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**Conference of the Parties to the Basel Convention  
on the Control of Transboundary Movements of  
Hazardous Wastes and Their Disposal**

Eighth meeting

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Item 6 (d) of the provisional agenda\*\*

**Implementation of the decisions adopted by  
the Conference of the Parties at its seventh meeting:  
Technical matters**

**Proposed decisions approved by the Open-ended Working  
Group at its fifth session for submission to the Conference of the  
Parties at its eighth meeting**

**Note by the Secretariat**

**Addendum**

**Draft 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)**

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\* Re-issued for technical reasons.

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## Abbreviations and acronyms

DDD	1,1-dichloro-2,2-bis(4-chlorophenyl)ethane
DDE	1,1-dichloro-2,2-bis(4-chlorophenyl)ethene
DDT	1,1,1-trichloro-2,2-bis(4-chlorophenyl)ethane (dichlorodiphenyltrichloroethane)
EPA	Environmental Protection Agency (United States of America)
ESM	environmentally sound management
FAO	Food and Agriculture Organization of the United Nations
GC	gas chromatography
ILO	International Labour Organization
IMO	International Maritime Organization
IOMC	Inter-Organization Programme for the Sound Management of Chemicals
IPCS	International Programme on Chemical Safety
MS	mass spectrometry
NFPA	National Fire Protection Association (United States of America)
OECD	Organisation for Economic Co-operation and Development
PCB	polychlorinated biphenyl
POP	persistent organic pollutant
UNEP	United Nations Environment Programme
WHO	World Health Organization

## Units of measurement

Mg	megagram (1,000 kg or 1 tonne)
mg	milligram
mg/kg	milligram(s) per kilogram. A measure of the concentration of an analyte in a given solid medium. Corresponds to parts per million by weight.
ppm	parts per million

## I. Introduction

### A. Scope

1. The present technical guidelines provide guidance for the environmentally sound management (ESM) of wastes consisting of, containing or contaminated with dichlorodiphenyltrichloroethane (DDT) pursuant to decisions IV/17, V/26, VI/23 and VII/13 of the Conference of the Parties to the Basel Convention on the Control of Transboundary Movement of Hazardous Wastes and Their Disposal; decisions OEWG-I/4, OEWG-II/10, OEWG-III/8, OEWG-IV/11 and OEWG-V/12 of the Open-ended Working Group of the Basel Convention; resolution 5 of the Conference of Plenipotentiaries to the Stockholm Convention on Persistent Organic Pollutants; decisions INC-6/5 and INC-7/6 of the Stockholm Convention Intergovernmental Negotiating Committee for a Legally Binding Instrument for Implementing International Action on Certain Persistent Organic Pollutants and decision SC-1/21 of the Conference of the Parties of the Stockholm Convention.

2. DDT is covered by Annex B of the Stockholm Convention on Persistent Organic Pollutants and is the subject of the present technical guidelines because of its importance for malaria vector control in many tropical countries; all other pesticides listed as POPs in Annex A of the Stockholm Convention are covered separately in the document entitled *“Technical guidelines for the environmentally sound management of wastes consisting of, containing or contaminated with the pesticides aldrin, chlordane, dieldrin, endrin, heptachlor, hexachlorobenzene (HCB), mirex or toxaphene or with HCB as an industrial chemical”* (UNEP, 2006a).

3. The breakdown of DDT typically gives rise to two other substances, 1,1-dichloro-2,2-bis(4-chlorophenyl)ethane (DDD) and 1,1-dichloro-2,2-bis(4-chlorophenyl)ethene (DDE). Those substances are also usually present as impurities in commercial DDT. Their physical and chemical properties are similar to those of DDT and they are even more persistent in the environment than DDT itself. Consequently, most wastes containing or contaminated with DDT are likely also to contain or be contaminated with DDD and DDE. From the point of view of their environmentally sound management and disposal, such wastes should be treated as though the amounts of DDD and DDE were the equivalent amount of DDT.

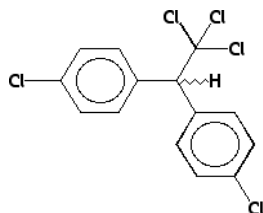
4. The present document should be used in conjunction with the document entitled *“General technical guidelines for environmentally sound management of wastes consisting of, containing or contaminated with persistent organic pollutants”* (“the general technical guidelines”) (UNEP, 2006b). That document provides more detailed information on the nature and occurrence of wastes consisting of, containing or contaminated with DDT for purposes of their identification and management.

