ACTIVITY REPORT 106

ENVIRONMENTAL HEALTH PROJECT

Nicaragua: Rural Water Supply, Sanitation, and Environmental Health Program

Harold Lockwood
with
Gertrudis Medrano Morales and Jesus Olmedo Altamirano

Environmental Health Project
Contract HRN-I-00-99-0011-00
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Cover photo: **Young girl using the Nicaraguan rope pump *(bomba de mecate)* in Cerro Grande. (Photo by Eduardo Perez, 2001.)**

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About the Authors

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Holding a master's degree in small-scale engineering and rural development, Harold Lockwood currently operates as an independent consultant based in England. With over 10 years of international experience in water supply, sanitation, and environmental health, as well as in disaster management and humanitarian response, he has worked in many countries in Latin America, Asia, and Africa. Lockwood's principal clients include major donor government agencies, such as the U.K. Department for International Development (DFID) and the U.S. Agency for International Development, UN agencies, international nongovernmental organizations, and the private sector. In addition to design and evaluation of rural water supply and sanitation projects, Lockwood's particular area of expertise is institutional analysis and support for long-term operation and administration of community-managed projects. He has previously worked on Environmental Health Project (EHP) technical teams, most notably in Central America and the Dominican Republic.

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Over the past four years Gertrudis Medrano Morales, a social scientist, has worked on programs addressing rural drinking water, environmental sanitation, and community organization. She was social development manager for the EHP/Nicaragua Rural Water Supply, Sanitation, and Environmental Health Program and gender and training manager at the Drinking Water, Sanitation, and Community Organization Program (PASOC) in the South Atlantic Autonomous Region. For seven years Medrano worked in the field of sexual and reproductive health at IXCHEN, a nongovernmental organization, where she was director for training and staff development. She has over 10 years of experience in education, training, social promotion, and the gender approach in the areas of sexual and reproductive health, community organization, health education, drinking water, and environmental sanitation.

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Abbreviations

ACH	Action Against Hunger
ADRA	Adventist Development and Relief Agency
ARC	American Red Cross
CAPS	water and sanitation committee *(comité de agua potable y saneamiento)*
CARE	Cooperative for Assistance and Relief Everywhere
CDC	U.S. Centers for Disease Control and Prevention
CDM	Camp Dresser & McKee International Inc.
COSUDE	Swiss Agency for Development and Cooperation (Agencia Suiza para el Desarrollo y la Cooperación)
DFID	U.K. Department for International Development
EHP	USAID Environmental Health Project
EHP/Nica	EHP/Nicaragua Rural Water Supply, Sanitation, and Environmental Health Program
ENACAL	Nicaraguan Water and Sewage Company (Empresa Nicaragüense de Acueductos y Alcantarillados)
ENACAL-GAR	ENACAL Directorate of Rural Water Supply (Gerencia de Acueductos Rurales)
GoN	Government of Nicaragua
HIF	Hygiene Improvement Framework
IR	intermediate result
JHU	Johns Hopkins University
M&E	monitoring and evaluation
MARENA	Ministry of Natural Resources (Ministerio de Recursos Naturales)
MEASURE	USAID Project Monitoring and Evaluation to Assess and Use Results
MECD	Ministry of Education, Culture, and Sports (Ministerio de Educación, Cultura y Deportes)
MINSA	Ministry of Health (Ministerio de Salud)
NGO	nongovernmental organization
O&M	operations and maintenance

PASOC	Drinking Water, Sanitation, and Community Organization Program
PVO	private voluntary organization
RAAN	North Atlantic Autonomous Region (Región Autónoma Atlántico Norte)
RNAS	National Network for Water Supply and Sanitation
RRASCA	Regional Water and Sanitation Network—Central America (Red Regional de Agua y Saneamiento—Centro América)
Save	Save the Children USA
SILAIS	local system for integrated health care *(sistema local de asistencia integrada en salud)*
SINAS	National Water and Sanitation Information System (Sistema de Información Nacional de Agua y Saneamiento)
SpO	special objective
SNV	Netherlands Development Organization
UNICEF	UN Children's Fund
UNOM	Operation and Maintenance Unit (Unidad de Operación y Mantenimiento), ENACAL-GAR
USAID	U.S. Agency for International Development
USAID/Nicaragua	USAID Nicaragua mission
VIP	ventilated improved pit
WASH Project	Water and Sanitation for Health Project
WSS	water supply and sanitation

Executive Summary

This document constitutes the final report of the Environmental Health Project (EHP) Nicaragua Rural Water Supply, Sanitation, and Environmental Health Program (EHP/Nica)—a two-year reconstruction program funded by the U.S. Agency for International Development mission in Nicaragua (USAID/Nicaragua). The program, which ran from 1 September 1999 through 31 December 2001, with a total budget of $9.783 million, was managed on behalf of USAID/Nicaragua by EHP. This program was one component of a $94 million package of assistance that the U.S. Congress approved to address the damage wrought by Hurricane Mitch in Nicaragua's northern regions in late October 1998.

The report documents the program's history from design and start-up through the final review and evaluation of specific components and closeout activities. Written by an external EHP consultant, with support from the EHP/Nica staff, the report draws upon a wide range of inputs: program documentation, monitoring outputs, final reports of private voluntary organizations (PVOs), and the results of a wrap-up workshop held in early December 2001 that discussed key lessons and conclusions.

The report is presented in five chapters. The first chapter provides a background to Hurricane Mitch, the broader USAID reconstruction efforts, the design of the reconstruction program, and the underlying approach — one focusing on health improvements. Chapter 2 describes program components and activities in more detail and presents a global picture of the quantifiable outputs achieved over the two-year implementation period. Chapter 3 presents an in-depth description and analysis of the program's main components and discusses their impact upon the beneficiary population. Chapter 4 discusses key aspects of program management and technical assistance provided by EHP to the implementing PVO partners. The fifth and final chapter summarizes some of the most significant conclusions and lessons learned from the two-year effort, with the objective of informing the design and management of future such programs.

Program Design and Expected Outputs

As part of the design process, a four-person team led by EHP consultants carried out a sector review and impact assessment in May 1999, with funding from the health program within the USAID/Nicaragua Mission. Hurricane Mitch had a devastating impact on Central America, with Nicaragua being one of the worst-hit countries in the region. Government of Nicaragua (GoN) estimates at the time indicated that the hurricane had destroyed or damaged water and wastewater supply systems serving over 800,000 people. In addition, it appeared that over 10,000 household latrines in rural areas were damaged or destroyed. Sustaining the worst damage were the areas in the north along the Honduran border, with the departments of Jinotega, Madriz, Nueva Segovia, and Chinandega being hardest hit.

Following the field assessment, a proposal for the reconstruction program was drafted, which subsequently formed the basis of a task order under the EHP Indefinite Quantity Contract with USAID/Washington. The EHP contract is managed by the contractor Camp Dresser & McKee International Inc., which established EHP/Nica to administer the program and to provide oversight and monitoring of program implementation on behalf of USAID/Nicaragua.

The program for reconstruction of water supply and sanitation (WSS) facilities described in the task order had the overall *objective* of maintaining or improving the *health status* of families affected by Hurricane Mitch in rural or resettled population centers of Nicaragua. The program *purpose* was to increase *sustainable WSS services* for up to 200,000 people in the affected parts of the country.

To this end EHP developed the program design, using a conceptual model known as the *Hygiene Improvement Framework*, with the primary objective of improving health within the beneficiary population. Developed by EHP over many years of field experience and research, the model takes an integrated approach to improving health and addresses three key areas:

1. *WSS infrastructure:* Improving people's access to safe sources of drinking water (either community-based systems or household wells) and excreta disposal facilities (generally speaking, household latrines)

2. *Hygiene promotion:* Promoting knowledge about hygiene and achieving sustainable changes in key high-risk behaviors to reduce the incidence of diarrhea among the beneficiary population

3. *Enabling environment:* Conducting capacity-building interventions to support project sustainability at community, institutional, and national levels

Program Implementation

Working within the overall Mitch-affected area as defined by USAID/Nicaragua, EHP/Nica was implemented in eight departments of the country and 37 individual municipalities, which were identified in the original assessment as being among the most needy. PVOs skilled in rural community-based projects served as subcontractors.

Under the task order, EHP/Nica was expected to provide a series of functions relative to overall program management, facilitation among partners, technical guidance, monitoring and evaluation, and logistical support. In addition, EHP/Nica maintained close working relations with the Nicaraguan Water and Sewage Company Directorate of Rural Water Supply (ENACAL-GAR), the GoN agency responsible for the rural sector, to coordinate project interventions and ensure that technical standards and methodological approaches under the program reflected best practices.

Given the strong focus on hygiene promotion and community organization, the PVOs had limited time to implement projects. From the outset, all stakeholders recognized this constraint as a potential obstacle to achieving well-integrated and sustainable projects.

Following a screening process and a start-up workshop in which the program approach and philosophy was explained, five PVOs received grants to carry out community water supply, sanitation, and environmental health projects in March 2000. A further grant was awarded to a sixth PVO in June of the same year. In addition to these grants, EHP/Nica awarded a contract to Cooperative for Assistance and Relief Everywhere (CARE) Nicaragua to supply WSS services to a number of rural health clinics in areas affected by the hurricane. Lastly, contracts were awarded for the operation and management of two drilling rigs that EHP/Nica procured as part of the implementation program.

As well as using PVO partners to implement individual WSS projects in rural communities, EHP/Nica aimed to contribute to national capacity to implement sustainable WSS projects—working both with the government and with nongovernmental sectors. Therefore, the original program design included components to support the work of ENACAL-GAR, increase drilling capacity at national level, and disseminate norms and best practices within the implementing PVOs.

Program Results and Impacts

WSS Infrastructure

In global terms EHP/Nica surpassed the physical output targets agreed upon with USAID/Nicaragua. Table A presents a summary of final program outputs and targets for physical infrastructure.

Table A. Program Outputs and Targets

Infrastructure	Program Targets	Program Output
Water supply systems	2,565	2,692
Household latrines	5,973	7,226
Environmental projects	832	3,503
Wells drilled	190	295
Services provided to health clinics	39	40

Translating the above results for system construction into the total number of EHP/Nica beneficiaries, the goal set out in the original task order—provision of WSS services for up to 200,000 people—was also surpassed. (See Table B.)

According to ENACAL-GAR year 2001 data, 46% of Nicaragua's rural population (approximately 1.2 million people) have access to safe water; this compares with a

coverage level of approximately 33% in 1998. ENACAL-GAR estimates that new systems constructed under EHP/Nica account for about 10 points of this 13% increase in coverage over the past two years.

Table B. Population Served, by Program Component

Components	Population Served
Community Rural WSS Projects	
WSS	114,466
Sanitation	16,491
Subtotal	130,957
Clinic Rehabilitation Projects	
Indirect beneficiaries*	404,174
Direct beneficiaries**	68,744
Subtotal	68,744
Well-Drilling Projects	
EHP rural WSS projects***	4,857
Other projects	16,217
Subtotal	16,217
Total Population Served	**215,918**

* Total indirect population living in catchment area of all clinics included in program.

