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## **Synthesis Report for the Terminal Evaluation of UNEP DDT Projects:**

**Demonstrating Cost-effectiveness and Sustainability of Environmentally Sound and Locally  
Appropriate Alternatives to DDT for Malaria Vector Control in Africa  
(GEF ID 1331)**

**&**

**Demonstrating and Scaling Up Sustainable Alternatives to DDT for the Control of Vector Borne  
Diseases in Southern Caucasus and Central Asia  
(GEF ID 3614)**

**&**

**Regional Program of Action and Demonstration of Sustainable Alternatives to DDT for Malaria  
Vector Control in Mexico and Central America  
(GEF ID 1591)**

**&**

**Demonstration of Sustainable Alternatives to DDT and Strengthening of National Vector  
Control Capabilities in Middle East and North Africa  
(GEF ID 2546)**

**&**

**Establishment of efficient and effective data collection and reporting procedures for  
evaluating the continued need of DDT for disease vector control  
(GEF ID 3349)**

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## Evaluation Office of UN Environment Programme

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## About the Evaluation

**Joint Evaluation:** No

**Report Language(s):** English

**Evaluation Type:** Synthesis

**Brief Description:** This report is a synthesis evaluation of five UNEP-GEF projects, independently implemented between 2003 and 2017. The overall objective of these regional projects was to demonstrate the cost-effectiveness and sustainability of environmentally sound and locally appropriate alternatives to DDT for (malaria) vector control in order to protect human health and the environment. An overview of the five projects is shown in Table 1 and Figure 1.

These initiatives are here considered from a more global perspective that assesses their synergies and coherence in achieving higher-level results in the GEF-funded Global Demonstrating and Scaling up of Sustainable Alternatives to DDT (DSSA) Programme. Complementarities with the Malarial Decision Analysis Support Tool (MDAST) project are also considered in trying to piece together the organisation's work in promoting sustainable malaria control strategies that are consistent with the successful implementation of the Stockholm Convention on Persistent Organic Pollutants (POPs). The evaluation therefore sought to summarise, compare, evaluate and synthesize the net performance of these projects (in terms of relevance, effectiveness and efficiency), and determine outcomes and impacts (actual and potential) stemming from these, including their sustainability. This synthesis serves two primary purposes: (i) to provide evidence of results to meet accountability requirements, and (ii) to promote learning, feedback, and knowledge sharing through results and lessons learned among UNEP, WHO, the GEF, the Secretariat of the Stockholm Convention, and the participating countries.

**Key words:** DDT, disease vector control, Stockholm Convention, WHO, PAHO, synthesis

**Table 1.** Overview of the projects evaluated in this synthesis report<sup>1</sup>.

	Africa	Southern Caucasus and Central Asia	Mexico and Central America	Middle East and North Africa	Global
<b>GEF ID#</b>	1331	3614	1591	2546	3349
<b>Planned budget at approval (USD)</b>	7,125,246	5,482,000	13,905,400	13,026,416	1,447,540
<b>Funding</b>	GEF	GEF	GEF	GEF	GEF
<b>Co-funding</b>	WHO, RBM, participating countries	WHO, Governments from the project countries, Green Cross, Milieukontakt International	PDF-B, CEC, PAHO, Governments	WHO, Governments from the project countries	WHO, Governments from the project countries
<b>Time period</b>	2009-2017	2011-2016	2003-2008	2009-2015	2011-2014
<b>Implementing agency</b>	UN Environment	UN Environment	UN Environment	UN Environment	UN Environment
<b>Executing agency</b>	WHO AFRO, WHO national offices	Green Cross Switzerland	PAHO	WHO EMRO	WHO HQ, WHO AFRO
<b>National implementation partners</b>	Countries Ministries of Health	WHO Regional Office for Europe, Countries Ministries of Health, Milieukontakt International	Countries Ministries of Health	WHO country offices	WHO country offices
<b>Countries involved at inception</b>	Eritrea Ethiopia Madagascar	Georgia Kyrgyzstan Tajikistan	Belize, Costa Rica, El Salvador Guatemala, Honduras, Mexico, Nicaragua, Panama	Djibouti, Egypt, Islamic Republic of Iran, Jordan, Morocco Sudan, Syrian Arab Republic, Yemen	Eritrea, Ethiopia, Gambia Madagascar, Mauritius Morocco, Mozambique Namibia, Senegal, South Africa, Swaziland, Uganda, Yemen, Zambia

**GEF ID, Project titles and project abbreviations**

<sup>1</sup> GEF ID, project titles, and country participation in the projects are shown on the next page.

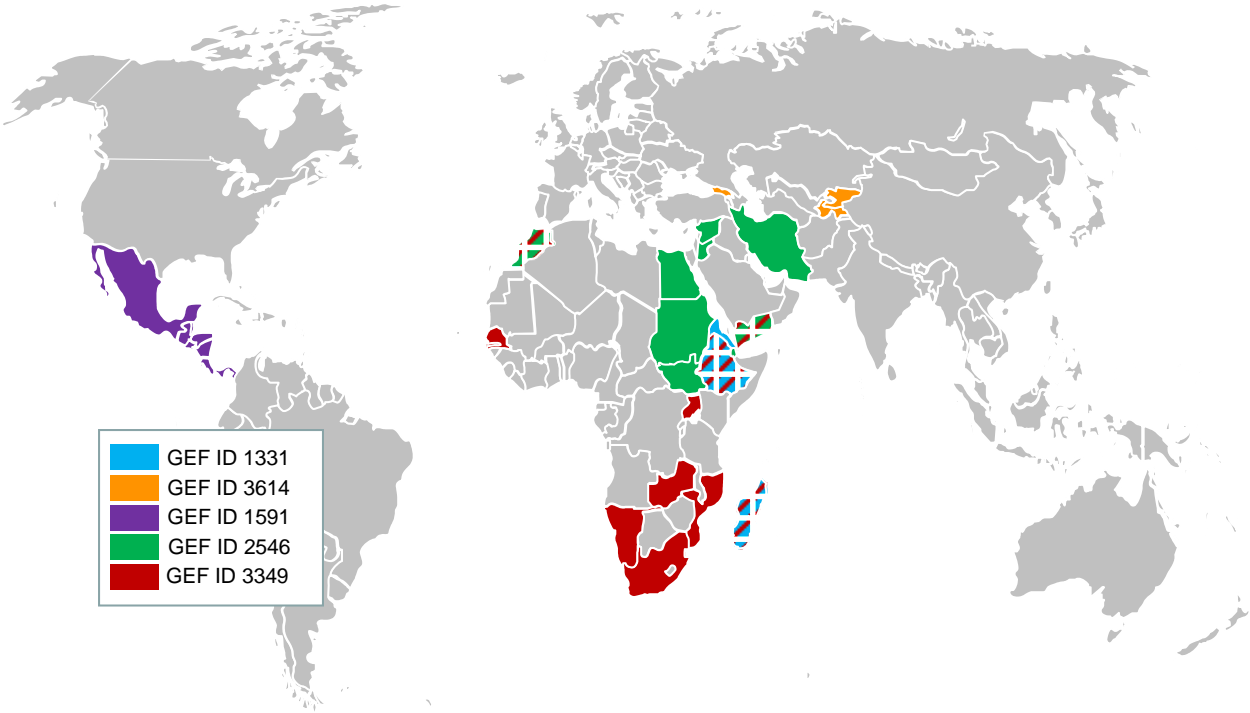
- GEF ID 1331: Demonstrating Cost-effectiveness and Sustainability of Environmentally Sound and Locally Appropriate Alternatives to DDT for Malaria Vector Control in Africa = AFRO I
- GEF ID 3614: Demonstrating and Scaling Up Sustainable Alternatives to DDT for the Control of Vector Borne Diseases in Southern Caucasus and Central Asia = SCCA
- GEF ID 1591: Regional Program of Action and Demonstration of Sustainable Alternatives to DDT for Malaria Vector Control in Mexico and Central America = MECA
- GEF ID 2546: Demonstration of Sustainable Alternatives to DDT and Strengthening of National Vector Control Capabilities in Middle East and North Africa = MENA
- GEF ID 3349: Establishment of efficient and effective data collection and reporting procedures for evaluating the continued need of DDT for disease vector control = GLOBAL

### Countries and projects in which these were involved and current DDT register status

Country	Project	DDT register status*	
		Production (P) or use (U)	Notification (N) and withdrawal (W) date
Djibouti	MENA		
Egypt	MENA		
Eritrea	AFRO I & GLOBAL	U	N: 31-5-2010
Ethiopia	AFRO I & GLOBAL	P + U	N: 12-9-2006
Gambia	GLOBAL		
Madagascar	AFRO I & GLOBAL	U	N: 27-8-2007
Mauritius	GLOBAL	U	N: 27-9-2007
Morocco	MENA & GLOBAL	U	N: 14-4-2005 W: 28-12-2015
Mozambique	GLOBAL	U	N: 13-9-2007
Namibia	GLOBAL	P + U	N: 28-1-2009
Senegal	GLOBAL	U	N: 9-7-2006
South Africa	GLOBAL	U	N: 24-11-2004
Sudan	MENA		
Swaziland	GLOBAL	U	N: 28-6-2006
Uganda	GLOBAL	U	N: 20-7-2008
Zambia	GLOBAL	U	N: 20-10-2008
Georgia	SCCA		
Kyrgyzstan	SCCA		
Tajikistan	SCCA		
Belize	MECA		
Costa Rica	MECA		
El Salvador	MECA		
Guatemala	MECA		
Honduras	MECA		
Mexico	MECA		
Nicaragua	MECA		

Country	Project	DDT register status*	
		Production (P) or use (U)	Notification (N) and withdrawal (W) date
Panama	MECA		
Islamic Republic of Iran	MENA		
Jordan	MENA		
Syrian Arab Republic	MENA		
Yemen	MENA & GLOBAL	U	N: 29-3-2005

\* According to DDT register (accessed 23 July 2020), see: <http://chm.pops.int/Implementation/Exemptions/AcceptablePurposes/AcceptablePurposesDT/tabid/456/Default.aspx>



**Figure 1.** Geographical range of UNEP/GEF funded projects evaluated in this synthesis report. Countries with two colours (Ethiopia, Madagascar, Morocco and Yemen) participated in two projects.

