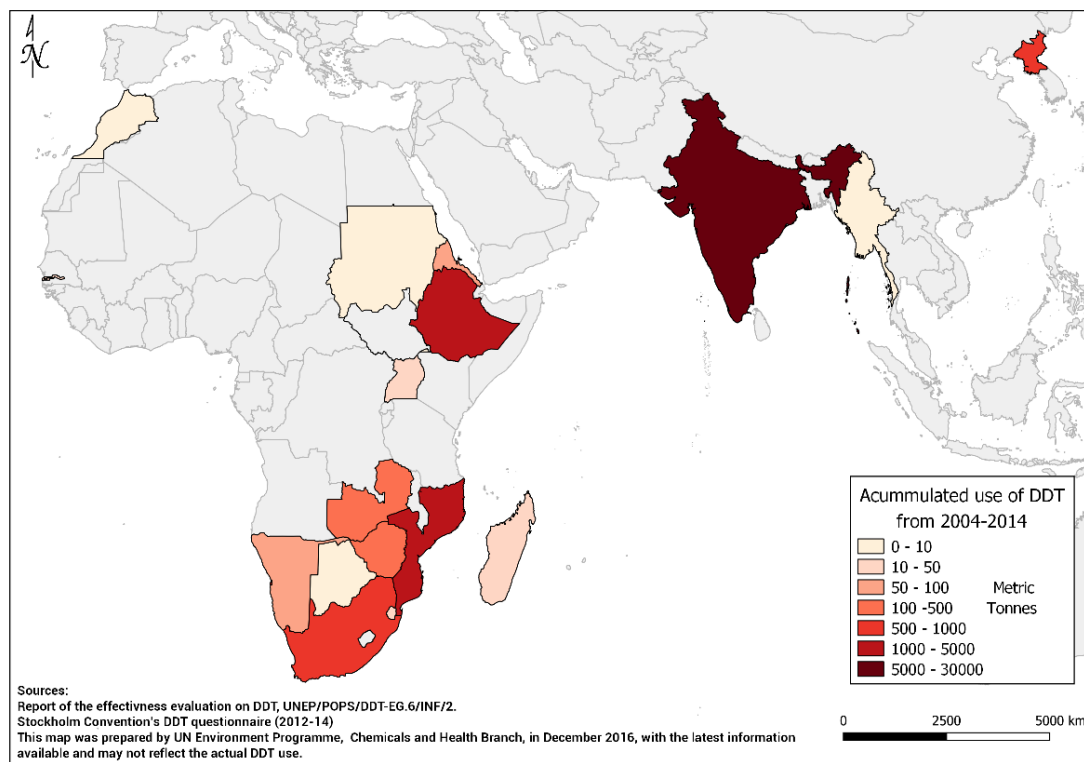


Figure 9. Global accumulated DDT use from 2004 until 2014

# Annex IV **International best practices for the implementation of sound management of DDT stockpiles and their disposal**

This section is based on practical experience with safeguarding of solid and liquid obsolete pesticides in the frame of GEF projects in the area of the former Soviet Union and West Africa. While not all the lessons learnt might apply directly to each country and safeguarding project, the following summary should make planning and implementation easier and avoid the repetition of pitfalls.

## **1. DDT stockpiles in different surroundings**

The accumulation of stocks of obsolete pesticides is often the reflection of a series of earlier shortcomings, which need to be addressed on the way to sound and sustainable management of DDT stockpiles and DDT buried in landfills. These shortcomings can include:

- Incomplete legislation and regulatory frameworks resulting in a lack of regulatory control of obsolete pesticides;
- Absence of national reporting systems on chemicals;
- Incomplete control of the import/export as well as sale of pesticides;
- Lack of information to/training of end-users on the correct application of agro-chemicals;
- Absence of a system for the collection and management of unused stocks of pesticides and empty containers;
- Absence of or incomplete inventory data on obsolete pesticides, landfills and contaminated sites, making development of a national safeguarding strategy impossible;
- Loss of existing inventory data due to an absence of institutional procedures for data management;
- Accumulation of stocks with large amounts of mixed unknown pesticides due to deterioration of packaging labels and/or lack of documentation of previous purchase, sale and/or use of pesticides;
- Orphaned stocks of pesticides with no clear attribution of responsibility for management and disposal;
- Absence of a waste management industry and related practical experience, making final disposal of repacked obsolete stocks in the country/sub-region impossible.

This results in a series of common challenges to be resolved. These challenges are partially different whether the obsolete pesticides are in stores, landfills or contaminated sites and are described in the following text.

