

## PROJECT BRIEF

### IDENTIFIERS

<b>Project Number:</b>	<b>Not yet assigned</b>
<b>Project Name:</b>	<b>Demonstrating Cost-effectiveness and Sustainability of Environmentally Sound and Locally Appropriate Alternatives to DDT for Malaria Vector Control in Africa</b>
<b>Duration:</b>	<b>5 years</b>
<b>Implementing Agency:</b>	<b>United Nations Environment Programme</b>
<b>Executing Agency:</b>	<b>World Health Organization, Regional Office for Africa (WHO ROA), Brazzaville, Congo; Ministry of Health in Eritrea; Ministry of Health of Ethiopia; Ministry of Health of Madagascar; SIMA (System wide Initiative on Malaria and Agriculture), Pretoria, South Africa; ICIPE (International Centre of Insect Physiology and Ecology), Nairobi, Kenya.</b>
<b>Requesting Countries:</b>	<b>Ethiopia, Eritrea and Madagascar</b>
<b>Eligibility:</b>	<b>Ethiopia, Eritrea and Madagascar are Parties to the Stockholm Convention.</b>
<b>GEF Focal Area:</b>	<b>Persistent Organic Pollutants</b>
<b>GEF Programming Framework:</b>	<b>Operational Programme 14 on Persistent Organic Pollutants</b>
<b>GEF Strategic Priorities (Strategic Programming for GEF-4, July 25, 2007):</b>	<b>Strategic Objective 2: Partnering in investments for NIP implementation. Strategic Objective 3: Partnering in the demonstration of feasible, innovative technologies and best practices for POPs reduction.</b>

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## SUMMARY

Malaria is a major public health problem in sub-Saharan Africa. Three countries of this geographical region currently rely on indoor house spraying of DDT for malaria vector control. DDT is still an effective insecticide for malaria vector control. However, the production and use of DDT was restricted by the Stockholm Convention because of its persistence and transboundary movement that adversely affects the environment and human health. There are a number of reasons for the continued use of DDT including, lack of capacity to implement new integrated vector management (IVM) procedures, and the lack of scientific information on the effectiveness of alternative methods or resistance to alternative insecticides. This project aims to demonstrate that alternative vector control interventions not involving the use of DDT are cost-effective, environmentally sound, sustainable and replicable in other parts of the world where DDT is currently used for vector control. This will be done by strengthening of national and local institutional capacity to control malaria and minimize the risks associated with DDT exposures to humans and environment in the three participating African countries. The project will benefit the local population with reduced malaria burden and consequently with increased agricultural productivity. The project is consistent with the goals of the Stockholm Convention and will contribute to the GEF POPs target of stress reduction and sustainable alternatives to DDT, the demonstration of technologies (IVM) with indicators of strengthened policies, legislation, and institutions.

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<b>GEF:</b>	Project:	3,460,296
	PDF A	0
	PDF-B:	384,000
	<b>SUB TOTAL GEF</b>	<b>3,844,296</b>

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<b>CO-FINANCING:</b>		
Governments in kind & cash:		1,055,525
Contributions from other organisations:		
The World Health Organization		1,556,425
Roll Back Malaria		300,000
International Centre for Insect Physiology and Ecology & System Wide Initiative of Malaria in Agriculture		55,000
PDF-B Co-financing		314,000
<b>SUB TOTAL CO-FINANCING</b>		<b>3,280,950</b>

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<b>TOTAL PROJECT COST + PDF-B</b>		<b>7,125,246</b>
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**OPERATIONAL FOCAL POINT ENDORSEMENT(S):**

<b>COUNTRY</b>	<b>OPERATIONAL FOCAL POINT NAME</b>	<b>POSITION</b>	<b>DATE OF ENDORSEMENT</b>
<b>Ethiopia</b>	Dr. Tewolde Berhan G. Egziabher,	General Manager, Environmental Protection Authority	28 June 2007
<b>Eritrea</b>	Mr. M. Wolde- Yohannes	Director General, Ministry of Environment and Forestry	13 July 2007
<b>Madagascar</b>	Mr. Rakotobe Tovondriaka	Secretary General de l'Environnement Direction Generale de l'Environnement	29 June 2007

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## Acronyms/Abbreviations

ACT	Artemisinin based combination therapy
AFRO	WHO regional office for Africa
ANVR	African Network on Vector Resistance to Insecticides
ASP	Africa Stockpiles Programme
AU	African Union
COMBI	Communication for behavioural impact
DDT	Dichloro diphenyl trichloroethane
EIA	Environmental Impact Assessment
FAO	Food and Agricultural Organization
GEF	Global Environmental Facility
GIS	Geographic Information System
GPS	Global Positioning System
GFATM	Global Fund for Aids Tuberculosis and Malaria
HIA	Health Impact Assessment
IEC	Information Education Communication
IMIS	Integrated Malaria Information System
ICIPE	International Centre for Insect Physiology and Ecology
IRS	Indoor residual spraying
IPCS	International Programme on Chemical Safety
IPM	Integrated Pest Management
ITN	Insecticide Treated Nets
IVM	Integrated Vector Management
LLIN	Long lasting insecticide treated nets
LSDI	Lumbobo Special Development Initiative
NGO's	Non-Governmental Organizations
NIP	National Implementation plans for the Stockholm Convention
NMCP	National Malaria Control Program
NSC	National Steering Committee
PDF	Project Development Fund
POPs	Persistent Organic Pollutants
RHMTs	Regional Health Management Teams
RBM	Roll Back Malaria
RSC	Regional Steering Committee
SADC	Southern African Development Community
SIMA	System Wide Initiative of Malaria in Agriculture
STAP	Scientific and Technical Advisory Panel on POPs
UNEP	United Nations Environment Program
VCNA	Vector Control Needs Assessment
WDP	Water Disposable Powder
WHO	World Health Organization

## TABLE OF CONTENTS

SUMMARY .....	ii
OPERATIONAL FOCAL POINT ENDORSEMENT(S): .....	iii
Acronyms/Abbreviations .....	iv
TABLE OF CONTENTS .....	v
LIST OF ANNEXES .....	vi
PROJECT DESCRIPTION.....	1
<b>BACKGROUND AND CONTEXT (BASELINE COURSE OF ACTION).....</b>	<b>1</b>
<b>Malaria control and DDT use.....</b>	<b>1</b>
<b>GEF PROGRAMMING CONTEXT.....</b>	<b>5</b>
<b>UNEP PROGRAMMING CONTEXT .....</b>	<b>6</b>
<b>EXECUTING AGENCY CONTEXT .....</b>	<b>7</b>
<b>LINKAGE WITH OTHER GEF AND NON-GEF PROJECTS.....</b>	<b>8</b>
<b>GEF assisted DDT Projects.....</b>	<b>8</b>
<b>AFRICA STOCKPILES PROGRAMME.....</b>	<b>9</b>
<b>RATIONALE AND OBJECTIVES (ALTERNATIVE) .....</b>	<b>10</b>
<b>PROJECT ACTIVITIES/COMPONENTS AND EXPECTED RESULTS.....</b>	<b>11</b>
<b>Component 1. Strengthening of national and local capacities for malaria control .....</b>	<b>12</b>
Outcome 1.1. National and local capacities in planning, monitoring and evaluation of malaria control are strengthened.....	12
Outcome 1.2. Health centers are strengthened for emergency situations .....	13
Outcome 1.3. Local communities are equipped with insecticides and application apparatus for dealing with emergencies.....	14
Outcome 1.4. National referral centres are strengthened to provide technical support .....	14
Outcome 1.5. Community awareness is raised on alternative interventions less dependent on DDT .....	15
<b>Component 2. Implementation of alternative methods of malaria vector control tailored to local circumstances .....</b>	<b>15</b>
Outcome 2.1. Integrated Malaria Monitoring and Surveillance System is developed.....	16
Outcome 2.2. Locally appropriate alternative interventions are implemented .....	17
Outcome 2.3. Community attitudes to alternative interventions are evaluated .....	19
Outcome 2.4. Environmental and health impact of alternatives is assessed.....	19
<b>Component 3. Management and use of DDT and other public health pesticides.....</b>	<b>20</b>
Outcome 3.1. DDT and other pesticides are managed in an environmentally sound manner .....	20
Outcome 3.2. Systems for detecting insecticide resistance and management of resistance are created.....	21
<b>Component 4: Transboundary information exchange and technical support, and Project Management .....</b>	<b>21</b>
Outcome 4.1. Transboundary information exchange and technical support to countries achieved	22
<b>Component 5: Project Management .....</b>	<b>23</b>
Outcome 5.1 Project management structure is established.....	23

<b>RISKS, SUSTAINABILITY AND REPLICABILITY .....</b>	<b>23</b>
<b>RISKS .....</b>	<b>23</b>
<b>SUSTAINABILITY .....</b>	<b>24</b>
<b>REPLICABILITY.....</b>	<b>26</b>
<b>INCREMENTAL COST AND PROJECT FINANCING.....</b>	<b>30</b>
<b>MONITORING, EVALUATION AND DISSEMINATION .....</b>	<b>34</b>

## LIST OF ANNEXES

Annex A:	Incremental Costs Analysis of the Project
Annex B:	Logical Framework Matrix
Annex C:	STAP Technical Review
Annex C1:	Response to the STAP review
Annex D:	Letters of Endorsement from GEF Operational Focal Points
Annex E:	Country experience in using DDT for malaria control
Annex F:	Vector Control Needs Assessment Process
Annex G:	Project Activities and Costs to the GEF
Annex H:	Characteristics of pilot districts and proposed alternative interventions
Annex J:	Summaries of proposals of participating countries
Annex K:	Project Monitoring and Evaluation Plan
Annex L:	Workplan and Timetable

## PROJECT DESCRIPTION

### BACKGROUND AND CONTEXT (BASELINE COURSE OF ACTION)

#### Malaria control and DDT use

1. Malaria is a major public health problem and obstacle to socio-economic development in most countries of the tropical world, especially in Africa. In 2003, malaria was the single biggest cause of death among young children in Africa and one of the most common threats to the health of pregnant women. It is estimated that 80-90% of the global annual malaria cases (300 million) and deaths (1 million) occur in Africa. In sub-Saharan Africa alone it is estimated that malarial mortality among children is in the range of 430,000 and 680,000 per year.

2. Malaria transmission in the project countries is characterized by sudden upsurge of malaria morbidity and mortality that has recently been aggravated by population movements, floods and drought coupled with increased prevalence of the most deadly forms of malaria parasites. *Plasmodium falciparum* accounts for 95% of malaria infections. Malaria is transmitted by a specific group of mosquito vectors that feed on humans. The most important malaria vector species in sub-Saharan Africa are *Anopheles gambiae*, *Anopheles arabiensis* and *Anopheles funestus*.

3. In Ethiopia, malaria constitutes a major public health problem and impediment to socio-economic development. The annual incidence of malaria in the 1990s was 21 per 1,000 population based on statistics reported to the Ministry of Health. In Madagascar, malaria is the second most common cause of morbidity and the second major cause of death in patients admitted to hospitals.

4. One of the elements of the Global Malaria Control strategy is vector control aimed to kill mosquitoes. Indoor Residual house Spraying (IRS) is an effective way of obtaining large-scale benefits at affordable cost. It involves infrequent spraying with insecticides inside human habitations to reduce mosquito life span and density, thereby reducing malaria transmission and the prevention of epidemics. This method relies on the fact that malaria-carrying mosquitoes enter houses during the night to feed on the occupants and rest on the walls or roofs prior to or after feeding.