### B. Description, production, use and wastes

#### 1. Description

5. The substance DDT (CAS no. 50-29-3) was synthesized by Zeidler in Switzerland for first time in 1874. It does not occur naturally in the environment. Its pesticidal properties were recognized in 1939 by Paul Muller.

6. Pure p,p'-DDT (or 4,4'-DDT) is a colourless crystalline or powder-like substance with a melting point of 108°C and a boiling point of 260°C. It is nearly insoluble in water but soluble in many organic solvents. Because of its lipophilicity ( $\log K_{ow} = 6.36$ ), it concentrates in sediments and shows bioaccumulation (in adipose tissues) and biomagnification. Furthermore, it is a flammable substance (flash point 72–75°C). Technical DDT consists of various isomers with similar properties. If released to the terrestrial compartment, DDT will adsorb very strongly to soil and be subject to evaporation and photooxidation near the surface. It will not hydrolyse and will not significantly biodegrade in most waters. If released to the air it will be subject to direct photodegradation and reaction with photochemically produced hydroxyl radicals. DDT was regarded as an ideal pesticide because it was toxic to a wide range of insects but was relatively harmless to mammals, fish, and plants, particularly when compared to other pesticides in common use at the time, such as lead arsenate. The basic structure of DDT is shown in Figure 1 below.



**Figure 1.** The structure of DDT

## 2. Production

7. The early popularity of DDT was due to its reasonable cost, effectiveness, persistence and versatility. In the United States of America during the 30 years before its use was banned, a total of approximately 613,000 Mg of DDT was used domestically. After 1959, DDT usage declined greatly, dropping from a peak of approximately 36,000 Mg in that year to just under 5,500 Mg in the early 1970s. The decline in DDT usage was attributable to increased insect resistance; the development of more effective alternative pesticides; growing public concern over adverse environmental side effects; and increasing government restrictions on its use. In addition to domestic consumption, large quantities of DDT were purchased by the United States Agency for International Development and by the United Nations and exported for malaria control. DDT exports increased from 12 per cent of the total production in 1950 to 67 per cent in 1969. However, exports showed a marked decline, from approximately 32,000 Mg in 1970 to 16,000 Mg in 1972 (EPA, 1975).

8. DDT is also produced for use as a chemical intermediate in the production of the pesticide dicofol (2,2,2-trichloro-1,1-bis(4-chlorophenyl)ethanol, CAS no. 115-32-2). Information on production processes and volumes is given in the provisional table for listing notifications of production and use of closed-system site-limited intermediates pursuant to note (iii) of Annex A and note (iii) of Annex B of the Stockholm Convention posted at [www.pops.int/documents/registers/closedsys.htm](http://www.pops.int/documents/registers/closedsys.htm).

9. Information on current use of DDT is provided in the DDT register posted on the Stockholm Convention website at [www.pops.int/documents/registers/ddt.htm](http://www.pops.int/documents/registers/ddt.htm). Further information on past production of DDT can be found in the national implementation plans posted at [www.pops.int/documents/implementation/nips/submissions/default.htm](http://www.pops.int/documents/implementation/nips/submissions/default.htm).

10. Common trade names of DDT products include those listed below (see annex I for a more detailed list of DDT trade names and synonyms and section D of chapter IV below for considerations regarding precautions to take when using trade names in inventory exercises):

Agritan  
Anofex  
Arkotine  
Azotox  
Bosan supra  
Bovidermol  
Chlorophenothane  
Dedelo  
Deoval

## 3. Use

11. DDT was the first of the chlorinated organic insecticides to come into wide commercial use, during the Second World War, as a pesticide against mosquitoes for the prevention of malaria and yellow fever and also for the control of tsetse flies (TOMES Plus® System from Thomson MICROMEDEX). It was also used as an insecticide on crops, including tobacco and cotton.

12. DDT was banned by most developed countries during the 1970s because of its damaging effects on the environment and human health. DDT is still used today, however, under restrictions, for vector control to prevent malaria transmission and for controlling epidemics in some countries.

## 4. Wastes

13. Obsolete pesticide stocks consisting of or containing DDT are present in most developing countries and countries with economies in transition (FAO, 2001). Quantities range from a few tonnes to several thousands of tonnes. In addition, there are large quantities of heavily contaminated soil and

sediments, together with contaminated production facilities and many contaminated empty containers and other used packing materials which must be regarded as hazardous waste. In many cases, the contaminated soil, sediments, production facilities, empty containers and other used packing materials must be treated in the same manner as the obsolete pesticides. Countries in the migratory locust zone, agricultural countries and countries where DDT is or was manufactured often still have large quantities of DDT-containing compounds left over from old strategic stocks for locust control, from former agricultural uses and from previous production. New data on obsolete pesticide stocks containing DDT can be obtained from the national implementation plans prepared under the Stockholm Convention and their associated POPs inventories (see [www.pops.int/documents/implementation/nips/submissions/default.htm](http://www.pops.int/documents/implementation/nips/submissions/default.htm)). Additional information on obsolete pesticide stocks containing DDT will be provided through the African Stockpile Project for pesticide disposal.

