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**Conference of the Parties of the Stockholm
Convention on Persistent Organic Pollutants
First meeting**
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Item 6 (a) (i) of the provisional agenda*

**Matters for consideration or action by the
Conference of the Parties: measures to reduce
or eliminate releases from intentional production and use: DDT****

**Evaluation of the continued need for DDT for disease vector
control**

Note by the Secretariat

1. Paragraph 6 of part II of Annex B of the Stockholm Convention on Persistent Organic Pollutants states:

“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 [of part II of Annex B];
- (b) The availability, suitability and implementation of the alternatives to DDT; and
- (c) Progress in strengthening the capacity of countries to transfer safely to reliance on such alternatives.”

2. At its sixth session, the Intergovernmental Negotiating Committee for an International Instrument for Implementing International Action on Certain Persistent Organic Pollutants, in its

* UNEP/POPS/COP.1/1.

** Stockholm Convention, Article 3 and Annex B, part II; Report of the Intergovernmental Negotiating Committee for an International Legally Binding Instrument for Implementing International Action on Certain Persistent Organic Pollutants on the work of its sixth session (UNEP/POPS/INC.6/22), annex I; decision INC-6/2; Report of the Intergovernmental Negotiating Committee on the work of its seventh session (UNEP/POPS/INC.7/28), annex I, decision INC-7/2.

decision INC-6/2, requested the Secretariat, in cooperation with the World Health Organization, to develop a report on guidance and information needed to assist the Conference of the Parties in evaluating the continued need for DDT for disease vector control, as required under paragraph 6 of part II of Annex B of the Convention.

3. The Secretariat, in cooperation with the World Health Organization, identified for consideration by the Intergovernmental Negotiating Committee at its seventh session a possible initial list of information items needed to assist the Conference of the Parties in evaluating the continued need for DDT for disease vector control. This list is set out in annex I to the present note. In paragraph 1 of its decision INC-7/2, the Intergovernmental Negotiating Committee decided to submit the list to the Conference of Parties for possible consideration at its first meeting.

4. In paragraph 3 of decision INC-7/2, the Intergovernmental Negotiating Committee requested the Secretariat, in cooperation with the World Health Organization, to develop a modified format for reporting by Parties that use DDT for disease vector control and a questionnaire for reporting on other information relevant to the evaluation of the continued need for disease vector control pursuant to paragraph 6 of part II of Annex B of the Convention. The format and questionnaire are presented for consideration and possible adoption by the Conference of the Parties at its first meeting in document UNEP/POPS/COP.1/3.

5. In paragraph 4 of decision INC-7/2, the Intergovernmental Negotiating Committee invited "Parties that use, produce, import, export and/or maintain stocks of DDT to provide information on such activities using the draft format and questionnaire [prepared by the Secretariat] to the Secretariat not later than six months before the first meeting of the Conference of Parties." In paragraph 5 of the decision, the Intergovernmental Negotiating Committee requested the Secretariat to collect the information reported by the Parties "and other relevant information and to prepare a report to assist the Conference of Parties in evaluating at its first meeting the continued need for DDT for disease vector control".

6. In response to the above request, the Secretariat and World Health Organization circulated the format and questionnaire included in annex III of document UNEP/POPS/COP.1/3 to Stockholm Convention focal points, UNEP official contact points and national ministries of health on 26 August 2004 and requested countries that produce, use or maintain stocks of DDT for disease vector control to complete the format and questionnaire and return it to the Secretariat by 22 October 2004. The Secretariat received sixteen responses in response to the request. They are summarized together with other relevant information available in document UNEP/POPS/COP.1/INF/5.

7. These responses and other relevant information were considered by an expert group convened by the Secretariat and the World Health Organization from 22 to 24 November 2004 in Geneva, Switzerland, in their preparation of a report to the Conference of Parties to assist it in evaluating the continued need for DDT for disease vector control. This report is included in annex II to the present note.

Possible Action by the Conference of Parties

8. The Committee may wish to:

(a) Consider and adopt, with any amendments, the proposed list set out in annex I to the present note of information items needed for the evaluation of the continued need for DDT for disease vector control as required under paragraph 6 of part II of annex B of the Convention;

(b) Note the report of the expert group contained in annex II to the present note, including the conclusions and recommendations contained therein, and based on those:

- (i) Conclude that countries that are currently using DDT to may need to continue such use until locally appropriate and cost effective alternatives are available for sustainable transition away from DDT;
- (ii) Conclude that sufficient capacity at the national and subnational levels is necessary for effective implementation, monitoring and impact evaluation (including associated data management) of the use of DDT and its alternatives in disease vector control and recommend that the financial mechanism of the Convention support activities to build or strengthen such capacity;
- (iii) Request the Secretariat, in cooperation with the World Health Organization, to further elaborate the reporting and evaluation process on DDT, as envisaged in

the first recommendation of the expert group report on DDT (see paragraph 8.1 of the report contained in annex II to the present note), and to prepare cost estimates on such a process for the consideration by the Conference of the Parties at its second meeting;

- (iv) Consider the work plans outlined in annex III to the present note on immediate actions to support the preparations of Parties for reporting on DDT and the review and assessment process required for future evaluations of the continued need for DDT;
 - (v) Encourage Parties that produce or use DDT for disease vector control to fulfil their obligation under part II of Annex B of the Convention to notify the Secretariat of such production or use;
 - (vi) Recommend that the financial mechanism of the Convention and international financial institutions support ongoing processes to develop global partnerships on long-term strategies for developing new cost-effective alternatives to DDT, particularly the development of insecticide replacement for DDT for indoor residual spraying, as well as the development of long lasting insecticide treated materials;
 - (vii) Request the Secretariat to work closely with the World Health Organization on ongoing efforts to provide global leadership for strategic partnerships referred to under (vi) above;
- (c) Invite the World Health Organization to participate actively in the work referred to above and in any other manner that may support the Conference of the Parties in future evaluations of the continued need for DDT for disease vector control.