5. DDT is one of the twelve (12) insecticides recommended by the World Health Organization (WHO) for use in IRS. According to WHO, DDT is used primarily for malaria control in approximately 24 countries worldwide. WHO estimates that 1,000 – 1,300 tonnes of DDT are used annually in the region for malaria vector control. DDT is currently used for malaria vector control in the three countries targeted in this project (Eritrea, Ethiopia and Madagascar).

**Ethiopia DDT use baseline data<sup>1</sup>:** Since 1960 malaria control in Ethiopia has generally been implemented by using IRS with DDT for reducing the life span of vector mosquitoes. This involves the use of approximately 360 tonnes of DDT annually.

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<sup>1</sup> Ethiopia has not informed the Stockholm Convention Secretariat on its use of DDT as required under Paragraph 4, Part II of Annex B of the Convention (Source: Stockholm Convention Secretariat, 19 January 2008).

**Madagascar DDT use baseline data:** In Madagascar, after severe malaria epidemics in highland areas in 1987, DDT was re-introduced for vector control. This use of DDT has gradually decreased from 208 tonnes in 1993 to 60 tonnes in 2002. In 1993, some 66,000 km<sup>2</sup> were sprayed with DDT, covering a population of about 2,600,000 people).

As Madagascar clearly intends to use DDT<sup>2</sup> in case of serious malaria outbreaks, the annual estimated need of DDT is about 200 tons/year.

**Eritrea DDT use baseline data**<sup>3</sup>: Depending on the epidemiological situations, the DDT use in Eritrea varies between 7 and 30 tons annually.

Seen the above, the **baseline for DDT use in the project countries** is estimated at at least 567 ton per year.

History of malaria vector control using DDT is further presented in Annex E.

6. The Stockholm Convention on persistent organic pollutants (POPs) restricts the production and use of 12 chemicals including DDT. DDT, like the other POPs, poses significant global risks because it is toxic, bioaccumulates in the food chain, and is susceptible to long-range environmental transport (via air and water). The extensive use of DDT for agricultural purposes has resulted in a number of effects from egg-shell thinning with birds, developmental and reproductive effects manifested in wildlife as well as health effects in human beings (premature births, shorter lactation periods and subsequently increased child mortality). Continued exposure to DDT may severely threaten both biodiversity and human health.

7. As stated in the updated Toxicological Profile for DDT/DDD/DDE of the U.S. Department of Health and Human Services (September 2000) “[several] *studies raise concerns that exposure to DDT early in life might cause harmful effects that remain or begin long after exposure has stopped*” (ATSDR p.8). For DDT and its metabolites, the human health and environmental effects of concern are mainly chronic in nature. Although, there exists no conclusive evidence that DDT and analogues cause adverse developmental effects on humans, such effects have been observed in the offspring of animals after acute exposures to DDT, DDE or DDD during gestation. Acute, intermediate and chronic duration oral studies in animals provide evidence that DDT may cause immuno-suppression of a specific group of white blood cells. Recent data also indicate a positive association between the frequency of apoptosis and the exposure to DDT and DDE<sup>4</sup>.

## **Implementation of alternative interventions and baseline activities**

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<sup>2</sup> Final Draft National Implementation Plan, March 2007: « Madagascar a obtenu une dérogation jusqu'en 2010 sur l'utilisation du DDT contre l'épidémie du paludisme et c'est le Ministère de la Santé et du Planning Familial qui est responsable de leur gestion. On utilise environ 200 tonnes par an, mais le stockage de ces produits laisse à désirer et on se sert même des salles de soins pour garder ces produits ».

<sup>3</sup> Eritrea has not informed the Stockholm Convention Secretariat on its use of DDT as required under Paragraph 4, Part II of Annex B of the Convention (source: Stockholm Convention Secretariat, 19 January 2008).

<sup>4</sup> Pérez-Maldonado, I.N., Díaz-Barriga, F., De la Fuente, H., González-Amaro, R., Calderón, J., and Yañez, L. (2004). DDT induces apoptosis in human mononuclear cells in vitro and is associated with increased apoptosis in exposed children. *Environ. Res.* **94**, 38-46.



8. DDT using countries in Africa, for the most part, have not been able to appropriately assess and adopt alternatives to DDT that would be similarly, or more, effective, affordable and sustainable. While these countries are working together under the Roll Back Malaria partnership to strengthen health services and malaria control capabilities in general, there is no coordinated approach to the development, assessment and utilization of alternatives to DDT.

9. Although malaria control in Ethiopia is based on DDT spraying, the national malaria control programme emphasises alternative strategies such as anti-larval measures, modifications to physical environment and efficient water management. Based on epidemiological surveillance data, spraying operations in Madagascar have reduced by 50% the quantities of DDT used from 250 tonnes to 125 metric tones over a period of 5 years. Other examples of successful alternative interventions in the region should be examined for replication. For instance in 2000, the South African Malaria Control Programme embarked on a winter larviciding programme using Vectobac (Bti). This has worked well in reducing mosquito breeding during winter months and also offers positive benefits during the summer months in minimizing vector densities. This approach needs to be evaluated for wider application in combination with effective monitoring and evaluation procedures. However, there are severe limitations in the availability of resources for this work.

10. Currently there are limitations in the human resources and expertise necessary to deal comprehensively with the prevention of malaria based on using alternative interventions. Baseline activities in Madagascar do not extend to a vertically integrated approach to malaria vector control. Furthermore, there is limited regulation on the use, transport and storage of pesticides, limited epidemiological surveillance in endemic areas, or inadequate diagnostic and referral services.

### **Integrated Vector Management and Need for Demonstration of Alternatives**

12. Possible alternative interventions can be applied to local situations depending on environmental and epidemiological conditions and prevailing land-use practices and patterns. An integrated vector management (IVM) approach has been promoted in the planning and selection of alternative methods for vector control. IVM is defined as a process of evidence-based decision-making procedures aimed to plan, deliver, monitor and evaluate targeted, cost-effective and sustainable combinations of regulatory and operational vector control measures. It can have a beneficial influence on vector-borne disease transmission risks while adhering to the principles of subsidiarity, inter-sectoral collaboration and partnership. It also provides an adaptive management approach that ensures optimal levels of effectiveness of vector control interventions in local settings for compliance with the requirements of the Stockholm Convention. Implementation of IVM will, *inter alia*, lead to reduced reliance on insecticides for public health protection applications. IVM promotes appropriate management of insecticides, including judicious use and effective handling of stockpiles. It also allows a pro-active approach to vector-borne disease prevention through the incorporation of environmental management measures in water resources development. The establishment and/or strengthening of inter-sectoral links are the most crucial of the various factors involved in promoting the application of IVM.

13. In the context of IVM strategy for the control of disease vectors a regional Consultation to prepare African countries for reduced reliance on DDT for malaria control was held 8-10 February, 2000, in Harare, Zimbabwe. This consultation was attended by policy makers and programme managers from countries that use DDT for house spraying. The Regional Consultation formulated recommendations that include:

- Countries currently using DDT for malaria vector control must establish and maintain a regulatory basis to ensure that DDT is used for public health purposes only;
- Alternatives to DDT should be introduced gradually into the national malaria control programmes (NMCP) after investigation of insecticide resistance, status and prospects; and
- Insecticide policy, legislation and inter-sectoral collaboration should enforce human health protection in the context of the use of alternative insecticides.

Since the initiation of the IVM process by WHO in 2001, countries are willing to implement IVM when the necessary advocacy has been done. One of the proofs is the re-establishment of vector control units in many countries.

14. However, implementation of IVM requires selection of appropriate vector control methods that can be applied in a well-defined area having specific and well-defined epidemiological conditions. Most of African countries do not currently have adequate capacity to effectively plan, implement, monitor and evaluate vector control interventions.

15. Under circumstances of limited national and local capacity, countries tend to rely on the traditional house spraying method that is both cheap and cost-effective. In Africa, a number of constraints have impeded the ability of countries to implement alternative procedures as the primary methods of vector control. The most important needs that were identified in the Vector Control Needs Assessments (VCNAs) conducted during the PDF-B phase activities are (see Annex F):

- *Human resources:* Personnel trained on IVM are needed to provide data for epidemic forecasting or to map those areas in which IRS is needed to reduce disease incidence. General training in the overall management of pesticides (e.g., proper handling and safe use) is also needed to assure that pesticides are used appropriately as part of an integrated vector management strategy.
- *Epidemiological surveillance:* Epidemiological surveillance systems that would provide entomological and epidemiological data as an evidence-base for the selection of areas that need targeted spraying are essential. The establishment of laboratories and capacity to conduct bioassays and assess vector susceptibility to insecticides will assist in strengthening epidemiological surveillance and implementing monitoring and evaluation.
- *Operational research:* Adequate capacity to define an operational research agenda and to conduct targeted research is critical to the development and implementation of integrated vector management (IVM) and the assessment of viable alternatives to DDT. Evidence on

the effectiveness of alternatives for use in malaria control programs will be critical to reducing reliance on DDT.

- *Health delivery system:* Adequate health delivery systems are essential for early diagnosis and prompt treatment to minimize malaria mortality. The training of medical caseworkers will improve the management of uncomplicated and severe malaria cases and strengthen overall preparedness and diagnostic capabilities.
- *Institutional and intersectoral coordination:* Coordination and expertise is needed to promote IVM and to manage vector control programs at the local level. The lack of integration with other sectors, including agriculture and environment inhibits the implementation of IVM. The need for coordination among relevant sectors is also important in the implementation for the implementation of the Stockholm Convention.
- *Community mobilization:* national authorities need to prepare training and mechanisms for community outreach and education activities to solicit support for alternative malaria control strategies.
- *Legislative framework, policy, guidelines and enforcement:* National legislation addressing the management and use of pesticides will strengthen the ability of countries to promote proper use of pesticides and implement the Stockholm Convention including the regulatory and other mechanisms to ensure DDT use is restricted to disease vector control. Legislation should address the production, use, and import of pesticides and eliminate trade barriers (e.g., tariffs) that inhibit the import of public health pesticides and other vector control products. A national infrastructure for the sound management of pesticides is needed to meet international quality specifications and is also necessary for the development of appropriate and effective regulatory systems.

16. Without coordinated action and financial and technical assistance, it will be difficult for countries to successfully implement and sustain efforts to reduce and eliminate the use of DDT. The proposed project will allow the participating countries to acquire with evidence regarding alternative interventions that can maintain or reduce the current level of malaria disease burden or reduce it. In addition, the project will enable countries to meet their obligations under the Stockholm Convention by progressively phasing-out of DDT. It will also demonstrate to other non-DDT using countries the efficacy and affordability of alternative vector control measures.

