PAN AMERICAN HEALTH ORGANIZATION, WORLD HEALTH ORGANIZATION (PAHO/WHO)
UNITED NATIONS ENVIRONMENTAL PROGRAM (UNEP),
GLOBAL ENVIRONMENT FACILITY (GEF)

REGIONAL PROGRAM OF ACTION AND DEMONSTRATION OF SUSTAINABLE ALTERNATIVE TO DDT FOR MALARIA VECTOR CONTROL IN MEXICO AND CENTRAL AMERICA
(PROJECT DDT/UNEP/GEF/PAHO)

DRAF
FINAL REPORT
FROM SEPTEMBER 2003 TO DECEMBER 2008

Washington DC, December 2008

FINAL REPORT PROJECT DDT/UNEP/GEF/PAHO
SECTION: PROJECT IDENTIFICATION

Title of Sub-Programme	**POPS projects**
Title of Project	Regional Program of Action and Demonstration of Sustainable Alternatives to DDT for Malaria Vector Control in Mexico and Central America (Project DDT/UNEP/GEF/PAHO)
Project Number	IMIS No.: GFL-2328-2760-4680 PMS No.: GF-4030-03-22
Geographic scope	Regional: Belize, Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua and Panama
Implementation:	Pan American Health Organization, PAHO (Area of Sustainable Development and Environmental Health, SDE) and executing countries: Ministries of health and the environment of Belize, Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua and Panama.
Duration of the Project:	64 months
Commencing:	September 2003
Completion:	December 2008 (with authorized extensions)

Cost of Project (millions US$)	**Cash**	**In-Kind**	**Total**
UNEP/GEF	7.165	0.0	7.165
Cofinancing			
Countries		5.8838	5.8838
PAHO		0.7848	0.7848
CEC		0.400	0.400
Municipal Governments		0.180	0.180
Private Sector		0.080	0.080
Total	**7.165**	**7.3286**	**14.4936**

SUMMARY: Based on the Roll Back Malaria Partnership and the Mexican experience the Project DDT/UNEP/GEF/PAHO was implemented in eight Mesoamerican countries between September 2003 and December 2008. Through this project was demonstrated the effectiveness of alternative methods to DDT for malaria control with community participation and organized a public critical mass that will help to curb any attempt to reintroduce DDT in the sub-region. Increased public awareness of DDT effects was achieved in public institutions (health, environment and education), and populations affected, including mayors and indigenous populations, that exercise local social surveillance. Furthermore, it was possible to achieve institutional strengthening for malaria control without using DDT and for monitoring and evaluating environmental and human health risks due to exposure to persistent organic pollutants (POPs). Carried out an inventory of pesticides stockpiles in the eight countries and celebrated a contract with a European company for repackaging, transportation and adequate final elimination of 200 tonnes of POPs. Due to breach of contract from the company and new regulations from the European Union on transportation of dangerous substances, this component will have to be concluded in 2009.

PRESENTATION

This document is the final report of the Regional Program of Action and Demonstration of Sustainable Alternatives to DDT for Malaria Vector Control in Mexico and Central America (Project DDT/UNEP/GEF/PAHO), implemented by the Pan American Health Organization (PAHO) in eight Mesoamerican countries (Belize, Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua and Panama) from September 2003 to December 2008. This report describes the main achievements of the Project, the methodological process, the strategies and the difficulties faced during the implementation of the four components.

In Mesoamerica there is a population of around 90 million, including indigenous population, living in areas at risk of malaria transmission, from which approximately 35% lives is highly endemic areas, mainly in the Atlantic slope of Central America and the Pacific region of Mexico, which made this the geographic area of the target population for this project.

During the 50's the countries in the Americas implemented sizable programs to curb malaria, prioritizing vector elimination with DDT and the eradication of the parasite using treatment schedules prescribed by health regulations of the countries. During the preparatory stage of this project it was estimated that during the last 40 years around 85,000 tonnes of DDT were spayed in the households and surrounding areas in malaria endemic areas. The indiscriminate use of DDT in public health programs and for agricultural purposes caused the resistance to the vector which, along with high operational costs, weakened said programs and at the same time undermined the strategies used.

The awareness of DDT persistence and its negative effects on health and the environment prompted the Mesoamerican countries to support the design and implementation of the DDT/UNEP/GEF/PAHO Project, which was based on the promotion of approaches for integrated vector control and the substitution of persistent toxic substances by strategies against malaria friendly to the environment.

This project was implemented by the United Nations Environment Program (UNEP), with resources from the Global Environment Facility (GEF), the governments from the participating

countries, the Commission for Environmental Cooperation of North America (CEC), PAHO, and the support from collaborating centers, universities, cooperation institutes, municipal governments and the communities involved. From PAHO participated in the design, execution and evaluation the areas of Sustainable Development and Environmental Health (SDE/PAHO), including the Institute of Nutrition of Central America and Panama (INCAP); External Relations, Resources Mobilization and Partnerships (ERP); Health Surveillance, Disease Prevention and Control (HSD); Technology, Health Care and Research (THR), with the Regional Program of Health of the Indigenous Peoples; Management of Financial Resources (FRM); Management of Purchases and Procurement (PRO), and PAHO's Representative Offices in the eight countries, which, under one inter-program coordination strategy maintained a systematic and constant communication with the Project's key stakeholders.

The most significant achievements made by the Project in relation to the four components were:

- That the eight Mesoamerican countries have adopted and adapted in the demonstration areas the *malaria vector integrated control model* with alternative techniques without using DDT or other pesticides, contributing to prevent the reintroduction of DDT in the region of the Americas and in other parts of the world. In 202 demonstration communities there was a 63% reduction of cases without using DDT or other pesticides; a 86.2% reduction of cases caused by *Plasmodium falciparum*, the type of parasite that causes the most severe type of the disease and mortality in the world, there were no deaths caused by this disease during the period. The 63% reduction in the demonstration communities is part of the efforts made to achieve the Millennium Development Goals (DMG) and towards the goal established by the Roll Back Malaria Initiative of a reduction in half by 2010 of the cases in the countries.
- Strengthening of institutional capabilities of the countries to control malaria without DDT through a sustained trained program in epidemiological surveillance, entomology, social participation, participative planning, risk factors due to exposure to DDT and other POPs, geographic information systems and other technical areas, complemented with guidelines and manuals generated from the project's experiences, and the basic equipment for the geographic information systems and monitoring the demonstration projects, as well as the equipment for the Mesoamerican network of laboratories for the monitoring and evaluation of environmental and human health risk due to exposure to POPs.

- Within the framework of the Basel Convention, progresses were made towards the final and adequate elimination of 200 tonnes of persistent organic pollutants (POPs) found inadequately stored and with high risk for the environment and human health, from which 136.7 tonnes are DDT and 64.5 of other POPs. Due to difficulties caused by regulations from the European Union and delays from the international company contracted, this component will be concluded during 2009.
- Project's coordination and management, which through the organization and implementation of the Steering and Technical Committees, the eight countries were able to meet at least twice a year to analyze, debate and reach joint decisions in relation to malaria epidemiological surveillance and alternative control without depending on toxic substances dangerous for the environment and human health.

The conditions for the Project's sustainability are there for the first component, since it was achieved an institutional and community empowerment regarding the malaria control model with alternatives friendly for the environment adapted to the social and cultural conditions of the populations and the local capabilities. But particularly due to the high social perception reached in relation to the success in the marked reduction of malaria cases without using DDT or other pesticides, through the active participation of the national programs in malaria control, the inter-sector action among health, environment and education, mobilization of communities, municipal governments and the indigenous populations.

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I. PROJECT'S NEEDS AND RESULTS

JUSTIFICATION

Malaria is a transboundary public health problem. In the Americas there are four large regions with high malaria transmission: Mesoamerica (from Mexico to Panama), the Pacific slope of the South Cone, the Amazons and the Caribbean. In these regions there are differences in the vectors, parasites, human groups, geographic characteristics, climate and the response capability of control programs which influence malaria transmission behavior.

Malaria is caused by three species of parasites *Plasmodium falciparum, P. vivax* and *P. malariae* and it is transmitted by the female mosquito vector, particularly *Anopheles pseudopunctipennis, An. albimanus, An. vestitipennis* and *An. darlingi.*

During the last 40 years in Mesoamerica it was sprayed around 85,000 tonnes of DDT as part of the efforts to control malaria. During the Project's drafting and preparation (PDF-B Phase 2000-2001) initially found in Mesoamerica approximately 135 tonnes of DDT, and subsequently found is 2004, through an update of the inventory 136.7 tonnes of DDT and 64.5 tonnes of other POPs. Repackaging, transportation and adequate final elimination of these stockpiles is one of the components of the Project. Its ecologically sound elimination is implemented according to the guidelines of the Conventions of Stockholm, Basel and Rotterdam.

DDT and its metabolites are toxic compounds highly stable that persist in the environment for several years and can accumulate in living organisms and can persist for decades in the soil, combined with organic substances and clay particles. DDT is transported through the water cycle by rain and flow of surface waters, and it can also be transported to remote areas in the atmosphere, thereby contributing to environmental pollution at global scale.

The malaria control interventions of the "Roll Back Malaria" Strategy of the World Health Organization includes prioritizing human settlements at risk, integrated vector management, timely diagnosis and treatment of diseased people, strengthening of national capabilities for research and management of information.

Since 2000, Mexico implemented this strategy with emphasis on targeted control of malaria, eradication of persistent parasites in the population, control of vector larvae by cutting water vegetation in breeding sites and the prevention of contacts with the adult vector. All these was carried out through organized community work using low-cost techniques and with low-impact for the environment. The most striking achievement was to reduce malaria cases below 4000 in 2003 in 16 areas, compared to that of 1998; which accounted for an 84.8% reduction. This historical milestone in the Mexican malaria epidemiology was achieved without using DDT or any other persistent organic pollutant (POPs).

Based on this experiences it was identified the need to strengthen the institutional technical capability for the evaluation and control of malaria vector at the regional level, taking into consideration that the countries with less capabilities to address malaria control without DDT could benefit from the experiences in other countries. Therefore, it was proposed a long-term regional cooperation program to persuade countries not to reintroduce DDT or other persistent pesticides for the vector control of endemic malaria.

OBJECTIVES AND RESULTS

The Project's general objective was to demonstrate that the methods for malaria vector control without DDT or other persistent pesticides are replicable, cost-effective and sustainable preventing thus the reintroduction of DDT in Mesoamerica.

The Project was executed by PAHO and the Governments of Belize, Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua and Panama, with the support from the United Nations Environmental Program, through the Global Environment Facility (UNEP-GEF) and the participation of the Commission for Environmental Cooperation of North America (CEC), universities, collaborating centers and cooperation institutes.

The Project's four components were:

1. Execution of nine demonstration projects with the objective to implement, evaluate and disseminate alternative strategies of malaria vector control without DDT.
2. Strengthening of the countries' institutional capabilities to control malaria without releasing in the environment DDT or other persistent pesticides.
3. Elimination of 135 tonnes of DDT reserves found in the participating countries in an ecologically sound manner compatible with the Conventions of Stockholm and Basel.
4. Project's coordination and management.

The Project successfully achieved the results of three out of four planned components (Annex 1).

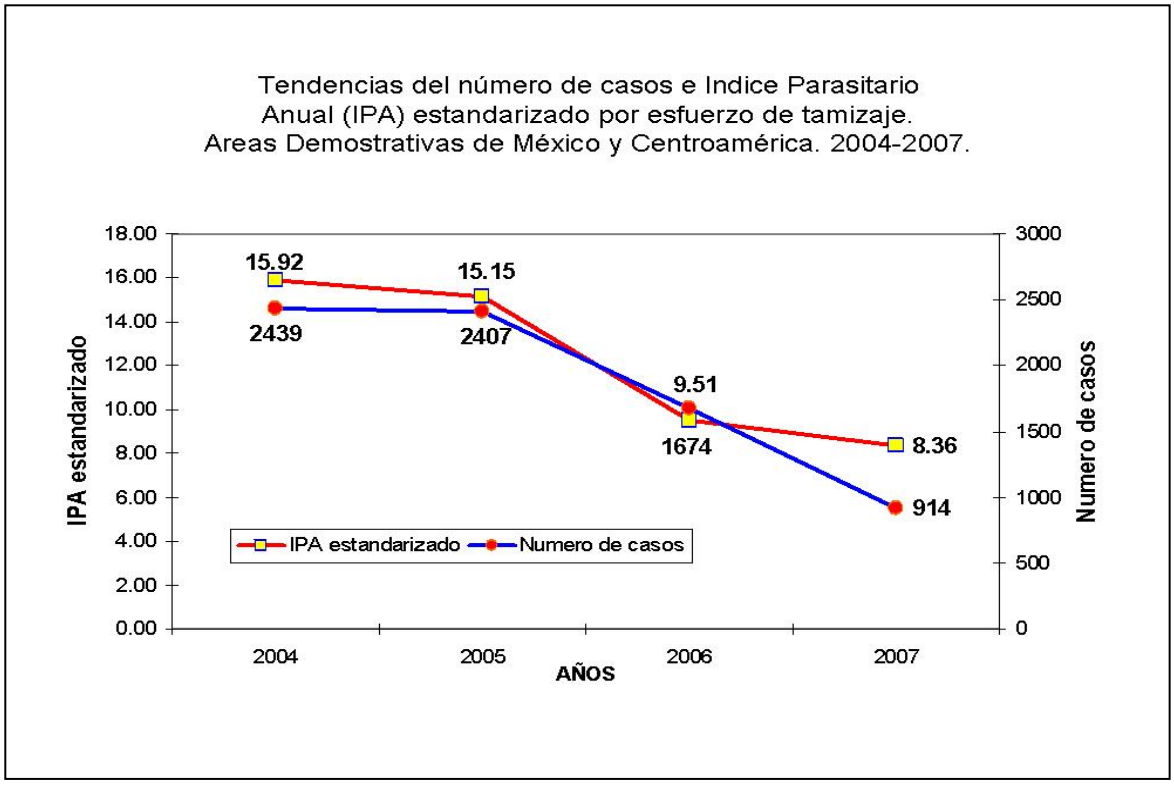
The most successful component was the first one. Based on the "Roll Back Malaria" strategy and the Mexican experience the DDT/UNEP/GEF/PAHO Project was executed during the period comprised from September 2003 to December 2008 and the activities are described in Annex 1. With the implementation of this Project it was possible to demonstrate the effectiveness of alternative methods to DDT for malaria control and organized a public critical mass that will aid to curb any initiative to reintroduce DDT in the sub-region. The increased awareness in relation to the effects of DDT was achieved in the populations directly affected and in their main leaders, including mayors and indigenous leaders, who exercise local social surveillance.

As a final result of implementing the malaria control model, in the 202 demonstration communities there was a 63% reduction in the number of people with the disease without using DDT or any other type of pesticide, decreasing from 2,439 people with malaria in 2004 to 914 in 2007 (Chart 1). The program acted upon one of the Millennium Development Goal (MDG), the the sixth, with attempts to stop and reverse the incidence of HIV/AIDS, malaria and other diseases by 2015. The 63% reduction in the demonstration communities is part of the efforts to reach the goal established by the MDG and the goal of the Roll Back Malaria initiative that established a reduction in half in the countries of this disease by 2010.

This reduction meant for the health systems, the communities and families savings in the cost of health care and lost in productivity of 1,525 cases avoided (difference between reported cases in 2004 and 2007). Also, cases due to *P. falciparum* decreased from 29 cases to 4, an 86% reduction

which is relevant due to the mortality and severe morbidity involved in this specie (Table 1). In these communities no mortality due to malaria was reported during the Project.

Chart 1. Trend in the reduction of malaria in the demonstration communities



Source: Arbelaez et al. 2008

Table 1. Reduction of malaria cases in demonstration countries and communities. Project UNEP/DDT/GEF/PAHO 2004-2007

País	Número de Casos en el País			Casos en las Localidades Demostrativas		
	2004	2006-7*	% reducción	2004	2007	% reducción
Belize	1.057	844	20%	376	128	66%
Costa Rica*	1.289	1.223	5%	99	112	-13%
El Salvador	76	49	36%	26	0	100%
Guatemala	35.349	31.093	12%	265	92	65%
Honduras	14.813	11.561	22%	521	105	80%
Mexico	6.861	2.514	63%	902	456	49%
Nicaragua*	5.095	2.514	51%	94	16	83%
Panama*	3.406	1.281	62%	156	5	97%
Total	67.946	51.079	25%	2.439	914	63%

Source: PAHO, Health Analysis and Statistics Unit. Regional Core Health Data Initiative; Technical Health, 2007 and Project's data. Only in Costa Rica demonstrative localities had an increase, it was due because they included during the last two years of the project a new locality (Estrada, Matina) which was affected by an outbreak of malaria; if we exclude this locality in the analysis, the reduction of cases in the demonstrative localities of Costa Rica would had been of 87%.

Regarding the third component, carried out the inventory of pesticide stockpiles in the eight countries and celebrated a contract with a European company for the repackaging, transportation and adequate final elimination of 200 tonnes of POPs. Due to breach of contract by part of the company and new regulations of the European Union in relation to handling of dangerous wastes this component will be concluded in 2009.

A costs study was carried out in three out of the nine countries, El Salvador, Honduras and Nicaragua. In El Salvador and Nicaragua the study was performed in all the demonstration areas, while in Honduras in two communities from one demonstration municipality.

The Program's cost in each country was USD$ 140,210 in El Salvador, USD$ 25,740 in Honduras, and USD$ 199,596 in Nicaragua. The mean cost per person was in El Salvador of USD$ 14 in Honduras USD$51.

When assessing data according to the marginal increment analysis based on the population studied, in El Salvador the cost was USD$ 0.20 per infection avoided, while in Honduras and Nicaragua this cost was USD$ 1.31 and USD$ 2.06, respectively. The cost per avoided case is

lower that the costs reported in studies in Togo and Tanzania regarding bed nets of USD$ 4.4 and 15, respectively.

II. PROJECT'S ACTIVITIES

All the activities of the components 1, 2 and 4 were completed in percentages equal to or exceeding 100%. In the second component, in relation to the support of low-cost rapid tests and easy to use for the identification of pesticides in human samples (ELISA or DELFIA), it was not necessary to implement this activity because in the countries was already the capability to perform ELISA. In relation to the studies of risk assessment, all the studies were carried out in the countries with the capability developed under the Project. Only in Belize the study in blood samples from children was not carried out by decision of the national authorities.

As previously explained, in the third component was implemented the following: update of the inventory, transportation and temporary of the stockpiles identified and repackaging of 115 tonnes out of a total of 200. Repackaging of the remaining materials, transportation and incineration of the DDT and other POPs stockpiles will be completed in 2009.

