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of Hazardous Wastes and Their Disposal  
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**Matters related to the implementation of the  
Convention: scientific and technical matters:  
national reporting**

## **Practical guidance on the development of inventories of obsolete pesticides and pesticide-container waste**

### **Note by the Secretariat**

At its fifteenth meeting, the Conference of the Parties to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal took note of, in decision BC-15/13 on national reporting, the practical guidance on the development of inventories of obsolete pesticides and pesticide-container waste, on the basis of the draft guidance contained in document UNEP/CHW.15/INF/50. The text of the final version of the practical guidance, as taken note of by the Conference of the Parties, is set out in the annex to the present note. The present note, including its annex, has not been formally edited.

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\* In accordance with decisions BC-15/1, RC-10/2 and SC-10/2 of the conferences of the Parties to the Basel, Rotterdam and Stockholm conventions, the 2021/2022 meetings of the conferences of the Parties are being held in two segments: an online segment held from 26 to 30 July 2021 and a face-to-face segment to be held from 6 to 17 June 2022 in Geneva.

## **Annex**

### **Practical guidance on the development of inventories of obsolete pesticides and pesticide-container waste**

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# 1 Introduction

1. Parties to the Basel Convention are required under Article 13, paragraph 3 of the Convention to annually transmit to the Conference of the Parties a national report on information related to the measures taken towards its implementation. Undertaking inventories of hazardous wastes and other wastes can be an effective way of gathering information on the generation, transboundary movements, and management of hazardous wastes and other wastes for the purpose of national reporting. Such information, and other relevant information, should be submitted through the Secretariat of the Convention, using the national reporting format.<sup>1</sup>

2. Different types of hazardous wastes may require specific guidance with respect to how inventories are gathered as the nature of the products involved and their supply chains vary. This guidance aims to provide practical instructions to assist Parties and others in developing an inventory of obsolete pesticides and pesticide-container waste in line with existing procedures developed by other organizations such as the Food and Agriculture Organization (FAO)<sup>i</sup> and the World Health Organization (WHO).<sup>ii</sup> It is meant to be used in conjunction with the Methodological guide for the development of inventories of hazardous wastes and other wastes under the Basel Convention<sup>iii</sup> which provides complementary guidance on the methods of developing national inventories for the preparation of national reports. Accordingly, this guidance proposes an approach for developing an inventory that is consistent with the one contained in the Methodological guide.

3. The present guidance document addresses the preparation of inventories of obsolete pesticides and pesticide-container waste throughout the supply chain, including in the private sector, through the design and implementation of a comprehensive national inventory.

4. The main objective of developing an inventory of obsolete pesticides and pesticide-container waste is to obtain information on the amount of such waste generated at a country level, as well as its disposal and transboundary movement. Having a clear picture as to which wastes are generated and the quantities that need to be managed provides the basis for their environmentally sound management (ESM).<sup>iv</sup> This information can be used to develop appropriate strategies and policies including for the collection and disposal of plastic waste and is an important input into the planning of facilities for recovery and final disposal that require substantial financial investment. In addition, the development of the inventory can provide insight into the effectiveness of the system in place in a country to regulate the transboundary movement of obsolete pesticides and pesticide-container waste. The conducting of inventories should be streamlined with the process of developing national policies, legislation, planning and implementation of environmentally sound management of hazardous wastes and other wastes.

5. The reasons for the accumulation of obsolete pesticides include bans on the use of Highly Hazardous Pesticides (HHPs), illegal trade, over-ordering and supply of strategic stocks of pesticides for migratory pest control, and poor storage and management. Pesticide stocks are often stored under very poor conditions, resulting in container deterioration and leakage into the surrounding environment which is a threat to people, animals, as well as to soil, air and ground water quality.

6. FAO has been working to identify and help resolve the problems associated with obsolete pesticides stocks and contaminated materials since the early 1990s. As part of this assistance, FAO publishes a range of guidance documents, training modules and toolkits that give countries practical advice on the management of obsolete pesticides, in particular those that have accumulated through past government tenders.<sup>v</sup> The successful planning and implementation of disposal projects can only be achieved once the types, quantities, distribution and environmental risks of the pesticides have been assessed. The inventory can also help countries to identify the manufacturers, suppliers and donors of the pesticides that eventually became obsolete. These organizations are of particular importance as they are often willing to provide resources for subsequent safeguarding and disposal activities.

7. Pesticide containers can be “one-way” containers that are not re-used or re-usable packs. One-way pesticide containers can be a risk to human health and the environment they are often highly contaminated. They are sometimes attractive to be reused as food and water storage which can lead human and animal exposure and result in poisonings.<sup>vi</sup>

8. This guidance document focuses on a number of key aspects of inventory development and offers practical advice based on recent experience in a range of developing countries. By aligning with existing proposals and procedures of the FAO and WHO, it aims to make the most efficient and effective use of resources to achieve the objectives of all the organizations concerned.

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<sup>1</sup> UNEP/CHW.12/INF/16/Rev.1; available at: <http://www.basel.int/Countries/tabid/8754/Default.aspx>.