Annex I

Possible initial list of information items needed to assist the Conference of the Parties in evaluating the continued need for DDT for disease vector control

<p>A Production and Use of DDT</p> <ol style="list-style-type: none"> 1. Availability (source, quality) 2. Efficacy (entomological, including susceptibility and resistance management, epidemiological) 3. Acceptability 4. Annual use for disease control (in kg of active ingredient, by disease and target population) 5. Current stocks, including stock management 6. Human & environmental safety (risk assessment, regulatory measures) 7. Cost analysis
<p>B DDT Alternatives (insecticides, methods & strategies)</p> <p>B 1 Alternative Insecticides including bio-pesticides</p> <ol style="list-style-type: none"> 1. Alternative insecticide and bio-pesticide options in use 2. Availability (source, quality) 3. Efficacy (entomological, including susceptibility & resistance management, epidemiological) 4. Acceptability 5. Annual use for disease control (in kg of active ingredient, by type of application, disease and target population) 6. Current stocks, including stock management 7. Human & environmental safety (risk assessment, regulatory measures) 8. Cost analysis <p>B2 Non-chemical Methods</p> <ol style="list-style-type: none"> 1. Non-chemical options in use 2. Availability (source, quality) 3. Efficacy (entomological, epidemiological) 4. Acceptability 5. Annual use for disease control (by disease and target population) 6. Current stocks, including stock management 7. Human & environmental safety (risk assessment, regulatory measures) 8. Cost analysis <p>B3 Strategies</p> <ol style="list-style-type: none"> 1. Disease management strategies 2. Vector control strategies 3. Resistance management strategies
<p>C Systems Strengthening</p> <ol style="list-style-type: none"> 1. Institutional set-ups 2. Capacity for planning, implementing, monitoring and evaluation (financial, human resources, infrastructure) 3. Capacity for operational research (financial, human resources, infrastructure) 4. Capacity for insecticide management (regulatory: registration & control) 5. Targets and needs for reducing reliance on DDT

Annex II

WHO/SSC meeting of experts for the preparation of a report to assist the Conference of the Parties to the Stockholm Convention in its evaluation of the continued need for DDT in disease vector control 22–24 November 2004; Geneva, Switzerland

Report to the Conference of the Parties to the Stockholm Convention on Persistent Organic Pollutants at its first meeting

1. Background

The Stockholm Convention on Persistent Organic Pollutants (POPs) restricts the production and use of DDT to disease vector control in accordance with World Health Organization (WHO) recommendations and guidelines. The Convention further stipulates that commencing at its first meeting, and at least every three years thereafter, the Conference of Parties (COP), in consultation with WHO, will evaluate the continued need for DDT for disease vector control (Annex B, Part II, Paragraph 6). The Convention requires that each Party that use DDT for disease vector control provides to the Secretariat and the WHO, 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 Parties in consultation with the WHO. (Annex B, Part II, Paragraph 4). At the request of the Sixth and Seventh Sessions of the Intergovernmental Negotiating Committee (INC), a country reporting questionnaire was designed and field-tested, as part of the reporting mechanism being developed under the Convention. The questionnaire has subsequently been used for the first round of reporting by Parties, as requested by INC-7.

An Expert Meeting was subsequently called by WHO and the Secretariat of the Stockholm Convention (SSC), with the overall objective to prepare a report to assist the evaluation of the first meeting of COP, which is scheduled for May 2005. To carry out the objective, the meeting was asked to:

- (i) Undertake a situational analysis on the production and use of DDT, and the conditions for such use, including a review of the responses by countries to the questionnaire.
- (ii) Evaluate the availability, suitability and implementation of alternative products, methods and strategies to DDT.
- (iii) Evaluate progress in strengthening the capacity of countries to transfer safely to reliance on such alternatives, based on a review of the opportunities and needs in countries for sustainable transition.
- (iv) Develop a report with recommendations to the Conference of Parties based on items (i) to (iii)

Additionally, the Meeting made recommendations on the evaluation and reporting mechanisms relating to paragraphs 4 and 6 of Part II of Annex B (i.e. processes, requirement and resources for generating quality advisories to the COP). This was carried out with due consideration of document UNEP/POPS/INC.7/INF/21 regarding the guidance and information needed to assist the Conference of Parties in evaluating continued need for DDT for disease vector control.

Participants attending the Meeting included experts from The Gambia, Morocco, South Africa, and the USA, as well as representatives from WHO, UNEP Chemicals, and the Secretariat of the Stockholm Convention.

2. Review of the information collection process for the first evaluation of the continued need for DDT for disease vector control

2.1 Responses to the questionnaire on DDT and its alternatives

The INC requested at its sixth session in June 2002 that the Secretariat in cooperation with WHO prepare a report on a possible format for the reporting by Parties using DDT for disease vector control.

A proposed format was considered at the 7th session of INC combined with a questionnaire on alternatives. The combined questionnaire was proposed for use by Parties that use, produce, import and/or export DDT to facilitate the evaluation of the continued need for DDT. In its Decision INC7-2 on DDT, the INC requested that:

- the draft format and questionnaire be field-tested in countries that use DDT;
- experts in forms design be consulted regarding how the format and the questionnaire could be modified to be more efficient and effective in collecting the required information;
- a modified format and questionnaire be developed taking into account the results of the field testing and the expert consultation; and
- the modified format and questionnaire be submitted to the first meeting of the Conference of Parties for its consideration and possible adoption, with any amendments.

With the same decision, the INC further invited Parties that use, produce, import, export and/or maintain stocks of DDT, to provide information on such activities using the draft format and questionnaire to the Secretariat not later than 6 months before the first meeting of the Conference of Parties. It requested the Secretariat to collect such information and other relevant information, and to prepare a report to assist the COP in evaluating the continued need for DDT at its first meeting.

Field-testing of the draft format and questionnaire took place with the support of the Regional Offices of WHO. Six countries participated in the field-testing. Subsequently, on 19-20 August 2004, a meeting with experts and representatives from selected countries that took part in the field-testing was subsequently convened jointly by the Secretariat and WHO in Geneva. The meeting reviewed and evaluated the results of the field testing, developed a modified version of the draft format and questionnaire on DDT for consideration by the Conference of Parties at its first meeting in May 2005, and made recommendations on the data collection and review processes required to enable comprehensive assessment in accordance with Paragraph 6 of Part II of Annex B.

