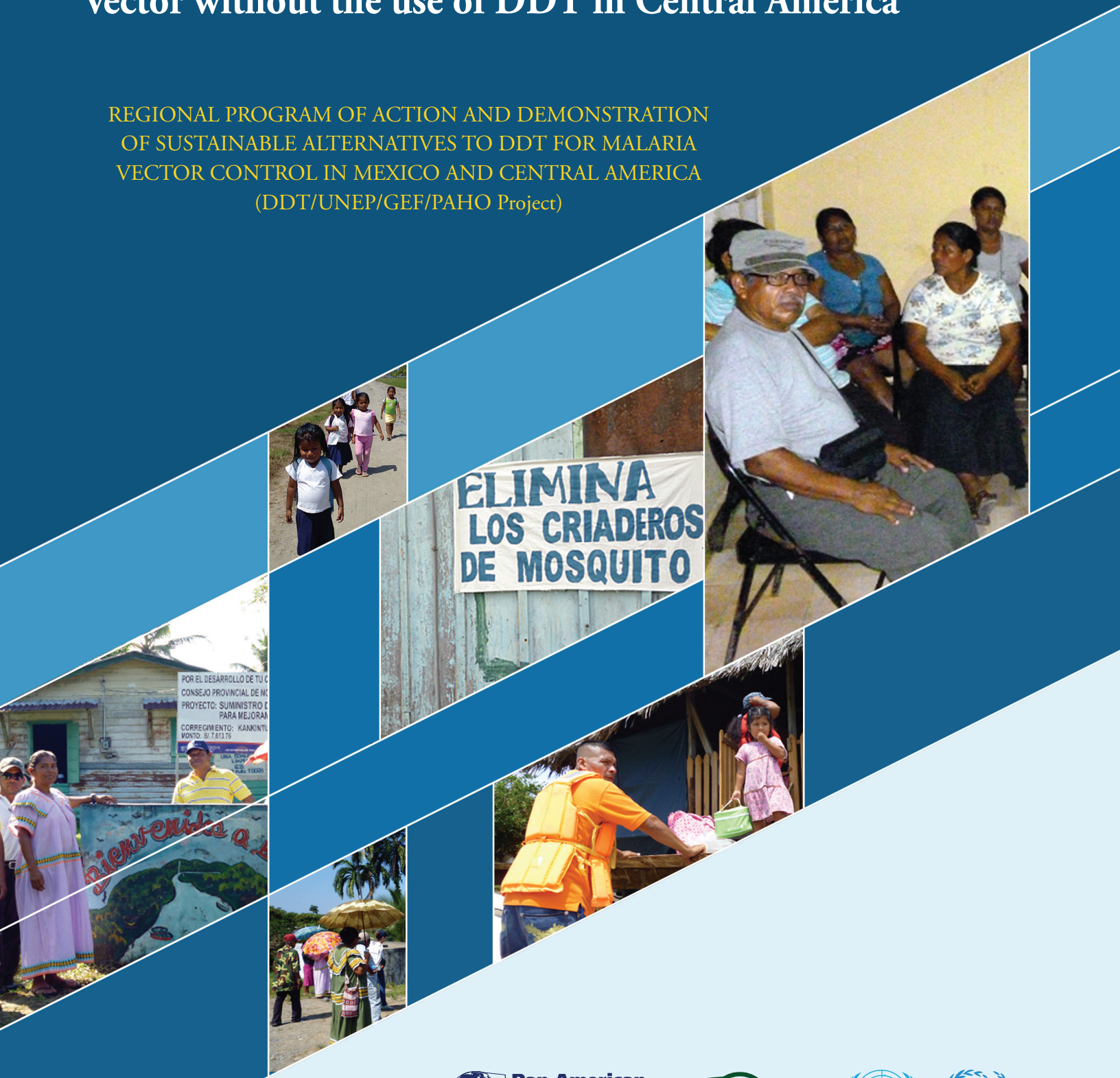
The role of municipal governments and community participation in the integrated management of the malaria vector without the use of DDT in Central America

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



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ACRONYMS

API	Annual Parasite Index
CCAD	Central American Commission on Environment and Development
CEC	Commission for Environmental Cooperation of North America
COL-VOL	Malaria Volunteers (from the Spanish *Colaboradores Voluntarios*)
DDT	Dichloro Diphenyl Trichloroethane
GEF	Global Environment Facility
GIS	Geographic Information System
HMC	Healthy Municipalities, Cities, and Communities Strategy
HP	Health Promotion
NGO	Nongovernmental organizations
PAHO	Pan American Health Organization
PEC	Primary Environmental Care
PHC	Primary Health Care
POPs	Persistent Organic Pollutants
SDH	Social Determinants of Health
UNEP	United Nations Environment Program
WHO	World Health Organization

CONTENTS

EXECUTIVE SUMMARY

Malaria is the most significant vector-borne disease in the world. Current strategies to combat malaria include implementation of interventions that prevent transmission, and optimize the use of vector-control resources and instruments. The *Regional Program of Action and Demonstration of Sustainable Alternatives to DDT for Malaria Vector Control in Mexico and Central America* (DDT/UNEP/GEF/PAHO Project) was implemented between 2003 and 2008 in Belize, Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, and Panama, with the goal of showing that malaria-vector control methods without using DDT or other persistent pesticides are replicable, cost-effective, and sustainable, and thereby preventing the reintroduction of DDT in the Region. Demonstration projects were conducted in each of these countries using a model based on alternative methods for the integrated management of malaria vector control without DDT or other persistent pesticides. The participation of communities and municipal governments formed the strategic basis for these projects. This project model was based on a successful experience in the state of Oaxaca, Mexico where vector-control strategies were implemented without using DDT and included community participation.

Selective vector control, epidemiological surveillance, and timely treatment of the sick led to a 63% reduction in malaria cases in the demonstration communities between 2004 and 2007, and an 86.2% reduction of malaria cases caused by the parasite *Plasmodium falciparum*, which causes most severe malaria mortality and morbidity in the world. Success was largely due to the dynamic actions and commitment of municipal governments, which played a central role in coordinating across sectors to implement interventions in their communities. This was the first time in the subregion that municipal governments were part of and contributed to activities to combat malaria in their municipalities.

Municipal governments facilitated community participation and intersectoral collaboration, financed major infrastructure works, and provided logistical and personnel resources to the project. However, their most important contribution was the preparation of public policies and the implementation of innovative management mechanisms. These actions produced sustainable changes in the social, cultural, and physical structure of their communities, and led to enhanced malaria prevention and control. Identification and training of community leaders improved the organizational capacities of communities, which led to increased community initiative and less dependence on public institutions for initiatives geared toward the common good. There was also increased awareness among the population of its knowledge and abilities, resulting in better environmental management and a change in attitudes and behaviors about the population's shared responsibility with regard to individual, community, and family health. New emphasis on the volunteering (col-vol) gave the project's volunteers a more active role in community organization and training on vector control and led to a 63% increase in participation.

The strategic partnerships stemming from the project promoted the integration of an important group of stakeholders traditionally excluded from malaria-control interventions. At the municipal level, this included the participation of municipal governments, indigenous leaders and populations, malaria volunteers, the private sector, educational centers, NGOs, and health, education, and environment workers. The national level incorporated ministries of health, education, and environment; PAHO; universities and research centers; and national malaria control programs. Private sector participation in certain countries strengthened firms' social responsibility and commitment to the population's health and environmental conservation.

The challenges of working with municipal governments included delays and interruptions during election periods, constant changes in government, differing ideas and attitudes about malaria, insufficient technical and legal capacities to take on responsibilities related to human and environmental health, and limited budget and municipal infrastructure to support malaria control activities.

Municipal governments are in a good position to take action using a broad range of factors and to create an environment that promotes the successful implementation of sustainable of vector-borne disease prevention and control interventions. The participation of municipal governments in demonstration areas facilitates the inclusion of malaria control on the local political agenda and generates synergy to resolve health problems without creating new or parallel structures. All this indicates that the decentralization of decision-making power and resources to the local level is an effective and sustainable public health strategy.

INTRODUCTION

Vector-borne diseases are responsible for 17% of the overall parasitic and infectious disease burden, with malaria being the most significant (WHO, 2008). Current strategies to combat malaria include a package of interventions geared toward controlling transmission. These integrated vector-management strategies have been shown to reduce or interrupt disease transmission when applied on a large scale, (WHO, 2008). Implementation of these strategies requires institutional commitment, creation of regulatory frameworks, decision-making processes, intersectoral actions, and development of procedures at local, administrative levels (WHO, 2008).

The *Regional Program of Action and Demonstration of Sustainable Alternatives to DDT for Malaria Vector Control* (DDT/UNEP/GEF/PAHO Project) was implemented from September 2003 to June 2008 in Belize, Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, and Panama. The objective of the project was to prevent the reintroduction of DDT for malaria control in the subregion by demonstrating and evaluating alternative, intersectoral vector-control methods that were cost-effective, replicable and sustainable (PAHO/WHO, 2004).