## Acronyms and Abbreviations

AFRO	African Regional Office of the WHO
DDT	3-5 Dichloro Diphenyl Trichloroethane
DSSA	Demonstrating and Scaling up of Sustainable Alternatives to DDT
EMRO	Eastern Mediterranean Regional Office of the WHO
FAO	Food and Agriculture Organization
GEF	Global Environment Facility
HQ	Head Quarters
ICIPE	International Centre of Insect Physiology and Ecology
IPHA	International HCH and Pesticides Association
IRS	Indoor residual spraying
IRM	Insecticide Resistance Management
ITN	Insecticide Treated Net
IVM	Integrated Vector Management
LLIN	Long Lasting Insecticidal Nets
M&E	Monitoring and Evaluation
MoH	Ministry of Health
NGO	Nongovernmental Organization
NIP	National Implementation Plan
NMCP	National Malaria Control Programme
OP	Obsolete Pesticides
NST	National Scientific Committee
PAHO	Pan American Health Organization
POP	Persistent Organic Pollutant
RBM	Roll Back Malaria
STAC	Scientific and Technical Advisory Committee
UNEP	United Nations Environment Programme
VBD	Vector Borne Disease
WHO	World Health Organization



## Executive Summary

- i. This report is a synthesis evaluation of five UNEP-GEF projects, independently implemented between 2003 and 2017.
- ii. The overall objective of these projects was to demonstrate the cost-effectiveness and sustainability of environmentally sound and locally appropriate alternatives to DDT for (malaria) vector control in order to protect human health and the environment.
- iii. Five regional projects have been implemented and completed to demonstrate the cost-effectiveness and sustainability of environmentally sound and locally appropriate IVM-based alternatives to DDT for (malaria) vector control.
- iv. Combined, the projects had a planned budget at approval of USD 40,986,602, and were all funded through the GEF. Mostly, regional WHO offices served as the executing agencies.
- v. Thirty-one countries, at launch, participated in the projects. Four (Ethiopia, Madagascar, Morocco and Yemen) participated in two projects.
- vi. Between 2000 and 2015, most malaria-endemic countries witnessed major reductions in disease morbidity and mortality due to vastly expanded and intensified control efforts. However, since 2015 the decrease in malaria cases has come to a halt and has now even resulted in an increase in morbidity and mortality in several countries; one of the main reasons for the continued use of DDT is wide-spread pyrethroid resistance.
- vii. The Stockholm Convention on POPs listed DDT in 2004 in its Annex B for phase out. An acceptable purpose of DDT was negotiated for public health use in recognition of its role in disease vector control, especially taking into consideration the fight against malaria. The provision is available under certain conditions including its use in accordance with related WHO recommendations and the strict control of DDT stocks to prevent unauthorized uses (e.g. in agriculture), environmentally sound management of any obsolete stocks and promotion of safer alternatives to DDT in disease vector control. Continued use of DDT is subject to additional administrative requirements under the Convention, namely to register in the DDT Register and provide additional reports on use and management aspects (the DDT Questionnaire) every three years; and to demonstrate the continued need for DDT based on efficiency, accessibility to safer alternatives and cost grounds.
- viii. The significance of these projects was three-fold: To strengthen capacity to report on the use of DDT and alternatives, to share available data on DDT use and alternatives, and to contribute to the implementation of the Stockholm Convention.
- ix. The common development objectives of these projects were:
  - Support the global phase-out of persistent insecticides, including DDT, through reduced reliance on these and through a gradual reduction in their use and elimination of stockpiles in such manner that the occurrence and spread of malaria and other VBDs does not increase.

- Promoting appropriate integrated vector management (IVM) practices through strengthening capacities and capabilities of countries to implement environmentally sound, effective and sustainable vector control alternatives.
  - Support the availability of data related to the use of DDT and its alternatives to enable proper evaluation of the continued need of DDT in malaria vector control.
- x. The common project objectives of these projects were:
- To prevent the reintroduction of DDT for malaria control through the demonstration and evaluation of alternative and integrated vector management (IVM) methods that are cost effective, replicable and sustainable.
  - To establish an IVM framework, criteria and procedures for the prevention and control of vector-borne diseases through optimized use of tools and resources, strengthened inter- and intra-sectoral coordination, partnerships and community empowerment, as the basis for a reduced reliance on DDT.
  - To develop the capacity of the selected Parties to enable the provision of complete information on the production and use of DDT for disease vector control.
- xi. The overall rating at the time of terminal evaluation for the respective projects was:
- AFRO I: (Africa: Eritrea, Ethiopia, Madagascar) **Moderately satisfactory** (draft report March 2020).
  - SCCA (Southern Caucasus & Central Asia): **Moderately Satisfactory**.
  - MECA (Mexico & Central America): **Highly satisfactory**.
  - MENA (Middle East & North Africa): **Moderately Satisfactory**.
  - GLOBAL: **Moderately Satisfactory**.
- xi. Performance of the portfolio of projects was assessed based on the indicators of success contained within their project designs (see Table below for summary).

**Summary Table, grouped by indicator/strategy.**

<b>Use of DDT:</b>
<ul style="list-style-type: none"> <li>- In the period (2003-2017) covering the five GEF projects, a decline of 32% in the global production of DDT was reported. Similarly, global use of DDT, for control of VBDs, showed a 30% decline over the period 2001 –2014.</li> <li>- 25 out of 31 countries (80.6%) had stopped using DDT by 2018, this outcome is considered <b>satisfactory</b>. For the period 2001-2014, the number of countries involved in the GEF projects reported to have used DDT was 13, which means that the number has slightly more than halved since then.</li> <li>- It is concluded that the GEF projects were responsible for a <b>highly satisfactory</b> reduction in the use of DDT. It is recommended that the six remaining countries that still use it are encouraged to closely monitor DDT resistance as this may provide the necessary data to terminate its use based on failing effectiveness.</li> </ul>

<b>DDT Stockpiles:</b>
There has been a substantial reduction in the number of countries still maintaining stocks, with only four remaining with stockpiles. This is considered <b>highly satisfactory</b> .
<b>Malaria Endemicity:</b>
In terms of malaria endemicity, most countries that participated in the evaluated projects continue to see malaria cases/deaths, as reported in the World Malaria Reports of WHO. <ul style="list-style-type: none"> <li>- All three Caucasian/Central Asian countries that participated in the GEF ID 3614 project eliminated malaria by the end of the project or shortly afterwards (Tajikistan and Georgia have not yet been certified malaria free as of now).</li> <li>- Only Morocco eliminated malaria during the time the MENA project was being implemented (in 2010).</li> <li>- Resistance of (malaria) vectors to DDT has played an important role and has been a major cause for countries to move away from DDT to alternative insecticides for IRS.</li> </ul>
<b>Reporting on the Stockholm Convention commitments:</b>
<ul style="list-style-type: none"> <li>- The most recent (and fourth) reporting cycle ended on 31 August 2018. By that time, only 11 out of 31 (35%) of the countries involved in the five GEF projects between 2003 and 2017, had submitted their reports; the rating thereof can be considered as <b>moderately unsatisfactory</b>.</li> <li>- For the last (and third) reporting cycle, 14 countries that had submitted reports for one or more of the previous cycles did not do so. Considering that 25 (out of the 31) countries did report at least once, this represents a significant decline in reporting between the 3<sup>rd</sup> and 4<sup>th</sup> round and is considered <b>unsatisfactory</b>. It should be noted, though, that countries not listed on the DDT register and no longer use DDT are not required to report.</li> <li>- A significant decline in reporting between the 3<sup>rd</sup> and 4<sup>th</sup> round was observed and is considered <b>unsatisfactory</b>. It is recommended that reporting is subjected to quality assurance and a compliance mechanism.</li> </ul>
<b>Integrated Vector Management:</b>
<ul style="list-style-type: none"> <li>- By the end of the five projects (2017), and in line with expectations, moderate progress had been made by countries in terms of establishing and/or amending their legal measures regarding DDT.</li> <li>- 11 out of 31 countries have clearly indicated to have IVM practices and/or policies in place, which is considered <b>moderately unsatisfactory</b>. However,</li> </ul>

given that the reports for many countries have not clearly indicated their activities in this regard, this conclusion may be somewhat conservative.

- It is recommended that countries that have successfully implemented IVM projects seek wider dissemination of their findings as a means to encourage other Parties to adopt similar approaches in future.
- The development of vector control strategies that do not rely on chemical insecticides, such as house improvement and larval source management, deserve increased attention in future IVM strategies.

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## I. Introduction

1. Between 2000 and 2015, most malaria-endemic countries witnessed major reductions in disease morbidity and mortality due to vastly expanded and intensified control efforts funded by the Global Fund, US President’s Malaria Initiative, UNICEF, and others<sup>2</sup>. These reductions, most notably in the World Health Organization (WHO) African Region where the burden remains highest, can mainly be attributed to the increased coverage and use of long-lasting insecticidal nets (LLINs) and indoor residual spraying (IRS) with insecticides<sup>3</sup>.

2. However, since 2015 the decrease in malaria cases has come to a halt and has now even resulted in an increase in morbidity and mortality in several countries. The continued use of the previously successful tools is faced with new challenges such as increasing insecticide resistance against pyrethroids<sup>4</sup>, one of the main reasons for the continued use of DDT.

3. DDT is still one of the effective alternatives for malaria vector control in areas with increasing pyrethroid resistance. The Stockholm Convention on Persistent Organic Pollutants (POPs), however, restricts the production and use of DDT because of its possible negative effects on the environment and on human health. Therefore, the Convention only allows the use of DDT “... for public health interventions for disease vector control as recommended by and under the guidance of the WHO due to unavailability of locally appropriate and cost-effective alternatives”<sup>5</sup>. Other reasons to continue the use of DDT are the lack of capacity to develop and implement an Integrated Vector Management (IVM) strategy and the lack of scientific information on the effectiveness of alternative methods and on resistance to alternative insecticides and the relatively cheap purchase price of DDT compared to available alternatives.

4. Malaria endemic countries need area specific evidence-based alternative vector control interventions as part of an integrated cost-effective, ecological and sustainable IVM approach in order to minimize the dependence on DDT for malaria control and elimination. IVM offers the possibility to combine different non-chemical and chemical interventions and therewith facilitates the development of situation-specific effective malaria control strategies<sup>6</sup>.

5. Several regional projects have been implemented and completed to demonstrate the cost-effectiveness and sustainability of environmentally sound and locally appropriate alternatives

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<sup>2</sup> For an overview of donor support between 2006-2010, see Pigott *et al.* (2012). Funding for malaria control 2006–2010: A comprehensive global assessment. *Malar. J.*, **11**, 246.

<sup>3</sup> World Health Organization. World malaria report 2018. Available at: <https://www.who.int/malaria/publications/world-malaria-report-2018/en/>

<sup>4</sup> Hemingway J. (2018). Resistance: A problem without an easy solution. *Pestic Biochem Physiol.*, **151**,73-75.

<sup>5</sup> United Nations Environment Programme, 2011. Stockholm Convention on Persistent Organic Pollutants (POPs). Available at: <http://chm.pops.int/Convention/ConventionText/tabid/2232/Default.aspx>

<sup>6</sup> World Health Organization, Regional Office for Africa. Demonstrating Cost Effectiveness and Sustainability of Environmentally Sound and Locally Appropriate Alternatives to DDT for Malaria Vector Control in Africa – Project Report 2017. Available at: <https://www.afro.who.int/publications/demonstrating-cost-effectiveness-and-sustainability-environmentally-sound-and-locally>

to DDT for malaria vector control. The following projects are described below, compared and evaluated in this synthesis report:

1. **Africa:** Demonstrating Cost-effectiveness and Sustainability of Environmentally Sound and Locally Appropriate Alternatives to DDT for Malaria Vector Control in Africa
2. **Southern Caucasus and Central Asia:** Demonstrating and Scaling Up Sustainable Alternatives to DDT for the Control of Vector Borne Diseases in Southern Caucasus and Central Asia
3. **Mexico and Central America:** Regional Program of Action and Demonstration of Sustainable Alternatives to DDT for Malaria Vector Control in Mexico and Central America
4. **Middle East and North Africa:** Demonstration of Sustainable Alternatives to DDT and Strengthening of National Vector Control Capabilities in Middle East and North Africa
5. **Global:** Establishment of Efficient and Effective Data Collection and Reporting Procedures for Evaluating the Continued Need of DDT for Disease Vector Control

6. The overall global significance of these projects is three-fold:

(1) Strengthening of countries' capacity to complete and timely report on the use of DDT and alternatives to DDT for vector control;

(2) Improved reporting allows the sharing of available data on the use of DDT and alternatives for vector control contributes to the global evaluation of the need to use of DDT for disease vector control;

(3) Improved reporting on the use of DDT for vector control contributes to the implementation of the Stockholm Convention.

7. This synthesis report was compiled on the basis of annual, interim final, final, and evaluation reports of the five projects that were availed to the evaluation team by UNEP. Beyond the use of these secondary data resources, no additional interviews or surveys were undertaken.