## 2 Description of pesticides and related wastes

### 2.1 Classification of obsolete pesticides and pesticide-container waste

9. An indicative list of entries of Annexes I, II and VIII to the Basel Convention relevant to obsolete pesticides and pesticide-container waste is provided below:

(a) Annex I:

- (i) Y2: Wastes from the production and preparation of pharmaceutical products
- (ii) Y4: Wastes from the production, formulation and use of biocides and phytopharmaceuticals
- (iii) Y5: Wastes from the manufacture, formulation and use of wood preserving chemicals

(b) Annex II:

Y46: Wastes collected from households;

(c) Annex VIII:

(i) A4130: Waste packages and containers containing Annex I substances in concentrations sufficient to exhibit Annex III hazard characteristics

(ii) A4140: Waste consisting of or containing off specification or outdated chemicals corresponding to Annex I categories and exhibiting Annex III hazard characteristics

10. A pesticide is described in the International Code of Conduct on Pesticide Management as any substance or mixture of substances of chemical or biological ingredients intended for repelling or controlling any pest or regulating plant growth.<sup>vii</sup> Such pesticides may include, herbicides, insecticides for agricultural or vector control, fungicides, plant growth regulators, biocides and veterinary treatments. The use of these materials in different market sectors is described in Table 1. Each of these sectors will have different indications, examples of which are shown in Table 2.

**Table 1. Sectors to which different pesticidal products are supplied**

	Agriculture	Vector Control	Household & Garden	Amenity Areas	Materials Protection	Veterinary
Herbicide	√		√	√		
Insecticide, molluscicide	√	√	√	√	√	√
Fungicide	√		√	√	√	√
Plant growth regulator	√		√	√		
Biocide			√	√	√	
Treated seeds	√					

**Table 2. The indications in the different sectors**

Sector	Indications
Agriculture	Small holder (including rice & cocoa). Vegetables. Broadacre (corn, soy, cereal, cotton). Plantation (fruits, oil palm, banana, pineapple, coffee, tea). Covered crops (vegetables, flowers). Invasive pests (locusts, Fall Army Worm). Grain stores.
Vector Control	Malaria, Dengue, Chikungunya, Zika, Schistosomiasis, rats.
House & garden	Nuisance pests, storage pests, lawn & garden
Amenity areas	Urban areas, sporting turf
Materials protection	Building material, fabrics
Veterinary	Biting insects and ticks, nematodes

### 2.2 Obsolete pesticides

11. Obsolete pesticides are defined by FAO as those pesticides that can no longer be used for their intended purpose or needed to be used and therefore must be disposed of.<sup>viii</sup> This will include:

- (a) Pesticides that have been voluntarily withdrawn, banned or that have been severely restricted and can no longer be used, in particular those considered to be Highly Hazardous Pesticides (HHPs).<sup>ix</sup> These materials are no longer registered for their original purpose because of a re-assessment of the risk that they are considered to pose to users;
- (b) Outdated pesticides formulations that have exceeded their stated shelf life. These are no longer registered for use;
- (c) Deteriorated products that have undergone an unacceptable loss of biological efficacy or those whose physical properties have changed to such an extent that they can no longer be applied as directed with standard application equipment and offer no benefits but only risk;
- (d) Deteriorated products that have undergone physical or chemical changes that may result in unacceptable risks to human health or the environment;
- (e) Pesticides that are unlabelled or are of unknown composition and therefore present an unknown risk.

12. One group of particular interest during the inventory should be obsolete POPs pesticides. The following POPs are currently listed under the Stockholm Convention: aldrin, alpha hexachlorocyclohexane, beta hexachlorocyclohexane, chlordane, chlordecone, DDT, dicofol, dieldrin, endrin, heptachlor, hexachlorobenzene, mirex, pentachlorobenzene, pentachlorophenol and its salts, perfluorooctane sulfonic acid, technical endosulfan and its related isomers and toxaphene. For further information on the identification of waste POPs pesticides, it is referred to the General technical guidelines on the environmentally sound management of wastes consisting of, containing or contaminated with persistent organic pollutants,<sup>x</sup> the Technical guidelines on the environmentally sound management of wastes consisting of, containing or contaminated with the pesticides aldrin, alpha hexachlorocyclohexane, beta hexachlorocyclohexane, chlordane, chlordecone, dieldrin, endrin, heptachlor, hexachlorobenzene, hexachlorobutadiene, lindane, mirex, pentachlorobenzene, pentachlorophenol and its salts, perfluorooctane sulfonic acid, technical endosulfan and its related isomers or toxaphene or with hexachlorobenzene as an industrial chemical<sup>xi</sup> and the Technical guidelines for the environmentally sound management of wastes consisting of, containing or contaminated with 1,1,1-trichloro-2,2-bis(4-chlorophenyl)ethane (DDT).<sup>xii</sup>

### 2.3 Illegally produced pesticides

13. The global trade in counterfeit and illegal pesticides is growing.<sup>xiii</sup> With increasing quantities of fake and illegal pesticides produced, marketed and sold by organised criminals around the world, counterfeit and illegal pesticides present risks to farmer's health, the environment and the economy. Such products may make up 14-20% of the products used. Counterfeit pesticides are fake products often produced and packaged to look like the genuine article. The widespread availability of technology needed to produce counterfeit and illegal pesticides, coupled with the lack of enforcement of existing laws and legislative loopholes contribute to facilitate the trade of counterfeit products. Counterfeit pesticides:

- (a) Might contain chemicals that are either banned or restricted due to the potential risks they may pose to human health and/or the environment;
- (b) Are not authorised for sale by competent pesticide authorities;
- (c) Can lead to a total loss of treated crops;
- (d) May contain untested products or undeclared active substances or formulants that could result in unacceptable residue levels or unintended application patterns.