** Estimate for health clinic based upon Ministry of Health (MINSA) figures for actual visits made by community members in the year preceding project execution.

*** The number of wells drilled with EHP/Nica–procured drilling rigs is included as a component of the sum of community rural WSS projects.

Hygiene Promotion

Direct implementation of the hygiene promotion component was carried out by the six PVOs under EHP/Nica, and during the course of the two-year effort over 45,000 community members took part in activities relating to hygiene promotion and behavior change. These interventions were aimed at generating knowledge and promoting positive attitudes and practices with regard to hygiene and sanitation at personal, household, and community levels.

The impact of hygiene promotion was primarily assessed on the basis of the monitoring system established by EHP/Nica and carried out by PVO partners in 169 communities and 1,183 households. The system measured progress in 11 key indicators relating to hygiene behavior and practices. These data were complemented by more in-depth case studies carried out in five beneficiary communities and five control communities during the program.

In general, it was found that families in the beneficiary communities had assimilated key messages concerning transmission of water-based diseases, handwashing at critical moments, excreta disposal, and the role of insects as vectors in disease

transmission. The final aggregated PVO monitoring results indicate that initial targets were met or exceeded for 10 of the 11 indicators. These targets included a reduction in the percentage of homes where children aged four and under were reported to have had diarrhea during the two weeks preceding the survey: from an average of 20% at the start of the program to an average of 13% during the final monitoring period.

These positive tendencies are supported by epidemiological surveillance data from the Ministry of Health (MINSA) in areas where the program has greatly increased access to WSS facilities among municipal population. In addition, the PVO partners have amassed a wealth of anecdotal evidence from individual beneficiaries about the positive impacts of the projects on public health.

Enabling Environment

EHP/Nica included a number of specific activities directly related to promoting an enabling environment, which, broadly speaking, focused on the following elements: community capacity building for managing and operating water supply facilities over time; capacity building of institutions implementing sustainable WSS projects at the national level; and promotion of improved coordination and policy dissemination within the rural WSS subsector at the national level.

At the community level EHP/Nica supported the formation of management structures, or water supply and sanitation committees (CAPSs), which empower communities to administer and operate their own water supply systems in the long term without significant external support. The establishment of such structures has led to a strengthening of leadership capacity more generally within communities; in a number of the PVO projects, these committees have provided women with new forms of access to leadership structures within a culture that traditionally limits such opportunities. In more quantitative terms, EHP/Nica worked in 289 individual communities, involving over 34,000 participants in organizational and technical training events, and formed 242 new CAPSs, with a total of 1,342 members.

The PVO partners were the main focus of institutional capacity-building efforts under EHP/Nica. Although it is difficult to quantify PVO gains in a systematic manner, a number of clear examples show how far some of the organizations have come in terms of their capacity and competence to execute rural WSS projects. In purely quantitative terms, 55 professional PVO staff have engaged in these projects, received technical training and orientation, and benefited from almost two years of project implementation experience.

In addition to supporting PVO capacity, EHP/Nica also emphasized involvement of municipal authorities, or *alcaldías,* in project planning, implementation, and monitoring. These developments are fully in line with the broader transition in Nicaragua from heavily centralized to more decentralized provision of (social) services at the municipal level. EHP/Nica contributed to the rural subsector through the procurement of two high-performance drilling rigs and the establishment of

drilling teams operated by two PVOs. These rigs were left in country for the PVOs to provide not-for-profit drilling services to poor rural communities.

As part of its contribution to improving the nongovernmental sector's capacity to execute rural WSS projects, EHP/Nica used its facilitator role to promote coordination between the PVO partners and GoN agencies and dissemination of best practices and sector policy. These efforts have increased PVOs' awareness about the role and functions of both ENACAL-GAR and MINSA in the subsector.

Conclusions and Lessons Learned

Throughout the course of the two-year program, many useful lessons emerged from successful experiences as well as some failures; these lessons cover a variety of areas, from technical issues to the design and delivery of project software and overall program management. One source of underlying tensions for EHP/Nica was the very short implementation period, which caused particular concern about the sustainability of the program's software components, such as community organization, hygiene promotion, and behavior change.

However, EHP/Nica's results were for the most part extremely encouraging, with progress made in key software areas as well as in meeting (and in most cases surpassing) physical output targets. To date, community management structures have been established or strengthened, hygiene promotion has brought about improvement in critical behaviors, and retention of hygiene-related messages is high. The overwhelming majority of the physical facilities are to a high standard of construction and in line with ENACAL-GAR norms. In addition, by greatly increasing the institutional capacity of partner PVOs, the program has had a strategic impact upon the subsector in Nicaragua.

In summary, EHP/Nica demonstrated that it is possible both to implement a large-scale rural WSS program and to achieve relatively high-quality results within a narrow time frame. However, after a number of years it would be prudent to follow up an investment program of this magnitude with a postproject review to assess fully the sustainability of project benefits over time.

Another key lesson, very much linked with the above, is that a WSS program of this magnitude and complexity benefited enormously from having the continuous and proactive program management and technical expertise of an organization such as EHP/Nica. The overwhelming evidence suggests that the program provided a range of functions and services beyond those of conventional management and administration and that there was a significant added value to the program on the basis of EHP's involvement.

Lastly, one of EHP/Nica's most significant aspects was its strategic impact upon redefining the emphasis of WSS project interventions, consistently reinforcing the conceptual shift from a *water and sanitation intervention,* which includes a health component, to a *health intervention* with water and sanitation infrastructure

components, among others. The impact of this change in approach was clearly recognized and welcomed by key players, including the MINSA's environmental health director, who spoke of a "new paradigm" for water and sanitation interventions, placing them at the center of preventive health efforts.

1 Introduction and Background

1.1. Background to Hurricane Mitch and the USAID/Nicaragua Reconstruction Plan

In late October of 1998, Hurricane Mitch struck the isthmus of Central America, causing an unprecedented swath of destruction that left thousands dead and injured and caused hundreds of millions of dollars in damage to residential housing, transport infrastructure, schools, clinics, and drinking water supply systems. One of the worst-hit countries in the region was Nicaragua, whose government estimated that the hurricane destroyed or severely damaged water and wastewater supply systems serving over 800,000 people. In addition, over 10,000 household latrines in rural areas were reported damaged or destroyed. The worst-affected parts of Nicaragua were in the north along the Honduran border, with the departments of Jinotega, Madriz, Nueva Segovia, and Chinandega being the hardest hit; the department of Managua was also affected due to greatly increased water levels in Lake Xolotlán.

The national and international response to this disaster was rapid and large scale, including actions on the part of the Government of Nicaragua (GoN), the Red Cross, nongovernmental organizations (NGOs), multilateral institutions, and bilateral donors. The response of the U.S. Agency for International Development mission in Nicaragua (USAID/Nicaragua) to Hurricane Mitch was immediate, with funds made available for emergency humanitarian interventions. After the initial emergency, the U.S. Congress made supplemental funding available in response to the continuing needs of those living in departments and municipalities most affected by the disaster.

Funding of approximately $94 million was made available under a special objective (SpO) entitled “Rapid Reconstruction and Sustainable Recovery in Mitch-Affected Areas.” Because of delays in approval, however, these funds were in fact used for both rehabilitation and new construction and were tied to a discrete, and limited, time frame of only two years. Five specific intermediate results were listed in the SpO: (1) maintained or improved health status, (2) restored economic livelihoods, (3) mitigated vulnerability to natural disaster, (4) restored primary education conditions, and (5) repaired basic municipal infrastructure.

Within the intermediate result (IR) for public health were two further subcomponents, one of which (IR 1.2) had the objective of rehabilitating or constructing new rural water supply and sanitation (WSS) facilities. At the time of program formulation, USAID/Nicaragua anticipated funding on the order of $10 million for this activity, with a two-year disbursement time frame to meet the requirements set forth by the U.S. Congress. Given the scale of funding and the wide range of reconstructive

activities included under the SpO, one of USAID/Nicaragua's concerns was to achieve a synergetic impact, both among these new programs and with existing pre-Mitch USAID/Nicaragua development projects. Therefore, strategic coordination and collaboration among different USAID/Nicaragua–funded programs was seen as a critical component of the overall SpO effort.

1.2. Background to Environmental Health Project

At the time of program formulation, USAID/Nicaragua requested technical assistance from the Environmental Health Project (EHP) in assessing the situation in post-Mitch Nicaragua and, more specifically, the existing needs and capacities in the rural WSS subsector. Subsequently, a task order was issued under EHP for overall management of the two-year EHP/Nicaragua Rural Water Supply, Sanitation, and Environmental Health Program (EHP/Nica).

EHP is a global USAID-funded five-year project that provides technical assistance to missions around the world in core fields, such as WSS, vector-borne diseases, and environmental health. EHP is an indefinite-quantity contract, which allows USAID offices and missions to access services through buy-ins known as task orders. The project comprises a consortium of private-sector consulting firms and research bodies, led by the environmental engineering firm Camp Dresser & McKee International Inc. (CDM).

EHP advocates an integrated approach, combining hygiene education and behavioral change, along with appropriate hardware facilities, to reduce diarrheal diseases. To implement this approach in the field, EHP works with local communities or other partners to identify what risk factors are associated with diarrhea transmission in a target area and then works with these partners to develop and implement strategies to address the factors selected.

During EHP's first seven years, such strategies have typically included—but not been limited to—behavior change, community mobilization and participation, policy improvement, cost recovery, public-private partnerships, institutional strengthening, ensuring the presence of handwashing facilities, construction of community water systems, and increasing appropriate use of sanitation facilities. EHP believes that these interventions should be viewed as a part of integrated solutions that reduce diarrheal diseases. Access to, and appropriate use of, technologies can directly improve hygiene. Institutional strengthening and policy improvement create enabling environments that determine the scale of public health impact and the sustainability of hygiene improvement activities. Community participation, behavior change, and social marketing are methods to promote hygiene and bring about desired improvements.

Despite current levels of knowledge and experience, diarrhea prevention is seldom systematically addressed in child health, water supply, environmental, or infrastructure programs. Where diarrhea prevention is considered, interventions typically do not focus on those risk factors important globally. Locally important risk

factors, as well, are also frequently overlooked, and priorities are consequently misplaced. As a result, interventions all too often fail to achieve the desired health impacts. Factors that have demonstrated inverse correlation with diarrheal disease include the following:

- Washing hands at proper times using a proper methodology
- Disposing of feces in a sanitary manner
- Keeping drinking water free of fecal contamination
- Keeping food free of fecal contamination

Each of these factors can be addressed through improved personal, household, and community hygiene. As addressed by EHP, *hygiene improvement* is an integrated approach to preventing diarrheal diseases through three components: (1) expanding access to hardware, (2) conducting hygiene promotion, and (3) creating enabling environments. EHP has integrated these three components into the Hygiene Improvement Framework (HIF) (Figure 1).