## II. Projects overview, objectives, components and achievements, sustainability and replicability, recommendations for future projects, publications and linkages with other GEF and non-GEF interventions

### Ila. Project: Demonstrating Cost-effectiveness and Sustainability of Environmentally Sound and Locally Appropriate Alternatives to DDT for Malaria Vector Control in Africa (GEF ID 1331)

7. At the stage of project inception, Ethiopia, Eritrea and Madagascar no longer, or only to a limited extent, relied on IRS with DDT for malaria vector control, in accordance with the recommendations and guidelines of WHO. The project aimed to demonstrate cost-effective, environmentally sound, sustainable and replicable malaria vector control interventions, while strengthening countries' capacity to effectively plan, implement, monitor and evaluate vector control interventions that do not involve DDT.

#### A. Objectives

8. **Development objective:** To reduce the use of DDT and to eliminate the DDT stockpiles through the strengthening of malaria vector control practice in Eritrea, Ethiopia, Madagascar.

9. **Project objective:** To demonstrate cost-effective, environmentally sound, and locally appropriate alternatives to DDT use in malaria control, ensuring their sustainable application through strengthened national and local capacity.

10. WHO AFRO conducted activities on project development, coordination, technical support, capacity building, and information-gathering and sharing. Project development was successful and the coordination of the implementation included technical support missions to the three countries. Project activities were supported by external experts. Quarterly and annual reports were submitted to UNEP. During a training course in 2016 at ICIPE in Kenya 18 staff from the three countries were trained on IVM. The 'Atlas on trends and the current status of insecticide resistance in malaria vectors 2010-2015' (2016) and 'Report on the status of implementation and coverage of IRS and LLINs in the Region during 2008–2013' were produced. The capacity of the countries with regards to malaria diagnosis, treatment, and surveillance was strengthened through the provision of basic equipment and supplies.

#### B. Components & achievements

11. Five components were developed to guide the implementation of the project:

1. Strengthening of national and local capacities for malaria control
  - 2,764 health staff and community members trained in: diagnosis and case management; IVM and IRS; insecticide resistance monitoring and management; integrated planning, monitoring and surveillance systems.



- Diagnostics tools, stockpiles of alternative insecticides, equipment and supplies for spray operations and entomological monitoring and surveillance provided.
  - 4 entomological laboratories revived or strengthened.
  - Community involvement in IVM strengthened.
  - Policy and strategic documents produced.
2. Implementation of alternative methods of malaria vector control tailored to local circumstances
- A combination of high-coverage LLINs and IRS using alternative chemicals or on non-chemical methods was implemented as follows:
    - Eritrea: LLINs + rotation of bendiocarb and lambda-cyhalothrin IRS + larval control
    - Ethiopia: LLINs + propoxur IRS vs LLINs + pirimiphos-methyl IRS
    - Madagascar: LLINs alone vs LLINs + bendiocarb and pirimiphos-methyl IRS or LLINs + community engagement
  - Eritrea replaced DDT for IRS with alternatives in 2012, Ethiopia in 2010, but Madagascar already before the start of the project (in 2009). Evaluation of the impact of the changed IRS policy showed progressive decline in malaria incidence in Eritrea and Ethiopia, but not so clearly in Madagascar.
3. Management and use of DDT and other public health pesticides and disposal of stockpiles
- Detailed analysis of insecticide management systems carried out in Eritrea and Ethiopia. In Ethiopia, national policy documentation and procedures were later developed, and inter-sectoral collaboration strengthened for better management of insecticides.
  - 458 staff trained in IRS and safe management of insecticides.
  - Insecticide resistance in major malaria vectors monitored and documented.
  - Insecticide resistance management (IRM) plans produced.
  - 81 staff trained in IRM.
4. Cross-border information exchanges and technical support to countries
- National IVM committees initiated to advise the national malaria control programmes (NMCPs).
  - 3 national project coordinators participated in annual meetings of a similar project organized by the WHO Regional Office for the Eastern Mediterranean (EMRO).
5. Project management
- Operation through 5 hierarchical bodies: Steering Committee, WHO AFRO, UNEP, Ministry of Health (MoH)/NMCP, partners/local communities. The project was prepared well and based on elaborate discussions with stakeholders. However, the mobilization phase of the project took more than two years. During the first years, little progress was made. Several reasons for this were mentioned; this was the first time such a larger-scale project was implemented in this region, high bureaucracy

and an initial lack of common understanding between implementing and executing agencies.

12. The following documents were published during or as a result of this project:

- World Health Organization. Atlas on Trends & Current Status of Insecticide Resistance in Malaria Vectors of the WHO African Region. WHO Regional Office for Africa, 2016. Available at: <https://apps.who.int/iris/handle/10665/272781>
- World Health Organization. Review of current evidence on combining indoor residual spraying and long-lasting insecticidal nets. Malaria Policy Advisory Committee Meeting – Background document session 3 (12 March 2014). Available at: <https://www.who.int/malaria/mpac/background-combining-irs-llins-mar2014.pdf>

### **C. Sustainability & replicability**

13. Based on the outcomes of this project the DDT-Alt-Model was developed to facilitate the sustainability and replicability of the project. This model focuses on the effective implementation of IVM and on the continuous strengthening of local capacities (Appendix 1). The project provides evidence of the successful implementation of alternatives to DDT and their impact on the burden of malaria. It is replicable at programme level within and beyond the WHO AFRO Region, particularly in the context of GEF projects. The application of alternative malaria vector control interventions with changes in the use of insecticides resulted in a reduced malaria burden in the project districts. However, no data were provided on the cost-effectiveness of these alternative interventions and this may have a negative effect on the sustainability of the use of these interventions as part of an IVM strategy.

### **D. Factors affecting performance**

14. These were not available at the time of writing this report.

### **E. Linkages with other GEF and non-GEF interventions**

15. AFRO II is a similar project that is currently being implemented in the following 15 African countries: Botswana, Ethiopia, Gambia, Kenya, Liberia, Madagascar, Mozambique, Namibia, Senegal, South Africa, Swaziland, Tanzania, Uganda, Zambia and Zimbabwe<sup>7</sup> and builds on the experiences of this project. The DDT-Alt Model has been developed and can be used in other GEF projects in the WHO AFRO region and beyond.

### **E. Recommendations for future projects**

16. Recommendations at country level:

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<sup>7</sup> Report of Global Alliance Steering Committee and other stakeholders online meeting 9 November 2016. Available at: <http://tinyurl.com/s8ureq9>

1. Locally adapted IVM strategies need to be defined for malaria control that reduce the dependency on chemical insecticides and therewith prevent or delay the development of insecticide resistance.
2. In areas with vector resistance to DDT or pyrethroids, IRS should use and monitor prequalified carbamates or organophosphate insecticides.
3. Capacity building for IVM in vector control is required in order to adapt the programmes to the needs of local communities and countries.
4. The monitoring of entomological and epidemiological malaria indicators in sentinel sites needs to be reinforced in order to support evidence-based decision making of appropriate interventions.

17. Recommendations at AFRO, UNEP and GEF level:

1. Continue to support countries to eliminate the use of DDT in (malaria) vector control and stimulate further research on alternative vector control interventions. Immediate notification of countries following prequalification of novel vector control tools by WHO should be encouraged, as well as closer collaboration between novel IVM research efforts and implementing parties (national programmes) to enhance uptake of alternative vector control interventions. Holistic monetary cost/benefit analyses (including transport costs, disposal costs of obsolete stocks, etc. etc.) of all available alternatives to DDT in comparison with the use of DDT should be undertaken.
2. Continue to support countries with technical assistance to implement the Global plan for insecticide resistance management (GPIRM) and facilitate regional collaboration on IVM for malaria control.
3. Continue to support countries with training, supervision, monitoring and evaluation of malaria vector control in the WHO AFRO Region.
4. Continue to support countries (especially through mechanisms other than GEF) with required entomological resource mobilization and to develop and implement data collection and analysis systems for evidence-based planning and implementation of vector control interventions.

## **IIb. Project: Demonstrating and Scaling Up Sustainable Alternatives to DDT for the control of vector borne diseases in Southern Caucasus and Central Asia (GEF ID 3614)**

18. At the start of the project design all three participating countries (Georgia, Kyrgyzstan and Tajikistan) had already banned DDT. But substantial stockpiles dated from the Soviet Union era and remained in the project countries. There is no evidence of the use of DDT for malaria control but poor storage conditions and illegal mining of DDT on the black market poses environmental and health risks. Most countries had eliminated malaria, or were close to elimination, and malaria vector control mainly focused on avoiding recurrence of the disease. Occasional outbreaks were mainly related to imported malaria. IVM for mosquito control had been used during the Soviet Union time but had been abandoned since independence. Both reducing the stocks of DDT, the environmental aspect, and the introduction of alternatives for malaria control as part of an IVM strategy that can be used in case of an outbreak (health aspect) should result in a reduced reliance on DDT.

19. The health component therefore sought to compare chemical, non-chemical and do-nothing approaches in three pilot sites in each country, applying the same approach in three countries and monitoring both efficacy and cost of the different approaches.

20. The project had a regional, multi-country geographical scope, involving three countries from Southern Caucasus and Central Asia, in Georgia, Kyrgyzstan and Tajikistan. All project countries being a part of the former Soviet Union do have a similar situation in former management of vector-borne diseases and application of pesticides, including DDT, for vector control and in agriculture. All three countries are part of the WHO-Europe region, managed from Copenhagen.

21. The project has ensured the safeguarding of DDT stocks in Tajikistan and Kyrgyzstan, and fully eliminated the remaining DDT stocks in Georgia.

22. This project has the potential for replication in other countries in the Central Asian region with stocks of DDT that could be eliminated. Because the countries in this region focus on development priorities there is no guarantee that there will be a budget available for policy implementation of the results of this project even after national approval of Ministries. Still the project performed well on the national coordination of ongoing initiatives and exceeded the initial DDT elimination target.

### **A. Objectives**

23. **Development objective:** To reduce global reliance on persistent insecticides, including DDT, without increasing the occurrence and spread of malaria and other VBDs, and to promote appropriate vector control management practices by strengthening capacities and capabilities of countries to implement environmentally sound, effective and sustainable vector control alternatives as well as to reduce the availability of DDT stocks to the population through safeguarding of relevant stocks.

24. **Project objective:** To protect human health and the environment by assisting countries to reduce and eliminate production, use and releases of POPs, and consequently contribute generally to capacity development for the sound management of chemicals.

25. To achieve its objective the project demonstrated the applicability and cost-effectiveness of DDT alternatives for VBD control at demonstration sites; developed national capacity for planning and implementation of VBD control based on IVM; identified and managed DDT stocks and wastes; and coordinated the dissemination and sharing of country experiences among countries and regions of the project.

## **B. Components & achievements**

26. Five components were developed to guide the implementation of the project:

1. Demonstrate the viability and cost-effectiveness of the alternative vector control interventions to DDT, appropriate to the major eco-epidemiological, social, cultural and environmental settings in the region in selected demonstration sites.
  - 3 research protocols with justification of the following selected methods and guidelines on country level were designed: (1) Indoor residual spraying (IRS) with insecticides (pyrethroids) to be applied in one or two rounds during the season; and (2) a combination of alternative vector control methods that include bed nets, larvivorous fish and water management.
  - Country protocols were developed in the first year of implementation.
  - WHO Europe provided assistance to national coordinators and representatives of national MoH's.
  - Monitoring activities of the management process and of the scientific process were conducted and reported.
  - Combination of vector control alternatives as part of an IVM strategy should suit local ecological and epidemiological conditions, which can be technically sound with similar entomological effects of IRS and vector control alternatives on the density of *Anopheles* adults and their larvae and can ensure cost-effectiveness and sustainability.
  - Final project report "Making Vector Control More Efficient Ecologically Sound Cost Effective and Sustainable" was produced in 2014 (this report was not available when writing this synthesis report).
2. Support national capacity for planning and implementation of IVM
  - Three national and one regional workshops were conducted.
  - IVM training conducted at country level.
  - A national IVM programme developed in all three countries.
  - Awareness raising materials developed and disseminated in pilot communities.
  - WHO guidelines on IVM translated in Russian and published.
  - Project reports disseminated to project stakeholders.
  - No formal intersectoral agreements established; inter-sectoral collaboration between health and environment has not been fully achieved.