## **GEF PROGRAMMING CONTEXT**

17. The proposed project is in accordance with the provisions of the Stockholm Convention on POPs regarding DDT which states that Contracting Parties shall encourage (Annex B Part II): *“the parties, within their capabilities, to promote research and development of safe alternative chemical and non-chemical products, methods and strategies for parties using DDT, relevant to the conditions of those countries and with the goal of decreasing the human and economic burden of disease. Factors to be promoted when considering alternatives or combinations of alternatives shall include the human health risks and environmental implications of such alternatives. Viable alternatives to DDT shall pose less risk to human health and the*

*environment, be suitable to disease control based on conditions in the parties in question and be supported with monitoring data.”*

18. This project meets 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. The expected outcomes and the proposed on-the-ground interventions, which include Integrated Pest and Vector Management, are consistent with OP # 14 and meet the GEF funding criteria under this operational program. This project contributes to the implementation of the GEF Strategic Priority POP-3: Demonstration of Innovative and Cost-Effective Technologies and Practices. The activities under this strategic priority include *“the use of DDT for vector control.”*

19. The project also relates to the development and implementation of the National Implementation Plans under the Stockholm Convention. The GEF is currently supporting the preparation of National Implementation Plans by developing countries and countries with economies in transition to meet the requirements of the Convention. Although this project specifically addresses DDT use, in that context it will also provide capacity-building and information relevant to the preparation of NIPs by the participating countries that are Contracting Parties to the Convention.

#### **UNEP PROGRAMMING CONTEXT**

20. UNEP is the Implementing Agency for a DDT project in Mexico and Central America and is involved in developing DDT/ IVM projects in Middle East and North African as well as in Southeast Asia and Western Pacific. UNEP will therefore be in a position to facilitate and coordinate exchange of information and experience among the various regions and countries undertaking efforts to reduce the reliance on DDT for malaria control. UNEP will look for ways of bringing the respective DDT project managers together to review progress, exchange experience and to find solutions to address common challenges related to project implementation. UNEP is also aware of the GEF co-funded African Stockpiles project (ASP), which involves the removal, and destruction of POPs pesticides in Africa.

21. The Stockholm Convention requires countries to develop a National Implementation Plan (NIP) for meeting the obligations of the convention on POPs. UNEP is the implementing agency for GEF NIPs projects in Madagascar<sup>5</sup>. Eritrea has ratified the Convention in March 2005 and currently it is formulating the NIP. Component activities in the development of NIPs include the creation of POPs inventories, assessments of national infrastructure and capacity, priority assessment and objective setting. The current project coordination mechanism and implementation arrangements provide a forum to address DDT action plans in NIPs.

22 The following activities will be included in this project to contribute to the preparation of NIPs, specifically in relation to DDT:

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<sup>5</sup> UNIDO is the implementing agency for POPs enabling activity for Ethiopia.

- 1) The NIP project coordinator of each participating country will participate in the National Steering Committee of the project. Correspondingly, the NMCP coordinator in the Ministry of Health will be requested to participate in the development of NIPs.
- 2) Participating countries are requested to prepare inventories of DDT stockpiles in the country with reports to be subsequently discussed in the Regional Steering Committee for action within the African Stockpile Programme.
- 3) Outputs and products from the demonstration project will be used as a basis for introducing alternative interventions in non-project districts within the framework of integrated vector management.

23. The cost-effectiveness and local availability of alternatives to DDT for malaria vector control demonstrated in this project can serve as the basis for developing priority action plans to reduce the use of DDT to be included in the National Implementation Plans.

#### **EXECUTING AGENCY CONTEXT**

24. The Executing Agency for the project will be WHO. As the secretariat and technical arm of the Roll Back Malaria (RBM) partnership, WHO takes full advantage of the opportunities available at global, regional and country levels to identify and allocate appropriate technical support for project implementation, monitoring and evaluation.

25. WHO's own structures, coupled with the opportunities provided by the RBM partnership at the international and country level, that support functions of advocacy, coordination, resource mobilization and technical support for planning, implementation, and the monitoring and evaluation of malaria control efforts, provide an ideal and perhaps unique context in which to address the constraints to DDT reduction and elimination. In addition, WHO country offices that are currently undergoing major strategic changes in the formulation and implementation of country cooperation strategies, will better articulate malaria prevention measures and country priorities. This will help in identifying and allocating the necessary human resources at national level for a proper technical support for project implementation, monitoring and evaluation. The WHO has the capacity to widely disseminate information and experiences gained from the project with all malaria endemic countries.

26. The WHO Regional Office for Africa is also providing programmatic and strategic support for the implementation of IVM to Member States of the Region through capacity building, provision of technical guidelines and strengthening of vector control services. The IVM approach provides an excellent opportunity for strengthening national capacities for vector control, to reduce or prevent the application of POPs pesticides (such as DDT) or to minimize the risk of countries to revert to the use of these chemicals.

27. The Regional Office for Africa established a partnership on IVM in 2003 to promote the implementation of IVM through broader participation in national programmes and organizations such as WHO, UNEP, ICIPE, the Environmental Health Project, the Hashimoto Initiative and the Panel of Expert on Environmental Management. The aim of such partnerships is to promote the

implementation of IVM as part of a broader integrated disease management strategy and as a way of preventing the release of Persistent Organic Pollutant (POP) pesticides in the environment.

28. The 2<sup>nd</sup> IVM partnership meeting was convened in Cameroon, in April 2004. The meeting was attended by national malaria programme managers (including those of the project countries) and POPs focal points from 12 countries of the region. The meeting made the following recommendations to countries.

- National IVM focal points and Stockholm Convention Focal Points are encouraged to undertake joint planning to ensure effective integration of the IVM/VCNA process with NIP development; and
- Incorporate IVM into national health policies.

#### **LINKAGE WITH OTHER GEF AND NON-GEF PROJECTS**

##### **GEF assisted DDT Projects**

29. This GEF project provides a unique example of demonstrations of alternative interventions to DDT use for malaria control through improvement of personal and household hygiene and the use of environmental management practices to eliminate mosquito breeding sites. This combined approach has resulted in substantial reductions in malaria transmission and the use of DDT for malaria vector control in Mexico. In addition, the experience gained in utilizing sophisticated surveillance techniques and designing innovative strategies for managing DDT stocks will be useful for this analogous project in Africa.

30. The GEF project to phase-out DDT in Mexico and Central America provides a good opportunity for gathering information and experiences on alternative malaria control approaches. Specifically, the experience in Mexico and Central America in utilizing sophisticated surveillance techniques and in designing innovative strategies for managing DDT stocks will be useful in Africa. However, due to the existence of different vector species and the variability of malaria epidemiology in the two regions, it is inevitable that integrated disease management approaches unique to the conditions and needs of African countries will be necessary to decrease the heavy burden imposed by malaria. In addition, the Africa region requires appropriate strategies that can be sustained under conditions where resources are extremely limited and the health infrastructure is unreliable. Both UNEP and the World Health Organization (WHO) will ensure that information is shared between both regions and will facilitate the testing of innovative control methods across regions that show promising results and which can be appropriately utilized under local conditions.

31. The GEF project to phase-out DDT in Eastern and Southern Mediterranean countries focuses on gathering information and experiences on alternative malaria control approaches in some Northern African countries and some countries in the Middle East. As such, this project will contribute with regional information and possibilities for alternative strategies in these areas.

In combination with the current proposal, it is expected that sufficient practices can be developed to be implemented by other DDT applying countries in the African continent.

32 The proposed GEF project in South East Asia and the Pacific will gather information and experiences on alternative malaria control approaches of 10 different countries in South East Asia and the Pacific. Combined with the above mentioned projects and a possibly project for the Eastern European/Central Asian region, it will complete the global and unique partnership between UNEP/WHO in the field of promoting alternatives for DDT use in malaria control and as such drastically and sustainably reducing DDT application in malaria control world wide. The combined outcomes of the various above mentioned projects will influence the WHO global strategy on malaria (and vector control) in the near future.

33 Currently one project is under development related to the development of policy and strategic guidelines to Governments with regards to malaria control: “Malaria Decision Analysis and support Tools (MDAST): Evaluating Health, Social and Environmental Impacts and Policy Tradeoffs” for East Africa (Kenya, Uganda, and Tanzania). It is anticipated that the information and experiences gathered in the above mentioned regional projects will be used in defining strategic advices to Governments requesting malaria control guidance and facing malaria outbreaks without application of DDT.

34. This ‘strategy development project’, for which GEF funding will be requested as well, will complete the global approach on the reduction of DDT application for malaria control initiated by UNEP/WHO.

#### **AFRICA STOCKPILES PROGRAMME**

35. DDT stockpiles pose additional risks to the environment and human health if not managed properly. The “*Africa Stockpiles Programme*” (ASP) will address the issue of obsolete stockpiles disposal in all African countries over a period of 10 years or so. The present project activities dealing with stocks will be fully coordinated with the work of the Africa Stockpiles Programme, which is implemented by the World Bank in cooperation with FAO and in which UNEP is a partner. Coordination with the ASP will be important, particularly as Ethiopia, is one of the participating countries during phase 1, Eritrea and Madagascar are scheduled to participate later in the ASP. A preliminary discussion has taken place between the proposed project and the ASP with the purpose of avoiding the duplication of activities between the two projects. The current project will deal with the management of DDT stocks associated with public health applications, as part of the IVM framework, and will not deal with the much broader range of obsolete stockpiles that will be addressed by the ASP.

36. However, to prevent the risk of diverting DDT stocks for use in particular in the informal sector or elsewhere, the project will find a clear link with the ASP to make sure that stocks are destroyed within a reasonable time limit and in an environmentally sound manner. For Ethiopia, this might be easy as Ethiopia is currently already involved in the ASP collection and disposal operations of POPs related stocks. For the other project countries discussions with ASP will be opened.

## **RATIONALE AND OBJECTIVES (ALTERNATIVE)**

37. This project will demonstrate cost-effective, environmentally sound, and locally appropriate alternatives to DDT, ensuring their sustainable use through strengthened national and local capacity for malaria control. The project aims to move countries from traditional method of house spraying to selective vector control. Selective and targeted vector control is based on sound knowledge of the prevailing local situation. Planning and implementation of vector control interventions require selection of appropriate vector control methods that can be applied in an area having specific and well-defined environmental and epidemiological conditions. These interventions need to be evaluated through regular ecological, entomological and epidemiological assessments that permit changes in the objectives of vector control programmes over time. The project strategy is to enhance the capacity of the participating countries to effectively plan, implement, monitor and evaluate vector control interventions that do not involve a short sighted use of DDT with its long term negative side effects.

38. Reductions in malaria burden, which result from enhanced capacity, both at national and local levels, and improved environmental conditions through the reduced use of DDT for IRS, will constitute the immediate benefits to the participating countries. In addition, the project will leave countries with sound district malaria control programmes that will serve as a basis for replication in other districts and countries. Longer-term benefits will include overall strengthening of national and district level programmes of improved malaria control. These will have associated socio-economic development benefits through multi-sectoral collaboration with other stakeholders who have negative or positive influences on malaria prevention due to their activities. Any reduction of the malaria disease burden will result in increased agricultural productivity and income of individual households. Another significant benefit will be the optimal functioning of the health systems in the project districts.

39. The participating countries have already initiated a series of interventions for malaria vector control. The project will add to, and expand, the existing baseline activities to demonstrate alternatives to DDT as malaria vector control while similarly expanding and enhancing the existing capacity to review, select and implement such alternatives. The GEF intervention will, in this way, enable coordination and dissemination of results and experiences in order to obtain the desired national, regional and global benefits.

40. The overall development objective of the project is the reduction of DDT use and the sound management of DDT stocks through the strengthening of malaria vector control practice in three African countries. The demonstration of alternative interventions requires the improvement and strengthening of existing control efforts. This includes: improving the capacity of health workers for case management of uncomplicated and severe malaria; strengthening preparedness for malaria epidemics and response at all levels; improving the diagnostic capabilities of health outlets to provide effective treatment of the disease and disease surveillance; participation of local communities in the adoption of alternative interventions; improving the involvement of communities at risk through the dissemination of health information regarding malaria vector control; and develop the capacity to undertake operational research to improve the knowledge base for decision-making.