14. Wastes consisting of, containing or contaminated with DDT are found in a number of physical forms, including:

- (a) Obsolete stocks of DDT in original packages which are no longer usable because their shelf life has been exceeded or the packaging has deteriorated;
- (b) Liquid technical-grade DDT diluted with solvents such as gas oil;
- (c) Solid technical-grade DDT diluted with inert materials;
- (d) Demolition wastes such as storage walls and slabs, foundations, beams and so forth;
- (e) Equipment such as shelves, spray pumps, hoses, personal protective materials, vehicles and storage tanks;
- (f) Packaging materials such as drums, bags, bottles and gas cylinders;
- (g) Soil, sediment, sewage sludge and water;
- (h) Spent treatment media such as activated carbon;
- (i) Foodstuffs and animal feeds.

## **II. Relevant provisions of the Basel and Stockholm Conventions**

### **A. Basel Convention**

15. Article 1 ("Scope of the Convention") defines the waste types subject to the Basel Convention. Subparagraph 1 (a) of that Article sets forth a two-step process for determining whether a "waste" is a "hazardous waste" subject to the Convention: first, the waste must belong to any category contained in Annex I to the Convention ("Categories of Wastes to be Controlled"), and second, the waste must possess at least one of the characteristics listed in Annex III to the Convention ("List of Hazardous Characteristics").

16. Annex I lists some of the wastes which may consist of, contain or be contaminated with DDT. These include:

- Y4 Wastes from the production, formulation and use of biocides and phytopharmaceuticals
- Y18 Residues arising from industrial waste disposal operations
- Y45 Organohalogen compounds other than substances referred to in this Annex (e.g., Y39, Y41, Y42, Y43, Y44)

17. Annex I wastes are presumed to exhibit an Annex III hazardous characteristic such as H11 "Toxic (Delayed or Chronic)", H12 "Ecotoxic", H3 "Flammable liquids" or H 4.1 "Flammable solids" unless, through "national tests", they can be shown to not exhibit such characteristics. National tests may be useful for identifying a particular hazardous characteristic listed in Annex III until such time as the hazardous characteristic is fully defined. Guidance papers for each Annex III hazardous characteristic are currently being developed under the Basel Convention.

18. List A of Annex VIII of the Convention describes wastes that are "characterized as hazardous under Article 1 paragraph 1 (a) of this Convention" although "Designation of a waste on Annex VIII does not preclude the use of Annex III (hazard characteristics) to demonstrate that a waste is not hazardous" (Annex I, paragraph (b)). List B of Annex IX lists wastes which "will not be wastes covered by Article 1, paragraph 1 (a), of this Convention unless they contain Annex I material to an extent

causing them to exhibit an Annex III characteristic”. The following Annex VIII waste categories in particular are applicable to DDT:

- A4030 Wastes from the production, formulation and use of biocides and phytopharmaceuticals, including waste pesticides and herbicides which are off-specification, outdated,<sup>1</sup> or unfit for their originally intended use
- A4100 Wastes from industrial pollution control devices for cleaning of industrial off-gases but excluding such wastes specified on list B
- A4130 Waste packages and containers containing Annex I substances in concentrations sufficient to exhibit Annex III hazard characteristics.
- A4140 Wastes consisting of or containing off-specification or outdated<sup>2</sup> chemicals corresponding to Annex I categories and exhibiting Annex III hazard characteristics
- A4160 Spent activated carbon not included on list B (note the related entry on list B B2060)

19. For further information, see section II.A of the general technical guidelines.

## B. Stockholm Convention

20. The Stockholm Convention addresses DDT in its Article 3 (“Measures to reduce or eliminate releases from intentional production and use”), Article 4 (“Register of specific exemptions”) and Annex B (“Restriction”).

21. With respect to the production and use of DDT, the Stockholm Convention differentiates between the acceptable purpose of production and use, which is for disease vector control in accordance with Part II of Annex B of the Convention, and the specific exemption for production and use, which is production of dicofol and intermediate.