- International support (WHO Europe and consultants) to restructure national vector control services for implementation of IVM.
3. Develop, support and demonstrate an integrated management approach for the participatory safeguarding of (on average and at least) 60 tons of prioritized POPs stockpiles per country and the development of participatory disposal concepts (mainly DDT) as example for similar projects in other countries in the region.
    - Knowledge and skills of personnel from responsible agencies in the three countries has been transferred on inventory, risk analysis, and repacking.
    - Inventory reports of POPs stockpiles have been produced.
    - Risk analysis of stockpiles has been conducted.
    - Central storage of DDT has been established in Kyrgyzstan and Tajikistan. In Georgia all POPs were sent for disposal after repackaging<sup>8</sup>.
    - The total amount of 361.82 tons of DDT and associated waste was repackaged.
    - Only Kyrgyzstan realized a national stakeholder platform to coordinate both health and environment activities.
    - National campaigns were organized in Georgia and Kyrgyzstan.
    - Local interventions have been realized by Non-Governmental Organizations (NGOs) in the three countries.
    - Communication materials were developed and disseminated in pilot communities.
  4. Support existing regionally coordinated mechanisms for effective dissemination and sharing of the specific project/country experiences.
    - There was no approved communication strategy with clearly established indicators, targets and results.
    - The project provided support to two international forums organized by the International HCH and Pesticides Association (IPHA).
  5. Design and implement a Monitoring and Evaluation (M&E) mechanism according to GEF M&E procedures.
    - (No information available).
  6. Provide essential managerial supervision to ensure quality in terms of project management throughout the project life time (reference Terminal Evaluation Report).
    - (No information available).

### **C. Sustainability & replicability**

27. All project countries are parties to the Stockholm Convention, they do have National Implementation Plans (NIPs) and IVM programs. Institutional health and environment systems

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<sup>8</sup> In Tajikistan and Kyrgyzstan it was not possible to transport repackaged stockpiles to incineration facilities by land because transportation of such chemicals is prohibited by the Customs Union (see: UNEP. Terminal Evaluation of the Global Environment Facility UNEP Project “Demonstrating and Scaling Up Sustainable Alternatives to DDT for the control of vector borne diseases in Southern Caucasus and Central Asia”. August, 2018).

were strengthened by activities. However, there is a general lack of clear division of responsibilities and there is little understanding between decision makers and local communities. The project countries are to a large extent dependent on external sources for continuation of the activities.

#### **D. Factors affecting performance**

28. Overall, the factors affecting performance were evaluated in the terminal evaluation report as: **Satisfactory**.

- Preparation and readiness: **Satisfactory**  
The project started in due time and a regional steering committee was established to supervise the implementation process.
- Quality of project management and supervision: **Satisfactory**  
Green Cross Switzerland established coordination mechanisms at the beginning of the project with Milieucontact International and WHO (responsible for the project components).
- Stakeholders participation and cooperation: **Moderately Satisfactory**  
Stakeholders were involved in all steps of project implementation and at all levels.
  
- Responsiveness to human rights and gender equity: Not rated, as these aspects were not programming principles at the time of the project initiation  
Human rights and gender equality aspects were not fully integrated in the Project document phase (it was not a requirement at the time of the project design), but the approaches and methodologies did incorporate these aspects, i.e., subcontractors implementing activities in the countries adhered to human rights and promoted gender equality.
- Country ownership and driven-ness: **Moderately Satisfactory**  
Key governmental institutions were involved in the project implementation, both at the planning and implementation stages. Contributions were done for the project implementations.
- Communication and public awareness: **Satisfactory**  
Various communication and awareness raising approaches were used. The approaches were tailored to the needs of the target groups and stakeholders.

#### **E. Linkages to other GEF and non-GEF interventions**

29. The project aligned with GEF Persistent Organic Pollutants Focal Area Strategy for GEF-4, that aims to reduce and eliminate the negative impact of POPs on the environment. The project also supports the malaria elimination programme “Demonstrating and Scaling-up of Sustainable Alternatives to DDT in Vector Management” (DSSA).

30. The GEF projects in Central America provide unique examples of alternative interventions for the control and prevention of VBDs by improving environmental management and personal- or and protection against the vector. Some examples of projects on alternative control approaches to control VBDs are copied and implemented with minor adaptations to the local conditions in countries of the WHO European Region. The WHO provides information and recommendations about safe and sensible use of pesticides with respect to people's health and the Food and Agriculture Organization (FAO) does the same with respect to agriculture. Both organisations signed a Memorandum of Understanding for a joint programme for the sound management of pesticides.

31. There are two effects that in the long run should contribute to reduce the global reliance on persistent insecticides, including DDT, the region. The medium-term effect of the project is on the national level of the project countries (Georgia, Kyrgyzstan and Tajikistan). The longer-term effect of the project is the potential changes on the regional level with Central Asia as a main source of the DDT stocks. Achievement of impact in the region will depend on political will to apply an IVM strategy and sound Obsolete Pesticides (OP) management and available funding.

#### **F. Recommendations for future projects**

32. The following recommendations were reported:

1. Awareness raising activities should be an integral part of a chemical management project and clearly described in the Project Document and integrated in the logical framework.
2. Potential national and local partners for awareness raising activities should be identified using a stakeholder analysis at the start of the project.
3. Activities that focus on reducing the risks of using DDT need to be developed following a multi-stakeholder approach and involve stakeholders from both the health and the environment sector, even if these sectors usually do not have a strong relation.
4. A needs & gaps assessment needs to be conducted prior to developing interventions that require a new legal and political framework.
5. National steering committees need to be established at the start of the project to support cross-sectoral cooperation and guide project implementation.
6. Detailed documentation of activities that are implemented in collaboration with other, similar, projects will strengthen project management and monitor progress.
7. A gender analysis and a human rights-based approach (HRBA) as part of the preparation phase will enhance the gender sensitive aspect of the project.



8. A policy review of laws, by-laws and regulations needs to be conducted before the start of the intervention because this will reveal opportunities and limitations that will need to be taken into account when an intervention is adapted to local circumstances.
9. Multi-stakeholder coordination at national level needs to facilitate communication and interaction between actors from different sectors. This will strengthen the cooperation between actors that are involved in different project activities.

### **IIC. Project: Regional Program of Action and Demonstration of Sustainable Alternatives to DDT for Malaria Vector Control in Mexico and Central America (GEF ID 1591)**

33. Even though there is still a serious malaria risk in Mexico and Central American countries, these countries have gradually reduced the use of DDT for malaria vector control activities during the last decade. This project was implemented between 2003 and 2008 in 8 countries in Central America and Mexico with the goal to prevent the reintroduction of DDT in the region by showing that malaria vector control without the use of DDT or other persistent pesticides is replicable, cost-effective and sustainable. Demonstration projects based on a model that focused on the participation of communities and municipal governments were implemented. The project followed the successful community participation model for vector control without the use of DDT previously conducted in Oaxaca, Mexico in 1998, and was the first project in the sub-region where municipal governments contributed to malaria control activities<sup>9</sup>. In general, the communities took part in cleaning-up of aquatic weeds; drainage, sanitary landfills, and channelling waste-water; biological control with the use of larvivorous fish; planting of repellent trees; and the use of biological larvicides.

34. The project used a health approach based on the following elements: prevention and integrated vector control strategy as recommended by WHO; a multidisciplinary and multisectoral approach; community participation; equity with priority in rural areas and areas with predominance of indigenous populations, critical poverty and malaria persistence.

#### **A. Objectives**

35. **Development objective:** To support the phase-out of DDT, globally, in a sustainable manner by validating and widely disseminating an array of alternative methods for malaria vector control that do not rely on DDT or other persistent pesticides.

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<sup>9</sup> Pan American Health Organization (PAHO), 2011. The role of municipal governments and community participation in the integrated management of the malaria vector without the use of DDT in Central America. Available at: <https://www.paho.org/en/documents/role-municipal-governments-and-community-participation-integrated-management-malaria>

36. **Project objective:** To prevent the reintroduction of DDT for malaria control through the demonstration and evaluation of alternative and integrated methods of vector control that are cost effective, replicable and sustainable.

37. This project aimed to achieve these objectives through: the implementation of replicable malaria vector control demonstration projects that do not use DDT or other persistent pesticides; the strengthening of national and local institutional capacity to control malaria without the use of DDT; and the elimination of DDT stockpiles in the eight participating countries.

## **B. Components & achievements**

38. Four components were developed to guide the implementation of the project:

1. Execution of nine demonstration projects with the objective to implement and evaluate:
  - 9 demonstration projects have been implemented, 1 in each country and 2 in Mexico, in 202 demonstration communities.
  - All countries have adopted alternative vector control methods without the use of DDT.
  - 63% reduction in malaria cases in the demonstration communities with field interventions without the use of DDT.
  - 86.2% reduction of cases due to *P. falciparum*.
  - No mortality due to malaria was reported in the demonstration communities during the project.
2. Strengthening of national institutional capacity to control malaria without DDT: to strengthen national and local institutional capacities to control malaria with methods that do not rely on DDT or other persistent pesticides:
  - All countries developed institutional capacity.
  - Training of national and local personnel, community members was conducted.
  - Equipment was delivered.
  - Guidelines on malaria control were formulated and implemented.
  - Steering Committees, National Committees, and Local Committees were constituted.
  - Inter and intra institutional coordination was provided.
3. Elimination of DDT stockpiles: to address the existing problem of stockpiles in six of the eight participating countries:
  - 184.404 tons of DDT were repackaged or incinerated.
  - An additional 46 tons of other POPs were disposed of by El Salvador outside of this project.
  - 0 kg of DDT remaining.
4. Coordination and management.

39. Eight articles were drafted and submitted to scientific journals (no further information available).

### **C. Sustainability & replicability**

40. All countries developed their own strategy to sustain the project's achievements. Community volunteer participation of local governments and indigenous people were considered to ensure the sustainability of the project's achievements. Malaria volunteer collaborators (COLVOLs) were trained to motivate and organize communities to become engaged with integrated malaria prevention and control without the use of DDT.

41. The malaria vector control strategy that relied on the involvement of community leaders and health workers was replicated in other localities and municipalities. In Guatemala, Nicaragua and Honduras alliances with Global Fund Projects were established and in Costa Rica this strategy was implemented in the entire Atlantic region. (Reference: Final evaluation of the UNEP GEF project "Regional Program of Action and Demonstration of Sustainable Alternatives to DDT for Malaria Vector Control in Mexico and Central America")

42. The high degree of staff rotation turned out to be a challenge for collaboration between different sectors and the flow of activities. The communication between different Ministries was difficult and slowed down progress. This tended to become even worse during times with political tensions prior to elections or government changes.

43. Historical conflicts between the central government and local communities, such as in countries with a guerrilla movement, damaged the trust of people in the project. Extra efforts were made to convince people and once they received benefits the reputation of and collaboration with the project improved. Some communities had a shortage or absence of community leaders. This posed a challenge to the project's progress.

44. Furthermore, on a regional level the sustainability of this project may be hampered by weather conditions, such as tropical storms and hurricanes, lack of financial resources, global crisis, and high migration of people between countries.

### **D. Factors affecting performance**

45. Overall, the factors affecting performance were evaluated in the terminal evaluation report as: **Highly satisfactory**.

