PROJECT REVIEW SHEET
Work Program Inclusion - UNEP International Waters

Project Title: "Belize, Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, and Panama: Regional Program of Action and Demonstration of Sustainable Alternatives to DDT for Malaria Vector Control in Mexico and Central America"
Date: 7 January 2002

	Work Program Inclusion per criteria established in Draft # 8 of the project review criteria	**Reference Paragraphs and Explanatory Notes:**
1. Country Ownership		
• Country Eligibility		• The participating countries are eligible under paragraph 9b of the GEF Instrument – see cover page.
• Country Driveness	Clear description of Project's fit within: • National reports/communications to Conventions • National or sector development plans. • Recommendations of appropriate regional intergovernmental meetings or agreements.	• The project is set in the context of the recently adopted POPs Convention, which all countries have either signed or expressed an intention to sign, and the North American Action Plan on DDT (para 7 and 10).
• Endorsement	• Endorsement by national operational focal points	• Endorsements have been received from all participating countries and are included in Annex I.
2. Program & Policy Conformity		
• Program Designation & Conformity	Describe how project objectives are consistent with Operational Program objectives or operational criteria	• The project is consistent with the objectives of Operational Program #10, and of the draft OP on POPs – see paragraph 7.
• Project Design	Describe: • Sector issues, root causes, threats, barriers etc affecting global environment • Project logical framework, including a consistent strategy, goals, objectives, outputs inputs/activities, measurable performance indicators, risks and assumptions • Detailed description of goals, objectives, outputs and related assumptions, risks and performance indicators • Brief description of project activities, including	• The issues, barriers and threats to be addressed by this project are described in para 1-6, and incremental costs and root cause annexes (A and D). • The overall goal is the protection of human health and the environment from DDT. The objective of the project is to demonstrate that methods for malaria vector control without DDT or other persistent pesticides are replicable, cost-effective and sustainable, thus preventing the reintroduction of DDT in the region. • Project outcomes are detailed in the logical framework matrix (Annex B) and include: **(i)** At the national level, each one of the 8 participating countries will have the documented results of a well

	Work Program Inclusion per criteria established in Draft # 8 of the project review criteria	Reference Paragraphs and Explanatory Notes:

	an explanation how the activities would result in project outputs (in no more than 2 pages)
	• Global environmental benefits of the project.
	• Incremental cost estimation based on the project logical framework
	  • Describe project outputs (and related activities & costs) that result in global environmental benefits
	  • Describe project outputs (and related activities & costs) that result in global and national environmental benefits
	  • Describe project outputs (and related activities & costs) that result in national environmental benefits
	  • Describe the process used to jointly estimate incremental cost with in-country project partner
	  • Present the incremental cost estimate. If presented as a range, then a brief explanation of the challenges and constraints and how these would be addressed by the time of CEO endorsement.
		monitored demonstration project of malaria vector control without DDT or other persistent pesticides; **(ii.)** At the regional level the lessons learned in each country will be exchanged and a regional consensus will be built; **(iii.)** At the global level the results of this project will define replicable models for malaria control based on cost effective, environmentally sound and sustainable strategies.
		• A detailed logical framework is included as Annex B. Objectively verifiable indicators include nine replicable documented demonstration projects that test a set of procedures for different malaria vector control, under well identified environmental and social-economic conditions.
		• Activities are grouped into 4 major components and include: Demonstration Projects and Dissemination; Strengthening of National Capacity to Control Malaria Without DDT; Elimination of DDT stockpiles; and Coordination and Management.
		• The incremental costs analysis in annex A describes the national, regional, and global benefits to be expected from the project. The global environmental benefits stem from the reduction of the total load of a ubiquitous persistent and toxic contaminant, DDT.
		• The participating countries' contribution to baseline costs consists mostly of redirection of malaria control programme funds in the demonstration areas.

• Sustainability (including financial sustainability)	Describe proposed approach to address factors influencing sustainability, within and/or outside the project to deal with these factors	Issues regarding sustainability are discussed in paragraphs 31 – 33. Sustainability depends on the wider adoption of alternative practices that will be demonstrated during the project.
• Replicability	Describe the proposed approach to replication (for e.g. dissemination of lessons, training workshops, information exchange, national and regional forum etc.) (could be within project description)	The nature of the project implies replicability both within each participating country, and to the benefit of other developing countries that use DDT for vector control. The whole project design is geared toward ensuring replicability.
• Stakeholder Involvement	• Describe how stakeholders have been involved in project development • Describe the approach for stakeholder involvement in further project development and implementation	• Primary stakeholders are populations in poor rural communities who are affected by malaria; public sector institutions that are responsible for the malaria issue; and agricultural workers and health workers who have been exposed to DDT and would be again if DDT were reintroduced. - see para 34-35.

	Work Program Inclusion per criteria established in Draft # 8 of the project review criteria	Reference Paragraphs and Explanatory Notes:
		• Project strategy is to strengthen local capacities to control malaria without DDT. Emphasis will be given to strengthening civil society's role in addressing the problems caused by POPs and other pesticides.

• Monitoring & Evaluation	• Describe how project design has incorporated lessons from similar projects in the past
	• Describe approach for project M&E system, based on the project logical framework, including the following elements:
	  • Specifications of indicators for objectives and outputs, including alternate benchmarks, and means of measurement.
	  • Outline organisational arrangement for implementing M&E
	  • Indicative total cost of M&E (may be reflected in total project cost).
		• Project design has benefited from the experience of developing alternatives to DDT in Mexico.
		• Indicators for individual objectives and outputs are described in Annex B.
		• Monitoring of project progress will be the primary responsibility of the UNEP GEF Co-ordination Office and the Bureau of Fund Management Services and will be undertaken via Quarterly Operational Reports, half yearly and end of year financial and substantive reporting in accordance with UNEP's internal guidelines for project monitoring and evaluation.
		• A post project implementation review will be undertaken by UNEP 2 years after the end of the project.
		• The indicative cost of the M&E related activities for the Implementing Agency is 83,000 US$ and is included within the Implementing Agency Fee.

3. Financing		
• Financing Plan	• Estimate total project cost. • Estimate contribution by financing partners. • Propose type of financing instrument	• Total project cost is estimated at 11.09 million US$ - see cover page and budget table 2. • Estimated contribution from financing partners is 3.62 million US$ (including in-kind contributions) - see cover page. • Grant financing.
Implementing Agency Fees	Propose IA fee	• 382,000 US $ based on the agreed flat fee. • 15,000 US$ premium based on added cost of evaluation in 8 countries.
• Cost-effectiveness	• Estimate cost effectiveness, if feasible • Describe alternate project approaches considered and discarded	• The approach adopted to rely heavily on demonstration activities provides a cost-effective way to facilitate widespread adoption of the alternatives to DT that will be implemented.
4. Institutional Coordination & Support		

	Work Program Inclusion per criteria established in Draft # 8 of the project review criteria	Reference Paragraphs and Explanatory Notes:
IA Coordination and Support • Core commitments & Linkages	Describe how the proposed project is located within the IA's • Country regional/global/sector programs • GEF activities with potential influence on the proposed project (design & implementation)	• The project is to be implemented within the framework of UNEP's activities in Chemicals Management, including early implementation of the POPs Convention. • Links will be established with relevant activities. In particular, linkages with the proposed UNEP/CAR-RCU project on Reducing pesticide runoff to the Caribbean.
• Consultation, Coordination and Collaboration between IAs, and IAs and EAs, if appropriate.	• Describe how the proposed project relates to activities of other IAs and 4 RDBs in the country/region. • Describe planned/agreed coordination, collaboration between IAs in project implementation.	Discussions are underway to coordinate activities with the relevant projects and programmes active in the region, and particularly: DANIDA –PLAGSALUD; WHO - Roll Back Malaria; DANIDA - Programme of Regional Environmental Management and Sustainable Development in Central America; GEF/PNUD/PNUMA – El Corredor Biologico Mesoamericano: una iniciativa regional de Desarrollo Sostenible; Plan Puebla-Panamá (PPP) – Mexico and Central America sub-regional for coordinated planning and actions.
5. Response to Reviews		
Council	Respond to Council comments at pipeline entry	N/A
Convention Secretariat	Respond to comments from Convention Secretariat.	N/A
GEF Secretariat	Respond to comments from GEFSEC on draft project brief.	N/A
Other IAs and 4 RDBs	Respond to comments from other IAs, 4RDBss on draft project brief.	Comments received from the WB are supportive and responded to in Annex C1.
STAP	Respond to comments by STAP at work program inclusion.	N/A
Review by expert from STAP Roster	Respond to review by expert from STAP roster	Comments received from STAP roster expert are supportive and responded to in annex C1.

PROJECT BRIEF

IDENTIFIERS

PROJECT NUMBER:	*[Implementing Agency Project No not yet assigned]*
PROJECT NAME:	**Regional** (Belize, Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, and Panama): **Regional Program of Action and Demonstration of Sustainable Alternatives to DDT for Malaria Vector Control in Mexico and Central America**
DURATION:	3 years
IMPLEMENTING AGENCY:	United Nations Environment Program
EXECUTING AGENCIES:	Regional: Pan American Health Organization (PAHO) National: Ministries of Health of Belize, Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, and Panama
ELIGIBILITY:	The participating countries are eligible under paragraph 9 (b) of the Instrument for the Restructured GEF. The proposed intervention is consistent with the provisions of the POPs Convention.
GEF FOCAL AREA:	International Waters
GEF PROGRAMMING FRAMEWORK:	Global Contaminants, Operational Program Number 10 Draft Operational Programme 14 on POPs

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SUMMARY:

During the last decade Mexico and Central American countries have gradually discontinued DDT sprayings for vector control. Malaria, however, still poses a serious risk for the population of these countries. This proposal aims to prevent reintroduction of DDT for malaria control by promoting new integrated vector control techniques and implementing a coordinated regional program to improve national capacities. Major project components will be: the implementation of demonstration projects of vector control without DDT or other persistent pesticides that can be replicable in other parts of the world and which are cost-effective, environmentally sound, and sustainable; the strengthening of national and local institutional capacity to control malaria without the use of DDT; and the elimination of DDT stockpiles in the eight participating countries.

COSTS AND FINANCING (MILLION US $):

GEF

Project	:	**6.599**
Project Support Costs	:	0.528

PDF B	:	0.330
Project Preparation Costs	:	0.038
Sub-Total GEF	**:**	**7.495**

Co-financing

PDF-B (all sources)	:	0.440
CEC	:	0.200
PAHO	:	0.654 (in kind)
Governments		5.1164 (in cash & kind)*
Sub-Total Co-Financing	**:**	**6.4104**
Total Project Cost	**:**	**13.9054**

* This figure represents an in principle commitment from the participating countries to redirect their malaria program budgets in the demonstration areas to project activities.

OPERATIONAL FOCAL POINT ENDORSEMENTS:

COUNTRY	OPERATIONAL FOCAL POINT NAME	POSITION	DATE OF ENDORSEMENT
Belize	Nancy Namis	AG Chief Executive Officer Ministry of Economic Development	8/1/02
Costa Rica	Licda. Guaria Vargas	Executive Director , FUNDECOOPERACION	28/9/01
El Salvador	Ana Maria Majano	Minister of Environment and Natural Resources	29/10/01
Guatemala	Dr. Sergio Augusto Lavarreda Anieu	Minister of the Environment	20/10/01
Honduras	Ing. Xiomara Gomes de Caballero	Minister of Environment and Natural Resources	25/9/01
Mexico	Lic. Ricardo Ochoa	Ministry of Finance of Mexico, Director, International Financial Institutions (SHCP)	5/12/01
Nicaragua	Garcia A. Cantero	Advisor to the Minister Coordinator for PROTIERRA	24/9/01
Panama	Ing. Ricardo R. Anguizola M.	General Administrator, National Environmental Authority	26/10/01

IA CONTACT:

Name: Mr Ahmed Djoghlaf, Executive Coordinator, UNEP/GEF Co-ordination Office, UNEP,

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LIST OF ACRONYMS/ABBREVIATIONS

CEC	Commission for Environmental Cooperation (NAFTA)
CDC	Center for Disease Control and Prevention (USA)
CINVESTAV	Centro de Investigación y Estudios Avanzados del Instituto Politécnico Nacional. Unidad Mérida, Mexico
CIRA-UNAN	Centro para la Investigación en Recursos Acuáticos de Nicaragua, Universidad Autónoma de Nicaragua
DANIDA	Danish International Development Agency
DDT	dichloromethyltrichloroethane [1,1,1-trichloro-2,2-bis(4-chlorophenyl)ethane]
GEF	Global Environment Facility
GIS	Geographic Information System
GTZ	German Agency for Technical Cooperation
HCP	Division of Disease Prevention and Control (PAHO)
HEP	Division of Health and Environment (PAHO)
IDA	International Development Association (World Bank Group)
IDB	Inter-American Development Bank
IDRC	International Development Research Center
LUCAM	Laboratorio Unificado de Control de Alimentos y Medicamentos – Guatemala
MAG	Ministerio de Agricultura y Ganaderia – Costa Rica
MASICA	Program on Health and Environment in Central American Isthmus
NAFTA	North American Free Trade Agreement
NARAP	North American Regional Action Plan
NGO	Non Governmental Organizations
PAHO	Pan American Health Organization
PDF	Project Preparation and Development Facility
PLAGSALUD	Occupational and Environmental Aspects of Pesticides in the Central American Isthmus (DANIDA/PAHO)
SHA	Special Program for Health Analysis (PAHO)
SICA	Sistema de la Integración Centroamericana (Central American Integration System)
RBM	Roll Back Malaria Program (WHO)
UN	United Nations
UNEP	United Nations Environment Programme
USAID	United States Agency for International Development
WB	World Bank
WHO	World Health Organization

PROJECT DESCRIPTION

BACKGROUND – BASELINE COURSE OF ACTION

1. Malaria is a transboundary problem affecting most tropical countries. It is a protozoal infection transmitted to human beings by an infected anopheline mosquito bite mainly between sunset and sunrise. Human malaria is caused by four species of Plasmodium protozoa: *P. falciparum, P. vivax, P. ovale and P. malariae*. In Central America and Mexico the main malaria vectors are *A. pseudopunctipenis, A. albimanus,* and *A. vestitipenis*. It is estimated that 89,128,000 people in Mesoamerica live in areas environmentally suitable (high temperatures and humidity) for the transmission of malaria, of which 23,445,000 (35%) live in highly endemic areas. Migration of infected people and environmental conditions such as rainfall patterns, altitude and temperature all facilitate the movement of the disease across national borders. Only an integrated regional approach can address the human and environmental challenges in malaria prone areas.