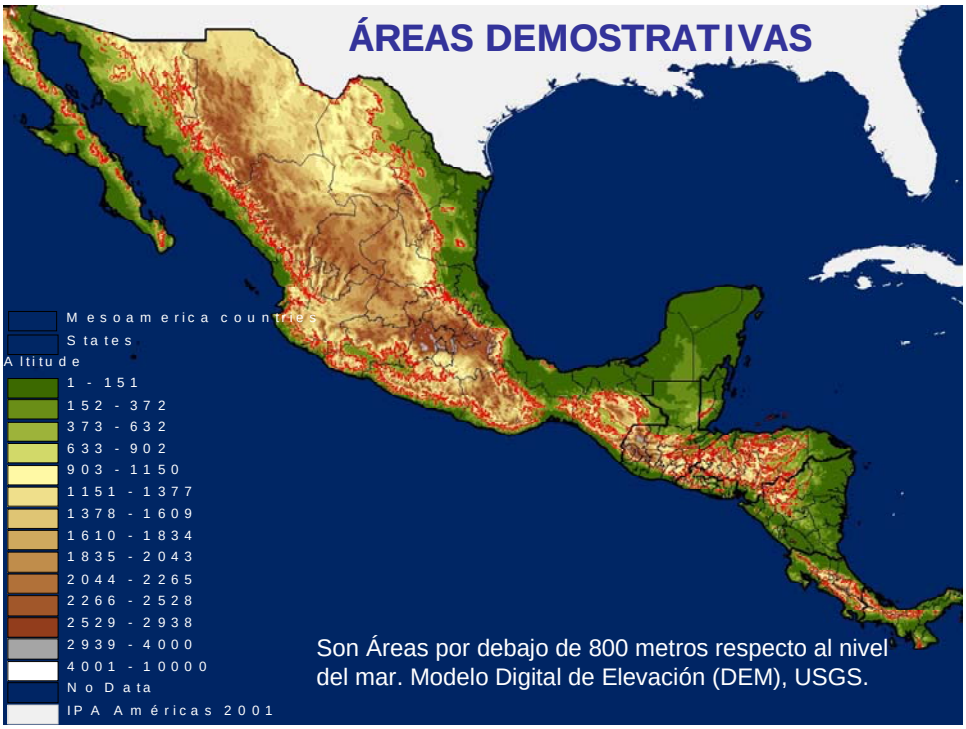
III. PROJECT'S PRODUCTS

Bellow there is a description of the main products of each component of the project. In addition to highlight the programmatic implications of said results, there is a description of methodological processes, lessons learned, perspectives for sustainability and the most striking limitations.

COMPONENT 1: IMPLEMENTATION OF NINE DEMONSTRATION PROJECTS AND DISSEMINATION

Implemented in the eight countries a total of nine demonstration projects under specific ecological conditions, (Map 1) using integrated malaria control methods without DDT.

Map 1. Ecological conditions of the demonstration areas



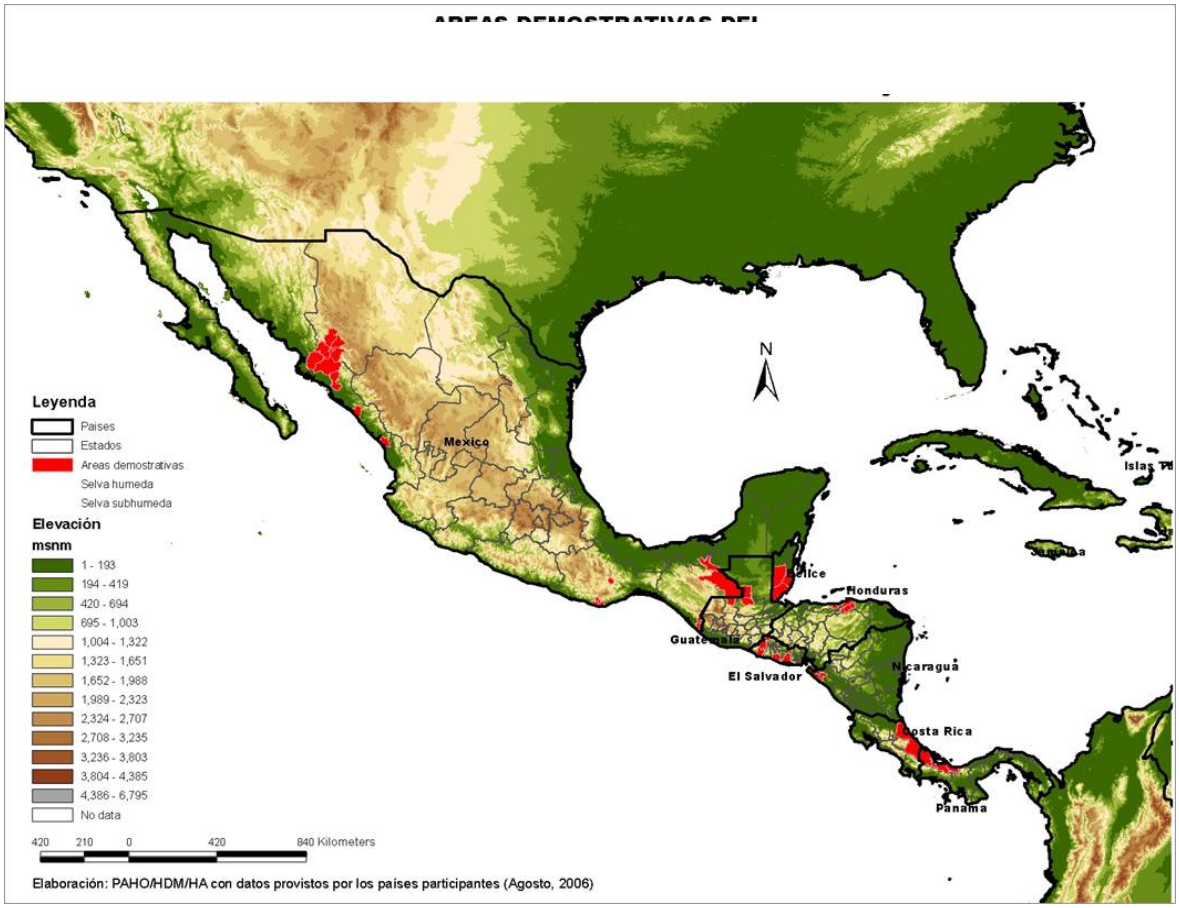
Source: PAHO/WHO

The nine sites of the demonstration projects were defined during the PDF-B phase and ratified in 2004 according to the local needs in each country. For its characterization was included different types of malaria vectors, endemic levels of the disease, environmental conditions, climatic and socio-economical (Annex 2). The demonstration projects were executed according to a manual[1] or technical guidelines made in consensus by the eight countries at the beginning of the Project.

This component was designed as the most important and complex component of the Project, thereby receiving most of the resources as well as great deal of institutional and community effort. It was achieved the successful implementation of nine demonstration projects, one in each country and two in Mexico, that were implemented in 202 demonstration communities y 52 municipalities (Map 2), directly benefiting a total population of 159,018 inhabitants and indirectly a population at risk of 6, 845,000 people, which accounts for 29% of the population living in highly malaria endemic areas of Mesoamerica.

[1] Méndez-Galván, J; Betanzos Reyes; Velásquez-Monroy, O; Tapia-Conyer, R. Guía de Implementación y Demostración de Alternativas Sostenibles para el Control Integrado de Malaria en México y Centro América. México: Secretaría de Salud de México, 2004.

Map 2. Demonstration areas of the Regional Program of Action and Demonstration of Sustainable Alternatives to DDT for Malaria Vector Control in Mexico and Central America.



It is worthy to stress that the eight Mesoamerican countries, with no exception and with different degree of development, adopted ad adapted in the demonstration areas the "***malaria vector control integrated control model***", with alternative techniques without using DDT or other pesticides (Table 2). Demonstrating that the alternative control methods proposed by the Project are replicable, cost-effective and sustainable, thus contributing to prevent the reintroduction of DDT for malaria control in the region.

Table 2. Malaria control measures implemented in the DDT/UNEP/GEF/PAHO Project. Mesoamerica, 2003 - 2008.

EXPECTED EFFECT	CONTROL MEASURES
1. Destruction of parasites	Rapid diagnosis and complete and timely treatment
	Supervision of adherence: counseling on complete treatment and graphic therapy schedules, supervised oral treatment, evaluation of complete therapy and hematological control on the last day of treatment
2. Elimination of the reservoir	Single dose treatment (only in Mexico)
	Collateral treatment of positive cases
3. Reduction of mosquito contact with people	Insecticide-treated nets
	Mesh in doors and windows
	Repellent threes
	Liming of households
4. Destruction of breeding sites and shelters of mosquitoes	Control of breeding sites by physical means: drainage, filling, channels.
	Biological control: fish and bacilli (in Guatemala, Costa Rica, Nicaragua and Honduras)
	Chemical control: ethoxylated alcohol for *Anopheles albimanus*, (only in Mexico)
5. Elimination of shelters and attractors	Clean house
	Elimination of shelters outside the household (clean backyard)
	Promotion of personal hygiene

Promoted through the demonstration projects trans-boundary activities between countries, such as Costa Rica and Panama; Mexico and Guatemala, where technical meetings with exchange of information were held, also provided logistical support, joint emergency plans, exchange and dissemination of community experiences.

What is the added-value of the methodological strategy used?

During the promotion of the demonstration projects (initial dissemination phase from June 2004 to June 2005), prevailed the principle to promote satisfactory results with strategies different to that of the traditional ones. It was forecasted that the difference would be successfully advocated if promoting a methodological strategy that would place added-value to malaria control with principles that would include a) the spontaneous, volunteer, organized and informed participation

of the community, b) to avoid the perception that through the Project would do more of the same and c) at the same time, to control any initiative that could generate false expectations.

With the exception of Mexico and Nicaragua, most malaria control national programs were idle, executing traditional control activities, which at first were a limitation to embrace the new methodological proposal, which was overcome after a year of intense demonstration work. An important milestone of the methodological launch that marked the difference was the thorough discussion of the project's technical guidelines (*"Guidelines for the Implementation and Demonstration of Sustainable Alternatives for Integrated Malaria Control in Mexico and Central America")* during the first[2] meeting of the Regional Technical Committee. The study, validation and approval of this technical guide by the eight countries generated an enriching exercise of exchange of knowledge and experiences among participants. Contents, strategies and operational basis were reviewed. Carried out a rapid observation travel to a Zapotec indigenous community in Santo Domingo Morelos that have collected five years of experience. Participants in the observation indicated that "the ***material incentives*** to achieve community participation jeopardize the sustainability of actions and that the best incentive is the development of local capabilities, transference of knowledge, managerial mechanisms and others"[3].

As a preventive measure, anticipated actions for the organization, training and advocacy of the national, sub-national and community teams in each country, as well as the dissemination and study of the methodological manuals with participative approach. These teams were trained using the Project's framework document[4] signed by PAHO and UNEP/GEF on September 2003, but mainly based on the Project's technical guidelines which describes the methodological strategy of integrated malaria vector control. These activities (organization/training/advocacy) were aimed at involve stakeholders with the Project's objectives and strategies, generate awareness of the disease's impact in the community and particularly, the risks faced by the populations and the environment due to the use of DDT.

[2] OPS/Proyecto DDT/PNUMA/GEF/OPS. "Memoria Primera Reunión del Comité Técnico Regional. Huatulco, Mexico, May 24-28, 2004.
[3] Ibid.
[4] PAHO/WHO-UNEP/GEF, Regional Program of Action and Demonstration of Sustainable Alternatives to DDT for Malaria Vector Control in Mexico and Central America. Project submitted to the Global Environment Facility (GEF), by Belize, Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua and Panama. September 2003.

During the initial dissemination of the project allowed to discuss the problems associated with malaria, the critical review of traditional control models and the innovation of the Project's proposal. In most of the demonstration communities it was found that they were not aware of the malaria epidemiological situation, the lack of alternative techniques for prevention and control and a complete lack of knowledge on the negative effects of DDT on the human health and the environment.

Through the intensive activities carried out during this stage it was possible to obtain in a short term the awareness that the model proposed was the main part of the project and that, once satisfactory results are demonstrated, the countries would be in a position to recommend alternative to the use of DDT for malaria vector control. The communities acquired the practical knowledge of entomology and its relation with the seasons, habits and breeding sites of the mosquito, but particularly the basic concepts of public health to forecast risks at the community level. Although the demonstration projects were designed for not using persistent pesticides, all the communities decided to avoid the use of all types of pesticides or, in extreme cases, to be used only for the control of outbreaks or positive cases in high risk areas. These extreme situations only occurred once at the beginning of the project in one demonstration community in Panama and in another of El Salvador.

After several activities of local, national and international exchanges, dialog and training, the eight Mesoamerican countries gradually adopted the model in the specified demonstration areas, including representative communities with high transmission and presence of the disease during the three year-period prior to the implementation of the Project. The communities understood that the rationale behind the Project was to reduce morbidity and mortality through decreasing the transmission of the diseases by interrupting, with means available in the community, the contacts of the vector with the people, as well as the early diagnosis and timely and complete treatment of people with the disease. Soon public and private institutions provided the opportunity of horizontal dialog with the communities and local governments recognizing the model's comparative advantages.

By the end of 2004, Costa Rica showed the first evidences of results related to community organization and participation in the control of breeding sites by the health sector (Social Security

-Ministry of Health) with other local sectors at the municipal level, while associating a trans-boundary model with the demonstration project of Panama. Simultaneously, the rest of the countries began to report on their own experiences. Thus, Belize was the last country, by the end of 2005, in adopting the model as a result of several reciprocal exchanges with Mexico, Guatemala, Honduras and Panama.

By the end of 2005, UNEP/GEF carried out an external mid-term evaluation[5], whose report was submitted on March 2006, and timely analyzed by the Regional Operational Committee who met on April 25-26, 2006 in Panama City.

The evaluation mission confirmed that all the countries have adopted in the demonstration areas alternative methods for malaria vector control, not only without using DDT, but also without using persistent pesticides, thereby evaluating the project as highly satisfactory. Likewise, stressed that the project was using a combination of control methods adapted to the local reality, with risk approach and with targeted interventions; selective vector control; strengthening of basic information capability at the local level (GIS) and research, as well as several undocumented innovations in recent international literature, such as elimination of the human reservoir of the plasmodium, liming of households, malaria houses, clean backyard and others.

A very important aspect stresses by the evaluation mission was related to the ecological and systemic approach, characterized by five elements:

1. A prevention strategy and integrated control based on epidemiological models of the health sector;
2. A multidisciplinary and multisector approach when involving the environment and education sectors to the health sector;
3. Community participation as central axis of the control activities;
4. Equity prioritizing rural areas with mostly indigenous populations in critical poverty and the persistence of malaria.

[5] Juan Alberto Narváez Olalla. “Evaluación de medio término del Programa Regional de Acción y Demostración de Alternativas Sostenibles Para el Control de Vectores de la Malaria Sin el Uso de DDT en México y Centro América”. Marzo de 2006.

5. Combination of control methods according to the Global Strategy in the Fight Against Malaria and the Roll Back Malaria initiative.

At the same time the evaluation mission issued more than 20 recommendations to the Regional Operational Committee that the Committee immediately acted upon, which significantly improved the integration of the model, since implemented actions to improve the lack of uniformity in the treatment schedules; the deficiencies found in relation to diagnosis, treatment and quality control of laboratories; lack of a methodology to systematically evaluate the cost-effectiveness of the methods used by the project and others.

Therefore during the fifth and last meeting[6] of the Steering Committee on July 1-2, 2008, the eight countries signed a declaration recognizing the Project for the successes achieved and for the recuperation of the methodological process for malaria control that have been abandoned during the last three decades. Through simple technologies and based on epidemiological stratification delimited at the macro- and micro-level the targeted conditions of transmission in each population under the intervention and facilitated the strategies to curb the problem with available resources. The effectiveness attributed to the model was sustained in targeting and integrating the interventions against malaria without using any type of pesticide and with the participation of the community and other sectors.

How to implement the theory?

The technical manual or guide explaining the model integrates epidemiology with social sciences, entomology, management, and development of human resources, health services, support to laboratories and other related areas. Characterized by five interdependent components: epidemiological stratification of risk; elimination of persistent parasites in the population; ecological larvae control with community participation; Adult anopheles control with low-cost techniques and lower environmental impact and a sustained educational program aimed at the community.

[6] Acta declaratoria de la quinta reunión del Comité Directivo del proyecto DDT/PNUMA/GEF/OPS. México, Distrito Federal, 2 de julio de 2008.

The manual also steer the local teams to understand that the best strategy to fight malaria is the one that acts in a comprehensive manner over the complex interaction of four different components: the **parasite** which is the cause, the **mosquitoes** that act as vector of these parasites, the **human beings** in whose blood is the food of the mosquitoes, and the **environment**, which provides the right conditions for the development and survival of the vector.

Moving from theory to practice was the main challenge. This step was completed by using an "in-service learning" approach training local groups with professional with expertise in the different fields. The fundamental concepts of epidemiological stratification, complemented with basic knowledge on geographic information systems (GIS), were the key tools in this process to deepen in the targeted transmission of malaria. In the field using maps, charts, tables of indicators and other tools the teams understood that while all the population of a community was exposed to the disease, the existence of "malaria niches" or the persistence of people or families infected by the disease, relapses and re-infections by *Plasmodium* became evident. Through field observations established that around the families or individuals identified there were the permanent source of infection of parasites for the vector and provided the ideal conditions in terms of breeding sites and natural shelters for the survival and transmission of the parasites in the same habitat[7], [8], [9], [10], [11], [12], [13].

[7] Lysenko AJA, Beljaev AE, Rybalka VM. Population studies of Plasmodium vivax. I. The theory of polymorphism of sporozoites and epidemiological phenomena of tertian malaria. WHO Bull. 1977; 55: 541-549.

[8] Mason J. Patterns of Plasmodium vivax recurrences in a high-incidence coastal area of El Salvador, C.A. Am J Trop Med Hyg 1975; 24: 581-585.

[9] Ungureanu E, Killick-Kendrick R, Garnham PC, Branzei P, Romanescu C, Shute PG. Prepatent periods of a tropical strain of Plasmodium vivax after inoculations of tenfold dilutions of sporozoites. Trans R Soc Trop Med Hyg. 1977; 70(5-6):482-483.

[10] Bond JG, Rojas JC, Arredondo-Jimenez JI, Quiroz-Martinez H, Valle J, William T. Population control of the malaria vector Anopheles pseudopunctipennis by habitat manipulation. Proc. Biol. Sci. 2004; 271:2161-2169

[11] Chanon KE, Méndez-Galván JF, Galindo-Jaramillo JM, Olguin-Bernal H, Borja-Aburto VH. Cooperative actions to achieve malaria control without the use of DDT. Int J Hyg Environ Health. 2003; 20:387-94.

[12] Rodríguez MH, Loyola EG, Betanzos AF, Villarreal C y Bown DN. Control Focal. Tratamiento focal usando quimioprofilaxis y rociado intradomiciliar con insecticida para el control del paludismo en el sur de México. Gaceta Médica de México 1994; 130(5) 313-19

[13] SSA/Proyecto GEF/DDT. Secretaria de Salud de México. Guía para la Implementación y Demostración de Alternativas Sostenibles de Control Integrado de la Malaria en México y América Central. Centro Nacional de Vigilancia Epidemiológica y Control de Enfermedades (ED): México DF. 2004. Disponible en: http: //www.mex.ops-oms.org/contenido/malaria/materiales.htm, accessed on June 5, 2007.

From this technical perspective the intervention model prioritized the epidemiological stratification complemented with GIS, enabling the working teams to characterize at the macro and micro level the focused transmission condition. At the *macro level*, inter-community, within the demonstration projects and in the universe of communities that concentrated around 80% of the cases during the last three years, each country selected demonstration communities (Table 3) for a total of 202 communities in 52 municipalities in the nine demonstration projects. In general terms it is known that above 60% of the cases occur in 20-30% of the communities of a country or region (RABREDA-AMI, 2007), therefore a defined control model in the project, targeting the intervention in communities with the highest history of transmission (Narváez 2006, Méndez 2003).