41. The overall objective of the project is 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. The above overall project objective will be achieved through satisfaction of the following specific objectives:

- a) **To strengthen the capacity for malaria diagnosis, treatment and vector control in project districts, particularly for emergency malaria occurrence that may be associated with introduction of alternatives;**
- b) **To strengthen national and local capacities for planning, monitoring and evaluation of vector control interventions;**
- c) **To strengthen national reference centres to support the implementation of alternative malaria control interventions;**
- d) **To design, implement, monitor and evaluate studies that will assess the cost-effectiveness and sustainability of alternative interventions;**
- e) **To strengthen community participation and mobilization to support the sustainable implementation of alternative interventions;**
- f) **To strengthen pesticide management practices that will prevent the accumulation of DDT and other toxic pesticides in stockpiles and reduce the development of vector resistance;**
- g) **To assess the potential risks to human health of alternative, non POP, insecticides; and**
- h) **To disseminate information on the best alternative malaria vector control methods for wider application.**

## **PROJECT ACTIVITIES/COMPONENTS AND EXPECTED RESULTS**

42. This project will demonstrate alternative interventions to the use of DDT in the project districts and reduce malaria incidence. The most important lesson learned during the PDF-B process is that countries are sensitive to both the risks and the constraints associated with the use of DDT in malaria vector control. Countries committed to reducing their reliance on this insecticide recognize that significant steps away from the use of DDT can only be taken after reliable and cost effective alternatives are identified and proven and appropriate resources have been made available. Some of the activities are relevant to building the necessary capacity to address possible emergency malaria outbreaks during demonstration activities.

43. The demonstration sites for the project were chosen during the national stakeholders meeting that was held in each of the participating countries during the PDF- B phase. All the 10 project demonstration districts are currently being sprayed with DDT for malaria control. Additional criteria that were used during the selection process with in the context of IVM: malaria disease burden, accessibility to health services and the initial introduction of some alternative interventions that supplement IRS as well as the presence of other vector borne disease where ever applicable. Further details on the demographic, socio-economic and disease burden of the selected districts and proposed alternative interventions to implemented during the project are given in Annex J.

The following 10 demonstration districts were selected:

- Eritrea: Anseba, Debub, Gash Barka
- Ethiopia: Adama, Kafta Humera, Sodo, Tach Armachiho
- Madagascar: Anjozorobe, Ambalavo, Vatomandry

44. The project will comprise four components. These are: 1) Strengthening of national and local capacities for malaria control; 2) Implementation of alternative methods of malaria vector control tailored to local circumstances; 3) Management and use of DDT and other public health pesticides; and 4) Transboundary information exchange and technical support, and Project Management. A summary description on project activities and costs to the GEF can be found in Annex H. A summary of country proposals is presented in Annex J.

### **Component 1. Strengthening of national and local capacities for malaria control**

45. The overriding concern underlying the Malaria Control Programs is to protect the local populations from the burden of malaria and to provide effective prevention through vector control. A number of opportunities and funding offered by partners and government for baseline activities are available. These, however, are not sufficient to replace proven intervention methods with alternatives. The implementation of IVM for the control of malaria and reducing the release of DDT require the human resources and technical capacity to implement evidence-based alternative interventions. IVM is a sub component of the broader context of disease management strategy. Initial work on IVM focuses building the capacity and delivery system of vector control interventions. For instance effective prevention of malaria depends on a strong and responsive health system to diagnose and treat malaria promptly, adequate surveillance system, and efficient vector control program. As such it requires building capacity of the health system at different levels. Currently, the capacities of the participating countries for the development and implementation of effective alternative malaria vector control interventions are lacking. This project component comprises five sub-activities, described in the following sections, to provide appropriate capacity-building in each of the participating countries. Some of the activities are relevant to building the capacity required to address possible emergency malaria outbreaks and implement demonstration activities.

#### **Outcome 1.1. National and local capacities in planning, monitoring and evaluation of malaria control are strengthened**

46. **Rationale:** The participating countries have relied on a traditional method of blanket spraying of houses for the control of malaria transmission in epidemic prone areas. In order to reduce the amount of DDT spraying, well-trained personnel are required to provide data for epidemic forecasting or to map out those areas where IRS is necessary to reduce disease incidence. Comprehensive training regarding project planning, implementation, monitoring and evaluation at national, provincial, district and community levels is a key to success in this respect. There is a need to increase and strengthen these capacities, so that they can effectively promote alternative interventions. General training in the overall management of pesticides

(e.g., proper handling and safe use) is also needed to ensure that pesticides are used appropriately as part of an integrated vector management strategy.

47. **Activities:** Project activities involve organizing and implementing training courses on IVM. The training program will be organized for national and district level managers at ICIPE. A total of 20 participants from each of the participating countries will be recruited from district and national level. The training will be conducted for 2 months. Trainees will be exposed to techniques for identifying and understanding the most important malaria vectors, understand the role of data management and analysis for vector surveillance and participate in multisectorial team to plan and manage vector control programs. Already existing training manuals and modules will be used to support this training. The outcome of this activity will be the installation of capacities at national, provincial, district and community levels to undertake planning and implementation of alternative malaria prevention measures to reduce the dependence on DDT.

### **Outcome 1.2. Health centers are strengthened for emergency situations**

48. **Rationale:** Prompt and effective treatment of malaria is a critical element of malaria control. In African south of the Sahara, where most malaria is due to *Plasmodium falciparum* and potentially fatal, early and effective treatment saves many lives. It is vital that children especially start treatment within 24 hours of onset of fever, to prevent, often rapid, progression to severe malaria and death. However in most malaria endemic areas, access to curative and diagnostic services is limited and often out of reach of communities affected by malaria. Therefore, it is essential to develop the capacity for early diagnosis and prompt treatment to minimize malaria mortality during the introduction of alternative interventions. Although a significant increase in malaria is not expected in the project areas, precaution will be exercised to minimize an unlikely event of increase in malaria morbidity and mortality. The reference system will be strengthened and district hospitals equipped with the necessary capacity to manage severe malaria cases. This also involves strengthening community level capacities through the provision of appropriate anti-malarial drugs so that cases are treated promptly at the community level.

49. **Activities:** The outcome of this activity will be improved health care services in the target areas of the project. Existing health services will be augmented by effective malaria diagnostic and treatment capacities. Anti-malarial drugs will be made available to all health posts and centres and community health workers and other health personnel will be trained or provided with refreshers on malaria diagnosis through the provision of rapid detection test kits and microscopes to ensure that each malaria case is diagnosed and treated within 24 hours from the onset of fever. In order to ensure rapid and effective response to such effects the following contingency measures will be put in place: the provision of appropriate anti-malaria drugs so that cases can be treated promptly at the community level; the training of 30 health personnel on the proper diagnosis and treatment of malaria; strengthened capacity for the diagnosis of malaria at health facilities through the provision of rapid detection tests kits and microscopes at different levels of health care. The average cost per dose of ACT (Artemisinin based combination therapy) for an adult is approximately USD 1.00. Simplified methodologies of

malaria diagnosis are available in the form of kits known as Rapid Diagnostic Tools. It is estimated that such kits will about US\$ 0.50 for each test. The provision of commodities and the organization of training in each country will be implemented by the national authorities.

### **Outcome 1.3. Local communities are equipped with insecticides and application apparatus for dealing with emergencies**

50. **Rationale:** The Afro-tropical vectors of malaria are characterized by their efficiency for malaria transmission and physiology to breed profusely in small water bodies such as hoof prints, pits etc. Interventions such as environmental management that will be given prior consideration as alternative options might result in missing such breeding habitat. Documentation of malaria cases indicates an epidemic warning necessitate the application of insecticide spraying to kill vector mosquitoes that are the transmission. In the unlikely event of such scenarios measures to halt the transmission are mandatory.

51. **Activities:** To deal with emergency situations in project districts that may result from introduction of alternative interventions, vector control program will be strengthened. This will involve training vector control program staff on the appropriate timing and application of insecticides for indoor residual spraying that can be deployed rapidly to respond by spraying affected areas. To ensure rapid and effective response to such circumstances, the following steps will be taken: maintaining a contingency stock of DDT at national level that can be rapidly distributed to affected areas; training and maintaining a team of entomological technicians and sprayers. In such circumstances, the project design will be revisited and adjusted appropriately. The list of equipment and commodities include 8 litre Hutchinson spray pump at US\$ 110 each. Training of local spray men is based on squads of 8 spray men/ 100,000 people. Spray men will be given 8 days training on appropriate use, mixing and handling.

### **Outcome 1.4. National referral centres are strengthened to provide technical support**

52. **Rationale:** The implementation of vector control tailored to local situation requires the collection and analysis of data that can reveal the mechanism of malaria transmission. The epidemiology of malaria among selected districts in the participating countries is not homogenous. Therefore, careful geographical, epidemiological and entomological baseline data are required to guide the selection of appropriate interventions. This is achieved through the use of Geographical Information Systems (GIS). GIS are automated systems for the capture, storage, retrieval, analysis and display of spatial data. GIS allows analysis of data global positioning system (GPS). Combined with data from surveillance of different variables, GIS in GPS provide a powerful tool for the analysis and display of areas of high disease prevalence and the monitoring of control measures. A major aspect of the project is to identify environmental factors that affect the patterns of disease risks and transmission. The GIS data collected in malarial areas of the project districts will be used to identify mosquito breeding sites, so that guidance can be provided to vector control personnel to implement appropriate interventions that take full account of environmental considerations and lead to reduce ecological impacts. The national referral centres will form a network to promote and disseminate the results of the project, to the districts other than demonstration districts. Further

such a network of centres can be incorporated into the WHO network on malaria control and IVM, so that the results can be transmitted to the WHO network, so that replication work will be facilitated

53. **Activities:** In each of the participating countries, national reference centers will be identified and strengthened to be responsible for district project design and provide technical support for implementing, monitoring and evaluation, including quality assurance of laboratory techniques. The instruments, methodologies and skills required for the collection of such information are lacking. For the project districts, a basic district-specific GIS will be developed and used to collect geo-referenced data on environmental and ecological factors related to vector distribution, the distribution of the malaria burden, the location and types of malaria control interventions and health system coverage.

#### **Outcome 1.5. Community awareness is raised on alternative interventions less dependent on DDT**

54. **Rationale:** The behavioral challenges in implementing effective vector control strategies are immense. This can only be achieved through engaging people in a deliberate process of behaviorally focused social mobilization and communication. Social mobilization through participatory approach is a key prerequisite for the success of public health interventions. Although there are successful experiences involving communities in public health programs in Africa, effective community mobilization for malaria control remains an outstanding challenge in many countries. In malaria vector control, this ranges from reducing vector breeding sites, introducing personal protective measures to health promoting practices. For instance, the use of insecticide-treated nets (ITNs) for malaria control relies that personal sleep under treated nets at all times.