2. DDT has been extensively used as an insecticide for malaria vector control and in agriculture in Mexico and Central America since the 1950's; sprayed not only in households but also on water surfaces in an attempt to control mosquito breeding. Concerns regarding environmental contamination by DDT compounds as well as the development of vector resistance to the organochlorine insecticides, motivated the countries to initiate policies to gradually discontinue DDT sprayings during the 1980's and the 90's. Belize, for example, had been using DDT up to the year 1999 and Mexico, up to the year 2000. The assessment made during the PDF-B phase revealed that at least 85,000 tons of DDT was sprayed in households and its surroundings in malaria endemic areas in the last 40 years. Malaria endemic areas in Guatemala received an average of 204 tons of DDT per year between 1958 and 1979. Nicaragua sprayed 268 tons/year between 1959 and 1962. Mexico sprayed 5,110 tons/year of DDT between 1957 and 1960, going down to 290 tons/year between 1992 and 1999. El Salvador sprayed 198 tons/year from 1960 to 1973.

3. DDT and its metabolites, especially *p,p'*-DDE, are highly stable toxic compounds that persist in the environment for many years and can accumulate in living organisms. They can persist decades in soils in association with organic matter and clay particles. DDT is transported though the water cycle by rainfall and surface water runoff, and can be carried to remote areas by the atmosphere as well, thus contributing to environmental contamination at global level. Concerns about DDT residues in water, sediment and soil, as well as in the food chain in Mexico and Central America were reinforced by data brought forth sub-regional and national reports developed during the PDF-B phase. An assessment of DDT and deltamethrin exposure was carried out in Mexico in the two states with the highest prevalence of malaria and a history of pesticide application. In Chiapas, samples were obtained at the time when DDT was being used in the malaria control program. In Oaxaca, samples were collected two years after the final spraying of DDT and two days after deltamethrin (a pyrethroid used as a substitute for DDT) application. Soils samples collected from the bare dirt floor inside a house that had been sprayed with DDT and analyzed during the PDF-B phase showed 83 mg/kg of DDT, 41 mg/kg of DDD and 14

mg/kg of DDE, compared to 0.37 mg/kg of DDT, 0.02 mg/kg of DDD and 0.2 mg/kg of DDE found in a house that had not been sprayed. Outside the same house, the soil samples had 49 mg/kg of DDT, 13 mg/kg of DDD and 5.7 mg/kg of DDE, compared to 0.6 mg/kg of DDT, 0.6 mg/kg of DDD and 0.2 mg/kg of DDE in the control area. In Nicaragua, samples of sediments taken from coastal lagoons in malaria endemic area had 50 µg/kg of DDT, 46 µg/kg of DDD and 94 µg/kg of DDE.

4. Long-term health effects of these compounds on the malaria campaign personnel that were exposed by spraying DDT, or populations residing in villages where these pesticides were applied are also of concern, although the specific effects are not well understood. Mean concentration of DDT and DDE, as measured in whole blood, were 68 and 87 µg/l for children living in Chiapas and 27 and 61 µg/l for adults respectively. Sprayers in Chiapas had the highest levels of exposure with 170 and 190 µg/l of DDT and DDE. As expected, DDT levels were bwer two years after the final application in Oaxaca (20 and 13 µg/l for children and adults respectively). 60 newborn had their umbilical chord blood tested in Oaxaca coastal zone and DDE was found in a mean level of 13 µg/g. Deltamethrin exposure was assessed only in children in Oaxaca: 50% of the exposed group had urinary levels above the limit of detection and 6% had levels above 25 µg/l (five times the limit of detection), with a negative trend with age. Information related to Central America is reported in the regional report, however, most of these countries do not have data or documentation on the level of DDT residues.

5. These environmental and health effects are compounded by the fact that Central American countries are particularly vulnerable to natural hazards such as hurricanes and earthquakes. After Hurricane Mitch in 1998, approximately one ton of DDT that was poorly stored was washed into the Caribbean Sea in Nicaragua. Preliminary studies conducted in Honduras after the hurricane indicated the presence of DDT in the environment and human population, probably originating from an industrial plant that had been flooded. The existing DDT stockpiles in these countries, which generally are stored in improper conditions, therefore pose a great risk of contamination of national and international waters as well as the possibility of harm to human health and environment under disaster situations.

6. In the absence of GEF intervention, given the low national budgets for malaria control, weak national health systems, and lack of institutional and community level awareness about the effects of DDT exposure on environment and human health, the reintroduction of DDT for malaria control is likely. Particularly considering its low cost and relative effectiveness as an insecticide. Countries such as Guatemala, Honduras and Belize, where national malaria campaigns have been weak, might contribute to increase the regional problem because of transboundary spread of the malaria disease. The benefits of the isolated initiatives to develop new techniques of malaria vector control, that have flourished in Mexico, Costa Rica, Nicaragua and Panama during the last few years, could be lost in the long run due to lack of coordination and exchange of experience. The recent experience of South Africa that has had recently to resolve itself using DDT to fight a malaria outbreak exemplifies the difficulty of phasing-out DDT in a sustainable manner, and the need to demonstrate conclusively the efficiency of an array of alternative methods.

GEF Programming Context

7. This project conforms with the "Contaminant-based" Operational Programme No 10 and will "*help demonstrate ways of overcoming barriers to the adoption of best practices that limit contamination of the International Waters environment*". The proposed activities are also consistent with several provisions of the recently adopted Stockholm Convention on POPs, and with the draft Operational Programme on POPs under development. Five of the participating countries have already signed the POPs convention: El Salvador, Honduras, Mexico, Nicaragua and Panama. The other three countries have expressed their intention to sign it.

Implementing Agency Programming Context

8. UNEP is the task manager for chapter 19 of agenda 21 on toxic substances and the Secretariat for the Stockholm Convention on Persistent Organic Pollutants which was adopted in May 2001. UNEP will facilitate the coordination between this project and the other POPs projects developed under its aegis. In particular links with the UNEP/GEF project under development "Reducing Pesticide Runoff to the Caribbean Sea" which is focused on Colombia, Costa Rica and Nicaragua will be consolidated through participation of the national coordinators to the respective national committees and participation of the regional project manager to the respective steering committees. Contacts have been established with the regional coordinator of the GEF/UNDP/UNEP project "*El Corredor Biologico Mesoamericano: una iniciativa regional de Desarrollo Sostenible*" for future coordination of environmental activities, particularly related to community participation and awareness in the areas of demonstration projects in Costa Rica and Panama.

Executing Agency Context

9. PAHO has an office in each country in the region and has a central role in providing technical cooperation for both the establishment of malaria control programs and prevention of adverse effects related to the use of pesticides. PAHO has been called upon by UNEP to play a strategic role in Latin America and the Caribbean in the implementation of Governing Council Decision 19/13C (1997) which mandates a series of immediate actions on POPs, including exchange of information. As part of the initiative for the Sustainable Development of the Central American Region, PAHO, with strong support of the Nordic Countries, has launched the "Program on Health and Environment in the Central American Isthmus", known by its Spanish acronym MASICA (1990). This program has focused on obtaining political commitments to integrate environment, health and development actions. One of its main components is the Project PLAGSALUD (Occupational and Environmental Aspects of Pesticides in the Central American Isthmus), established in 1994 with funding from DANIDA. Using a bottom-up approach, this project has been active in all seven Central American countries for the last six years. Enjoying government and civil society support, it has already achieved important results such as the improvement of the surveillance and control of acute intoxication from pesticides, the revision of pesticide legislation, the establishment of local pesticide committees, and more specifically the

improvement of the protection of malaria and other vector control personnel from exposure to pesticides. This proposal will build on and complement the groundwork already accomplished by PLAGSALUD.

National and Regional Context

10. In 1996 the Parties to the North American Free Trade Agreement (NAFTA), working with the Secretariat for the North American Commission for Environmental Cooperation (CEC), approved a North American Regional Action Plan (NARAP) to reduce the exposure of humans and the environment to DDT compounds through phasing out the use of DDT for malaria control in Mexico, transferring this experience to other countries, and eliminating illegal uses of DDT. The CEC continued its holistic approach to malaria control in Mexico during the PDF-B phase by executing demonstration projects which brought together an integrated vector control management strategy with the full spectrum of related public health activities and services. This program maintains a regional perspective that encourages sharing of experiences with other Latin American and Caribbean countries to ensure that malaria is controlled throughout the Region by environmentally sound methodologies, with participation of local communities, non-governmental organizations, business and industry sectors, state and municipal government institutions, academia, and technical and policy experts. The proposed project has received very strong support from the health sectors of the participating countries, as evidenced by the letters of support received from the Ministries of Health (Annex J).

11. In 1991, 1260 tons of DDT were sprayed in Mexico, in 1997 477 tons, and in the year 2000 no DDT was sprayed. Belize discontinued the use of DDT during the PDF-B phase. Three different pilot projects were undertaken in the State of Oaxaca in Mexico to assess the effectiveness of alternative malaria control measures including field assessment of bed nets as a complementing measure to control malaria and field evaluation of delthametrin as a substitute to DDT as well as environmental actions to prevent the proliferation of malaria vector. The successful methodologies tested in these pilot projects will be replicated in the demonstration projects. Guatemala, Nicaragua and Honduras have had positive experience in using *Bacillus thurigiensis* and *Bacillus sphaericus* as a biological tool for malaria vector control. Honduras and Guatemala have also experimented controlling mosquito breeding by using larvae eating fishes. Guatemala has been experimenting with Neem tree, an African specie of plant with repellent properties. Costa Rica, El Salvador and Panama reported positive malaria vector control by improving the sanitary conditions in malaria endemic areas. Physical barriers such as mosquito nets have also been adopted as complementary strategies in all participating countries.

RATIONALE AND OBJECTIVES

12. There is a need to strengthen institutional technical capacity at a regional scale for assessment and control of malaria disease vectors. Countries with less capacity to address malaria control without DDT need help from their neighbors who have had successful experiences. Only a long-term regional

cooperative program can help deter some countries from returning to use DDT or using other persistent pesticides to control endemic malaria vectors. The participating countries are committed to developing and implementing comprehensive management practices that will build and strengthen awareness about the importance of environmental conservation and sound water management in the control and prevention of endemic diseases with the active participation of local communities, particularly in immigration corridors. The principles which form the basis for the proposed project are: integrated inter-institution and inter-sectoral (environment and health) approaches; broad community participation in all steps of the project; integration of the work to existing national institutions so that no parallel structures are created; technical, financial and organizational sustainability of the new approaches to malaria control; and widespread dissemination of the information generated by the project.

13. The proper storage and eventual disposal of POPs presents a problem throughout the Region. The PDF-B has identified approximately 135 tons of DDT stored throughout the region, some in very bad conditions in leaking containers as the 15 tons in Guatemala. Current methods of storage in old warehouses are insufficient to prevent environmental contamination and human contact. Nicaragua and Honduras have already received international help to dispose of their DDT stockpiles, but assistance is required for the other six countries for this endeavour.

14. In the execution of the PDF-B Grant, the following lessons were learned: **(i)** The experimental projects developed in Mexico showed that integrated vector management with community participation, in addition to new ways of monitoring and treating the disease, can eliminate the use of pesticides after 2 years of continuous actions; **(ii)** The communication network initiated during the PDF-B facilitates the exchange of technologies in use in different countries as was seen in the 3 regional meetings where the participating countries presented and were questioned about their malaria control strategies; **(iii)** In order to be replicable in other parts of the world, in different ecosystems and socio-economic conditions, the Mexican and Central American experiences of malaria control without DDT need further detailed documentation and close monitoring of activities and results; **(iv)** There is a need for standardization and validation of laboratory procedures for monitoring the presence of DDT in the environment and in people, and for malaria detection, in order to have comparable data; **(v)** there is a need for national and local institutional capacity building in order to achieve sustainability of the new methodologies of malaria control, and **(vi)** a specially designed Webpage and the application of a GIS are useful tools for malaria risk assessment, epidemiological analysis, monitoring and evaluation of the effectiveness of interventions, decision making in health/environment related issues, and will contribute to the sustainability and replicability of the project activities.

15. The overall objective of the project is to demonstrate that methods for malaria vector control without DDT or other persistent pesticides are replicable, cost-effective and sustainable, thus preventing the reintroduction of DDT in the region. Human health and the environment will be protected in Mexico and Central America by promoting new approaches to malaria control, as part of an integrated and coordinated regional program. The establishment of a regional network will facilitate the exchange of best practices and lessons learned among neighboring countries. A major outcome will be increased

government and local community awareness of DDT and other pesticides hazards to the environment and human health, and adjustment of future behavior regarding the use of persistent pesticides.

16. The results of this project will be felt at three levels: **(i)** At the national level, each one of the 8 participating countries will have the documented results of a well monitored demonstration project of malaria vector control without DDT or other persistent pesticides; **(ii.)** At the regional level the lessons learned in each country will be exchanged and a regional consensus will be built; **(iii.)** At the global level the results of this project will define replicable models for malaria control based on cost effective, environmentally sound and sustainable strategies. These models which will be thoroughly tested and documented in a series of interconnected demonstration projects will constitute a set of best practices which may be applied in other regions of the world.