Table 3. Demonstration communities by country. Project DDT/UNEP/GEF/PAHO. Mexico and Central America, 2004 - 2007

Country	Demonstration community	
	Number (%)	Population (%)
Belize	18 (9.0)	17,621 (11.1)
Costa Rica	10 (4.5)	9,429 (6.0)
El Salvador	7 (3.5)	10,028 (6.3)
Guatemala	8 (4.0)	4,668 (3.0)
Honduras	12 (6.0)	5,649 (3.6)
Mexico	133 (66.2)	83,056 (52.2)
Nicaragua	6 (3.0)	21,281 (13.4)
Panama	8 (4.0)	7,286 (4.6)
TOTAL	**202**	**159,018**

52 Municipalities: Belize: El Cayo, Toledo, San Greeck. Costa Rica: Matina, Talamanca. El Salvador: El Porvenir, La Paz, Sonsonate, Jiquilisco. Guatemala: Ixcán, Sayaxché, Chisec. Honduras: Jutiapa, Atlantida, Balfate, Santa Fé, Sabá, Bonito Oriental y Trujillo. Mexico: Oaxaca: Candelaria, San Agustin, San Bartolomé, San Pedro El Alto, San Pedro Pochutla, Santa María Huatulco, Santa María Tonameca, Santo Domingo de Morelos. Chiapas: Cacahoatan, Escuintla, Ocosigno, Palenque, Sabanilla, Suchiate, Tapachula, Tuxtla Chico. Sinaloa: Choix, El Fuerte, Mocorito, Sinaloa. Chihuahua: Batopilas, Morelos, Urique. Durango: Mezquital, Tamazula. Sonora: Alamos. Nicaragua: El Viejo, El Realejo, Chichigalpa, Chinandega. Panama: Kusapin, Kankintú, Changuinola

The demonstration communities within the demonstration projects were selected by following the criteria outlined in the Project's technical guidelines:

1. High malaria transmission determined by the historical comparative analysis of malaria indicators during the last three years in each community (2001, 2002 and 2003: Annual parasite index (API), the positive slides index (PSI), accumulated malaria cases, annual absolute number of cases.
2. High presence of the main vectors involved in malaria transmission, including, whenever possible, the ecological characteristics promoting its survival such as temperature, rainfall, types of breeding sites, among others.
3. Road access both during the rainy and dry season for timely follow-up.
4. Political, social and cultural stability in order to ensure community participation during all the phases of the model.
5. Population per community not below 100 households.
6. Communities with history of being served by malaria programs using DDT in the past decades.

At the *micro level*, within the household, prevailed the operational research of risk factors associated to transmission, adapting the definition of the Mexican strategy of targeting through the identification of the "malaria house" defined as the "household with at least one registered case in the year during the last three to five years", generally characterized with conditions to become permanent source of infection of parasites and with higher possibility of surviving the vector.

Simultaneous to the macro and micro analyses it was important to make demonstrations in the field of the vector control practices both in the immature and mature phases by measuring the larvae density before and after the interventions with community participation. Visits to places with high malaria indexes were unavoidable, particularly to those communities that recently had outbreaks and therefore there was a higher awareness of the problem. It was also key to explain farmers on the repercussions of the use and handling of DDT, along with demonstration of new methods friendly with the environment.

Which were the operational moments?

The experience of bringing theory to practice with the hands-on approach, accumulated different operational moments executed indistinctly in each community according to the particular conditions, which are summarized below:

1. Contacts of technical advocacy with institutional and community key leaders, followed by brief meetings with strategic agreements.
2. Meetings to deepen on the Project's scope and agreements regarding the first methodological steps.
3. Macro stratification for the selection of communities with high malaria transmission.
4. Micro stratification for targeting risk factors in the community, families and individuals.
5. Preparation of a baseline assessment with demographic, social, resources, morbidity and mortality, epidemiological, entomological and social participation indicators.
6. Local plans, maps and demonstration of interventions.
7. Training meetings to organize committees, working groups or teams (department/area, municipality and community).
8. Intensive community intervention for vector control, diagnosis, treatment and surveillance of people with malaria.
9. Participative evaluation, social surveillance and feedback.

What are the alternatives for control without using DDT in the demonstration projects?

Parasite control

In each country the working teams increasingly targeted the risk factors associated to malaria in communities, families and individuals with higher persistence. Designed adequate methods according to each reality for selective vector control, epidemiological surveillance and timely treatment of people with malaria.

The first activity was to provide care to people with malaria. It was considered that it was worthwhile to make the efforts to control parasite dispersion (*Plasmodium)* taking advantage of the weak infrastructure available for early diagnosis and timely treatment of people with malaria;

however, this activity resulted very difficult since most of the rural communities selected were isolated, laboratory services were extremely weak as well as insufficient personnel in the field. On the other hand, malaria care actions were executed outside the activities of the rest of local healthcare personnel, with weak communication and coordination. Although malaria programs were turned horizontal during the reform of the health sector, its functional performance continues to show the characteristics of vertical programs with scarce resources.

The Project's initial efforts and the regular malaria programs were aimed at addressing said problems. The awareness process was able to regain personnel from the malaria programs, to involve other health programs and raise the issue in to political and technical areas at all levels. Departmental, area and municipal directors joined the efforts to address the malaria problem and at the same time involved the rest of the team, which made possible to place back the malaria issue in the formal systems and the vectors staff felt additional institutional support. At the community level malaria volunteer collaborators (MVC) played a key role, they joined the effort right from the beginning and intensified their actions in surveillance, reference and counter-reference of all the people identified with the disease.

During the Project's PDF-B phase it was considered that the early diagnosis and timely treatment was strongly developed in the countries; however, the reality found demonstrated just the opposite. Although there was an initial agreement to use the current treatment schedules in each country, it was found that only Belize and Nicaragua were using treatments recommended by PAHO/WHO: Chloroquine for 3 days and primaquine for 7 days or chloroquine for 3 days and primaquine for 14. The other countries were using primaquine in doses and number of days bellow those recommended.

Since 200 Mexico has been using the "monthly single dose treatment for three consecutive months, resting three months and repeating the treatment until completing 18 doses during three consecutive years of follow up (TDU 3x3x3)". The El TDU treatment comprise 10 mg of chloroquine per kg of body weight and 0.75 mg of primaquine per kg of body weight.

Under the influence from the Project, the technical cooperation from PAHO/WHO Regional Malaria Program and other projects in Central America, with the exception of Mexico, all the

countries standardized their treatments according to PAHO/WHO guidelines, strikingly improving the surveillance system and expanded the network of laboratories for the timely diagnosis and treatment of people with malaria.

Vector control

Environmental measures aimed at vector control in their immature phases and the elimination of shelters for adult mosquitoes were grounded around the main idea of the Mexican strategy of the *elimination and modification of anophelines habitat and breeding sites (EMHCA)*, which was adapted by the countries according to the specific conditions of each ecosystem.

"The EMHCA strategy is part of the physical vector control and comprise the manual elimination of vegetation growing in rivers with or without streams that during dry seasons generates ponds directly exposed to sunlight, condition that promotes the female *Anopheles pseudopunctipennis* lay eggs…[14]". This strategy has the advantage of not contaminating water with pesticides, with immediate effects, inexpensive since does not require the purchase of pesticides and equipment for its application; it only require household tools such as machetes, shovels, picks, grub hoes, rakes, wheelbarrows and others.

Which was the physical vector control measure mostly used in the demonstration projects?

According to EMHCA the communities, with institutional support, fostered the following physical control methods: clean house, clean backyard, clean street and clean neighborhood, as key tactics for the vector control activities. It was also added cleaning of water weeds, such as green algae, where mosquito breeding sites tend to concentrate, drainage of stagnated waters, sanitary landfills, cutting the grass in the backyards and around the houses (below photograph of physical control of breeding sites).

[14] Méndez-Galván, J; Betanzos Reyes; Velásquez-Monroy, O; Tapia-Conyer, R. Guía de Implementación y Demostración de Alternativas Sostenibles para el Control Integrado de Malaria en México y Centro América. México: Secretaría de Salud de México, 2004

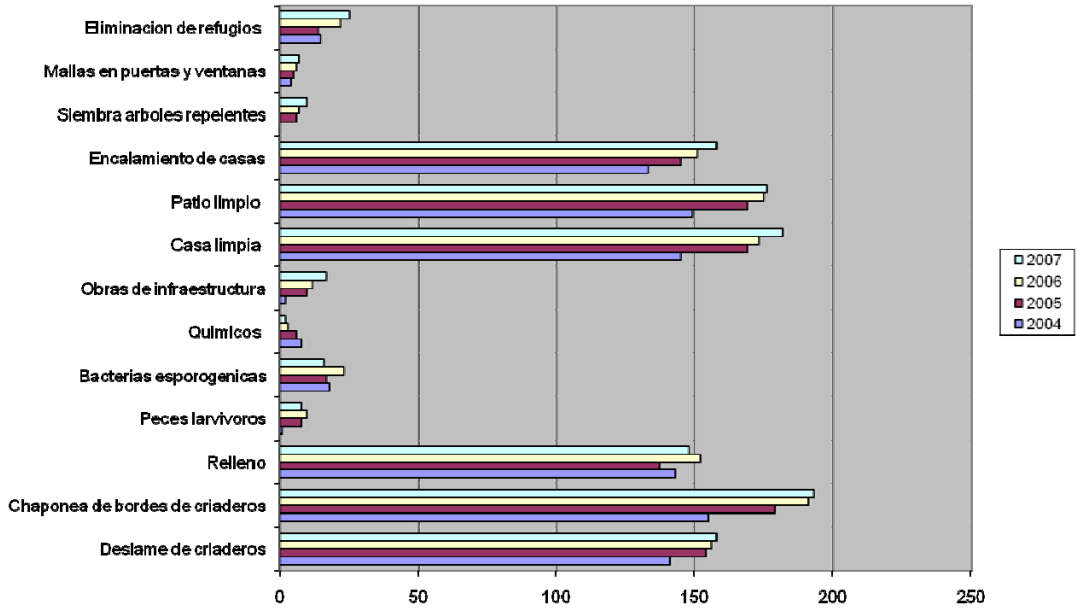
The countries made the adjustments of the EMHCA strategy according to the ecological and epidemiological situation of each community, the vector specie, experience, acceptability of the method, implementation costs, empirical evidence of efficacy and knowledge or vector behavior, among others[15]. In fact, the interventions most frequently used by the communities for breeding sites control corresponded to those actions that was possible to implement with the community's own resources without relying from external resources [16] (Chart 2)

As seen in Chart 2, the elimination of shelters and attractors of adult vectors (such as clean house, clean backyard, clean street, clean neighborhood, photograph below, indigenous community from Bisira, Panama), was one of the interventions with more adherence during the Project, despite that globally has not been explored as an intervention alternative and there are not studies evaluating its impact.

[15] Chanon KE, Mendez-Galvan JF, Galindo-Jaramillo JM, Olguin-Bernal H, Borja-Aburto VH. Cooperative actions to achieve malaria control without the use of DDT. Int J Hyg Environ Health. 2003; 206: 387-394

[16] World Health Organization. Long-Lasting Insecticidal Nets for Malaria Prevention. A manual for malaria programme managers. 3ª. Edition, WHO, 2007 .*http://www.who.int/malaria/docs/itn/LLINmanual.pdf*

Chart 2. Number of communities according to the interventions carried out against the vector in its immature and adult phases Project DDT/UNEP/GEF/PAHO, Mesoamerica. 2004-2007



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Even though these interventions could have had a marginal effect in malaria reduction, due to its potential role in the prevention of other diseases, is a contribution to WHO's framework of vector integrated management[17].

Two interventions for malaria vector control were used without recent scientific evidence, but were highly accepted by communities due to its involvement in the potential improvement of households, modifying vector's habits and strengthening the concept of healthy houses and communities, relating painting the houses with lime and planting trees with insect's repellent properties (neem and oak).

[17] WHO. WHO position statement on integrated vector management. Weekly Epidemiological Record. No. 20, 16 May 2008, 83rd, 177–184. http://www.who.int/wer

Which were the biological control methods?

Some countries (Costa Rica, El Salvador, Guatemala, Honduras and Nicaragua) used other control interventions such as larivorous fish sporogenic bacteria for breeding site control and repellent trees (neem, *Azadirachta indica* A. Juss and oak). The use of larvivorous fish recommended by WHO for the control of larvae and pupae. In Mesoamerica fish of the *Poecilidae* family were used for anopheles control. This intervention did not required external resources and was easily adopted by the communities[18], [19].

The efficacy of using sporogenic bacteria (*Bacillus sphaericus* and *Bacillus thuringiensis var. Israeliensis)* for the control of malaria vector breeding sites was recommended in the Project's technical guidelines. However, this intervention was not widely used in the communities perhaps because it requires an specific technological development and high cost for purchase and maintenance. Therefore, Only Honduras and Nicaragua used this option since the resources were obtained from other projects of external cooperation finances by the Global Fund.

Which were the chemical control measures?

As explained in previous sections of this report, all the countries not only adopted in the demonstration areas control alternatives without suing DDT, but also did not use any type of pesticide. Indoor residual spraying was carried out temporarily in the demonstration community of Barranco Montaña Adentro in Panama with Sumition® in 2004 and pyrethroids in El Salvador in 2005, on both occasions due to outbreaks.

The use of insecticide-treated nets has been widely documented and it is recommended[20] by WHO/PAHO, in this project the use of insecticide-treated nets was reduced to communities covered by projects from the Global Fund (Guatemala, Honduras and Nicaragua) and where there

[18] Use of fish for mosquitoes control. World Health Organization (WHO-EM/MAL0289/E/G). Geneva, 2003
[19] PAHO/WHO. Manual Operativo para la Vigilancia y Control de las Fases Inmaduras de los Vectores de Malaria en Guatemala. PAHO/WHO Guatemala, 2007.
[20] World Health Organization. Long-Lasting Insecticidal Nets for Malaria Prevention. A manual for malaria programme managers. 3ª. Edition, WHO, 2007, Disponible: *http://www.who.int/malaria/docs/itn/LLINmanual.pdf*

was great movement of population and where it was difficult for the local teams the bionomic characterization of the vector, particularly *An. vestitipennis*

That was how the use of chemicals for the control of malaria vectors was so low in the demonstration areas as seen in Chart 2, that shows that the use of chemicals was due to outbreaks at the beginning of the project.

What was the social strategy?

The strategic axis of the model was social participation and that of the local governments with an intercultural approach within the framework of the global strategies supported by PAHO/WHO such as Health Promotion, the Initiative of Healthy Municipalities, Cities and Communities, Primary Health Care and Primary Environmental Care.

Under this modality the decisions were supported by the same communities through their local leaders, volunteer collaborators, organized community groups and other forms of popular expression. Established a new paradigm of participation where the population was the subject and objects of their own decisions, and officials from public institutions and from external cooperation were the main support for the changes wanted by the population.

The Project's intercultural approach enabled the identification of community leaders that were essential for a linkage between the Project and community groups. Leaders participated in a continuous process of training on the model strategies, which included the identification of malaria symptoms, reference of patients to receive appropriate care and the mode of transmission. These people provided updated information to the community in a variety of places and on their own language and coordinate actions for family self-care. Support from leaders was particularly important for the countries in the countries where the Ministry of Health had insufficient staff and, therefore, was only capable to provide support from time to time to the communities.

The most frequent role of leaders was to coordinate and organize local activities, to organize working groups, to evaluate the breeding sites before and after interventions, to review adherence

of activities in coordination with technical staff from the Ministry of Health and to take care of tools and supplies from the Project.

They also cooperated with the Project's management at the community level, to provide venues for meetings, to invite key stakeholders for activities and meetings, and to attend the meetings. They played a key role so that the other stakeholders could keep their commitments and agreements reached with the community, which increased the Project's credibility in the population. They also were useful to increase the respect, acceptance and understanding among stakeholders regarding the cultural diversity in the communities.

Also stand out the volunteer collaborators known as "ColVol" in Central America and "notificante" in Mexico. These agents played a key role since the 50's, they assumed new responsibilities at the time to organize, motivate and train the community on vector control, expanding their field of action which previously was limited to obtain blood samples and to provide malaria treatment. The countries reexamined the role of these volunteers which resulted in a 63% increase in the number of these volunteers in the demonstration areas, when provided with a more active role to organize and to train the community on vector control (Table 4).

This strengthened social equity by achieving greater coverage of interventions in rural indigenous communities traditionally excluded from development processes and scarce access to health and education.

Table 4. Number of volunteer collaborators in the demonstration areas in Mesoamerica.

Countries/Years	2004	2005	2006	2007
Belize	20	20	20	20
Costa Rica	10	29	40	41
El Salvador	14	27	28	28
Guatemala	10	16	22	22
Honduras	12	14	18	18
Nicaragua	23	23	23	23
Panama	1	11	20	20
Mexico	748	887	1185	1197
TOTAL	**838**	**1027**	**1356**	**1369**

Source: Arbelaez et al, 2008.

Resources were devoted so that the new modalities of vector control would be developed with complete participation of the populations and adapted to the cultural characteristics to consolidate the credibility of methods without relying on dangerous pesticides.

Community leaders turned into streamliners of the project and exchanged experiences with other communities and countries. An example is the *First Forum on Health and Inter-culture in Indigenous Populations: Malaria Control Without Using DDT in the Demonstration Areas of the Project DDT/UNEP/GEF/PAHO in Areas With Indigenous Population*, held on December 2005 in Bisira, Nögbe Buglé, Panama, with the participation of more than 100 indigenous leaders and institutional representatives from Belize, Costa Rica, Guatemala and Panama.

During the event the leaders reached agreements with national, regional and municipal health authorities to replicate the model in other areas with indigenous population using the intercultural approach. During that meeting was prepared in a participative manner the *Manual for Community Leaders and Community health Workers of Indigenous Populations and Afro Descent for Malaria Prevention, Surveillance without using DDT,* which was published on October 2007 both in English and in Spanish. The lesson learned is that community leaders were key actors for the development of the model, aware of cultural, ethnical and beliefs diversity and a key element for the interaction between technicians and the population.

Why and which was the contribution from the municipal governments in the implementation of the demonstration projects?

Since the 80's most of the countries in the Americas have lived, in higher or lesser degree, decentralization processes to achieve territorial redistribution of power and autonomy of decision and control to municipal authorities.

Municipal authorities are responsible to set policies in a determined territory and population (PAHO/WHO, 1999), and therefore have a better reach for mobilization of local stakeholders. They can also place health as a priority in the municipal political programs, according to the social, cultural and ethnic context of the community.

Despite it is widely recognized that the municipal governments are in a privileged position to implement programs based on decentralized and participative models, some public health

problems, including malaria, remain unattended and are not part of the political agenda of the municipal governments, as found in the demonstration areas of the Project.

The Project proposed to test the viability of participative approaches based on a leading role of municipal governments, that demonstrated a broader vision to expand inter-sector alliances integrating stakeholders that usually were excluded from malaria control, but from their specific positions, can provide health and quality of life to the population.

For the first time in the sub-region it was achieved that 52 municipal governments participated in the fight against malaria in their municipalities (Table 5). At the beginning of the Project it was sought the material support as their main role, however, the very same process assigned the primary function of managing local public measures that contributed to the sustainability of achievements, long-term attention to the malaria issue and the inclusion of malaria control in the public municipal agenda without creating parallel or new structures.

Table 5. Municipalities of the demonstration areas.

Country	**Municipalities**			
Belize (3)	Cayo Stan Creek Toledo			
Costa Rica (2)	Matina Salamanca			
El Salvador (4)	El Porvenir La Paz Sonsonate Jiquilisco			
Guatemala (3)	Ixcán, Sayaxché, Chisec			
Honduras (6)	Balfate Bonito Oriental Jutiapa Atlantida Saba Santa Fe Trujillo			
Mexico (27)	Alamos Batopilas Cacahoatan Candelaria Loxicha Choix El Fuerte Escuintla	Mezquital Mocorito Morelos Ocosingo Palenque Sabanilla San Agustin Loxicha	San Bartolomé Loxicha San Pedro El Alto San Pedro Pochutla Santa Maria Colotepec Santa Maria Huatulco Santa Maria Tonameca Santo Domingo de Morelos	Sinaloa Suchiate Tamazula Tapachula Tuxtla Chico Urique

Nicaragua (4)	Chichigalpa Chinandega El Realejo El Viejo
Panama (3)	Changuinola Kankintú Kusapín

The municipal governments facilitated community participation and inter-sector collaboration; they financed important infrastructure constructions and provided logistical and human resources as counterpart to the Project. Their contribution was estimated in approximately $USA 180,000 as co-financing from the municipal governments and not included in the Project's design (Table 6). The figures for co-financing showed in Table 6 were estimated based from interviews with key informants.