Thereafter, the revised questionnaire was sent by the Secretariat to all national Focal Points of the Stockholm Convention, Heads of Delegations to INC7, UNEP Official Contact Points and by WHO to malaria / vector control programmes at the ministries of health in approximately 150 countries. Countries (both Parties and non-Parties) that produce and/or use DDT or maintain stocks of DDT for disease vector control were requested to complete the questionnaire for the reporting period of 2001-2003 and to return it by 22 October 2004.

By 22-24 November 2004 when the Expert Group met, 16 countries had responded to the questionnaire and completed questionnaires from another 4 countries were also available through the field-testing. UNEP/POPS/COP.1/INF/5 provides a summary of the information received together with some of the additional data available to the Secretariat and WHO.

The main reasons for the low response rate may include:

- the need for involving several national agencies and institutions in the completion of the questionnaire;
- insufficient time for coordinating responses from the agencies holding the relevant information ;
- inadequacy of routine reporting procedures of vector control programmes
- the timing of the request (circulation of the questionnaire) was only three months following the entry into force of the Convention: hence reporting structures in most countries will not have been fully developed.

The exchange of information within each country is critical for achieving accurate and comprehensive information on DDT. Therefore, linkages with all relevant entities within each country should be encouraged. The Meeting was aware of countries that were still in the process of completing the questionnaire.

In considering the outcome of the field-testing and revision of the questionnaire, the Expert Group endorsed the initiative to combine information requirements as specified in the Convention (Annex B, Part II, Paragraphs 4 and 6) into one questionnaire for the first reporting period. The group also noted that further simplification and reorganization of the questionnaire should be explored for future reporting periods, to make the reporting flexible and responsive to changing circumstances. It was also

noted that for the purposes of evaluating the continued need for DDT, it will be necessary to use other (active) data collection methods to supplement the information generated by the questionnaires.

It was strongly felt that awareness raising and appropriate training for concerned institutions should be carried out in countries, possibly at regional level, making use of existing regional structures such as the Regional Offices of WHO.

As this is the first report on DDT related issues produced for the COP, it does reflect the development/preparatory phase in which countries presently are with regard to implementing their obligations under the Convention. Future reporting should also provide information on progress made in the implementation of the Convention obligations.

2.2 Sources and Quality of Data

The primary source of data for this evaluation was the questionnaires received from the countries. Country data was derived from both the test phase and final phase of the questionnaires. Additional information was also collected from other sources. Most notable was the knowledge available through various WHO sources, although it is apparent that no single source had all the data and that no combination of different sources provided a complete picture.

Another important source of information used was the DDT Register. Pursuant to paragraph 1 of Part II of Annex B of the Convention, Parties that intend to use and / or produce DDT shall notify the Secretariat thereof and the Secretariat is required to maintain the DDT Register, which is available through the Stockholm Convention Website at <http://www.pops.int/>. By the end of November 2004 only four Parties to the Convention had submitted notifications of intentions to use DDT. This number raises some concern, as there are other Parties to the Convention that are known to use DDT. Information from the DDT Register is also included in the Summary table in Annex 1.

It was also evident that, even in the case where data was available from a specific country from different sources, these data did not always match or correspond, probably as a function of the mode and manner of data collection. In some cases, extrapolations were made from data from periods preceding the coverage of the present overview.

Most countries participating in the field testing had no problems in obtaining the information. However, some questions were left unanswered by some countries, primarily because for those countries the data was not readily available for inclusion in the questionnaire due to information management constraints. While it was not possible to make substantive conclusions on trends in the use of DDT in this first round of reporting because of the short 3-year baseline (2001-2003), significant basic data was derived. It is anticipated that data from future reporting cycles would enable a good tracking of the trends in imports, stocks and use. However, this will require a systematic strengthening of country capacities.

Information (although mostly qualitative) was also available from the experts that were present for this evaluation. When presenting data, an attempt was made to distinguish between data provided by countries, and data sourced from elsewhere.

3. Situation analysis of the production and use of DDT for disease vector control

3.1 Use and Production of DDT in the Current Reporting Period

Due to the low response rate, it was not possible to conclude on the total global production, export/import, use and stocks of DDT. This emphasizes the need for countries to fulfill their reporting obligations under the Convention. Of the responding countries, eight reported use of DDT for disease vector control for the reporting period (2001-2003). Information received is summarized in Document UNEP/POP/COP.1/INF/5. According to the DDT register, three countries have notified use of DDT in disease vector control and one country notified the intention to use DDT if necessary. From other information available to the Secretariat and WHO, the group estimates that in total around 20 countries are still using DDT for disease vector control and five countries have indicated to WHO the likelihood to revert to it if necessary.

None of the countries responding to the questionnaire reported production of DDT. However, most reported importing, while others reported use of existing stocks. From information available to WHO and the Secretariat, it is believed that since 2001, two countries have been producing DDT. There is

anecdotal information that another country may be producing for internal use, however this needs verification.

The diseases targeted in responding countries is mainly malaria and to a lesser extent, leishmaniasis. This corresponds well with information available from WHO.

3.2 Trends in the use of DDT for Disease Vector Control

In recent years a number of countries have successfully curtailed the use of DDT. These include Cape Verde, Thailand, and Solomon Island. Other countries, such as Papua New Guinea and Madagascar have also significantly reduced the annual amounts used. However, all these countries are facing serious challenges in scaling up the use of alternative interventions, and this has the potential to undermine the achievements made so far. On the other hand a number of countries, mostly in Africa, are presently considering the re-introduction of DDT to strengthen malaria control, while others have informed WHO of the intention to do the same. In most cases these possible/intended reversals are being prompted by a diminishing level of effectiveness in alternative options in use or considerations related to cost and efficiency. This reversal has already happened in South Africa, where an unanticipated return of a vector, that has acquired resistance to the alternative insecticide, resulted in outbreaks of malaria, forcing a reintroduction of DDT.

3.3 Efficacy of DDT and related resistance management practices

The efficacy of DDT and its alternatives is important information for deciding the actual need for DDT for disease vector control in any local area. Of the eight countries reporting use of DDT through the questionnaire, three reported data indicating the presence of resistance to DDT.