PROJECT ACTIVITIES / COMPONENTS AND EXPECTED RESULTS

17. After a consultation process, led by PAHO and the CEC, consisting of meetings and studies implemented during the PDF B phase, four different groups of actions were identified as necessary to address countries' needs to lower their vulnerability to using DDT for malaria control. The actions, as presented in Annex B (Logical Framework), are organized under the following four components:

18. **Component 1: *Demonstration Projects and Dissemination*.** The objective is to implement, evaluate, and disseminate the alternative strategies of malaria vector control without use of DDT which were developed during the PDF-B phase. The main outcome is to avoid future reintroduction of DDT or other persistent pesticides in national malaria control programs. This component represents a major part of this project and most of the resources will be concentrated on it. A total of nine demonstration projects will be implemented under specific ecological conditions in each of the participating countries, using a set of integrated methods of malaria control according to the RBM/WHO and the Mexican experience of malaria control without DDT. The nine sites for demonstration projects were defined and delimited in each country during the PDF-B according to government suggestions about local needs. The alternatives tested in each demonstration projects will be closely assessed and evaluated in terms of their technical and economic effectiveness.

19. The activities that will be implemented in the demonstration projects are described in Annex F. The settings for demonstration areas include different malaria vectors, endemic levels of the disease, and environmental and social-economical conditions. A technical manual will provide basic information on malaria vector control without use of DDT while confronting different vector species and different ecological conditions in each country. Workshops will be organized locally for health and environment personnel, community leaders, and NGOs involved in each demonstration project. The exchange of information and experiences of all 8 participating countries on malaria vector ecology and entomology, integrated malaria vector control methods, field operations, as well as community participation techniques will be facilitated. Community awareness, community training and public participation are

important tools in the implementation of integrated vector control strategies and will be encouraged and supported through workshops, training courses, participation in demonstration projects, preparation of material for wide diffusion, media campaigns, educational activities, etc.

20. A region-wide information system on DDT and malaria control will be the basis for gathering and disseminating data adequate to the needs of government in the decision-making process. Links with other regions of the world will facilitate the exchange of information related to malaria control, and the sharing and dissemination of the results of the demonstration projects on a world-wide basis. The electronic platform developed during the PDF B phase includes a Web and an Intranet page. It will provide access to project documents, national reports, technical studies, reports of meetings and workshops, as well as results of demonstration projects and will facilitate communication among project participants.

21. In the demonstration projects areas, the population and environmental compartments (water, soil, sediment and biota), as well as the malaria programs personnel, will be monitored for exposure to DDT and newly introduced pesticides for malaria control. An inter-laboratory control program will be implemented to ensure that analytical results are reliable and comparable across the participating countries and at the international level. A current baseline of DDT exposure will be established in each demonstration project area. Training on exposure assessment techniques will be provided, including sampling and laboratory techniques. Exposure risk areas will be identified and mapped, and the generated data will integrate national and regional information systems. Epidemiological assessment of malaria personnel will be implemented in each participating country. Educational and public information material will be formulated to raise awareness about the risks of exposure to DDT and other pesticides.

22. The outcomes of this project component address needs at several levels. Local health services will be strengthened and communities involved in demonstration projects will learn participatory and integrated techniques for malaria control and will become aware of DDT exposure hazards. National institutions in the health, environment and other sectors will establish links in formulating an integrated and preventive approach to malaria vector control. At the Global level, the documented experience of each demonstration project will constitute a set of malaria control techniques replicable in other parts of the world under similar ecological conditions. This component includes workshops and training of local technicians and community, assessment of all activities, and evaluation of results. The estimate of costs for each demonstration project was based on the Mexican experience. Each country will contribute to this component through redirection of its budgetary malaria control program in the demonstration areas. Based on information provided by each participating country after definition of the areas where the demonstration projects will be implemented, the total cost of demonstration projects is estimated at US$ 8,873,400. Of this amount, US$ 5,026,400 will be provided by the countries and US$ 350,000 by CEC and PAHO (Table 2). GEF is requested to provide US$ 3,497,000 (for details see Annex E).

23. **Component 2:** *Strengthening of national institutional capacity to control malaria without DDT*. The objective is to strengthen national and local institutional capacities to control malaria with methods that do not rely on DDT or other persistent pesticides. The outcome of this component will be strengthened national capacities of malaria risk assessment, development of analytical laboratory infrastructure, community participation and training regarding malaria vector control and pesticide management. The activities described in Annex E will provide the tools for countries to make well-informed decisions about malaria control based on new methods. National Action Programs aiming at decentralization and implementation of integrated methods will be reinforced. Government authorities of health, environment, and agriculture of the participating countries will have the opportunity to exchange and discuss the existing alternative strategies that will be tested and documented through the demonstration projects.

24. Laboratory analysis capacity for chemical assessment will be strengthened in Mexico (Universidad Autónoma de San Luis Potosí and Centro de Investigación y Estudios Avanzados del Instituto Politécnico Nacional - CINVESTAV – Unidad Merida), Guatemala (Laboratorio Unificado de Control de Alimentos y Medicamentos - LUCAM), Nicaragua (Centro para la Investigación en Recursos Acuáticos de la Universidad Autonoma de Nicaragua – CIRA/UNAM), Panama (Instituto Gorgas de Estudio de la Salud), Costa Rica (Laboratorio del Ministerio de Agricultura y Ganaderia - MAG), El Salvador (Ministerio de Agricultura y Ganaderia), and Central Laboratory of Belize.

25. The Geographic Information System which was developed during the PDF-B phase (cf. Annex G for demonstration) will include geo-referenced data on malaria control, population at risk, environmental and ecological factors related to vector distribution, malaria vector control interventions, health system coverage, etc. A specific GIS will be developed for use at local levels with selected indicators to monitor project data related to pesticide use and environmental and health impacts of DDT. These computerized tools will strengthen: the institutional capacities to monitor and disseminate information related to malaria control under integrated health/environmental approach; the regional capacity for epidemiological analysis the health workers; the national epidemiological surveillance systems; the regional epidemic forecasting and preparedness; and the detection of insecticide resistance, *inter alia*.

26. A substantive Final Report will be printed in book format and CD to disseminate the results of the project and the methodologies for malaria control without DDT tested in the demonstration projects. It will include maps of malaria risk areas, extensive descriptions of the methodologies and results of each demonstration project, the effects of DDT exposure documented during the implementation of this project. The document will provide national governmental institutions with the information needed to support the sustained phasing-out of DDT in public health programs.

27. Details of these activities and their related costs are shown in Annex E (Description of Project Activities and Costs). The electronic platform containing Webpage, Intranet, and GIS will be developed by the Special Program for Health Analysis (SHA) of PAHO which will facilitate the future maintenance

and continuation of the services. A special effort aimed at the sustainability of these activities will be made by building local capacity. Specific detailed Terms of Reference for all contracted services will be prepared by HEP/PAHO in close consultation with UNEP during the first quarter of the project. The total cost of this component will be US$ 1,608,000.

28. **Component 3: Elimination of DDT stockpiles.** This component will address the existing problem of stockpiles in six of the eight participating countries (Nicaragua and Honduras have already received international support for final disposal of their DDT stockpiles). All activities will be documented and management plans will be put into place to prevent further accumulation of stockpiles of pesticides. During the PDF-B, approximately 135 tons of DDT were identified in Belize (13 tons), Costa Rica (9 tons), El Salvador (6 tons), Guatemala (15 tons), Mexico (87 tons), and Panama (5 tons). The national inventories will be completed, including finding and quantifying evidence of DDT uses in agriculture or other sectors. All obsolete stocks in leaking containers will be repackaged and prepared for shipment. The objective of this component is to eliminate the existing DDT stockpiles, repack materials as required, and arrange ways to eliminate DDT in an environmentally sound manner consistent with the provisions of the Stockholm and Basel Conventions. The total cost of activities under this component is US$ 450,000.

29. **Component 4: Coordination and Management.** A regional coordinator will be hired for this project under terms of reference established by the steering committee. The regional coordinator be hired by PAHO and be based in one of the participating countries. Each country will have a national coordinator, based in the PAHO country office, with the main tasks of organizing and coordinating all activities implemented in the demonstration projects, facilitating local community participation, and monitoring and evaluating all activities, results, and data generated by the demonstration projects. This component also includes three annual meetings of the steering committee, three regional meetings for planning and evaluation of activities, and three regional annual reports. The total costs are US$ 1,638,000.

RISKS AND SUSTAINABILITY

30. Drawing on the experience gained during the PDF-B phase, when participants from the eight participating countries were brought together in regional meetings, several assumptions about inherent risks can be made. These include: the possibility of a large scale malaria resurgence; unexpected natural hazard phenomena (earthquakes and hurricanes) that could create difficult conditions for implementing the proposed vector control strategies; lack of adequate community participation in the demonstration projects; lack of capacity of national malaria control surveillance systems; persistent transmission of malaria in areas close to demonstration projects. These risks will be mitigated by monitoring them very closely and by the communication network which will be put into place and will facilitate rapid discussion and search for adequate solutions.

31. All participating countries are signatories of several international conventions and their governments have decided to use this project as an instrument to update and upgrade their malaria control programs for the benefit of public health, the environment and sustainable development. Consequently, significant co-financing is available in each of the participating countries which can ensure post-project sustainability of the initiatives developed in the course of the project. Local communities will be involved in each demonstration project and public awareness on the problems related to DDT use will be the key factors for the sustainability of the new approaches to malaria vector control generated by this project.

32. Sustainability will also result from the integration of project activities with the ongoing work of participating institutions. For example, epidemiological surveillance of pesticide problems is already an integral part of the national health surveillance systems supported by national Health Ministries in most countries. The PLAGSALUD project has activities related to agricultural use of pesticides, community involvement and public awareness on pesticides. The integration among these projects will enhance sustainability of pesticide control strategies developed by the DDT phase out effort. At the local level the project will work through the existing health service structure, thus avoiding distorting host country activities and resource capabilities in an unsustainable way. Regional level activities that enhance local and national level capacities will be emphasized. This approach is consistent with the increasing emphasis on decentralization promoted by PAHO within the health sector throughout the region.

33. It is expected that the local level experience generated by the demonstration projects will form a model that will be adopted at country level and later can be applied at a global level. The "bottom-up" approach based on the active participation of local communities, government technical officers, NGOs and local level institutions is designed to bring the desired sustainability to the models introduced by this project.

STAKEHOLDER PARTICIPATION AND IMPLEMENTATION ARRANGEMENTS

34. The primary beneficiaries of this project will be: a) populations in poor rural communities who are affected by malaria, b) public sector institutions that have to deal with the malaria problem, and c) agricultural workers and health workers who have been exposed to DDT and would be again if DDT is reintroduced. All stakeholders will benefit from the incorporation of integrated malaria vector control principles into the existing framework of national health policies; the strengthening of the new strategies for malaria control without DDT or hazardous pesticides; the involvement and training of local communities in malaria vector control techniques; the elimination of the existing DDT stockpiles; improved inter-sectoral collaboration especially between the health and environment ministries; and the strengthening of health surveillance and pesticides monitoring systems. The Governments of the 8 participating countries, local NGOs, research centers, and universities have demonstrated their willingness to cooperate and coordinate activities during the implementation of this project. This proposal has been formulated with the active participation of representatives of the governments and other stakeholders. The final draft was presented and discussed during the 2nd Steering Committee Meeting in Mexico city.

35. One of the main strategies of this project is to strengthen local capacities to control malaria without DDT. Great emphasis will be given to strengthening civil society's role in addressing the problems caused by POPs and other pesticides, by integrating local NGOs, church groups, etc into meetings, workshops and planned actions related to the demonstration projects. The project will provide information and technical support to civil society initiatives by providing technical manuals and reports on Malaria control without DDT in an accessible language.

36. PAHO, due to its historic involvement in the region and its role in implementing activities under related projects, will be the lead regional Executing Agency. The Division of Health and Environment (HEP) in Washington D.C. PAHO headquarters will be responsible for the management of the project. PAHO will be implementing the actions with close participation of its local officers in each of the participating countries. Technical assistance will be provided by other PAHO units (Office of External Relations (DEC), Program on Human Resources Development (HSR), Special Program for Health Analysis (SHA), and Program on Communicable Diseases (HCT)). The lead institution responsible for project execution in each country will be the Ministry of Health. Additionally, the project will involve the Ministries of Environment and Agriculture, the Plagsalud national pesticide commissions, and the local health care systems, as well as civil society organizations such as NGO's, research centers, and universities.

37. The project will have a regional coordinator contracted by PAHO, living in one of the participating countries. Each country will have a national focal point for this project, appointed by the executing ministry, and a national technical coordinator to be contracted by PAHO in consultation with the governments and UNEP for the full 36 months of the project. A National Operational Committee

will be established in each participating country under the coordination of the national focal point, with the participation of the technical coordinator and representatives of community organizations and NGOs involved in the project. Its role will be to promote the active participation of all stakeholders and to advise on the orientation of the project. It will be co-chaired by the national focal point and technical coordinators and will be the mechanism for the coordination of national actions. A Regional Operational Committee will be formed by the national focal points (Ministries of Health and national technical coordinators) and will be chaired by the regional coordinator. This will be a technical body to discuss, plan and evaluate the technical activities of the project.

38. The Steering Committee will be composed by representatives of the Ministers of Health, PAHO, UNEP, CEC, CCAD, other relevant projects in the region and NGOs, as well as the national focal points and technical coordinators. This will be the highest organ of the project and will meet at least once a year to approve the workplans of the countries, the terms of reference of the demonstration projects, and provide advisory functions. Any significant change to programs and budgets must be approved at this level.