14. Falsely declared products regularly ignore the international labelling requirements designed to ensure safety during transport. Thus, highly toxic, flammable or otherwise hazardous substances are transported without regard for the safety of people or the environment. Additionally, the production, trade and use of counterfeit and illegal pesticides circumvents regulations and deprives countries of revenue and tax.

15. When preparing an inventory of obsolete pesticides, the possibility of encountering illegal materials should be taken into account.

### 2.4 Waste pesticide containers

16. Empty pesticide containers are often highly contaminated and can be a risk if they are reused for food and water storage, which can lead to human and animal exposure and result in poisoning. If disposed of in the field or in watercourses, they can lead to environmental contamination and harmful

effects on wildlife and natural resources like drinking water. Some containers are designed for re-use, but one-way containers can accumulate in pesticide stores or be disposed of in the field if they are not disposed of in an environmentally sound manner. Once they have been triple-rinsed, pesticide containers can be collected and recycled into products such as electrical conduiting and road crash-prevention barriers. Further details of the management options for empty pesticide containers are given in the Guidelines on Management Options for Empty Pesticide Containers.<sup>xiv</sup>

17. Pesticide containers come in a wide variety of sizes. Typically, they are supplied in 1, 2 or 5 litre packs. For small farms, smaller sizes are available of around 50 to 250 ml as well as sachets for some products. Larger drums are available from around 50 to 250 l. These are often used by plantations and refillable mini-bulk containers holding more than 200 and up to 1500 l are often used for example in Canada and the United States of America.

18. Over time a number of different materials have been used to make pesticide containers. Currently, the majority of pesticide containers are made of plastic and the most frequently used material is high-density polyethylene (HDPE). A smaller number are made of polyethylene terephthalate (PET). Larger drums can be made of steel and the returnable mini-bulk containers are often HDPE in a steel cage. Small sachets are made of aluminium foil coated in PET. Pesticide containers are rarely made of glass now but there may be some examples of older products in obsolete stocks.

## 2.5 Other pesticide-contaminated wastes

19. In addition to obsolete pesticides and waste one-way containers, there may also be other wastes contaminated by pesticides. This can include personal protective equipment (PPE), coveralls, masks, goggles, face-shields, chemical resistant aprons, gloves, boots, etc. and also old, contaminated spraying equipment, buckets and other used mixing and loading equipment. These objects can be made of a range of materials, but may all be contaminated and need special safeguarding and disposal.

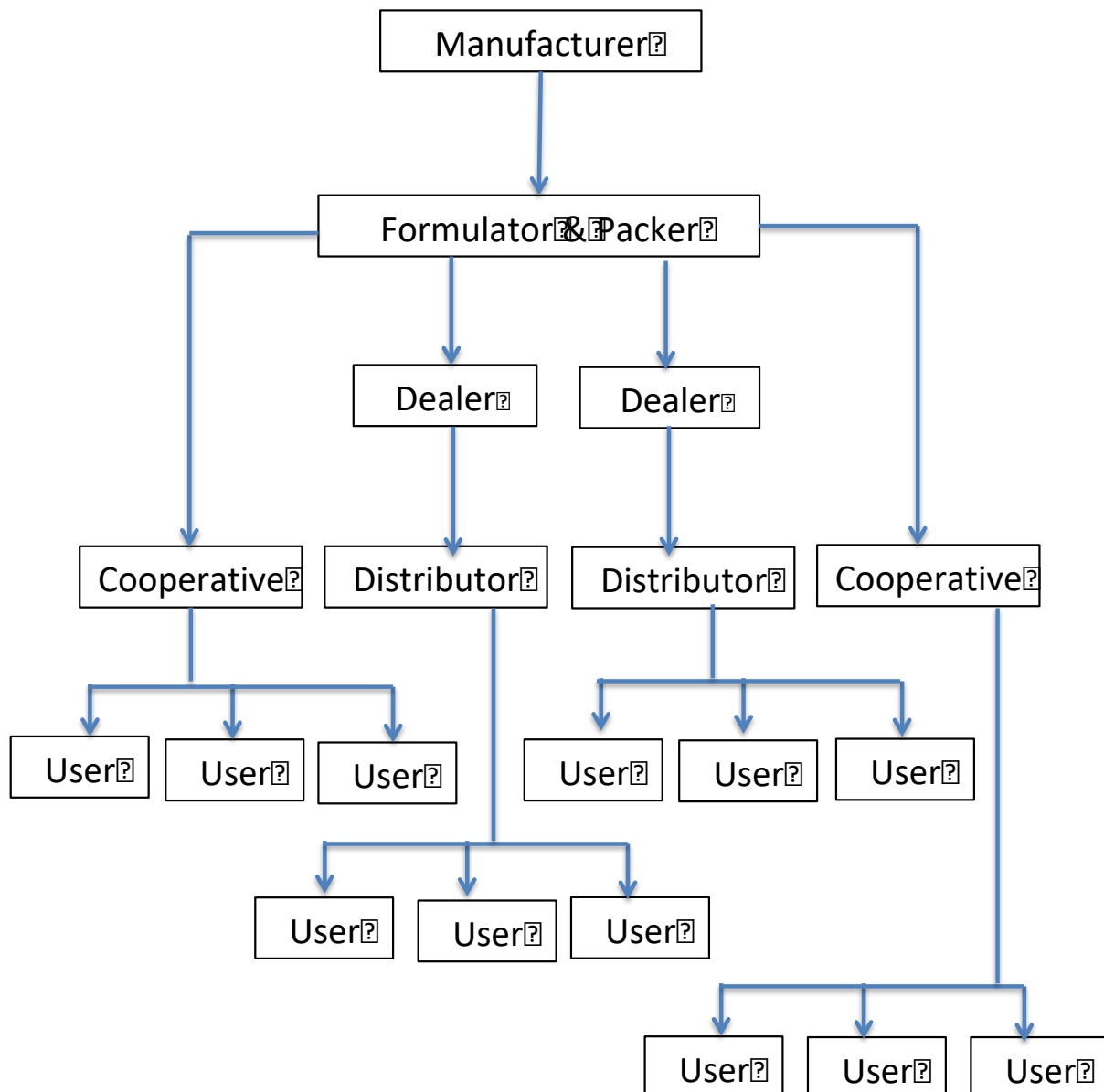
## 3 Defining the scope of the inventory