22. Part I of Annex B sets forth specific requirements with respect to DDT, as follows:

Chemical	Activity	Acceptable purpose or specific exemption
DDT (1,1,1-trichlor-2,2-bis(4-chlorophenyl)ethane) (CAS No.: 50-29-3)	Production	<u>Acceptable purpose:</u> Disease vector control use in accordance with Part II of this Annex <u>Specific exemption:</u> Intermediate in production of dicofol Intermediate
	Use	<u>Acceptable purpose:</u> Disease vector control in accordance with Part II of this Annex. <u>Specific exemption:</u> Production of dicofol Intermediate

Notes:

- (i) Except as otherwise specified in this Convention, quantities of a chemical occurring as unintentional trace contaminants in products and articles shall not be considered to be listed in this Annex;
- (ii) This note shall not be considered as a production and use acceptable purpose or specific exemption for purposes of paragraph 2 of Article 3. Quantities of a chemical occurring as constituents of articles manufactured or already in use before or on the date of entry into force of the relevant obligation with respect to that chemical, shall not be considered as listed in this Annex, provided that a Party has notified the Secretariat that a particular type of article remains in use within that Party. The Secretariat shall make such notifications publicly available;
- (iii) This note shall not be considered as a production and use specific exemption for purposes of paragraph 2 of Article 3. Given that no significant quantities of the chemical

<sup>1</sup> “Outdated” means unused within the period recommended by the manufacturer.

<sup>2</sup> Ibid.

are expected to reach humans and the environment during the production and use of a closed-system site-limited intermediate, a Party, upon notification to the Secretariat, may allow the production and use of quantities of a chemical listed in this Annex as a closed-system site-limited intermediate that is chemically transformed in the manufacture of other chemicals that, taking into consideration the criteria in paragraph 1 of Annex D, do not exhibit the characteristics of persistent organic pollutants. This notification shall include information on total production and use of such chemical or a reasonable estimate of such information and information regarding the nature of the closed-system site-limited process including the amount of any non-transformed and unintentional trace contamination of the persistent organic pollutant-starting material in the final product. This procedure applies except as otherwise specified in this Annex. The Secretariat shall make such notifications available to the Conference of the Parties and to the public. Such production or use shall not be considered a production or use specific exemption. Such production and use shall cease after a ten year period, unless the Party concerned submits a new notification to the Secretariat, in which case the period will be extended for an additional ten years unless the Conference of the Parties, after a review of the production and use decides otherwise. The notification procedure can be repeated;

- (iv) All the specific exemptions in this Annex may be exercised by Parties that have registered in respect of them in accordance with Article 4.

23. Part II of Annex B (“DDT (1,1,1-trichloro-2,2-bis(4-chlorophenyl)ethane)”), sets forth specific restrictions with respect to DDT, as follows:

“1. The production and use of DDT shall be eliminated except for Parties that have notified the Secretariat of their intention to produce and/or use it. A DDT Register is hereby established and shall be available to the public. The Secretariat shall maintain the DDT Register.

2. Each Party that produces and/or uses DDT shall restrict 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.

3. In the event that a Party not listed in the DDT Register determines that it requires DDT for disease vector control, it shall notify the Secretariat as soon as possible in order to have its name added forthwith to the DDT Register. It shall at the same time notify the World Health Organization.

4. Every three years, each Party that uses DDT shall provide to the Secretariat and the World Health Organization information on the amount used, the conditions of such use and its relevance to that Party’s disease management strategy, in a format to be decided by the Conference of the Parties in consultation with the World Health Organization.

5. With the goal of reducing and ultimately eliminating the use of DDT, the Conference of the Parties shall encourage:

(a) Each Party using DDT to develop and implement an action plan as part of the implementation plan specified in Article 7. That action plan shall include:

- (i) Development of regulatory and other mechanisms to ensure that DDT use is restricted to disease vector control;
- (ii) Implementation of suitable alternative products, methods and strategies, including resistance management strategies to ensure the continuing effectiveness of these alternatives;
- (iii) Measures to strengthen health care and to reduce the incidence of the disease.

(b) The Parties, within their capabilities, to promote research and development of safe alternative chemical and non-chemical products, methods and strategies for Parties using DDT, relevant to the conditions of those countries and with the goal of decreasing the human and economic burden of disease. Factors to be promoted when considering alternatives or combinations of alternatives shall include the human health risks and environmental implications of such alternatives. Viable alternatives to DDT shall pose less risk to human health and the environment, be suitable for disease control based on conditions in the Parties in question and be supported with monitoring data.