In addition to the financial contribution, it was more important the political support, related with resolutions of local public policies and the managerial mechanisms of said resolutions that caused cultural changes on the social management of health. The municipal governments effectively passed environmental legislation, municipal plans for malaria and dengue vector control and specific budgetary line-items, hiring of human resources and letters of understanding and agreements with different public and private institutions.

Table 6. Co-financing Project DDT-GEF. September 2003 - December 2008

Co-financing(type/resources)	**Multilateral Agency (Non-GEF) Mill US$)**		**Central Government (Mill US$)**		**Local Government (Mill US$)**		**Private Sector (Mill US$)**		**Total (Mill US$)**	
	Budget	Actual	Budget	Actual	Budget	Actual	Budget	Actual	Budget	Actual
In-kind	0.854	*1.2321	5.1164	5.8838	0.00	0.180	0.00	0.080	5.9704	7.1959
Other type of resource - PDF-B	0.440	0.440							0.440	0.440
TOTAL	**1.294**	**1.6721**	**5.1164**	**5.8838**	**0.00**	**0.180**	**0.00**	**0.080**	**6.4104**	**7.635.9**

*PAHO: Approximately $US 0.7848

* CEC: Approximately $US 0.4473

What was the inter-sector collaboration?

The inter-sector strategic alliances established by the municipal governments within the framework of the Projects produced the integration of a set of stakeholders traditionally excluded from interventions related with malaria control. At the municipal level it is worthy to mention the participation of community leaders, schools, non-government organizations (NGOs) and staff from health, education and environment.

The inter-sector approach promoted by the Project mobilized an important amounts of resourced from the private sector for vector control, mainly from farmers and international companies dedicated to crops of sugar cane, bananas, oil palm and others which is described in the section of cases of the demonstration projects in each country.

At the national level in the national committees were included public institutions, such as the ministries of health, environment, PAHO, universities and research centers and national programs for malaria control.

Under the leadership of health authorities of the countries these inter-sector committees were responsible for the design of strategies, technical and operative models to steer the decision making process of the community teams. On the other hand, the local committees designed and implemented activities and operative plans in each community adapting the models proposed according to the context of each community.

The inter-sector action promoted by the Project was useful to strengthen the alliance with the private sector and resulted in an increase of volunteer and technical personnel in the demonstration communities. Community participation and from other non-governmental stakeholders provided continuity to the Project under difficult situations, such as strikes, natural disasters, changes of governments and rotation of institutional staff.

Which were the scientific papers generated with the experience?

Based on the experience of the demonstration projects, several documents were prepared and published in PAHO's web page, which are listed in Annex 3 of this report. But more important, even though it was not planned in the Project's framework document, also prepared eight scientific papers to be published in scientific journals, which are described bellow:

1. “Malaria Control Without DDT in Mesoamerica: Targeted Control and Management of Breeding Sites as Basic Strategies”, that was submitted to The Lancet.
2. “Cultural Constructions of Malaria in a Health Project in Panama”, submitted for publication on the PAHO’s Journal.
3. “Effective use of native fish for the control of the malaria vector larvae and pupae of Anopheles albimanus (diptera: Culcidae): A Case Study in Guatemala”, submitted to the Malaria Journal.
4. “Ways of beating malaria without using DDT”, published in The Japan Times, 15 August 2008.
5. “Cost-effectiveness of Malaria Vector Control without using DDT or other persistent pollutants, 2004-2007”, pending publication.
6. “Environmental Health Risk Assessment of DDT in Mexico and Central American Countries”, pending publication.
7. “Participation of municipal governments and the community in malaria control without using DDT”, submitted to the International Quarterly of Community Health Education.
8. “More alternatives against malaria”. Published in the Revista las Américas, October 2008. Organization of American States.

COMPONENT 2. STRENGTHENING OF THE INSTITUTIONAL CAPABILITY OF THE COUNTRIES TO CONTROL MALARIA WITHOUT DDT

The most relevant activities for the development of institutional capabilities were as follows:

Training

Within the second component the Project reinforced the malaria control national programs without using DDT in the Mesoamerican countries. From 2004 to mid 2008, maintained a technical training program in epidemiological surveillance, entomology, social participation, participative planning, risk factor due to exposure to DDT and other POPs, geographic information systems (GIS/Epi/PAHO/regional and INCAP) and other technical areas complemented with guidelines and manuals generated by the Project’s experience. In Annex 4 there is a description of the meetings organized at the regional level, with the participation of institutional and community delegates of the eight countries.

With Project's resources edited and published educational materials to support the training, exchange and dissemination programs as part of the strategy to strengthen institutional, community and indigenous capabilities for malaria vector control without using DDT. Annex 3 describes 50 educational materials made by the countries and with resources from the regional component, from which 23 are documents, and the rest are videos, brochures, posters and others.

This way it was possible to share information, knowledge and experiences among the countries that facilitated the decision making process through meetings, consultation meetings, training workshops aimed at health and environment technicians, volunteer promoters, indigenous leaders, committees, majors and others. Reports from the countries recorded 888 meetings, workshops or seminars financed with Project's resources held from December 2003 to December 2008, from which 75% of these meetings were at the local level (668 meetings), within or very close to the communities, the rest were developed at the regional or national level (Table 7), These reports also indicate a total of 21,306 participants, from which 54% were community personnel (11,459) and the rest institutional personnel, both from the education, environment and health sector, as well as municipal mayors and other key stakeholders.

Table 7. Meetings and participants per country. Project DDT/UNEP/GEF/PAHO. 2003-2008

	Countries	# of meetings	Type of meeting			Level			# of participants		Total
			1	2	3	Local	National	Regional	Community	Institutional	
1	Belize	124	1	17	106	89	35	0	591	676	1267
2	Costa Rica	28	3	4	21	23	5	0	488	468	956
3	El Salvador	79	1	2	76	60	19	0	757	721	1478
4	Guatemala	231	3	47	181	186	45	0	4246	2828	7074
5	Honduras	63	2	5	56	50	13	0	261	818	1079
6	Mexico	181	3	29	149	161	20	0	2917	1764	4681
7	Nicaragua	94	0	16	78	62	32	0	1284	1332	2616
8	Panama	47	1	5	41	37	10	0	623	305	928
	Regional Component	41	27	7	7	0	0	41	292	935	1227
	Total	888	41	132	715	668	179	41	11,459	9,847	21,306

Does not include meetings of the Steering Committee (5) and the Regional Operational Committee (3)

Type of meeting: (1) Inter-governmental meeting (2) Expert group meeting (3) Training workshop-seminar

This combination of strategic actions enabled to revitalize the malaria national programs and to place the malaria issue in the political and technical agendas of the countries. The joint action of the health and environment sectors was also benefited, as well as the performances of other

external cooperation projects with are investing in malaria supported by the model proposed by this project.

Strengthening of the capability of toxicology laboratories

Another important contribution of the Project that is included in this second component of institutional strengthening was to develop the capability of the network of gas chromatography laboratories in Mesoamerica, with technical capability for monitoring and evaluating environmental and health risks due to the exposure to POPs in the region. It was possible to articulate the Central American laboratories with the regional reference laboratories such as the Toxicology Laboratory of the University of San Luis Potosí, Mexico and the Regional Institute of Toxicology of the National University of Heredia, Costa Rica, to exchange and develop the inter-laboratory capabilities and the analysis of DDT compounds in samples of soil, sediment, fish and blood in children.

Therefore, it was important the network of laboratories that in a reliable manner analyzed the samples and prepared country reports, which was used for making a Mesoamerican report and the scientific paper “Environmental Health Risk Assessment of DDT in Mexico and Central American Countries” which was submitted for publication.

Purchase of equipment

The laboratories were equipped with microwave ovens for the extraction of samples, centrifuges, scales and other equipment necessary to develop the risk assessments due to exposure to residual DDT; likewise, technicians from each laboratory received continuous advice on perishable working materials.

Thus, the laboratory network is trained for the evaluation of other POPs, thereby providing the countries and additional tool to comply with the commitments of the Stockholm Convention for the reduction of these substances.

Training of laboratory staff

Each country assigned two national laboratory professionals that were trained on gas chromatography and preparation of protocols, sites selection and obtaining environmental and biological samples. Organizing the first course on chromatography, a second course on sampling

and risk assessment and a third for the analysis of results and to define the scope of the scientific paper.

Each Mesoamerican country (with the exception of Belize where the national authorities did not authorize to perform the study), made the protocol that were approved by their respective ethics committee, selected a demonstration community with history of DDT use (although Honduras, Nicaragua and Costa Rica studied more than one community) and collected the samples with collaboration from the communities.

Among the difficulties faced during the study stands out the ethical component. Most of the countries faced great deal of difficulties to obtain formal ethical approval, particularly for blood samples from children, therefore recommending to future projects to be very careful in this sence to save time in this matter.

Summary of the risk assessment due to exposure to residual DDT, according to technical report submitted by the University of San Luis Potosí, Mexico.

Regarding the environmental samples evaluated the soil inside and outside the households of communities sprayed with pesticides in the past and in relation to biological samples collected samples from fish and blood in children exposed to the residual action of DDT. Fish evaluation had two objectives: to determine a potential route of exposure to humans and also to serve as a biomarker of the presence of DDT and its metabolites in sediments and in the food chain (bio-magnification).

Results showed, with few exceptions, values range according to the elapsed time of DDT elimination; thus, higher concentrations of almost all samples were found in Mexico that used more DDT for malaria control and was the last country to stop using it in 2000. In relation to external soil samples Costa Rica and Mexico had 10% or more above the reference value. Followed by Honduras with more than 5% and none for the rest of countries (Nicaragua, El Salvador, Guatemala and Panama). Regarding to inside soil once again Costa Rica, Mexico and Honduras had more than 10% of the reference value, while in the other countries there were no residual values.

The results from fish showed surprises since not were as expected, Nicaragua (in the community Nuevo Amanecer) and Panama, showed more than 40% from the samples analyzed values above

the reference. The third country facing this situation was Mexico. Despite this the most striking result was to find exposure in children in almost all communities studied, although what was mainly found was DDE. Mexico exceeded by far the rest of the countries both in concentration and percentage of children with detectable values (90%). Costa Rica in exterior and interior soil and Mexico in interior soil found more DDT than DDE, which it is interpreted as a relatively recent exposure possibly due to uncontrolled use.

With all this information it is possible to state that the project was a success because now there is evidence of environmental presence (external and internal soil) and exposure to DDT in biota (fish) and children in Mesoamerica. This will facilitate surveillance that avoids the illegal use of the substance and enables to initiate intervention programs to reduce the risks found.

COMPONENT 3. ELIMINATION OF DDT RESERVES

The Project's component addressed the problem of DDT and other POPs reserves in the Mesoamerican countries.

During the Project's PDF phase (2000-2001) it was estimated the the stockpiles of DDT in the eight countries were 135 tonnes. In order to have a more real figure of these reserves during the Project's first year carried out an inventory with the participation of the national authorities and the ministries of health and environment finding 136.7 tonnes of DDT and 64.5 of other POPs (toxaphene, chlordane HCB, aldrin, dieldrin, and mirex, Table 8).

Table 8. Regional Program of Action and Demonstration of Sustainable Alternatives to DDT for Malaria Vector Control in Mexico and Central America. Updated Inventory of DDT and other POPs in Mexico and Central America. Update period: June 2004 to August 2005.

Country	Stockpile sites	DDT*												
								Container conditions				Transportability		
		10%	75%	94.20 %	100%	Unknown concentration	Subtotal	Good	Minor damages	Major damages	Unknown	Yes	No	Unknown
Belize	1		13.000				13.000			13.000			13.000	
Costa Rica	1	0.028	4.060		4.533		8.621		0.028	8.593		0.028	8.593	
El Salvador	1			4.672			4.672	4.672				4.672		
Guatemala	4				15.058		15.058		0.150	14.907		0.150	14.907	
Honduras	1					3.539	3.539				3.539			3.539
Mexico	53		42.043		45.269		87.312	58.055	13.137	11.385	4.735	71.192	11.385	4.735
Nicaragua	2					0.003	0.003	0.003				0.003		
Panama	1	4.545					4.545	4.545				4.545		
Total	64	4.573	59.103	4.672	64.859	3.541	136.749	67.274	13.316	47.885	8.274	80.590	47.885	8.274
Percentage		3.34%	43.22%	3.42 %	47.43%	2.59%		49.20%	9.74%	35.02%	6.05%	58.93%	35.02%	6.05%

Country	Stockpile sites	Other POPs*												
									Container conditions			Transportability		
		Toxaphene	Chlordane	HCB	Aldrin	Dieldrin	Mirex	Subtotal	Good	Minor damages	Major damages	Yes	No	
Belize	1						0.008	0.008		0.008		0.008		
Costa Rica**	2					0.120	0.002	0.122		0.002	0.120	0.002	0.120	
El Salvador	5	36.636		7.802	1.814			46.252			46.252	13.776	32.476	
Guatemala														
Honduras	1		12.490					12.490		12.490		12.490		
Mexico														
Nicaragua**	4	5.640	0.003				0.004	5.647	0.007	5.640		5.647		
Panama														
Total	13	42.276	12.493	7.802	1.814	0.120	0.014	64.519	0.007	18.140	46.372	31.923	32.596	
Percentage		65.52 %	19.36%	12.09%	2.81%	0.19%	0.02%		0.01%	28.12%	71.87%	49.48%	50.52%	

* Figures in metric tons.

** Include one site storing DDT and other POPs

Although in the third component in the framework document refers to elimination of DDT stockpiles, finding in said reserves other POPs, UNEP/GEF authorized during the third meeting of the Steering Committee, held in Washington in 2006, to include within this component the elimination not only of DDT, but also the other POPs.

Based on the information provided by FAO, 15 specialized companies were invited by PAHO through a public biding to implement this component. Four companies responded to and SEMTREDI was selected. In March 2007 PAHO signed with SEMTREDI a contract for $ 500,000, this company with field offices in Mexico and Colombia (the last one responsible for the Central American Countries) agreed to repackage, transport and eliminate 200 tonnes of DDT and other COPs, as well as advised the countries to prepare the transit documents.

Between March and April 2007 the contracted company (TREDI) verified the sites and materials, contacting the national authorities and PAHO's representative offices in each country.

On May 2007, received in El Salvador certified materials from repackaging the POP's in Central America sent by TREDI from Holland.

Between July and August 2007 the countries prepared the documents of notification and request of transit according to the Basel Convention. During that same period the European Union enacted new regulations in relation to notification and request of transit. This new regulations (EC 1013/06) forced all the countries to prepare new documents in addition to those already signed, including to request of transit countries.

On October 2007 60 tonnes of POPs in El Salvador were repackaged and in February 2008, 55 tonnes of DDT in Mexico.

Due to delays from TREDI to fulfill the contract, on March 2008 PAHO held in Washington DC a meeting with TREDI officials. The company requested an increase in the contract amount, arguing increase of administrative costs in carrying out the contract and having found additional 70 tonnes of DDT. PAHO, in consultation with UNEP/GEF, offered an increase in the contract of $66,000.00 ($ 30,000 not for the 70 additional tones claimed by TREDI but for actual 7.5 tonnes found in Belize and Honduras and $ 36,000 for the increase in administrative costos). Subsequently the company informed PAHO that they do not accept the proposal.

In response to the critical situation in the implementation of this component, PAHO meet with TREDI and the eight focal points of the Basel Convention in Managua Nicaragua on May 21, 2008. During this meeting updated the Basel Convention application processes, including completing the forms. The eight countries were committed to complete the transit requests to the Central American Countries and Europe where the shipping company hired by TREDI will pass. In June 2008 seven countries submitted the request of transit authorization to Central America and Europe (Mexico did it until September 2008).

On October 2008, TREDI informed PAHO that the shipping company hired to transport the POPs filed for bankruptcy and proposed three options in relation to the contract: to increase the cost per kilogram of POPs from $ 2.5 to 3.5 Euros; to use the $500,000 without guaranteeing the total elimination of 200 tonnes, or to reach an agreement to liquidate the current contract. PAHO's Legal Office, in agreement with Procurement Office and the Area of Sustainable Development and Environmental Health, responded to TREDI that official response will be available by the last week of November of 2008.

On October 25, 2008 no country has received transit authorization from Europe. Guatemala issued a transit authorization to Mexico and Belize. Costa Rica issued transit authorization to Panama. Honduras is reviewing the requests from Guatemala, Mexico, El Salvador, Nicaragua and Belize.

On the other hand, on October 29, 2008, the Program Officer from the United Nations Environmental Program (UNEP/GEF) informed PAHO "that, as of now, it is not possible to import chemical waste to countries of the European Union". Therefore, UNEP/GEF and PAHO are analyzing alternatives to adequately solve the implementation of this key component. PAHO's Legal Office is in contact with TREDI in order to obtain the contract fulfillment according to the terms established.

COMPONENT 4. PROJECT'S MANAGEMENT AND COORDINATION

PAHO and the Governments from the eight countries (Ministries and Secretariats of Health and the Environment), supported by the Commission for Environmental Cooperation of North America (CEC) and the Central American Commission for the Environment and Development (CCAD), implemented the Project's activities as described in the previous components and according to the agreements of the Steering and Technical Regional Committees.

Human resources

For the coordination and management of the Project PAHO hired a regional coordinator with office in Guatemala and seven national coordinators located at PAHO's office in each country (with the exception of Costa Rica, where the duties were undertaken by an international consultant form SDE/PAHO upon decision from the national authorities). To support the management of the national coordinators and the regional coordinator, made institutional cooperation agreements and hired consultants under terms of reference and protocols with regional, national and local scope.

Having a national coordinator hired by PAHO responsible in each country solve the effects derived derivate from the instability from institutional national focal points. These coordinators served to provide continuity to the Project, but most importantly to take advantage of the influence, leadership and infrastructure from PAHO into the Ministries of Health and the Environment in the Region. In summary they played a key role in the national coordination, particularly in providing technical cooperation to the countries to develop community participation, to harmonize the linkage among institutions, to supervise, implement and evaluate the demonstration projects in their country.

The regional coordinator was located in the headquarters of the Institute of Nutrition of Central America and Panama (INCAP) PAHO's center located in Guatemala. Placing the regional coordinator at INCAP was beneficial, because as PAHO's sub-regional institute facilitated the management with most of the countries. Also enabled to boost the transference experiences due ton INCAP's leadership in the sub-region, as well the technical support provided in the areas epidemiology and geographic information systems.

Regional management was based on the principles of management and development of administration, focusing on organization, planning, execution, monitoring, and evaluation. Management was highly participative and including, prioritizing joint decisions with the highest degree of consensus among the eight countries. One of the essential functions of the regional coordinator was to comply with the commitments made in the framework agreement signed between PAHO and UNEP/GEF, as well as to facilitate linkage between members of the Steering and Technical Committees to comply with the agreements. This function was made possible through a series of managerial mechanisms, which included periodical supervisions to each country; preparation of technical reports; financial programming; organization and development

of meetings of the Steering Committee, forums and regional meetings to exchange experiences; mobilization of financial and technical resources through contracts, agreements and other modalities.

Since the beginning of the implementation of the projects it was made clear that the projects would be under the responsibility of the regional coordinator and the eight national coordinators, one in each country, under the guidance of PAHO Headquarters in Washington, with administration, technical and financial facilitation functions in coordination of the focal points appointed by the Ministries of Health and the Environment in each of the eight participant countries.