EHP, its predecessor Water and Sanitation for Health (WASH) Project, and a range of international partners have many years of experience in all three aspects of hygiene improvement, but the tools used and the results achieved are too often either not well documented or not widely disseminated. EHP is working to document an integrated approach that uses hygiene behaviors as the focal point for developing and evaluating programs integrating all three aspects of hygiene improvement. This approach

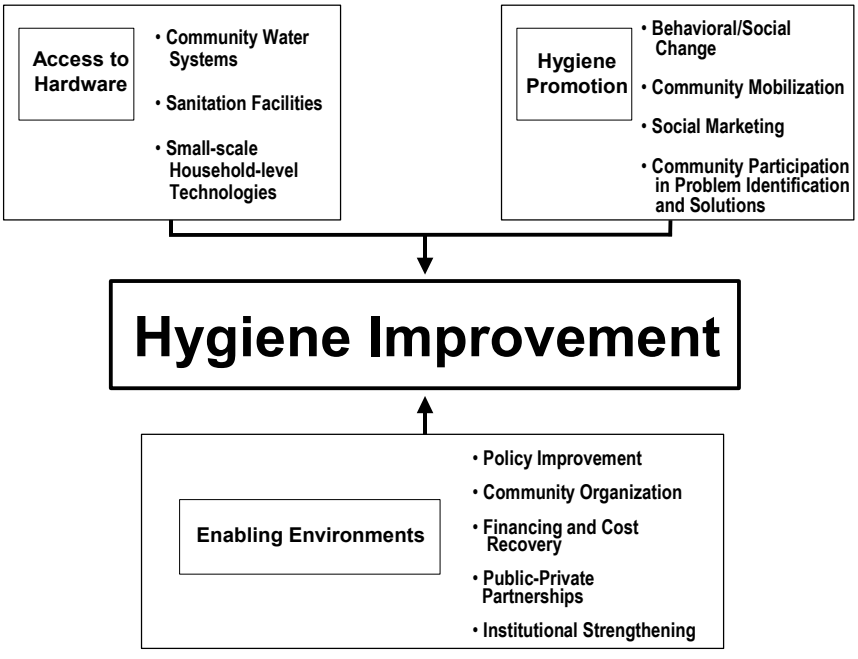

Figure 1. Hygiene Improvement Framework

complements and is supported by increasing global interest in behavior-focused approaches to achieve health impacts through water, sanitation, and hygiene programs. International support and action for the approach comes from various sources, including the UN Children's Fund (UNICEF), the London School of Tropical Medicine and Hygiene, the International Water and Sanitation Center, the Cooperative for Assistance and Relief Everywhere (CARE), the Pan American Health organization, and the Water Supply and Sanitation Collaborative Council.

The HIF approach was used as a conceptual basis to inform the design process for EHP/Nica. Each component of the approach was addressed within the specific context of Nicaragua, and as the program moved forward, the framework served to guide strategic decision making.

1.3. Rural Water Supply, Sanitation, and Environmental Health Program

1.3.1. Program Design and Objectives

At the request of USAID/Nicaragua, EHP sent a four-person team (two EHP consultants and two USAID staff members) in May 1999 to develop a proposal document (Narkevic et al. 1999) addressing potential interventions to be funded under the Mitch-related SpO. This document was subsequently revised and then finalized to form the basis of a task order (under the EHP indefinite-quantity contract managed by CDM) to administer the entire two-year rural WSS program in Nicaragua. Under this task order, CDM/EHP held the role of principal contractor to USAID/Nicaragua for the oversight, management, and monitoring of program implementation. In this report, the EHP office and presence in Nicaragua is referred to as EHP/Nica to distinguish it from the permanent EHP office in Washington, D.C.

EHP received a preapproval for expenditures beginning on 1 September 1999, the date subsequently taken to be the start date for EHP/Nica. The final budget agreed to by USAID/Washington, including several amendments to the original task order, was for a total of $9.783 million. This budget included direct implementation costs as well as EHP's costs of managing the overall effort. The two-year program had these overall goals:

- *Objective:* To maintain or improve the health status of families affected by Hurricane Mitch in rural or resettled population centers of Nicaragua. (This is consistent with USAID/Nicaragua IR 1.)

- *Purpose:* To increase sustainable WSS services for up to 200,000 people. (This is consistent with USAID/Nicaragua IR 1.2.)

More specifically, the original EHP/Nica task order contained a number of expected results. Those presented in the box entitled "Specific Program Results," below, incorporate modifications to the original task order that occurred during the two-year project period.

Specific Program Results

1. Between 150,000 and 200,000 people benefiting from the rehabilitation or new construction of water supply systems
2. Between 25,000 and 30,000 people benefiting from the rehabilitation or new construction of household latrines*
3. Orientation and training of project beneficiaries in proper health and hygiene practices related to water supply, on-site excreta disposal, and environmental sanitation
4. Orientation and training of project beneficiaries in source water protection and conservation techniques
5. Orientation and training of project beneficiaries in technical, administrative, and managerial aspects of their WSS systems.
6. Formation and training of small community organizations or municipal offices to be responsible for water, sanitation, and solid waste management**
7. Increased institutional capacity for monitoring and surveillance of (microbiological) water quality in the rural sector and for providing prompt and effective interventions
8. Increased local capacity of NGOs and/or the private sector to implement WSS projects in the rural subsector
9. Dissemination of official sector policy and norms among NGOs and private-sector organizations implementing rural WSS projects
10. Increasing the management, planning, and monitoring capacity of the Nicaraguan Water and Sewage Company Directorate of Rural Water Supply (ENACAL-GAR) at the national level
11. Supporting a national strategy and operational plan to increase local or municipal-level capacity to manage and provide goods and services related to long-term operations and maintenance (O&M) of rural systems

Note: *Specific Program Results 2 and 6 were modified by Amendment 5 to the task order on 15 May 2001.*

* This specific result originally indicated 150,000 to 200,000 beneficiaries.

** This specific result originally referred to the establishment of small companies for the provision of solid waste management services in periurban areas.

1.3.2. Geographic Focus

As prescribed under the overall USAID/Nicaragua SpO for Reconstruction, the EHP/Nica geographic extension was limited to those departments and municipalities considered to be worst affected by Hurricane Mitch (see Figure 3).

1.3.3. Program Strategy

From the outset it was clearly understood that EHP/Nica had an overarching goal of achieving *health improvements* in the beneficiary population. Therefore, in addition to its aim of redressing the impact of Hurricane Mitch in terms of physical infrastructure, the program design sought to provide added value by incorporating a number of critical components that support this broader health goal.

In the first instance the program took an integrated approach to service provision by improving access to water supply and excreta disposal *infrastructure* at the household and community levels. Secondly, the program incorporated strong *hygiene promotion* and *community organization* components, with the overall aim of achieving sustained changes in key behaviors and thereby improving people's health. Thirdly, the program was designed to address institutional capacity building and the dissemination of best practices and recognized norms, thereby contributing to an *enabling environment* within the rural WSS subsector in Nicaragua.

For the health benefits from improved infrastructure and behavioral changes to be maintained over time, it is imperative that the sanitary works provided be sustainable. Therefore, the EHP/Nica design addressed the long-term sustainability of projects in a number of important areas:

- *Community capacity building:* Active participation of beneficiaries, transfer of knowledge and skills, and organization of management structures within the beneficiary communities allowing for the administration and operations and maintenance (O&M) of systems

- *Technical:* Adoption of appropriate system designs and technologies that can be managed by communities and guaranteeing the quality of construction

- *Financial:* Establishment of mechanisms within the community for collecting tariffs and motivating end users to pay for their system's upkeep

- *Environmental:* Protection and conservation of the water source upon which the system relies, as well as guarantees that project construction and siting do not adversely affect the local environment

In addition to supporting infrastructure development and improved health impacts, the program design recognized the need to address the issue of institutional capacity in Nicaragua's rural WSS subsector. During the course of the post-Mitch assessment, it became apparent that the function and role of the Nicaraguan Water and Sewage

Company Directorate of Rural Water Supply (ENACAL-GAR) were undergoing a significant shift in emphasis, moving from one of direct project implementation to one focusing on planning, facilitation, and coordination. Therefore, the development of alternative capacity was made an explicit program goal in terms of increasing the experience of private voluntary organizations (PVOs), disseminating best practices, and improving the coordination among various actors in the subsector.

1.4. Program Partners

1.4.1. PVO Implementation Partners

EHP/Nica's approach was based upon subcontracting project implementation to qualified PVOs that either had experience in Nicaragua's rural sector or demonstrated the capacity to initiate such programs at short notice. During the course of program design and start-up, a number of potential PVO partners with suitable capacity and experience were identified. An initial shortlist of 14 such organizations was drawn up, including both national and international PVOs.

Following the grant application procedure and agreed-upon technical, managerial, and financial selection criteria, five PVOs were awarded contracts under EHP/Nica to implement community WSS projects:

1. Action Against Hunger (ACH)
2. Adventist Development and Relief Agency (ADRA)
3. Alistar/Raya Ka Laya
4. Plan Nicaragua
5. Save the Children USA (Save)

After a subsequent review of the original proposals and a reassessment of the program budget, a further grant was made to the American Red Cross (ARC) in July 2000 for work in resettlement communities of people permanently displaced by Hurricane Mitch. In addition, contracts were awarded to Save and CARE for the operation and management of the two drilling rigs procured by the program; this subproject is discussed in detail in Section 3.3.4.

In addition to the contracts for community-based water supply, sanitation, and environmental health projects, a further contract was awarded to CARE for WSS services to a number of rural health clinics in areas affected by Hurricane Mitch (see Section 3.1.5)

1.4.2. Government of Nicaragua Sector Partners

As envisioned in the original planning document, EHP/Nica interacted and collaborated with a range of government agencies at both national and local levels,

foremost among them ENACAL-GAR (the subsector agency responsible for executing and administering rural water supply and sanitation) and the Ministry of Health (MINSA). Other agencies with less direct involvement in the program included the Ministry of Education, Culture, and Sports (MECD) and the Ministry of Natural Resources (MARENA).

In terms of macro-level planning, policy issues, and information sharing, EHP/Nica was designed to maintain regular coordination with ENACAL-GAR and MINSA at the national level in Managua. Through the PVO partners, the program would also coordinate activities at the local level through regional and subregional ENACAL-GAR offices and the departmental and municipal MINSA offices and health facilities.

Over the past several years Nicaraguan municipal governments have assumed increasing importance in the provision of social services and infrastructure, their growing role being part of a wider strategic process of decentralization undertaken by the GoN. Therefore, the program design took account of the need to incorporate municipal authorities, or *alcaldías,* in the process of planning and project implementation at the local level. It was also envisioned that alcaldías would take a leading role in coordination among PVOs, communities, and line ministries with a local presence. Given their potential role for support to community-managed systems, the alcaldías' involvement from the outset was considered vital to long-term sustainability of projects at the municipal level.