Insecticide resistance has been commonly recorded in many malaria vector populations throughout the world. Resistance to DDT is also widespread. Two types of resistance to DDT are generally recognized; (i) specific resistance - developed directly in response to the use of DDT, and (ii) cross-resistance (non-specific resistance) - as a result of the development of resistance to other insecticides such as pyrethroids. In relation to the latter, the multi-purpose use of pesticides that are also possible alternatives to DDT for indoor residual spraying, is of great concern because of the increased pressure for the development of resistance in disease vectors. For a majority of malaria endemic regions, the main group of alternative insecticides currently applied for indoor residual spraying are pyrethroids. Unfortunately, this group of insecticides are also heavily relied on in agriculture, animal husbandry, space spraying, and for household pest control. WHO currently recommends 12 insecticides from 4 chemical groups for indoor spraying. Of these, six are pyrethroids, which in terms of resistance, should be considered as a single product, since resistance to one most likely mean resistance to the others.

Implication of vector resistance to insecticides

Insecticide resistance has grave implications for vector control. Growing vector resistance, the lack of introduction of new insecticide products over the past two decades, as well as withdrawals of effective compounds due to cumbersome/non-harmonized registration procedures, means the arsenal of available and effective insecticides has diminished significantly. In areas with DDT resistance, residual spraying programmes can no longer rely on the use this insecticide. Where non-specific resistance develops, it is likely that both DDT and all other pyrethroids could become ineffective for malaria control. In such circumstances, there are only a handful of available alternatives, and for most of these, vector resistance problems are already reported. A viable resistance management strategy is to rotate the use of different effective insecticides. Hence, it may be necessary in the short to medium term, to maintain the use of DDT as an option for rotation with other insecticides, until a suitable alternative is available.

In areas with cross resistance between DDT and pyrethroids, it has been demonstrated that pyrethroid treated nets remain effective in preventing malaria. In such circumstances, the use of insecticide treated nets (ITNs) is a viable alternative to the use of DDT or pyrethroids for indoor residual spraying. The situation could change dramatically should pyrethroid-specific resistance mechanisms appear.

Information available to WHO indicates that countries face significant problems in the monitoring and management of pesticide resistance. In response, WHO has recently produced guidelines for resistance management and these are currently being adapted to region-specific contexts. Additionally, regional networks for resistance monitoring and management have been established, which are supporting the training of national technicians in resistance monitoring. These networks could also be used to complement and validate country information regarding insecticide efficacy.

3.4 Current Management of DDT

From the responses received it was noted that some countries lack appropriate regulatory controls governing the purchase and use of DDT, while others have challenges regarding their enforcement. With the decentralization of the malaria control programmes in countries this issue is of even greater concern than in the past. The Expert Group reaffirmed the urgent need for countries to develop action plans to address this issue in order to ensure that DDT use is restricted to disease vector control, as spelt out in paragraph 5(a) of Part II of Annex B. In this regard, note is taken of regional and sub-regional initiatives to harmonize pesticide registration schemes.

Several countries reporting use of DDT also reported usable stocks of DDT. Some of these stocks were not properly stored (e.g. open shed storage).

A significant finding from the reporting is that both countries using and countries not using DDT, have problems with obsolete stocks of DDT, often mixed with other pesticides. Many of these obsolete stockpiles, some of which date back 25 years, are in poor condition and pose serious environmental threats due to leakage. Urgent repacking and other remedial actions are therefore needed. The Expert Group felt that a regional initiative, such as the African Stockpiles Project, provides a potential opportunity for addressing the problem. Hence, action should be expedited to initiate such programmes in other regions.

3.5 Issues Relating to Human & Environmental Safety

No reports were made regarding major DDT incidents, such as production or road accidents and spills, resulting in human exposures to and/or environmental contamination. While this seems to be good news, it may however be reflecting the deficiency in country reporting systems, as well as a lack of clarity in what qualifies as a pesticide incident. For example, a road accident involving the spilling of pesticides from a vehicle may just be reported as a normal vehicular accident.

4. Availability, costs and efficacy/effectiveness of alternatives, chemical and non-chemical

An alternative to DDT may be broadly defined in two ways. One category of "alternatives" refers to direct replacement or substitute insecticides for indoor residual spraying. WHO currently recommends 12 insecticides from 4 chemical classes for indoor residual spraying. The other category refers to different vector control interventions that can be used either alone or in combination, to reduce or eliminate reliance on DDT. These include, among others, Insecticide treated nets (ITNs), larvicides, and vector source reduction through environmental management.

A number of alternative tools, method and strategies to DDT are currently available and new ones are also under development. The major ones are listed in the following section.

4.1 Existing alternative tools, methods and strategies

- Insecticide treated nets (ITNs) and materials:* if properly implemented and used, ITNs are as effective as residual spraying in preventing malaria and can be deployed in various epidemiological settings. Although ITNs continue to be seen primarily as a tool for personal protection, research has shown, however, that they could be an alternative to indoor residual spraying. The use of ITNs is a method of choice in high malaria transmission areas (*stable malaria* areas), which are characterized by high and year-round malaria transmission, and a relatively high level of immunity in the human population. A major limitation of ITNs has been the need to retreat the nets on a regular basis, and this explains why treatment coverage rates of nets, especially in Africa, have been very low so far (current re-treatment levels are just around 5%). The recent development of long lasting insecticidal nets (LLINs) presents a credible solution to the retreatment difficulties. LLINs are factory-treated to incorporate the insecticide within or bound to the netting fibres and resist multiple washes, thereby remaining effective for the entire lifespan on the net (that is between 4-5 years). This technology prevents the handling of insecticides at the peripheral (end-use) level by non-specialist. It reduces, by at least 5 times, the amount of insecticide needed to treat nets, as well as the amount released in the environment during washing. The LLIN technology has been transferred to Africa (currently Tanzania), as part of strategy to facilitate local production and increase access. Currently an LLIN cost around US\$4 - US\$5. At this price, the net is very cost effective, if the additional cost and difficulties of retreating traditional nets are taken into account. However, a majority of populations at risk of malaria cannot afford the nets at the current prices. The expectation is that the price of the

LLINs will further decline as production increase and demand is created. WHO is promoting the use of country-tailored strategies on subsidies to increase access to the most vulnerable population groups.