6. Commencing at its first meeting, and at least every three years thereafter, the Conference of the Parties shall, in consultation with the World Health Organization, evaluate the continued need for DDT for disease vector control on the basis of available scientific, technical, environmental and economic information, including:

- (a) The production and use of DDT and the conditions set out in paragraph 2;
- (b) The availability, suitability and implementation of the alternatives to DDT;
- (c) Progress in strengthening the capacity of countries to transfer safely to reliance on such alternatives.

7. A Party may, at any time, withdraw its name from the DDT Registry upon written notification to the Secretariat. The withdrawal shall take effect on the date specified in the notification.”

24. Further information on the DDT register is available at [www.pops.int/documents/registers/ddt.htm](http://www.pops.int/documents/registers/ddt.htm).

25. For further general information, see section II.B of the general technical guidelines.

### **III. Issues under the Stockholm Convention to be addressed cooperatively with the Basel Convention**

#### **A. Low POP content**

26. The provisional definition of low POP content for DDT is 50 mg/kg. For further information, see section III.A of the general technical guidelines.

#### **B. Levels of destruction and irreversible transformation**

27. For the provisional definition of levels of destruction and irreversible transformation, see section III.B of the general technical guidelines.

#### **C. Methods which constitute environmentally sound disposal**

28. See section IV.G of the general technical guidelines.

### **IV. Guidance on environmentally sound management (ESM)**

#### **A. General considerations: Basel and Stockholm conventions and Organisation for Economic Co-operation and Development**

##### **1. Basel Convention**

29. One of the principal vehicles for the promotion of ESM is the preparation and dissemination of technical guidelines such as the present document and the general technical guidelines. For further information see subsection IV.A.1 of the general technical guidelines.

##### **2. Stockholm Convention**

30. The term “environmentally sound management” is not defined in the Stockholm Convention. Environmentally sound methods for disposal of wastes consisting of, containing or contaminated with DDT are, however, to be determined by the Conference of the Parties in cooperation with the appropriate bodies of the Basel Convention.

31. Parties should consult *Interim guidance for developing a national implementation plan for the Stockholm Convention* (UNEP, 2003).

##### **3. Organisation for Economic Co-operation and Development**

32. For information regarding the Organisation for Economic Co-operation and Development and ESM, see subsection IV.A.3 of the general technical guidelines.

## B. Legislative and regulatory framework

33. Parties to the Basel and Stockholm conventions should examine national controls, standards and procedures to ensure that they are in keeping with the conventions and with their obligations under them, including those which pertain to ESM of wastes consisting of, containing or contaminated with DDT.

34. Elements of a regulatory framework applicable to DDT could also include the following:

- (a) Environmental protection legislation establishing a regulatory regime and setting release limits;
- (b) Restrictions on the production and use of DDT for disease vector control and use only in accordance with World Health Organization (WHO) recommendations and guidelines;
- (c) Prohibitions or restrictions on the manufacture, sale, import and export (for use) of DDT;
- (d) Phase-out dates for DDT in inventory or storage;
- (e) Transportation requirements for hazardous materials and waste;
- (f) Specifications for containers, equipment, bulk containers and storage sites;
- (g) Specification of acceptable analytical methods for DDT;
- (h) Requirements for waste management and disposal facilities;
- (i) A general requirement for public notification and review of proposed government regulations, policy, certificates of approval, licences, inventory information and national emissions data;
- (j) Requirements for identification and remediation of contaminated sites;
- (k) Requirements for health and safety of workers;
- (l) Other potential legislative controls, as for waste prevention and minimization, inventory development and emergency response.

35. The restriction on production and use and, eventually, the timing of the DDT phase-out will probably be the most critical legislative concern for most countries, although most already have some form of legislative framework covering DDT.

36. For further information, see section IV.B of the general technical guidelines.

## C. Waste prevention and minimization

37. Both the Basel and Stockholm Conventions advocate waste prevention and minimization, while DDT is targeted in the Stockholm Convention for restriction in production and use or complete phase-out. The issue of waste prevention and minimization is being considered by the Stockholm Convention Expert Group on Best Available Techniques and Best Environmental Practices; in that connection, see also the draft *Guidelines on best available techniques and provisional guidance on best environmental practices relevant to Article 5 and Annex C of the Stockholm Convention on Persistent Organic Pollutants* (UNEP, 2004). A final text of the guidelines is expected to be adopted by the Conference of the Parties of the Stockholm Convention in mid-2007.

38. Quantities of waste containing DDT should be minimized through isolation and source separation to prevent mixing with and contamination of other waste streams. It should be borne in mind that obsolete DDT poorly packaged in warehouses can contaminate large amounts of soil and water.

39. Mixing of wastes with DDT content above a defined low POP content with another material solely for the purpose of generating a mixture with a POP content below the defined low POP content is not environmentally sound. Nevertheless, mixing of materials before waste treatment may be necessary in order to optimize treatment efficiencies.