INCREMENTAL COST AND PROJECT FINANCING

39. Table 1 presents the baseline of this intervention and the incremental costs of achieving global environmental benefits. This is discussed in Annex A. Table 2 presents the project financing by components. During the Steering Committee meeting in Mexico City, on September 11-12, 2001 the average cost per capita for alternative techniques of malaria vector control was established, based on Mexico's experience during the PDF-B phase, at $2.2 US dollars. This cost includes various activities such as community training, campaigns for creating community awareness, local environmental actions related to cleaning vector breeding sites, treatment of infected people, etc. The amount necessary for each country to develop their demonstration project was then established by multiplying the per capita cost by the inhabitants present in the malaria risk areas chosen by the countries as their demonstrative sites. It was asked to the governments that they should meet at least 50% of the expenses related to their demonstrative projects by redirecting part of their national malaria program budgets, to be used in the demonstration areas, especially in actions related to the treatment of infected people. Significant co-financing is available from malaria control programs in the participating countries as seen in the letters of endorsement (Annex J). The estimated co-financing includes US$ 5,026,400 from national budgets for malaria control programs specifically oriented to the population of the demonstration project areas. US$ 654,000 are in kind contribution from PAHO (10% of 3 PAHO Technical Regional Advisors, 10% of 7 PAHO's PLAGSALUD Technical Support Agents, 5% of 7 PAHO National Environmental Health Advisors, 15% of PAHO's Environmental Health Advisor in Mexico, and 5% of 3 PAHO Supervisors. The CEC is contributing US$ 200,000 to be directed to assessment of pesticides residues in the two demonstration project areas in Mexico. The total Cost of the project is estimated at US$ 13,905,400 of which US$ 7,495,000 is requested from the GEF.

Table 1 Baseline & Incremental Costs of achieving domestic & global environmental benefits

000 US$	Baseline	Alternate	Increment
GLOBAL ENVIRONMENTAL BENEFITS	**1,773**	**9,268**	**7,495**
PDF-B phase	440	770	330
Comp. 1 Demonstration projects and dissemination	1,064	4,561	3,497
Comp. 2 Strength. Natl. capacity to ctrl malaria without DDT	64	1,308	1,244
Comp. 3 Elimination of DDT stockpiles	25	425	400
Comp. 4 Coordination and Management	180	1,638	1,458
Executing Agency Project Support Costs	0	566	566
DOMESTIC ENVIRONMENTAL BENEFITS	**1,825**	**1,825**	**0**
PDF-B phase	0	0	0
Comp. 1 Demonstration projects and dissemination	1,500	1,500	0
Comp. 2 Strength. Natl. capacity to ctrl malaria without DDT	300	300	0
Comp. 3 Elimination of DDT stockpiles	25	25	0
Comp. 4 Coordination and Management	0	0	0

Table 2. Project budget summary and component financing (000 US $)

COMPONENT	GEF	Co-financing			TOTAL
		PAHO	Government	CEC	
1. Demonstration Projects and Dissemination	**3,497**	150*	5,026.4**	200	**8,873.4**
2. **Strengthening of national capacities to control malaria without DDT**	**1,244**	364*			**1,608**
3. Elimination of DDT stockpiles	**400**	50*			**450**
4. **Coordination and Management**	**1,458**	90*	90*		**1,638**
SUB-TOTAL	**6,599**	654*	5,116.4	200	**12,569.4**
Project Support Costs – PAHO (8%)	**528**				**528**
Project preparation costs recovering* **	**38**				**38**
PDF-B phase	**330**	100*	240*	100	**770**
TOTAL	**7,495**	754	5,356.4	300	**13,905.4**

* In kind contribution
** National budget for malaria control program in the demonstration areas
*** As of writing agreement reached during the PDF negotiations

MONITORING, EVALUATION AND DISSEMINATION

40. The administrative, technical and financial reporting framework will be provided in the framework of the standard UNEP and GEF reporting protocols. Indicators will be implemented through the establishment and integration of monitoring tools into project components, as agreed by the Steering Committee. A monitoring and evaluation plan, consistent with GEF criteria, will be prepared by the PAHO and CEC, and submitted to the Steering Committee and UNEP. The objective of this monitoring is to contribute to improving, and, if needed, adapting management of work program activities as well as creating the basis for project evaluation. The work plan and terms of reference for project staff and consultants will be discussed and agreed at the first and second meetings of the Steering Committee. A post project implementation review will be undertaken by UNEP two years after the end of the project.

41. Incorporated into the action plan are specific components (see Components 1 and 2) which explicitly aim to promote and disseminate the experiences obtained through the project implementation process to the Mexican and Central American stakeholders and communities within the region. Program activities encourage and facilitate technology transfer and information dissemination through programs of public participation, stakeholder involvement, and professional and community-based education and information dissemination. States and municipal governmental organizations, NGOs and citizen involvement in project execution will also contribute to the dissemination of information on specific technologies and techniques that contribute to the sustainable environmental management and public health development. Finally, the electronic platform with a web site and GIS will also facilitate the dissemination of the results of the project as well as the new strategies and techniques of malaria vector control.

42. The Final Report of this project will have a book format consisting of an extensive report on different strategies for malaria control without DDT under different ecosystems and socio-economic conditions, containing data and results from all the five project components, illustrated by data, maps and pictures showing and/or reflecting the following achievements:

- An established regional epidemiological information system for malaria control and related pesticide problems integrated into the national health surveillance systems of each country.
- Improved diagnosis of the effects of pesticides used in public health for the control of malaria in people and the environment in each country.
- Strengthened involvement at local, national and regional levels of NGO's, research institutions, and other civil society organizations on avoiding DDT reintroduction and supporting new strategies of malaria control.
- Strengthened reliance upon the results of the demonstration projects developed in the region, and

strengthened promotion of these alternatives by organizations and institutions collaborating with this project.

- Established regional and local capacities to monitor and respond to DDT related problems in a multi-sectoral and coordinated fashion.
- Strengthened inter-institutional cooperation and dialogue on malaria problem-solving, with particular attention to improving the capacity of the health, environment, and agriculture sectors to counteract the more traditional set of interests involved in pesticide application policy.
- Achievement of pesticide policy reforms, in particular the banning of persistent pesticides.

TIMETABLE, WORKPLAN AND GEF DISBURSEMENT SCHEDULE FOR THE IMPLEMENTATION OF THE COMPONENTS AND ACTIVITIES (IN 000 US $).

COMPONENT/ACTIVITIES	Duration of the Project - 36 months						Total
	6	12	18	24	30	36	
COMPONENT #1 – DEMONSTRATION PROJECTS AND DISSEMINATION							
9 Demonstration Projects of malaria control in 8 different countries/ecosystems	600	600	600	600	600	185	3,185
Local meetings for preparing community participation and training	40						40
Communication plan to promote public awareness on DDT and educational campaign		20		20		16	56
Implement Web and Intranet pages		25		25			50
Assessment of environmental, biota, and human exposure to DDT and newly introduced pesticides	20	20	20	20	20	20	120
DDT compounds risk evaluation and risk maps			10				10
Local meetings for annual evaluation project)		15		15		6	36
SUB-TOTAL: COMPONENT #1	**660**	**680**	**630**	**680**	**620**	**142**	**3,497**
COMPONENT #2 – STRENGTHENING OF NATIONAL CAPACITIES TO CONTROL MALARIA							
Workshop for government authorities of health, environment and agriculture (decision making personnel) to promote the new techniques for malaria control without DDT and create awareness on DDT hazards	30						30
Technical Manual with the main guidelines for malaria vector control without DDT to guide the demonstration projects	15						15
A total of 8 training courses (one in each Demonstration Project area) for health and environment personnel	32						32
Regional technical workshop to exchange experience and information on new approaches to malaria control	40						40
Improve laboratory analysis capacity	160		160		160		480
Strengthen reference centers for malaria control	60		60				120
Workshop for lab technicians on laboratory analysis standardization and quality control	30						30
Rapid test validation		30		20			50
Inter-laboratory quality control program and capacity building	50		50				100
Malaria surveillance system and exchange of information on malaria control		15					15
Travel fellowship for technical training		50					50
Implement GIS application and specific GIS	100		50		50		200
Travel and local meetings for technicians to exchange experience on alternative malaria vector control techniques		16		16			32
Publication of the Final Report on strategies for malaria control without DDT (book and CD format)					25	25	50
SUB-TOTAL: COMPONENT #2	**517**	**111**	**320**	**36**	**235**	**25**	**1,244**
COMPONENT #3 – ELIMINATION OF DDT STOCKPILES							
Repack and elimination of stocks (Belize, Costa Rica, El Salvador, Guatemala, Mexico, and Panama	200	200					400
SUB-TOTAL: COMPONENT #3	**200**	**200**					**400**

COMPONENT/ACTIVITIES	Duration of the Project - 36 months						Total
	6	12	18	24	30	36	
COMPONENT #4 – COORDINATION AND MANAGEMENT							
Regional coordination and supervision	76	100	100	100	102	95	573
8 national project coordinators	103	123	123	123	123	65	660
3 Steering Committee meetings	30			30		30	90
3 Regional Technical meetings for planning and evaluation (Operational Committee)		40		40		40	120
3 Regional annual reports with results and geo-referred data		5		5		5	15
SUB-TOTAL COMPONENT #4	**178**	**253**	**203**	**278**	**183**	**190**	**1,458**
SUB-TOTAL: PROJECT COMPONENTS							**6,599**
PROJECT SUPPORT COSTS – PAHO **(8%)**							528
PROJECT PREPARATION COSTS RECOVERY							38
PDF-B PHASE (already disbursed)							330
TOTAL GEF							**7,495**

LIST OF ANNEXES

ANNEX A - INCREMENTAL COSTS ANALYSIS OF THE PROJECT: REGIONAL PROGRAM OF ACTION AND DEMONSTRATION OF SUSTAINABLE ALTERNATIVES TO DDT FOR MALARIA VECTOR CONTROL IN MEXICO AND CENTRAL AMERICA

Background

The overall objective of the project is to support the phase-out of DDT, globally, in a sustainable manner by validating and widely disseminating an array of alternative methods for malaria vector control that do not rely on DDT or other persistent pesticides. The project is to be implemented chiefly through demonstration projects in Mexico and the seven Central American countries - Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua and Panama.

The analysis of the incremental costs attached to this intervention requires a discussion of the baseline and additional costs associated with achieving domestic and global benefits respectively. The regional scope of this project also requires a consideration of the regional benefits achieved through the intervention.

Global and Regional Benefits

The global environmental benefits resulting from this project stem from the reduction of the releases to the environment of DDT and its metabolites. These are recognised global contaminants which have the capacity, once introduced in the environment, to persist for long times, be transported far away from point of origin, and bioaccumulate and elicit toxic chronic effects in biota, including humans. As the participating counties all border the Caribbean Sea, global benefits are also derived from the protection of its biodiversity and coastal resources from contamination from pesticides. Although the direct immediate global environmental benefits to be expected from the project will be relatively modest – resulting from the reduction in pesticide use in the demonstration areas and reduced risks posed by obsolete stockpiles of DDT, the mid to long term benefits will be much greater as the alternative methods validated by the demonstration projects are disseminated and replicated naionally in the particpating countries, and globally. In addition to the benefits to the environemnt, human health benefits accrue globally from improvements in countries' capacity to address malaria, resulting in reduced morbidity and mortality, as well as from reduced exposure of malaria control personnel and populations to DDT and other toxic pesticides.

Regional benefits that will accrue as a result of taking an integrated regional appraoch, in addition to the improvement of the quality of the environment, will stem from the greater emphasis placed on the mitigation of transbounday issues – from the better protection offered to temporary migratory workers to the mitigation of the risks of resurgence of malaria because of temporary weaknesses in the malaria control program of one of the countries.

National (domestic) benefits

The most immediate benefits resulting from this project at the national level will be mostly savings on the health systems resulting from reduced impact of malaria in the areas of demonstration projects. Indirect further benefits will result from the adoption and systematic replication of the best practices and lessons learned during the implementation of the demonstration projects. Greater public awareness about the hazardous effects of DDT compounds on environmental and human health will be an important tool to prevent reintroduction of DDT use in the participating countries. Other benefits will derive from: the incorporation of integrated malaria vector control principles into the existing framework of national health policies; the training of public health officers; the involvement and training of local communities in malaria vector control techniques; the elimination of the existing DDT stockpiles, the improved inter-sectoral collaboration, particularly between the health and environment sectors; and the strengthening of national health surveillance and pesticides monitoring systems.

Baseline Actions

All participating countries are engaged in national and regional actions to control the use of and risks from pesticides. One of such activities is the MASICA program and the PLAGSALUD project led by PAHO in the Central American countries, with support from the Nordic countries. This has already resulted in positive developments such as improvement of the surveillance and control of acute intoxication from pesticides, the revision of pesticide legislation, the establishment of local pesticide committees, and more specifically the improvement of the protection of malaria and other vector control personnel from exposure to pesticides. In particular, the national reports prepared during the PDF-B phase show that every country has been experimenting new and integrated approaches to malaria vector control during the past years. Mexico has been working on developing alternatives to DDT in order to phase-out DDT in a sustainable manner in the context of the North Ameirican Regional Action Plan on DDT. These activities contribute directly to the baseline on which the project relies by providing the set of tools that will be systematically applied, asessed, and validated. In addition, Nicaragua and Honduras have already disposed of their DDT stocks with international help.