1.4.3. Other USAID/Nicaragua–Funded Partners

EHP/Nica was but one component under the overall USAID/Nicaragua SpO; also included were other U.S. agencies as well as ongoing (pre-Mitch) USAID/Nicaragua programs, such as environmental and democratization programs, operating in the same geographic areas. Therefore, at the time of program formulation EHP had identified a number of key potential collaborators:

- U.S. Centers for Disease Control and Prevention (CDC): water quality, public health education)
- U.S. Environmental Protection Agency: laboratory capacity building and water quality monitoring, watershed protection
- USAID Project Monitoring and Evaluation to Assess and Use Results (MEASURE): epidemiological surveillance, health surveys, and evaluation
- PROSALUD: public health, health infrastructure
- U.S. Peace Corps: specific technical assistance and training for PVOs
- U.S. Geological Survey: mapping capabilities and geographic information systems

- U.S. Army Corps of Engineers: direct implementation of WSS infrastructure
- U.S. Department of Agriculture: watershed protection and short-term technical assistance

Johns Hopkins University (JHU) was a principal partner with EHP/Nica in executing the program, playing a key role in social marketing and mass communication relating to WSS interventions and key behaviors. The two organizations collaborated closely in coordinating activities and maximizing the impacts of interventions in specific rural communities (see Section 3.2 for further details).

1.4.4. Other Partners

EHP/Nica worked with a wider group of partners as well, all with an interest in Nicaragua's rural subsector, including UNICEF and the National Network for Water Supply and Sanitation or (RNAS, which is itself a member of the Regional Network for Water Supply and Sanitation—Central America [RRASCA]). RNAS is an important forum in Nicaragua, allowing a wide spectrum of institutions—government, donors, and NGOs—to exchange information and address technical issues.

Other agencies that participated or interacted with EHP/Nica included bilateral agencies, such as the Swiss Agency for Development and Cooperation (COSUDE) and the Netherlands Development Agency (SNV). All of these organizations and institutions are important players in Nicaragua's rural subsector, and EHP/Nica was proactive in engaging with them throughout the lifetime of the program.

1.4.5. Context of Program Implementation and Challenges Faced

As noted above, EHP/Nica focused on improving health conditions and on guaranteeing that individual project benefits would be sustainable over time. As with many other infrastructure-investment programs of this type, such an approach often leads to a conflict between the quantity and speed of implementation of *physical facilities,* on the one hand, and the quality and integrity of the *social components* (often referred to as the software), on the other. Based on global experience with similar project interventions, such software components are known to enhance sustainability in terms of system management and continued health benefits over time.

EHP/Nica's challenge was complicated by the program's very narrow time frame. Because of the USAID requirement to design and apply a rigorous grant application and management process, most partner PVOs did not actually sign bilateral contracts with EHP/Nica until March 2000, with physical implementation of most projects starting in about April or May of the same year. With the need to close out projects and draw up final accounts and reports at the end of the grant period, the original two-year implementation time frame was effectively reduced to approximately 16 to 18

months for the PVO partners: a key challenge facing projects that included significant software components in addition to physical infrastructure works.

Other constraints, in some cases also related to the issue of a limited time frame for project execution, included the following:

- Limited access to more remote rural areas during the rainy season
- Conflicts with periods of high labor demand in the agricultural cycle and/or the temporary migration of people dependent on paid work in the coffee industry
- Continued high levels of soil saturation in some areas of the country affected by the hurricane
- Lack of a clearly defined framework for legalizing water and sanitation committees (CAPSs)

2 Program Implementation and Results

2.1. Program Activities

Following USAID's formal approval of the original program proposal and preapproval for expenditures, EHP immediately began to establish an in-country presence and to work on a detailed plan of activities for the program's first year. In November 1999, EHP/Nica held a start-up workshop, which was instrumental in launching the program and brought together potential PVO partners, GoN agencies, and USAID representatives (from both Washington and Nicaragua). Thereafter, the finalization of all program activities and targets was carried out bilaterally by EHP/Nica and USAID/Nicaragua. Once the details of the work plan were finalized at this level, the original task order between the USAID Office of Health and Nutrition in Washington and CDM/EHP was amended to reflect these changes; the activities and outputs described in this final report reflect the amended task order. Key events and milestones of the two-year program are presented in chronological order in Figure 2.

As noted in section 1.3.3, the EHP/Nica strategy focused on three broad areas of intervention—(1) WSS infrastructure, (2) hygiene promotion, and (3) enabling environment—which, taken together with the actual program management tasks, describe all of the principal implementation activities carried out over the two years:

- *WSS infrastructure:* Providing community or family-based water supply systems, household-level excreta disposal, and environmental projects

- *Hygiene promotion:* Aiming continuous interventions at promoting knowledge about hygiene issues and achieving sustainable changes in key high-risk behaviors

- *Enabling environment:* Supporting the sustainability of projects, at both community and institutional levels, through training, mobilization activities, and coordination, and through dissemination of best practices and recognized norms

- *Program management and technical assistance:* Facilitating all aspects of grant disbursement, support to PVO partners, monitoring, and reporting to USAID/Nicaragua

In Section 2.2 all quantifiable output data are presented, and, where appropriate, planned targets are compared with final outputs. In Chapters 3 and 4, each of the above group of activities is presented in detail with an analysis of the process and impacts measured by EHP/Nica.

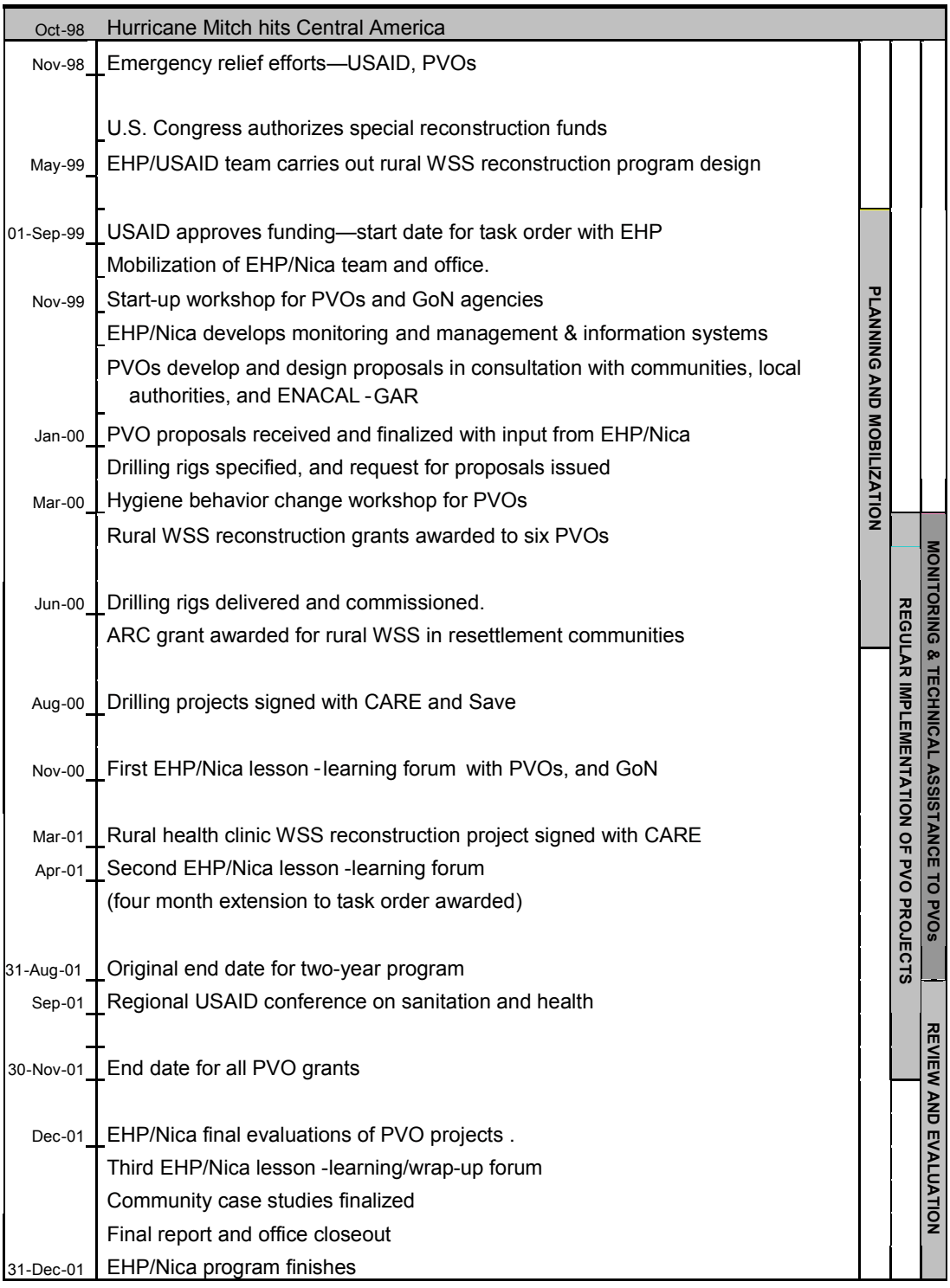

Figure 2. Chronology of EHP/Nica

2.1.1. Specific Program Targets

Following approval of the first work plan, specific targets were established for physical progress. These targets were revised during the finalization of the year 2 work plan and through subsequent amendments to the task order, resulting in a new cumulative total for the entire program ending 31 December 2001. The resultant summary targets are presented in Table 1.

Table 1. Program Targets by Year

Outputs	Targets
Water supply systems	2,565
Household latrines	5,973
Environmental projects	832
Wells drilled*	190
Services provided to health clinics	39

*By drilling rigs procured under EHP/Nica

The original program design document and task order called for the establishment of small companies to provide solid-waste management services in periurban areas. Given the final focus on more rural, dispersed populations and the subsequent development of the detailed program planning, this target was recognized as no longer being a priority; therefore, EHP/Nica sought approval from USAID/Nicaragua to modify this particular component of the task order. In addition, the target for environmental projects was lowered from the original 2,599 projects, because the proposed projects did not satisfy ENACAL-GAR norms due to soil conditions in the projected areas (see Section 3.1.4).

USAID/Nicaragua approved these changes at the time the year 2 work plan was drafted. The interpretation of environmental projects was also modified to include activities relating to WSS and solid-waste interventions at the household or community level:

- Localized drainage and elimination of standing water for vector control
- Gray-water infiltration pits
- Nurseries and replanting efforts
- Solid waste cleanup
- Environmental education

2.2. Program Results

2.2.1. Geographic Focus

Working in eight departments, EHP/Nica included the individual municipalities shown in Table 2 and Figure 3.