20. Important considerations in defining the scope of the inventory include: its purpose (including for completing the national report under the Basel Convention), desired outcomes, category of applications of obsolete pesticides and pesticide-container waste to be included, geographical area to be covered and specific exclusions and limitations due to e.g., access to information sources.

21. The scope of the inventory will have a critical influence on the complexity, time and budget needed to develop the inventory. The scope is typically set following consultation with stakeholders. Relevant considerations for setting the scope of the inventory are also provided in *The Preparation of Inventories of Pesticides and Contaminated Materials*<sup>xv</sup> that addresses pesticide stockpiles rather than materials held in the private sector. To assist in the scoping exercise, the following sections provide an overview of the pesticides supply chain and factors that influence the generation of waste pesticides for each actor in the chain.

22. A generalized view of the pesticide supply chain is shown in Figure 1. Though the detail of the supply chain will be different in different countries, it will usually contain these elements, though they will be integrated in different ways.

Figure 1. The pesticide supply chain



### Manufacturer

23. The manufacturer produces the active ingredients for the pesticide. These may be research-based companies that discover and develop new pesticide active ingredients or generic manufacturers of existing chemicals. Originally, these companies were principally in Europe, the USA and Japan, however increasingly basic manufacture of pesticide active ingredients is moving to China and India. Some of these companies run international vertically integrated supply chains that extend into individual countries, but others do not. Though some biological pesticides are produced centrally and exported, due to the shorter shelf-lives of these materials, it is often more effective for them to be produced locally to avoid extensive shipping and handling.

24. Though basic manufacturers will have the ability to store considerable amounts pesticide prior to shipping, they tend to move these materials into the supply chain as soon as possible, as they are expensive to produce and to store. Though it is always possible that there will be stores of obsolete stocks, basic manufacturers are interested in moving these on either to recycling or disposal rather than allowing them to take up expensive storage space.



### Formulator and packer

25. The pesticide active ingredients are formulated with solvents, surfactants, emulsifiers, adjuvants, stabilizers and numerous other materials to make stable and effective pesticidal products. In many formulations there may be two or more different active ingredients. Though these formulations are often made by the basic manufacturer, it is often more cost effective for them to ship the active ingredients and to make the formulations locally as they are more voluminous than the active ingredients and therefore expensive to ship. Also, different countries often have different product requirements, and this may be better to deal with locally.

26. Once the pesticides are formulated, they are often put into their final sales packaging and labelled. Packing and labelling plants are typically integrated with formulation plants. Each country has specific label and language requirements that have to be added.

27. Formulators and packers will have warehouses for finished product but will have financial incentives to move these on into the supply chain as soon as possible. Like the basic manufacturers, they will be looking to recycle or dispose of obsolete product rather than store it.

### Dealer

28. Within a country, a pesticide dealer will take responsibility for shipping pesticide products from the point of entry or from the formulation and packaging plant to the rural areas where the products will be used. Their focus is on supply and so will have warehousing and trucks. The dealers supply the distributors who sell them to the users. In some countries where there are many small distributors, such as in Asia or Africa, there may be a number of dealers who trade pesticides locally before they get down to the distributors. In the other countries, e.g., the United States of America, some of the dealers may be substantial horizontally integrated agricultural companies.

### Cooperative

29. Sometimes, farmers will join together in a cooperative to buy pesticides directly and so cooperatives will take the place of distributors and often dealers as well. This is quite common for large farmers in Brazil, but a number of different schemes can be found in different countries.

### Distributor

30. These actually supply the users with pesticides. They vary between large integrated agricultural suppliers and small stores in villages in Asia. Sometimes there are salesmen who travel to isolated rural areas in Africa to sell small quantities of pesticide. In former times these were known as "bicycle salesmen". Distributors will have storage facilities, but these will vary from lockable rooms to warehouses. Distributors may find it more difficult to dispose of obsolete stocks as they sometimes lack the connections that dealers might have. In some countries, users will join together in cooperatives to buy and distribute pesticides to the group.