Demonstration projects were set up in each participating country based on a model that used alternative methods and techniques for the integrated management of malaria vector control and did not use DDT or other persistent pesticides (Annex 1). These demonstration projects were implemented in the 202 demonstration communities participating in the project and in 52 municipalities where malaria is endemic (Map 1). The majority of these communities have indigenous populations and specific environmental and socioeconomic conditions. The demonstration areas were identified by type of component (*Plasmodium*, vector, environmental, and epidemiological), This allowed for the development of country-specific interventions to combat vectors without using DDT, and allowed for community and municipal participation.

The model was based on local management and community participation in the organization, execution, and evaluation of the alternatives for integrated management of the malaria vector. This model's strategic line of action focused on the participation of communities and municipal governments from an intercultural approach, and also incorporated the principles of overall strategies such as Health Promotion (HP), Primary Health Care (PHC), Primary Environmental Care (PEC), and the Healthy Municipalities, Cities, and Communities (HMC) initiative.

The project reduced vector density and, by extension, decreased the number of malaria cases in the demonstration communities[1]. This led to improvements in the environment and in families through activities geared towards health, self-care, environmental conservation, and the organized labor of

[1] For more information about the project's impact on reducing the incidence of malaria, see the following web pages:
http://www.paho.org/spanish/ad/sde/ddt-home.htm (project website in Spanish)
http://www.paho.org/english/ad/sde/ddt-home.htm (project website in English)
http://www.bvsde.ops-oms.org/sde/ops-sde/bvsdeeng.shtml (PAHO/WHO Virtual Library of Sustainable Development and Environmental Health)

the community. Municipal governments played a pivotal role in coordinating and articulating intersectoral interventions in their communities. Their dynamic participation was key to the project's success and showed the potential for creating conditions and mechanisms suitable for implementation of sustainable control strategies.

Application of these innovative strategies yielded important lessons on the inclusion of municipal governments, intra and intersectoral collaboration, citizen mobilization in health promotion, and the prevention and control of communicable diseases such as malaria. This document analyzes the strategies used; the impact of the participation of key partners, factors affecting the sustainability of achievements, and changes in local public policies.

BACKGROUND

Beginning in the 1950s, various countries launched malaria eradication programs focused on eliminating the vector through the use of Dichloro Diphenyl Trichloroethane (DDT) and on eliminating the parasite with chemotherapeutic agents (PAHO/WHO, 2004). Since DDT does not exist naturally in the environment, it polluted air, water, and soil during its time of use. In the 1970s, the use of DDT in the United States of America and in other countries was prohibited, especially for agricultural purposes. However, due to its persistence in the environment, reserves of DDT remain and are a permanent threat to the human health and the environment.

In 1998, the Mexican State of Oaxaca implemented a project to control a malaria outbreak. Targeted actions were taken at the homes of the sick by eliminating vector breeding sites. DDT was not sprayed in homes, and there was an emphasis on community participation. The concept of "malaria houses or niches" was promoted to introduce practical measures to improve homes and family hygiene. These and other joint activities to identify, control, and eliminate the habitat and the anopheline breeding sites helped break the infectious disease transmission chain. As a result, mortality decreased from 500.3 to 7.1 per 100,000 people between 1998 and 2002 (PAHO/WHO, 2008).

The success of the Mexican experience, in conjunction with the World Health Organization's (WHO) global "Roll Back Malaria" strategy served as a platform for the DDT/UNEP/GEF/PAHO Project to extend the malaria vector integrated management model to Central America, under the leadership of the Pan American Health Organization (PAHO), and in coordination with the Commission for Environmental Cooperation (CEC) of North America and the ministries of health and environment of Belize, Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, and Panama. Between 2000 and 2002, situation analyses were made concerning the use of DDT and malaria control in each country and in the subregion. Activities began in 2003 under an agreement signed between the United Nations Environment Program (UNEP) and PAHO.

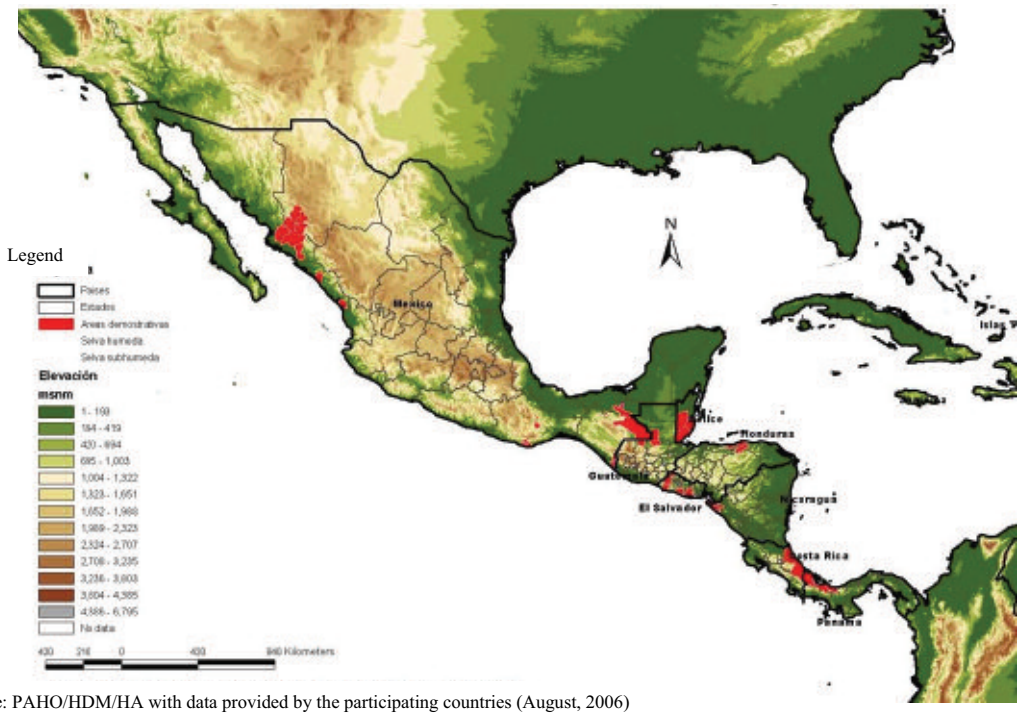
The direct project beneficiaries were an exposed population of 159,018, and the indirect beneficiaries were an at-risk population of 6,845,000 people, which represents 29% of the population living in highly endemic areas of Central America. The principal components of the project were:

1. Implementation of demonstration projects and their dissemination for vector control without the use of DDT or other POPs in malarial locations.
2. Strengthening of national and local institutional capacities.
3. Elimination of DDT reserves in participating countries.

The model's main technical tool was epidemiological stratification to prioritize communities and households, along with entomological operational studies and low-cost computer programs, such as the Geographic Information System (GIS). This made it possible to gear interventions toward risk factors associated with malaria in communities, families, and persons with a higher incidence.

Actions under this strategy included selective vector control, epidemiological surveillance, and timely treatment of the sick.

Map 1. Demonstration Areas of the Regional Program of Action and Demonstration of Sustainable Alternatives to DDT for Malaria Vector Control in Mexico and Central America



Source: PAHO/HDM/HA with data provided by the participating countries (August, 2006)

CURRENT MALARIA STATUS IN THE DEMONSTRATION COMMUNITIES

In 2004, a total of 2,439 people were sick with malaria. This number fell to 914 in 2007, meaning a 63% reduction during the years that interventions were in place. A decrease from 15.3 per 1,000 inhabitants in 2004 to 6.1 in 2007 was observed in the Annual Parasite Index (API). Cases caused by *Plasmodium falciparum*, the malaria parasite that causes death and the most serious morbidity throughout the world, decreased by 86.2%. The decrease in malaria cases led to a drop in care costs and prevented the loss of 1,525 work days.

WHY SHOULD MUNICIPAL GOVERNMENTS BE INVOLVED IN PROJECT IMPLEMENTATION? THE DDT/UNEP/GEF/PAHO PROJECT PROPOSAL

Since the 1980s, the majority of the countries in the Americas have undergone decentralization processes to redistribute power and give municipal authorities autonomy in decision making and controlling resources. As a result, the concept of regional and municipal governments as facilitators of community participation and mobilization of resources and capacities at the local level has strengthened.

The experiences of recent decades in the Region show that local governance, i.e. municipal and regional levels, meets the conditions for facilitating implementation of health promotion programs and strengthening social participation. With a wider margin to carry out activities, municipal governments also demonstrate greater motivation and social, political, and technical commitment in projects to improve people's living conditions.

Municipal authorities are responsible for establishing policies for a certain area and population (PAHO/WHO, 1999), and thus enjoy a wider operating field for integrating the contributions and actions of different local actors. They can prioritize health in the municipality's policy programs and adapt these programs to the community's social, cultural, and ethnic context. Thus, municipal governments are in a unique position to implement programs based on decentralized, participatory models.

In conjunction with this decentralization, various strategies have arisen in the health sector in recent decades at the international level, such as Health Promotion (HP), Primary Health Care (PHC), Primary Environmental Care (PEC), and the Healthy Municipalities, Cities, and Communities (HMC) initiative,[2] which are geared toward promoting equity, democracy, and sustainable development. Some countries in the Region have successfully applied one or more of these strategies and have demonstrated the effectiveness of approaches that have a comprehensive focus on health and that view the local level as an indispensable part of community development processes. Even so, certain public health problems, including malaria, continue to be neglected and do not appear on authorities' agendas.