Table 2. Geographic Intervention of EHP/Nica Program, by PVO and by Municipality

PVO (number of municipalities)	Department	Municipalities
Alistar Nicaragua (3)	Jinotega	Cua-Bocay, Wiwilí
	RAAN*	Waspán
ADRA (14)	Nueva Segovia	Dipilto, Jicaro, Santa María, Mozonte, Ciudad Antigua, Quilalí, Murra, Macuelizo, San Fernando
	Madriz	San Lucas, Yalagüina, Palacagüina
	Estelí	San Juan de Limay, Pueblo Nuevo
ACH (8)	Madriz	Totogalpa, Palacagüina, San Lucas, San Juan de Río Coco, Telpaneca, Somoto
	Jinotega	Cua-Bocay
	Estelí	Pueblo Nuevo
Plan Nicaragua (3)	Chinandega	Puerto Morazán, Villanueva, Chinandega
Save (2)	Chinandega	El Realejo, El Viejo
ARC (13)	Madriz	S. J. Cusmapa, Yalagüina, Totogalpa, Palacagüina, Somoto, San Lucas, Telpaneca.
	Nueva Segovia	Dipilto, Ciudad Antigua, Jalapa
	Matagalpa	Ciudad Dario, Matagalpa
	Managua	Tipitapa, Managua
CARE – Health Clinic Projects (9)	Jinotega	Cua-Bocay, Santa Maria de Pantasma, Wiwilí, Paiwas
	RAAN*	Waslala
	Matagalpa	Rio Blanco, Paiwas, Matagalpa, El Tuma–La Dalia, Rancho Grande, Matiguas

*Región Autónoma del Atlántico Norte

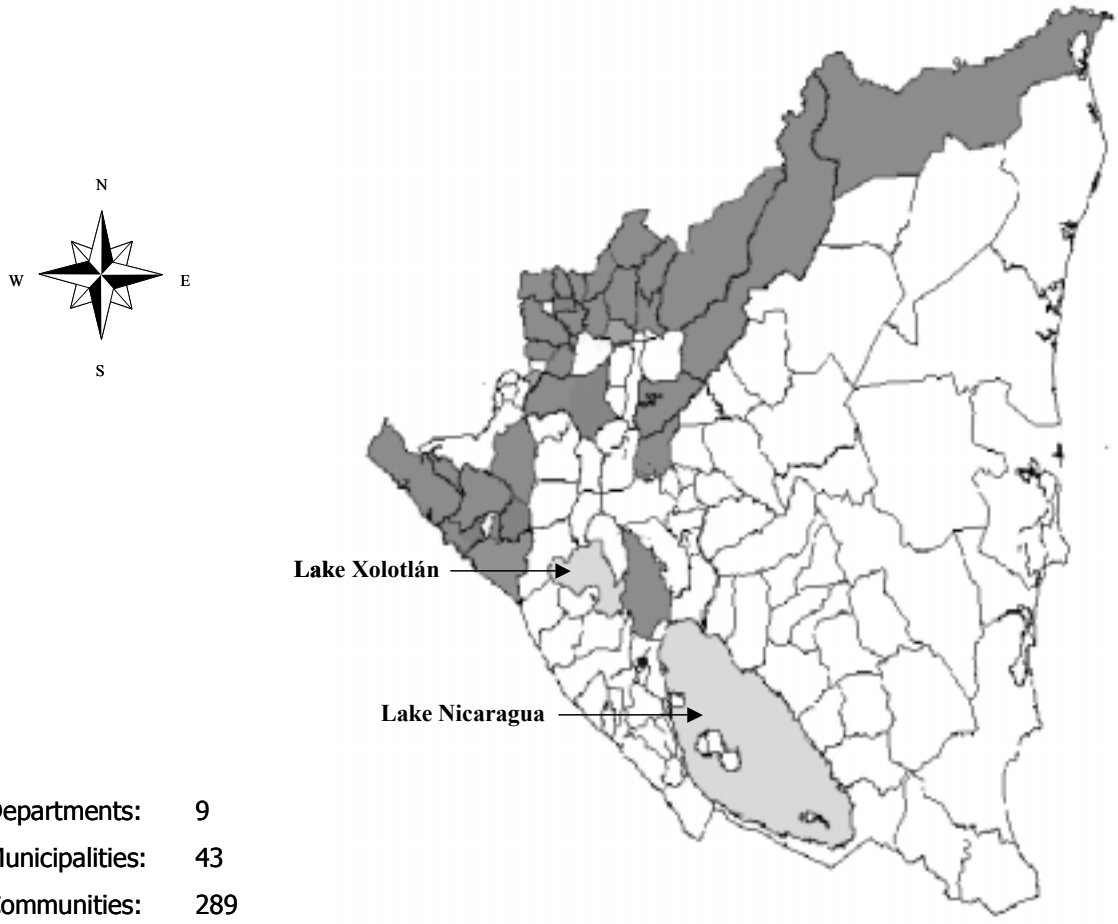

Figure 3. Project locations (areas of EHP/Nica activity are shaded)

2.2.2. Physical Infrastructure

In global terms EHP/Nica surpassed targets in many categories established in the original work plans. Details of the physical infrastructure constructed are presented in Section 3.1. Table 3 summarizes the final program outputs as compared with planned targets. A more detailed breakdown of physical infrastructure outputs by municipality appears in Annex I.

Table 3. Program Outputs and Targets

Infrastructure	Program Targets	Program Output
Water supply systems	2,565	2,692
Household latrines	5,973	7,226
Environmental projects	832	3,503
Wells drilled	190	295
Services provided to health clinics	39	40

2.2.3. Program Beneficiaries

Translating the results for system construction into the total number of beneficiaries reached under EHP/Nica, the goals as set out in the original task order and subsequent amendments were also reached or surpassed. Table 4 breaks down of total numbers of people served.

Table 4. Population Served, by Program Component

Components	Population Served
Community Rural WSS Projects	
WSS	114,466
Sanitation	16,491
Subtotal	130,957
Clinic Rehabilitation Projects	
Indirect beneficiaries*	404,174
Direct beneficiaries**	68,744
Subtotal	68,744
Well-Drilling Projects	
EHP rural WSS projects***	4,857
Other projects	16,217
Subtotal	16,217
Total Population Served	**215,918**

* Total indirect population living in catchment area of all clinics included in program.

** Estimate for health clinic based upon Ministry of Health (MINSA) figures for actual visits made by community members in the year preceding project execution.

*** The number of wells drilled with EHP/Nica–procured drilling rigs is included as a component of the sum of community rural WSS projects.

According to ENACAL-GAR, the current level of coverage (based on year 2001 figures) for access to safe water is 46% of the rural population, or approximately 1.2 million people; this compares with a coverage level of approximately 33% in 1998. ENACAL-GAR estimates that the new systems constructed under EHP/Nica account for about 10 points of this 13% coverage increase over the past two years.

2.2.4. Social Promotion, Training, and Community Organization

Social promotion, training, and community organization activities all formed important elements of EHP/Nica's work, with the overall aim of achieving health improvements. A more detailed discussion of the strategies adopted and the results of these interventions appears in Sections 3.2 and 3.3.

As part of its regular reporting procedure, EHP/Nica monitored global progress of the social components of PVO projects quantitatively; the results of this monitoring are presented in Table 5.

Table 5. Global Summary of Community Organization, Training, and Hygiene Promotion Events

Description	Participants			
	Activities	Women	Men	Total
Workshop with CAPSs	317	1,294	2,141	3,435
Community meetings	1,020	11,283	11,507	22,790
Hygiene promotion (household visits)	8,077	11,730	9,185	20,915
Hygiene promotion (community)	1,605	8,703	5,770	14,473
Hygiene promotion (schools)	585	5,051	4,604	9,655
Technical training	316	2,331	3,624	5,955
Water source protection training	88	994	964	1,958
Total general	**12,008**	**41,386**	**37,795**	**79,181**

These social interventions were made throughout the course of project implementation cycles, and the PVOs adopted various modalities to reach and interact with project beneficiaries. The activities summarized in Table 5 relate directly to the expected results listed in the original task order and address the following specifically: orientation and training of beneficiaries in health and hygiene practices (Specific Program Result 3), in source water protection and conservation techniques (Specific Program Result 4), and in technical, administrative, and managerial aspects of WSS systems (Specific Program Result 5).

3 Implementation Strategy and Impact

3.1. Infrastructure

The issue of selecting appropriate technologies to be employed by EHP/Nica was first addressed in November 1999, in the document titled "Technical Considerations for the Implementation of the EHP-Managed Rural Water Supply, Sanitation, and Environmental Health Project" (Lockwood 1999). Technology selection was determined by a number of critical factors, such as the available water source (groundwater or surface water), physical characteristics of the community, and social and economic conditions of the beneficiaries. In combination with community choice, these factors determined the possible types of systems for water supply, sanitation (type of latrine), and level of service (communal or household).

One overriding consideration for the choice of project technology was a community's capacity to operate and maintain its own system in the long term with a minimum of external support. Therefore, several additional factors linked to O&M were taken into consideration:

- Acceptability of design, ease of operation (including ease for children), and maintenance
- Local availability of spare parts and skilled labor for repairs
- Affordability, in terms of regular maintenance and replacement

Official ENACAL-GAR design standards for WSS in rural communities were presented and reviewed as part of the orientation process for the PVOs. Throughout the program PVOs adhered to these norms and standards, with EHP/Nica promoting ongoing interaction between ENACAL-GAR and the PVOs. Designs for some of the more complicated systems, such as gravity-fed piped water supply systems, were reviewed by EHP/Nica technical staff and submitted to ENACAL-GAR for final approval prior to implementation. In cases where national norms or standards did not exist (for example, household-level water supply systems), proposed design options were presented to ENACAL-GAR for comment and approval.

The quality of work for WSS systems constructed under the program was generally very high. The EHP/Nica technical engineering team carried out a final evaluation of the workmanship on the constructed facilities, beneficiaries' knowledge of appropriate facility use, and O&M practices. The purpose of this evaluation was to give the EHP/Nica technical team a final opportunity to provide guidance and

recommendations on improvements that PVOs could implement before the end of the program.

The evaluation took place in a sample number of communities from each of the PVO implementing partners; in total, 35% of EHP/Nica's community WSS works were evaluated, representing about 3,500 individual facilities. Over 95% of these facilities passed the final evaluation and were found to be of acceptable or above-average quality in their design, construction, and maintenance. In the rural heath clinics reconstruction program, 38 of the 40 facilities evaluated passed inspection; the remaining 2 clinics were inaccessible during the evaluation period. Based upon the evaluation, the EHP/Nica technical team provided recommendations for improvements and potential follow-up activities to all PVOs.

For the number of different types of technologies constructed under the program by department and municipality, see Annex I. Table 6 provides a summary breakdown of the facilities constructed under the program by design type.