Long lasting insecticide treatment technologies are also being used to produce specific insecticide treated materials for personal protection or vector control. These include window and eave curtains, hammocks, tents or plastic sheeting for use in emergency situations (e.g. refugee camps). The insecticide impregnation is done during the manufacture of the materials. While there is growing evidence on the efficacy of these materials, further entomological and disease control trials are currently being conducted to verify their efficacy and operational acceptability. The appropriate use of such materials for housing improvements [especially temporary (slum) and traditional habitats] should provide increased collective protection for inhabitants by reducing indoor transmission of vector borne diseases. It will complement and enhance the impact of the use of ITNs, particularly in areas where indoor biting occurs before people actually go to sleep

- *Environmental management*: This consists of environmental modification, environmental manipulation and measures to reduce human-vector contact. Environmental management is still not used to its full potential. It should be a fundamental part of any integrated vector management approach. Among the reasons why the use of environmental management for vector control continues to lag behind are economic considerations, a lack of capacity to carry out cost-effectiveness analysis, rigidity in the planning and delivery of vector control programmes, absence of effective institutional arrangements between the health sector and sectors in charge of infrastructure development, and limited commercial interest in environmental management (compared to chemical products).

In the urban setting, environmental management is a tool of particular importance. This is true both for the public infrastructure (drains, depressions where water accumulates during the rainy season, broken drinking water supply pipes) and in the private homes (roof top, drinking water tanks, and water collections inside and around the house). In rural settings, a direct link between housing quality and malaria transmission risks has been demonstrated. Methods from before the DDT era (screening of windows, ceiling fans, enforcement of building codes, prevention of water seepage linked to rural water supplies) need to be re-visited, updated and scaled up.

The lack of update guidelines for environmental management features importantly among that the areas that need attention. The Expert Group therefore welcomed the intention of WHO to update the *Manual for Environmental Management for Mosquito Control* and to prepare a modular toolkit, which will possibly also be web-based to increase access. It was recommended by the Group that this updating exercise be undertaken by WHO with suitable partners, and that inter-agency collaboration between WHO, FAO, UNEP, and UN Habitat, focus on this effort.

- While there are no truly new developments in the area of biological control, the recent successes in malaria control in the Indian states of Maharashtra and Karnataka, in an IVM approach with larvivorous fish as the main component, needs mentioning for the innovative delivery approach.
- *Larvicides*: New larvicides, such as microbial products or insect development inhibitors (IDI), are now available that are more environmentally friendly. These include stable and easy-to-use formulations of bacteria or slow release formulations of insect development inhibitors (IDIs), which may remain active for months at very low concentrations (in the range of parts per billion) in artificial breeding sites such as water tanks. These larvicides can be used to treat well-identified and accessible larval breeding sites, especially within urban environments (mostly man made). Contrary to insecticides which target adult vectors, there are a number of new larvicides under development. Resistance to larvicides is not an issue and will likely remain as such in the foreseeable future.
- *Insecticides (adulticides)*: There is no new insecticide available or in the pipeline that could be used for residual spraying, and none is expected for the foreseeable future unless urgent action is taken. Currently, there is only 1 carbamate and less than 5 organophosphate insecticides available on the public health market for indoor residual spraying as alternatives to DDT and pyrethroids.

- New formulation technologies such as micro-encapsulation are being developed by some pesticide manufacturers to enhance the efficacy of organophosphates or carbamates, by increasing their residual activity to a level comparable to that of DDT (at least 6 months).

No substantive cost analysis could be made from the first reporting by Parties, partly because of the insufficient time to gather relevant data. Future reporting cycles should enable better analysis. There have been a number of studies comparing the cost of the current two main malaria vector control intervention tools, that is, insecticide treated nets and indoor residual spraying - using either DDT or a substitute. Results have been mixed: while some studies indicate DDT operation could be cheaper in certain settings, other studies show that operational cost of indoor residual spraying programmes could easily cancel any such cost differences. It is also worthy of note that the price of DDT has risen over the last couple of years and this may be a trend that persists as a reduced demand erodes the economies of scale in a shrinking production. The cost of indoor spraying could be very prohibitive where there is no pre-existing programme infrastructure or where the targeted populations are spread over a wide geographical area.

5. Analysis of country capacity to transfer safely to reliance on alternatives

Two main opportunities exist through which current reliance on DDT may be reduced in a sustainable manner, where DDT is currently used for indoor residual spray:

- Immediate actions to optimize the implementation efficiency and impact of current DDT use, while minimizing human and environmental exposure; and
- Diversification of intervention options to incorporate alternatives.

5.1 Immediate actions

5.1.1 *Technical capacity strengthening*

The first step in reducing current reliance on DDT is to improve the capacity of local malaria vector control programmes to determine where and when DDT is needed and how much of it is needed. The objective is to ensure that current use levels are predicated solely by, and matched to actual needs. This will require the strengthening of the technical capacity of countries to plan, implement and monitor malaria vector control programmes - in particular, the capacity for sound decision making in the selection, application and evaluation of the impact of DDT and other insecticides. The ability of local vector control programmes to assess the driving forces of local malaria transmission (including basic epidemiological and entomological evaluation), and conduct appropriate operational research is a prerequisite to improving the efficiency and impact of the programmes. Techniques such as geographical information systems, decision support systems, and mapping techniques present major opportunities for improving the selectivity and better targeting of residual insecticide application spraying. It is essential that support be provided in training countries on these methodologies.

The development of national implementation plans (NIPs) on POPs, provide the opportunity for Parties to prioritize capacity needs. Related to this, the GEF supported regional projects, which are described elsewhere in this report (section 5.2.2), provide additional opportunities: Vector control needs assessment tools have been developed and will be used by countries for comprehensive evaluation (essentially an analysis of the strengths, weaknesses, opportunities and threats faced by the vector control programme) and the development of specific action plans on DDT and vector control, as part of the overall NIPs.

There is a need to establish or strengthen current resistance management practices to improve on the monitoring and timely detection of vector resistance and the implementation of preventive and remedial action. This is essential to ensure the continued utility of the few remaining public health pesticides (Section 3.3). In addition to direct technical support to countries, WHO is also facilitating the creation of regional networks on resistance management to further enhance technical support for countries.

5.1.2 *Policy and institutional strengthening*

A 2003 survey by WHO, as well as the first reporting by countries, indicate an urgent need for countries to strengthen public health pesticide management practices, particularly the regulatory and control mechanisms. Effective regulation and control of DDT as recommended by WHO (Section 6) will require a conducive policy and institutional framework that enable intersectoral action to prevent the

diversion of DDT for non-recommended use and improve accountability. These issues are also central to strategies to scale up the use of alternative interventions, and this is further discussed under Section 5.2.1.