55. **Activities:** Information, education and communication with local populations on the use of alternative interventions such as ITNs, re-treatment of nets and environmental management will be provided to communities in each of the participating countries. This is for the purposes of awareness-raising at community level as a means of mobilizing support and action to reduce malaria transmission. Various media that are appropriate to the participating communities will be chosen to disseminate information aimed at promoting effective implementation of alternative methods of malaria control that are not dependent on the use of DDT. The process of producing the desired behavioral change is implemented, monitored and evaluated using the Communication for Behavioral Impact (COMBI) approach developed by WHO. This includes radio shows, awareness events, road show campaigns, adverts, posters and pamphlets. These promote and improve community involvement and knowledge, particularly in the context of explaining the advantages of introducing new procedures for malaria control. The activity will be supported by the Social Mobilization and Training team of WHO based in Tunis.

#### **Component 2. Implementation of alternative methods of malaria vector control tailored to local circumstances**

56. This component represents the core of the project. The project will be implemented in ten (10) districts within the territory of the three participating countries. Major sub-activities include the development of an Integrated Malaria Information System (IMIS) for the purpose of case surveillance, data entry and management. It will provide a basis for identifying patterns in malaria incidence and clustering, determine the risk factors associated with disease clustering, and implementing, monitoring and evaluating malarial control measures. It will enable documentation of each experience, evaluating effects on disease transmission and determining the cost-effectiveness of each of the alternative procedures (*e.g.*, house spraying with an alternative insecticide, screening of houses, larviciding, scaling up the use of ITNs and environmental interventions); recording community participation and assessing the risks of the pesticides used.

57. Participating countries have instituted the strategy and resources for implementing alternatives such as screening of houses, larviciding, ITNs and environmental management.

- Implementation of alternative strategies tested for viability, applicability and cost effectiveness under local conditions;
- Entomological information collected and analyzed to allow for timely and appropriate application of interventions;
- Evaluation of community participation using COMBI indicators on behavioural impact ;
- Undertaking risk assessment of alternative insecticides.

### **Outcome 2.1. Integrated Malaria Monitoring and Surveillance System is developed**

58. **Rationale:** Monitoring and evaluation is an integral component of any vector control program to assess the impact of interventions and trends in disease distribution and abundance. The implementation of alternative vector control interventions may conceivably lead to an increase in malaria transmission. Therefore a sensitive monitoring and surveillance system is required to provide a basis for informing the project coordinators and allowing them to take corrective action in the event of this happening. Strong epidemiological surveillance systems will provide entomological and epidemiological data as an evidence-base for selection of areas that need targeted spraying. The collection and analysis of information on the behavior and characteristics of the primary vectors and their impact on malaria transmission will help target vector control interventions.

59. **Activities:** An Integrated Malaria Information System (IMIS) will be developed to correlate all aspects of disease transmission, control and case management. The IMIS will use relevant information of the GIS mentioned in Component 1, Outcome 1.4. This system will be made available to all participating countries and will facilitate communication and comparison of data among projects. Malaria cases are notified weekly to the national malaria control programs and entered on an IMIS database. Data are analyzed weekly and reports sent to national and district offices. To strengthen the system, cases will be recorded down to household level in the project district. Historical data are available from the proposed study sites to determine thresholds for emergency intervention. Activities for strengthening the surveillance system include the establishment of sentinel (surveillance) health facilities, training of personnel in data collection and processing, management to maintain the sentinel sites, and the purchase of computers for data processing and communication purposes. The

project activity will result in improved collection, collation and analysis of epidemiological data thereby enhancing proper planning, implementation and evaluation of malaria control activities including vector control.

## **Outcome 2.2. Locally appropriate alternative interventions are implemented**

60. **Rationale:** The basic list of interventions that will be tested separately and in combination within the context of IVM in project districts include IRS using alternative insecticides, such as pyrethroids and carbamates, the use of ITNs, environmental management and larviciding, screening of houses, the application of repellents and the use of plants and biological control.

61. Residual house spraying involves the application of insecticides in liquid form, which on drying leave a crystalline deposit on the sprayed surfaces on which mosquitoes rest. These insecticides have a certain period of persistence when sprayed on the inside walls and ceilings of houses. Residual house spraying is method of transmission interruption with target coverage of more than 80% of the entire target houses/structures.

62. Traditionally spraying of DDT inside houses for malaria vector control in the demonstration project districts has recently been alternated with pyrethroid insecticides such as deltamethrin depending upon resistance of house owners to DDT spraying (DDT leaves marks on painted wall) and insecticide resistance by malaria vectors (*An. funestus* in South Africa). Although accurate figures of annual consumption of DDT in the project district is to be gathered during baseline survey (outcome 1.4), estimated amount of DDT usage is as follows (see as well # 5):

- Eritrea: between 7 and 10 tons annually
- Ethiopia: 360 tons annually
- Madagascar: 200 tons annually

63. ITNs have been effective in reducing malaria mortality and morbidity in different epidemiological settings. Protection is achieved by the treated nets constituting a barrier to biting mosquitoes and repelling or killing mosquitoes that are attracted to feed. Most African households in malaria risk areas do not possess such nets because of poverty. Reducing the burden of malaria in a community using ITNs requires adequate coverage of nets within the most vulnerable groups. Low insecticide retreatment rates pose another major challenge as the effectiveness of the insecticides declines with time. In response to the low re-treatment rates of conventional insecticide treated nets, WHO prompted the development of long lasting insecticide pre-treated nets (LLIN that require no further treatment during their expected useful life of 4-5 years. The current price of LLIN is around US\$ 6.00 per net. Two brands of LLIN are currently recommended by WHO for malaria control: Olyset and Permanent.

64. Environmental management targets larval population and aims at depriving the vector population of its requirements for breeding. Environmental management is especially relevant in urban areas and in areas where development projects such as irrigation schemes, dams, and road and building construction projects are underway.

65. Larviciding is a method of applying insecticides into identified breeding sites to kill the immature stages, particularly the larvae, of the vector mosquitoes. Target breeding sites should be identified and baseline information on larval density should be made available before the beginning of insecticide application. Alternatively breeding sites can be treated with bacterial larvicides.

66. Alternatives to DDT will be assessed and evaluated in terms of their technical suitability, cost-effectiveness, safety and acceptability to communities. The choice of alternatives for use in each district will depend on the prevailing malaria vectors, endemic levels of the disease, and environmental and social-economical conditions that prevail in the district.

67. **Activities:** Based on local epidemiological situation, development and operational testing of alternative malaria control methods using the entomological, epidemiological and ecological parameters gathered by the GIS (Outcome 1.4), a number of pilot demonstrations will be conducted in the field to determine the applicability and viability of alternatives under local conditions, which will take into account *inter alia* cost-effectiveness and impact on human health and the environment. National reference centres will support the NMCPs and district health management teams to design the various demonstrations including monitoring and evaluation components. Assessments of the efficacy of the proposed interventions and their combinations will use a set of predefined entomological, parasitological and clinical indicators. Proposed interventions using alternatives in project districts are illustrated by the case scenarios. The output of this activity will be a matrix of the results of demonstrations of alternative procedures for malaria control applied in a range of circumstances. These outputs will form the basis the transferability and replicability of the tested applications to regions and circumstances beyond the demonstration sites in the participating countries and elsewhere in the region. Strategic outputs will be communicated with strategy and policy developing projects in eastern and western Africa (in preparation)

### **Case scenarios**

68. In areas where breeding sites of the local vectors are limited and accessible environmental management of groundwater will be carried out in villages to reduce the available breeding sites for *An. arabiensis* and *An. funestus* where it is deemed effective for malaria control as per the information gathered on local situations. In such scenarios environmental management constitutes the principal method of interventions. Part-time community workers will be employed to assist in this activity and to participate in the maintenance of the canals. Swampy areas will be drained after consultation with local community structures. Other possible breeding sites, such as road ruts, will be monitored for mosquito larvae and either filled in or larvicide as necessary. The efficacy of using *Bti* as a larvicide will be tested and results monitored. This will be supplemented by IRS spraying, ITNs and/ or LLINs where necessary.

69. In areas where the use of ITNs is not common and areas where seasonal epidemics precipitate in large number of malaria cases, houses are sprayed with alternative insecticides to DDT, which will be the principal methods of malaria vector control. In order to minimize any development of insecticide resistance, different classes of insecticides, such as carbamates and pyrethroids, will be sprayed taking into account the susceptibility of the vectors. The cost of



insecticides for conducting a spraying operation is estimated by considering the number of households living at risk of epidemics. An application rate of about 50 mg/ m<sup>2</sup> and about 100 m<sup>2</sup> surface to be sprayed per house is assumed. This led to an estimated cost of about 4-9 USD per household, depending on the cost of labour, type and size of sprayed houses, which includes transportation and management cost. In such cases, source reduction and ITNs will supplement IRS during low transmission season.

70. In places where the rate of malaria transmission is low and the use of ITNs has already been started, the reduction of use of DDT and other pesticides will be implemented. This will be done through concomitant increase in bed net availability/ distribution to affected population. Most African households in malaria risk areas do not possess any net and a major barrier to net ownership is poverty. Additionally compliance and usage efficiency cannot be taken for granted with ITNs. Based on the average family size net coverage will be increased per household in project district/s to produce adequate coverage. It is assumed that one net is shared between 2 people and using the baseline nets and the number of nets required to make adequate coverage will be calculated. The cost of a net including the re-treatment cost is 4 USD. Because of the low re-treatment of ITNs observed in population of many countries Long Lasting Insecticide Nets that do not require re-treatment will be promoted based on their availability. The current price of (LLIN) is around USD 6 per net. Two brands of LLIN are currently recommended by WHO for malaria control: Olyset and Permanet

### **Outcome 2.3. Community attitudes to alternative interventions are evaluated**

71. **Rationale:** Community participation and awareness will be achieved through intensive health promotion in each district by applying the Communication for Behavioral Impact Approach (COMBI) that entails community sensitization, highlights community roles and responsibilities based on increased knowledge and changed attitudes and perceptions towards malaria and its control. The COMBI indicators will be used to assess the impact of project activities on public awareness and perceptions and the acceptance of new interventions.

72. **Activities:** One component of the COMBI tool indicted in Outcome 1.5 is monitoring and evaluation. This allows for tracking of emerging behavioral impacts and provides opportunity for strategy modification to better achieve the desired behavioral results. Activities will be introducing the COMBI tools such as random sample survey to evaluate the number of people sleeping under treated mosquito nets. The output of this activity will be a detailed analysis of the influence of public attitudes on procedures for the reduction and prevention of malaria in the region. This will provide, together with the results of Outcome 2.2, a basis for examining both the public acceptability and appropriateness of individual alternative procedures and combinations of procedures for malaria control. The activity will be conducted with the support of the Social Mobilization and Training team of WHO.

### **Outcome 2.4. Environmental and health impact of alternatives is assessed**

73. **Rationale:** Persistent and non-persistent insecticides can pose risks to the population under the local condition and practice. The insecticides that have been identified as forming a component of IVM within this project will be subjected to a risk assessment in the context of

effects on human and environmental health. This will be done following appropriate WHO/IPCS (International Programme on Chemical Safety) guidelines, using the best available information. This will produce a statement regarding health and environmental risks.

74. **Activities:** activities involve conducting a survey using a standardized questionnaire in project districts and analysis of samples. Different age groups need to be involved due to variation in the risk of exposure and physiological features. Aspects to be included will be, *inter alia*, risks to women, infants and potential environmental levels in relation to relevant local handling practices. Different ecological data such as soil samples, milk samples and food products will be analyzed to assess the exposures to children. The output of this activity will be an assessment of risks to individuals and communities associated with the use of alternative chemical pesticides to DDT. It will also provide some exemplar estimates of exposures to women and children who are the most vulnerable to adverse effects of exposures to chemicals.