Organization of the Project's coordination and management process

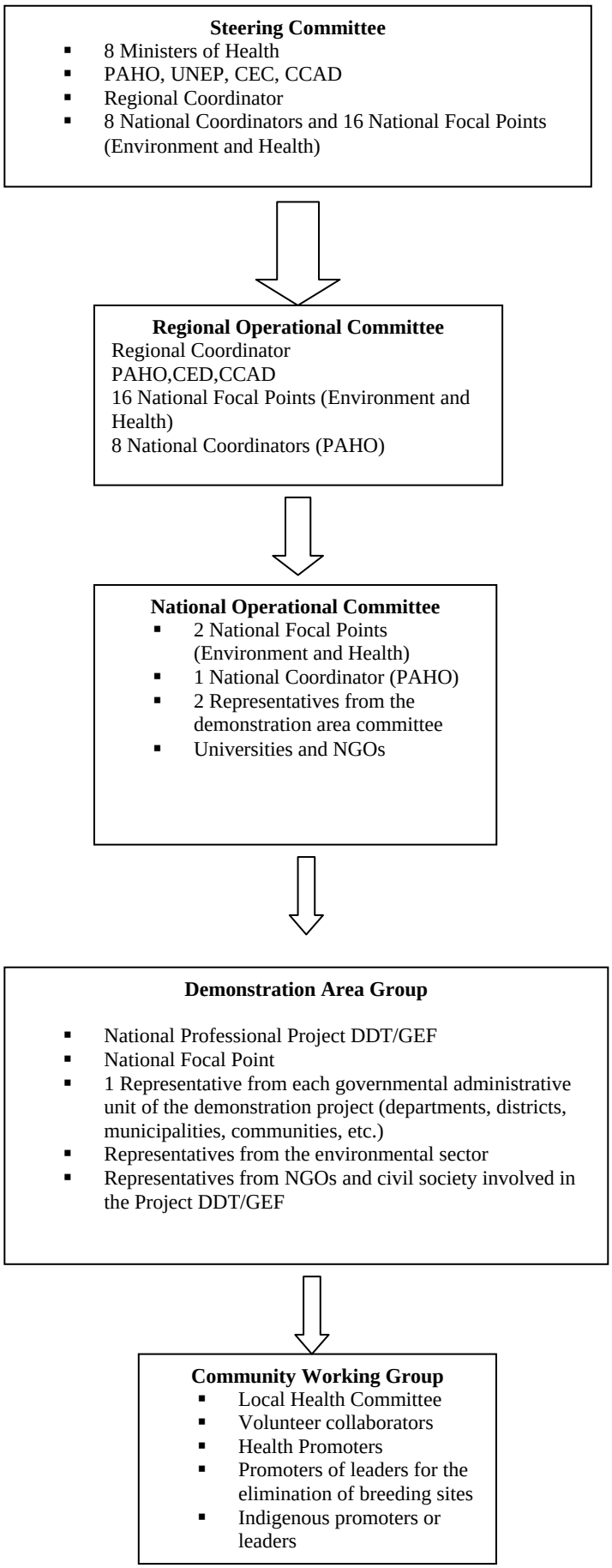
Each of the eight countries with focal points from health and environment sectors, CEC, CCAD, UNEP/GEF, PAHO, the national coordinators and the regional coordinators formed the Steering and Technical Committees and had permanent access to the Project's fundamental framework; established and order of responsibilities and functions and maintained constant communication with all stakeholders.

The Project implementation was supported from three WHO/PAHO collaborating centers: the National Institute of Public Health and the Autonomous University of San Luis Potosí, Mexico and the Regional Institute of Toxic Substances (IRET) of Costa Rica.

Especial attention was provided to an accurate and permanent technical communication among those involved in administering, managing and implementing the project, verifying the flow of communication to all the participating communities trough the ministries of health and the environment and the municipal governments.

The following flowchart depicts the five levels of coordination and management, which is not hierarchical in nature, but a facilitator of professional communication (Figure 1). The flowchart illustrates more than the quantity the quality of the stakeholders that participated in the management at the regional level and in each of the demonstration projects. Care was taken to avoid creating parallel structures, but to provide the official stakeholders the mechanisms that facilitate dialog and coordinated activities.

Figure 1. Flowchart for the coordination and management of the Project



Steering Committee

The Steering Committee, organized as previously described, was the highest organisms of the Project and met five times to approve working plans of the countries and other duties to ensure the Project's success. Every significant change to programs and budget were approved at this level. The Steering Committee met twice at PAHO's Headquarters in Washington, twice in Mexico and once in Guatemala. (Table 9 and Annex 5).

Table 9. Meetings of the Steering Committee 2003-2008. Project DDT/UNEP/GEF/PAHO

No.	Venue and Date	No. of participants	Summarized objectives
1	Washington, D.C, 25 November 2003	28	1. To organize the Steering Committee and operational procedures. 2. To approve the regional and country working plans. 3. To present the terms of reference of the demonstration projects. 4. To present the actions of the Commission for Environmental Cooperation of North America, CEC.
2	Guatemala City, 30-31 March 2005	35	1. To evaluate the first year of activities of the Project. 2. To approve the working plans for the second year. 3. To analyze and approve the Project's programmatic changes.
3	Washington, D.C, 30-31 August 2006	39	1. To evaluate the activities for the September 2003 to July 2006 period. 2. To approve the working plans for the final period from August 2006 to June 2007. 3. To approve the Project programmatic changes.
4	Cancun, Mexico, 18-20 April 2007	56	1. To present the Project's progresses at the regional and country level for the 2003-2006 period. 2. To approve the working plans and budgetary adjustments for the Project's final phase.
5	Mexico D.F, 1-2 July 2008	101	1. To present the Project's results at the regional and country level for the 2003-2008 period. 2. To disseminate the Project's achievements through a press conference.

Regional Technical Committee

The Regional Committee was composed by the Regional Coordinator, the focal points from health and environment, the national coordinators, PAHO, CEC, CCAD, and members of the civil society in the demonstration projects. Met three times in Mexico, Costa Rica and Panama to be informed regarding the Project's progresses, to propose technical adjustments and to exchange experiences. (Table 10 and Annex 6).

Table 10. Meetings of the Regional Technical Committee. Project DDT/UNEP/GEF/PAHO

No.	Venue and Date	No. of participants	Summarized objectives
1	Huatulco, Mexico, 24-28 May 2004	32	1. To analyze and approve the operational guidelines for the demonstration projects. 2. To train in its use to the eight participating countries and reach operational agreements.
2	San José, Costa Rica, 12-14 September 2005	39	To evaluate and plan technical and administrative activities in its current implementation stage.
3	Panama City, 25-27 April 2006	63	1. To review the mid-term evaluation report submitted by UNEP/GEF. 2. To reach agreements to implement the recommendations.

National Operational Committees

In all the countries National Operational Committees were organized under the leadership of the Ministries of Health and PAHO, with the participation of the ministries of the environment, universities, institutes, in some countries like Nicaragua, Honduras and Guatemala participated representatives from other projects from external cooperation such as the Global Fund, Health in Action and others. One of the weaknesses found was the slow organization of these committees and the lack of consolidation; however, this situation was solved when the Project was showing results to the national authorities. The operational committees met at least six times a year to reach agreements in the project's operations in each country.

Groups of the demonstration areas

The demonstration area groups operated in each country closed to the demonstration project and were formed by the national coordinator, the health focal point representing each governmental administrative unit (departments, districts and municipalities), environment, education and other sectors at the local level, representatives from NGOs and the civil society involved in the Project DDT/GEF/PAHO.

Community working groups

In all the demonstration communities working groups were organized to address in a comprehensive manner the malaria problem taking advantage of current structures in order to avoid creating parallel organizations. In Panama these were channeled through the health committees and other organizations. In Guatemala through the Health Action Groups (GAS), responsible of the malaria control process and administered the resources provided by the Project and in Honduras through community foundations and religious action groups. In al the countries malaria volunteer collaborator (COLVOL) were involved, and is a figure known in all the countries since the 50's (Table 4)

Guidelines to the local levels

Guidelines to the local levels were provided at all times through the official channels from the ministries of health and the environment in order to preserve the institutionalism of the decisions, therefore the role of PAHO was that of support and facilitation. Meetings, workshops and joint supervisions enabled PAHO to have direct contact with the communities and institutions from the local level, aware of the directive role from the ministries. The Project's progress control was carried out through reports, meetings and technical supervision. Autonomy of the demonstration projects was maintained since the resources were decentralized to the administrative levels closest to the communities. Although in the Central American countries health systems remain centralized, PAHO ensured resources at the local level though agreements with local governmental agencies. In Mexico there was more autonomy since the specialized malaria structure was not affected by the reform of the health sector, as was the case in the rest of the countries.

IV. USE OF THE PRODUCTS

The Project's products and results were widely disseminated at the national and international level. Experiences, methodologies and knowledge gathered were published and are available in

web sites and libraries of the countries and in PAHO. During the fifth and last meeting[21] of the Steering Committee on July 1-2 2008 this fact was confirmed by representatives from the eight countries by signing a declaration recognizing for the Project's successes and for rescuing the methodology of malaria control that have been abandoned during the last three decades.

V. DEGREE OF ACHIEVEMENT OF OBJECTIVES AND RESULTS

With the implementation of the project it was achieved the general objective of avoiding the reintroduction of DDT for malaria control in Mexico and Central America through the demonstration and dissemination of vector control techniques without DDT or other persistent pesticides. By obtaining with the project a 63% reduction of malaria cases in 202 demonstration communities in Mesoamerica without DDT or any other type of pesticide significantly contributed to achieve the Project's general objective. This Project's contribution is part of the efforts undertaken by the countries to achieve the goals of the DMG and the goals of the Roll Back Malaria Initiative for 2010. It was also useful the framework document and the Project's technical guidelines that were used for the implementation of organization, training and awareness activities of the national, sub-national and community teams in each country.

VI. CONCLUSIONS AND FACTORS CONTRIBUTING TO SUSTAINABILITY

CONCLUSIONS

Below there is a summary of the main conclusions and factors for sustainability.

1. PAHO and the Governments of the eight countries (Ministries and Secretariats of Health and the Environment), supported by the Commission for Environmental Cooperation of North America (CEC) and the Central American Commission for the Environment and Development (CCAD) implemented the Project's activities according to the agreements of the Steering and Technical Regional Committees.

[21] Acta declaratoria de la quinta reunión del Comité Directivo del proyecto DDT/PNUMA/GEF/OPS. México, Distrito Federal, 2 July 2008.

2. Expansion and implementation of the malaria integrated control model without using DDT based on the Mexican experience and the global strategy Roll Back Malaria in eight Mesoamerican countries with varying degree of capability in their national response.
3. A 63 percent reduction of malaria cases in the demonstration areas between 2004-2007 and to 86.2 percent the cases of malaria caused by *Plasmodium falciparum*, the specie that causes the most severe morbidity and mortality in the world, without registering a single death due to this disease.
4. Acted upon the Millennium Development Goal (MDG) number 6 that attempts to curb and revert the incidence of HIV/AIDS, malaria and other diseases by 2015. The reduction of malaria cases in communities historically endemic is part of the efforts undertaken by the countries to achieve the MDG and the goal of the Roll Back Malaria initiative to reduce malaria cases in 50% by 2010.
5. The Project's success can be attributed to the simultaneous combination of several control measures (diagnosis and treatment, elimination of breeding sites, elimination of human reservoirs), to the inter-cultural and inter-sector approaches, as well as the high degree of community organization and mobilization. Conditioned to the surveillance and control established by the benefited and neighboring demonstration communities, that were also indirectly benefited by the Project's influence.
6. The impact achieved in the demonstration communities can also be attributed to the duration of presence and number of visits from the vectors staff, community work and technical cooperation from PAHO through the national professionals assigned by the Project, which ratifies the need to stratify and implement interventions with more persistence and periodicity in priority communities with history of high transmission.
7. Malaria control is no longer exclusive of vector control technicians, by retaking the management and supervision by the structures from the ministries of health, the community and the municipal governments, which strengthened the technical performance of malaria technicians and linked with other sectors from the civil society.
8. The combination of strategic actions revitalized the institutionalism of the malaria national programs, to place the malaria problem back in the political and technical agendas of the countries.

9. The network of laboratories organized in trained to evaluate other persistent organic pollutants; therefore, the countries have now another tool to comply with the commitments of the Stockholm Convention for the reduction of these toxic substances.
10. The joint action from the health and environment sectors were benefited, as well as the performance of other external cooperation projects investing in malaria and supported by the model proposed in this Project.
11. In relation to the regulatory framework of the Basel Convention, progress was made in the adequate final elimination of 200 tonnes of POPs ill stored and posing a high human and environmental risk, from which 136.7 tonnes are DDT and 64.5 other POPs (toxaphene, chlordane HCB, aldrin, dieldrin, and mirex). Due to the new regulations enacted by the European Union and the delays from TREDI, this component will be concluded in 2009, a process that was initiated in 2004.
12. The Project's adequate management was thanks to the organization of a Steering and Technical Regional Committees, and the operational implementation was guaranteed by the national focal points appointed by the ministries of health and the environment from each country.
13. Having a regional coordinator and national coordinator in each country was beneficial, by solving the effects derived from the instability in the countries caused by changes in governmental administrations, emergencies due to natural disasters, labor conflicts and strikes, and others. But particularly to provide health technical cooperation to the countries, to supervise, implement and evaluate the demonstration projects.

FACTORS CONTRIBUTING TO SUSTAINABILITY

1. Therefore it is expected to have had ensured sustainability due to the high perception achieved during implementing the Project, demonstrated by a marked reduction of malaria cases; adequate coordination between projects (DDT/UNEP/GEF/PAHO and the Global Fund), the ministries of health and the environment; as well as a rapid adherence from the countries to the Project's objectives, which was achieved with the participation in the design, execution, implementation monitoring and final evaluation, which could be useful for the continuity and historical memory of the project.

2. The strategy prioritized the vector elimination in its immature phases with low-cost techniques independent of external resources. Community interventions for vector control were adopted by most of the population from the demonstration communities.
3. Cost for the State, community and other key stakeholders were lower due to the targeting strategy used as well as selective interventions, as well as the community contribution, which could account for a reduction of more than 50% to that of operational costs using chemical substances, without taking into consideration the danger posed to human health and the environment.
4. the trans-disciplinary and inter-sector approach of the Project with the participation of the municipalities and indigenous organization was maintained throughout interventions. This level of mobilization reached could become a guarantee that the community could demand continuing the Program.

VII. RECOMMENDATIONS

1. To identify the strategies, as well as the national and regional sources of funding that could support the countries in the Region of the Americas and throughout the world to expand the model in other areas with high transmission.
2. To continue the promotion and dissemination of the Project's achievements and experiences with regional and global reach.
3. To consider for the design of future complex projects with regional scope in several countries six years for the organization and institutional arrangements, implementation, evaluation and preparation of final reports.
4. For future projects for malaria integrated control without using POPs to empower the civil society and their legitimate leaders from the design phase until the final evaluation as an strategy for liong-term sustainability.

VIII. NON-EXPENDABLE ITEMS (value above US $ 1,500).

Concluded the inventory of non-expendable items purchased with Project's funds and prepared a proposal for its final destination, which is part of this final report.

IX. DIFFICULTIES

The main difficulties faced during the Project's implementation were as follows:

1. Mos of the countries faced great difficulties to obtain the formal approval from the ethics committee, particularly to obtain blood samples in children, thereby recommending extreme caution in future projects in order to save time in this matter.
2. Breach of contract from TREDI for the elimination of DDT and other POPs.
3. Labor instability from the national counterparts, national emergencies due to natural disasters, strikes and outbreaks due to reemerging diseases.
4. The need to undertake additional efforts to adapt the educational and dissemination materials to the cultural characteristics of each country and for indigenous populations.
5. At the beginning of the projects the national counterparts identified during the PDF phase did not were in their positions, therefore it was necessary to start all over the advocacy, awareness and information process.

ANNEX 1
PROJECT DDT/UNEP/GEF/PAHO
DESCRIPTION OF PLANNED AND IMPLEMENTED ACTIVITIES/COSTS AND RESUTLTS OBTAINED
September 2003 to December 2008

Project's component and objective	Expected results	Activities programmed	Activities implemented and results obtained	Implementation %	Costs in US$ (Total for 3 years)
Component #1: Demonstration Projects and Dissemination. Objective: implement, evaluate and disseminate 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 socioeconomic conditions. Document each experience and evaluate the cost effectiveness of the different methods.	Successfully implemented and evaluated 9 demonstration projects of malaria control without using DDT in Mesoamerica, 1 in each of the 7 Central American countries and 2 in Mexico, under specific ecological conditions, using a set of integrated malaria control methods without DDT. Whose results were documented and published, but more importantly, made 6 scientific papers not originally considered in the Project's design phase. The geographic location of the 9 demonstration projects was defined during the PDF-B phase and ratified on 2004 according to the local needs of each country. Included different malaria vectors, endemic levels of the disease, environmental conditions, climatic and socioeconomic (Annex 2). The 9 demonstration projects were implemented in 202 demonstration communities of 52 municipalities, directly benefiting 159,018 inhabitants and indirectly a population at risk of 6, 845,000, which accounts for 29% of the population living in highly endemic areas of Mesoamerica. In summary, the benefited countries adopted and adapted the "***integrated malaria vector control model***", with alternative techniques without using DDT or other pesticides, with high community participation and empowerment, demonstrating that the alternative methods are replicable and sustainable, which contributes to prevent any initiative for the reintroduction of DDT in the region for malaria control. The impact in the reduction of malaria cases in these areas was highly significant. In the 202 demonstration communities there was a 63% reduction in the number of people with malaria with field interventions and without using DDT or any other pesticide (Table 1). There was a reduction of 2,439 people with malaria in 2004 to 914 in 2007, exceeding the goal of reducing malaria morbidity by 50% by 2010. This accounted for savings for the health systems, communities and families due to the cost of care and working days lost of 1,525 events avoided. Also cases due to *P. falciparum* were reduced from 29 to 4 cases, a 86% reduction, which is relevant due to the severe mortality and morbidity caused by this specie. These communities did not reported mortality due to malaria during the Project's period.	100%	$2,533,014
	1.2 Community participation and educational strategies to build public awareness on new strategies for malaria vector control and the	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	This activity reflects that the Project was highly participative, decentralized to the municipalities and communities. The strategic axis was community participation of municipalities and indigenous populations, supported by staff from the health, education and environment sector.	100%	$69,863

	negative effects of DDT use.	emphasize and support local community participation in the process of alternative malaria vector control strategies, and to strengthen the activities of local health services.	Reports from the countries recorded a total of 888 meetings or workshops (Table 11). Three quarters of these meetings were developed at the local level (668 meetings). Also reported a total of 21,306 participants to said meetings, where 54% accounted for community personnel (11,459), the rest was institutional personnel, both from the education, environment and health sectors, mayors and other officials.		
	1.3 Strengthening 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 and communication plan with participation of NGOs and educational, environmental and health national sectors, to support the evaluation of DDT and other newly introduced pesticide effects on human health and environment, as well as to create awareness on DDT and integrated methods of malaria control of population in risk areas.	This result was highly successful. Final analyses enables to conclude the following: - Initial communication plans were very weak in contents and traditional educational strategies. - The experiences helped to reissue the communication and dissemination plans, adding elements of popular education and with cultural respect. - Educational techniques mostly used were puppets, plays, dramas, popular art and others, which enabled interaction and inclusion of multiples actors. - Use of different dissemination materials from photographs, brochures, posters, flipcharts, videos, educational board game PALU, to published documents such as manuals, guidelines, and materials generated with the geographic information system (GISEpi)(Annex 3). - In the transference and dissemination stand out elementary education teachers, leaders from local churches, malaria volunteer collaborators and organized community groups, all supported by technicians from the malaria program and the environment sector from each country. - The Project's interventions for malaria control without DDT were accepted by the communities and received institutional support, since most of them relied on the ownership of knowledge. - As a result all the communities decided not to use any type of pesticide and to use it only in case of epidemiological emergency, which was reinforced by public awareness on the effects and risks of using DDT or any other pesticide. - The use of media such as radio and television was very restricted, due to the scarce access of the rural and indigenous communities with malaria.	100%	$ 53,676
	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 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.	Developed the Project's web page which includes virtual tools: • Sharepoint: Virtual connection among a selected group of people to access the Project's page. • Intranet/PAHO: For all PAHO's personnel • Internet: Information globally shared. • Virtual Library in Health and Environment (BVSDE): Information globally shared. • Links in the webpage of Project DDT/GEF in PAHO are: http://www.paho.org/spanish/ad/sde/ddt-home.htm http://www.paho.org/english/ad/sde/ddt-home.htm http://www.bvsde.ops-oms.org http://www.mex.opsoms.org/contenido/malaria/materiales.htm	100%	$ 37,384
	1.5 Risk assessment of environmental and health	1.5.1. Assessment of environmental and human exposure to DDT and	The Project developed a plan of institutional strengthening for malaria control without using DDT. This program comprised developing the	100%	$98,880