40. In particular, Parties with ongoing production or use of DDT should consider the following actions, as appropriate:

- (a) Process modifications in the synthesis or formulation of dicofol pesticides with a view to reducing DDT impurities;
- (b) Maintenance of equipment so as to prevent spills and leaks;

(c) Training in the correct use of DDT and in ways to minimize waste production during use, handling, transport and storage;

(d) Development of waste management plans which could include decontamination of containers and equipment containing DDT. Logically, such plans should cover all toxic and hazardous wastes, with POPs wastes, including DDT, taken into consideration as one component;

(e) Raising awareness amongst workers in particular and the public in general concerning DDT and how they and the environment can be harmed by it.

41. For further information, see paragraph 6 and section IV.C of the general technical guidelines.

## **D. Identification and inventories**

### **1. Identification**

42. DDT and its wastes typically occur in the following forms and places:

- (a) In residues from DDT production and at sites where it was produced and formulated;
- (b) In government storage under health and agriculture ministries;
- (c) In storage facilities at farms, stables and other livestock facilities;
- (d) In homes (domestic storage), outlets for drugs and pesticides, shopping centres, schools, hospitals, industrial facilities, office and apartment buildings and so on;
- (e) In contaminated materials including protective clothing, application equipment and accessories, empty packaging materials, containers, floors, walls, windows and mosquito nets;
- (f) At dumpsites and in landfills;
- (g) In soils, sediment and sewage sludge and in water which has been contaminated by spills;
- (h) In commercial products containing DDT such as paints, household insect sprays and mosquito coils;
- (i) In residues from dicofol production and at sites where it is or was produced and formulated.

43. It should be noted that even experienced technical persons may not be able to determine the nature of an effluent, substance, container or piece of equipment by its appearance or markings. It is very probable that obsolete DDT containers were not properly labelled. Experienced inspectors may be able to determine the original contents from other information using guidance manuals issued by various organizations or by contacting the manufacturer. Critical aspects of waste identification require knowledge of products or articles consisting of, containing or contaminated with DDT, including their manufacturers, trade names and synonyms, dates of manufacture, the applications to which they were put, the manner in which they were used and the sector which used them.

44. The information on production, use and waste types provided in section I.B of the present document may be found useful in identifying DDT.

45. For further information, see subsection IV.D.1 of the general technical guidelines.

### **2. Inventories**

46. A complete inventory of DDT may be very difficult to compile, mainly because of the dispersed nature of the uses and storage of the chemical over broad rural and urban areas. In that connection, national and local governments responsible for pesticides and pesticide wastes may be able to provide valuable assistance. In developing a complete inventory, it should be borne in mind that the security of the inventoried site should match the effort put into carrying out the inventory itself. If the inventory is detailed, then the inventoried stock should be secured so that only known additions to or removals from the stock occur and so that contamination of or mixing with other materials is prevented. Consequently, an inventory should also provide a summary of categories of possible destination for the inventoried DDT (see UNEP, 2001).

47. In the case of DDT, an additional use of an inventory may be to determine which products, articles and wastes consisting of, containing or contaminated with DDT are obsolete and which may still be usable.

48. For further information, see subsection IV.D.2 of the general technical guidelines. It is advisable also to refer to the FAO pesticide storage and stock control manual (FAO, 1996) and the FAO provisional guidelines on prevention of accumulation of obsolete pesticide stocks (FAO, 1995).

## **E. Sampling, analysis and monitoring**

49. For general information, see section IV.E. of the general technical guidelines.

### **1. Sampling**

50. The types of matrix which are of special interest for sampling and analysis of DDT include consumer goods impregnated with DDT such as mosquito coils, bed nets and so on, and indoor air in homes to determine the exposure of the general population, in contrast to workplace monitoring.

51. For further information on sampling, see subsection IV.E.1 of the general technical guidelines.

### **2. Analysis**

52. For information on analysis, see subsection IV.E.2 of the general technical guidelines.

### **3. Monitoring**

53. Monitoring programmes should be implemented for facilities managing wastes consisting of, containing or contaminated with DDT. For further information see subsection IV.E.3 of the general technical guidelines.

## **F. Handling, collection, packaging, labelling, transportation and storage**

54. For general information on handling, collection, packaging, labelling, transportation and storage, see the first two paragraphs of section IV.F of the general technical guidelines.