Table 6. Physical Infrastructure Outputs, by System Type

	USAID Target	EHP/Nica Target	EHP/Nica Output
Water Supply			
Gravity-fed system		33	33
Pumped system		5	14
Borehole with hand pump		41	138
Hand-dug well with hand pump		2,606	2,507
TOTALS	**2,565**	2,685	2,692
Household Sanitation			
Ventilated improved pit latrine		5,261	5,533
Composting latrine		60	293
Double-vault latrine		1,149	1,233
Water-seal latrine		1	167
TOTALS	**5,973**	6,471	7,226
Environmental Projects			
Infiltration pits		800	807
Solid waste systems		1	11
Source protection		31	2,685
TOTALS	**832**	832	3,503

The USAID targets referenced above reflect the agreement between USAID/Nicaragua and CDM/EHP for the number of works in each category. The EHP/Nica target is a reflection of the sum of the targets in the agreements between CDM/EHP and the PVO grantees.

3.1.1. Water Supply Infrastructure

The water supply systems (including wells) constructed and/or rehabilitated under EHP/Nica tended to focus on the simplest technology available to meet beneficiary needs for a potable water supply. These were the most common types of water supply systems and service levels implemented under EHP/Nica:

- Small-scale community gravity-fed piped systems
- Community or household-level boreholes with hand pumps
- Community or household-level hand-dug wells with hand pumps

In the northwest area, the prevalence of high groundwater levels and the small size of rural communities dictated that the most commonly constructed water systems were hand-dug wells or drilled boreholes equipped with hand pumps at the household level. The most frequently installed hand pump was the rope pump, or *bomba de mecate,* a locally produced pump that had already been widely used in Nicaragua and that is simple to maintain and repair compared with other options. In the more mountainous central and eastern parts of the country, small-scale gravity-fed piped systems were more in evidence. In a small number of cases, community systems were constructed using electromechanical pumps and piped distribution networks, although this option was one of last resort, given the maintenance and cost issues relating to electrical pumps.

3.1.1.1. Water Quality Monitoring

As part of guaranteeing a safe supply of potable water to project beneficiaries, EHP/Nica incorporated standard procedures for water quality testing and evaluation for all water supply projects either built or improved under the program. To this end all PVO partners were required to perform water quality checks on the systems they constructed or rehabilitated. Groundwater sources were tested for standard physical and chemical water quality parameters; in addition, a special monitoring program to detect arsenic was developed because of concerns over the presence of arsenic in the center of the country (see Section 3.1.1.2 for greater detail). Regular testing was also carried out to determine the presence of fecal coliforms as an indicator of bacteriological contamination, particularly in the case of hand-dug wells.

The objectives of the water quality monitoring plan were as follows:

- To gather information regarding the bacteriological, physical, and chemical quality of the water and determine the presence and concentration of arsenic in groundwater
- To facilitate both preventive and corrective actions as necessary on the basis of the monitoring results by eliminating the cause of contamination or providing adequate treatment

Monitoring of bacteriological water quality was also carried out at the household level in the containers that families used to store water for drinking and cooking. This level of testing included the presence and concentration of fecal coliforms and the amount of free residual chlorine, thereby establishing whether the beneficiary population had understood the need for adding chlorine to water intended for human consumption.

Although in the majority of cases bacteriological analysis showed the water sources to be free of contamination, the containers used for water storage at the household level were contaminated. This finding highlights the need for rigorous hygiene promotion efforts that address adequate handwashing and that address hand-to-water contact in collecting water from the storage receptacle. In cases where the presence of fecal coliforms was detected at the point of water distribution (pump or tapstand), it was apparent that these were for the most part recently finished works that had not yet been cleaned and disinfected; once this was done, water quality was found to have improved.

The EHP/Nica technical team was responsible for collating the results of the testing and analysis and for providing prompt feedback to PVO partners concerning possible risks and recommendations about remedial actions in specific systems. In turn, PVO staff provided feedback both to CAPS members and to individual households in order to ensure that corrective measures were taken where contamination levels were found to be unacceptable. Through this monitoring program it was possible to localize specific wells with water quality problems and to take appropriate action, such as cleaning and disinfection with high-concentration chlorine.

3.1.1.2. Arsenic Testing Plan

The arsenic testing plan was developed in March 2001 in response to concerns raised by USAID/Nicaragua about potential risks caused by the consumption of arsenic-contaminated groundwater from wells developed under EHP/Nica. Nicaragua had experienced cases of severe arsenic poisoning in communities located in the southern and southeastern zones of the Sébaco Valley, in San Isidro Municipality, Matagalpa (in the central region of the country). In 1996, a study traced arsenic poisoning to a well with a concentration of 1,320 µg of arsenic per liter. According to guidelines in Nicaragua, the maximum recommended level of arsenic is 10 µg/L; the maximum recommended by the U.S. Environmental Protection Agency is 50 µg/L.

EHP/Nica's arsenic testing plan was formulated on the basis of laboratory testing, discussion and evaluation of these results, and formulation of recommendations that would allow decisions to be made in response to the findings. EHP/Nica met with collaborating organizations (UNICEF, ENACAL-GAR, and MINSA) to discuss implementation of the plan and follow-up. UNICEF is committed to continuing the work related to arsenic contamination of water supplies and will continue to collaborate and provide follow-up after the end of EHP/Nica.

The arsenic testing plan consisted of three phases. In the first, water quality was analyzed in all communities where the water supply system was developed from underground sources. Based on the results obtained from the first round of testing, a second phase of monitoring focused on those locations where levels of arsenic were near or above the recommended limit of 10 µg/L. Finally, in phase 3, specific monitoring was carried out in neighboring areas and communities within a 2 km radius, as well as in the communities confirmed during phase 2.

The Nicaraguan Engineering University was contracted to provide laboratory services, analysis of test results, and recommendations. Analyzing water samples from 124 wells, the university found 6 wells with concentrations of arsenic above the maximum recommended level: The highest value found was 23.3 µg/L. These wells are located in communities in the municipalities of El Jícaro and Ciudad Antigua in the department of Nueva Segovia; Somoto and Palacagüina in Madriz; and Ciudad Darío in Matagalpa. EHP/Nica discussed the laboratory results with UNICEF, ENACAL-GAR, and MINSA, which will undertake follow-up activities with affected municipalities, relating to the communities involved and expanding water quality monitoring. Before this initiative, arsenic content was not typically included as a routine water quality testing parameter, but it has now become a part of standard testing procedures.

The arsenic testing plan is an example of technical assistance that extends beyond program management and technical assistance to the PVOs. Through this initiative, USAID/Nicaragua was able to facilitate discussions and raise the level of attention and awareness concerning arsenic contamination as an environmental health risk factor at a national level, with a relatively modest investment.

3.1.2. Household Sanitation Infrastructure

By far the most common latrine constructed under EHP/Nica was the ventilated improved pit (VIP) latrine. However, a number of different versions of the VIP were constructed, with variations dependent upon specific needs (e.g., elevated VIP for areas with a high water table) or particular design preferences of the individual PVOs concerned. The double-seat latrine is also a variation on the standard VIP design, which includes one adult and one child seat.

In the course of the program, some innovative materials and designs were used to great success. One of the most notable of these was a fiberglass molded integral pedestal seat and latrine cover (weighing 3.6 kg), which proved to be a highly desirable improvement over the heavier and harder-to-clean concrete design. These integral units were also easier to transport and less prone to breakage. The fiberglass seat was used on VIPs and modified for use with compost latrines as well. For some of the VIP latrines constructed, prefabricated panels were used, which simplified and increased the rate of construction. The panels were heat reflective, which made the inside of the latrine more comfortable than those constructed with traditional materials. The use of high-resistance plastic water storage tanks was also seen as an improvement over traditional materials.

In one community served by Save in Chinandega, a pour-flush latrine program was implemented, the choice of more sophisticated technology being based upon community demand and on technical feasibility and social issues. That community exhibited characteristics that were more periurban than typically rural in terms of population density, water use, and overall awareness about sanitation issues and designs. Because people were not satisfied with a latrine option limited to the VIP design, the pour-flush latrines were implemented and well received by the community. In total, Save constructed 167 pour-flush latrines.

Save also constructed a number of compost latrines (293 under the same program in the department of Chinandega, in response to problems of high water table levels and the associated risks of flooding with traditional VIP designs. Composting latrines were a late addition to Save's program and followed a seminar in March 2001 on the particular design requirements of these specialized latrines. The decision to implement this design was a controversial one, given PVO partners' lack of knowledge in the implementation of compost latrine designs. Composting latrines have higher construction costs than VIP designs, and much higher levels of follow-up training and promotion are needed to ensure that the latrines are used and adequately maintained.

The compost latrine was also the main topic of a regional forum that USAID/Nicaragua organized in September 2001 on lessons learned relative to appropriate technologies for rural sanitation in areas subject to flooding. The general conclusion of the forum was that compost latrines are an option of last resort for latrine technology and should be implemented only when sufficient postconstruction promotion and follow-up support is made available.

Conventional septic systems were constructed in some of the rural health clinics under the CARE contract for water and sanitation service provision; these are discussed in greater detail in Section 3.1.5.

3.1.3. Household-Level Technologies

3.1.3.1. *Bacinilla* Program

The development of the *bacinilla* (portable potty) program resulted from a baseline survey that the Program Communication Center of JHU conducted in Nicaragua as part of a national campaign for water and sanitation. The survey results revealed alarming evidence with regard to children's excreta practices, particularly children under six years old.

Many children (almost 50%) commonly defecated in areas just outside of the house but still within the boundary of the homestead, or *patio*. In addition, the survey highlighted the widely held belief that children's excreta are not dangerous to public health. Consequently, adults exhibited very high-risk behaviors, such as not washing hands after changing an infant or child's clothing that contained traces of feces.

This poor understanding of the dangers presented by children's feces appeared to be independent of the presence of sanitary facilities (latrines). The implication of the survey was that children under a certain age did not use a latrine, even in families that had access to such a facility. This message corresponds with the commonly expressed fear, by both children and adults alike, that young children using the latrine might fall into the vault and be killed.

The results of this study were shared with PVO partners, MINSA, and others in the November 2000 lesson-learning forum. To address this issue, a strategy was conceived to improve disposal practices associated with children's excreta by introducing and promoting plastic bacinillas. EHP/Nica funded the procurement of 25,000 bacinillas of two different sizes, which were donated to the PVOs for distribution to families with children of five years and under.

EHP/Nica worked with JHU in the design of appropriate messages and posters for the promotional campaign, which was subsequently included in the JHU Blue Star Campaign (see Section 3.2.1). PVO promoters were encouraged to engage primary caregivers during the course of their community visits and to provide training to families about the importance of safe disposal of children's excreta.

3.1.3.2. Household Water Filters

As an additional caution against the transmission of waterborne diseases, a household water filter program was implemented in communities with particularly high-risk characteristics. These communities were located in the department of Chinandega, where shallow wells are commonplace and regular disinfection is necessary but unrealistic, given the capacity of the beneficiary population. In total, 1,342 water filters were distributed, and household beneficiaries received training on the appropriate use, installation, and O&M of the filters.