[2] For more information about these strategies, see Annex 2.

The DDT/UNEP/GEF/PAHO Project proposal applied the overall principles and strategies described in the previous section to obtain the participation of municipal governments in the prevention and comprehensive management of the malaria vector without the use of DDT. In addition to demonstrating the replicability, cost-effectiveness, and sustainability of the proposed model, the project set out to prove the feasibility of participatory approaches led by municipal governments.

Implementing the DDT/UNEP/GEF/PAHO Project in the politico-administrative context of the municipalities meant that decisions had to be decentralized and resources had to be controlled at the local level. Furthermore, success necessitated effective community participation, and collaborative attitude among social organizations and the municipal government. To this end, municipal governments needed to return to their central role in the organization, planning, execution, and evaluation of the proposed activities.

The actions of municipal governments were key in promoting community participation, project's strategic foundation, as a means to combat malaria and to promote vector control and prevention. Activities centered on self-care in individual, family, and community health were carried out to improve the physical environment, build capacities, conserve the environment, and promote community organization. Municipal governments also played an important role in identifying and training the community leaders needed to successfully implement the model.

The population was integrated during different project phases through knowledge transfer, innovative malaria vector control practices and technologies, integration of local committee representatives, and application of various educational techniques (including, for example, PALU,[3] puppet shows, and competitions). Increased knowledge about mosquitoes made it possible for the community to identify breeding sites and resting places, learn about seasonal habits, and adopt physical and biological control measures to eliminate mosquito habitats.

[3] PALU is an educational game developed by PAHO/WHO to teach about integrated malaria control and prevention in homes and the community without the use of DDT or other POPs.

Municipal governments emphasized intersectoral strategic partnerships. The inclusion of a subset of social actors who had traditionally been excluded from malaria control interventions, but who could contribute to the population's health and quality of life from within their specific areas was very important. This project showed that a population's health and well-being are determined by the interaction of a series of conditioning factors at various levels -individual, family, community, local, regional and national- that extend beyond the health sector's areas of expertise and resources.

THE ROLE OF MUNICIPAL GOVERNMENTS IN MALARIA CONTROL: THE EXPERIENCE OF CENTRAL AMERICAN COUNTRIES WITH THE DDT/UNEP/GEF/PAHO PROJECT

Official project reports showed that eight Central American countries adopted the model of using alternative techniques for malaria vector without DDT or other persistent pesticides in the demonstration areas. Clear results were achieved in the demonstration communities, with up to a 63% reduction in malaria cases during the project period. The primary contributions made by the municipal governments, which will be discussed in depth in this section, included investment of financial, material, and human resources in project activities, identification and training of community leaders, support for the formation of community committees and community participation, and the facilitation of intersectoral collaboration.

For the first time in the subregion, municipal governments contributed to malaria - combating activities in their municipalities, a subject normally considered the exclusive purview of the ministry of health. At the end of the project, it was estimated that municipal governments cofinanced approximately US$180,000

from 2003 to 2007.[4] This additional financial contribution from the municipal governments had not been taken into account during the project design phase. At the beginning of the project, the main role of the municipal government was to provide material support. However, the process itself created a new role that involved structural changes. The creation of new management mechanisms based on local public measures contributed to the sustainability of achievements and to the long-term prioritization of malaria. The participation of municipal governments made it possible to include malaria control on the municipal political agenda and created synergy for resolving health problems without creating new or parallel structures.

In all the participating countries, the municipal governments invested in drainage systems, expansion of riverbeds, and improvement of dwellings, latrines, and other installations. These works have greatly improved the demonstration communities' quality of life (see Examples 1, 3, and 5). Municipal governments also provided logistical support in terms of transportation, inputs, hand tools, food for project activities, assigned support personnel for community days, and delegated representatives to participate in the committees, community groups, and national and international events.

The project also provided major economic and environmental benefits in the demonstration areas. El Salvador, for example, reported a reduction of up to 90% in the use of insecticides using the new methodologies. This, in turn, reduced malaria control operational costs in the country's demonstration areas. The ministries of health of Honduras' demonstration communities reported a 70% reduction in spending on insecticides, which are now only used for outbreaks. This savings made it possible to increase budget spending on other inputs to control breeding sites and the laboratory materials needed to diagnose malaria.

The countries reported the creation of budgets and specific allotments for malaria prevention and control and hired human resources to support health workers in combating communicable diseases (malaria and dengue). They also established letters of agreement and agreements with different public and private institutions. For example, Honduras' six demonstration municipalities allocated an annual budget of 10,000 dollars to municipal health plans for an indefinite period of time, a measure which the municipal commissions continue to approve each year. Talamanca a demonstration community in Costa Rica dedicated approximately 25,000 dollars to malaria per year between 2005 and 2007, in addition to contributing logistical and staff support for malaria prevention and control activities.

These results show commitment and ownership of the problem, which came about once the institutionalization or regulation of municipal mechanisms was reflected on the municipal policy agenda. At the same time, the continuity of activities improved, despite changes in the politico-administrative context of the municipality.

[4] Source: Final Report on the DDT/UNEP/GEF/PAHO Project, December 2008.
http://www.paho.org/english/ad/sde/DDT_GEF_Final_Report(2008).pdf

EXAMPLE 1. The contribution of municipal governments to malaria vector prevention and control in El Salvador

During the project period, the municipality of El Porvenir allocated between US$10,000 and US$20,000 per year from the municipal budget specifically for vector-borne disease control (malaria, dengue, Chagas' disease). This allowed El Porvenir to channel the area's river water and reduce vector breeding sites. The municipality also provided heavy machinery for community clean-up campaigns, making it possible to continue vector-control activities.

The municipal government of Acajutla, in the demonstration area of Metalio, contributed machinery, transportation, labor, and stone (the equivalent of US$10,000) to build an artisanal bridge and to drain the Moscua river. This was the first time the municipal government had contributed to malaria-control activities. Participation in the DDT/UNEP/GEF/PAHO Project was key in accomplishing this work that the community had been requesting for more than 60 years. An extensive swampy area was drained in a zone with a high risk of malaria transmission, significantly decreasing vector breeding sites and, subsequently lowering the community's incidence of malaria.

These works also improved the quality of life of a population that had been frequently isolated due to flooding. The risk of drowning while swimming from one side of the river to the other during the rainy season was reduced, and farmers recovered land suitable for planting, grazing, and construction of homes. This helped family economies, created jobs and improved communication and transportation among the communities, citizens had faster access to work, to schools, and to health services.

Project implementation improved coordination between municipal authorities and the central government (ministries of health and environment). Greater cooperation helped resolve issues related to health and the natural environment (illegal refuse dumps, violations of environmental regulations, etc.) as well as problems most felt by the community, such as adequate access to drinking water. Collaboration with the municipal governments facilitated knowledge transmission, not only on malaria, but also on local management and development. In this way, local capacities were strengthened and new leaders were trained in the area of human and environmental health promotion.

EXAMPLE 2. Improvement of the municipal environment through public policies in Nicaragua

In Nicaragua, the community of Virgin of Candelaria approved a municipal ordinance that prohibited pouring wastewater into the street and established a fine for violators. The objective was to prevent pools of wastewater from accumulating, and thereby destroy potential vector breeding sites. This ordinance strengthened prevention measures and improved physical surroundings by preventing streets and the areas around homes from standing water, which also hinders pedestrian traffic, damages streets, interferes with vehicle traffic, and facilitates the proliferation of disease-transmitting vectors.

Community participation

The involvement of municipal governments in the project strengthened community participation helped to change behaviors, and encouraged the population to adopt healthier environmental hygiene practices. Sanitary conditions of homes and communities improved and permanent vector-breeding sites disappeared. Both developments directly reduced malaria cases in the demonstration communities. Furthermore, changes in the culture of hygiene and personal and environmental cleanliness reduced other disease transmitting vectors (bed-bugs, flies, rats, snakes, etc.).

EXAMPLE 3. Change behavior by improving the community setting:: Mexico

Local authorities of the demonstration communities of Horcones, municipality of Santa Maria Tonameca (715 inhabitants), and Comala, Municipality of San Pedro Pochutla (517 inhabitants), contributed funds to purchase tools (shovels, rakes, machetes, etc.) for breeding site clean-up activities throughout the project period. These clean-up activities, carried out by both community inhabitants and the program's technical staff, included removal of filamentous algae and cutting down vegetation that serve as vector resting sites near breeding sites and homes. They also provided calcium hydroxide[5] to paint the walls of homes to make them inhospitable as vector rest sites and to block off the nesting niches of other vectors, such as triatomines.[6]

In addition to diminishing the breeding sites of the malaria vector, these activities improved the community environment. Cleaning up the area and painting the houses white created a uniform, hygienic image, resulting in increased self-esteem and a sense of community responsibility that led inhabitants to clean their yards and houses more frequently. Changes in individual behavior were also noted, with greater attention to personal hygiene habits, such as bathing and changing clothes daily.