### User

31. Users farming units vary in size enormously from subsistence farmers through to mega farmers. The International Labour Organization (ILO) classification of farming units is shown in Table 3. A number of other holders of pesticides, such as national and local government facilities and international agencies are considered in table 4.1 of The Preparation of Inventories of Pesticides and Contaminated Materials.

**Table 3. ILO Categorization of different agricultural holdings<sup>xvi</sup>**

Holding	Approximate Size	Description
Micro-holding	< 0.5 ha	Subsistence
Small. <i>For this guidance Small and micro-holdings will be combined.</i>	< 10 ha	Traditional methods Individual livestock may be kept Surplus produce sold locally
Middle-sized	10 – 50 ha	Traditional methods and technology Livestock may be kept Produce sold nationally or internationally
Large	50 - 500 ha	Mechanization and advanced technology Intensive and extensive livestock production Produce sold nationally or internationally

<b>Holding</b>	<b>Approximate Size</b>	<b>Description</b>
Mega	>500 ha	Intensive methods and advanced technology Intensive or extensive livestock production Produce sold nationally or internationally

32. Though subsistence farmers primarily use traditional farming methods for their region, it is possible that they will have access to some pesticides, but they will be unlikely to have the resources to store any significant amounts of them. Small farmers in many regions will have access to pesticides. Although some will have the possibility to have locked stores for pesticides, many do not. Some small farmers will even bury unused pesticides in the field to be dug up and used at a later date. It is possible that these farmers will be storing pesticides that are obsolete, unlabelled or illegal.

33. Middle-sized farms will typically have a separate locked store for pesticides that may contain products that are obsolete, unlabelled or illegal. Generally, large farms will be using a number of different pesticides and will have the ability to store significant amounts. Though they may have obsolete, unlabelled or illegal pesticides, as they are likely to be more organized at a business level and have sufficiently good connections with the supply chain to give them an opportunity to manage unwanted pesticidal products if they want to. Similarly, larger farmers will usually be substantial users of pesticides and will have the ability to store significant amounts securely. They will have a close relationship with the supply chain that should facilitate the management of that are obsolete, unlabelled or illegal pesticides.

#### **Integration of the supply chain**

34. Pesticide manufacturers are typically located in Europe, the USA and Japan, but increasingly in China, and India. Basic manufacturers are often vertically integrated with formulators and packers and will either ship finished products to the countries where they are used or ship the technical active ingredients to formulation and packing plants that they operate in the regions. There are also many significant local or regional formulation and packing plants that are independent of the basic manufacturers and produce pesticidal products tailored for their regional market.

35. Though it is not unknown for multinational companies to vertically integrate from basic manufacture and formulation, there are a few examples of them being vertically integrated right down to the distributor level, it is not the usual situation. Within a country, dealers tend to be locally established and may be horizontally integrated with other segments of the agricultural supply market. Some of these dealers can be significant agricultural stakeholders in the countries in which they operate. Distributors tend to be local companies that have a direct interface with the users. Though they are likely to supply a number of different needs of the users, their focus tends to be local rather than vertically integrated in the supply chain.

#### **The location of wastes in the supply chain**

36. Considering the supply chain categories in Figure 1, the types of obsolete pesticides and contaminated pesticide-container waste that can be expected to be held by each actor in the supply chain is described in Table 4.

**Table 4. Where obsolete pesticides and contaminated waste containers accumulate**

<b>Supply Chain actor</b>	<b>Obsolete Pesticide</b>	<b>Records</b>	<b>Issue</b>	<b>Contaminated waste packaging</b>
<b>Manufacturer</b>	Active ingredients in storage	Should be accessible	Should be equipped to manage appropriate disposal	Equipped to deal with legally if necessary
<b>Formulator &amp; Packer</b>	Formulated Products in storage	Should be accessible	Should be equipped to manage appropriate disposal	Equipped to manage appropriate disposal
<b>Dealer or cooperative</b>	Products in storage, may also hold illegal pesticides	Should be accessible	May not have ability to manage disposal	May not have ability to manage disposal

Supply Chain actor	Obsolete Pesticide	Records	Issue	Contaminated waste packaging
<b>Distributor</b>	Products in storage and on display, may also hold illegal pesticides	Variable	No ability to manage unless part of a formal scheme	No ability to manage unless part of a formal scheme
<b>User mega</b>	Products in storage, may also hold illegal pesticides	Should be accessible	No ability to manage unless part of a formal scheme	No ability to manage unless part of a formal scheme
<b>User large</b>	Products in storage, may also hold illegal pesticides	Should traceable	No ability to manage unless part of a formal scheme	No ability to manage unless part of a formal scheme
<b>User middle</b>	Products in storage, may also hold illegal pesticides	Variable	No ability to manage unless part of a formal scheme	No ability to manage unless part of a formal scheme. May undertake inappropriate re-use and disposal
<b>User small</b>	Limited ability to store securely, may be in the house or buried in field. May hold illegal pesticides.	Often no records	No ability to manage unless part of a formal scheme.	No ability to manage unless part of a formal scheme. May undertake inappropriate reuse and disposal