- Preparation and readiness: **Satisfactory**  
There was a long preparation phase which included feasibility evaluations of baseline setting, establishing contacts and involving stakeholders. This preparation was not adequate and many administrative arrangements and involvement of stakeholders were done alongside project the implementation and caused a one-year delay in the start of activities.
- Country ownership and driven-ness: **Highly satisfactory**

At the national level, Technical Committees were constituted with delegates of several institutions (principally health and environment), universities and researchers. In pilot areas Technical Local Committees were constituted with participation of Municipalities and relevant NGOs. At the community level, there was a high participation of delegates of the majority of the community organizations (committees on malaria control or other health-related groups).

- Stakeholder involvement: **Highly satisfactory**

There was high empowerment of the health workers (vector control and environment) at the local levels and of community leaders. At all levels, stakeholder participation was very good.

## **E. Linkages to other GEF and non-GEF interventions**

46. The project has been implemented conform the GEF Contaminant-based Operational Programme No. 10 and helped to demonstrate ways of overcoming barriers to the adoption of best practices that limit contamination of the International Waters environment. Implementation of the project was in line with the Stockholm Convention on POPs and with the draft Operational Programme on POPs, which was still under development<sup>10</sup>. Project experiences and results may be useful to other GEF projects in countries with similar problems in Africa, Middle East & North Africa, Southeast Asia & Western Pacific, and India<sup>11</sup>.

## **F. Recommendations for future projects**

47. The following recommendations were reported:

1. The main condition for environment-friendly malaria control methods without the use of DDT is intersectoral and community participation. Interventions are easily adopted and empower communities.
2. Malaria control requires a multi-methodological strategy that uses a combination of the following interventions: (1) diagnosis and treatment; (2) elimination of the plasmodium reservoir; (3) control of mosquito breeding sites; (4) control of indoor and outdoor mosquito hiding places; (5) putting up barriers between people and mosquitoes such as with insecticide treatment nets (ITNs).
3. To maintain political and financial support PAHO should convince the MoH's to commit to malaria eradication as a medium-term goal.
4. This project could be replicated in other areas with high malaria transmission with support of PAHO.

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<sup>10</sup> Alberto Narváez Olalla. Final Evaluation of the UNEP GEF Project "Regional Program of Action and Demonstration of Sustainable Alternatives to DDT for Malaria Vector Control in Mexico and Central America". November, 2009.

<sup>11</sup> Alberto Narváez Olalla. Mid-term Review of the UNEP/GEF Project "Regional Program of Action and Demonstration of Sustainable Alternatives to DDT for Malaria Vector Control in Mexico and Central America". March, 2006.

5. NMCPs should monitor the achieved impact and improve surveillance in Mesoamerican countries.

## **IId. Project: Demonstration of Sustainable Alternatives to DDT and Strengthening of National Vector Control Capabilities in Middle East and North Africa (GEF ID 2546)**

48. Malaria is considered a major public health problem with an estimated 80-90% of the global annual malaria cases (220 million in 2018) and deaths (405,000 in 2018) occurring in Africa. One of the interventions that is used to reduce malaria transmission is IRS with insecticides.

49. An IVM approach has been promoted in the planning and selection of alternative methods for vector control. Implementation of IVM is intended to contribute to reduced reliance on insecticides for public health protection applications. Since the initiation of the IVM process by WHO in 2001, countries are willing to implement IVM. However, this requires selection of appropriate vector control methods that can be applied in a well-defined area having specific and well-defined epidemiological conditions.

50. Countries in the Middle East and North Africa region have a long history of using DDT for the control of malaria and leishmaniasis. During the past decade, however, no country had reported the use of DDT for disease vector control. Nevertheless, many countries maintain large usable or obsolete stocks of this insecticide. Hence, an upsurge of malaria or other vector-borne diseases could trigger countries, especially resource-poor countries, to revert to the use of DDT.

51. The following eight countries were selected to participate in this project: Djibouti, Egypt, Islamic Republic of Iran, Jordan, Morocco, Sudan, Syrian Arab Republic and Republic of Yemen. However, due to conflict and political unrest, implementation stopped in Yemen and Syria.

52. The Project was a component of the UNEP/WHO global portfolio of projects called "Demonstrating and Scaling up Sustainable Alternatives to DDT in Vector Management" (DSSA). Within this global portfolio, the Project has an important example function to other, later-developed projects, in that it generated scientific evidence on alternatives to DDT.

### **A. Objectives**

53. **Development objective:** To reduce reliance on DDT during vector-borne disease outbreaks and minimize the potential to revert to DDT for the prevention and control of vector-borne diseases in all countries, through the use of sustainable, cost-effective and environmentally friendly alternative interventions.

54. **Project objective:** To establish an IVM framework, criteria and procedures for the prevention and control of vector-borne diseases through optimized use of tools and resources, strengthened inter- and intra-sectoral coordination, partnerships and community empowerment, as the basis for a reduced reliance on DDT. Building national capacities for IVM and for the sound management of pesticides was a crucial pre-requisite to successfully and sustainably comply with the obligations under the Stockholm Convention.

## B. Components & achievements

55. Five components were developed to guide the implementation of the project:

1. Viability, availability, sustainability and cost effectiveness of alternatives to the use of DDT demonstrated.
  - 8 protocols (1 for each country) completed.
  - Mechanisms for all countries in place for their implementation.
  - 7 countries (except Syria due to conflict) given the necessary support for implementation of protocols.
  - 1 regional harmonization workshop was conducted in Jordan (2008).
  - Harmonized country protocols, standardized methods and template for reporting produced during the STAC meeting in 2009.
  - 8 harmonized country reports produced.
  - 16 demonstration studies planned at design. Reduced to 5 demonstration studies because 3 countries (Djibouti, Egypt and Jordan) had insufficient available capacity. For the remaining 5 countries (Islamic Republic of Iran, Morocco, Syrian Arab Republic, Sudan and Yemen) STAC decided on 1 demonstration study per country due to size of project and available resources.
  - Project in Syria discontinued due to conflict.
  - In the end only 4 demonstration studies implemented out of 16.
  - Onsite technical support was given to Morocco, Yemen and Sudan. Remote control support was given to Iran. Egypt received support to develop IVM strategy.
  - 8 STAC meeting reports produced.
  - Internal mid-Term review conducted in 2012.
  - Final Evaluation conducted in 2015; report available.
  - 3 reports for cost analysis of data developed, and progress reports (with technical inputs from the consultants) submitted by Jordan, Iran and Morocco.
  - The final 8th STAC meeting held in Iran (June 2015).
  
2. Capacity built in each country to plan, implement and evaluate the application of alternatives based on the principles of IVM.
  - National strategies and action plans developed.
  - National IVM committees in place all countries but not functional in Jordan.
  - Review of legal framework for IVM completed in all countries by high level committees
  - Regional resolution on management of public health pesticides adopted by WHO EMRO in 2011.
  - Not all countries have an IVM policy framework and IVM legal arrangements in place.
  - Seminars to increase intersectoral collaboration conducted in all countries.
  - Posters and brochures in several key languages for the Region..
  - 7 countries restructured Vector Control Unit operating on the basis of IVM (excluding Syria).

- Advocacy and communication promoting IVM and sound management of pesticides and targeting rural communities satisfactorily undertaken in some countries (Morocco, Sudan, Jordan, Egypt), but no evidence in other countries – country reports not available.
  - 7 countries restructured Vector Control Unit operating on the basis of IVM (excluding Syria).
  - Several countries expanded the scope and mandate of their vector control coordination unit during the Project period, but at local level, coordination is still sub-optimal or lacking.
  - WHO guidelines on IVM, pesticide management and testing of insecticide resistance developed and shared with all countries.
  - Updated strategic framework for integrated vector management (2016-2020) to be published by the Regional Office.
  - Although guidelines in all countries, but were outdated and not updated during project in a few countries.
  - In-country training on IVM related topics undertaken in all countries except Syria.
3. Collection, repackaging and disposal of POPs pesticides used in public health and agriculture completed.
    - All DDT and associated waste eliminated from Jordan, Morocco, and Iran as planned. 95 tons safeguarded and shipped for incineration in France.
  4. Information on good practices and demonstrated cost-effective and sustainable alternatives are taken up by national institutions and in planning processes.
    - 5 articles published in international scientific journals.
    - WHO EMRO revamped its tri-lingual MCE web site, which includes project results: <https://tinyurl.com/uc83cmv>.
  5. National & transboundary coordination, information sharing and monitoring and evaluation mechanisms operational and effective in promoting Integrated Vector Management without the use of DDT.
    - Full-time Project coordinator was assigned in 2009.
    - Full-time Assistant Technical Project coordinator was recruited from 2010 – 2012.
    - 8 national project coordinators (NPCs) assigned in 2009, but poor response from several NPCs.
    - Mid-Term Review conducted in 2012 & Final Review conducted in 2015; reports available.
    - WHO EMRO initiated a regional database on insecticide resistance and vector distribution in response to the problem of insecticide resistance in the Region.
    - National Steering Committees (NSCs) established in 7 countries except Syria.
    - NSCs functional and meeting regular in 5 of 7 countries.
    - STAC established and met annually as planned.

56. Five articles were published in international scientific journals.

### **C. Sustainability & replicability**

57. The national governments have given strong support to the project and all countries have signed a number of multilateral environmental agreements that indicate the strong political will to soundly manage hazardous chemicals and wastes. Prior to the project, vector control units existed in all the NMCPs and were directly involved in the pilot demonstration projects for IVM capacity building. Additionally, national IVM committees have been established in all the participating countries. According to the final review report of the project, national funding was available to support and sustain project results in some countries.

58. In order to share the achievements and experiences of this project, a sub-regional IVM course was held in 2014 in Pakistan for participants from the non-Project countries, Pakistan and Afghanistan. In 2015, a questionnaire survey among non-Project countries was conducted by EMRO and showed an IVM disparity between Project and non-Project countries such as major shortcomings in policy development and lack of capacity. These results highlight the importance of replication from Project to non-Project countries.

### **D. Factors affecting performance**

59. Overall, the factors affecting performance were evaluated in the terminal evaluation report as: **Moderately satisfactory**.

- Preparation and readiness: **Moderately satisfactory**  
WHO adequately staffed initially but capacity of national counterparts to undertake demonstration projects was not properly assessed.
- Quality of project management and supervision: **Satisfactory**  
Adequate management and supervision was provided by WHO EMRO.
- Stakeholders participation and cooperation: **Moderately satisfactory**  
Participation of key stakeholders was satisfactory in most countries, these were engaged early in the preparatory phase for VCNA process. In one country, however, the IVM committee was not functioning properly due to lack of policy support.
- Responsiveness to human rights and gender equity: **Not applicable, criteria not rated**  
Not a requirement under GEF-4.
- Country ownership and driven-ness: **Satisfactory**  
The project benefitted from strong governmental support in most countries.
- Communication and public awareness: **Satisfactory**  
Advocacy and communication to promote IVM was adequately undertaken in most countries.



## **E. Linkages to other GEF and non-GEF interventions**

60. DDT/ GEF Projects in Mexico and Central America and in Africa: These projects provide a unique example of demonstrations of alternative interventions to DDT use for vector-borne disease control and prevention through improvement of personal and household protection and the use of environmental management practices to eliminate mosquito breeding sites. However, due to the variability of the epidemiology of vector-borne diseases in the region, it is inevitable that integrated vector and disease management approaches unique to the conditions and needs of the region will be necessary to decrease the heavy burden imposed by such diseases.

61. Africa Stockpiles Programme: The “Africa Stockpiles Programme” (ASP) was expected to address the issue of disposal of obsolete stockpiles in all African countries over a period of 10 years or so. The project activities dealing with stocks were fully coordinated with the work of the ASP, which was implemented (until its closure in 2013) by the World Bank in cooperation with FAO and in which UNEP is a partner.