5.2 Diversification of intervention options

The second major and long-term strategy to sustain reduction of reliance on DDT is premised on the fact that the use of a single intervention is not sustainable. It is necessary to use a combination of interventions in order to achieve and sustain significant reductions in disease transmission. Diversification of options will depend on the availability and access of countries to locally appropriate and cost-effective alternatives, as well as the capacity to deploy them effectively.

As part of ongoing efforts to prepare Parties for the implementation of the Stockholm Convention on POPs, WHO and UNEP have organized a series of joint workshop to inform on and discuss with countries the provisions, obligations and implications of the Convention for national disease vector control and to reach a consensus on the role WHO and UNEP can play in this. The selection of appropriate and cost-effective alternative interventions in the major eco-epidemiological and operational settings in a region, as well as strategies for addressing constraints to scaling up these alternatives, were identified as of foremost priority.

5.2.1 *Approaches for scaling up the implementation of alternatives*

One of the main characteristics of malaria is its diversity in terms of environment, vectors, transmission and severity of the disease. There is no single solution that can fit all situations. Most of the new tools are being developed for specific applications (niche products) and to be used in combination with other tools and interventions. The selection of malaria vector control interventions should be evidence-based and appropriate to the local ecology and epidemiology of the vector-borne disease. WHO is promoting integrated vector management (IVM), which may be defined as a process of evidence-based decision-making procedures aimed to plan, implement, monitor and evaluate targeted, cost-effective and sustainable combinations of regulatory and operational vector control measures, with measurable and sustainable impacts. The characteristic features of IVM include 1:

1. A public health regulatory and legislative framework
2. Collaboration within the health sector and with other public and private sectors whose actions impact on vectors
3. Empowerment and involvement of local communities and other stakeholders
4. Methods based on knowledge of factors influencing local vector biology, disease transmission and morbidity
5. Use of a range of interventions, often in combination and synergistically

IVM promotes a policy and institutional framework in which local appropriate interventions (chemical and non-chemical) are utilized synergistically and cost-effectively through inter-sectoral action to impact on the reduction of disease transmission. This will consequently lead to reducing reliance on DDT and other pesticides. It fosters the involvement of principal stakeholders, especially local communities and those public sectors whose actions impact vector ecology and disease transmission. Conducive conditions are also created for effective regulation to minimize/prevent the private sector's role in creating conditions that support vector-borne disease transmission. The scope of IVM is comprehensive. It promotes the appropriate management of insecticides, including their judicious use and the effective handling of stocks. Similar to Integrated Pest Management (IPM) in agriculture, IVM will also minimize the development of insecticide resistance in disease vectors. As it limits insecticide applications to conditions where they are critically needed, it helps extend the effective life expectancy of alternative insecticides.

The negotiation process for the Stockholm Convention on POPs, particularly the debate over the use of DDT for disease vector control, was instrumental in accelerating the evolution in the use of IVM as a

¹ WHO (2004) *Global strategic framework for integrated vector management*. World Health Organization, Geneva, Switzerland. WHO/CDS/PVC/2004.10. 12 Pages.

centrepiece for efforts to promote DDT alternatives. It is noted that the general goal of reducing reliance on insecticides (as recommended by WHO Resolution 53.19) is not restricted to considerations of safety to human health and the environment, but also addresses the need to treat insecticides as important resources that need to be preserved, through resistance management, for strategic purposes.

Ongoing decentralization and the attendant administrative reforms have created significant challenges to effective implementation of vector control programs. However, such reforms can provide an opportunity to strengthen vector control at the district level and steer the programme to an IVM strategy. When executed properly, decentralization should lead to the creation of technical capacity at the district level for decision-making, planning and timely response to local epidemiological and ecological changes. At the same time, certain central-level competence and coordination functions should be maintained to provide ongoing strategic direction, monitoring, training and coordination of external funding. In large countries, there is room for research and development, training and quality control activities at the intermediate (e.g. provincial) level. Therefore, it is important to establish and maintain communication channels across administrative levels, among sectors, and with the public.

5.2.2 *Promoting research for the development of new tools and generating lessons*

There is a need for continued research into new products and approaches. A priority area is the development of new insecticide alternatives to DDT for use in indoor residual spraying. The need for urgent action to develop new insecticide replacement for DDT is covered under Section 3.3. Countries will move away faster from DDT if there is a real substitute for indoor residual application, which while providing long lasting activity and comparative cost-effectiveness, also addresses the environmental impact concerns. The challenge is to provide non-POP substitute(s), and this calls for pro-active international partnership and significant financial resources. Informed by lessons from the Malaria Medicines Venture, WHO, in collaboration with various partners, is planning to develop a business plan to mobilize international action.

The important role of international partnerships in accelerating the development and transfer of new technologies has been demonstrated in the development of LLINs, where under the leadership of WHO, industry has evolved long lasting insecticide impregnation technologies and the technology has been successfully transferred to Tanzania for local production.

A systematic approach is needed to (i) generate, (ii) document and (iii) disseminate lessons on the use of new and emerging alternative interventions (tools, methods and strategies). There are several on-going activities in this regard. For example, WHO and UNEP are currently implementing regional projects with support from the GEF. The projects are aimed at (i) demonstrating the applicability and cost-effectiveness of alternative interventions within different epidemiological and operational settings, (ii) developing national capacity for planning and implementation of vector control in the context of integrated vector management; and (iii) establishing regionally coordinated mechanisms for effective dissemination and sharing of country experiences to facilitate systematic replication and scaling up of the interventions. The projects will have active involvement of other international partners such as FAO, UNIDO, UNDP and USEPA, as well as regional research organizations.

Another major activity is the establishment of joint WHO/UNEP information system to collate information from all available sources (WHO, UNEP, research institutions, countries, etc.) relevant to the production, use and management of DDT and its alternatives and policies in disease vector control. This will facilitate timely access by countries to critical information and lessons learned. Furthermore, the system will also be used to facilitate the reporting and the evaluation processes of the Stockholm Convention regarding the use and continued need for DDT in disease vector control.