### **1. Handling**

55. The main concerns when handling wastes consisting of, containing or contaminated with DDT are human exposure, accidental release to the environment, unwanted release during DDT production and contamination of other waste streams with DDT. Such wastes should be handled separately from other waste types to prevent contamination of other waste streams. Recommended practices towards that end include:

- (a) Inspecting containers and other packing materials for leaks, holes, rust, high temperature (resulting from chemical reactions), and appropriate repackaging and relabelling as necessary;
  - (b) Handling wastes at temperatures below 25°C, if possible, because of the increased volatility at higher temperatures, and also the flammability;
  - (c) Ensuring that spill containment measures are in good condition and adequate to contain liquid wastes if spilled, i.e., the total volume plus 10 per cent;
  - (d) Placing plastic sheeting or absorbent mats under containers before opening them if the surface of the containment area is not coated with a smooth surface material (paint, urethane or epoxy);
  - (e) Removing liquid wastes either by removing the drain plug or by pumping with a peristaltic pump and suitable chemical-resistant tubing;
  - (f) Using dedicated pumps, tubing and drums, not used for any other purpose, to transfer liquid wastes;
  - (g) Cleaning up any spills with cloths, paper towels or absorbent;
  - (h) Triple rinsing of contaminated surfaces with a solvent such as kerosene to remove all residual DDT;
  - (i) Treating all absorbents and solvents from triple rinsing, disposable protective clothing and plastic sheeting as wastes consisting of, containing or contaminated with DDT when appropriate.
56. Staff should be trained in the correct methods of handling hazardous wastes.

## 2. Collection

57. A significant fraction of total national inventories of DDT may be held in small quantities by small farms, business owners and homeowners (e.g., commercial-sized DDT containers, small containers of pure products and small stockpiles). It is difficult for small-quantity owners to dispose of those materials. For example, the regulatory situation may require that they must be a registered waste generator, logistical considerations may prevent or discourage pick-up (e.g., no industrial waste pick-up allowed or available in a rural location or residential neighbourhood), and costs may be prohibitive. National, regional and municipal governments should consider establishing collection stations in rural and urban areas for those small quantities so that each small-quantity owner does not have to make individual transport and disposal arrangements.

58. Collection and collection depots for wastes consisting of, containing or contaminated with DDT should ensure that such wastes are handled and stored separately from all other wastes.

59. It is imperative that collection depots do not become long-term storage facilities for wastes consisting of, containing or contaminated with DDT.

60. For further information, see subsection IV.F.2 of the general technical guidelines.

## 3. Packaging

61. Wastes consisting of, containing or contaminated with DDT should be properly packaged before storage or transport:

(a) Liquid wastes should be placed in double-bung steel drums or other approved containers;

(b) Regulations governing transport often specify containers of a certain quality (e.g., 16-gauge steel coated on the inside with epoxy); consequently, containers used for storage should meet transport requirements given that they may be transported in the future;

(c) Drums and equipment may be placed on pallets for movement by forklift truck and for storage. Drums and equipment should be strapped to the pallets before they are moved.

62. Bulk quantities of pesticides are commonly supplied in 200-litre metal drums. For countries without good repackaging facilities this may create problems if the DDT is intended for use by plant protection staff, extension staff or small-scale farmers. To transfer the contents of large drums into smaller packages, large numbers of small empty containers, a pump, labels and so on are needed. These are often not available at the repackaging location or are not available in sufficient quantities. Consequently, DDT may remain unused or improvised measures may be taken which are dangerous to handlers or users.

63. DDT may sometimes be delivered in containers of poor durability which soon start leaking. Once drums have corroded or leak, they can no longer be transported, which makes it considerably more difficult to use their contents. The same applies to torn bags and other damaged packaging. If the container quality is not specified in tender documents, bidders may be tempted to reduce their price by compromising on the quality of containers.

64. Adequate precautions should be taken to ensure that pesticide containers cannot be used for other purposes, particularly the storage of food or water for human or animal consumption.

65. For further information, see subsection IV.F.3 of the general technical guidelines.

## 4. Labelling

66. All containers containing DDT should be clearly labelled with both a hazard warning label and a label which gives the details of the container and a serial number. The details should include the contents of the container (exact counts of volume and weight), the type of waste, the trade name, the name of the active ingredient (including percentage), the name of the original manufacturer, the name of the site from which it originated so as to allow traceability, the date of repackaging and the name and telephone number of the responsible person during the repackaging operation. Each new package should bear identification labels as specified in the FAO training manual for inventory taking of obsolete pesticides (FAO, 2001). Additional and separate labels are required for materials classified as marine pollutants.