62. WHO/FAO collaboration on pesticide management and disposal of obsolete Pesticides: WHO and FAO have a unique position within the UN-system as they provide Member States with recommendations and advice on safe and judicious use of pesticides in health and agriculture, respectively. The two Organizations are in the process of development of a Memorandum of understanding (MoU) on development of a joint programme on pesticide management, in order to provide Member States, and other stakeholders, with unified, coordinated and consistent advice and support on sound management of pesticides.

63. Another important link between WHO and FAO, under another and already existing Memorandum of Understanding (MoU) on the prevention and control of water associated diseases will result in technical cooperation on environmental management measures in irrigated agricultural production areas, where the adaptation of hydraulic structures and the improvement of water management practices can contribute significantly to the reduction of vector breeding.

## **F. Recommendations for future projects**

64. Due to its late planning, this evaluation exercise was faced with many challenges. In particular it was very difficult to obtain the views and feedback of many key stakeholders involved in the project as either they retired or they moved to other positions. For future evaluations, it is recommended that implementing agencies should plan terminal evaluations according to the timeframe planned in the project documents.

65. For countries embarked / that would embark in follow up initiatives (on-going or future), it is recommended that the results and outcomes of the project be considered during the implementation of these initiatives to ensure sustainability and also avoid duplication of efforts.

## **Ile. Project: Establishment of efficient and effective data collection and reporting procedures for evaluating the continued need of DDT for disease vector control (GEF ID 3349)**

66. Malaria is a major public health problem and an obstacle to socio-economic development in malaria endemic countries. IRS, with or without the use of DDT, is effective to obtain large-scale benefits at an affordable cost while reducing malaria transmission. The need to monitor DDT production and use, and to establish its continued necessity in disease vector control is urgent. Accurate reporting and data collection are crucial in order to decide whether or not to use DDT for malaria vector control but data collection was found to be insufficient at the time of the project design.

67. Fourteen countries in the Africa and Eastern Mediterranean regions were selected to participate in this project. The selection of the countries was based on: (1) known or intended use of DDT for health purposes; (2) poor reporting procedures and infrastructure; and (3) participation endorsement in the project. All proposed project countries have ratified the Stockholm Convention.

68. This project focused on the provision of support activities to build and strengthen data collection and reporting capacity at national and regional level.

### **A. Objectives**

69. **Development objective:** To protect human health and the environment by supporting the availability of data related to the use of DDT and its alternatives to enable proper evaluation of the continued need of DDT in malaria vector control.

70. **Project objective:** To develop the capacity of the selected Parties to enable the provision of complete information on the production and use of DDT for disease vector control.

### **B. Components & achievements**

71. Five components were developed to guide the implementation of the project:

1. Identification and strengthening through the development of institutional infrastructure of a central institution responsible for proper registration and regular reporting of data related to import/export/local formulation of DDT, the local application, areas of application, details of the field campaigns, impacts, etc.
  - 9 central institutions identified in the nine AFRO countries.
  - 18 (2 per country) awareness raising, happenings, workshops, meetings conducted.
  - 8 out of 9 countries provided commitment letters.
  - 9 lists with provided means of strengthening to each selected Central Institution.
  - Guidelines for reporting available in all countries.
  - 7 of the 9 countries reported on DDT.

2. Training of spray team leaders and regional support teams on field data collection and reporting (Regional cascade training to develop critical mass)..
  - 1 (instead of 2) training developed.
  - Trainings held in 8 of 9 project countries.
  - Number of trained persons exceeded the 390 planned at design.
  
3. Training institutionalized as routine in-service training within national vector control programs.
  - Training materials & programs produced in all 9 countries.
  - Training curricula adapted in 8 of 9 countries. As IRS being implemented by a partner in an independent manner in Senegal, training not institutionalized.
  
4. Countries enabled to monitor resistance of vectors to chemicals in an adequate way.
  - 9 regional/provincial training on resistance monitoring held.
  - 9 regional training on resistance monitoring held.
  - 8 countries, except Madagascar, developed Insecticide Resistance monitoring action plan, training of staff, and conducting IR monitoring contributing to the ongoing countries' effort to implement the Global Plan for Insecticide Resistance Management.
  
5. Establishment of cross-sectoral alliances and implementation of guidelines for data collection and sharing between relevant government and non-government agencies.
  - All countries identified stakeholders and held intersectoral working groups.
  - Data not shared in many of the participating countries.
  - No information whether guidelines have been implemented in countries.

### **C. Sustainability & replicability**

72. In most of the participating countries the ownership of the project was high. The project worked with existing institutions and the authorities provided strong support. However, some financial as well as institutional risks have been identified. In some countries, it appears that without external financial assistance, sustainability of results that have been achieved so far would be at risk. In some countries, adequate capacity for systematic data collection was still lacking and in other countries an adequate vector control surveillance system was not in place.

### **D. Factors affecting performance**

73. Overall, the factors affecting performance were evaluated in the terminal evaluation report as: **Moderately satisfactory**.

- Preparation and readiness: **Moderately unsatisfactory**  
WHO was understaffed at the start of the project.
- Quality of project management and supervision: **Moderately satisfactory**

Overall, project supervision and oversight were adequately undertaken by UNEP; WHO adequately coordinated activities. However, a significant portion of project documentation was not available, as was information regarding management at national level.

- Stakeholders participation and cooperation: **Moderately satisfactory**  
Key stakeholders actively participated according to the regional project coordinator, but no information was available to confirm this level of engagement.
- Responsiveness to human rights and gender equity: **Not applicable, criteria not rated**  
Although participation of women was seen in the project, much more effort could have been done to involve women.
- Country ownership and driven-ness: **Moderately satisfactory**  
Strong support from authorities in most countries was observed.
- Communication and public awareness: **Satisfactory**  
Key stakeholders were adequately informed about the project.

#### **D. Linkages to other GEF and non-GEF interventions**

74. The project is in line with the UNEP subprogram - Harmful Substances and Hazardous Waste. In particular, it was complementary to five GEF-funded DDT projects that were being implemented or developed by UNEP in the Middle East and North Africa, Mexico and Central America, Sub-Sahara Africa, and Southeast Asia and the Pacific, and Central Asia. These projects were part of a global programmatic approach aiming at promoting sustainable alternatives for DDT use in vector control.

75. This project is consistent with the Chemicals Focal Area of the GEF, and in particular it met the objectives of the GEF operational program on POPs (OP#14) to provide incremental assistance to developing countries and countries with economies in transition to reduce and/or eliminate the release of POPs into the environment. This project was expected to contribute to the implementation of the GEF Strategic Priority POP-4: Promote partnering in demonstration of innovative technologies and practices for POPs reduction.

#### **E. Recommendations for future projects**

76. Due to its late planning, the evaluation of this project was faced with many challenges<sup>12</sup>. In particular it was very difficult to obtain the views and feedback of many key stakeholders involved in the project as either they retired or they moved to other positions. For future projects, it is recommended that implementing agencies should plan terminal evaluations according to the timeframe planned in the project documents.

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<sup>12</sup> UNEP. Draft Terminal Evaluation of the GEF-UNEP Project: "Establishment of efficient and effective data collection and reporting procedures for evaluating the continued need of DDT for disease vector control". February, 2020.

77. For countries that are embarked or would embark in follow up initiatives (on-going or future), it is recommended that the results and outcomes of the project be considered during the implementation of these initiatives to ensure sustainability and also avoid duplication of efforts.

### III. Synthesis

#### IIIa. Development and project objectives

78. All projects shared common development and project objectives that can be broadly synthesized as follows<sup>13</sup>:

79. **Development objectives:**

- Support the global phase-out of persistent insecticides, including DDT, through reduced reliance on these and through a gradual reduction in their use and elimination of stockpiles in such manner that the occurrence and spread of malaria and other VBDs does not increase.
- Promoting appropriate integrated vector management (IVM) practices through strengthening capacities and capabilities of countries to implement environmentally sound, effective and sustainable vector control alternatives.
- Support the availability of data related to the use of DDT and its alternatives to enable proper evaluation of the continued need of DDT in malaria vector control.

80. **Project objectives:**

- To prevent the reintroduction of DDT for malaria control through the demonstration and evaluation of alternative and integrated vector management (IVM) methods that are cost effective, replicable and sustainable.
- To establish an IVM framework, criteria and procedures for the prevention and control of vector-borne diseases through optimized use of tools and resources, strengthened inter- and intra-sectoral coordination, partnerships and community empowerment, as the basis for a reduced reliance on DDT.
- To develop the capacity of the selected Parties to enable the provision of complete information on the production and use of DDT for disease vector control.

#### IIIb. Projects overall assessment at terminal evaluation

81. At the time of the terminal evaluation of the projects, the following ratings were assigned:

- **AFRO I: Moderately satisfactory** (draft report March 2020). In the first 2.5 to 3 years, project progress was overall very low. In the last 4 years of the project, progress was much better, which resulted in the most important outputs being delivered. These

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<sup>13</sup> For outcomes, outputs and activities the reader is referred to the mid-term and final evaluation reports for the respective projects.

outputs were related to capacity building, testing of alternatives to DDT in Ethiopia and Madagascar and insecticide resistance management.

- SCCA (Southern Caucasus & Central Asia): The overall rating of the project according to the evaluation was '**Moderately Satisfactory**'. The project was operating in a complex environment, with implication of various partners at the country level and regional level. It showed good results in delivering its outputs<sup>14</sup>.
- MECA (Mexico & Central America): The fulfilment of the objectives was '**Highly satisfactory**', although Objective 3 (elimination of DDT's stockpiles) was not achieved at the time of terminal evaluation. All the countries adapted, in demonstrative areas, techniques of vector control without using persistent insecticides<sup>15</sup>.
- MENA (Middle East & North Africa): Overall, the project was rated '**Moderately Satisfactory**'. Only one of the five direct outcomes of the project was satisfactorily achieved. The four others were only partially attained. While all countries have accepted IVM as a good approach for vector control, not all of them have developed IVM policies or have in place the adequate legal framework. Chances for impact of project are considered moderate<sup>16</sup>.
- GLOBAL: Overall, the project was rated '**Moderately Satisfactory**'. Only four of the nine AFRO countries managed to successfully achieve all the five outcomes of the project. Three countries fully achieved some and partially achieved the others, and two countries did not achieve at least one while achieving or partially achieving the rest. Despite these shortcomings, the project was quite successful as seven (which did not report before the project) of the nine countries reported on DDT to the Stockholm Convention Secretariat. Chances for impact of project is considered moderately likely<sup>17</sup>.

82. The development and project objectives listed in section IIIa are shown in Table 2 and formed the basis for an overall assessment of the success of these combined GEF projects.

83. Rating of successful completion of development/project objectives was as follows:

- HS: Highly satisfactory (85-100%);
- S: Satisfactory (68-84%);
- MS: Moderately Satisfactory (51-67%);
- MU: Moderately Unsatisfactory (34-50%);
- U: Unsatisfactory (17-33%);
- HU: Highly Unsatisfactory (0-16%).

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<sup>14</sup> UNEP. Terminal Evaluation of the Global Environment Facility UNEP Project "Demonstrating and Scaling Up Sustainable Alternatives to DDT for the control of vector borne diseases in Southern Caucasus and Central Asia". August, 2018.

<sup>15</sup> UNEP. Final Evaluation of the Regional Program of Action and Demonstration of Sustainable Alternatives to DDT for Malaria Vector Control in Mexico and Central America. November, 2009.

<sup>16</sup> UNEP. Draft Terminal Evaluation of the GEF-UNEP Project "Demonstration of Sustainable Alternatives to DDT and Strengthening of National Vector Control Capabilities In Middle East and North Africa". February, 2020.