Regional networks such as the Vector Resistance Networks in Africa, Eastern Mediterranean and South East Asia, as well as research institutions could play an active role in the evaluation of new products.

5.3 **Financing mechanisms**

Countries need financial support to adequately address the policy and institutional reform needs, as well as the relevant areas of technical strengthening described in the previous sections, for a safe and sustainable transition from DDT. Vector control programmes continue to face significant resource constraints, which tend to undermine the quality of interventions. The situation is clearly demonstrated by the reports received from countries. While the Global Fund for HIV/AIDS, Tuberculosis and

Malaria(GFATM), and other international initiatives have enabled a significant increase in financial resources for malaria control in endemic countries, funding for specific vector control activities is still far below the pressing needs. There is a strong need for better coordination and accountability among donors and recipients to improve funding effectiveness and to reduce duplication of effort. Particularly, a clear determination of the incremental benefits (complementarity) of GEF's role is needed. This will help define appropriate boundaries for the critical support needed by countries and better assist the integration of supported activities into national efforts.

6. Summary of current WHO Recommendations regarding DDT and disease vector control

The WHO position with respect to the use of DDT in activities aimed at disease vector control to interrupt disease transmission is as follows. There is no convincing evidence of adverse effects of DDT exposure as a result of correctly implemented indoor residual spraying as carried out in malaria control activities. There is therefore, at this stage, no justification on toxicological or epidemiological grounds for changing current policy and recommended practices towards indoor spraying of DDT for vector-borne disease control^{2, 3}

DDT may therefore be used for vector control, provided that all the following conditions are met:

- a. It is used **only** for indoor residual spraying⁴
- b. It is effective (against the targeted vectors)
- c. It is manufactured to the specifications issued by WHO
- d. The necessary safety precautions are taken in its use and disposal
- e. It is authorized by governments for public health purposes only, and that, in those instances, such use is limited to government-authorized programmes and that strong steps are taken to ensure that there is no diversion of DDT to entities in the private sector.
- f. Indoor residual spraying of DDT must be done by trained technicians.

In considering whether or not to use DDT, governments should take into account the following additional factors:

- The cost involved in the use of insecticides (DDT or alternatives), and their cost-effectiveness compared to other non-chemical alternatives;
- The role of insecticides in focal or selective vector control (DDT must be used within the context of an integrated vector management approach, where locally appropriate and cost-effective interventions are implemented, based on a good understanding of the local vector ecology and epidemiology of malaria);
- The availability of alternative vector control methods, including alternative insecticides (in view of the availability of alternative insecticides for indoor residual spraying, some of which may compete with DDT in terms of epidemiological impact, public acceptability, logistic suitability and compliance with specifications issued by WHO, DDT no longer merits being considered the only insecticide of choice)⁵;

² WHO (1995). *Vector control for malaria and other mosquito-borne diseases*. Report of a WHO Study Group. Geneva, World Health Organization, WHO Technical Report Series, No. 857.

³ WHO (2000). *WHO Expert Committee on Malaria*. Twentieth Report. Geneva, World Health Organization. Technical Report Series No. 892.

⁴ Defined as the application of a liquid insecticide with long-lasting residual properties which dries to form a crystalline deposit on the sprayed surface. A lethal dose of the insecticide is absorbed by insects which come into contact with the surface. The insecticide is applied to the indoor resting places of the vector. The recommended dosage used for spraying is 1-2 grams (g) active ingredient per square meter (m²) of sprayed surface.

⁵ WHO recommends 12 insecticides from four different chemical classes for indoor residual spraying.

- The implications for insecticide resistance, including possible cross-resistance to some alternative insecticides;
- The changing public attitude to pesticide use, including public health implications.

The appropriate role of residual insecticides for disease vector control

Indoor residual spraying of insecticides has been found to be most effective in areas of relatively low or very seasonal *malaria* transmission (unstable malaria). These are usually highland or fringe areas (e.g. Southern Africa, Sahel) in Africa as well as most malaria foci outside Africa. The human populations in these areas generally have a low level of immunity to malaria. Unstable malaria areas may therefore be prone to epidemic outbreaks, largely as a result of climatic factors, and because low levels of immunity affect people of all ages, with severe health consequences. Vector control strategies in unstable malaria areas should focus on interrupting transmission, and for which indoor residual spraying is a proven and effective intervention. The interruption of disease transmission is most effective where there is good prediction of the onset of epidemic outbreaks.

7. Lessons learned and conclusions

7.1 Evaluation and reporting mechanisms relating to DDT

7.1.1 Lessons learned from the first reporting cycle

The first reporting cycle generated the following major lessons:

- The use of a questionnaire is an appropriate way to gather data directly from countries. However, complementary information collection and validation is needed to provide a more complete and accurate picture.
- In order to generate a comprehensive global evaluation, it will be necessary for all countries that produce and use DDT to be included in the reporting. Therefore the participation of non-Parties for future reporting and evaluation activities should be encouraged. Likewise, countries not using but maintaining stockpiles, usable and obsolete, should be encouraged to participate. The close linkages between WHO and Ministries of Health should be further explored to facilitate reporting from both Parties and non-Parties.
- In the quest for reliable and timely information from countries, it would be worthwhile to introduce a process within countries that brings together representatives from the relevant national agencies and institutions to discuss and to complete the questionnaire. Participants to this meeting would then be mandated to provide further information to complete the questionnaire post-meeting as needed. In addition, there is a need to strengthen the capacity of countries in gathering and managing relevant data, including the routine reporting activities of disease vector control programmes. An induction workshop, after COP1, should also be considered to ensure that Parties and other countries are well informed on the processes for completing the questionnaire and the information required. Additional opportunities are provided by national and regional workshops/meetings on vector control.
- There is a need for an appropriate investment in the reporting and evaluation processes as it affects the quality and timeliness of reporting. Considering the very limited resources available during the first reporting and evaluation cycle, the Expert Group notes that future reporting and evaluation processes could be improved considerably if adequate resources are provided.