For the purpose of this analysis, however, the only baseline costs that are considered in a conservative manner (as shown in Table 1) are the costs incurred directly by the participating countries (as well as PAHO and the CEC) in the implementation of project activities. The bulk of this baseline is represented by the redirection of the budgetary resources of the malaria control programs in the demonstration areas of each country. During the year of 1999, the national Malaria Control Programs of the 8 participating countries (according to governmental information provided to PAHO) spent the following amounts with the population of malaria risk areas, which is the basis for the estimate of a baseline contribution from the participating countries of US$ 2,214,000 to project component No 1 “demonstration projects and dissemination:

Country	**Malaria Program** (US$)	**Number of population in malaria risk area**	**Cost per capita (US$)**
Mexico	15,349,724	50,338,000	0.31
Nicaragua	5,972,907	4,938,000	1.21
Panama	783,700	461,000	1.70
Honduras	388,956	5,667,000	0,07
Guatemala	730,232	5,371,000	0.14
El Salvador	3,307,167	6,154,000	0.54
Costa Rica	2,664,000	1,332,000	2,00
Belize	51,598	220,000	0.23

In addition, PAHO will support the project with an in-kind contribution estimated at US$ 654,000, representing the cost of technical assistance to the participating countries directed specifically to this project. CEC will contribute with US $200,000 for the assessment of DDT contamination in the environment and people in the areas of demonstration project in Mexico. The eight participating countries are committed to implementing this project as stated in the endorsement letters (Annex A1). Five of them have already signed the Stockholm Convention on Persistent Organic Pollutants of May 2001. There is a regional willingness and preparedness to the adoption of techniques of vector malaria control which do not depend on DDT or other persistent pesticides. This project will however enhance the adoption of new vector control techniques by facilitating the transfer and exchange of experience between countries.

Incremental Actions

The GEF intervention is necessary to ensure that activities in the eight participating countries are coordinated and sustained. Indeed, without the GEF intervention, it is likely that countries will lack the capacity and the financial resources necessary to shift from an *ad hoc* testing of alternatives to DDT to their systematic application. Moreover, shifting the emphasis from the national/regional to the global level, the project will demonstrate that viable alternatives can be implemented that are safe, efficient, and cost-effective. Indeed, the bulk of the GEF financing is directed to project component No 1 "Demonstration projects and dissemination". The project will add significantly to the baseline of national and regional activities by providing the participating countries the means to systematically and strategically validate alternative measures to control malaria vector, and assess, document, and widely disseminate the results.

ANNEX B - LOGICAL FRAMEWORK MATRIX

Project Purpose: To contribute to protecting human health and the environment in Mexico and Central America by promoting new approaches to malaria control, as part of an integrated and coordinated regional program.			
Overall Objective	**Objectively Verifiable Indicators**	**Means of Verification (Monitoring focus)**	**Critical Assumptions and Risks**
To prevent the reintroduction of DDT for malaria control in Mexico and Central America by demonstrating and disseminating techniques of vector control without DDT or other persistent pesticides, that are replicable, cost effective and sustainable.	Malaria vector control programs in each of the eight participating countries adopt techniques of vector control that do not rely on DDT or other persistent pesticides.	Regional Information Network with data on Malaria and DDT residues implemented and functioning. National health programs in Mexico and Central America are able to lower malaria rates by adopting new approaches for malaria vector control that do not rely on DDT. Raised public awareness on DDT hazards in environment, food chain and population prevents reintroduction of DDT for malaria control.	That the Governments of the participating countries will scale-up the methodologies used in the project and will apply them in the rest of the country, if proven successful. This seems likely in view of the strong support that this project has been receiving in the region.
Outcomes	**Objectively Verifiable Indicators**	**Means of Verification (Monitoring focus)**	**Critical Assumptions and Risks**
Global level: New, affordable, cost effective and sustainable models for malaria vector control without DDT are tested in different ecosystems and geographic locations and can be replicated in other parts of the world.	Nine replicable documented demonstration projects test a set of procedures for malaria vector control without the use of DDT or other persistent pesticides, under well identified environmental and social-economic conditions, during a 3-year period.	Reports from each demonstration project result in a Case Study of procedures of malaria vector control without DDT tested for specific vectors, under different ecological and social-economical conditions. Technical manual of new techniques for malaria vector control.	That national governments and local authorities will accept the arguments put forward. The impetus created by the POPs Convention should ensure that other governments will be willing to adopt the process and design of DDT-free malaria vector control is likely.
Regional level: Strengthened institutional capacities to control malaria with methods that do not rely on DDT.	Regional network for sustained capacity building (laboratories, vector control technology, etc); and communication and information exchange among the participating countries (GIS, Web page, publications, etc).	Information on new techniques for malaria control and databases related to the demonstration projects are available through regional network. Reference centers strengthened, laboratories validated and connected to network.	National governments are willing to exchange information, lessons learned, and results of their experiences of malaria control without DDT. Collaborative efforts initiated during the PDF-B augur well for this.
National level: National institutions establish links between health, environment, and other sectors to ensure a sustainable and integrated approach to malaria vector control that relies on epidemiological surveillance systems, epidemic forecasting, detection of insecticide	Malaria control programs in each of the participating countries shift away from reliance on DDT and consider alternative methods.	National Health Programs incorporate new methods of malaria control.	That the Governments of the participating countries are willing to adopt techniques for malaria control without DDT or other persistent pesticide. This is likely if demonstration is made of the availability of cost-effective alternatives.

resistance, judicious use of chemicals and application of effective alternative control methods without DDT.			
Local level: communities involved in demonstration projects are aware of new participatory and integrated techniques for malaria vector control and are aware of the hazards of exposure to DDT.	Workshops held in each demonstration project site with the participation of community leaders and local NGOs.	Report of workshops. Community participation section in methodology manual. Description of process and outcome of community participation in Demonstration Projects Case Studies and in final report.	Local communities are receptive and are willing to collaborate and participate in the activities of each demonstration project. Experience shows this can be the case provided local communities are an integral part of project planing and preparation.
Results	**Objectively Verifiable Indicators**	**Means of Verification (Monitoring focus)**	**Critical Assumptions and Risks**
1. Dissemination of information related to new techniques for malaria vector control.	Region-wide information network on DDT and new techniques of malaria vector control (Web page, Intranet and GIS).	Project's Web Page and Intranet functioning. Geographical Information System (GIS) accessible, containing digitized maps, malaria database for each participating country, geographical and environmental data relevant to malaria vector control. Electronic platform containing reports, documents, maps and database related to malaria control and exposure to DDT.	That the existing malaria reference centers in Mexico, Guatemala, Nicaragua, Panama, and Costa Rica are willing to integrate the regional Malaria Reference Center Network.
2. Strengthened regional institutional capacity to assess environmental and human exposure to DDT compounds and newly introduced pesticides	Strengthened national laboratory analysis capacity for chemical assessment and monitoring. Protocols to produce comparable data.	Results from inter-laboratory comparison exercises. Governments and local communities are aware of environmental and human contamination due to past exposure to DDT.	That trained personnel can be retained to perform technical tasks.
3. Final disposal of DDT stockpiles.	The existing 135 tons of DDT stockpiles already identified in the region are disposed on a cost-effective basis.	Report from disposal operations.	That public opinion in receiving countries is such that no country can accept DDT waste. This seems unlikely to happen in all potential receiving countries in the immediate future.
Components/Activities	**Objectively Verifiable Indicators**	**Means of Verification (Monitoring focus)**	**Critical Assumptions and Risks**
Component 1: ***Demonstration Projects and Dissemination.***	- Demonstration projects of malaria control in each country. - Costs and feasibility of the new methods for malaria control evaluated in different countries and ecosystems. - Assessment of environment, biota and human exposure to DDT and other pesticides used for vector control. - Regional workshop on new approaches to malaria control.	- Reports showing the results of each demonstration project in terms of technical and economical feasibility, environmental soundness and community participation. - Information on new approaches to malaria vector control and DDT compounds hazards to environment and human health available by the electronic platform and printed reports. - Web page with results of demonstration projects, national reports, technical studies, information on participating institutions.	That the Demonstration Projects are well managed and the new techniques can be demonstrated to be environmentally sound, technically efficient, and cost effective. This risk is mitigated by the fact that the participating countries can already rely on a body of experience and expertise, and by the active involvement of PAHO's experts in

	- Local meetings to facilitate community participation and training. - Implementation of Web and Intranet pages, and GIS. - 3 annual evaluation meetings. - Communication plan to promote public awareness on DDT hazards including printed educational materials and educational Campaign.	- GIS with geo-referred data on malaria control, DDT and insecticide use, malaria cases and population at risk; vector distribution, control interventions; environmental and ecological factors, health system coverage. - Reports from workshops and meetings. - Distribution of educational material.	the execution of the project.
Component 2: ***Strengthening of regional institutional capacities to control malaria without DDT.***	- Technical manual on methodologies to be used in demonstration projects. - Final technical report on new strategies for malaria vector control - 8 national workshops and training courses for malaria and environment personnel on malaria vector entomology and ecology, integrated malaria vector control methods, field operations and community participation techniques. - Technical training and travel fellowships for technical personnel. - Strengthening of national reference centers for malaria control with personnel capacitated in risk assessment, community education and participation regarding to malaria control without DDT or other persistent pesticide. - Strengthening of laboratory analysis capacity.	- Publication and distribution of manuals. - Publication and wide dissemination of report. - Reports of meetings and workshops. - Number of training and fellowships awarded. - System for monitoring and evaluating human and environmental exposure is implemented in the demonstration projects. - Annual reports of national reference centres. - Inter-laboratory quality control program for standardization of assessment procedures is put in place.	That the Governments of the participating countries have the will to support and encourage institutional strengthening in this field. This seems likely to be realised in light of the strong support and enthusiasm generated during the PDF-B phase.
Component 3: ***Elimination of DDT stockpiles*****.**	- Materials stored in leaking or inadequate containers are repacked in United Nations approved containers. - Shipment for final disposal of all 135 tons of DDT already identified.	- Government warehouses are cleaned and all remaining materials are packed and stored in a safe manner. - Elimination of obsolete stockpiles scheduled and/or implemented.	That the stockpile elimination operations do not uncover great amount of yet unsuspected stockpiles.
Component 4: ***Coordination and Management.***	- 1 Project Coordinator. - 8 national technical coordinators to conduct the demonstration project activities. - 3 Steering Committee meetings - 3 regional technical meetings. - 3 annual reports of the demonstration projects.	- Issuance of contracts. - Reports from meetings.	That hiring of regional project coordinator and of national technical coordinators can proceed expeditiously.

ANNEX C: STAP ROSTER TECHNICAL REVIEW

The phasing out of DDT in favor of alternative methods more benign to the environment and maintaining and improving human health in all aspects, remains a difficult, but necessary and worthwhile endeavor. For this to be successfully implemented in a region as vast and populated as Mexico and Central America, requires an approach of great scope and ambition. To combine the various malaria control activities of eight different countries will require a number of steps to accomplish. This proposed project will build on the past and present efforts of PAHO and other organizations in this regard, and could very well serve as a catalyst for further expansion and implementation of alternative malaria control methods, here and elsewhere.

The scope of this project is vast, but so is the disease. The gains that have been achieved with traditional malaria control practices are great, and these gains should not be compromised with short-sighted, short-term or unsustainable practices, that could introduce risks at levels other that those that are currently in effect. On the other hand, the known and insidious effects of DDT on humans and the biota are also not acceptable. To move away from DDT needs attention on an integrated and sustainable strategy to combat the disease on all fronts available for intervention. This project aims to achieve this for a large area, where smaller or disjunct efforts will, of necessity and design, have less impact. This project then very sensibly builds upon, and will strengthen local experience.

The results of an eventual successful adoption and implementation of cost effective and acceptable alternatives to DDT will not only be felt in the stated objectives alone, but will also support economic development of the region, as the burden of disease will be reduced. There is therefore a great responsibility upon the managers and all participants in this project to continue collaboration and communication through difficult times that undoubtedly will be experienced during this project. I therefore, have no hesitation to support this project design in all four of its components. There are however a number of areas where more attention can be given to, and these will be outlined below. In some cases these concerns might have been taken care of implicitly in the design process (logframe) or intention, and, if so addressed and understood, will therefore be moot. It is my opinion however, that the urgency of this project is such that improvements to the design can be made by the different levels of planning, management and supervision involved, without delaying the inception of this project.

TERMS OF REFERENCE

KEY ISSUES

1. Scientific and technical soundness of the project

Judged from the broad basis of the presentation of the project (Annex A), as well as the good detailed objective strategies of the demonstration projects provided (Annex F), it is clear that this is the product of wide participation in preparation of this brief and outline.

- Although the role of agriculture is mentioned, the root cause analysis has one obvious short-coming. This is the potential of the concomitant use of pesticides, also intended for malaria

control (most likely pyrethroids, but also others), to compromise sustainable use of such pesticides for malaria control, by contributing towards pesticide resistance. Although this was a root cause identified for the unstable use of DDT (i.e. the likelihood or resistance developing in mosquitoes to DDT), this is also valid for other pesticides. Agricultural use of alternatives was the cause of the multiple resistance development that led to the forced re-introduction of DDT in South Africa.

Resistance development was not as such identified as a possible cause for the re-introduction of DDT, due to the vectors becoming resistant to the alternatives. This concern should be incorporated into the objectives of the demonstration projects. This is especially the case for the demonstration projects in Honduras and Panama, where high agricultural use of pesticides is obvious from cotton and banana plantations near by. An effort should be made to incorporate the assessment of the agricultural use of pesticides close to the demonstration projects.

- In addition, activity 2.1.3 (Annex E) should also include the training to determine resistance in mosquitoes, as a basic assessment tool to determine and protect the sustainability of alternatives.

- Overall, and both on a national and regional level, the management of resistance should receive attention so that the methods that show promise in the demonstration projects, can be implemented on a larger scale, during the follow-up of this project. Information gathering relevant to a possible regional policy on resistance management, should therefore be part of the objectives of this project. This could be included as one of the outcomes on the regional level.