In general, the community's contribution consisted of inhabitants taking part in clean-up days and other field activities. The main interventions included cleaning up aquatic weeds, such as filamentous green algae; drainage, sanitary landfills, and channeling wastewater; biological control with larvivorous fish; planting repellant trees such as the Nim; and using biological larvicides. In the majority of the demonstration communities, local committees were responsible for organizing the population into working groups to carry out these activities, while individuals were responsible for keeping their own houses, yards, and surrounding areas clean. One of the major benefits of community participation was the involvement of the entire family in promoting its health.

Development of community and municipal leadership

Collaboration with the municipal governments via the project's intercultural approach made it possible to identify and train indigenous and non-indigenous community leaders. These lenders were essential in making the connection between the project and community groups and provided up-to-date project information to the community. They also coordinated basic sanitation actions to take care of the physical environment as part of malaria control. The support of community leaders was

[5] There are no controlled studies on this intervention. Calcium hydroxide has a high pH and is an irritant for the malaria vector and other insects.
[6] Triatomines are blood-sucking insects found primarily in Latin America that live in and around houses. They transmit *Trypanosoma cruzi*, the parasite that causes Chagas' disease.

especially important in countries whose ministries of health had limited staff and were only able to provide technical support to the communities.

The most common role of the leaders was to coordinate and organize local activities. They set up working groups, evaluated breeding sites before and after interventions, reviewed the status of activities in coordination with technical personnel from the ministries of health, and took care of the project tools and inputs. They also helped manage the project at the grass-roots level, facilitating spaces for meetings, inviting relevant stakeholders to events and meetings, and attending these meetings themselves. They played a central role in helping other stakeholders meet their commitments and honor agreements made with the community, which increased the project's credibility among the population. These leaders also increased respect, acceptance, and understanding among stakeholders with regard to wealth and cultural diversity in the communities.

Community leaders guided and educated the community on health practices and promotion through talks and home visits. The goal was to address health problems, as well as the determinants of health with an emphasis on elements in the environment that contribute to the transmission of diseases. In some demonstration communities, community leaders received training on how to identify malaria symptoms and refer patients to appropriate treatment.

EXAMPLE 4. Strengthening municipal leaders for malaria control: Honduras

The case of the municipality of Santa Fe

In 2004, Mr. Lucas García Caballero was a community leader in the Community Working Group of the Municipality of Santa Fe, Department of Colón. His leadership in integrated malaria management interventions within the framework of the project helped him win the election for municipal mayor in 2005. As mayor, Mr. Caballero continued to support the project and supported replication of the integrated vector management model by sharing experiences with other communities and other municipalities. His leadership and dedication influenced other mayors on malaria and, thanks to him, the benefits of the project model were disseminated in the Region.

The case of the municipality of Balfate

Between 2004 and 2006 the mayor of the Municipality of Balfate, Department of Colón, Mr. Roberto Arias Ramirez, embraced the proposed model with a great deal of dynamism and provided comprehensive support to local interventions. Although he was not reelected in 2006, Mr. Ramirez continued to be involved as one of the principal community leaders, supporting various promotion, prevention, and integrated malaria management activities and sharing his experiences in national meetings and international forums.

The participation of women in Honduras' demonstration communities

In 12 localities of the Honduran demonstration municipalities, 90% of the Community Working Groups, that coordinated interventions at the local level, were women. They played an important role in raising awareness about malaria among other members of their family and in encouraging them to participate in local intervention activities. Thanks to the project, these women played a leading role traditionally reserved for men and gained greater community influence. By being part of the social and sanitary transformation process in their communities, these women became agents of change and today are an integral part of sustainable, local level processes.

Volunteers played a major role in the project. They are also known as "col-vol" [taken from the Spanish *colaboradores voluntarios*] in Central America and as "*notificantes*" in Mexico where malaria epidemiological surveillance activities have been underway since the 1950s in communities. These volunteers acted as liaisons between the population and the technical staff from ministry of health programs. During the project, the "col-vol" took on new responsibilities in organizing, motivating, and training the community on vector control. Before, their field of action was limited to obtaining

blood samples and providing malaria treatment. During 2004 and 2007, the number of col-vols in the demonstration areas increased by 63% (Table 1). This rise strengthened social equity by providing greater intervention coverage in rural indigenous communities traditionally excluded from development processes and with little access to health and education systems.

Table 1. Volunteers in demonstration areas in Central America

Countries	NUMBER OF VOLUNTEERS PER YEAR				
	2004	2005	2006	2007	% of increase (2004 to 2007)
Belize	20	20	20	20	0
Costa Rica	10	29	40	41	310
El Salvador	14	27	28	28	100
Guatemala	10	16	22	22	120
Honduras	12	14	18	18	50
Mexico	748	887	1185	1197	60
Nicaragua	23	23	23	23	0
Panama	1	11	20	20	1900
Total:	**838**	**1027**	**1356**	**1369**	**63**

The organizational capacities of communities improved significantly thanks to community leaders. This resulted in greater confidence in community initiative and less dependence on public institutions to carry out community interventions. In Honduras, for example, community clean-ups are conducted every month, regardless of whether a health specialist is present. Better community organization also resulted in better problem-solving, greater solidarity, a greater sense of responsibility for community health, and more transparent decision-making processes.

Community leaders became vital representatives of the model and shared their experiences with other communities and countries. One example was the *First Forum on the Health of Indigenous*

Populations and Interculturalism: Malaria Vector Control without the Use of DDT in DDT/UNEP/GEF/PAHO Project Demonstration Areas with Indigenous Populations, which was held in December 2005 in Bisira, Nögbe Buglé region of Panama. Over 100 indigenous leaders and institutional representatives from Belize, Costa Rica, Guatemala, and Panama participated. Agreements were reached during the event with national, regional, and municipal health authorities on implementing the model in other indigenous population from an intercultural approach. As a result of this event, a participatory approach was used to develop the *Manual for Community Leaders and Community Health Workers of Indigenous Populations and Afro-Descent for Malaria Prevention, Surveillance, and Control without Using DDT*, which was published in October 2007, in English, and in Spanish (see Example 8).

EXAMPLE 5. Development of municipal leadership: Guatemala

The mayor of the Ixcan municipality in Guatemala contributed the municipality's material resources and appointed a health adviser to monitor malaria prevention and control activities during the operational period of the project. This was the first time that the Ixcan municipality invested in the fight against malaria. Community working groups were responsible malaria control activities, while the municipality contributed funds to purchase cement, PVC pipes, iron and fuel for small engineering works to permanently control breeding sites in the demonstration communities of Santa Maria Dolores and Santo Tomas Ixcan.

The results of these interventions were systematically presented at the "*health table*," a popular forum that meets once a month and brings together approximately 100 leaders from more than 70 communities within the municipality. The Global Fund and *Salud en Acción* projects in these areas included the model in their work programs and continue to strengthen community and municipal work. For 2008-2011, municipal authorities committed to continuing activities during their leadership term. This experience was shared at national and international events where municipal and community representatives took part.

Intersectoral collaboration

The intersectoral strategic partnerships forged by municipal governments as part of the project led to incorporation of a significant group of stakeholders traditionally excluded from malaria-control interventions. At the municipal level, this included the participation of municipal governments, community leaders, private enterprises, educational centers, nongovernmental organizations (NGO) and health, education, and environment workers. At the national level, public institutions, such as ministries of health, the environment, and education; PAHO; universities and research centers; and national malaria control programs all took part. The table in Annex 3 provides a summary of the different stakeholders at the municipal level and their contributions.

Community and national intersectoral committees were organized under the leadership of the countries' health authorities. The national committees in charge of designing strategies and operational models guided the municipal team in making decisions. The community committees, in turn, designed and carried out specific activities for each locality, and adapted the proposed models within the context of each community.

EXAMPLE 6. Municipal government as a facilitator of intersectoral collaboration: Costa Rica

The Talamanca demonstration municipality in Costa Rica issued a municipal decree to create the Municipal Malaria and Dengue Commission, which confirmed its commitment and leadership in addressing these diseases. The Commission, chaired by a community leader and financed with municipal government funds, included representatives from ministries of health and education, the municipality, civil society, and the Costa Rican Social Security Fund. This commission facilitated the coordination of social and institutional actors and helped to legitimize the allocation of resources for malaria and dengue control.

The intersectoral organizational structures were established by including representatives from other organizations and sectors into existing groups. Thus, no new or parallel structures were created, making it possible to mobilize indigenous representatives, religious groups, boards of trustees, cooperatives, development advisers, and community NGOs, among others, in a coordinated malaria surveillance and control effort.

The committees worked primarily to coordinate activities, promote community participation, provide information on project progress, and supervise equipment use. In Belize, for example, the Bullet Tree community council, formed under the project, conducted monthly community collections to remove refuse and worked with the authorities of the neighboring town to send a truck for collection and transport. While this agreement was in effect, no malaria cases appeared in the community.

The intersectoral action promoted by the project strengthened the partnership with the private sector and increased the number of volunteers and technical personnel in the demonstration communities. In the community of El Tesoro, in the Salvadorian municipality of El Porvenir, volunteers and community working groups received more training, which improved surveillance of thick blood film (microscopic diagnosis of malaria), community organization and training, clean-up campaigns, and planting repellent Nim trees.