75. All participating countries have a history of using DDT for more than three decades. Storage facilities may not be constructed properly to prevent the release of pesticides thereby resulting in environmental contamination. Sprayers in local situations may not be trained and households not informed of the hazards of pesticides.

### **Component 3. Management and use of DDT and other public health pesticides**

76. Participating countries will continue to use DDT, as appropriate, in non-project districts during the five-year period of project implementation. Regulations governing the use of DDT and other pesticides will be put in place and enforced. The import, packaging, registration, transport and storage of DDT and other public health pesticides will be based on WHO pesticide management guidelines and national rules and regulations where these are consistent with the provisions of the Stockholm Convention on POPs. This component will comprise the following activities.

#### **Outcome 3.1. DDT and other pesticides are managed in an environmentally sound manner**

77. **Rationale:** DDT stocks pose additional risks to the environment and human health if not managed properly. In Africa, in some instances, stocks are stored under poor conditions that can result in leakage to the environment (*e.g.*, to water bodies) or direct exposures to unprotected populations (*e.g.*, to workers handling stocks and children playing with containers). It is essential that storage facilities are secure and that storage containers are maintained in good condition. Moreover, mechanisms need to be put in place to ensure that DDT stocks are not misused or diverted to agricultural applications. This may require the erection of new storage facilities or refurbishment of existing structures to prevent the release of POPs pesticides into the environment. Spray operators will be trained in the safe use, mixing, handling and disposal of DDT to minimize human exposure and environmental contamination.

78. **Activities:** The alternative actions are intended to reduce DDT exposures to sprayers and erecting or refurbishing existing storage structures. Activities included are:

- Technical evaluation of the quality of existing DDT stocks and the identification of options for appropriate management/disposal (the latter in close collaboration with the Africa Stockpiles Program-ASP);
- Secure and environmentally sound storage facilities will be erected or sub-standard facilities refurbished to reduce environmental contamination and human exposures. The outcome will be the creation of safe storage facilities for DDT stocks and control procedures to ensure that DDT is not diverted from health protection applications to other purposes that could be contravene the provisions of the Stockholm Convention;
- Human exposure will be reduced through training of spraymen on the judicious use of pesticides and the application of protective equipment;
- The project will further assist countries using DDT to register their use in a proper way according to the guidelines of the Secretariat of the Stockholm Convention.

### **Outcome 3.2. Systems for detecting insecticide resistance and management of resistance are created**

79. **Rationale:** Chemical pesticides have been used in vector control with varying degrees of success. However, insecticides remain as important agents for alleviating the ravages of vector borne diseases. Currently, insecticides use is complicated by resistance within insect vectors. Since the first report of pyrethroid resistance in *Anopheles gambiae*, kdr mutation has been detected across West and Central Africa. Pyrethroid resistance has also been reported in South Africa, one of the participating countries in this project. These events pose a great threat to the viability of bednets and their retreatment for malaria control. WHO/AFRO is the coordinator of the African Network on Vector Resistance (ANVR) that links sub-network institution throughout Sub-Saharan Africa to detect, monitor and manage insecticide resistance. It will take full advantage of this opportunity to evaluate pyrethroid resistance in the project districts.

80. **Activities:** Monitoring of the susceptibility of malaria vectors to insecticides used for intervention is essential for detecting vector resistance at an early stage, and devising alternative resistance management strategies that will help to prolong the usable life of insecticides. The latter strategies are used to prevent the emergence of resistance in insect vectors using procedures such as insecticide rotation.

81. Evidence of the effectiveness of alternatives for use in malaria control programs will be critical for reducing reliance on DDT. WHO has developed a standard methodology for testing insecticide resistance in malaria vectors. Throughout this project, monitoring of insecticide susceptibility will take place to ensure the timely detection and management of resistance.

### **Component 4 : Transboundary information exchange and technical support**

82. Transboundary information exchange and expertise is needed to promote IVM and manage vector control programmes at local levels. The lack of integration with other sectors, including agriculture and environment, inhibits the implementation of IVM. The need for coordination among different sectors is also important for the implementation of the Stockholm

Convention and is required in the development of National Implementation Plans (NIPs) under the Convention.

83. In many countries, Ministries of Agriculture are responsible for regulating the import, use and disposal of pesticides, including uses for public health purposes. Collaborative activities among the Ministries of Health, Agriculture and Environment will be undertaken that will lead to the harmonization of regulations and pesticide management practices that minimize environmental contamination and prevent the development of insecticide resistance. Opportunities for synergy between this project and existing Integrated Pest Management (IPM) programmes in agriculture will be explored, as appropriate, to facilitate the overall management of pesticides

84. Most countries are decentralizing processes as a means of transferring decision-making and administration from central governments to local governments or health districts. It is envisaged that such decentralization will necessarily require consideration of national legislation to strengthen the ability of the countries to promote the proper use of pesticides and to implement the Stockholm Convention. Such consideration will include regulatory and other mechanisms to ensure DDT use is restricted to disease vector control. In addition, it will address the production, use, and import of pesticides and other vector control products (*e.g.*, ITNs).

#### **Outcome 4.1. Transboundary information exchange and technical support to countries achieved**

85. Transboundary information exchange and project management of the project will be carried out as follows:

- A (part-time) Regional Coordinator who is well conversant with malaria control in the region will be selected by UNEP and WHO and hired by WHO/AFRO to coordinate project activities. The part-time Regional Coordinator will combine his duties with being (part-time) National Coordinator in one of the project countries. He will be partly based in his project country, and partly be based at WHO/AFRO in Brazzaville. The part-time Regional Coordinator will act as well as consultant to the other countries involved in the project.
- Two National Coordinators will be appointed to work either in the NMCP or at the national reference centre or in the WHO country office as appropriate.
- At district level, District Project Officers will be responsible for the implementation and monitoring of project activities at district level.
- The (part-time) Regional Coordinator will conduct regular travels to the various project countries and to the WHO AFRO office to coordinate and harmonize the various interventions. Seen the character of the countries within the African context and seen the lack of suitable and effective communications, regular personal visits are of crucial importance for smooth project implementation.

## **Component 5: Project Management**

### **Outcome 5.1 Project management structure is established**

86. A Regional Steering Committee (RSC) will be established based largely on a similar committee established during the PDF-B phase. The RSC will act as the highest supervisory organ of the project. It will comprise of the Regional Project Coordinator, representing the participating countries, WHO/AFRO (Project Manager; see # 88), UNEP (Task Manager UNEP/DGEF), SIMA/ICIPE and specific regional research institutions. A representative of the African Stockpiles Program (ASP) will also be invited to participate in the RSC. The Committee will meet at least once a year to review progress and provide guidance on project implementation.

87. The National Steering Committees (NSCs) that were established during the PDF-B phase will continue to provide guidance on the implementation of the project at national levels. The National Project Coordinator and the relevant district project officer will participate in meetings of the NSCs. The NSCs will be linked to country NIPs development through the inclusions of each national NIP project coordinator on respective NSCs to ensure cross-linkages and mutual benefits.

88. Besides the Regional Steering Committee, management-mechanisms will include the following:

- a) WHO will make available a part-time Project Manager with proven project management skills in vector control for the duration of the project. The Project Manager will be based at the AFRO office in Brazzaville.
- b) Establishment of a network based on a mailing list system among project staff and stakeholders at all levels (district, national and regional). This will enable information exchange and discussion of project implementation issues on a daily basis.
- c) NSC meetings will be held twice per year in each of the participating countries and opportunities for bilateral and/or multilateral collaboration will be explored.
- d) Production of annual reports with detailed progress on implementation and outputs, outcomes and impacts as appropriate and available.
- e) Wherever necessary, project managers and other specialists from other DDT projects from other regions will be invited to participate in meetings and/or activities, such as Regional Project Steering Committee or special technical meetings, so that mutual learning and exchange of lessons learnt will be facilitated on an inter-regional scale.
- f) Mid Term- and final Evaluation missions will be conducted and the required budget (\$ 50,000) is included in the budget for activity 4.2 (Project Management).

## **RISKS, SUSTAINABILITY AND REPLICABILITY**

### **RISKS**

89. There is potential risk of increased malaria transmission posed by reduced reliance on DDT or its withdrawal for IRS applications. Community acceptance of the alternative interventions may not be at the desired level at the beginning of the project. The comparative

high prices of alternative insecticides to DDT, as well as exorbitant tariffs on imported nets, could undermine the implementation of alternative interventions (ITNs and use of pyrethroids etc.). Insecticide resistance to alternative that will be used the reluctance of some policy makers to move to the use of alternatives are important anticipated risks to project success. In addition, the sustainable application of alternative vector control interventions, which are proven to be cost-effective and acceptable to communities, could be jeopardized by inadequate financial allocation by national authorities for the implementation of these options.

90. These risks can be averted through the establishment of an effective disease surveillance system coupled with prompt diagnosis and treatment. The project is designed to ensure the intimate involvement of communities in the project. This will include increasing public awareness of the nature, availability and effectiveness of alternative interventions. Clear insecticide resistance management guidelines and well-designed projects with clear objectives and the imposition of precautionary measures will help to convince policy makers.

91. A critical assumption of the project is that governments will maintain their political will towards scaling up the implementation of interventions that are proven to be effective. Industry and the Ministries of Finance and Trade as stakeholders in the project, will promote dialogue and facilitate appropriate changes in relevant policies. Additional resources channelled to the countries by the Global Fund for HIV/AIDS Tuberculosis and Malaria (GFATM), the RBM and projects funded by other donors aimed at lowering the costs of health interventions will also contribute to resource mobilization and to the reduce costs of alternative methodologies.

92. The experience gained through implementation of the project will result in operational experience for each of the various alternative interventions. This experience will not only include logistical issues, but also the problems, constraints and potentially weak links associated with each type of alternative intervention. Documentation of these potentially weak links as well as the constraints and problems experienced, will allow an assessment of the risks associated with sustainability. DDT spraying is well understood in these terms, but the newer methods are not. As yet, there is not a comparable body of knowledge to characterise such risks, and therefore comprehensive anticipation of options for reducing them. The assessments of alternative interventions may reveal problems associated with adverse climatic conditions or difficulties of funding and retraining. These are all subjects that will be considered in respect to scaling up to wider areas and ensuring wider community acceptability.

## **SUSTAINABILITY**

93. The proposed interventions and demonstration alternatives will be carried out based on the national malaria control programs. During the project, particularly in the implementation of Component 1, the countries will enhance malaria control programs that are less dependent on use of DDT for malaria vector control. The results of the project will be incorporated into the NIP implementation framework as well as the NMCPs on the basis of the enhanced capacity of the participating countries and the scaling up of experience gained through this project. The project adopts an approach of capacity building on existing entities and networks will be targeted, so the project benefits, particularly enhanced capacities can be maintained. Subsequent follow-up

actions can also be based on networks and entities the project created or augmented through project activities.