### Tender business

37. In addition to these private enterprise supply chains, there are other routes in which pesticides are supplied that involve large tenders placed by national governments and aid agencies, charitable foundations and international organizations. These tenders relate to the control of invasive pests such as locusts or vector-borne diseases such as malaria. In the case of locust control, stockpiles of insecticides have been created across sub-Saharan Africa in order to be prepared for locust outbreaks. However, these stockpiles have themselves become potential threats to human health and the environment and have been subjected to a program of safeguarding and disposal. Details of where these can be found are given in The Preparation of Inventories of Pesticides and Contaminated Materials, Table 4.1. Tenders for pesticides are often quite substantial and, in the past, have led to problems because of:

- (a) Inadequate stores and safeguarding;
- (b) Excess donation;
- (c) Lack of coordination between aid agencies;
- (d) The requirement for tenders to take the lowest priced option sometimes leading to poor quality or unsuitable products and packs;
- (e) Insufficient consideration of disposal of the pesticides and packs remaining after the project has ended.

38. Donors have responded to these concerns with attempts to improve the tendering process, in particular with a focus on the prevention of stockpiles and the removal and appropriate disposal of unwanted materials at the end of projects. The problem of existing stockpiles has been addressed by FAO through the Obsolete Pesticide Programme.<sup>2</sup>

<sup>2</sup> <https://www.fao.org/agriculture/crops/obsolete-pesticides/what-now/guides/en/>.

39. In many countries it will not be possible to directly inventory all supply chains and end users for obsolete pesticides, pesticide-container waste, other pesticide contaminated wastes and the potential for the generation of wastes. Sub samples should be taken that are representative of the whole country. In order to do this it is necessary to understand 1) the size of the various sub-sectors, 2) how this varies in the country, 3) the supply chains for each sector and 4) any attempts to collect, safeguard, recycle or dispose of pesticidal materials and wastes in that sector. Having made assessments of the sub-sampled areas, the overall multiplication factor to country or region must be established.

## 4 Methodologies for developing the inventory

40. This section addresses developing inventories of obsolete pesticides, pesticide-container waste and other wastes contaminated with pesticides. This focuses on forming the project management team and designing budget requests, identifying stakeholders and conducting the inventory at the desk, questionnaire and inspection level.

### 4.1 Stakeholder engagement

41. In order to conduct the inventory, the whole pesticide supply chain as described in Figure 1 should be identified. In order to understand each sector and subsector, it is important to map the stakeholders and to engage with them. For that purpose, it will be necessary to devise a stakeholder map based on level of interest and influence in the sector, an engagement plan, a messaging plan, and an implementation plan.

42. A comprehensive stakeholder map that also identifies the groups in each quadrant with positive or negative attitudes towards the implementation should be the basis of the stakeholder engagement plan. The Preparation of Inventories of Pesticides and Contaminated Materials gives advice about prioritizing the sectors, which is incorporated into Table 5.

**Table 5. Prioritizing sectors for investigation**

	Manu.	F&P	Dealer	Distri butor	Coop.	Small User	Med. User	Large User	Mega User
<b>A</b> Estimated number of locations									
<b>B</b> Estimated quantity at each location									
<b>C = A x B</b>									
<b>D Storage conditions good to bad (1 – 10)</b>									
<b>E = C x D</b>									
<b>Ranking based on E</b>									

### 4.2 Desk analysis

43. The first step is document list the relevant laws and statutes that impact the manufacture, distribution and use of pesticides in the reporting country. It is necessary to understand and record the existing supply chains, infrastructure for storing, safeguarding and disposing of obsolete pesticides, waste pesticide containers and other pesticide-contaminated wastes. All documents available relating to the sale and shipment of pesticides are relevant to this activity. It is possible that legislation, infrastructure and policies may be lacking or under development.

### 4.3 Questionnaires

44. The next level of investigation involves direct questions to a sub-sample of the organizations or people at the different levels of the supply chain in order to ascertain whether obsolete pesticides and contaminated waste packaging is an issue in their sector. Steps in developing an inventory by

questionnaire are described in The Preparation of Inventories of Pesticides and Contaminated Materials.

#### 4.4 Site investigations

45. A sub-sample of the organizations or people at the different levels of the supply chain can be visited to ascertain the amount of obsolete pesticides and contaminated waste packaging that exists. The Preparation of Inventories of Pesticides and Contaminated Materials detail an approach to site visits that includes determinations as to whether the products found are:

- (a) Banned or restricted;
- (b) Needed for any legal purpose;
- (c) Physically degraded;
- (d) Chemically degraded;
- (e) Still effective;
- (f) Possible to revise the expiry date;
- (g) Monitoring of management options.

46. Forms are available from the FAO Environmental Management Tool Kit.<sup>xvii</sup> Relevant forms include:

- (a) Site information;
- (b) Site plan;
- (c) Pesticide information;
- (d) Risk analysis;
- (e) Empty containers;
- (f) Contaminated equipment.

#### 4.5 Obsolete pesticides

47. Using the definitions included in sections 2.2 and 2.3, the pesticide supply chain map in Figure 1 and the stakeholder engagement mapping section 4.1 and the methodologies in sections 4.2 and 4.3, a system can be built to start an inventory of obsolete pesticides.