### **Stores**

Often, dilapidated stores contain volumes with deteriorated, leaking packaging and are publicly accessible and form attractive playgrounds for children. Risks of exposure can be considerably reduced with a few simple measures: areas should be fenced off, warning symbols installed, and the community informed on the risks stemming from POPs and from trespassing onto the site. Sometimes, contaminants leave the site through air and/or water; in these cases the pathways need to be blocked.



Dilapidated stores can cause a risk to inventory and repackaging teams, when walls or roofs collapse.

Asbestos has been used as a roofing material in many areas of the world, creating an additional layer of complexity for repackaging due to different risk profiles of asbestos and chemicals. If asbestos is present and mixed with the obsolete pesticides, it is important to mention that in a repackaging tender as the bidders will have to propose other approaches and equipment.

Some agro-chemicals can ignite when getting in contact with water or oxidisers during the repackaging process or following intermediate storage. Fires can break out immediately, but sometimes also only after months of storage. Risks can be considerably lowered by having an experienced chemist on site during repackaging who ensures that no incompatible materials/chemicals are repacked together. Also, the configuration of materials in the intermediate store is important (distance between the materials, accessibility for visual inspection, proximity and readiness of firefighting equipment, etc.).

Large amounts of mixed unknowns form an unclear risk to repackaging teams. In absence of information, it must be assumed that the unknown materials belong to the highest risk class. This again has consequences for the type of protective and repackaging materials to be used (e.g. metal drums instead of plastic drums, level of personal protection equipment to be worn, precautions to be taken during road transport), which again increases considerably costs. Such a situation should be avoided through a prior quality inventory, including laboratory analysis of samples of unknowns. Analytical costs can be reduced by using e.g. composite sampling.

Also, the better the understanding is of materials present, the better one can plan for cost-saving measures. E.g. not all products present must necessarily be disposed of, sometimes they can be reused for the initial or alternative purposes. E.g. laboratory tests can define whether a pesticide is still fit for use, some oxidisers like magnesium chlorate pose a high fire risk in presence of organic materials or heat but can be disposed of locally, or many solvents are oil-based, and if not contaminated by pesticides can be used for other purposes.

Disposal facilities cannot treat all drum types and sizes. It has to be clarified before safeguarding starts, which types of repackaging materials the selected disposal facility will accept.

A disposal facility will request information on the chemical group<sup>17</sup> of repackaged pesticides. Reasons are: 1) The chemical group determines the proper UN packaging materials to be used; 2) ADR<sup>18</sup> safety measures to be complied with during road transport are also determined by the chemical group; 3) Wastes are usually blended at the disposal facility before incineration such as to ensure the quality of the burning process. For proper blending, the chemical group needs to be known.

After repackaging, contaminated structures and soils remain. They remain a threat<sup>19</sup>, so planning their aftercare is important.

The end point of repackaging is often hard to define, especially when contaminated soil needs to be excavated. Therefore, an experienced technical officer/expert representing the

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<sup>17</sup> The chemical group describes the basic, chemically active ingredient leading to a pesticide's action. Chemical groups can include e.g. organochlorines (like DDT), organophosphates (like parathion), heavy metals-based pesticides (like the mercury-containing granozan), etc.

<sup>18</sup> European Agreement concerning the International Carriage of Dangerous Goods by Road, which has been negotiated under the auspices of UNECE. The agreement entered into force on 19 April 1985 and has currently 49 member states, mostly from the European and FSU region.

<sup>19</sup> See e.g. the 2002 nitrofen food scandal in Germany where direct and indirect damages have been estimated to exceed €500 million.

regulator should be onsite during repackaging and agree with the repackaging team when to stop repackaging/excavation.

Repackaging is hard physical work, day/night temperatures and weather seasons need to be considered when tendering repackaging work.

Also, access roads, electricity, light, water are often lacking. This must be clearly mentioned in a tender so that the bidders can plan for power generators, lamps, etc. as needed.

## Landfills

Often, information on the precise location, quantities and types of pesticides buried in a landfill is absent because of a lack of archive documents or the landfill has been disturbed by e.g. waste mining.

Due to rain, erosion and wind transport, large volumes can become contaminated over time. Early repackaging is key to reduce risks of additional volumes of materials becoming contaminated.

Waste miner excavate buried pesticides and bring them back to sale on local markets. Fencing of the landfill area and awareness raising campaigns with the surrounding population on pesticides risks are important mitigation measures.