67. For further information, see subsection IV.F.4 of the general technical guidelines.

**5. Transportation**

68. For information, see subsection IV.F.5 of the general technical guidelines.

**6. Storage**

69. Whereas many countries have adopted storage regulations or developed storage guidelines concerning hazardous materials and waste, most do not have specific storage regulations or guidance concerning DDT. Nevertheless, it can be assumed that storage procedures should be similar. Although the recommended practice varies somewhat from country to country, there are many common elements to safe storage of these wastes.

70. For further information, see subsection IV.F.6 of the general technical guidelines.

**G. Environmentally sound disposal****1. Pre-treatment**

71. For information, see subsection IV.G.1 of the general technical guidelines.

**2. Destruction and irreversible transformation methods**

72. For information, see subsection IV.G.2 of the general technical guidelines.

**3. Other disposal methods when neither destruction nor irreversible transformation is the environmentally preferable option**

73. For information, see subsection IV.G.3 of the general technical guidelines.

**4. Other disposal methods when the POP content is low**

74. For information, see subsection IV.G.4 of the general technical guidelines.

**H. Remediation of contaminated sites**

75. For information, see section IV.H of the general technical guidelines.

**I. Health and safety**

76. For further information, including on the distinction between higher- and lower-risk situations, see section IV.I of the general technical guidelines.

**1. Higher-risk situations**

77. For information on higher-risk situations, see subsection IV.I.1 of the general technical guidelines. Potential higher-risk situations specific to DDT may include the health sectors and approved use for vector control.

**2. Lower-risk situations**

78. For information on lower-risk situations, see subsection IV.I.2 of the general technical guidelines. Lower-risk situations specific to DDT may include:

- (a) Exposure to consumer goods containing DDT such as mosquito coils and impregnated bed nets;
- (b) Sites producing, handling or using DDT, including dicofol sites.

**J. Emergency response**

79. Emergency response plans should be in place for DDT, in storage, in transport and at disposal sites. Further information on emergency response plans is given in section IV.J of the general technical guidelines.

**K. Public participation**

80. Parties to the Basel and Stockholm Conventions should have an open public participation process. For further information see section IV.K of the general technical guidelines.

## Annex I

## Synonyms and trade names for DDT

Chemical	Some synonyms and trade names <sup>3</sup>
DDT CAS-No: 50-29-3	Aerosol DDT, Aerosol DL, Agritan, Anofex, Antrix, Arkotine, Azotox, benzene,1,1'-(2,2,2-trichloroethylidene)bis(4-chloro-alpha, alpha-bis(p-chlorophenyl)-beta,beta,beta-trichlorethane, Bercema-Aero-Super, Bercema-Spritz-Aktiv, Bercema-Bekusal, Bosan Supra, Bovidermol, chlorophenothan, chlorophenothanes, chloro phenothan, chlorophenothane, chlorophenotoxum, Citox, Clofenotane, Cyklodyn, p,p'-DDT, Dedelo, Deoval, Detox, Detoxan, Dibovan, Dibovin, dichlorodiphenyltrichloroethane, p,p'-dichlorodiphenyltrichloroethane, 4,4'-dichlorodiphenyltrichloroethane, Dicophane, Didigam, Didimac, Diphenyltrichloroethane, Dodat, Duaryl, Dykol, Dynocid, Dynol, Estonate, Gamadyn, Genitox, Gesafid, Gesapon, Gesarex, Gesarol, Guesapon, Guesarol, Gyron, Haverro-extra, Hildit, Holus, Hylotox 59, Ipsotox, Ipsotox Special, Ivoran, Ixodex, Kopsol, Lidykol, Meryl N, Micro DDT 75, Mutoxin, Nera-emulze, Nerafum, Neracaine (Nerakain), Neratidine (Neratidin), Neocid, OMS 16, Parachlorocidum, Pararyl, Pentachlorin, Pentalidol, Pentech, Pilusan, Ppzeidan, p,p'-dichlorodiphenyltrichlormethylmethane, R50, Rukseam, Santobane, Solomitol, Tech DDT, Trichlorobis(4-chlorophenyl)ethane, 1,1,1-Trichloro-2,2-bis(p-chlorophenyl)ethane, 1,1,1-trichloro-2,2-di(4-chlorophenyl) ethane, 1,1'-(2,2,2-trichloroethylidene)bis(4-chlorobenzene), 1,1-bis-(p-chlorophenyl)-2,2,2-trichloroethane, 2,2-bis(p-chlorophenyl)-1,1,1-trichloroethane, 4,4'-dichlorodiphenyltrichloroethane, Tridynol Zeidane, Zerdane

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<sup>3</sup>

The list of trade names is not intended to be exhaustive.



## Annex II

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