7.1.2 Options for future reporting

The Expert Group discussed at length options to improve the reporting system on DDT and compared the experiences from similar data collection activities, such as the reporting on the access to safe drinking water supply and basic sanitation that ensued from the International Decade for Drinking Water Supply and Sanitation (1981-1990). Based on the discussions, three scenarios, linked to different resource inputs, were identified for consideration by the COP. These are:

(a) meeting a minimum requirement for reporting under the Stockholm Convention, through passive data collection using the questionnaire. This will necessitate a number of reporting cycles for structural and content improvements. Such wholly passive data collection will impact the quality of evaluations.

(b) a progressive development of the questionnaire in response to future needs for use as part of an overall active data collection process, including a complementary strengthening of the verification and validation component.

(c) a substantive capacity building component within the context of option b) that will allow countries to gradually increase their role in the reporting / monitoring process.

In considering the above options COP is reminded of documents INC7/4 and INC7/INF/21 regarding the guidance and information needed to assist the Conference of Parties in evaluating continued need for DDT for disease vector control.

7.2 The use of DDT and alternatives for disease vector control

- It will be necessary for countries that are currently using DDT to continue such use until locally appropriate and cost effective alternatives are available for sustainable transition away from DDT.
- There is an immediate need to improve the capacity of national malaria vector control programmes to determine where and when DDT is needed and how much of it is needed. This will reduce over-reliance on the insecticide, as it will ensure that current use levels are predicated solely by, and matched to actual needs.
- In recent years a number of countries have stopped using DDT while the annual amount of DDT used in a few other countries has also been reduced. However, there are considerable challenges in scaling up the use of alternatives in these countries, which may undermine these early successes. On the other hand, there is a growing number of countries that are presently considering the reintroduction of DDT. Urgent international support is needed to resolve country-specific bottlenecks at implementing sustainable intervention options. It is only then that realistic scaling up can be undertaken to sustain the withdrawal of DDT.
- Whilst there has been significant progress in the development of new tools such as LLINs, there is the need to improve the access of endemic countries to these products. A primary limitation is inadequate financial resources.
- There is a need to increase country capacities for effective resistance management. The development of vector resistance to insecticide replacements for DDT, particularly pyrethroids, is a serious threat to the reduction of current reliance on DDT. The multipurpose use of such insecticides is therefore of primary concern.
- Due to the shortage of available insecticides and the spread of insecticide resistance, the targeted use of DDT for residual spraying in rotation with other insecticides remains a viable option for resistance management until a new alternative to DDT and pyrethroids is found.
- There is, hence, an urgent need for a longer-term investment for research and development of new insecticide products to address the issue of the dwindling arsenal of public health pesticides. Similarly, further development of non-chemical products, methods and strategies are urgently needed.
- Integrated vector management (IVM) provides a viable opportunity for reducing the reliance on DDT and other insecticides in a sustainable manner, as it facilitates the cost-effective utilization of alternatives. The creation of an appropriate enabling environment (including technical and institutional capacities) is key to such sustainable transition. On-going efforts to promote the adoption of IVM through routine WHO and UNEP activities, as well as through the regional and country projects under the Convention's financial mechanism is commendable and should be accelerated.

7.3 Pesticide management issues

- In order to ensure that the use of DDT is restricted to disease vector control, there is a need to support countries still using DDT to urgently review and improve their management practices, especially the regulatory and enforcement mechanisms. Ongoing NIP processes and GEF support regional projects provide some opportunities in this regard.
- Effective stockpile management is an issue requiring serious attention in many countries.

8. Recommendations of the Expert Group

From the lessons learned and conclusions addressed above, the Expert Group recommends that the COP consider taking the following actions:

1. Ensure that adequate investment is made for the reporting and assessment processes to provide a sound and reliable basis for the COP evaluation of the continued need for DDT. In this regard, it is recommended that a well-resourced mechanism for reporting and assessment on DDT use for disease vector control, be set up under the auspices of the Secretariat and WHO. This mechanism should involve active data collection and appropriate verification and validation processes, and should also enable systematic strengthening of relevant country capacity for data collection and management to progressively increase the role of countries in the reporting and monitoring process.
2. Ensure clear criteria for what constitutes incremental activities under the financial mechanism to enable the prioritisation of the capacity building activities aforementioned, and thereby expedite the realization of the objectives of the Convention regarding DDT.
3. Ensure long-term investments are made to encourage the development of new alternatives and to facilitate their implementation in recognition of the current need of countries to continue the use of DDT in disease vector control. Of particular relevance, is the development of new insecticide substitutes for indoor residual spraying. This could be done within an international partnership.
4. Encourage Parties producing and/or using DDT to fulfill their obligation to notify the Secretariat.

Annex III

Work plan for immediate actions to support the preparations of Parties for reporting on DDT and the review and assessment process required for the second and future evaluations of the continued need for DDT

Activity	Timeframe	Estimated costs in US\$
1. Building capacities of countries to implement, monitor and assess the impact (including associated data management) of the use of DDT and its alternatives in disease vector control: <ul style="list-style-type: none"> a) Compilation and development of guidance materials to assist countries in information gathering and management b) 3-4 regional induction workshops on reporting and data requirements for Stockholm Convention Focal Points and representatives from national malaria control programmes in Ministries of Health in countries that use, or potentially will use, and/or produce DDT 	June 2005 – June 2006	<ul style="list-style-type: none"> a) 40,000 b) 225,000-300,000
2. Carry out a study on possible mechanisms for active information collection to provide an adequate information base for the evaluation of the continued need for DDT	September 2005- March 2006	50,000
3. Preparations for and conducting expert review and assessment of the continued need for DDT to assist COP in its second evaluation of the continued need for DDT in disease vector control ¹ : <ul style="list-style-type: none"> a) collection of information from countries that produce, use, export, import and / or maintain stocks of DDT b) processing and analysis of country information and identification of data gaps c) collection of complementary information needed for the evaluation d) meeting of experts for review and assessment (2-3 experts and 1 WHO representative from five regions) 	June 2006 – November 2006	<ul style="list-style-type: none"> a) 50,000 b) 50,000 c) 100,000 d) 75,000

¹ It is expected that the second evaluation of the continued need for DDT in disease vector control will take place at the third meeting of the Conference of Parties in 2007 since no meeting is planned in 2008. Any new mechanism identified under point 2 and possibly adopted by the second meeting of the Conference of Parties will not be operational in time for an evaluation in 2007. Therefore, activities under point 3 represent an interim measure.