#### 4.6 Waste pesticide containers

48. Waste pesticide containers, especially one-way containers, will accumulate in the supply-chain, and especially with users, in the absence of specific recycling or disposal options. An assessment of pesticide-container waste is given in Table 6. The weight of materials that have been triple-rinsed and those left unrinsed should be considered. Such information could be requested from stakeholders as part of a questionnaire survey or collected during site investigations.

**Table 6. Assessment of waste pesticide containers**

Container Type	Size (volume contained in l)	Material (e.g. HDPE, PET, steel, aluminium sachet, cardboard, glass)	Weight (Kg) triple-rinsed	Weight (kg) unrinsed, highly contaminated
Bottle or jug				
Drum				
Bag				
Box				
Sachet				
Mini-bulk container				
Other				

## 4.7 Other pesticide-contaminated wastes

49. Items contaminated with pesticides such as personal protective equipment (PPE), coveralls, masks, goggles, face-shields, chemical resistant aprons, gloves, boots, etc. and also old, contaminated spraying equipment, buckets and other used mixing and loading equipment may also accumulate in the supply chain, especially with users. These items are not generally non-hazardous waste and so need special handling and disposal. Their occurrence should be recorded and their handling classified according to Figure 3, as for waste pesticide containers.

## 5 Preparing national summaries and forecasts

50. If the inventory has been developed based on information from a limited geographic area, then the estimated amount of obsolete pesticide and contaminated waste pesticide containers in that area needs to be extrapolated to the whole country to obtain a national estimate. Information on the total amount of hazardous wastes generated is requested in table 6 of the national reporting format. Parties have the option of providing detailed information concerning specific hazardous wastes categorized according to the codes of Annex I or VIII to the Basel Convention or national codes. Further instructions can be found in the Manual for completing the format for national reporting under the Basel Convention.<sup>xviii</sup>

## 6 Obtaining data on options for final disposal and recovery

51. Information on options for the final disposal and recovery of hazardous wastes and other wastes available in a country is requested in Table 2 and Table 3 of the national reporting format, respectively. It is therefore important to collect information on existing facilities for the disposal of obsolete pesticides and pesticide-container waste in the course of developing the inventory. Information on the amount of obsolete pesticides and pesticide-container waste processed by these facilities can also be cross-checked against the amount of obsolete pesticides and pesticide-container waste generated. When such facilities do not yet exist in a country, information collected on alternative disposal practices will help in devising an appropriate strategy for the ESM of obsolete pesticides and pesticide-container waste.

52. Some examples of national programmes on the disposal of obsolete pesticides and pesticide-container waste take back are provided in the Annex. In many countries container management programmes have been developed as part of partnerships between the government and the crop protection industry that have also developed a roadmap<sup>xix</sup> for establishing such programmes. The disposal of other wastes is often not systematically addressed. Examples of general guidelines on this issue include those prepared by North Carolina State University cooperative extension services.<sup>xx</sup>

## 7 Obtaining data on the transboundary movements of obsolete pesticides and pesticide-container waste

53. Parties to the Basel Convention have the obligation to designate one or more authorities (competent authorities) for approving the transboundary movements of hazardous wastes and other wastes. Competent authorities should therefore maintain a record of annual imports and exports of obsolete pesticides and pesticide-container waste. Parties should provide this information in table 4 (export) and table 5 (import) of their national report.

## 8 Updating the inventory

54. Applying the methodology described in section 4 provides an estimate of the amount of obsolete pesticides and pesticide-container waste generated in a given year. To monitor the amount of obsolete pesticides and pesticide-container waste generated every year it is recommended to establish a procedure for collecting the needed information from sources on a regular basis so that the inventory can be updated. For instance, a procedure could be established to send out the questionnaires to the data sources at a given date each year. Similarly, since information on the import and export of obsolete pesticides and pesticide-container waste will likely vary from year to year, the data can be updated by obtaining it from the competent authorities on an annual basis (see section 7).

## 9 Assessment of results and conclusions

55. It is important to assess the results of the inventory to identify measures that can make it more complete. Key elements to be assessed include the reliability of the data collected and the accuracy of

the results. The assessment may also identify potential gaps in the control system for the implementation of the Basel Convention.

56. An approach of assessing the accuracy is to assess the trend of the time series. Another option is to benchmark the outcomes to other comparable countries. In that case, one can calculate the obsolete pesticides and pesticide-container waste generated per inhabitant per year and to compare that the outcomes of comparable countries in the region.

57. Discrepancies between the amount of obsolete pesticides and pesticide-container waste generated and the amount disposed domestically and/or exported could be due to a number of reasons that are worth investigating. It could indicate inaccuracies in the data collected, poor record keeping, differences in classification, missing data, etc. In some cases, consulting other sources of information may also help to resolve discrepancies.