	effects of DDT, newly introduced pesticides, or other alternatives, in the areas and populations of demonstration project.	newly introduced pesticides in the areas of demonstration projects.	capability of 8 gas chromatography laboratories through training, technical cooperation, provision of equipment and risk assessment due to exposure to residual DDT and its metabolites in environmental and biological samples with the support from the University of San Luis Potosí, Mexico. The results from the assessment were used to prepare a scientific paper, thereby it was important to strengthen the laboratory network in order to perform a reliable assessment in each country. Thus, organized the first course on chromatography, a second course on sampling and risk assessment and a third course to analyze the results and prepare the paper. Laboratories were provided with equipment (microwave ovens for the extraction of samples, centrifuges, scales and other) and received continuous advice. Due to its importance below there is a brief description of the results and limitations faced: - Each Mesoamerican country (except Belize) selected a community sprayed with DDT in the past (Honduras, Nicaragua and Costa Rica studied more than one community) to collect environmental and biological samples. - Collected environmental samples from soil inside and outside households, and biological samples from fish and children under 10 years. In relation to fish there were two objectives: to establish a potential route of exposure to humans and as a biomarker for the presence of DDT and its metabolites in sediment and the food chain (bio-magnification). - Results indicate that aside a few exceptions, values agree with the elapsed time from prohibiting the use of DDT, which explains that the higher concentrations were recorded in Mexico country that use more DDT for malaria control and was the last country that discontinued its use (2000). - In relation to soil exterior samples from Costa Rica and Mexico showed values over 10% of the reference value. Honduras had more than 5% and the rest of the countries none (Nicaragua, El Salvador, Guatemala and Panama). - In reference to inside soil, again, Costa Rica, Mexico and Honduras showed more than 10% to that of the reference value and the rest of the countries none. It is important to indicate that for the case of Costa Rica and Mexico no values were reported for domestic soil. - The results from fish showed surprises since not were as expected, Nicaragua (in the community Nuevo Amanecer) and Panama, showed more than 40% from the samples analyzed values above the reference. The third country facing this situation was Mexico (which is not surprising). - But perhaps the most important results was having found child exposure in practically all the communities studied, but particularly for DDE. That means an old exposure. Mexico had the largest concentration compared to that of the remaining countries with percentage of children with detectable values (90%). - Costa Rica in inside and outside soil had more DDT than DDE,		

			which means a relatively recent exposure whose origin could be uncontrolled use. - With all this information it is possible to state that the project was a success because now there is evidence of environmental presence (external and internal soil) and exposure to DDT in biota (fish) and children in Mesoamerica. This will facilitate surveillance that avoids the illegal use of the substance and enables to initiate intervention programs to reduce the risks found. Likewise, the network of laboratories organized is in the capacity to analyze other POPs, and y therefore, the countries could comply with the agreements reached in the Stockholm convention for the reduction of these toxic substances. - Among the limitations found, stand out the ethical component. Most of the countries faced great difficulties to obtain formal ethical approval, particularly to collect blood in children, therefore it is recommended to be careful in future projects to save time at this level.		
		1.5.2 Identify and map areas previously sprayed with DDT which are under risk of contamination by DDT compounds and have this information in digitized format.	All the Project's communities were geo-referenced and there is a data base on the Project's files, as well as the information related to malaria epidemiology and risk factors.	100%	$ 6,459
	1.6 Demonstration projects are evaluated with community participation, results are available in CD and printed format, and disseminated throughout the electronic platform and webpage.	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 participation of community, local NGOs, local health services, environment and agriculture technicians to plan and evaluate the implemented activities.	The main strategy of this project was to strengthen local capacity for malaria control without DDT, with community, municipal governments and indigenous population participation. At least 2 local meetings were held annually with the civil society and local technicians to evaluate demonstration projects in each demonstration area (Table 6). Likewise, in each demonstration community held training meetings to leaders and community groups, which enhanced their power to voice their opinion on the evaluations and the quality of the results. This national effort was strengthened with regional exchange activities among demonstration areas and discussion of the technical guidelines (Annex 4) which included field visits with delegated from different demonstration projects. Provided in these activities information and technical support to the initiatives from the civil society on malaria control without DDT in a language understandable by the population. With this it was possible to achieve support of the decisions from the direct beneficiaries throughout their local leaders, volunteer collaborators, organized community groups and other form of popular expression. As a final results, established a new paradigm of participation where the population is subjected to their own decisions, and the officials provide the necessary support of the desired changes. But also more important was that the communities already informed decided not to use any type of pesticide for malaria control and use it only in cases of epidemiological emergency. This decision can induce to several conclusions, one is that reinforced public awareness on the effects and risks of using DDT or any other pesticide.	100%	$42,147
		Subtotal for Project component #1		**$2,841,423**	
Component #2: Strengthening of national	2.1 Strengthened national institutional capacities for	2.1.1 Organize and provide support for a workshop in Mexico (Oaxaca)	Supported the participation of national authorities from health and environment in regional activities held in Central America, with support	100%	$28,698

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.	malaria risk assessment and malaria control without DDT.	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.	from the rest of the countries, achieving the activity's objective, since the participants were in contract with ongoing activities in each country (Annexes 4, 5 and 6).		
		2.1.2 Develop and print a technical manual addressing malaria control personnel, local farmers and migrant farm workers, providing technical information on alternative strategies for malaria vector control to be used under different ecological conditions.	An important milestone of the methodological boost was the development of the technical guide (*"Implementation Guide and Demonstration of Sustainable Alternatives for Integrated Malaria Control in Mexico and Central America")*, both in English and Spanish, in hard- and softcopy, with more than 2000 copies. Said guide was validated and approved by the 8 countries during the first meeting[22] of the Regional Technical Committee, held in Mexico, May 24-28, 2004 and disseminated in all the countries through national and regional meetings and workshops (Annex 4).	100%	$17,185
		2.1.3. 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 stockpiles disposal.	Prioritized as supporting material the technical guide and the Project'[s framework document, completed with additional educational material (Annex 3). With participation from delegates from the ministries of environment and health, indigenous leaders, mayors and local technicians, developed six international activities in different venues of the demonstration projects, which included visits to demonstration communities to exchange experience on malaria vector control methods without using DDT, preparing reports and published documents documenting the experience in each country: 1. Two meetings to discuss the technical guide (in Flores, Peten, Guatemala, June 2005, with the participation of Belize, El Salvador, Honduras, Mexico, Nicaragua and Panama; in La Ceiba Atlantida, Honduras, July 2005, with the participation of Costa Rica, El Salvador, Honduras and Mexico). 2. 4 regional forums to exchange experience between demonstration projects (in Bisira, Panama, 6-7 December 2005, with the participation of Belize, Costa Rica, Guatemala and Panama; in San Santa Fe, Colon, Honduras, 25-26 October 2006, with the participation of Belize, El Salvador, Guatemala, Honduras and Panama; in La Canoa, Jiquilisco, El Salvador, 27-28 November 2006, with the participation of Costa Rica, El Salvador, Honduras, Mexico, Nicaragua and Panama; in Peten, Guatemala, 13-17 March 2006, with the participation of Belize, Costa Rica, Guatemala, Nicaragua y Panama).	100%	$40,009
		2.1.4. Organize and implement	Each country organized at least three national training workshops on	100%	$57,593

[22] OPS/Proyecto DDT/PNUMA/GEF/OPS. "Memoria Primera Reunión del Comité Técnico Regional. Huatulco, Mexico, 24-28 May 2004.

		eight training courses for health and environment personnel as well as customs/import control personnel who will be involved in each of the demonstration projects on basic malaria epidemiology, malaria entomology, integrated malaria vector control methods, field operations and community participation techniques, taking into consideration the different vectors, endemic levels and different environmental and socioeconomic conditions in each country.	malaria vector control, field operations and entomology. This activity was reinforced with the Central American activities organized by the office of the regional coordinator, which include a course on entomology developed in Tapachula Mexico, by the Malaria Research Institute (CIP), aimed at 30 technicians form the countries (4/country and 2/Mexico, 13/11-9/12/2006), who upon return could organize local workshops in each demonstration project.		
		2.1.5. Strengthen reference centers for malaria control in the participating countries. Such as Mexico's Malaria Research Institute (CIP) and facilitate the regional exchange for information on malaria among laboratories and existing reference centers in the eight participating countries throughout the region-wide information network established by the project.	The eight countries, supported by PAHO, made an agreement with the Malaria Research Institute (CIP) to strengthen national malaria programs, microscopic diagnosis and entomology. As a result 30 technicians from the eight countries were trained at CIP for the entomological management of malaria and produced an updated manual on entomology. As part of the program, CIP provided direct technical cooperation to Nicaragua, sending consultants to develop an efficacy assessment of the treatment schedule of single dose.	100%	$77,257
		2.1.6. Establish a malaria surveillance system and exchange information on malaria control at the regional level.	Maintained malaria surveillance with exchange of relevant and timely information. Malaria programs from the eight countries had an active participation from the beginning of the demonstration projects and systematically exchanged information. Each country named two focal points, in the ministries of environment and health as national counterparts of the project. These focal points actively participated in the 8 meetings of the Steering and Regional Technical Committees, as well as in national and regional activities. This network of professionals linked with PAHO offices in each country established mechanisms to exchange information, experiences and active surveillance of malaria in the sub-region. Another important contribution was to establish two trans-boundary (Panama-Costa Rica; Mexico-Guatemala), taking advantage of the proximity of the demonstration projects. In both trans-boundary territorial units the local teams reached agreements on joint malaria surveillance, exchanged resources and established common control mechanisms of the migrating population, with more development in the Panama-Costa Rica unit. This experience was used to prepare a scientific paper with the participation from the eight countries, advised by a team of experts and coordinated from the office of the regional coordinator, with the support from SDE/PAHO/WDC, which is an useful tool to reinforce the need of malaria surveillance but through the use on new control method without persistent pesticides.		$15,000
		2.1.7. Short-term travel and local meetings for malaria control technicians to exchange experience	The eight countries supported travel and local meetings of national technicians to improve their performance to fight malaria without DDT. Benefiting directly and permanently the national focal points from health		32,799

		on alternative integrated malaria vector control techniques.	and environment (two per country). The ministries of health appointed projects liaisons at each level to overcome bureaucratic barriers (regions, areas and municipalities, in some cases demonstration communities), which produced more participation and training of technicians with less effort. Based on country reports approximately 9847 institutional technicians participated in local, national and regional training activities (Table 6).		
	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 y CINVESTAV-Mérida, LUCAM), Nicaragua (CIRA-UNAM), Panama (Instituto Gorgas), Costa Rica (MAG), El Salvador (Ministerio de Agricultura y Ganadería) and Central Laboratory of Belize, as well as the exchange of information among them and other institutions.	The eight countries established agreements and alliances with national institutions and laboratories to develop risk assessment due to exposure to residual DDT in Mesoamerica, that were equipped and provided with the technical capability of chemical analysis of environmental contamination using international standards as follows: - Belize made an agreement with the Belize Agricultural Health Authority's Central Investigation Laboratory. - Costa Rica with the Regional Toxicology Institute (IRET) of the National University. - El Salvador with the National Laboratory Dr. Max Bloch., Ministry of Public Health and Social Welfare. - Guatemala with the National Laboratory of the Ministry of Health. - Honduras with the Center of Studies and Control of Contaminants (CESCCO) of the Secretariat of Natural Resources. - Mexico with the University of San Luis Potosí to evaluate the residual action of DDT and provide technical cooperation to the eight countries to implement the study. - Nicaragua with the National Laboratory of the Ministry of Public Health. - Panama, with the Institute of Agriculture Research of Panama.	88%(Belize did not carried out the risk assessment)	$383,324
		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, georeferenced data, interpretation of results, data base for GIS application.	Supported by the University San Luis Potosí (USLP), Mexico, implemented a comprehensive program to develop the capabilities of national laboratories, one in each country. As a result, seven out of the eight countries developed a risk assessment due to residual exposure to DDT, and with the results prepared a technical report an a scientific paper. The program included 3 regional workshops for 16 laboratory technicians, 2 from each country. The first workshop was developed in the laboratory at USLP, aimed at 8 experts in gas chromatography and with a duration of 15 days, for the standardization of evaluation techniques. The second workshop in Guatemala for 8 technicians, one from each country, to train them in the selection of sites, sampling and protocols. The third workshop in Costa Rica, to review the results of the studies from each country and to reach agreements on the scientific paper. At the same time made an inventory of the capacity of each laboratory that used PAHO for the competitive biding and to provide equipment to the 8 laboratories according to national needs.	100%	$28,830
		2.2.3. Support the development of rapid inexpensive and easy to use assays for pesticide screening in human samples (based on ELISA or DELFIA) with collaboration of the Center on Environmental and	The ELISA test for DDT is available in the market and it iis not considered necessary to validate a new one.	0%	$0.00

		Occupational Health Impact Assessment and Surveillance (Quebec, Canada).			
		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 the international level through the participation ans support of internationally recognized institutions of excellence.	This activity was solved by implementing the comprehensive program (described under activity 2.2.29 supported by the University of San Luis Potosí, Mexico and the Regional Institute of Toxicology (IRET) of the National University of Costa Rica. Both institutions with recognized capacity, so provided the required support to the rest of Mesoamerican laboratories. Resources from this activity were reallocated to other line-items upon approval of the Steering Committee.	0%	$0.00
		2.2.5. Travel fellowship for qualified personnel for laboratory training for 8 technicians from Central American countries.	Organized a training course to Central American technicians in gas chromatography to assess DDT in environmental and biological samples. Each country selected a technician to be trained in the Department of Environmental Toxicology of the School of Medicine of the University of San Luis Potosí, Mexico, for 15 days. The course focused on DDT analysis and its metabolites in the samples evaluated during the Project (soil/sediment, fish and blood). Nicaragua received special follow up due to low technological level through direct technical cooperation and technical assistance from IRET Costa Rica to conclude the analysis of blood samples.	100%	$36,989
	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.	The greatest progress observe through the implementation of GIS was methodological. With this tool the countries were able to perform micro- and macro-stratification of malaria, more precision in risk factors and targeting interventions for integrated malaria vector control. Digital maps, geographic data and related statistics were used for the transference of knowledge. With the exception of Honduras, the rest of the countries not only developed this tool, but expanded it to other areas of transmission.	100%	$202,477
		2.3.2 Organize, prepare and print a substantive final report (CD and book format) to disseminate the information on the results of the demonstration projects, information and maps of malaria risk areas, strategies for malaria control in different ecosystems without using DDT and analysis of effects of	Completed the Project's final report showing the results of different strategies for malaria control without DDT under different ecosystems and socioeconomic conditions, with illustrations in color, maps and information on malaria risk areas, data on effects of DDT exposure on human health and environment.	100%	$ 57,457

		DDT and alternative pesticide exposure on human health and environment at the sub-regional level.			
		Sub-total for project component #2		**$977,618**	
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. Elimination of existing DDT stockpiles.	3.1. Adequate disposal of 135 tonnes of DDT identified during PDF-B phase: Belize 13; Costa Rica 9; El Salvador 6; Guatemala 15; Mexico 87; Panama 5.	According to the regulations of the Basel convention, progress was made in the final elimination of 200 tonnes of POPs found inadequately stores and with high human and environmental risk, from which 136.7 tonnes are DDT and 64.5 other POPs (toxaphene, chlordane HCB, aldrin, dieldrin, and mirex). Due to new regulations enacted by the European Union and delays from TREDI this component will be concluded in 2009. Most important actions are described below: 1. During PDF-B phase (2000-2001), a total of 135 tonnes of DDT were estimated in six countries. 2. During the first meeting of the Steering Committee on 2003 ratified the decision to continue the elimination of POPs stockpiles in Mesoamerica. 3. On 2004/2005 updated the inventory finding 136.7 tonnes of DDT and 64.5 of other POPs (toxaphene, chlordane HCB, aldrin, dieldrin, and mirex), including Nicaragua and Honduras. 4. Between July 2006 and February 2007, requested to 15 specialized companies recommended by FAO to submit proposals, received four proposals and TREDI from France was selected signing the contract on March 2007 to repackage, transportation and final elimination of POPs. 5. On April 2007 TREDI performed on-site verifications of sites and materials, contacting national authorities and local PAHO offices; as well as trained national technicians for the national and international arrangements. 6. On May 2007 received in Central America certificate material for repackage of POP´s from TREDI in Holland. 7. Between July and August 2007 preparation and signature of notification and request of transit documents of the Basel Convention from the eight countries. 8. New international European regulations related to notification and request of clearance of transit became effective. This new regulation (EC 1013/06) forced all the countries to modify the documents already signed, including the transit requests. 9. October 2007, repackaging of 60 tonnes of POPs in El Salvador and repackage of 55 tonnes of DDT in Mexico (February 2008). 10. On March 2008, PAHO met with TREDI officials to analyze the reasons for the breach of contract. This meeting was prompted due to numerous letters and e-mails requesting TREDI to fulfill the contract. 11. TREDI requested the first increased in the amount of the contract arguing dollar devaluation in relation to Euro and having found 70 additional tones of POPs. Due to said request, PAHO offered a $66,000.00 additional for adding 7.5 tonnes of DDT and to cover	30%	$633,556

			additional administrative costs. 12. In response to the delay PAHO arranged an urgent meeting with the eight focal points from the Basel Convention in Mesoamerica in Nicaragua on May 21, 2008 to update the processes for the application of the Basel Convention, with participation from TREDI and PAHO. 13. On June 2008, seven countries submitted they transit authorization to Central America and Europe (Mexico completed until September 2008). 14. On October 2008, TREDI submitted to PAHO a new contract adjustment proposal with an increase of almost 100%. The contract signed on March 2007 was for $500,000 and the new request was for US$978,132.96. 15. On October 25, 2008, no country had received transit authorization from Europe. Guatemala issued transit authorization to Mexico and Belize. Costa Rica issued authorization to Panama. Honduras is reviewing the request from Guatemala, Mexico, El Salvador, Nicaragua and Belize. 16. PAHO's Legal Office is in contact with TREDI in order to obtain the contract fulfillment according to the terms established.		
		Sub-total for project component #3		**$633,556**	
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 during the period of 32 months (approximately $690,028). Hire and support other consultants as required to support coordination of projects in administrative and technical issued (approximately $174,217).	PAHO hired a regional coordinator, Honduran, located in Guatemala, from 16 June 2004 to 31 December 2008. Also hired short term consultants to support the eight countries in the national projects (approximately $ 174,217). Performance of the regional coordinator guarantee the integrality in the entire sub-region, and maintained coordination, supervision and follow up of the project in Mesoamerica, recognized by the countries, PAHO and UNEP/GEF.	100%	$969,282
		4.1.2. Hire and support a national coordinator in each participating country .	Seven countries (Belize, El Salvador, Guatemala, Honduras, Mexico, Nicaragua and Panama) hired a national coordinator from June 2004 to July 3, 2008, approved by the Steering Committee**.** Mexico's national coordinator was hired until December 31, 2008 to follow up the activities pending to be implemented. In Costa Rica, national authorities decided not to hire a national coordinator, assuming the responsibility the international consultant from SDE/PAHO in the country. Fund for this position were distributed to other line items approved by the Steering Committee. At the conclusion of the project the performance of the national coordinators was regarded as outstanding, facilitating national coordination and communication and provided local and national technical cooperation, which was pivotal for implementing the project.	100%	$752,746
		4.1.3 Organize and implement 3 steering committee meetings (90,000)	Successfully held 5 meetings of the Steering Committee (Annex 5), with the participation of representatives from the ministries of health and environment of the eight countries, PAHO, CCAD, CEC, UNEP/GEF, special guests and representatives of leaders and technicians from the demonstration projects. In the fifth and last meeting of the Steering	100%	$153,256