3.1.4. Environmental Projects

EHP/Nica's environmental projects were oriented first and foremost toward minimizing negative environmental impacts and health risks that can accompany water projects: for example, providing localized drainage at the point of a new water supply. Other environmental projects were oriented toward household and community solid-waste management, spring protection, and soil conservation. The characteristics of the environmental work varied by PVO and area in which it worked.

The design standards of ENACAL-GAR that the PVOs used incorporate features to minimize environmental impacts: a sanitary seal to the well, well enclosure, and a drainage channel to a collection or infiltration pit for a drilled or hand-dug well served by a hand pump; strategic location of a latrine to maximize appropriate use; and maintenance of a minimum distance between the bottom of a latrine and the water table. These design aspects are recognized as important to protect water sources and reduce public health risks. When a system of a higher level of complexity or greater service area is designed, such as a community water supply system,

ENACAL-GAR's approval is subject to the inclusion of measures, such as spring protection, and reforestation that minimize environmental impacts.

Notwithstanding the existing local norms and regulations, EHP/Nica distributed environmental guidelines for the PVOs to follow in their water and sanitation programs. A copy of the guide (in Spanish) is included in Annex II, along with the environmental assessment matrix, submittal of this matrix having been a requirement before implementing projects. USAID/Nicaragua also made clear that all works constructed with USAID funding must incorporate environmental protection measures. The following types of environmental projects were planned:

- Infiltration pits for water drainage, from supply points
- Solid-waste collection, transport, and final disposal
- Spring protection structures, soil conservation, and reforestation

The infiltration pits were planned for construction in Chinandega, but this component was not possible due to high levels of soil impermeability. As an alternative, the EHP/Nica technical team developed a design for collection pits that was subsequently approved by ENACAL-GAR. The water from the collection pits was used for household-level irrigation.

A solid-waste collection and management program was planned for the new resettlement community of Nuevo Jerusalén, which was scheduled to be completed during the program. However, construction was delayed, and the community was not yet inhabited by the time EHP/Nica ended. In place of this solid-waste project, cleanup campaigns and programs at the community and household levels were developed in 11 program communities.

The environmental projects in water source protection included well protection structures as well as works and activities associated with spring sources. The well protection structures were classified as environmental projects under source protection after the objective for the number of environmental projects was established; hence, the large difference between the objective and output. The spring protection structures were among the strongest points in the implementation of environmental projects because the construction of these structures, plus reforestation and soil conservation projects, encouraged active community participation.

3.1.5. Health Clinics Project

In consultation with USAID/Nicaragua, EHP/Nica set aside part of its implementation budget for funding water supply and/or sanitation facilities targeting rural health posts and centers in Matagalpa and Jinotega—specifically, those currently operating without such services. A survey of clinics in the two departments carried out in conjunction with MINSA and the PROSALUD project identified an initial list of 29 such facilities. In March 2001, EHP/Nica contracted CARE

Nicaragua to carry out the WSS improvements at those clinics on the basis of a fixed-cost contract.

In August 2001, this contract was amended to include 10 more clinics, bringing the total to 39. The geographic distribution of these clinics is given by municipality in Table 2 (Section 2.2). MINSA estimated the total number of direct beneficiaries served by installation and upgrading of services (the total number of people living in the catchment areas of the clinics) to be over 400,000. However, EHP/Nica took the number of people recorded as actually having visited these clinics in the previous 12 months (68,744) as a more conservative estimation of beneficiaries.

The overall objectives of this component were to

- Provide 39 clinics in rural areas of Matagalpa and Jinotega with water supply systems, sanitation, and/or solid waste disposal systems

- Promote the sustainability of the water and sanitation systems in the 39 rural clinics by protecting water sources (where appropriate), providing tools and equipment for maintenance, training clinic staff from MINSA, and providing refresher training and/or restructuring of CAPSs in adjacent communities.

Part of CARE's work over the course of eight months was subcontracted to private companies in Matagalpa, which provided and installed standard-design 1.5 m^3 elevated storage tanks. The sanitary works consisted of septic tanks and absorption pits, as well as incinerators for the disposal of potentially hazardous wastes. In addition, CARE hired a small number of promoters and a coordinator to carry out the project's training and promotional aspects, which included an explanation of the project, reformation of the CAPS if necessary, and refresher training courses in O&M, tariff collection, and watershed protection. Based on the regular reporting by CARE and EHP/Nica's own monitoring visits to the clinic sites, EHP/Nica is satisfied with the general construction quality and adherence to standard designs under this project.

EHP/Nica worked with CARE on coordination issues with MINSA at the central level, and there were strong working relations between the implementing teams and the local system for integrated health care (SILAIS) offices at both the departmental and the local levels. Health center staff received training and orientation, and each departmental SILAIS (Matagalpa and Jinotega) received design details of the systems and a mobile pumping unit with spares and accessories needed for periodic emptying of septic tanks. MINSA staff, both local and in Managua, have expressed satisfaction with this project and view it as a unique intervention among WSS infrastructure programs, which, they say, normally fail to address the needs of health facilities.

3.2. Hygiene Promotion

3.2.1. Hygiene Promotion and Behavioral Change Strategy

Central to EHP/Nica's goal of health improvements in beneficiary communities were hygiene promotion and changes in key behaviors, both stressed throughout the implementation period. The strategy was to promote sustainable changes in high-risk behaviors in order to reduce the incidence of water- and excreta-related diseases, particularly diarrhea. More specifically, the program interventions implemented through the various PVO partners were aimed at generating knowledge and promoting positive attitudes and practices with regard to hygiene and sanitation on the personal, household, and community levels. There were four principal components of the EHP/Nica hygiene promotion strategy:

1. *Hygiene education and promotion within the community:* a range of interventions involving community leaders, CAPSs, other local organizations, and community health volunteers from MINSA

2. *Hygiene education and promotion within schools:* a more focused range of interventions aimed at promoting formative health behaviors within children in primary schools from the first to third grades (7 to 10 years of age); this component involved teachers and also management from MECD

3. *Social communication and promotion:* a mass-communication campaign (also financed by USAID/Nicaragua) entitled "Blue Star" ("Estrella Azul") developed by JHU and designed to complement the implementation of WSS projects in the community and to reinforce common messages through radio, newspapers, and "Blue Bus" (Bus Azul) visits; EHP/Nica actively supported the campaign and was involved in identifying and developing key messages

4. *Special bacinilla program:* a complementary intervention aimed at the safe handling and disposal of children's excreta by providing plastic bacinillas and also appropriate health messages delivered by the PVOs, JHU, and MINSA; in all, 25,000 plastic bacinillas were distributed along with training materials and methodological guidance for promoters

3.2.1.1. Design of Hygiene Promotion Activities and Materials

A significant number of organizations already had WSS programs that included hygiene promotion components. Many of these organizations, including ENACAL-GAR, had developed their own strategies and education materials, which resulted in some duplication of efforts and lack of an overall unified approach to content, methodology, or focal groups. As part of the detailed design of the program, EHP/Nica reviewed these existing materials and approaches, determining that it would be inefficient to attempt to produce yet another set of hygiene promotion materials. Instead, EHP/Nica focused efforts on guaranteeing that hygiene promotion

in all PVO projects would employ a limited number of messages aimed at changing key behaviors, including those with the greatest impact on health:

- Handling, storage, and treatment of drinking water at the household level
- Handwashing: critical moments and techniques
- Use and maintenance of household latrines
- Environmental hygiene (solid wastes, gray-water drainage)

Throughout the program, EHP/Nica provided technical assistance to PVO social promoters in the methodological design and delivery of hygiene promotion interventions. This was achieved through ongoing training of PVO staff, both in formal events and in the field, or on-the-job training by EHP/Nica specialist staff. Because the implementing PVOs had differing levels of experience and capacity in hygiene promotion, much of EHP/Nica's supervision and coaching had to be tailored to each.

One of a number of events that EHP/Nica facilitated was a hygiene behavior change workshop in March 2000, which provided an orientation to the newly contracted PVO staff and identified principal indicators for behavior change. It is important to note that the development of the hygiene promotion strategy was closely linked to the design of the monitoring and evaluation (M&E) system, which incorporated key indicators to measure the impact of behavior change efforts. (See Section 4.3 for details.)

In November 2000, following the first lesson-learning forum, EHP/Nica also facilitated the process of reviewing and collating all relevant hygiene promotion materials, in conjunction with the PVO partners, JHU, ENACAL-GAR, and RRASCA. This exercise resulted in the selection of a limited number of the most relevant materials, which PVOs could then reproduce and use in their programs. This process highlights one of the added-value services delivered by EHP/Nica in terms of technical oversight, facilitation, and coordination. The process is illustrated in the box entitled "EHP/Nica Technical Assistance and Facilitation," below.

EHP/Nica Technical Assistance and Facilitation

Collation, Analysis, and Dissemination of Training Materials for Hygiene Promotion and Behavior Change

EHP/Nica took the lead role in the review, assessment, and dissemination of existing hygiene-education materials for use by PVOs in their rural WSS projects; a limited amount of new material was developed for several areas in which no resources existed. Other key players in this effort were ENACAL-GAR, MINSA, JHU, PVOs, and RNAS.

Key Steps

1. Physical collection of all existing examples of training materials from ENACAL-GAR, bilateral programs, UNICEF, and PVOs
2. Collective review and documentation of all materials (digital photography) to create a comprehensive database
3. Assessment and selection of the most-appropriate of these materials and identification of any gaps
   - Development of a limited number of new materials to fill gaps
   - Collation and preparation of master copies to be made available to any participating PVOs or outside agencies—e.g., the NGO Médicos Sin Fronteras, which took advantage of these materials
   - Modification of materials for use in specific contexts; e.g., Alistar/Raya Ka Laya and ARC translated materials into both Miskito and Nayagna

Materials Selected

School Hygiene Promotion Program

- "Coloreando en Salud" (Drinking Water, Sanitation, and Community Organization Program [PASOC])
- "Juanita y La Gotita" (RNAS)
- "Escuelas Saludables" (RNAS)

Community Hygiene Promotion Program

- Safe handling and use of water (PASOC)
- Handwashing techniques (developed by both ARC and JHU)
- Use and maintenance of household latrines (PASOC)
- Drainage, vector control, and environmental hygiene (CARE)

3.2.2. Hygiene Promotion and Community Mobilization

Six PVOs carried out direct implementation of the hygiene promotion strategy. During the course of the two-year effort over 45,000 community members took part in activities relating to hygiene promotion and behavior change. Because of social, cultural, and economic variations within the target population, PVOs worked in slightly different ways. In particular, Alistar/Raya Ka Laya and ARC—both of which were working with indigenous populations—had to modify their programs and translate materials into local languages. All PVOs carried out hygiene promotion at the community level except for ARC, which concentrated on CAPS training with the aim of achieving a multiplier effect. The most common modalities for hygiene promotion in the PVO projects are shown in the box entitled "Modalities for Delivering the Hygiene-Promotion Component," below.