<sup>17</sup> UNEP. Draft Terminal Evaluation of the GEF-UNEP Project "Establishment of efficient and effective data collection and reporting procedures for evaluating the continued need of DDT for disease vector control". February, 2020.

The above percentages refer (where possible) to the number of projects/countries that reached the anticipated development and project objectives and their respective outputs and/or outcomes.

#### 84. Ongoing malaria transmission (situation in 2018)

85. In terms of malaria endemicity, most countries that participated in the evaluated projects continue to see malaria cases/deaths, as reported in the World Malaria Reports of WHO. Only Morocco eliminated malaria during the time the Middle East and North Africa Project (GEF ID 2546) was being implemented (in 2010). None of the other African countries succeeded in malaria elimination after completion of the projects (Egypt and Mauritius were free of malaria prior to the projects).

86. All three Caucasian/Central Asian countries that participated in the GEF ID 3614 project eliminated malaria by the end of the project or shortly afterwards (Tajikistan and Georgia have not yet been certified malaria free as of now). In the Americas, El Salvador is the only country that has experienced several years without any locally transmitted cases of malaria. Finally, in the Middle East, only Yemen reported cases in 2018, the other countries either are not reporting or are considered free of malaria (The Islamic Republic of Iran has reported zero cases since 2018).

**Table 2. Development and project objectives completion by region and country.**

Projects regions and countries	Development/Project objectives					
	Malaria	Phase out of DDT			IVM	Data available
	Malaria endemic? (2018) <sup>18</sup>	DDT in use? (2018) <sup>1</sup>	DDT used between 2001-2014? <sup>19</sup>	DDT stockpile present or eliminated? <sup>20</sup>	Policy in place; Capacity and capability building <sup>21</sup>	Fourth round national report submitted <sup>22</sup>
<b>Africa</b>						
Djibouti	Y*	N	N	E	NI	N (N)
Egypt	N <sup>23</sup>	N	N	E	N	N (Y)
Eritrea	Y	Y	Y	E	Y	N (Y)
Ethiopia	Y	N	Y	E	N	N (Y)
Gambia	Y	Y	Y	E	NI	N (Y)
Madagascar	Y	N	Y	E	N	N (Y)
Mauritius	N (1973)	N	Y	P	Y	Y (Y)

<sup>18</sup> Data from World Malaria Report (2019). The year of malaria free certification is shown in parentheses.

<sup>19</sup> After Van den Berg *et al.* (2017). *Malar. J.*, 16, 401.

<sup>20</sup> Stockholm Convention, Fourth round of Party reports (2018). Alternative source: UNEP/POPS/COP.8/INF/6 (November 2016).

<sup>21</sup> Based on submitted reports (mid-term and final evaluations) and UNEP/POPS/COP.8/INF/6 (November 2016).

<sup>22</sup> Stockholm Convention, Fourth round of Party reports (2018). Between brackets is indicated if the Party submitted report for one or more of the previous cycles (2006, 2010, 2014)

<sup>23</sup> Three consecutive years of zero indigenous cases by 2000.

Morocco	N (2010)	N	Y	E	Y	Y (Y)
Mozambique	Y	Y	Y	P	Y	N (Y)
Namibia	Y	Y	Y	E	NI	N (N)
Senegal	Y	N	N	E	Y	N (N)
South Africa	Y	Y	Y	P	Y	Y (Y)
Sudan	Y	N	Y	E	Y	N (Y)
Swaziland	Y	Y	Y	E	NI	N (Y)
Uganda	Y	N	Y	E	NI	Y (Y)
Zambia	Y	N	Y	E	NI	N (Y)
<b>Southern Caucasus and Central Asia</b>						
Georgia	N <sup>24</sup>	N	N	E	Y	Y (Y)
Kyrgyzstan	N (2016)	N	N	E	Y	Y (Y)
Tajikistan	N <sup>25</sup>	N	N	E	Y	N (Y)
<b>Mexico and Central America</b>						
Belize	Y	N	N	E	NI	N (N)
Costa Rica	Y	N	N	E	NI	Y (Y)
El Salvador	N <sup>26</sup>	N	N	P	NI	Y (Y)
Guatemala	Y	N	N	E	NI	N (Y)
Honduras	Y	N	N	E	NI	N (Y)
Mexico	Y	N	N	E	NI	Y (Y)
Nicaragua	Y	N	N	E	NI	Y (Y)
Panama	Y	N	N	E	NI	N (Y)
<b>Middle East</b>						
Islamic Republic of Iran	N <sup>27</sup>	N	N	E	NI	N (Y)
Jordan	N (2012)	N	N	E	N	N (N)
Syrian Arab Republic	N <sup>28</sup>	N	N	E	NI	N (N)
Yemen	Y	N	N	E	Y	Y (N)

\* Y = Yes, N = No, NI = Not Indicated. \*\* P = Present, E = Eliminated.

### 87. Ongoing use of DDT (situation in 2018)

By the end of the five projects (2017), and in line with expectations, significant progress had been made by countries in terms of establishing and/or amending their legal measures regarding DDT. Most countries reported that they have legal measures in place that prohibit, or restrict, the production, import, export and use of DDT (Table 2). Only six (African) countries reported use of DDT, out of 31 countries that participated in (one or two of) the GEF projects between 2003 and 2017. In fact, most countries had legislation in place shortly after the Stockholm Convention was adopted in 2001.

<sup>24</sup> Three consecutive years of zero indigenous cases by 2012.

<sup>25</sup> Three consecutive years of zero indigenous cases by 2017.

<sup>26</sup> Reported zero indigenous cases in 2017 and 2018.

<sup>27</sup> Zero cases since 2018.

<sup>28</sup> Zero indigenous cases reported since 2010.



88. Considering that (based on available data) only 6 out of 31 countries still used DDT by 2018, this translates into 80.6% of the countries no longer using it at that time; the rating therefore can be considered as **satisfactory** (falls within the range of 68.0-84.0%). For the period 2001-2014, the number of countries involved in the GEF projects reported to have used DDT was 13, which means that the number slightly more than halved since.

89. The reported progress in countries across the globe in establishing or amending legal measures to prohibit or restrict DDT is encouraging, because it consolidates the path towards elimination of DDT use. Van den Berg *et al.* (2017) nevertheless caution that implementation of these legal measures will remain a challenge in many countries. WHO has highlighted critical shortcomings in how countries endemic with malaria and other major vector-borne diseases are regulating, managing and monitoring public health pesticides, which include DDT, particularly in the WHO African Region. For example, illegal trade in DDT, and actual or suspected use of DDT outside of the health sector have been mentioned in the national reports by some countries.

#### 90. Reporting on the use and stockpiling of DDT (2018)

91. According to Article 15 of the Stockholm Convention, each Party shall notify the Conference of Parties at four-year intervals about the measures it has taken to implement the provisions of this Convention and on the effectiveness of such measures in meeting the objectives of the Convention. The most recent (and fourth) reporting cycle ended on 31 August 2018. By that time, only 11 out of 31 of the countries involved in the five GEF projects between 2003 and 2017, had submitted their reports; the rating thereof can be considered as **moderately unsatisfactory** (35.4 % (11 out of 31 countries) falls in the range of 34.0-50%).

92. Six of the 31 Parties never submitted National Reports as part of the (four) reporting cycles. For the last (and fourth) reporting cycle, 14 countries that had submitted reports for one or more of the previous cycles did not do so. Considering that 25 (out of the 31) countries did report at least once, this represents a significant decline in reporting between the 3<sup>rd</sup> and 4<sup>th</sup> round and is considered **unsatisfactory** (19.4%).

93. Van den Berg *et al.* (2017) evaluated the reporting by the Parties as follows: The periodic national reporting to the Conference of the Parties has generally been deficient, with a low response rate and inaccurate or incomplete information contained in many submitted reports. In particular, the assessment and reporting on obsolete stocks, waste and disposal of DDT should be improved. Similarly, the response rate to the DDT Questionnaire has been inadequate, with several countries for which independent information sources indicate ongoing use of DDT failing to fulfil this specific requirement under the Convention. There are indications that deficiencies in the quality of reporting (e.g. on dates, DDT amounts, and formulations) are an impediment for the comprehensive evaluation of the continued need for DDT by the Conference of Parties.

94. Only 4 countries remain with DDT stockpiles (Mauritius, Mozambique, South Africa and El Salvador). Given that at any time prior to or during the GEF projects, countries must have

maintained some level of stockpiles of DDT, this substantial reduction in number of countries still maintaining stocks is **highly satisfactory** (27 out of 31 countries, or 87.1% no longer maintain DDT stockpiles).

#### 95. Promotion and application of appropriate integrated vector management (IVM)

Based on the reports and terminal evaluation, the following was reported regarding the promotion, implementation, and policies for IVM in the projects countries:

- AFRO I: National IVM committees were set up at the beginning of the project in order to advise the national malaria control programmes (NMCPs). No information available on National IVM policy. Eritrea has adopted IVM as the main platform for malaria vector control. It was recommended to build human resource capacity for IVM and to support resource mobilization to avoid shortages of entomology equipment and commodities.
- SSCA (South Caucasus & Central Asia): National IVM Programmes and strategies exist but shortage of financial resources for the implementation of the IVM strategies represent the major threat. Another big problem is the high turnover of employees. Approval of IVM strategies confirms governmental commitment and in-country expertise exists. Country specialists were trained, and methodological guides provided.
- MECA (Mexico & Central America): There was no mention of IVM but only of implementing new integrated vector control techniques and no reference to national IVM policy or capacity. Reportedly, an important problem that weakens the efforts of malaria control in Mesoamerica is that dengue is considered as more important than malaria since it is endemic in tourist areas of economic importance and because of explosive outbreaks of hemorrhagic dengue.
- MENA (Middle East & North Africa): Not all countries have an IVM policy framework and IVM legal arrangements in place. It was mentioned that in all countries, initiatives to review policy and legal frameworks on IVM and pesticide management have been undertaken. In some countries such as Sudan or Morocco, these have resulted in national strategies on IVM. In other countries like Jordan or Egypt, no national strategies exist yet. Capacity building on IVM has been extensively done in most countries through training on IVM, development of guidelines and training materials.
- GLOBAL: No particular IVM policy information available. Given that most of the countries are involved in the AFRO II project, it is anticipated that the capacities of these institutions would be further enhanced such that they would be able to implement and scale up evidence-based, innovative and environmentally sound disease vector control interventions in the context of IVM.

96. Eleven out of 31 countries have clearly indicated to have IVM practices and/or policies in place (35.5%), which is considered **moderately unsatisfactory**. However, given that the reports for many countries have not clearly indicated their activities in this regard, this conclusion may be somewhat conservative.

### IIIc. Current trends in the production and use of DDT for control of malaria and other vector-borne diseases

97. In the period (2003-2017) covering the five GEF projects, a decline of 32% in the global production of DDT was reported (for the period 2001-2014; Figure 2); from 5144 to 3491 metric tons of active ingredient per annum. Similarly, global use of DDT, for control of malaria and leishmaniasis, showed a 30% decline over the period 2001–2014, from 5388 metric tons p.a. to 3772 metric tons p.a. (Figure 3)<sup>29</sup>. Global production and global use of DDT for malaria and VBD control have shown a modest decline since the adoption of the Stockholm Convention.