- An additional capacity that would be very useful to acquire (or incorporated if available), is that of "Risk Assessment". The introduction of alternatives does have risks that are not negligible. The risk assessment process, that depend on data and information form the demonstration projects, will be a valuable addition to Component 3 of the logframe (Annex B) and "Expected Results" 1.5 (Annex E). The logical consequence of risk assessment is risk management, an aspect that should be taken note of at this stage, but will likely play a much bigger role in large-scale implementation of alternative measures, following this project.

- It is probably implicit in the objectives of the data gathering that these will be collected on a comparable basis across all the demonstration projects. As it is likely that, as there are already such activities in each country, that there will be differences between them. Care should be taken to ensure comparability for further evaluation and possible risk assessment. Development of explicitly stated indicators of success (including aspects such as social acceptability of alternative measures) could be another benefit, if comparability of data gathering is achieved.

- Since a large portion of this work concerns social aspects, the relationship and attitudes of the people regarding malaria control will be crucial. It is therefore incumbent upon the project team members to concentrate on this aspect, as acceptability of alternative measures, which may include alteration of habits and activity patterns, be handled with care and sensitivity. The ethical component of some of the activities are important as well (e.g. monitoring of levels of pesticides in people, the administration of questionnaires, etc). To obtain formal ethical approval on appropriate levels does take time (and is therefore urgent) and this must be incorporated in the planning. I suggest that the obtaining of ethical approval be stated explicitly as one of the

activities under 4.2.1 (Annex F), so that it can be included under workplans. The basis for ethical approval will largely be common for all demonstration projects, and economy of effort will be obtained on this level.

- Depending on the development of the project, changes in the activity patterns and habits of people, may in itself have economic and or social advantages or disadvantages. These should be documented where possible, as it will have a bearing on the analysis of the cost effectiveness of these methods.

- Since one of the criteria mentioned at the outset of this project refers to cost effectiveness, the basis and assumptions for this is not explained. From activity 1.1.1 I assume that this is covered by the budget stated, but care must be taken that enough money will be available at the suitable stage of the project, to conduct this exercise. Since DDT is relatively cheap, cost effectiveness in this regard will have to include reference to difficult quantifiable measures of environmental health, the pollution of international waters, and others.

- The sites for the demonstration projects seem to be well chosen, judged from the information required.

- It is also probably implicit in the intent of this project, that the information needs of the implementers of malaria control measures be served by the GIS system that is to be developed. The experience gained from the various demonstration project (that are located in different geographic areas), can be used to predict areas where alternatives measures can be implemented (or not), provided the information needs for this is taken care of during the design and improvement of the GIS system.

- The time frame is quite short. Care should therefore be taken that the effect of seasonality does not result in the loss of one season, as the start-up phase of the project (when the demonstration projects are not yet active) might conceivably coincide with a transmission season.

- The South African experience has shown two things.

1) The implementation of alternative methods, when tested on a small scale, showed good promise. There were however, factors present on the larger scale, that were not apparent during the initial development and testing, which had serious consequences. It will not always be possible to foresee these factors or considerations, and implementation on a large scale will therefore need to take account of this during the planning. Deliberations on possible large scale considerations should already start during the final phase of this project, as the experience and insight from the people at the demonstration projects will be invaluable and should not be lost.

2) To manage the risk of possible failure of implementing alternatives, as well as to bolster the malaria control capabilities of the countries, the final phase of this project should deliberate on back-up mechanisms if necessary. From my own experience the malaria control officials on the ground are extremely protective of the people they protect. A fall-back strategy will be very useful to obtain their cooperation, as well as those from any other structures involved.

2. Global benefit / drawbacks

Although the direct benefits of this three year project will only have local benefits (these are demonstration projects), the results of this project will give a much better basis from which to determine the global benefit. This restriction is inherent in the intent and scope of this project. Defining the potential benefit that can be obtained by this project is therefore operative at this stage.

3. GEF context and goals

Within the GEF, the OP10 is the current and valid structure, as well as the draft POPs OP. Eventually the POPs OP will probably be the more applicable one. Care should however be taken by GEF that the continuity of the funding and support of the project scope and intent will not be negatively affected by any technical or administrative difficulties that might be experienced by such a changeover. Any positive support to this project emanating from the activation of the POPs OP should however, be encouraged where possible.

Otherwise the GEF context is clear. There seem to be little large scale risk, considering the scope of the project, but proposed habitat alterations or introductions of biological control mechanisms (such as mosquito-eating fish), especially if these could impact on natural areas (biodiversity) and processes, may pose a risk. These impacts should be included in a risk assessment. The impact of effective alternative measures (that are as yet not known) on the environment might be significant, if implemented on a larger scale. An Environmental Impact Assessment and a sustainability assessment might therefore be required at a later stage.

4. Regional context

This project is clearly regional, including all the countries.

5. Replicability of project in other areas

The results from this project will be replicable in other areas, but more likely on a project development or process basis, than in the details. Environmental, social, vector and parasite conditions vary across the world, but much can be learned from this project, on how to find solutions, and how to avoid the pitfalls.

6. Sustainability of the project

The sustainability of this project, given the level of funding and short time period, does not seem to be a problem. The implementation of the findings on a larger scale will be subject to the usual economic and social considerations, given the high level of importance of malaria, to both the region and its people. The advantage of this project design is that local knowledge will be incorporated. This aspect should not be neglected through the participatory approach inherent in the design. Failure to obtain the cooperation of the population is an obvious and stated risk (Annex B - local level).

SECONDARY ISSUES

1. Linkages to other focal areas

There might be linkages to biodiversity, as risks to biota in this species rich region will likely be present (either positive or negative) by implementation of alternative measures.

2. Linkages to other programs

These are stated in the documents provided. The Stockholm Convention would be another linkage, when it becomes effective. The Basel Convention would be an additional linkage for the disposal of DDT.

The South African Malaria Control Program has had great success in the development and implementation of a GIS in its combat of malaria over large areas. Contact with this group could be considered to aid in the development of the GIS system for this project.

3. Other beneficial or damaging environmental effects

The reduction of the release of DDT to the environment will be an obvious immediate benefit. The risks associated with alternative measures, such as other pesticides or habitat alteration needs to be taken into account. Alterations to water bodies might for instance increase the risk of flooding, or affect the water table. This is the reason to incorporate elements of both risk assessment and risk management in this project at some stage.

4. Degree of involvement of stakeholders

There is a high degree of involvement of stakeholders. This in itself creates of course its own complexity that needs good communications, as well as effective project management to maintain and derive the potential benefits. The major drawback of such a complex system of collaborative involvement will be unexpected delays.

The agricultural community should play a major role in this project.

5. Capacity-building

There are good and strong elements of capacity building in this project. If the other capacities mentioned above could also be included, it will further strengthen the project.

6. Innovativeness of the project

This project will build on the innovativeness of previous efforts as such. The project is also innovative in its scope and intent which spans eight countries.

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ANNEX C1 – IMPLEMENTING AGENCY RESPONSE TO STAP/COUNCIL/ IMPLEMENTING AGENCIES COMMENTS

Response to STAP Roster Review

The STAP Roster Expert's comments are very supportive of this project in terms of its scope, objectives and design. Prof. Bouwman makes a number of valid suggestions and recommendations which, as he points out, do not necessarily imply changes in project design but will improve the chances of success of this project, if followed.

UNEP and PAHO agree with the comments of the reviewer and offer the following response to some of the issues raised.

a) Root cause analysis: The potential development of malaria vectors resistance to pyrethroids or other pesticides used in agriculture is a risk that has to be monitored. This concern will be incorporated into the objectives of the demonstration projects. The growing problem of vector's resistance will require further investigations and investments towards resistance management procedures, preferably in coordination with agricultural programs promoting integrated pest management. Discussions are underway with DANIDA for further cooperation and funding.

DANIDA/PAHO's PLAGSALUD project will provide the needed information on the agricultural use of pesticides in the demonstration project areas and their surroundings. The linkages between these two projects will facilitate the exchange of information related to types and quantities of pesticides used in the area. The need for assessment and identification of mosquito resistance to any of the newly introduced pesticides was discussed by the representatives of the participating countries during a meeting held in Mexico in the framework of the PDF-B, September 11-12 2001. We concur that the suggested "training to determine resistance in mosquitoes" should explicitly be included in the training workshops which will be conducted for the malaria control personnel involved in the project (item 2.1.3 Annex E). We further concur that "gathering relevant information for a possible regional policy on resistance management" will be one important outcome at the regional level.

b) Risk Assessment: We agree on the importance of risk assessment related to the introduction of alternatives for malaria control. This is explicitly considered in item 1.5 (Annex E) "Risk assessment of environmental and health effects of DDT, newly introduced pesticides, or other alternatives, in the areas and populations of demonstration projects".

c) Comparability of data: It is implicit in Annex E, items 1.4.1, 1.5.1, 1.5.2, that the data will be collected on a comparable basis across all the demonstration projects for further evaluation and possible risk assessment of the alternative techniques of malaria control.

d) Social aspects: We concur with the importance of social and ethical aspects related to the introduction of alternative measures which may require alteration of habits and activity patterns. An important asset for this project is the fact that DANIDA/PAHO's

PLAGSALUD program has been building community participation and public awareness on pesticides in Central America and Mexico since 1994. Most of the activities concerning social aspects will be developed in close collaboration with PLAGSALUD.

e) **Cost effectiveness**: Besides the assessment of environmental impacts and approval by the local communities, cost effectiveness is one fundamental aspect that will have to be evaluated as the project aims to develop replicable models of malaria control. UNEP and PAHO are aware of the complexity involved in this cost effectiveness due to the difficulty to quantify parameters related to effects of past use of DDT on environmental health, pollution of waters resources and others. On the positive side, the project will benefit from, and build upon, previous evaluation work, including work carried out in the participating countries.

f) **Sustainability of the project**: Special importance will be given to the incorporation of local knowledge and the participation of local community in all activities of the demonstration projects. Access to information and public participation at all stages of the demonstration projects, from workplan design to final evaluation, is the main strategy for the sustainability of this project.

Response to Implementing Agencies Comments

Comments were received from the World Bank. These comments are supportive, and only lament the lack of inclusion of some Caribbean Island States that could benefit from such a program. In view of the difficulty of the task proposed, however, an approach which initially focuses on a limited number of countries with experience of sub-regional collaboration on this particular issue is preferred.

ANNEX D – OUTLINE OF THE ROOT CAUSES OF THE CONTAMINATION OF THE ENVIRONMENT BY DDT IN MEXICO AND CENTRAL AMERICA

Major Problems	Transboundary Elements	Main Root Causes	Types of Action
Contamination of global ecosystems by DDT metabolites	• Transport of DDT and metabolites by transboundary waters through the water cycle • Transport of DDT and metabolites through air • DDT resistance to degradation • Negative impacts on biodiversity	• **Toxic properties of DDT as a persistent organic pollutant** • Large amounts of DDT have been used during the last 5 decades in malaria prone areas • Accumulation of DDT metabolites in terrestrial and aquatic ecosystems • DDT stocks in leaking containers	• T • A
Unsustainable use of DDT for malaria vector control at global level	• Provisions of the POPs Convention that has included DDT among the 12 first compounds candidates for international action • Increased global awareness of DDT related problems	• Malaria vector resistance • Adverse effects caused by DDT in all stages of its life cycle	• T • A
Possibility of reintroducing the use of DDT for malaria control in countries where it has been phased-out	• Illegal use of DDT specially in areas of transboundary migrant farm workers • Lack of awareness about adverse effects of DDT among indigenous and migrant population	• DDT traditionally known as a cheap and effective tool for controlling malaria vectors • Lack of safe, effective and affordable alternatives for malaria vector control • Existing DDT stockpiles in most countries (135 tons as known at present) • Availability of DDT at international level • Lack of awareness about the negative effects of DDT on human health and environment	• T • A
Low institutional and community awareness about effects on human health and environment due to exposure to DDT	• Growing international concerns resulting from local exposure to DDT during malaria control campaigns, in particular impacts upon women and, through them, upon future generations	• Lack of general environmental awareness • Lack of data and information on effects of DDT exposure to environment and human health	• T • A

Deficient national systems for monitoring environment and health	• Inadequate implementation of existing regional and national legislation on persistent pollutants	• Lack of interaction between health and environment sectors at institutional level • Lack of national capacity for monitoring effects of DDT on environment and human health • Low technical capacity of laboratories in Central American countries for monitoring DDT residues in environment and population previously exposed in malaria control campaigns	• T • A
Worsened human related conditions (lower quality of life, poverty, socio-economic decline) as a consequence of uncontrolled malaria disease and/or contamination with DDT metabolites	• Decreased quality of life due to contamination of water, soil and food chain • Difficulty in controlling farm workers migration • Particular risk upon indigenous communities due to the biomagnification of DDT and contamination of their traditional foods • Increase of malaria disease if not controlled efficiently	• Inadequate institutional capacity at national and local level • Insufficient coordinated inter-sectoral actions • Inadequate financial mechanisms and support • Lack of community involvement in actions related to malaria vector control	• T • A

Types of Action	
Technology Transfer (T)	• Demonstration of environmentally sound and cost effective alternative methods for malaria control without DDT • Training courses, workshops, publications, travel fellowships to increase regional and national knowledge of problems related to DDT use • Qualification and international standardization of national laboratories and reference centers for malaria control • Agreement on standard methodologies for monitoring contamination of environment • Repackage and disposal of obsolete DDT stockpiles
Awareness Raising (A**)**	• Involvement of local communities in the activities of the demonstration projects • Involvement of private sector and NGOs in the project • Monitoring environment and health in the areas of demonstration projects • Worldwide dissemination of the results of demonstration projects • Electronic platform to facilitate the exchange and dissemination of information on malaria risk assessment and malaria vector control techniques without DDT • Training courses and workshops about the relation between malaria, environment and potential hazards of DDT