Participation of the community and other nongovernmental partners on local committees lent the project continuity in difficult situations, such as strikes, natural disasters, and government and staff changes. In 2006, for example, tropical storm Stan monopolized the Salvadorian ministry of health's attention and resources. Despite this major limitation, the communities and local municipal leaders of La Canoa and El Porvenir continued the project activities.

EXAMPLE 7. Intersectoral collaboration in Nicaragua and El Salvador

Nicaragua

In the demonstration area of Everth Mendoza, in the municipality of El Viejo, department of Chinandega, the Ministry of Health of Nicaragua forged a strategic partnership with *Ingenio Monte Rosa*, which is a private agroindustrial sugar production company and the main source of employment for the local population. Since 2004, *Ingenio* has contributed approximately US$20,000 to hire a group of eight people trained in vector control measures to eliminate breeding sites in the areas surrounding *Ingenio* and in the communities bordering the sugarcane farms it owns.

This group is in charge of the physical and biological control of breeding sites, timely treatment of positive malaria cases and focal control, epidemiological surveillance of notification posts, and attending to any outbreaks that occur. A post was established for malaria notification and for taking samples in suspected malaria cases from all the workers cutting sugarcane during the annual harvest. In its efforts to remedy damages resulting from its agricultural practices, through malaria prevention and control action *Ingenio* is assuming significant social responsibility.

El Salvador

In El Salvador, the NGO *Trees and Water for People* was incorporated into the project to support demonstration communities in growing Nim trees, whose byproducts are used to control malaria- and dengue-transmitting vectors.[7] Through this partnership, 10,000 Nim trees were planted in the demonstration areas at up to 50% of the normal cost. This experience disseminated the benefits of growing Nim trees throughout the population and to other communities, which resulted in further Nim planting in parks and schools in various communities. Expansion of Nim trees also had an impact on controlling the dengue vector.

Strengthening of institutional and community capacities

With a view to strengthening the countries' institutional and community capacities to control malaria without the use of the DDT, municipal authorities and community leaders participated in workshops and courses on basic epidemiology, diagnosis, treatment of malaria, surveillance, monitoring, and

[7] However, this intervention, is experimental because there are no controlled studies on its effectiveness. Infusion of Nim tree leaves and seeds act as a natural repellent against mosquitoes. When planted three meters apart, adult trees (3 years old) create a natural barrier against mosquitoes.

entomological evaluation. Situation rooms[8] and training workshops for volunteer promoters and organized committees provided information for decision-making. Training was also provided on the project's strategies and benefits, the Primary Environmental Care strategy, local development, and health promotion.

EXAMPLE 8. Preparation of training manuals and guidelines for the population in the demonstration areas

In 2007, with the technical cooperation of the PAHO/WHO Regional Health Program of Indigenous Peoples, the project prepared the *Manual for Community Leaders and Community Health Workers of Indigenous Populations and Afro-Descent for Malaria Prevention, Surveillance, and Control without the Use of DDT*. The Manual, published in English and in Spanish, describes alternatives for malaria vector control based on the knowledge and experience of indigenous, Afro-descendent, and *mestizo* populations in the project's demonstration areas.

The Manual explains the status of malaria in Central America, the vector's life cycle, control alternatives, and available treatments. It also includes support tools and additional resources. The content and language of the material were adapted and evaluated to support joint action between population and institutions working with them. The Manual will support training, keep health workers and community groups in order to combat malaria using an intercultural approach. It will promote the individual and group decision-making power of indigenous communities regarding their health and other subjects that affect their development and quality of life.

[8] The health situation room is a physical and virtual space with access to various databases and documents where a work team can systematically consolidate and analyze data to determine the health status of a population or population group (PAHO/WHO, 2004).

STRATEGIES USED TO IMPLEMENT THE PROJECT

Initially, the majority of the demonstration communities had little knowledge of the epidemiological status of malaria, alternative prevention and vector-control techniques, or the effects of DDT on human health and the environment. A strategy was employed to guarantee the support of different actors, and sensitize them to the project's objectives and strategies, the impact of the disease on the community, and the risks they face from using DDT. These initial project interactions were accomplished through meetings, trainings, visits to key community leaders, and local forums, which provided the opportunity to discuss the malaria issue, traditional control models, and the new project proposals.

The employed strategy showed the impact of physical and biological control by presenting malaria-vector control experiences without using DDT that included community participation and led to a rapid reduction in the number of cases. In this way, the stakeholders became convinced of the need to change the common protocol for combating malaria and to include education and sensitization activities. The strategy emphasized the need to explain to farmers the impact of DDT use and handling, and on the need to conduct demonstrations in streams to eliminate *Anopheles* larvae.

Leaders (or instructors) made field visits to areas with high incidence or recent outbreaks of malaria to ensure municipal and community support. Existing structures, such as community groups or committees already working on health and environment issues in the community facilitated inclusion and municipal support for the project and prevented the creation of parallel structures.

Door-to-door visits were made to provide information about project activities and were key in motivating community participation. Given the ethnic and cultural diversity of populations in the subregion, many demonstration communities used translators and interpreters at meetings and other events, which guaranteed that the information was accessible and culturally appropriate for the specific population.

Defining the objectives and specific results within each member's area of interest facilitated the participation and functionality of intersectoral collaboration. Creation of a baseline showing the relevant social and health determinants (illiteracy, housing, water, refuse, etc.) made it possible to

capture the interest of the different actors and sensitize them to obtaining positive feedback from everyone. The baseline also helped to oversee and implement different actions and strategies in a coordinated manner, maximizing the use of available resources.

Many communities stressed the importance of having municipal government members participate on the committees. This enabled municipal representatives to be closer to community problems and to take on express commitments. Coordinating efforts through community committees or groups also helped to improve and mediate the relationship between municipalities and the health sector in some countries.

Health ministries were very effective at integrating other key actors. They played a technical and administrative role during the process, which facilitated community participation. This was also very important in terms of training and both knowledge and technical transfer to other stakeholders because the ministries have up-to-date knowledge, and credibility on the subject of malaria.

Application of the model within the framework of the Healthy Municipalities, Cities, and Communities (HMC) initiative was an effective strategy for many reasons. In Guatemala, for example, approaching the project as part of the MCS initiative made it possible to focus work around the project's basic elements, such as community participation and intersectoral collaboration. It allowed the municipal team and other actors to become familiar with relevant concepts (i.e. health equity) and to participatory evaluation as part of the overall initiative. The use of HMC strategy materials helped in developing process, results, and impact indicators as means to document changes in key elements of health promotion strategies, rather than using only epidemiological indicators.

EXAMPLE 9. Creation of healthy spaces to combat malaria

In the municipality of Ixcan, Guatemala, the schools of two demonstration communities, Santa Maria Dolores and Santo Tomas Ixcan, joined together under the Healthy Schools program. In coordination with teachers, improvements were made in cleaning the schools, and students changed behavior with regard to personal hygiene and measures for preventing diseases, such as malaria. More physical and recreational activities were also included in the school curriculum. Teachers and students used physical and recreational opportunities to educate the community about malaria using puppets, poetry, dramatizations, and other popular education tools and awarded prizes for clean homes and yards.

In the Santo Tomas Ixcan school, a raised water tank was installed with the support of the municipality and the Community Working Group. The tank improved access to drinking water for people at the school and enabled the school to be certified under the Healthy Schools program.

CHALLENGES AND DIFFICULTIES OF PROJECT IMPLEMENTATION

The DDT/UNEP/GEF/PAHO Project achieved significant results in malaria control and demonstrated the potential of approaches that actively involve municipal governments and the community in managing and controlling malaria. However, there were certain difficulties and challenges in implementing the project, as will be discussed in this section.

The greatest difficulty in working with municipal governments was dealing with the slowdowns and interruptions caused by elections and constant changes in government. These transition periods caused significant delays because of the need to sensitize new authorities, guarantee support for the project, and reaffirm the commitments and partnerships undertaken by previous officials. This also generated uncertainty among other partners about the continuity of activities and municipal support. The situation became more problematic when there was a change in political party or conflict between the new authorities and the central government.

Maintaining dialogue with incoming administrations and explaining the project's achievements to them allowed activities to continue. A broad and solid base of involved partners was needed to coordinate with the health sector and local committees, and thus provide continuity and sustainability to activities during these transition periods. In certain instances, the changes in government were positive. This occurred in a demonstration community in Costa Rica where new authorities provided more support to the initiative and worked better with both other partners and with the central government.

Other challenges included confronting the diversity of ideas and attitudes about malaria, the lack of clarity on who is responsible for maintaining the population's health and taking care of the environment, and the limited understanding of the malaria's determinants. Although the municipal governments had the ability to play a key role in regulation, intervention, and management of local human and environmental health, they often did not have sufficient legal or technical information to take on these functions. In general, municipal authorities initially resisted involvement in joint malaria-control activities with the community, planning actions designed to improve surroundings, and carrying out physical works because of the attitude that health and the environment were the responsibility of the respective ministries.

The participation of municipal authorities in workshops on health-related subjects, health promotion, and environmental management led to changes in attitude, clarified the responsibilities of all stakeholders, and generated a more comprehensive perspective on how to address the community's problems. Linking problems with relevant determinants (illiteracy, housing, water, refuse, etc.) and the mandates of municipal authorities allowed for management of actions and implementation of different strategies.