- The national referral centers will be identified during the project to provide technical support. Such centers will function as the national centers for providing technical assistance to the other districts within the countries, such as epidemiological surveillance, epidemic forecasting and preparedness and the detection of insecticide resistance. The enhanced function of the national referral centers will be maintained within the framework of the NMCPs and government programs.
- WHO, through the Roll Back Malaria and IVM Programs, has developed a network of health-related institutions in the region, including those within all the participating countries. During the project, information on the results of application of alternatives to DDT will be accumulated within the WHO RBM and IVM networks, so that continuous application of alternatives will be carried out based on the accumulated knowledge within these networks.
- One of the main bottlenecks for effective prevention of malaria is the amount of funding allocated for malaria by individual governments as well as community members' capacity to purchase personal protection methods such as ITNs. For instance the use of ITNs is low among rural and poor households that are more at risk of malaria. Recently, however, several countries have scaled up the distribution of free or subsidized nets using funds secured from the Global Fund for Aids, Tuberculosis and Malaria. Such funding will result in strengthening the health systems and preventive methods with a greater capacity to expand the utilization of project interventions to a wider scale, thus resulting in a reduce usage of DDT. The Global Fund for Aids, Tuberculosis and Malaria has become international source of funding which started disbursement in 2003 granting US dollar 450 million/ yr for malaria control to 28 countries in Africa, 15 countries in Asia and 4 countries in the Americas. Securing such additional financing will expand the base for the demonstration interventions in this project. Such enhancements and expansion of the base for the demonstration interventions will substantially improve the sustainability of the mechanisms and benefits engendered by the project.

94. The countries are, or will be, developing the National Implementation Plans (NIPs) for meeting the requirements of the Stockholm Convention. These will include action plans relating to DDT. It is anticipated that the action plans to be developed will be based on the NMCPs and other existing national capacity. The results of the demonstration activities should be provided to the NIP coordinators, so that the NIPs can feature activities based on the results of the project. NIP preparation and refinement and NMCPs will have national institutional mechanisms and continuous funding, be it external or governmental, and this will also contribute to project sustainability.

95. A key to the sustainability of the project lies also in preventing the participating districts from returning to the use of DDT following completion of the project and the demonstrations of cost-effective and locally-available alternatives to the use of DDT. For this purpose, as

indicated above, the project adopts a strategy of developing sufficient capacity to continuously modify and refine the alternative interventions based on assessment of the results. It is expected that the district-level project management capacity will also be absorbed into the district administration, charged with maintaining the alternative malaria control procedures. The sustainability of the proposed project relies as well in great part on the safety, efficacy, affordability and acceptability of **and** the political will to accept the various alternatives to DDT and other insecticides, which will be assessed and implemented. Alternatives should also contribute to minimize and/or prevent the development of vector resistance to insecticides, which is a problem of concern in the African Region. Transition to alternatives in the demonstration sites during the project phase, will also depend on the effectiveness of safeguards to address any surges in vector-borne disease incidence. Availability and utilization of alternatives will need to be guaranteed under the current fluctuating economic conditions, common to many vector-borne disease endemic countries in the Region. When this is feasible, countries of the Region will no longer have to depend on chemical methods to the extent they do presently that pose health risks to humans and to the environment. At the local level, the sustainability of the transition to alternatives will depend on fostering ownership at the community and at the national level. At national level, the establishing of a dedicated **Vector Control Unit** is anticipated in each of the project countries. Relevant project activities will per consequence be taken over by these Vector Control Units which are as well the basis for implementation of other and already ongoing health related programs (like the National Referral Centres, roll Back Malaria Program, and other relevant malaria control activities). This will guarantee mainstreaming of project activities in specific already ongoing national programs.

96. All the project activities have been developed with strong country commitment (as expressed in the country proposals in Annex J) and through wide stakeholder participation. Although the involved stakeholders clearly recognise the risks associated with this project, they have expressed their support for the project and will be continuously engaged in project activities. The stakeholder networks developed by this project will be maintained at the national and district levels (Component 1) and as such assure sustainability of the institutional enforcements as proposed by this project.

## **REPLICABILITY**

97. Replication of the demonstrated alternatives for malaria prevention in Africa and elsewhere depends on a sound and convincing demonstration of the effectiveness of the alternatives in preventing malaria while also being affordable and practical to apply in the participating countries. The demonstrations must accordingly also extend to a range of environmental and social phenotypes representative of conditions both in the project study area and beyond at national, regional and global levels. The project will clarify such applicability of the alternatives and actual impacts on the environment and human health. With clearly defined applicability and effectiveness, replication of the demonstrated alternatives will be facilitated.

98. Based on the results of the vector control needs assessment, the demonstration activities will be developed for varying environmental, socio-economic and epidemiological conditions. The project will include analyses of the results of the demonstration activities in terms of technical efficiency, cost-effectiveness and local acceptability. Replication of the results of the



demonstration activities will be facilitated by the conditions for the application of the alternatives and by using the assessment results in determining if the conditions are met. The results of the demonstration projects will not only be of generic value for replication of activities in similar settings throughout the Region, but they are also expected to lead to scaling up in each individual country: Institutional reforms of the Vector Control Units at the national level will be beneficial for the whole country.

Through the Project Steering Committee, the experience obtained through the demonstration interventions will be exchanged among the participating countries. At the initial stage of the project implementation, a detailed replication strategy will be devised and adopted by the Steering Committee. At the national level, the NSC will review the experience obtained so that both within-country replication and the scaling up of successful demonstrations of alternatives to vector control using DDT will be realized.

The National Steering Committee will be used as vehicle for developing funding proposals for in-country replication and scaling up, particularly for GFATM, so that scaling up efforts can immediately succeed the project. Towards the end of the project, the district coordinators will be given the opportunity to travel to other districts to exchange knowledge and experience, including lessons learned. Stakeholders in other districts will also be invited to visit the project demonstration districts to gain experience and to design replications of successfully demonstrated alternatives.

99. Replicability at the national level will be promoted through the medium of the National Malaria Control Programs using funding derived from non-project sources, to extend demonstrations of alternatives in other districts in the participating countries. The network of referral centers will be used to this effect. Replicability at the regional level will be encouraged through bringing representatives of countries in the region that are proposing to return to the use of DDT for malaria vector control, using non-project funding. These visits will be used to promote the testing and evaluation of alternatives in these other countries as a means of forestalling their return to DDT use. Seen the most recent regional developments with regards to intended and actual DDT application in Malaria vector control in Africa, it is expected that at the beginning of the project implementation, a larger group of African countries will propose a similar project (AFRO II) as the current one with relatively large co-funding possibilities. It is expected that both DDT related projects for the African continent will cover adequately the various and different areas where DDT is intended to be applied.

It is further more expected that replication at the wider, inter-regional, level will be promoted through bringing representatives from other regions, particularly North Africa, West Asia & Pacific and Central America, to demonstrate and exchange the utility and effectiveness of alternative methods of vector control.

100. Project outputs will be combined with those from the Mexico and Central America DDT projects to establish stronger evidence for the global promotion of more environmentally friendly methods for the control of malaria and other vector borne diseases around the world. The project will produce experience in models, technologies and alternatives as well as in the processes created by the project that will be useful to other countries in the region and to other regions, particularly to planned GEF projects in the Middle East and North Africa, and South-East Asia

and Western Pacific regions, respectively. WHO will ensure the smooth transfer of knowledge and experiences obtained from one regional GEF project to others.

## **STAKEHOLDER PARTICIPATION AND IMPLEMENTATION ARRANGEMENTS**

101. Effective vector control requires a multi-sectoral approach. Sectors such as agriculture (*e.g.*, irrigation schemes and plant protection activities), energy (dams) and public works (urban and rural infrastructure) may, through their development activities result in an increase of vector densities and disease transmission. The vector-borne disease burden is also affected by changes in the behaviour of vulnerable populations.

102. Vector Control Needs Assessment (VCNA) exercises were undertaken in the three participating countries as the most important component of the PDF-B process. The VCNA exercise addressed the most critical aspects of vector control systems including policy frameworks, organization and resources, regulations and quality assurance. Multi-sectoral committees were formed to guide the process and national stakeholder meetings were organized to endorse the results of VCNA and to formulate recommendations regarding the way forward.

103. The VCNA exercise provided a unique opportunity to complement the RBM situation analysis that, at the time of implementation (1999-2002), did not include a component on vector control. The three countries have compiled detailed information that will help them to adequately plan for integrated disease management strategies. Additionally the VCNA exercise enabled program managers and policy makers to establish appropriate structures to strengthen vector control programs and pesticide management. For instance, some countries identified that they lack national legislation to prevent the use of POPs pesticides in agriculture.

104. The PDF-B process was participatory, involving a wide range of stakeholders including Ministries of Health, Environment, Agriculture and Land and Tourism as well as academic institutions such as universities and research centres. The VCNA process was guided and overseen in each country by a multi-sectoral steering committee with representation from these institutions. It was demonstrated that the multi-sectoral interactions that are required for the implementation of IVM were not only possible, but entirely feasible. Countries will now take advantage of this to better reflect the DDT action plan in their NIPs and ensure harmonization of pesticide policies. A list of stakeholders is shown in Table 1.

105. The PDF-B management structure established solid collaboration and successful working relationships between UNEP (the Implementing Agency) and WHO (the Executing Agency) on the one hand, and among the WHO Regional and Country offices and national structures, on the other hand. The adoption of an analogous structure will facilitate the execution of the full project, as indicated in Component 4 of the project.

106. The primary beneficiaries of the proposed project will be:

- a) Populations living in project districts: malaria incidence will be reduced, the environment will be cleaner and they will be empowered for health choice decision-making through training and public awareness-raising on alternative interventions as the result of the COMBI;

- b) Health workers at risk of exposure through mixing and handling of public health insecticides will be trained on their safe use and management and this will reduce health risks related to continued exposures to insecticides;
- c) Public health institutions that will participate in capacity development activities will strengthen their own capacities; and
- d) Malaria control personnel who will receive training on alternative vector control strategies such as IVM.

107. Stakeholders listed above that were involved during the PDF will continue to participate through the National Project Steering Committees that involve the Ministries of Health and Agriculture, the NIP project coordinator, and research institutions with the broader list of stakeholders participating in the national consensus workshops.

108. During the PDF-B, a National project steering committee was formed in each of the participating countries. The NSC is the nucleus of the broader stakeholders that participated in the national consensus workshop that have direct and indirect impact on disease transmission. The National Steering committee are key players in malaria and take initiative as well as necessary preparation for implementation of IVM. However the process involved the participation of a wide range of national and international organizations. The Terms of Reference of the National Stakeholders meeting were to:

- Agree on the process for conducting vector control needs assessment
- Agree on the plan of action on the national framework of integrated vector management (IVM);
- Agree on capacity requirements including research for implementation of IVM nationally;
- Select districts for the project; and
- Draft the project plan of action for the selected districts.

109. An IVM stakeholder is any institution or organization which activity has a potential impact either positive (reduction) or negative (increase) on vector borne diseases. During the PDF-B phase of the project the following organizations were identified to move forward the implementation of IVM.

Eritrea:

Ministry of Health; Ministry of Agriculture; Ministry of Land, Water and Environment; Ministry of Public Works and Construction; Ministry of Local Government; Municipalities and Town Councils of the demonstration districts; Ministry of Finance; University of Asmara; World Health Organisation; Food and Agriculture Organisation of the United Nations; USAID; UNICEF; National Bureau of Standards; Ministry of Labour and Social Affairs.

Ethiopia:

Regional and National malaria control programs; Environment Protection Agency, Safe Environment Group; WHO; Ministry of Agriculture; Institute of Pathobiology, Addis Ababa University; Ethiopian Health and Nutrition Research Institute.

Madagascar:

Ministry of Health; Ministry of Environment; Ministry of Agriculture; Ministry of Finances and Commerce; Municipalities of demonstration districts; private sector (pesticide company); District Medical Offices; RBM national committee; WHO.