ANNEX E – DETAILED DESCRIPTION OF PROJECT ACTIVITIES AND COSTS TO THE GEF

Project Component and objective	Expected Results	Activities	Products	Costs (total for 3 years in US$)
Component # 1: Demonstration Projects and Dissemination **Objective:** implement, evaluate and disseminate the alternative strategies of malaria vector control without DDT	1.1.Documented demonstration projects of alternative malaria vector control without DDT or other persistent pesticides, in selected sites, using alternative techniques of malaria vector control.	1.1.1. Implement, monitor and evaluate 9 malaria control demonstration projects (2 in Mexico and 1 in each of the 7 Central American countries), in areas of different ecological characteristics, public health and/or social-economic conditions. Document each experience and evaluate the cost effectiveness of the different methods.	9 demonstration projects implemented and evaluated	**$ 3,185,000**
	1.2. Community participation and educational strategies to build public awareness on new strategies for malaria vector control and the negative effects of DDT use.	1.2.1. Organize and implement local meetings and workshops in each of the demonstration projects with participation of local health and environment professionals to emphasize and support local community participation in the process of alternative malaria vector control strategies, and to strengthen the activities of local health services.	Local meetings with community participation and training on techniques for malaria vector control in each of the demonstration projects.	**$ 40,000**
	1.3.Strengthened regional institutional capacity to disseminate information related to malaria control methods that do not rely on DDT or other persistent pesticides.	1.3.1. Develop a communication plan with participation of NGOs, and educational, environmental, and health national sectors, to support the evaluation of DDT and newly introduced pesticide effects on human health and environment , as well as to create awareness on DDT and integrated methods of malaria control of populations in risk areas.	Communication plan to promote public awareness on DDT and educational campaign on new approaches of malaria control.	**$ 56,000**
	1.4. A region-wide information system on DDT and malaria control as a tool for gathering and disseminating data adequate to the needs of government in the decision-making process.	1.4.1. Implement the web and intranet page designed during the PDF phase to facilitate the exchange of information and experiences among the participating countries, including collecting and validating existing regional information related to the project (documents, national reports, technical studies, participating institutions, regional reports); as well as the results of demonstration projects and analysis of DDT exposure.	Information available through the Internet. Results and lessons learned from demonstration project are shared among participating countries and other parts of the world	**$ 50,000**
	1.5. Risk assessment of environmental and health effects of DDT, newly introduced pesticides, or other alternatives, in the areas and populations of demonstration project.	1.5.1. Assessment of environmental and human exposure to DDT and newly introduced pesticides in the areas of demonstration projects.	Results of assessment of environmental and human exposure to DDT and other pesticides used for malaria control are available.	**$ 120,000**
		15.2. Identify and map areas previously sprayed with DDT which are under risk of contamination by DDT compounds and have this information available in digitized format	Priority areas for risk evaluation are identified and mapped	**$ 10,000**

	1.6. Demonstration projects are evaluated with community participation, results are available in CD and printed format, and disseminated through the electronic platform and Web Page.	1.6.1. Support and facilitate community participation in demonstration projects, and disseminate the alternative techniques for malaria control without DDT. Organize 3 annual local meetings in each demonstration project area with the participation of community, local NGOs, local health services, environment and agriculture technicians to plan and evaluate the implemented activities.	Annual reports of each demonstration project and organization of the information to be presented at the regional meeting	**$ 36,000**
		Subtotal for project component #1		**$ 3,497,000**
Project Component and objective	**Expected results**	**Activities**	**Products**	**Costs (US$)**
Component # 2: ***Strengthening of national institutional capacities to control malaria*** **Objective:** Strengthen national and local institutional capacities to control malaria with methods that do not rely on DDT or other environmentally persistent pesticides.	2.1. Strengthened national institutional capacities for malaria risk assessment, and malaria control without DDT.	2.1.1. Organize and provide support for a workshop in Mexico (Oaxaca) for national government authorities (decision making personnel) of health, environment, and agriculture ministries on the alternative strategies that will be applied in the demonstration projects, the assessment of DDT effects on human health and environment, and discussion of strategies for disposing the existing stockpiles of persistent pesticides and avoiding the formation of new ones.	A two-day regional workshop for 4 representatives of each country (health, environment, and agriculture personnel).	**$ 30,000**
		2.1.2 Develop and print a technical manual for training malaria control personnel, and providing technical assistance on alternative strategies for malaria vector control to be used under different ecological conditions	Technical manual of basic procedures for integrated malaria vector control without DDT	**$ 15,000**
		2.1.3. Organize and implement eight training courses for health and environment personnel who will be involved in each of the demonstration projects on basic malaria epidemiology, malaria entomology (including determination of resistance in vectors), integrated malaria vector control methods, field operations, and community participation techniques, taking into consideration the different vectors, the endemic levels, and different environmental and social-economic conditions in each country.	8 national training courses for qualified technicians from each country on Alternative Strategies for Malaria Vector Control and Field Operations	**$ 32,000**
		2.1.4. Organize, provide supporting material, and implement a regional workshop for malaria control personnel, and representatives of environment and agriculture ministries of the eight participating countries to exchange experience and information on new approaches to malaria vector control, DDT residues assessment and alternatives for stockpile disposal	Regional technical workshop to exchange experience and information on new approaches to malaria vector control.	**$ 40,000**
		2.1.5. Strengthen reference centers for malaria control in the participating countries, such as Mexico's Centro de Investigaciones en Paludismo (CIP) and facilitate the regional exchange of information on malaria among laboratories and existing reference centers in the eight participating countries through the region-wide information network established by the project (described in item 1.2)	Reference centers for malaria control are qualified, maintain recognized international standards and carry out information exchange	**$ 120,000**
		2.1.6. Establish a malaria surveillance system and exchange of information on malaria control at regional level	Malaria control programs of participating countries are integrated and sharing best experiences and lessons learned	**$ 15,000**
		2.1.7. Short-term travel and local meetings for malaria control technicians to exchange experience on alternative integrated malaria vector control techniques	Malaria technicians prepared to use alternative integrated vector control techniques	**$ 32,000**

	2.2. Strengthened analytical laboratory infrastructure and technical capacity regarding pesticide analysis, and assessment of environmental and human contamination	2. 2.1. Improve laboratory analysis capacity for chemical assessment in Mexico (Universidad Autónoma de San Luis Potosí and CINVESTAV-Merida), Guatemala (Laboratorio Unificado de Control de Alimentos y Medicamentos – LUCAM), Nicaragua (CIRA-UNAM), Panama (Instituto Gorgas), Costa Rica (MAG) , El Salvador (Ministerio de Agricultura y Ganaderia), and Central Laboratory of Belize, as well as the exchange of information among them and other institutions	Equipped laboratories with technical capacity for chemical assessment of environmental contamination under international standards.	**$ 480,000**
		2.2.2. Organize, provide support materials and implement a regional workshop for 2 laboratory technicians from each participating countries to establish mechanisms for standardization of assessment techniques, laboratory equipment, sampling techniques, georeferrenced data, interpretation of results, data base for GIS application	Workshop for 2 laboratory technicians of each participating country on laboratory analysis standardization.	**$ 30,000**
		2.2.3. Support the development of rapid inexpensive and easy to use assays for pesticides screening in human samples (based on ELISA or DELFIA methods) with collaboration of the Center on Environmental and Occupational Health Impact Assessment and Surveillance (Quebec, Canada).	Rapid test validated	**$ 50,000**
		2.2.4. Implement an inter-laboratory control program and capacity building on DDT compounds and other pesticides analyses in the participating countries to ensure that analytic results will be comparable across the participating countries and at international level through the participation and support of internationally recognized institutions of excellence.	Training courses, manual for assessment of exposure to DDT and other newly introduced pesticides is implemented and available, travel fellowships for pesticide analists	**$ 100,000**
		2.2.5. Travel fellowships for qualified personnel for laboratory training for 8 technicians from Central American countries.	Technicians with capacity to work under international standards.	**$ 50,000**
	2.3. GIS application providing data on DDT residues and new methods of malaria vector control in Mexico and Central America	2.3.1. GIS system to gather, organize and analyze the geographical and statistical components of malaria control and exposure to DDT and alternative pesticides used in the sub-region and in each demonstration project including standardized data on effects of exposure to DDT in Mexico and Central America, geo-referenced data on malaria control in the demonstration projects, spatial distribution of malaria vectors and populations at risk; distribution of control interventions; health system coverage, etc	A GIS application with maps, geographic and statistical data related to malaria control, DDT and alternative pesticides used in the sub-region and information on the demonstration projects.	**$ 200,000**
		2.3.2. Organize, prepare and print a substantive Final Report (CD and book format) to disseminate information on the results of the demonstration projects, information and maps of malaria risk areas, strategies for malaria control in different ecosystems without use of DDT, and analysis of effects of DDT and alternative pesticide exposure on human health and environment at the sub-regional level.	Printed final report showing results of different strategies for malaria control without DDT under different ecosystems and social-economical conditions, illustrations in color, maps and information on malaria risk areas, data on effects of DDT exposure on human health and environment	**$ 50,000**
		Sub-total for project component #2		**$ 1,244,000**

Project component and objective	Expected Results	Activities	Products	Costs (US$)
Component # 3: Elimination of DDT stockpiles **Objective:** To eliminate the existing DDT stockpiles identified during PDF-B phase, repackage materials as required, and arrange for elimination of DDT on a cost effective basis.	3. Existing DDT stocks disposed of	3. 1. Disposal of 135 tons of DDT identified during PDF-B phase: Belize 13; Costa Rica 9; El Salvador 6; Guatemala 15; Mexico 87; Panama 5.	Existing DDT stockpiles repacked and disposed	**$ 400,000**
		Sub-total for project component #3		**$ 400,000**
Project Component and objective	**Expected Results**	**Activities**	**Products**	**Costs (US$)**
Component # 4: Coordination and Project Administration **Objective :** Regional coordination of the project and related activities, and management of the project implementation	4.1. All project activities in the sub-region are coordinated and supervised; common objectives expressed by the countries are achieved	4.1.1. Hire and support a regional coordinator for the project during the period of 32 months.	Project activities are developed in a coordinated way and within the approved timetable	**$ 573,000**
		4.1.2. Hire and support a national coordinator in each participating country.	Activities developed by the project are coordinated, documented, evaluated and made available by Web and printed material.	**$ 660,000**
		4.1.3. Organize and implement 3 steering committee meetings.	Report of steering committee meetings	**$ 90,000**
	4.2. Operational Committee annual meetings for planning and evaluation of activities and approval of 3 annual reports .	4.2.1. Organize and implement 3 regional meetings (Operational Committee) with the participation of government representatives on national health and environment, NGOs and community representatives to prepare workplan and discuss the results achieved with the project in each participating country	Workplans and annual reports prepared and approved by the Operational Committee	**$ 120,000**
		4.2.2. Print 3 regional annual reports and prepare data for the electronic platform (Web page and GIS) on the demonstrative projects and all project activities.	Results, geo-referred data, and digitized maps are organized and available through the electronic platform, CD format and printed report	**$ 15,000**
	4.3. Public awareness and community participation	4.3.3. Make available printed information and promote community meetings and workshops as part of each country's Communication Plan	Printed educational material and support for local meetings.	**Plagsalud**

		4.4.1. Support public awareness campaigns and events related to malaria control in schools located in malaria risk areas	Events related to schools located in malaria risk areas	**Plagsalud**
		4.4.2. Support strategies to create a communication network among communities in malaria risk areas.	Educational events, publication of leaflets, community meetings.	**Plagsalud**
		Sub-total for project component #4		**$ 1,458,000**
SUB-TOTAL (project Costs)				**$ 6,599,000**
Project Support Costs – PAHO (8%)				$ 528,000
Project preparation costs recovering				$ 38,000
PDF-B (already disbursed)				$ 330,000
TOTAL				**$ 7,495,000**

ANNEX F - DEMONSTRATION PROJECTS: OBJECTIVES STRATEGIES AND ACTIVITIES

1. Overall objective:

Develop a series of cost effective models for malaria vector control without the use of persistent pesticides which are applicable in different ecosystems and geographic locations with a participatory and integrated methodology, sensitive to the environment and the needs of different social groups, in common agreement with local governments and communities.

2. Specific objectives:

a) Promote the concept of disease prevention and the relation between environment and human health at the level of local communities ensuring that the activities to prevent and control malaria will improve local living conditions.
b) Identify the correlation between different malaria vectors and environmental factors as temperature, altitude, vegetation, land use, superficial water distribution, time of the day, etc.
c) Identify and implement adequate environmental interventions with community participation as removing green algae, moss and mud in water bodies to prevent mosquito breeding.
d) Monitor and register all activities implemented in each demonstration project in order to establish environmentally sound models which are replicable under similar environmental conditions.
e) Reduce the API (Annual Parasite Index = Number of malaria cases per 1000 population) of malaria fever among the stable population in each demonstration project site.
f) Reduce the percentage of positive malaria slides (Smear Positive Rate) in each demonstration site by at least 40%.
g) Reduce the number of people with gametocytes in blood film, meaning earlier diagnosis and less likelihood that mosquitoes will transmit the disease.
h) Reduce the amount of insecticides used, comparing data from the years prior to the project and at the end of the project.
i) Reduce mosquito-breeding sites within 500 meters of households (survey before and at the end of project).
j) Increase the accessibility to fast malaria diagnosis and treatment.
k) Reduce the length of time for obtaining a malaria diagnosis (time between having blood smear taken and the diagnosis).
l) Reduce the time people take to seek treatment (time between onset of malaria fever and person's seeking diagnosis and treatment).
m) Decrease the number of persons with more than one episode of malaria per year (repeaters).
n) Decrease the number of households with more than one person affected with malaria per year.
o) Decrease the number of children under 5 years of age and between 5-9 with malaria.
p) Collect and register all activities related to malaria control implemented in each demonstration project area.
q) Identify and incorporate local knowledge on malaria control strategies.
r) Organize and strengthen community participation.