The high degree of staff rotation at the command structures of local institutions was a challenge to maintaining intersectoral collaboration. Constant changes in national project focal points at different ministries caused delays because work plans had to be reorganized and new people had to be incorporated into the activities.

In some countries, there were communication problems between the ministry of the environment and the ministry of health regarding responsibility for project implementation at the national level. Problems tended to worsen with political tensions brought on by elections and government changes.

Historical conflicts between the community and the central government (for example, if the municipal government is in the hands of the opposition party or a party made up of former guerrilla fighters) undermined the project's credibility among the population. This occurred in the community of La Canoa, in Jiquilisco, El Salvador, where most of the population actively participated in the country's guerrilla movement and initially viewed the project as being imposed by the central government. Consensus-building efforts between the population and public institution representatives addressed the situation with a view towards the common good. Once the project commitments had been met and the community had received the benefits, the population's attitude improved with regard to public institutions. This led to better coordination among counterparts as well as the community's recognition of its shared responsibility for its health. The positive image and credibility of PAHO/WHO in the community helped constructively mediate interactions among the population, the municipal government, and the central government.

The shortage of community leaders in some communities, mainly the poorer, disorganized or remote communities, provided another major barrier to the project's performance. In some cases, community leaders were not consistently present (i.e., they leave for temporary employment), which interrupted project activities and made it difficult to organize and plan follow-up meetings. In some countries, the population and community leaders sought economic or material incentives for their participation in the project. Meetings were held with local authorities in response to expectations of compensation, with the goal of forging partnerships and integrating a wide group of stakeholders and community associations into the project.

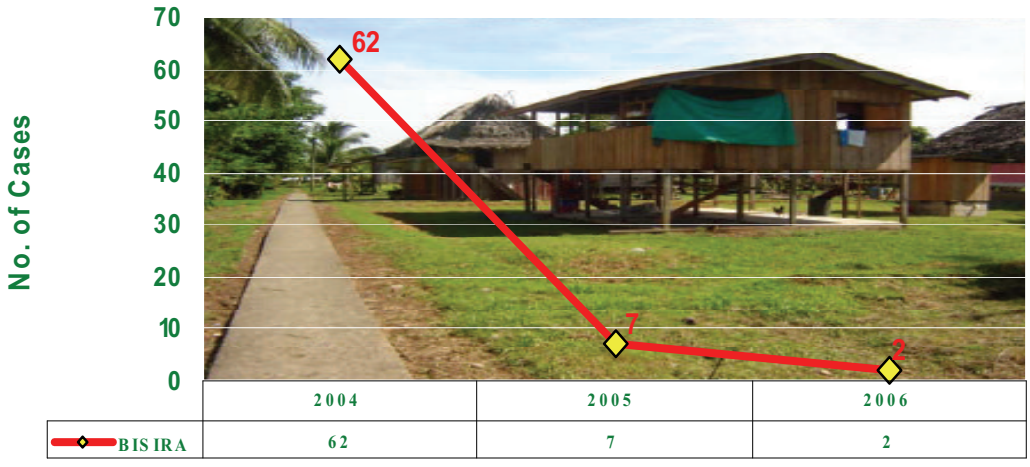
EXAMPLE 10. Maintaining the initial impetus: one of the challenges to project continuity

At the beginning of the project in Belize, intersectoral collaboration was active and dynamic. National level efforts included a detailed communications plan, and a wide-scale public awareness campaign on malaria. However, local health committees never implemented or adopted the plan. Lack of human resources in the vector-control unit and resistance by personnel involved provided the main barriers to success. Personnel resisted because of the perception that the campaign was too ambitious for the resources available. Frequent changes in the project coordinator at the national level hindered monitoring and resulted in suspension of the plan.

FACTORS AFFECTING THE SUSTAINABILITY OF ACHIEVEMENTS

Project experience showed that the communities successful in adopting malaria-control measures had certain factors in common that were key to promoting the sustainability of the model. These factors made it possible to continue with actions regardless of the problems and crises that frequently paralyze governmental institutions. They included the municipal government's greater decision-making capacity and ability to take action, continuous support for community leaders, and establishment of a broad and diverse intersectoral base to monitor activities and strengthen institutional and community capacities.

OVERVIEW OF MALARIA CASES IN BISIRA, NGÖBE BUGLÉ, 2004-2006
(the 2 cases from 2006 were imported)



Strengthening decision-making capacities and the ability to take action at the local level

In the DDT/UNEP/GEF/PAHO Project, the participation of municipal governments proved to be essential to the model's success. To achieve the effective participation of municipal authorities, decision-making and resources management had to be decentralized at the local level. Experience also showed the importance of clearly defining the responsibilities of the different levels involved in the project, with technical support at the central level, follow-up and monitoring at the regional level, and implementation and activity management at the municipal level.

Continuous support for community leaders

Community leaders have a clear commitment and interest in promoting the development of their communities. These people are known and respected by the population. They understand the community's cultural diversity, ethnicity, and its world view, making them key to interactions between the population and other actors. Their presence and actions facilitate the sustainability of the project and other health promotion and environmental conservation activities at the local level. Emphasis must also be placed on the potential for making achievements sustainable with regard to integration and expansion of volunteers' capacity to take action in community malaria-control activities.

Public institutions in some countries have limited infrastructure for visiting communities. This means that support of leaders and monitoring activities can often be interrupted, creating a disincentive for the population and community leaders to maintain the same level of participation throughout the project.

Recognizing the work of leaders and communities as contributing to the successful implementation of the project often motivates and increases commitment. In some countries, official diplomas from the health authority are awarded in recognition of the participation and work these leaders have done to benefit the community.

Strengthening intersectoral action and mobilization at the local level

Social and environmental determinants of health continually change, often as a result of decisions made outside the health sector's sphere of activity. Thus, incorporating the actions and resources of these other sectors into the design, implementation, and execution of malaria prevention measures is key to project sustainability. In this way, local, intersectoral committees play a large role in project implementation, maintenance, and sustainability. They are particularly important if they are not subject to changes in municipal governments. Ongoing follow-up and support from the project's technical staff is essential to stimulating and encouraging community participation.

The organization and culture of each community must be respected for community leaders to work hand-in-hand with municipal government, other forms of local representation, local associations, NGOs, the private sector, and other stakeholders. This combination of efforts and strategic alliances preserves the identity of each actor and strengthens the actors' primary roles in the community and municipal context.

Development of institutional and community capacities

Investment in the ongoing development of institutional and community capacities is a core aspect of the model's sustainability. Increases in malaria-control knowledge, abilities, and methodologies decrease the community's dependence on State institutions and reinforce the responsibility of municipal governments in supporting basic sanitation activities and health promotion. This component should be integrated and implemented in conjunction with the development of capacities at the national level. It should include updating the infrastructure needed to apply new knowledge and skills (updating of manuals, replacement of equipment, rehabilitation of infrastructure, such as laboratories, etc.)

EXAMPLE 11. Sustainability of project achievements

All countries developed different strategies for sustaining project achievement. Below are examples illustrating these strategies.

In mid-2006, **Costa Rican** authorities decided to extend the model for integrated malaria-vector control without the use of insecticide to the Canton of Matina, an area with historically high malaria transmission rates. This decision was based on the success of the DDT/UNEP/GEF/PAHO Project in the Canton of Talamanca, which is located in the Huetar Atlantic region. Coming from the country's highest political echelon, the model's expansion is evidence and recognition of its effectiveness and future sustainability.

The municipality of El Porvenir in **El Salvador** created a volunteer program for municipal employees to visit the communities every fifteen days. While there, the volunteers work together with the inhabitants to identify problems and conduct clean-up campaigns using city hall's equipment (the municipal refuse truck). This initiative resulted directly from collaboration between the municipality and the project. It was well-accepted among the community and brought local authorities closer to the population.

The success of the model in the La Canoa del Bajo Lempa community in the municipality of Jiquilisco, **El Salvador**, generated express interest from 24 other communities looking to duplicate the experience. Five more communities were incorporated in the last year of the project.

In **Guatemala**, the successful strategies of the DDT/UNEP/GEF/PAHO Project were incorporated into the Global Fund and *Salud en Acción* projects, covering more than 625 endemic locations. In 2008, with the support of PAHO, health authorities submitted the 2009-2013 malaria-control proposal to the Global Fund, which included the majority of the project's malaria-control methods and its community participation strategy. Furthermore, recently updated national standards and protocols on controlling malaria were based on the manual for the surveillance and control of immature malaria vectors, a publication made within the context of this project.

In **Honduras**, the project was coordinated from the beginning with the Global Fund to Fight AIDS, Tuberculosis, and Malaria in order to manage and formulate proposals for extending the project to other organizations. This coordination showed a way of promoting adoption of the model and creating synergy in activities at the local level. As a result, the model was incorporated into the ministries of health local intervention plans.

(continues)

EXAMPLE 11 (continues)

In **Mexico**, the project model was incorporated into the official standards of the National Health Plan. Cooperation partnerships were consolidated with national scientific groups to reinforce evidence of the effectiveness of the control strategies implemented in the country. The project techniques implemented in training workshops for volunteers and microscope technicians were also integrated.