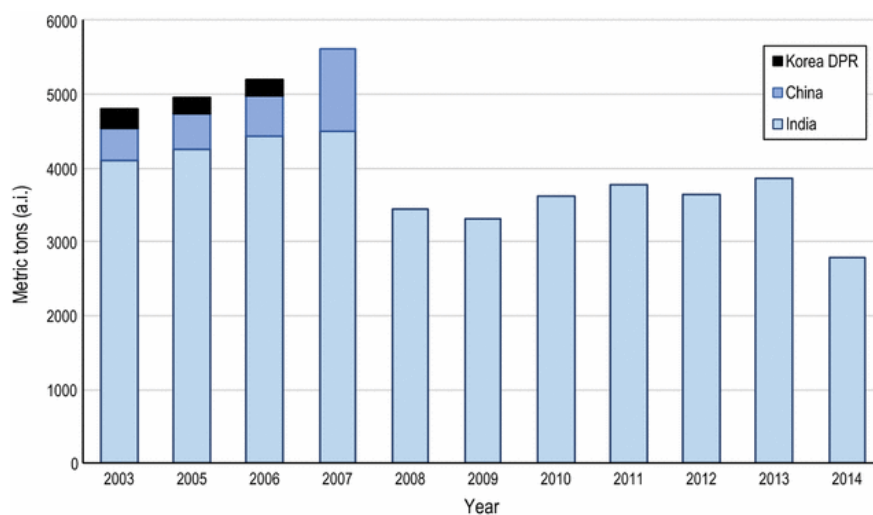


Figure 2. Annual global production of DDT (from Van den Berg et al., 2017).

<sup>29</sup> Van den Berg *et al.* (2017). *Malar. J.*, 16, 401.

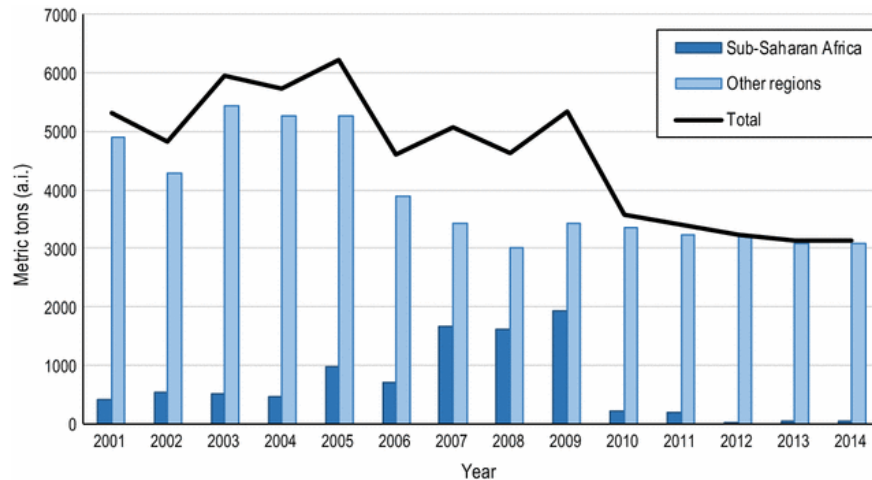


Figure 3. Annual global use of DDT (from Van den Berg et al., 2017).

98. Since the adoption of the Stockholm Convention a modest decline in the global production and use of DDT has been observed. However, the Convention itself has not been the sole factor influencing this reduction in use. Resistance of (malaria) vectors to DDT has also played an important role and has been a major cause for countries to move away from DDT to alternative insecticides for IRS. Strengthened capacity of insecticide resistance monitoring, in the WHO AFRO region since 2009, demonstrated high detected levels of DDT resistance in some countries, which lead to policy change and a substantial decline in DDT use in sub-Saharan Africa.

99. Insecticide resistance in malaria vectors against DDT and other recommended insecticides, particularly pyrethroids, is intensifying across Africa. This limits the choice of readily available insecticidal options for (malaria) vector control. In many parts of Africa, the main malaria vectors have become resistant to more than one non-organochlorine class of insecticide. In certain settings, this leaves only DDT and much more expensive organophosphates (at procurement costs; not in terms of transport, application, elimination of obsolete stocks, etc.), such as pirimiphos-methyl, as immediate options for insecticidal control and for use in insecticide resistance management strategies.

100. The experiences with insecticide resistance demonstrate the critical importance for countries to establish the technical capacity for monitoring of insecticide susceptibility, and for quality assurance of interventions, in order to facilitate timely and evidence-based decision-making on vector control.

101. Equally important will be the development of vector control strategies that do not rely on chemical insecticides, such as house improvement and larval source management. These deserve increased attention in future IVM strategies. In addition, further support is needed for

the development and evaluation of novel vector control tools, as alternatives to DDT, for which the road map has been published<sup>30</sup>.

102. WHO has highlighted critical shortcomings in how countries endemic with malaria and other major vector-borne diseases are regulating, managing and monitoring public health pesticides, which include DDT, particularly in WHO's African Region.

### IIId. Conclusions and recommendations

103. DDT continues to be used for control of malaria and leishmaniasis in accordance with the acceptable purpose under the Stockholm Convention. Following the adoption, and entry into force, of the Convention, there has been a modest decline in both global production and global use. Nevertheless, of the 31 countries that were involved in one or two of the five GEF projects, only 6 showed continued use of DDT in 2018 (Table 2). It is concluded that the GEF projects were responsible for a **highly satisfactory** reduction in the use of this chemical. It is recommended that the six remaining countries are encouraged to closely monitor DDT resistance as this may provide the necessary data to terminate its use based on failing effectiveness.

104. Not only did execution of the 5 GEF projects reviewed here result in a significant decline in the use of DDT, it also resulted in a change of mindset amongst all stakeholders involved towards the merits and potential of alternatives to DDT and broader recognition of IVM.

105. In some countries, DDT is used in response to the development of resistance of malaria vectors against pyrethroid and carbamate insecticides. Several other countries have switched to alternatives to DDT, in compliance to the Convention, or, after resistance monitoring demonstrated high levels of DDT resistance. This has contributed to the modest decline in the global use of DDT. The declining trend is expected to continue in the years ahead in view of recent data on DDT resistance in vectors of malaria and leishmaniasis<sup>31,32</sup>. The adoption of IVM frameworks and active implementation of IVM policies across countries has not been highly successful, and remains **moderately unsatisfactory**. It is recommended that countries that have successfully implemented IVM projects seek wider dissemination of their findings as a means to encourage other Parties to adopt similar approaches in future.

106. Major progress has been made by countries establishing or amending their legal measures on DDT since the Stockholm Convention was adopted in 2001. These developments, together with instruments such as the roadmap on development of alternatives of DDT, consolidates the path towards elimination of use of DDT. The majority of countries reported that they have legal

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<sup>30</sup> UNEP. Report by the United Nations Environment Programme on the road map for the development of alternatives to DDT. UNEP/POPS/COP.7/INF/6. Geneva: Secretariat of the Stockholm Convention, United Nations Development Programme; 2015.

<sup>31</sup> Coleman M *et al.* (2015) DDT-based indoor residual spraying suboptimal for visceral leishmaniasis elimination in India. *Proc Natl Acad Sci USA*, **112**, 8573–8578.

<sup>32</sup> Dhiman RC, Yadav RS (2016) Insecticide resistance in phlebotomine sandflies in Southeast Asia with emphasis on the Indian subcontinent. *Infect Dis Poverty*, **5**,106.

measures in place that prohibit, or restrict, the production, import, export and use of DDT beyond the acceptable purpose (vector control in public health). Implementation of the Stockholm Convention with regard to DDT, is constrained by major shortcomings in the national reporting, DDT questionnaire responses, and DDT Register. Complying with the reporting cycles, and considering that 25 (out of the 31) countries did report at least once in the history of the Convention, a significant decline in reporting between the 3<sup>rd</sup> and 4<sup>th</sup> round was observed and is considered **unsatisfactory**. It is recommended that reporting is subjected to quality assurance and a compliance mechanism, for instance, release of (future) funding being dependent on adequate and timely reporting.

## Appendix 1. The DDT-Alt-Model (from Final Project Report: Demonstrating the cost-effectiveness and sustainability of environmentally sound and locally appropriate alternatives to DDT for malaria vector control in Africa, 2009–2017)

The AFRO I project developed the DDT-Alt-Model, which was derived from the project outcomes. This Model relies on two interactive mechanisms, each of which involves six milestones needing to be achieved at the programmatic and operational levels as follows:

(a) Mechanism 1: Effective implementation of IVM. The milestones comprise adaptive strategic planning; available evidence-based alternative tools; a strong integrated malaria control, monitoring and surveillance system; multi-sectoral collaboration and partnerships; an insecticide resistance management plan; sustainable operational research and training plans;

(b) Mechanism 2: Continuous strengthening of local capacities. The milestones include: Knowledge of the usefulness of alternative tools; a locally adapted communication system; well-trained field entomologists; awareness among local communities and their compliance with alternative tools; effective home-based malaria case management; and available national referral centres to support the national malaria control programme.

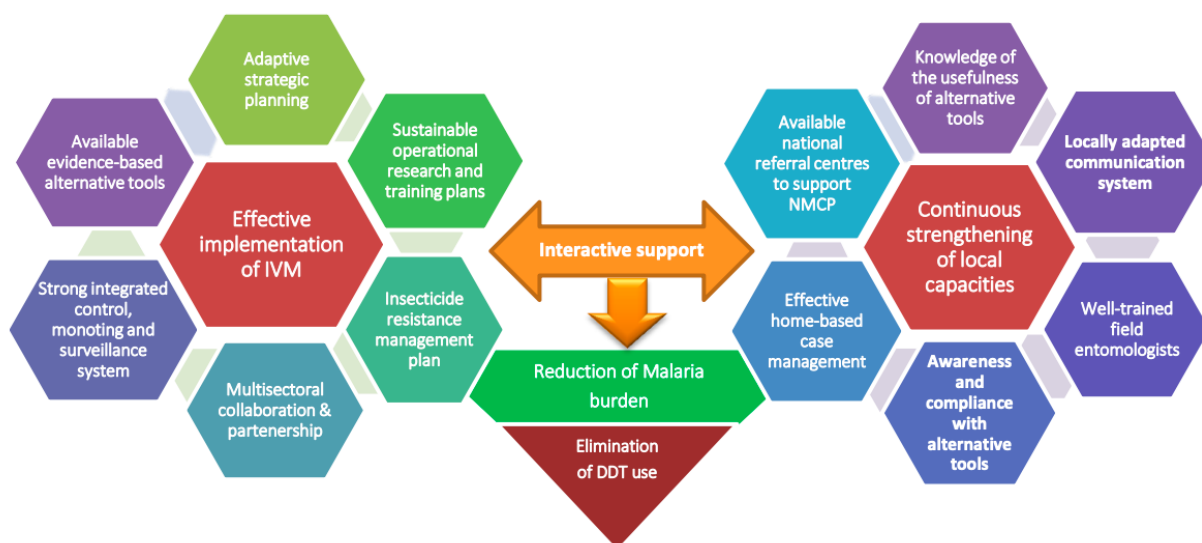


Figure 4: The DDT-Alt-Model (from Final Project Report).

Achieving at least 80% of these (12) milestones is expected to result in a significant reduction of the malaria burden and, subsequently, in the elimination of DDT use for the purpose of malaria control. A scorecard system can be used to classify country achievements in the implementation of this Model as follows:

- (i) < 8 milestones: Red card
- (ii) 8–10 milestones: Yellow card
- (iii) > 10 milestones: Green card

To implement the DDT-Alt-Model, each country is encouraged to create an 'IVM community workforce' (IVM-CW) in targeted districts to reinforce community engagement. This IVM-CW should involve community leaders, community health workers, spray operators, field entomologists, etc. These constituencies were among the attendees of the training sessions conducted by the country project teams. Since the IVM national committees have been created and are currently functioning as a partnership forum to advise the NMCP, the 'IVM community workforce' should be in charge of the implementation of IVM strategies at the operational level; it is expected that this will also benefit control of other vector-borne diseases. The continuous strengthening of local capacities (knowledge, equipment, commodities and subsidies) will be essential for effective and sustainable implementation of IVM if DDT is to be eliminated from malaria vector control.