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- <sup>ix</sup> See ii
- <sup>x</sup> UNEP 2019. General technical guidelines on the environmentally sound management of wastes consisting of, containing or contaminated with persistent organic pollutants. Available at: <http://www.basel.int/Implementation/TechnicalMatters/DevelopmentofTechnicalGuidelines/TechnicalGuidelines/tabid/8025/Default.aspx>
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<sup>xx</sup> Center for Integrated Pest Management. Pesticide Stewardship Website.  
<https://pesticidestewardship.org/disposal/pesticide-disposal-options/>

## Annex

### Examples of national programmes on the disposal of obsolete pesticides and pesticide-container waste take-back

#### Disposal of obsolete pesticides in Ethiopia<sup>1</sup>

Ethiopia had been accumulated obsolete pesticide stocks since pesticides were first imported in the 1960s due to prolonged storage of pesticides, inappropriate storage conditions because of poor storage facilities, the lack of trained staff and lack of national legislation for pesticide registration and monitoring system of pesticide use in the country. The first pesticide inventory was conducted in 1995 led by FAO in collaboration with the government of Ethiopia had identified about 426 tonnes of obsolete pesticides mainly on state-owned agricultural farms and held by the Ministry of Health. However, these stocks have increased to over 1500 tonnes (including 200 active ingredients) as found in a detailed inventory conducted in 1999. The stocks included organochlorines (258.3 tonnes), organophosphates (155.4 tonnes), carbamates (58.5 tonnes), coumarins (14.9 tonnes), inorganics (30.2 tonnes), others (257.2 tonnes), mixed pesticides (70.4 tonnes) and unknown pesticides (307.1 tonnes) including both liquid and solid state formulations. The obsolete organochlorine pesticides stocks were mostly pesticides such as chlordane, DDT, dieldrin and lindane that are banned or restricted in most countries. The highest amount of a single active ingredient found was the organophosphate insecticide pirimiphos methyl (172.1 tonnes). All these stocks were disposed of in the first phase of disposal in Finland (during 2000-2003) by the hazardous waste management company Ekokem at a cost of about US\$ 4.44 million.

Another 1000 tonnes of obsolete pesticides were identified and eliminated in a second disposal phase at a total cost of US\$ 8,135,500. Along with the disposal process, a number of activities were implemented to prevent future pesticides accumulation. These activities included the development and enforcement of pesticide policy, the implementation of Integrated Pest Management (IPM) and Integrated Vector Management (IVM), capacity building in terms of providing professional trainings, creating awareness among stakeholders on the environmental and human health hazard posed by obsolete pesticides as well as other actions to prevent their accumulation and enforcement of national legislations and policies related to pesticides use.

Pesticide use in the country is increased. For instance, 12 years of pesticides import data (1996-2007) by the Ministry of Agriculture shows that 2973 tonnes of pesticides were imported between 1996-1998, 3670 tonnes between 1999-2001, 5079 tonnes between 2002-2004 and 8302 tonnes between 2005-2007. In addition, 6 years of insecticide import data (1996/97-2001/02) by the Ministry of Health shows that around 919 tonnes of insecticides were imported between 1996/97-1997/98, 812 tonnes between 1998/99-1999/00 and 970 tonnes between 2000/01-2001/02 for malaria and other vector borne diseases control.<sup>xxi</sup>

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<sup>1</sup> Haylamicheal, Israel & Dalvie, Mohamed. (2009). Disposal of obsolete pesticides, the case of Ethiopia. *Environment international*. 35. 667-73. 10.1016/j.envint.2008.11.004.

## **Pesticide-container waste case study: Brazil<sup>2</sup>**

Since 2002, Brazil has collected 400,000 tons of empty pesticide containers from 1.3 million farms for proper final disposal or recycling. This is the largest and most successful container management program in the world. It is run by the National Institute for Processing Empty Containers (InpEV) and supported by the Brazilian government. InpEV is a non-profit organization was founded in 2002 by the Brazilian crop protection industry. InpEV has more than 100 member companies representing the entire value chain in Brazil, including 100 percent of all crop protection product manufacturers, the Brazilian farmers' federation, distribution channels and national crop protection associations such as ANDEF (Associação Nacional de Defesa Vegetal).

The program, named Campo Limpo ("Clean Field" in Portuguese), works in the following way. By law, farmers are required to properly rinse (pressure or triple rinse) all rigid crop protection product containers and puncture them to prevent reuse. Flexible bags are not rinsible, but they must be returned to collection centres. Growers take all empty containers to the local collection centre indicated on their product invoice. InpEV collects the containers and dispatches them to their final destination: a recycling centre (rinsed) or incinerator (unrinsed).

Distributors and cooperatives must provide the address to where containers must be returned on all crop protection product invoices. It is a legal responsibility of those selling the products to must recover them.

Crop protection product manufacturers sell their products through about 4,500 distributors and cooperatives or directly to farmers throughout the country. Farmers must deliver empty product containers within one year of purchase to designated receiving units. More than 400 collection sites are managed by about 270 regional cooperatives and distributor associations. Distributors also have to manage the collection sites and issue proof of delivery of empty containers, as well as guide farmers on container management procedures. InpEV supports the operational processes of the receiving units and also provides guidance to farmers about their responsibilities via a good operational practice manual. About 45,000 tons of empty crop protection product containers were recovered in 2015, representing 94 percent of all such containers made of plastic.

This high level of compliance began with a very effective law: In 2000, the proper disposal of empty crop protection product containers became obligatory under the Brazilian federal government with shared responsibility among stakeholders. The government grants licenses to receiving units, inspects all elements of the Campo Limpo system and fines stakeholders who don't comply. In addition, it supports public education initiatives to spread knowledge of the legislation. Compliance is at a high level and there have been only a few cases of prosecution.

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<sup>2</sup> For more information see: <https://inpev.org.br/en/inpev/>.