The Ministry of Health of **Nicaragua** submitted a proposal in the Seventh Round of the Global Fund to Fight AIDS, Tuberculosis, and Malaria based on the application, results, and evaluation of the six demonstration projects in the department of Chinandega. The proposal was approved, with the goal of implementing the model in ten of the country's municipalities, beginning in August 2008.

In **Panama**, authorities from the demonstration communities signed a Commitment Document outlining its proposals to make the project sustainable in its localities. In this document, the authorities committed themselves to including the project model in municipal development plans and replicating it in other communities. They maintained the annual budget allocation for hiring environmental sanitation workers, continued the exchange of experiences among communities, involved a university to strengthen the project, continued health promotion activities (such as health fairs), and strengthened partnerships among the community, the health sector, and local authorities.

LESSONS LEARNED

The inclusion of municipal governments and communities in the project promoted the success of the malaria-reduction interventions and improved financing of vector-control measures in the demonstration communities. This indicates that decentralizing decision-making power to the local level and sharing responsibility, knowledge, and resources for implementing and consolidating vector-control programs can be an effective and sustainable public-health strategy.

Municipal governments and community leaders play an important role in promoting citizen participation in basic sanitation and control of communicable diseases like malaria. Community groups were motivated because they had better access to knowledge about malaria and because they were able to carry out effective and sustainable control measures that improved health and did not damage the environment.

The inclusion of volunteers helped strengthen malaria epidemiological surveillance systems because more cases were detected. This resulted in increased case-findings and opportunities for timely treatment, thereby reducing the possibility of the problem spreading.

Responses to the population's health problems transcended the health sector and required the action of all other sectors for joint analysis and implementation of measures. The population's comprehensive human development should be a primary objective. By involving other sectors and actors in the vector-control and prevention programs, it was possible to include their procedures and experiences in the design, implementation, and management of the project; thereby reducing the risk of transmission and making good use of resources.

Education and access to information are essential to community participation, decision-making power, and the actions of people and communities. In this project, increased knowledge and skills raised awareness of the risks related to malaria and DDT, which helped increase citizen participation in vector-control actions and change attitudes and behaviors. One example was the establishment of situation rooms[9] within the context of the project. By creating forums for sharing relevant information with communities, municipal authorities, and other actors, the situation rooms made it possible to provide feedback to participating actors and to strengthen confidence regarding the handling, management, and sustainability of achievements. This resulted in better environmental management on the part of communities and municipal governments.

[9] Situation room: Physical or virtual space where health information is systematically updated to define a population's health situation.

CONCLUSIONS

Communicable vector-borne diseases, such as malaria, result in poor health and preventable deaths, as well as economic hardships for the affected communities and countries. Integrated vector-control strategies play an important role in reducing the burden of vector-borne diseases, making it possible to strengthen public health systems and increase sustainability of disease management and prevention methods.

DDT is a persistent organic compound that, despite its efficacy in controlling the malaria vector, has also polluted the environment and imposed a permanent risk to human health. This reinforces the need for strategies to combat malaria with alternative methods and techniques that do not use DDT. Experience with the DDT/UNEP/GEF/PAHO Project demonstrated the feasibility and effectiveness of these models by responding to the malaria problem with vector control strategies that do not negatively affect the environment or the population's health.

Malaria is a complex public health problem that transcends borders and stems from the interaction of biological, environmental, economic, cultural, political, social, and structural factors. Malaria control has brought together the work and resources of actors and organizations from different disciplines and spheres of action at the international level. However, malaria is also a regional and local problem that requires micro-level solutions. Thus, collaboration and decision-making authority must be ensured at lower administrative levels, in order to apply criteria and measures pertinent to the ecological, cultural, and epidemiological profile of the area where the malaria control and prevention strategies will be implemented.

The DDT/UNEP/GEF/PAHO Project experience showed that municipal governments are well-suited to implementing these strategies. They can act on a broad range of factors and levels, thereby creating an environment conducive to the successful implementation of local interventions. Contributions include support for community participation and intersectoral collaboration, financing of infrastructure works, and supply of logistic and personnel resources. Municipal governments can also act as agents for structural change by creating public policies and implementing management mechanisms with the potential for producing sustainable changes in the community's social, cultural, and physical structure.

The experience also showed the private sector's potential as an important partner in local human development and health promotion processes. In addition to making use of resources and improving the coordination of malaria prevention and control activities, integration of the private sector into the project strengthened firms' social responsibility and commitment to the population's health and environmental conservation.

The project launched in Central America brought together municipal governments, communities, indigenous populations, and public and private institutions in a joint effort to identify determinants and risk factors when creating cost-effective interventions for disease prevention and control.

Although the countries had different experiences in implementing the project, the efficacy of alternative strategies to traditional malaria-control methods, especially those that use DDT, was clear. In addition to reducing the disease burden, these strategies promoted planning, execution of sustainable health promotion and protection measures, and community participation and collaboration among governmental institutions, communities, and other actors and sectors in the organization.

GLOSSARY

Intersectoral action: The coordinated efforts of representative institutions from different social sectors, through joint interventions designed to transform the health situation and contribute to the population's well-being and quality of life (PAHO/WHO, 1999).

Primary environmental care: Environmental action strategy that is essentially preventative and participatory at the local level and which recognizes the right of human beings to live in a healthy and appropriate environment, and be informed about environmental risks as they relate to health, well-being, and survival; but that at the same time defines responsibilities and duties in terms of environment and health protection, conservation, and recovery (PAHO/WHO, 1998).

Primary health care: Basic health care that is accessible at a cost that the country and community can bear, using practical, scientifically-founded, and socially acceptable methods (WHO, 1998; PAHO, 2007).

Persistent organic pollutants (POPs): Chemical substances that persist in the environment, accumulate in the food chain, and run the risk of having adverse effects on human health and the environment.

DDT (Dichloro Diphenyl Trichloroethane)**:** Very stable toxic compound that accumulates in live organisms, last for decades in the soil, and is transported by the water cycle to remote areas where it has never been used, contributing to environmental pollution at the global level.

Lifestyles: Ways of life based on identifiable behavioral patterns, defined by the interaction of individual, personal characteristics; social interactions; socioeconomic; and environmental living conditions (WHO, 1998).

Annual Parasite Index: Index calculated based on confirmed/existing malaria cases in the community per 1,000 inhabitants (PAHO/WHO, 2004).

Social Participation: A social process inherent to health and development, through which community groups, organizations, institutions, sectors, and social actors of all the levels take part in identifying needs or health problems and join together to design and implement solutions or actions to follow (PAHO/WHO, 2002).

Health promotion: Providing people with the necessary means for improving their health and exercising greater control over the same (PAHO/WHO, 2002).

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ANNEX 1. DEMONSTRATION MUNICIPALITIES

Country	Municipalities			
Belize (3)	El Cayo Stan Creek Toledo			
Costa Rica (2)	Matina Talamanca			
El Salvador (4)	El Porvenir La Paz Sonsonate Jiquilisco			
Guatemala (3)	Ixcán, Sayaxché, Chisec			
Honduras (6)	Balfate Bonito Oriental Jutiapa Atlantis Saba Santa Fe Trujillo			
Mexico (27)	Alamos Batopilas Cacahoatan Candelaria Loxicha Choix El Fuerte Escuintla	Mezquital Mocorito Morelos Ocosingo Palenque Sabanilla San Agustin Loxicha	Saint 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			

ANNEX 2. SUMMARY OF THE STRATEGIES INCORPORATED IN THE CONCEPTUAL FRAMEWORK OF THE DDT/UNEP/GEF/PAHO PROJECT

Health Promotion

Since publication of the Ottawa Charter (PAHO/WHO, 1996), Health Promotion (HP) has been used internationally as an effective mechanism for positively influencing health and reducing inequities among population groups. HP consists of providing people with the means needed to improve their health and exercise greater control over it (PAHO/WHO, 2002). It covers areas of priority actions: (1) establishing healthy public policies, (2) creating healthy and supportive environments, (3) empowering community health actions, (4) developing personal skills, and (5) reorienting health services.

HP is increasingly recognized as a central strategy in community development processes. It is a strategy for mediating between people and their environments that combines social responsibility in health with personal choice and recognizes the complex interaction among multiple determining health factors (lifestyles, physical environment, education, housing, social support networks, employment, etc.) (PAHO/WHO 2005). It also emphasizes prevention, education, and lifestyle-related activities with a view to changing behaviors and establishing the conditions needed for better health.

The *Bangkok Charter for Health Promotion in a Globalized World* (2005) defines the application of HP as a way of addressing the Social Determinants of Health (SDH) in the current world context. This document is a step forward in health promotion actions to promote health causes based on human rights and solidarity; to support policies, actions, and infrastructure and address SHD in a sustainable manner; to build capacities in HP actions at all levels; to establish regulations and laws to guarantee protection, decrease damages, and support equitable access to health and well-being; and to collaborate with public, private, and nongovernmental organizations and with civil society in taking sustainable measures.

The Healthy Municipalities, Cities, and Communities (HMC) Initiative

PAHO has been promoting the HMC strategy in the Americas since the 1980s, in order to improve implementation of strategic health promotion actions at the local level.