			Committee, Mexico, 1-2 June 2008, with the participation of delegates from the demonstration projects, de countries signed a declaration of the contribution of the project in relation to the integrated malaria control without DDT and ratified the commitment to eliminate DDT and other POPs pending to carry out. During the five meetings the Steering Committee approved 44 agreements, achieving 93%, with the support from the Governments, national coordinators, focal points from health and environment, the regional coordinator y and support from PAHO.		
	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 work plan and discuss the results achieved with the project in each participating countries.	Held 3 meetings of the Regional Operational Committee with total participation from the eight countries (environment and health), CEC, CCAD and PAHO (Annex 6). These expended meetings with participation form leaders, mayors, indigenous, local officials and others, were key opportunities to discuss the integrated control model and to prepare work plans according to the needs and real scenarios in each country. The first meeting of the Operational Committee was held in Huatulco Mexico, 24-28 May 2004, to approve the technical guide of the demonstration projects; the second in San Jose Costa Rica, 12-14 September 2005, for the first monitoring of the demonstration projects and the third in Panama, 25- 27 April 2006, to make agreements on the recommendations from the mid-term evaluation carried out by UNEP/GEF. In total there were 19 agreements made by the Operative Committee, achieving 90%.	100%	$199,823
		4.2.2. Print 3 regional annual reports and prepare data for the electronic platform (web page and GIS) on the demonstration projects and all project activities.(15,000)	As of June 2004 Each country prepared 18 quarterly reports, used by the regional coordinator to prepare 20 quarterly consolidated reports submitted to UNEP/GEF and available in the Project's webpage. These reports were used for the systematic monitoring; assess limitations and strengths in the implementation of the project and finally for evaluation and documentation. These reports were powerful tools for management and timely decision-making.	100%	$ 25,000
	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.	Each country supported by the regional component and PAHO in Washington prepared educational material in printed and electronic form accessible for different audiences. Published 50 updated educational materials (Videos, manuals, guidelines, posters, flipcharts, educational games, photographs, presentations, banners, flyers and others, Annex 3), most refer to the methodology and strategy used by the project for malaria control without using DDT. Support from national and local groups trained by the project on pesticides and health (PLAG/SALUD), which was used as platform of the new DDT/GEF Project.	100%	PLAGSALUD
		4.4.1 Support public awareness campaigns and events related to malaria control in schools located in malaria risk areas.	From the beginning was considered a generational change. Elementary schools and teachers played a key role in this initiative. In demonstration communities schools became the ideal mean for the promotion and dissemination of the Project under PAHO’s initiative of Healthy Schools. Not only were receptive of knowledge, but became elements of change, using innovative means to convey the message of environment protection without pesticides.	100%	PLAGSALUD

		4.4.2. Support strategies to create a communication network among communities in malaria risk areas (PLAGSALUD)	The strategy used more frequently was exchange among demonstration and not-demonstration communities, and among demonstration projects and countries. Local leaders and technicians held reciprocal exchange visits and mutual support. National and international forums enabled cross-learning and motivation among groups. By the end of 2004, Panama demonstration project held the first exchange taking advantage the progress reached by the project in Costa Rica. Belize, the last to start the project, decided to join until their indigenous leaders and local technicians made direct contact mainly with the demonstration projects of Panama and Guatemala.	100%	PLAGSALUD
		Sub-total project component #4			**$2,100,107**
SUBTOTAL (project costs)					**$6,552,704**
Project support costos, PAHO (8%)					**$524,296**
Project preparation costs recovery					**$38,000**
PDF-B (already disbursed)					**$330,000**
Sub-total					**$7,445,000**
Returned to UNEP as requested (06-Nov-08)					**$ 50,000**
TOTAL					**7,495,000**

ANNEX 2

CHARACTERIZATION BY COUNTRY OF THE SITES OF THE NINE DEMONSTRATION PROJECTS INDICATED IN THE PDF-B PHASE AND CONFIRMED IN 2004

Place	Location and altitude	Environmental characteristics	Land use	Vectors: Anopheles predominant	Parasite: Type of Plasmodium	Health system	Community participation	Notes
BELIZE Districts of Toledo, Cayo and Stann Creek (17 demonstration communities) 20.000 inhabitants at risk approx. 10,000 Km.	89W/16.5 N ‹600 meters above sea level	Low and swampy Atlantic coast with lagoons, hills and valleys in the southern portion uplands, tropical and subtropical climate. Mean temperature between 23˚ C in December and 29˚ C in July. Annual rainfall around 2000 mm, with rain season from June to December. Vegetation: Mangroves, swamp forests close to rivers and parklike savanna in the coastal plains.	Agriculture: low scale staple grains; citrus fruits and bananas.	*An. albimanus.* *An. vestitipennis y* *An. darlingi*	*P. vivax (99%)* *P. falciparum*	Governmental health system with frequent external support from foreign countries.	Weak. There is no culture of health participation. Programs to foster participation are also weak. With Project participation from Cayo District was high, probably because the health infrastructure is strong.	Immigrant workers from Guatemala, Honduras and El Salvador, which complicated epidemiological surveillance.
COSTA RICA Huetar Atlántica (Cantón Talamanca) 32,661 inhabitants at risk Area: 2,809 km²	84W/9N ‹1000 meters above sea level	Mountains flanks and tablelands volcano fertile 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 (3200 mm); tropical broadleaf forest cover most of the area, while palms and mangroves thrive in the coastal plain.	Agriculture: bananas and organic cocoa.	*An. albimanus* (predominant)	*P. vivax (100%)*	Good coverage of medical service by the CCSS.	Well established and active	Easy access, immigration from Panama and Nicaragua, indigenous area (some with difficult access) and other ethnic communities. Border with Panama demonstration project.
Cantón Matina (Expansion of the demonstration area as of 2006) 44,798 inhabitants at risk Area 772.6 km^2	83 W/10N < de 50 meters above sea level in the transmission area	Mountains flanks and tablelands volcano fertile to swampy coastal plains; hot and humid climate	Banana industry	*An. albimanus*	*P. vivax (100%). In 2006 mixed outbreak of P. vivax-falcipaum (236 cases) controlled with first line medication CQ+PQ and other integrated care measures*	Good coverage of medical service by the CCSS.	Well established and active	Intense immigration of unstable and illegal workforce asymptomatic carriers and increase of susceptibles in the banana area of high reception, high rain and areas subject to flooding
EL SALVADOR Sonsonate (Armenia, Acajutla), La Paz (San Luis La	90W/14N ‹500 meters above sea level	Pacific lowlands and coastal hills; tropical climate (hot and humid) varies with altitude (annual average 23˚C; hottest months are April and May, rainy season from May to	Agriculture: coffee and sugarcane, corn, rice, livestock.	*An. albimanus*	*P. vivax*	Good network of rural medical services, 20 health service units in the area	Very good. Then project increased to 180 volunteers for malaria control in the area.	Immigration of workers from Nicaragua and Honduras during the season to

Place	Location and altitude	Environmental characteristics	Land use	Vectors: Anopheles predominant	Parasite: Type of Plasmodium	Health system	Community participation	Notes
Herradura, San Luis Talpa, San Pedro Masahuat), Usulután (Jiquilisco) y Santa Ana (El Porvenir) 120,000 inhabitants at risk.		November (1800 mm/year. Tropical grassland and deciduous broadleaf forest.						collect sugarcane.
GUATEMALA Petén Sur, Alta Verapaz, Quiché (Ixcán). Population 360,000 inhabitants at risk.	90W17N ‹ 600 meters above sea level	Flat interior region, tropical climate, average temperature 37˚C (30 to 40˚C) in the northern part, rains in winter (the entire year in Petén), tropical rainforest.	Hardwood forest, livestock production	*An. albimanus (*predominant*) An.pseudopunctipennis. An. Darlingi (*north) *An. Albimanus (*south)	*P. vivax* (in general) *P. falciparum*	Weak governmental, mainly in Ixcan. 10 physicians per 100,000 inhabitants	High community participation, strengthened by the project without creating parallel structures.	Good access with exception of Petén where access is only possible by boat on Río la Pasión
HONDURAS Department of Colon, municipalities of Balfate, Sava, Bonito Oriental, Trujillo y Santa Fe; and Department of Atlántida, Municipality of Jutiapa. (Total 6 municipalities). 280,000 inhabitants at risk. Area 10,247 km²	87W/16N ‹1000 meter above sea level	Interior uplands and low ranges extending to swampy coastal lowlands. Climate: hot and humid in lowlands (average 30˚C), but upland interior is cooler and drier, little variation in temperature throughout the year, rain from May to September (about 2700 mm/year) and dry season from December to April. Vegetation: evergreen tropical rainforest and swamps.	Cattle ranching and agriculture: Palm oil, banana and citric fruits for exports; maize and rice for local consumption.	*An. albimanus* (in winter) *An. darlingi* (in summer)	*P. vivax (93%)* *P. falciparum*	Governmental with satisfactory health service coverage.	Excellent. Since the 70's formed a network of volunteer community leaders and from the 90's participation of municipal governments. Strengthened with the Project and communicated with leaders from Mesoamerica.	Stable population area, internal immigration among communities for religious, commercial and labor reasons, which increase risk of high transmission of malaria and other diseases.
MEXICO Oaxaca, Chiapas Population: 2.800.000 inhabitants at 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˚. Tropical dry broad leaf forest.	Corn, citrus fruits, papaya, coffee, timber, livestock, tourism.	*An. pseudounctipennis* (winter) *An. albimanus* (summer)	*P. vivax*	1 physician per 1,000 inhabitants	Good	Experience with malaria control without DDT. Temporary migrant workers from other parts of the country in the south (Chiapas and Tabasco) with Guatemala
Sonora, Sinaloa,	108W/27N	3 main environmental units Pacific	Livestock, coffee,	*An.*	*P. vivax and*	Good	Good	Remote areas with

Place	Location and altitude	Environmental characteristics	Land use	Vectors: Anopheles predominant	Parasite: Type of Plasmodium	Health system	Community participation	Notes
Chihuahua, Durango. Population: 3,000,000 inhabitants at risk.	200-1.200 meters above sea level	marshy coastal lowlands with river deltas descending from the western Sierra Madre, piedmont ridges with isolated hills and slopes, interior lava plateau with fertile soil. Hills and the plateau highly productive with irrigation. Semiarid climate with rainfall concentrated from June to December; average temperature from 20-35˚C.	timber and tourism.	*peseudopunctipennis (winter).* *An. albimanus and* *An. vestitipennis*	*P. falciparum (imported)*			endemic malaria
NICARAGUA Chinandega (13 municipalities) 180.000 inhabitants at risk	86W/12N ‹500 meters above sea level	Pacific coastal low lands 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 grassland with forest along rivers.	Agriculture: sugarcane, corn, bananas, peanuts; recent commercial shrimp fishery.	*An. albimanus*	*P. vivax (97-98%)* *P .falciparum*	7.3 physicians per 10000 inhabitants	Good network of volunteers, participate in the cleaning of mosquito breading sites	60% of the population in the coastal zone. Migratory workers from El Salvador and Honduras.
PANAMA Health area Salud Bocas del Toro, District of Changuinola (Guabito Plata, Guabito Centro, Las Tablas, Puente Blanco, Las Mesas, Barranco Adentro,) Region Ngobe Buglé, District Kankintu (Bisira) Region Ngobe Buglé, District Kuzapin (Kuzapin) 55,000 inhabitants at risk	77,5W-8,5N ‹1200 meters above sea level	Caribbean coastal lowlands very rainy tropical climate (3000 mm rainfall per year), rains on most days throughout the year, tropical broadleaf forest.	Agriculture: banana plantation for export (with intensive use of agrochemicals), potatoes, sugarcane, coffee and others.	*An. albimanus*	*P. vivax*, presented in outbreaks (not endemic).	Good assistance of health services in Changuinola. Kankintu and Kusapin are indigenous areas with difficult access and lower health assistance.	Very good. With the project overcame cultural barrier that became as an example for Mesoamerica. Encourage participation of 2 health educators and 20 community participation promoters	Border with Costa Rica. Problem with drinking water (groundwater is no good). More than 50% of the population is indigenous. Most access to this region is by water. Migrant workers exchange with Costa Rica.

ANNEX 3
Project DDT/UNEP/GEF/PAHO
Educational material published by the countries and
Regional component 2003-2008

No.	Name	Copies
	DOCUMENTS PUBLISHED	
1.	PAHO/WHO. Programa de acción Integral para prevenir la reintroducción del DDT para el control de la malaria en Mexico y Centroamérica. *Diagnóstico Situacional de la Malaria y el Uso del DDT en Costa Rica.* San José, Costa Rica: PAHO 2001.	200
2.	PAHO/WHO. UNEP. *Programa Regional de Acción y Demostración de Alternativas Sostenibles para el Control de Vectores de la Malaria sin el Uso de DDT en Mexico y Centroamérica. (Presentación de Proyecto).* Washington, D.C.: PAHO/WHO**,** septiembre 2003. (Documento Marco, Regional).	1000
3.	PAHO/WHO.UNEP. *Regional Program of Action and Demonstration of Sustainable Alternative to DDT for Malaria Vector Control in Mexico and Central America.(Project Document).* Washington, D.C: September 2003. (Documento Marco, Regional).	1000
4.	Méndez-Galván, J; Betanzos Reyes, Velásquez-Monroy, O; Tapia-Conyer, R**.** *Guía de Implementación y Demostración de Alternativas Sostenibles para el Control Integrado de Malaria en Mexico y Centro América*. Mexico: Secretaría de Salud de Mexico, 2004. (Guía técnica Regional, español).	1000
5.	Méndez-Galván, J; Betanzos Reyes, A; Velásquez-Monroy, O; Tapia-Conyer, R. *Guide for the Implementation and Demonstration of Sustainable Alternatives for Integrated Control of Malaria In Mexico and Central America*. Mexico: Secretaría de Salud de Mexico, 2007. (Regional guide technical).	1000
6.	Ramirez Pinto, E; Rojas Almeida, R. *Primer foro Internacional sobre Salud de los Pueblos Indígenas e Interculturalidad*. Panama: PAHO/WHO, Diciembre 2005. (Regional).	500
7.	Ramirez, E. (ed.) ; Rojas, R (ed.); Serpas, M (ed.); Montoya, R. *III Foro Internacional sobre Control de la Malaria sin uso de DDT con la participación de Poblaciones Indígenas, Negras y Mestizas de Mesoamérica. Memoria: Construyendo alternativas innovadoras a partir del intercambio de experiencias entre los proyectos de demostración de Mesoamérica para el Control Integral de la malaria sin el uso del DDT.* El Salvador: PAHO/WHO, UNEP, Noviembre de 2006.	500
8.	*PAHO/WHO. Proyecto DDT/UNEP.GEF. Manual Cuidado con la Malaria. Nicaragua, Octubre 2006*	10,000
9.	El Salvador. Ministerio de Salud Pública y Asistencia Social. Dirección de Regulación. *Manual de Procedimientos Técnicos para el Diagnóstico Microscópico de la Malaria**.*** El Salvador: MSPAS, Octubre 2007.	200
10.	*PAHO/WHO. Área de Desarrollo Sostenible y Salud Ambiental (SDE**).** PALÚ, Guía del Facilitador: Juego educativo para la prevención y control integral de la malaria a nivel de los hogares y la comunidad, sin el uso de DDT ni otros contaminantes orgánicos persistentes**.** Washington, D.C: Marzo 2007.* (Regional).	*200 WDC* *1000 HON*

No.	Name	Copies
11.	PAHO/WHO. Área de Desarrollo Sostenible y Salud Ambiental. Área de Tecnología y Prestación de Servicios de Salud. *Guía de Sistematización. Experiencias en el Abordaje de Problemas Prioritarios con la Población Indígena, Afrodescendiente y Mestiza. Control Integral del Vector de la Malaria sin el uso del DDT.* Washington, D.C.: PAHO/WHO, julio, 2007. (Regional).	500
12.	PAHO/WHO. Área de Desarrollo sostenible y Salud Ambiental. Área de Vigilancia Sanitaria y Atención a las Enfermedades. Área de Tecnología y Prestación de Servicios de Salud. *Prevención, vigilancia y control de la malaria: Manual para líderes y agentes de salud de los pueblos indígenas y afrodescendientes. (Incluye CD y materiales complementarios)**.*** Washington, D.C: PAHO/WHO, Octubre 2007. (Regional).	500
13.	PAHO/WHO. Sustainable Development and environmental Health Area. Health surveillance and disease management Area. Technology and Health Services Delivery Area. *Malaria Prevention, Surveillance and Control: Handbook for Leaders and Community Health Workers of Indigenous and Afro Descendant People. Washington, D.C: PAHO/WHO,* December 2007. (Regional).	500
14.	PAHO/WHO. Proyecto DDT/UNEP/GEF. *Impacto de las Estrategias e intervenciones en el Control de la malaria en las comunidades demostrativas en 6 municipios de la Costa Atlántica de Honduras. 2004-2008. Honduras: PAHO/WHO, junio, 2008.*	200
15.	PAHO/WHO. Proyecto DDT/UNEP/GEF. *Rol de los Gobiernos Municipales y Autoridades Tradicionales en el Control de la Malaria sin el uso de DDT en Mesoamérica. Mexico: PAHO/WHO, agosto, 2007.* (Regional)**.**	200
16.	PAHO/WHO. Proyecto DDT/UNEP/GEF. *Instrumento Regional: Guía para presentar documentos de país; Diagnóstico o Línea Basal de Proyectos de Demostración*. Guatemala: PAHO/WHO, diciembre 2004. (Regional no publicado).	
17.	PAHO/WHO. Proyecto DDT/UNEP/GEF. *Experiencias en Comunidades Demostrativas de Honduras**.*** Honduras: PAHO/WHO, Marzo de 2007. (CD).	200
18.	PAHO/WHO. Proyecto DDT/UNEP/GEF. *Manual Operativo para la Vigilancia y Control de las Fases Inmaduras de los Vectores de Malaria en Guatemala*. Guatemala: PAHO/WHO, enero, 2007.	200
19.	PAHO/WHO. Proyecto DDT/UNEP/GEF. *Programa Regional de Acción y Demostración de Alternativas Sostenibles para el Control de la Malaria sin el uso de DDT en Mexico y América Central: Memoria de la Reunión de evaluación intermedia**.*** (Octubre: 24-26. Hotel Barceló, Managua, Nicaragua) Nicaragua: PAHO/WHO, 2006.	200
20.	PAHO/WHO. Proyecto DDT/UNEP/GEF. *Manual para la Educación: Títeres: Un Arte Milenario al Servicio de la Divulgación*. Costa Rica: PAHO/WHO, 2008.	200
21.	*PAHO/WHO. Proyecto DDT/UNEP/GEF.*	500