Organisations from the above mentioned list for each country might be consulted and/or participate at an ad-hoc basis. Local institutions (like municipalities of demonstration areas) will be involved through the Executing Agencies in project execution.

For the specific project purpose, the following local organisations have committed themselves to be partner ('Executing Agency') to the project:

Eritrea:

- Ministry of Health, Asmara, Eritrea.

Ethiopia

- Ministry of Health, Addis Ababa, Ethiopia.

Madagascar:

- Ministry of Health and Family Planning, Antananarivo, Madagascar.

Implementation arrangement and responsibilities during project implementation:

The Ministries of Health in each country are responsible for the local implementation of project activities in the selected demonstration areas. The MoH is responsible for project progress and as such facilitates proper and timely implementation of all project activities in each respected country.

SIMA (System wide Initiative on Malaria and Agriculture), Pretoria, South Africa.

As member of the Steering Committee, and co-funding agency, SIMA will provide expertise concerning Malaria vector related issues to the project.

ICIPE (International Centre of Insect Physiology and Ecology), Nairobi, Kenya.

ICIPE will in particular contribute to the Integrated Vector Management (IVM) training of National Coordinators. The Focal Point of the ICIPE will be a permanent member of the Regional Steering Committee meeting. ICIPE contributes with in-kind co-funding to the project.

## **INCREMENTAL COST AND PROJECT FINANCING**

110. Table 1 presents the baseline, alternative and incremental costs for the project. These are discussed in Annex A. Table 2 specifies project financing, including co-financing. It also shows the funding requested from the GEF and co-financing commitments to cover incremental costs. The amounts necessary for each country to develop the project was established based on a draft country proposal to implement alternative interventions at project sites. Governments also indicated expenses related to national activities as part of their NMCP budgets in the project areas, especially those relating to actions for the treatment of infected people. Significant co-financing is available from the malaria control programmes in the participating countries. The

estimated total co-financing is US\$ 2,966,950 of which US\$ 1,055,525 is allocated from national budgets for malaria control programmes specifically directed at the populations of the project areas. The co-financing includes in-kind contribution of US \$ 1556,425 (US\$ 924,375 + US \$ 632,050,=) from WHO, US\$ 300,000 (in-kind) from RBM, and US\$ 55,000 (in-kind) from ICIPE and SIMA. Incremental Costs are estimated as US\$ 6,427,246 of which US\$ 3,460,296 is requested from the GEF.

**Table 1**  
**Baseline, Alternative and Incremental Costs**

<i>Components</i>	<b>Base line</b>	<b>Alternative</b>	<b>Total Increment</b>
<b>Component 1: Strengthening of national and local capacities for malaria control</b>			
Outcome 1.1: National and local capacities are strengthened in planning, monitoring and evaluation of malaria control	279,017	411,000	131,983
Outcome 1.2: Health centres are strengthened for emergency situations	585,265	1,290,638	705,373
Outcome 1.3: Local communities are equipped with insecticides and application apparatus for dealing with emergencies	605,270	1,160,828	555,558
Outcome 1.4: National referral centres are strengthened to provide technical assistance	612,790	714,278	101,488
Outcome 1.5: Community awareness is raised on alternative interventions less dependent on DDT	62,713	224,185	161,472
<b>Sub total</b>	<b>2,145,055</b>	<b>3,800,929</b>	<b>1,655,874</b>
<b>Component 2: Implementation of alternative methods of malaria vector control tailored to local circumstances</b>			
Outcome 2.1: Integrated Malaria Monitoring and Surveillance System is developed	63,500	1,113,960	1,050,460
Outcome 2.2: Locally appropriate alternative interventions are implemented	352,375	1,966,894	1,614,519
Outcome 2.3: Community attitudes to alternative interventions are evaluated	-	2,625	2,625
Outcome 2.4: Environmental and health impact of alternatives is assessed	-	2,050	2,050
<b>Sub total</b>	<b>415,875</b>	<b>3,085,529</b>	<b>2,669,654</b>

<b>Component 3: Management and use of DDT and other public health pesticides</b>			
Outcome 3.1: DDT and other pesticides are managed in an environmentally sound manner	75,000	726,000	651,000
Outcome 3.2: Insecticides resistance detected and resistance management is conducted	6,000	19,050	13,050
<b>Sub total</b>	<b>81,000</b>	<b>745,050</b>	<b>664,050</b>
<b>Component 4: Transboundary information exchange and technical support</b>			
Outcome 4.1: Transboundary information exchange and technical support to countries are organised	-	500,550	500,550
<b>Sub total</b>	<b>-</b>	<b>500,550</b>	<b>500,550</b>
<b>Component 5: Project management</b>			
Outcome 5.1: Project management structure is established and functioning	-	680,800	680,800
<b>Sub total</b>	<b>-</b>	<b>680,800</b>	<b>680,800</b>
<b>Sum of components 1-5</b>	<b>2,641,930</b>	<b>8,812,858</b>	<b>6,170,928</b>
Executing Agency Fee (8 % of 3,203,978)	-	256,318	256,318
<b>Total Project</b>	<b>2,641,930</b>	<b>9,069,176</b>	<b>6,427,246</b>
PDF-B	-	698,000	698,000
<b>Total Project + PDF-B</b>	<b>2,641,930</b>	<b>9,767,176</b>	<b>7,125,246</b>

**Table 2  
Project Financing**

<i>Components</i>	<b>Incremental Cost</b>	<b>GEF</b>	<b>Governments</b>	<b>WHO</b>	<b>RBM</b>	<b>ICIPE/SIMA</b>
<b>Component 1: Strengthening of national and local capacities for malaria control</b>						
Outcome 1.1: National and local capacities are strengthened in planning, monitoring and evaluation of malaria control	131,983	49,883	7,100	75,000	-	-
Outcome 1.2: Health centres are strengthened for emergency situations	705,373	405,923	49,450	100,000	150,000	-
Outcome 1.3: Local communities are equipped with insecticides and application apparatus for dealing with emergencies	555,558	365,358	40,200	150,000	-	-
Outcome 1.4: National referral centres are strengthened to provide technical assistance	101,488	34,238	62,250	-	-	5,000
Outcome 1.5: Community awareness is raised on alternative interventions less dependent on DDT	161,472	46,722	30,375	84,375	-	-
<b>Sub total</b>	<b>1,655,874</b>	<b>902,124</b>	<b>189,375</b>	<b>409,375</b>	<b>150,000</b>	<b>5,000</b>
<b>Component 2: Implementation of alternative methods of malaria vector control tailored to local circumstances</b>						
Outcome 2.1: Integrated Malaria Monitoring and Surveillance System is developed	1,050,460	746,260	154,200	150,000	-	-
Outcome 2.2: Locally appropriate alternative interventions are implemented	1,614,519	1,199,469	115,050	100,000	150,000	50,000
Outcome 2.3: Community attitudes to alternative interventions are evaluated	2,625	2,625	-	-	-	-
Outcome 2.4: Environmental and health impact of alternatives is assessed	2,050	2,050	-	-	-	-

<b>Sub total</b>	<b>2,669,654</b>	<b>1,950,404</b>	<b>269,250</b>	<b>250,000</b>	<b>150,000</b>	<b>50,000</b>
<b>Component 3: Management and use of DDT and other public health pesticides</b>						
Outcome 3.1: DDT and other pesticides are managed in an environmentally sound manner	651,000	82,000	569,000	-	-	-
Outcome 3.2: Insecticides resistance detected and resistance management is conducted	13,050	4,450	8,600	-	-	-
<b>Sub total</b>	<b>664,050</b>	<b>86,450</b>	<b>577,600</b>	<b>-</b>	<b>-</b>	<b>-</b>
<b>Component 4: Transboundary information exchange and Technical Support to countries, and Project Management</b>						
Outcome 4.1: Transboundary information exchange and Technical Support to countries is organised	500,550	55,000	10,000	435,550	-	-
<b>Sub total</b>	<b>500,550</b>	<b>55,000</b>	<b>10,000</b>	<b>435,550</b>	<b>-</b>	<b>-</b>
<b>Component 5: Project Management</b>						
Outcome 5.1: Project management structure is established and operational	630,800	160,000	9,300	461,500	-	-
Independent evaluations	50,000	50,000	-	-	-	-
<b>Sub total</b>	<b>680,800</b>	<b>210,000</b>	<b>9,300</b>	<b>461,500</b>	<b>-</b>	<b>-</b>
<b>Sum</b>	<b>6,170,928</b>	<b>3,203,978</b>	<b>1,055,525</b>	<b>1,556,425</b>	<b>300,000</b>	<b>55,000</b>
Executing Agency Fees (8% of 3,203,978)	256,318	256,318				
<b>Total Project</b>	<b>6,427,246</b>	<b>3,460,296</b>	<b>1,055,525</b>	<b>1,556,425</b>	<b>300,000</b>	<b>55,000</b>
PDF-B	698,000	384,000	89,000	225,000	-	-
<b>Total Project + PDF-B</b>	<b>7,125,246</b>	<b>3,844,296</b>	<b>1,144,525</b>	<b>1,781,425</b>	<b>300,000</b>	<b>55,000</b>

## MONITORING, EVALUATION AND DISSEMINATION

111. A project administrative, technical and financial reporting framework will be established in a manner conforming to UNEP and GEF reporting protocols. A Monitoring and Evaluation plan has been prepared and is attached at Annex K. The executing agency will prepare, at project inception, Workplans and the Terms of Reference for project staff and consultants. These will be submitted to the first meeting of the RSC for review and approval.



112. The RSC will monitor the overall progress of the project through annual project evaluations in the context of the approved workplans, which will be revised annually. The workplan and evaluation will be based on the Logical Framework matrix (Annex B) and the implementation arrangements. The workplans will have component activities subdivided into time-bound milestones or indicators and progress made against these milestones will be assessed annually.

113. Each NSC will review project implementation progress twice a year and will prepare a comprehensive annual report on the progress made to the executing agency for the preparation of annual reports. After the first two years of project implementation, an independent **mid-term evaluation** will be carried out to assess the level of attainment of project objectives. The conclusions and recommendations of this evaluation will be used as necessary to adjust project implementation and management plans. The project will also be subject to an independent **final evaluation**. Both mid-term and final evaluation will be arranged by UNEP/DGEF (Implementing Agency).

114. WHO will provide UNEP with evaluation reports according to specific reporting requirements. The final report of the project will consist of an extensive review of project achievement/findings in the four project components. These will include detailed analyses of:

- a) Strengthened national capacities for control of malaria, which includes capacities for surveillance, diagnostics, case management and emergency/epidemic response;
- b) Strategies for the implementation of IVM not reliant on DDT in different eco-epidemiological and operational conditions, including inter-sectoral arrangements/mechanisms for effective vector control;
- c) Improved local and national capacities for the management of DDT and other public health insecticides, including achievements in pesticide policy reform; and
- d) Established regional network for information sharing and support to national and regional efforts for resolving problems related to the use of DDT.

115. Lessons learned from the project will be disseminated through a wide range of media (reports, web-page, emails/electronic discussion groups, meetings and conferences) to a number of target audiences both within and outside of the project region. Target audiences will include project and non-project countries, regional and international developmental organizations, the Conference of Parties to the Stockholm Convention on POPs, as well as regional and international journals. Wide dissemination of project lessons will ensure that maximum benefit is obtained from the project at both the local, national, regional and global levels.