Large volumes result in large budgets needed for comprehensive repackaging, disposal and aftercare. Landfill remediation needs clear planning for intermediate storage of excavated materials, transport to a final disposal facility, and long-term, controlled storage of lightly contaminated materials.

## Contaminated sites

Contaminated sites can be empty stores after repackaging (contaminated walls and floors, soil surrounding the store), but also former mixing stations or agricultural airfields.

The remediation of large, lightly contaminated areas can be an economic challenge. While hotspots can be excavated, phyto- and bio-remediation might be the most applicable measures for contaminated soils. Latter measures, however, can easily take 5-10 years before acceptable contamination levels are reached.

## 2. Management of obsolete pesticides

During repackaging and disposal operations it is important to follow best international practices to ensure the quality and safety of work undertaken and minimise risks to workers and the surrounding population and environment. FAO has developed the most comprehensive obsolete pesticides (OP) management cycle following best international practices called Environmental Management Tool Kits Volumes 1-6 (EMTK Vol. 1-6). The EMTK breaks down the OP management cycle into a series of logical, consecutive elements:

1. **Inventory:** Initially, archival and historical information is compiled. This gives indication on past use (types of chemicals, quantities, locations) of pesticides and where stores/landfills to be investigated are located. Based on that, inventory teams using a standardised FAO inventory form undertake inventories at each defined site. In addition, smaller legacy quantities at farms and in the houses of subsistence farmers can be found with the support of local administrations and NGOs. Inventory teams should make all efforts possible to define the type(s) of obsolete pesticides found, if only unknowns are listed, planning for repackaging becomes complex and costs can increase massively. Quality of the inventory

information is also very important, as 1) the inventory information is the planning basis for future repackaging, and 2) most of the time the repackaging manager will have no contact to the inventory team and can only rely on the information provided by the inventory forms. If the inventory information is of low quality, the repackaging manager is forced to redo the inventory, resulting in unnecessary additional costs. Also note: Inventory data, photos, etc. are valuable data and should be stored at a safe place. Redoing an inventory is costly.

2. **Risk assessment, risk prioritisation:** FAO has developed a risk prioritisation algorithm (EMTK Vol. 1, Tool B) which ranks automatically sites according to environmental and health risks. This prioritisation makes it easier to define which sites should be repacked first to maximise risk reduction in the frame of available budgets.
3. **Repackaging:** For 1) keeping costs reasonable and 2) ensure that repackaging experience is being built up within a country, the training and use of national teams is a practical approach. A national team can be formed using experts working on a daily base with chemicals (e.g. ministry of emergencies staff, pesticides spray teams, etc.) (note: women with a child-bearing wish should not be considered for such activities because of potential chemicals exposure and the specific properties of POP chemicals). This national team is then trained by an experienced international expert of a commercial waste management company<sup>20</sup>, who is then also supervising the team during repackaging. This approach ensures that knowledge on repackaging remains in the country. (Caution: In case of the repackaging of liquid pesticides, this should be done only by an experienced waste expert because of the higher risks related to pumping of liquids.)
4. **Intermediate storage:** Repacked materials designated for disposal abroad often need to be brought first to an intermediate, properly licensed store as several months can pass by until the Basel Convention notification has been issued by transit and recipient countries. Definition of such an intermediate storage site must be included from the beginning in repackaging planning.
5. **Transport:** Road transport to the disposal facility has to comply with ADR rules. Transport on sea can be complicated by the refusal of boat companies to transport hazardous wastes, as costly decontamination measures might be needed after unloading the cargo. Air transport, except maybe in very special circumstances, should be ruled out due to excessive transport costs per tonne.
6. **Disposal:** Disposal facilities have to demonstrate their compliance with relevant national environmental norms and international agreements. At the end of the destruction process, a disposal certificate is issued. Countries should report disposed amounts to the BRS Secretariat.
7. **Public awareness and information:** Local communities and administrations, farming associations, NGOs, media, etc, are all key stakeholders groups to be addressed when managing a safeguarding and disposal project. If no information is provided, local communities could be concerned that safeguarding activities are done with disrespect to health and environmental impacts, which can stall projects. Also, the public often needs a better understanding of the risks related to the use of pesticides, hazards from obsolete pesticides stocks in their communities as well as how to improve agricultural or pest control practices.

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<sup>20</sup> Reason to use a waste management company as trainer/supervisor is that their staff works on a daily base with hazardous materials and often has longstanding, practical experience. Using such a person minimises the risks of accidents and involuntary releases.

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