3. Criteria for the Selection of Areas for Carry out Demonstration Projects:

a) **Malaria risk:** Demonstration Projects will be carried out in areas where malaria is endemic and populations are under high risk of infection.
b) **Access:** The areas should be readily accessible throughout the year, in order to ensure that actions can be carried out without delays.
c) **Environmental characteristics:** Demonstration areas will have geographical/environmental characteristics which represent different types of climate (temperature and rainfall), topography (flat lands, low hills, mountains, etc), natural vegetation (mangroves, rainforest, etc.), and geographical location (coastal areas, interior regions, border zones, etc.).
d) **Budget:** Each demonstration project will receive government national and local budgetary allocations to complement the financial resources provided by GEF.

4. Detailed activities to be undertaken in each of the Demonstration Projects:

Step # 1: Diagnosis of the malaria problem

a) Identify incidence rates of malaria fever in the demonstration project area.
b) Identify type of Plasmodium most prevalent in the population.
c) Identify groups of people or families in the project area with the greatest number of malaria cases in the previous year.
d) Identify vectors responsible for the transmission of the disease in the locality.
e) Identify permanent and potential breeding sites of vectors in a radius of 500 meters of each house where malaria infection has occurred.
f) Identify periods of the day when there is greater vector density.
g) Identify potential health activists within the community (volunteers, midwifes, community leaders, etc.).
h) Identify health centers closest to the community.
i) Determine number and type of local health center personnel.
j) Inventory services available at local health center and/or hospitals (traditional diagnosis of malaria by microscopic analyses, availability of drugs, etc).
k) Identify criteria and treatment regimens used for suspected and/or diagnosed cases of malaria in the localities including: frequency of visit of malaria specialists for sampling and treatment of suspects. Determine if house spraying with insecticides was carried out; if there is participation of personnel outside the malaria service, etc.
l) Identify the length of time between collection of blood samples, diagnosis, and adequate treatment.
m) Identify historical use of insecticides in the area.
n) Inventory schools and churches in the area.
o) Identify sources of jobs or subsistence of local population.
p) Identify temporary migratory movements of people in the area.
q) Identify and quantify indigenous populations in the selected area.
r) Carry out fast tests for malaria diagnosis in international border areas.

Step # 2: Determination of environmental characterization of the area

a) Identify the climatic characteristics of the area (yearly distribution of rain and temperatures) and its relation to vector density and activity.
b) Identify the relation between altitude and the distribution of the malaria vector.
c) Identify the relation between malaria vector breeding sites and superficial water distribution.
d) Identify the relation between malaria vector breeding sites and the existing natural or introduced vegetation cover.
e) Identify the relation between malaria vector breeding sites and the location of agricultural fields.

Step #3: Implementation of environmental interventions

a) Mapping of vector breeding site locations identifying species of *Anopheles* mosquito present.
b) Implementation of breeding site clean-up with community participation by removing garbage and other materials that could facilitate the breeding of mosquito larvae.
c) Elimination of green algae, moss and mud in creeks to prevent mosquito breeding (with community participation, once a month).
d) Biological control of breeding sites (optional according to each country experience and decision). Available strategies are:
   - *Bacillus thurigiensis and/or Bacillus sphaericus* (positive experience in Guatemala, Nicaragua and Honduras);
   - Larvae eating fish (Honduras and Guatemala);
   - Use of alcohol to control larvae (Mexico);
   - Natural repellents produced from leaves of Neem tree (Guatemala).
e) Drainage of temporary deposits of stagnated water and cleaning of water canals
f) Spraying of non-persistent pesticides or oil components on water surfaces not subject to drainage to interrupt larvae breeding.
g) Collection (with local community involvement) of organic, recyclable and non-recyclable trash and facilitating its adequate disposal.

h) Promotion of domestic hygiene practices among the local population.
i) Spraying non-persistent insecticides in households where malaria has been persistent or had occurred in the last year. Determination of correct adjustments of volume and time in relation to specific vectors present at the site (*A. pseudopunctipennis* or *A. albimanus*).
j) Promotion of the use of physical barriers and personal protection such as bednets and repellents.

Step #4: Treatment of malaria

Different options for malaria treatment are available and may be incorporated in the practices employed in each demonstration project, i.e., "single dose" (sequence of 3 consecutive monthly doses and 3 months of rest is repeated during 3 years), "radical cure" in 3 days, "radical cure" in 5 days, or "radical cure" in 14 days.

Step #5: Organization of Community Participation

a) Organize working teams for diagnostic activities and environmental interventions.
b) Organize and implement meetings, workshops, training courses, etc. with local community in each demonstration area.
c) Identify and promote training on malaria control strategies for local leaders.
d) Build capacity of local volunteers to promote preventive strategies of malaria control among local people.

Step #6: Collection and analysis of data, and dissemination of results

a) Identify people in the community and local health service centers to be trained in malaria diagnosis, identification of vectors, and identification of breeding sites.
b) Identify and locate by GPS the existing malaria vector breeding sites.
c) Determine the number of persons living in each demonstration area.
d) Identify the main epidemiological variables including: migratory movements of workers, type of malaria vector present, and time of the year or season of great concentration of the vector (relation to climate), susceptibility of the vector to the insecticides utilized in vector control, immunological response of the population, degree of endemicity and distribution of different strains of the parasite, cultural behavior of the indigenous population, and socio-economic activities of the region.
e) Identify number of microscopes available in the area for rapid diagnostic tests.
f) Identify persons who do not respond to the applied treatment.
g) Complete provided forms with field information on environmental conditions and malaria vectors.
h) Register all implemented activities and results obtained related to the integrated strategies for preventing and controlling malaria.
i) Organize the geo-referenced database (with use of GPS) and provide data for the GIS.
j) Integrate the data to the National and Regional Information System (WebPage and GIS).
k) Monitor and register the impacts of the interventions.
l) Monitor and register all costs related to the malaria control interventions in each demonstration project.

SITES SUGGESTED FOR DEMONSTRATION PROJECTS:

PLACE	Location and Altitude	Environmental Characteristics	LAND USE	Vectors *Anopheles*	Parasite *Plasmodium*	Existing Health system	Community Participation	Notes
BELIZE Districts of Toledo, Cayo and Stann Creek 20,000 inhabitants under risk Approx. 10,000 km2	89W/16.5 N <600 meters above sea level	Low and swampy Atlantic coast with lagoons, hills and valleys in the southern portion uplands. Subtropical climate, mean temperatures between 23°C in December to 29°C in July. Annual rainfall around 2000 mm, with a dry season from February to May, rain season from June to December. Natural vegetation: mangroves, swamp forests close to rivers, parklike savanna in the coastal plains.	Agriculture: rice, citrus fruits (orange and grapefruit), bananas.	*A. albimanus* (predominant) *A.vestitipennis* A. darlingy	*P. vivax (99%)* *P. falciparum*	Good system, currently with foreign medical doctors participating in a program of health assistance for the villages.	Good	Immigrant workers from Guatemala, Honduras and El Salvador, and villages of refugees from El Salvador (UN); good terrestrial communications.
COSTA RICA Huetar Atlantica (Cantón Talamanca) 30,000 inhabitants under risk Area: 2,809 km²	84W/9N <1000 meters above sea level	Mountains flanks and tablelands made fertile by volcanic ash extending to swampy coastal plains; hot and humid climate (27°C) on the coast, cooler with altitude; moist northeast rains can bring rain throughout the year (3200mm); Tropical broadleaf forests cover most of the area, while palms and mangroves thrive in the coastal plain.	Agriculture: bananas and organic cocoa.	*A. albimanus* (predominant)	*P. vivax* (100%)	Good coverage of medical services	Well established and active.	Easy access, immigration from Panama and Nicaragua, indigenous area (some with difficult access) and other ethnic communities
EL SALVADOR Sonsonate La Paz, Usulutan 120,000 inhabitants under risk	90W/14N <500 meters above sea level	Pacific lowlands and coastal hills; tropical climate (hot and humid) temperature varies with altitude (annual average 23°C), hottest months are April and May, rainy season from May to November (1800 mm/year). Tropical grassland and deciduous broadleaf forest.	Agriculture: coffee, and sugarcane	A. albimanus	P. vivax	Good network of rural medical services, 20 health services units in the area.	180 volunteers already organized for malaria control in the area	Good access to the area.
GUATEMALA Peten Sur, Alta Verapaz, Quiche (Ixcan) Population: 360,000	90W/17N <600 meters above sea level	Flat interior region, tropical climate, average temperature 37øC (30 to 40ø C) in the Northern part, rains in winter, (the entire year in Peten), tropical rainforest	Hardwood forests, livestock production.	*A. albimanus* (predominant), *A. pseudopunctipennis.* *A. darlingy* in	*P. vivax* (in general) *P. falciparum*	10 physicians per 100 000 inhabitants	Low community participation	Good access with exception of Peten where access is possible only by boat on the Río

inhabitants under risk.				the Northern part and *A. albimanus* in the southern part				la Passion.
HONDURAS Region VI. Atlántida (10 municipalities) 280,000 inhabitants under risk. Area: 10,247 km²	87W/16N <1000 meters above sea level.	Interior uplands and low ranges extending to swampy coastal lowlands. Climate: coastal lowlands are hot and humid (average 30°C), but the upland interior is cooler and much drier, little variation in temperatures throughout the year, rains from May to September (about 2700 mm/year) and dry season from December to April. Vegetation: evergreen tropical rain forest and swamps.	Cattle ranching and agriculture: banana, maize, coffee, cotton, rice and citrus fruits.	*A. albimanus* (in winter) *A. darlingi* (in summer)	*P. vivax* (93%) *P. falciparum*	Satisfactory health service coverage.	Volunteer network (1200 of 7000 persons throughout the region).	Migration from other parts of the country, as well as from El Salvador and Guatemala. Good access.
MEXICO Oaxaca, Chiapas Population: 2,800,000 inhabitants under risk	108W/26N <900 meters above sea level	Pacific coastal plain, with slopes and valleys. Tropical climate with rainfall from May to October, temperatures from 23°C to 35°C. Tropical dry broad leaf forests.	Corn, citrus fruits, papaya, coffee, timber, livestock, tourism.	*A. pseudopunctipennis* (winter) *A. albimanus* (summer)	*P. vivax*	1 per 1,000 inhabitants	Good	Region with experience of malaria control without DDT Temporary migrant workers from other parts of the country.
MEXICO Sonora, Sinaloa, Chihuahua, Durango Population: 3,000,000 inhabitants under risk.	108W/27N 200-1,200 meters above sea level.	3 main environmental units: the Pacific marshy coastal lowlands with deltas of rivers that descend from Sierra Madre Occidental, the piedmont ridges with isolated hills and slopes, and the interior lava plateau with fertile soil. The hills and plateau areas are agriculturally very productive with irrigation. Climate is semiarid with rainfalls concentrated from June to December; average temperatures from 20–35°C.	Livestock, coffee, timber, and tourism.	*A. pseudopunctipennis* (winter) *A. albimanus and A. vestitipennis.*	*P. vivax and P. falciparum* (imported).	Good	Good	Remote areas with endemic malaria.
NICARAGUA Chinandega (13 municipalities) 180,000 inhabitants under risk	86W/12N <500 meters above sea level	Pacific coastal lowlands with volcanic ash covering large areas and very fertile soil; climate hot and humid (27°C), annual rainfall of near 2000 mm, rainy season from May to October, dry season from December to April; tropical forest and savanna	Agriculture: sugarcane, corn, bananas, peanuts; recent commercial	A. albimanus	*P. vivax* (97-98%) *P. falciparum.*	7.3 physicians per 10000 inhabitants	Good Network of volunteers, participate in the cleaning of mosquito breeding sites	60% of the population is in the coastal zone. Migratory workers from El

		grassland with forests along rivers.	shrimp fishery.					Salvador and Honduras.
PANAMA Bocas del Toro (Cankintú, Usapin, Guabito) 55,000 inhabitants under risk	77.5W/8.5 N <1200 meters above sea level	Caribbean coastal lowlands and swamps; very rainy tropical climate (3000 mm of rainfall a year), rains on most days throughout the year; tropical broadleaf forest.	Agriculture: banana plantations for export (with intensive use of agrochemicals), potatoes, sugar cane, coffee and others.	A. albimanus	*P. vivax,* is presented in outbreaks (not endemic).	Good assistance of health services in Changuinola. Cankintu and Usapin are indigenous areas with difficult access and lower health assistance	Two health educators and 20 promoters of community participaiton	Border with Costa Rica. Problem with drinking water (groundwater is not good). More than 50% of population is indigenous. Most access to this region is by water. Migrant workers exchange with Costa Rica.

ANNEX G: GEOGRAPHIC INFORMATION OF THE PROJECT AREA

(Report of the PDF-B phase of the GIS group of the Special Program for Health Analysis – SHA/PAHO in collaboration with the Division of Health and Environment)

INTRODUCTION

As a part of the preparation phase (PDF-B) for the project "Comprehensive Action Program to Prevent Reintroduction of DDT for Malaria Control in Mexico and Central America", the prototype of a Geographic Information System (GIS) was developed in order to facilitate the regional analysis of health and environmental problems. This Annex shows some of the techniques utilized to generate interactive thematic maps with preliminary results on the geographical distribution of malaria in Mexico and Central America, as well as the strategies that have been used for malaria control in the participating countries. Examples on the application of various methods of spatial analysis were incorporated in the GIS for the sake of identifying spatial standards in the distribution of malaria control and the use of pesticides.

The main objective of the GIS application in this Project is to compile, standardize and map data related to the use of DDT and newly introduced pesticides in Mexico and Central America, and include geo-referenced information on malaria control, positive cases of malaria and population at risk, distribution of vectors and interventions of control, environmental and ecological factors, and the distribution of the health system.