	Participación de la población indígena en el control integral de la malaria. La experiencia de Bisira, Comarca Ngöbe-Buglé, Panama. Panama: PAHO/WHO, 2008.	
22.	*PAHO/WHO. Proyecto DDT/UNEP/GEF Encuestas sobre Conocimientos, Actitudes y Prácticas (CAP): Una herramienta para el abordaje intercultural de la malaria. Panama: PAHO/WHO, 2008.*	100
23.	*PAHO/WHO. Proyecto DDT/UNEP/GEF. Guías de Bolsillo sobre "Cuidado con la Malaria", Octubre 2006 Nicaragua.*	10000
	POSTERS PUBLISHED	
24.	*Programa Regional de Acción y Demostración de Alternativas Sostenibles para el Control de Vectores de la Malaria sin el uso de DDT en Mexico y Centro América.* PAHO/WHO, 2007.	500
25.	*Regional Program of Action and Demonstration of Sustainable Alternative to DDT for Malaria Vector Control in Mexico and Central America*. PAHO/WHO, 2007	500
	TRIFOLIARES PUBLICADOS	
26.	Por la Salud de su Familia y de su Comunidad. Evita la Malaria o Paludismo. Organización Panamericana de la Salud. Panama.	5000
27.	V Reunión del Comité Directivo del Proy. DDT/GEF/PAHO. (Programa Regional de Acción y Demostración de Alternativas Sostenibles para el Control de Vectores de la Malaria sin el uso de DDT en Mexico y Centroamérica). Combatiendo la Malaria, Promoviendo el Desarrollo. Ciudad de Mexico, 1-2 de julio de 2008. (Regional).	2000
28.	*PAHO/WHO. Proyecto DDT/UNEP/GEF Brochures sobre "Cuidado con la Malaria", Octubre 2006, Nicaragua.*	5000
29	Programa Regional de Acción y Demostración de Alternativas Sostenibles para el Control de la Malaria sin el uso de DDT en Mexico y América Central. (Regional).	5000
	BANNERS PUBLISHED	
30.	Prevención y control integral de la malaria, Programa de malaria DDT/GEF/PAHO/WHO. Panama.	10
31.	V Reunión del Comité Directivo del Proyecto DDT/GEF/PAHO. Ciudad de Mexico, 1 y 2 de julio de 2008. (Regional).	10
32.	*PAHO/WHO. Proyecto DDT/UNEP/GEF. Modelo del Control Integrado de Vectores sin uso de plaguicidas persistentes en Chinandega, Uso de GIS en al análisis de información aplicado a malaria y Participación Comunitaria en el control de vectores. Nicaragua.*	2
33.	*Talamanca trabaja unida para prevenir la malaria.* Costa Rica: PAHO/WHO, 2008.	
	DVD PUBLISHED	
34.	PAHO/WHO. Proyecto DDT/UNEP/GEF. *Tratamiento Focalizado del Paludismo en Mexico: Modelo Ecológico con Trabajo Comunitario.* Mexico: PAHO/WHO, 2005. (Formato DVD, duración, 30 min.)	1000
35.	PAHO/WHO. Proyecto DDT/UNEP/GEF. *Focalized Treatment of Malaria in Mexico: Ecological model with community participation.* Mexico: PAHO/WHO., 2005. (format: DVD. Running Time, 30 min.)	1000
36.	PAHO/WHO. Proyecto DDT/UNEP/GEF. *Costa Rica 02/07, Malaria-Palu.* Fotos Proyecto DDT/GEF en Costa Rica.	100
37.	PAHO/WHO. Proyecto DDT/UNEP/GEF. *La Experiencia de El Salvador en el Control de la Malaria sin el uso de DDT.* El Salvador: PAHO/WHO, 2006. (formato: DVD)	100
38.	PAHO/WHO. *Programa de Control de la Malaria en Costa Rica. Palú* (Formato: DVD.)	2000
39.	PAHO/WHO. Proyecto DDT/UNEP/GEF. Combatiendo la malaria, promoviendo el desarrollo: V Reunión del Comité Directivo del Proyecto DDT/UNEP/GEF/PAHO (Julio 1-2, Mexico) Mexico: PAHO/WHO, 2008. (Regional).	150
40.	PAHO/WHO. Proyecto DDT/UNEP/GEF. T*ercera Reunión del Comité Operativo Regional del Proyecto DDT/UNEP/GEF. Abril, 2006, Panama).* Panama: PAHO/WHO, 2006.	50
	INFORMATION BANNERS	
41.	*El liderazgo Comunitario es esencial para la sostenibilidad de las acciones de Control y Prevención de la Malaria en Olivia y Paraíso de Talamanca. Doña Josefa Hernández es un ejemplo de compromiso y trabajo en esta comunidad.* Costa Rica: PAHO/WHO, 2008.	2
42.	*Educar sobre la Malaria puede ser divertido, el títere es una técnica milenaria que gusta a todas las personas. Pequeños y grandes lo disfrutan.* Costa Rica: PAHO/WHO, 2008.	2
43.	*El Liderazgo comunitario es esencial para la sostenibilidad de las acciones de control y prevención de la malaria. Doña Nena es un ejemplo de compromiso y trabajo en Luzón de Matina.* Costa Rica: PAHO/WHO, 2008.	2
44.	*Mujeres y hombres laboran juntos en la limpieza de canales en la comunidad de Olivia de Talamanca.* Costa Rica: PAHO/WHO, 2008.	2
45.	*Juguemos PALU. Aprender sobre la malaria puede hacerse divertido, sin importar la edad.* Costa Rica: PAHO/WHO, 2008	2
46.	*Los niños y niñas pueden participar en actividades de control biológico de la malaria por medio de peces.* Costa Rica: PAHO/WHO, 2008.	2
47.	*El trabajo y la mística de los funcionarios de salud es fundamental en las tareas de control y prevención de la malaria.* Costa Rica: PAHO/WHO, 2008.	2
48.	*Encalar las casas es una actividad familiar que permite mejorar el entorno de la vivienda y controlar el zancudo trasmisor de la malaria.* Costa Rica: PAHO/WHO, 2008	2
49.	*Comunidades activas Luzón de Matina, hacen posible el control de la malaria mediante la limpieza de canales.* Costa Rica: PAHO/WHO, 2008	2
50.	*Tomarse el tratamiento completo como hace Carlitos, es fundamental para curarse de la malaria. B-Line de Matina.* Costa Rica: PAHO/WHO, 2008.	2

ANNEX 4

PROJECT DDT/UNEP/GEF/PAHO.

MEETINGS ORGANIZED BY THE REGIONAL COMPONENT, WITH SUPPORT FROM THE COUNTRIES.

2003-2008

No.	Date	Venue	# of participants	Objectives		No.	Date	Venue	# of participants	Objectives
1	29 March to 2 April 2004	Guatemala	6	Preparation of the first draft of the technical guide.		**15**	25-26/10/2006	Santa Fé, Colón	100	First experience exchange forum of demonstration projects (Belize, El Salvador, Guatemala, Honduras and Panama).
2	5-9 July 2004	INCAP/Guatemala	3	Adjustment technical guide after being approved by the Operational Committee.		**16**	18/10-08/11/2006	Ecuador, Venezuela and Peru	9 (Honduras, Costa Rica and Mexico)	Dissemination of experiences in Andean countries: Ecuador, Venezuela and Peru.
3	11 May to 12 august 2005	San Luis Potosí, Mexico	8	Course on gas chromatography to facilitate risk assessment in health due to pesticides used in public health programs, one per country.		**17**	13/11-09/12/2006	Tapachula, Mexico	30	Diploma in entomology. 4 per country and 2 from Mexico.
4	11-13 March 2005	Bocas del Toro, Panama	27	Meeting border Panama-Costa Rica to reach agreements on border surveillance system.		**18**	15-19/08/2006	Belmopan, Belize	33	Technical support from staff demonstration projects of Guatemala to Belize.
5	13-18 June 2005	Flores, Petén, Guatemala	44	Training on the technical guide with participation of delegates from Belize, El Salvador, Guatemala, Honduras and Panama.		**19**	10-14/07/2006	Puerto Escondido, Mexico	23	Adaptation of the board game Palú.
6	13-18 May 2005	Honduras	33	Transference of GIS		**20**	13-17/03/2006	Petén, Guatemala	41	Fourth forum "Exchange of experience of the demonstration project". Participated Belize, Costa Rica, Guatemala, Nicaragua and Panama.
7	27 June to 1 July 2005	Honduras	44	Workshop to discuss the technical guide. Participated Costa Rica, El Salvador, Honduras and Mexico.		**21**	20-24/03/2006	Mexico	7	Reach agreements with the Malaria Research Center (CIP) of Mexico on entomology.
8	26-30 October 2005	INCAP/Guatemala	12	International course on site selection, sampling an protocol of risk assessment in health due to exposure to DDT.		**22**	05-09/02/2007	INCAP, Guatemala	33 (8 participants per country)	Course "Risk assessment on human health due to exposure to toxic residues", based on the Brazilian experience in using the methodology from the Agency for Toxic Substances and Disease Registry.
9	7-22 September 2005.	Guatemala, Costa Rica, Mexico and Panama	GUT (25), COR (23), MEX (15) PAN (38)	Mid-term evaluation visit.		**23**	14-17/05/2007	Belize	6	International visit to the Belize demonstration project.
10	06-11/11/05	Costa Rica	8 National coordinators	Project dissemination meeting with national epidemiology directors and malaria programs.		**24**	12-14/06/2007	Managua, Nicaragua	25	Analysis and processing of GIS data aimed at malaria officials in the countries.
11	06-07/12/05	Bisira, Panama	67	Second indigenous exchange forum of demonstration projects experts (Belize, Costa Rica, Guatemala and Panama).		**25**	26-28/02/2008	INCAP, Guatemala	25	Mesoamerican workshop health-environment to evaluate the demonstration projects, with epidemiologists and focal points from each country.
12	29/11 al 01/12/2005	Costa Rica	3	Healthy municipalities and malaria control (Costa Rica and Honduras).		**26**	08-12/06/2008	Guatemala	6	Review of scientific paper covering results of the demonstration project.
13	03-07/10/2005	Belize	16	Aplication GIS in Belize.		**27**	02-06/06/2008	Washington, D.C.	4	Review of scientific paper covering results of the demonstration project.
14	27-28/11/06	La Canoa, El Salvador	129	Third indigenous exchange forum (Costa Rica, El Salvador, Honduras, Mexico, Nicaragua and Panama).						

* As of third quarter of 2005, 10 teleconferences to discuss different aspects of Project implementation. Does not include meetings of the Steering and Operative Committees.

ANNEX 5

PROJECT DDT/UNEP/GEF/PAHO

SUMMARY OF AGREEMENTS OF MEETINGS OF THE STEERING COMMITTEE 2003-2008

NO.	DATE	VENUE	# OF PARTICIPANTS	ABRIDGED OBJECTIVES	SUMMARY OF AGREEMENTS
1	25 November 2003	Washington, DC	28	1. Organization of the Steering Committee and operational procedures. 2. Approve regional and country workplans. 3. Presentation of terms of reference of demonstration projects. 4. Presentation activities of North America Commission for Environmental Cooperation, CEC.	1. Ratify the Project main objective ”to demonstrate that the 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”. 2. Demonstration projects will be under constant evaluation and will be documented. 3. Participation from the environment, agriculture, education, private sector, municipalities, NGOs and others will be promoted in the National Committees. 4. Participation of the civil society and the communities should be strengthened in the Project’s planning, administration, management, implementation, evaluation and accountability. 5. Promotion of new approaches for malaria control will be implemented as part of an integrated and coordinated regional program according to the “Technical Guide”. 6. Results from the demonstration projects should be comparable and interchangeable. 7. The Project will facilitate the exchange of experience and lessons learned. 8. PAHO will administer a regional information system (Project’s webpage and Intranet) that will include data generated in the 9 demonstration projects. 9. Will provide reports according to the “UNEP/GEF Guidelines for Projects Management” to document the implementation of the project and its adequate evaluation. 10. Coordinate with other projects: POPs national plans, Global Fund (Nicaragua and Honduras), Roll Back Malaria and others. 11. Budget to update DDT inventories should be allotted to each country according to their specific needs (activity 1211).
2	30 -31 March 2005	Guatemala City	35	1. To evaluate activities during the first year. 2. To approve workplans for the second year. 3. To analyze and approve programmatic changes.	1. Strengthen national committees with the participation from the environment and agriculture, and the national technical commissions from the Stockholm Convention. 2. Each country will submit on June 30 a baseline with the pertinent indicators that would enable to measure interventions of the demonstration projects upon their conclusion. 3. The technical guide is the tool to implement the projects in the demonstration areas. Intensify implementation aware that the guide does no attempts to change malaria national programs, but it is the official tool to implement the demonstration projects. 4. Upon request from the eight countries, continue implementing GIS/DDT/GEF/INCAP and makit compatible with GIS Mexico. 5. Coordinate the development of entomology. 6. Adequate management of DDT and other POPs per Basel and Stockholm Conventions. 7. Feasibility study of the different alternatives for the destruction of DDT stockpiles. 8. Evaluate DDT concentrations in the environment, biota and humans in selected sites. 9. Prepare an expansion proposal until 30 June 2007 of the project based on the timetables of the countries. 10. Strategy for the Projects sustainability (April-july 2005). 11. Maintain the consensual spirit to reach relevant decisions.

3	30-31 August 2006	Washington, D.C.	39	1. Evaluate activities during the September 2003 to July 2006 period. 2. Approve workplans for the last period from August 2006 to June 2007. 3. Approve programmatic changes.	1. The Regional Coordinator, in consultation with UNEP/GEF, and the countries, can make budgetary transferences between the countries. 2. Conclude obligations contracted no latter than 30 June 2007 and make payments to September 2007. 3. Approved elimination, according to international conventions, of DDT stockpiles along with other POPs and other pesticides contaminated with POPs, quantified in the Project DDT/UNEP/GEF/PAHO. 4. The contract of the company responsible for repackaging, transportation and elimination is for the amount of $US 500,000.00. The regional coordinator will make the corresponding adjustments in the budget assigned to the countries to increase the initial line for the amount of $US 350,000.00, preferably using budget line 2101. 5. From result 8 (exchange of regional experience) from the Mexican budget will asign $US 100,000 for elimination of DDT and other POPs in Mesoamerica and $US 100,000 for activities of sub-regional technical cooperation among countries. 6. Upon request from Panama, Costa Rica and Honduras, the regional technical area of PAHO/HA/WDC in coordination with INCAP will provide direct technical support in GIS-Epi to each of these countries to strengthen the capacity of the local teams. 7. During the second semester of 2006 PAHO will implement a distance course on dangerous residues and its effects on health. 8. Awaiting opinion from the corresponding technical area from PAHO/WHO on the protocol of efficacy of TDU 3x3x3 and the current TCR guideline of each country for the treatment of *P. vivax* that adjust to operations and expand the evaluation to Guatemala and Honduras, according to the guidelines followed in Mexico and Nicaragua. 9. Deepen the epidemiological analysis in the demonstration areas with technical cooperation from PAHO's Malaria Regional Program and the Mexican Malaria Program. 10. Will implement a cours on entomology as an activity of the project with participants from Mexico and Central America. 11. The authority of the Basel Convention and/or the authority responsible identified in each country will be the contact with the company responsible of the final elimination of DDT and other POPs. 12. Organize the fourth meeting of the Steering Committee on February or March 2007. 13. Continue incorporating the health intercultural approach in the participating countries participating in the Project DDT/GEF.
4	18-20 April 2007	Cancún, Mexico	56	1. Present progress of the project by country and regional level during the 2003-2006 period. 2. Approve workplans and budgetary adjustments for the final phase.	1. Request the second extension for a 12-month period starting on July 2007. 2. Additional funds are not required for the extension period since there are available around US$ 2.4 millions. 3. Signature of the extension request attaching the request from the ministries in the countries.

5	1-2 July 2008	Mexico, DF.	101	1. Presentation of the results at the country and regional level for the 2003-2008 period. 2. Disseminate the project's achievements through a press conference.	1. Ratify the political commitment and support the elimination of stockpiles of DDT and other POPs before the end of 2008. 2. Continue the surveillance, prevention and control of malaria in Mesoamerica. 3. Continue community participation and intercultural approach in all the actions of prevention and control of malaria without using DDT. 4. Consolidate the integration of the network of technical cooperation and exchange of experience among countries, regions and others. 5. Promote, use and disseminate the experiences and tools developed during the Project (GIS, technical guidelines, manuals, educational materials). 6. Promote investigations that produce evidence leading to the implementation of public policies and strategies for a better malaria control and the development of laboratories. 7. Advocacy to obtain support from other sources of cooperation and funding to maintain and possibly expand the areas of implementation of this control model friendly with the environment and consistent with sustainable development. 8. Continue the relation with UNEP/GEF through initiatives leading to consolidate the progresses in the region facing the risks placed by climate change and other changes affecting the project sustainability on the long-term. 9. Support the initiative of malaria transmission whenever possible in the region. 10. Support the initiative of malaria transmission whenever possible in the region as well as the Mesoamerican System of Public Health. 11. Comply with the agreements and resolutions from the directive bodies of PAHO/WHO related to the matter.

ANNEX 6

PROJECT DDT/UNEP/GEF/PAHO

MEETINGS OF THE REGIONAL TECHNICAL COMMITTEE 2003-2008

NO.	DATE	VENUE	NO. OF PARTICIPANTS	SUMMARIZED OBJECTIVES	AGREEMENTS
1	24-28 May 2004	Huatulco, Mexico	32	1. Analysis and approval of the operational guidelines for the demonstration projects. 2. Train participants in its use from the eight countries and reach operational agreements.	1. After reviewing the technical guide the Operative Committee agreed to publish before July 2004. 2. Purchase of office equipment ensuring technological requirements for GIS. 3. Each country will have to identify availability of cartographic data in national institutions to collect geographic and demographic data from the demonstration projects. 4. PAHO/WHO/GIS will prepare a timetable to implement GIS. 5. National coordinators will streamline financial execution. 6. Analyzed the need to purchase vehicles. Each country will make consultation on maintenance costs before making the request.
2	12-14 September 2005	San José, Costa Rica	39	1. Evaluation and planning of technical and administrative activities in the current implementation phase.	1. After monitoring agreements of the second meeting of the steering committee held in March 2005 in Guatemala, the Operative Committee concludes that the agreements are in the implementation phase. 2. To include a representative from the environment sector to the meetings of the Steering Committee. 3. Streamline the execution of funds available through submitting an execution plan in the following 15 days. 4. For the project expansion each country will perform budgetary projections for 2005, 2006 and 2007, and will report the changes and decisions.

3	25-27 April 2006	Panama City	63	1. Review the mid-term evaluation report from UNEP/GEF. 2. Reach agreements to implement the relevant recommendations.	1. Continue the proposal of the regional malaria information system. 2. Each country and the regional component will separately make decisions to implement the recommendations from the mid-term evaluation according to specific commitments. 3. Focal points from the ministries of environment and CCAD prepared strategies approved by the Operative Committee: Include the environment component in the activities in the demonstration communities and public awareness on the risks related to using pesticides, impact for the introduction of exotic species, repellent plants and other alternative methods used for malaria vector control without using pesticides. 4. Support the characterization of sites identified as deposits of stockpiles of DDT and other POPs, management and handling according to Stockholm and Basel conventions, FAO and others. 5. Support the management for the elimination of DDT stockpiles linking the focal points from the Stockholm, Basel and Rotterdam conventions and support streamlining the authorization of exportation of dangerous residues of DDT upon request from environment authorities. 6. Support environment assessments (water, soil, sediments, biota) related to the practices involved in the projects and the health risk from the residual action of DDT and other POPs. 7. Support initiatives of vector control of agriculture and non-agriculture use, based on criteria of best available techniques, integrated and rational use of pesticides and better environment practices. 8. Ratify the decision of the focal points from the environment sector that will be in contact through a regional network of focal points and will be integrated to the national committees of the Project DDT/GEF in each country, as well as integrate the project with the initiatives from the ministries of environment and agriculture.