PAHO believes that a municipality, city, or community begins to be healthy when its political leaders, local organizations, and citizens commit and begin to improve the health conditions and quality of life of its inhabitants for forming a social pact among local authorities, community organizations, and public and private institutions. This pact uses local planning as a basic instrument

and includes social participation in management, evaluation, and the decision-making process (PAHO/WHO, 2002). The HMC strategy is truly a process and reflects the municipal government's commitment to making health a priority on the local political agenda.

The main elements of the HMC strategy include (PAHO/WHO, 2002):

1. Building a commitment with mayors, other local authorities and other sectors and key actors.

2. Ensuring and strengthening community participation during the planning, execution, and evaluation phases.

3. Developing a strategic plan to mobilize resources and technical support and encouraging the community to participate in decision-making processes and training.

4. Building a consensus and forming partnerships to create healthy spaces.

5. Promoting the leadership and participation of the health and other sectors.

6. Formulating healthy public policies at the local, regional, and national levels.

7. Monitoring and evaluating the progress and results obtained results.

The MCS strategy is implemented in a specific setting, defined from a geographical and physical, as well as a population, administrative, and political standpoint. This implies that actions are applied in communities that share a history, problems, and general conditions, and that have their own resources (economic, legal, material, human) and local political structure (PAHO/WHO, 1999). These elements facilitate the preparation and implementation of actions and appropriate programs to meet the needs of this MCS.

Primary Health Care

At the end of 1970s, the Primary Health Care (PHC) strategy emerged in response to growing inequity in the allocation of health resources at the world level. Defined as “essential health care made accessible at a cost a country and community can afford, with methods that are practical, scientifically sound and socially acceptable” (PAHO/WHO, 1998), the PHC combines the search for equity with community participation, intersectoral collaboration, and use of the most appropriate technologies and cost-effective interventions. It is based on reformulating the health services infrastructure, attending to the population's priority health problems, and strengthening the institutional capacities needed to perform these functions.

In recent decades, PHC has been officially adopted into the health policies of various countries in the Region and has largely contributed to general health improvements, with significant reductions in

risks to mothers and children, and increased life expectancy and quality in the Americas. Major social transformations in the region are attributed to PHC in terms of decentralization and community participation in the planning, organization, and operation of health systems.

In 2003, PAHO launched an initiative to reexamine the values and principles that inspired PHC in order to formulate its future strategic and programmatic orientations. The resulting strategy, known as Renewed Primary Health Care provides a renewed perspective and vision for developing PHC-based health systems, incorporates the Millennium Development Goals (MDG), and addresses the social determinants of health in order to achieve the possible highest level of health for all (PAHO/WHO, 2007).

Primary Environmental Care (PEC)

Primary environmental care is an environmental action strategy that is essentially preventative and participatory at the local level and which recognizes the right of human beings to live in a healthy and adequate environment and to be informed of environmental risks as they relate to health, well-being, and survival. It also defines their responsibilities and duties with regard to the protection, conservation, and recovery of the environment and the health (PAHO/WHO, 1998).

The concept is qualitatively different from, but complementary to, the PHC proposal applied to environmental issues and national environmental and international policies (PAHO/WHO, 1998). PEC incorporates preventive actions and planning in environmental management, allows for more rational use of resources, and takes into account individual and joint efforts to improve the quality of life in communities and the natural environment. At the same time, its goal is also to promote an environmental conscience and behaviors that foster citizen responsibility with regard to environmental defense and protection.

The PEC strategy is based on basic PHC values, in addition to others it incorporates to ensure its viability. Its fundamental principles consist of citizen participation, community organization, prevention, and environmental protection, solidarity and equity, its comprehensive nature, and diversity. PEC actions are also decentralized and intersectoral, which promotes public-private co-management, self-management, and political and functional autonomy (PAHO/WHO, 1998).

ANNEX 3. PARTNERSHIPS AND INTERSECTORAL COLLABORATION (continues)

Partner	Main project roles	Main contributions	Challenges and difficulties collaborating with this partner	Advantages and benefits of collaborating with this partner	Main results of this partner's participation
Ministries of Education	Coordination of education strategies at the local level Development of prevention strategies Promotion among the school-age population of adoption of healthy behaviors to prevent and control malaria	Training and education for communities on different interventions in coordination with the health sector Puppet shows at educational centers Student projects and competitions on malaria Preparation of a school primer and talks with students	Schools closed due to general teaching strikes	Possibility of training educators and students Message strengthened and behaviors changed at schools and within the students' families	Greater synergy of actions between the health and education sectors Strengthening of prevention actions for family units Change in attitudes and adoption of healthy lifestyles among educators and students
Ministries of Health	Project implementation and coordination at the local level Operational cooperation and evaluation in demonstration areas	Training of institutional teams and volunteers Formation of Community Working Groups	High turnover of technical personnel Government changes Variations in infrastructure and organization in terms of operating capacity and quality	Trained staff Infrastructure and an organized communication network in place for the communities in the demonstration areas	Project successfully implemented in the demonstration areas Capacities of institutional, municipal, and local personnel strengthened

ANNEX 3. PARTNERSHIPS AND INTERSECTORAL COLLABORATION (continues)

Partner	Main project roles	Main contributions	Challenges and difficulties collaborating with this partner	Advantages and benefits of collaborating with this partner	Main results of this partner's participation
			Strikes		Operating and technical capacity strengthened in terms of the program and at the grassroots level
City Halls, Municipalities	Logistical and financial support and inputs Coordination of activities at the local level Investment in small - scale environmental engineering works Calling upon and strengthening community participation Calling upon stakeholders and strengthening intersectoral coordination at the local level	Community coordination and orientation Coordination with project and health area personnel on various basic sanitation activities Participation on local committees Economic support and provision of machinery and vehicles for environmental clean-up days Creation of various management mechanisms	Changes in municipal governments Monitoring and support of the strategies adopted and coordinated by different actors Limited resources (economic, human and material) Little acceptance of alternative malaria-control models	Coordination and support of working groups Coordination of activities and active participation in the municipality Knowledge of the area and of the community's culture and language	Better coordination and synergy of actions with other sectors Incorporation of municipal budgets into health action plans Attendance at activities Purchase of inputs Lower costs for field interventions

ANNEX 3. PARTNERSHIPS AND INTERSECTORAL COLLABORATION (continues)

Partner	Main project roles	Main contributions	Challenges and difficulties collaborating with this partner	Advantages and benefits of collaborating with this partner	Main results of this partner's participation
Sponsors and local associations	Coordination, orientation, and strengthening of community participation in promotion and environmental education activities	Participation at planning meetings and in implementation of local interventions	Constant change of coordinators Temporary and permanent absences of coordinators Expectation of receiving monetary or material incentives for participation	Better coordination, participation, and local mobilization Shared responsibility with the other institutions and sectors	Development of trained working groups carrying out interventions at the local level Greater interaction between the public sector and the community Community leaders who are organized and trained to face the problem of malaria in communities
Private Sector	Financial and material support	Supply of materials and space for meetings Support with human resources for activity organization (clean-up crews) Strengthening of epidemiological surveillance and		Institutional projection Incentive for community participation	Volunteer crew for monthly clean-up of breeding sites (Nicaragua) Modification of determinants of health to decrease the social and economic impact of malaria in the communities

ANNEX 3. PARTNERSHIPS AND INTERSECTORAL COLLABORATION (continues)

Partner	Main project roles	Main contributions	Challenges and difficulties collaborating with this partner	Advantages and benefits of collaborating with this partner	Main results of this partner's participation
		measures to control breeding sites			
Community	Logistical support Participation in implementation of activities Knowledge of the local populations' cultures	Labor Team supervision granted for the project	Difficulty mobilizing the population for project activities Little community organization Expectation of financial or material incentives for participating Expectation of receiving economic and/or material incentives Cultural and ethnic diversity Geographical access	Strengthening of community participation and organization Understanding of community diversity Strengthening of community self-management Opportunity to introduce the concepts of local development, equity, and sustainable development	Change in attitude and behavior with regard to malaria's health and environmental problems Recognition of the effectiveness and the proposed strategies resulted in new habits in the population's daily life
Community Committees or Groups (Health Committees,	Community organization	Organization of clean-up activities and community campaigns	Temporary absence of community leaders to seasonal work outside the community	Greater community participation	Greater community awareness on its role in health and

ANNEX 3. PARTNERSHIPS AND INTERSECTORAL COLLABORATION (continues)

Partner	Main project roles	Main contributions	Challenges and difficulties collaborating with this partner	Advantages and benefits of collaborating with this partner	Main results of this partner's participation
Health Action Groups, etc.)	Organization of and communication about meetings and activities with the community Management of project funds and resources Coordination of interventions with other sectors	Support for the health sector in implementing interventions	Difficult coordination of teamwork and assignment of responsibilities Accountability for project resources	Capacity to bring together and motivate people Understanding of the community context	the clean-up and maintenance of the environment Greater and better link with public institutions
NGO	Technical support for specific activities (for example, planting Nim trees)	Support and technical expertise	Limited resources	Lower project costs	Optimization of efforts and resources Dissemination of benefits

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