Four PVOs (Plan Nicaragua, ACH, Save, and Alistar/Raya Ka Laya) worked with the school hygiene promotion strategy by establishing formal agreements with MECD and identifying appropriate schools to be involved in the local areas. In all, 219 teachers were involved in this initiative, representing 65 schools and incorporating 8,226 students. This approach was largely based on the model "Coloreando en Salud" developed by the Drinking Water, Sanitation, and Community Organization Program (PASOC) in southeastern Nicaragua. Under this component of the hygiene promotion strategy were the following interventions:

- Schoolteachers received initial training and orientation, followed by regular monitoring and supervision visits by PVO promoters.

- Teachers received books, teaching materials, visual aids, and practical demonstration items (e.g., buckets, soap, toothbrushes).

Modalities for Delivering the Hygiene-Promotion Component

- *Workshops and informal lectures:* held with focal groups, such as the CAPSs, women, adolescents, and children; designed to transfer knowledge and awareness about key hygiene issues at the personal, household, and community levels. (Plan Nicaragua also carried out workshops with male-only groups)

- *Entertainment, training activities, and practical demonstrations:* visits by the Bus Azul, dramas, fairs, and parties for all members of a community; designed to reinforce and complement the transfer of knowledge through interesting and easily accessible forms of communication

- *Household visits:* carried out by PVO promoters to provide follow-up to the demonstrative and educational components and to motivate individuals on a one-to-one basis, with special emphasis on mothers and other caregivers

- Once a week, the classes studied a formal lesson on hygiene education topics, using materials donated by the project to generate knowledge about hygiene-related issues.

- Throughout the week, teachers used practical examples to complement and reinforce the theory studied in the formal weekly lesson, such as handwashing, safe water storage, and personal hygiene.

3.2.3. Impacts of Hygiene Promotion Strategy

To measure the effectiveness and impact of its hygiene promotion strategy, EHP/Nica employed a number of instruments that allowed for ongoing monitoring and improvement and subsequent evaluation, at later stages of the program. In summary, these instruments consisted of the following:

- Monitoring results from ongoing level II (see Section 4.3) data collection and analysis

- Regular reporting from PVO partners

- Outputs of field monitoring visits made by health and community organization specialists from EHP/Nica

- Conclusions of the internal social evaluation study carried out by EHP/Nica in October and November 2001

- Evaluation results from level III case studies and analysis

- Outputs and conclusions from EHP/Nica lesson-learning forums

The consolidated, global results from the level II monitoring are presented in Table 7; the disaggregated monitoring results are also given in Annex III. Level II monitoring was carried out by PVO partners in a total of 169 communities and included 1,183 individual households, with sample sizes ranging from 10% to 15%, depending upon the absolute size of the community. In general, it was found that families in the PVO target communities had assimilated key messages concerning transmission of water-based diseases, the importance of adequate excreta disposal, and the role of insects as vectors in disease transmission.

Table 7. EHP/Nica Monitoring Indicators, Goals, and Results, 2000–2001

Project Indicators	EHP Goals (%)	Results (%)			
		Baseline	1st Monitoring	2nd Monitoring	3rd Monitoring
Water Indicators					
1. Families that use an appropriate water source for cooking and drinking	75	45	58	84	90
2. Families that use either water treated at the source or water treated at home for drinking and cooking	75	67	68	65	73
Sanitation Indicators					
3. Homes with working, well-maintained latrines	75	59	71	93	93
4. Homes that appropriately dispose of excreta	85	62	80	89	86
Hygiene Indicators					
5. Homes where people interviewed reported washing their hands at all "critical" times during the last 24 hours	80	81	77	90	88
6. Maximum of homes where children of 4 or under have had diarrhea during the last two weeks	15	20	20	15	13
7. Homes where the person interviewed appropriately demonstrated the four basic steps of handwashing	65	53	56	81	86
8. Children 1 year old or younger who are breastfed by their mothers	50	41	36	70	66
Training Indicators					
9. Homes where in the past 6 months one or more people have received some type of training related to the use of water	70	48	61	71	83
10. Homes where in the past 6 months one or more people have received some type of training on basic sanitation	70	35	58	80	90
11. Homes where in the past 6 months one or more people have received some type of training related to hygiene	70	32	67	81	88

One of the lessons learned from the beneficiary perspective was that household visits, including a one-on-one interaction, appeared to be the most effective instruments in delivering and reinforcing messages conveyed through other modalities, such as informal talks aimed at knowledge transfer. The household visits allowed for a "personalization" of the hygiene messages and reinforcement of key positive behaviors according to the circumstances of each individual or family. In cases where hygiene conditions were considered to be adequate, the visits served to motivate the beneficiaries to continue their positive behaviors. However, where behaviors were seen to be inadequate, the visits would last longer and serve to readdress key hygiene messages and practices with demonstrations and discussions.

Another key finding with regard to health impacts was that women in the community, and especially mothers, were the most effective target groups in the delivery of health promotion messages—acting as multiplying agents for family members who did not attend project educational events or demonstrations. Except for male members of the CAPSs, most beneficiary men can be considered as "absent" from the hygiene promotion process. In part, this is because most of the PVOs (except Plan Nicaragua) had not developed specific educational processes and timed training or educational events during hours when it is more feasible for men to attend.

Using the four main focus areas of the level II monitoring system as a guide, it is possible to draw some specific conclusions about the success of the hygiene promotion component of projects, based on monitoring results at the end of the interventions:

- *Water sources and handling:* The overwhelming majority of beneficiaries (90%) were found to be using a safe water source by the end of the program period, with 73% of respondents indicating that water for human consumption is treated by using chlorine or filtering. However, access to chlorine is generally problematic and the correct dosage not well understood by community members; therefore, these data should be viewed with caution.

- *Household excreta disposal:* A very high number of beneficiaries (93%) now own latrines that are properly used and adequately maintained. However, there are still cases in which the used paper is not deposited inside the vault of the latrine. It should be pointed out that the message from the PVOs was not always consistent on this topic, with some instructing residents to place the paper in boxes for burning. A significant number of the latrines surveyed had open seats, as the PVOs left it up to the family to build and install covers. It was found that 86% of households surveyed disposed of excreta, including children's feces, in an adequate fashion.

- *Hygiene and behavior change:* Eighty-eight percent of those surveyed were found to wash their hands at the two most critical points: before eating and after using the latrine. Women and children wash their hands with greatest frequency. By contrast, men claim that due to the nature of the work they do in the fields, it is difficult for them to wash their hands after completing work. Of those

beneficiaries observed, it was found that 86% carried out effective handwashing techniques, but there are still people who do not rub their hands together enough when washing or drying them. By the end of the projects, only 13% of the homes visited reported cases of diarrhea in children of four years or younger in the two weeks before the interview. The EHP/Nica target for this indicator was 15%.

- *Training:* Eighty-three percent of community residents were trained in water use and management, and 90% were trained in aspects of basic sanitation; 88% received training on personal and environmental hygiene. The EHP/Nica target was 70% for each of the three indicators. These results demonstrate that educational processes were implemented in the communities—an essential element for improving hygienic and sanitary practices in the longer term.

As well as the EHP/Nica system of monitoring and information collection, it is possible to use MINSA's epidemiological data to gauge potential impact on health within the beneficiary communities. However, aggregate figures from MINSA at the departmental and even the municipal levels are not entirely useful because of the uneven distribution of new WSS projects and existing levels of coverage. Nonetheless, in two municipalities in Chinandega—El Viejo and El Realejo—the pre–EHP/Nica coverage levels for potable water supply that ENACAL-GAR recorded were extremely low, at 1% and 0%, respectively. These figures are explained by the fact that most systems in these municipalities were household-based, open, hand-dug wells, which ENACAL-GAR does not considered safe sources.

At the end of EHP/Nica, Save had constructed 900 water supply systems in the two municipalities, benefiting 6,533 people and increasing coverage levels by 16% in El Realejo and by 14% in El Viejo. In the corresponding period (1999 to 2001), the total number of cases of acute diarrheal diseases treated at local health posts and clinics in both municipalities had dropped markedly, from the number-one position (in terms of consultations) to the third-most-common reason for seeking treatment. This vastly improved situation is reflected in the epidemiological data from the SILAIS in El Realejo, which shows the incidence of diarrhea in children under five years old having dropped from 757.60 per 10,000 inhabitants in 1998 to only 262.52 in 2001. There is a similar situation in El Viejo, where incidence per 10,000 has gone from 469.91 in 1998 to 152.73 in 2001.

These improvements to beneficiary health are summed up in the following statement, recorded in a discussion with a women's group in Buena Vista, Chinandega: "Before we had the wells and the latrines, we women spent all our time at hospital with sick children, and spent a lot of money on medicine. For us this has been a great change, and now we no longer go to the hospital because our children have diarrhea."

3.2.4. Constraints to Hygiene Promotion

Apart from the issue of limited time with communities, which was clearly recognized as an underlying constraint, a number of other key constraints were identified in the course of the final reviews and evaluations. These can be summarized as follows:

- Lack of previous training and orientation on the part of some PVO staff in both content and methodology of health promotion, as well as lack of motivation (and, in a limited number of cases, some resistance) to expend resources on software issues

- Too little planning of hygiene promotion components by some of the PVOs, which were late in developing concrete plans of action for interventions by project promoters and CAPSs

- Too few appropriate materials that could be left in the homes of individual families to reinforce key messages and, where possible, facilitate a form of self-monitoring in the longer term

3.3. Enabling Environment

The promotion of an enabling environment refers to the creation of conditions under which the impact of individual projects and specific benefits resulting from those projects can be maximized in the immediate term and made more sustainable over time. As such, the creation of an enabling environment can be achieved at local level—within a community, for example—by strengthening local capacity for water system management, as well as at higher levels by promoting synergy among programs and by disseminating best practices among project-implementing agencies.

To this end, EHP/Nica's design incorporated a number of specific activities that related directly to promoting an enabling environment; broadly speaking, they include the following:

- Capacity building with communities to enable them to manage and operate their facilities over time (Specific Program Result 5)

- Capacity building with institutions implementing sustainable WSS projects (Specific Program Results 8, 10, and 11)

- Promotion of improved coordination and policy dissemination within the rural WSS subsector (Specific Program Result 9)

3.3.1. Community Organization and Capacity Building

Full and active community participation in the process of implementing WSS projects was a key element in the EHP/Nica approach. Its immediate aim was to transfer knowledge and skills and motivate communities in the implementation of WSS

projects, both in physical construction and in delivery of software components. The overall goal of this strategy was twofold:

1. To empower the community—largely through focusing on traditional leaders, the CAPS, and health promoters—by establishing or reinforcing a management structure that will remain in the community permanently

2. To engender a sense of real ownership in the communal water system and household latrines, thereby motivating all users to care for the facilities in the long term

Ultimately, the aim was to enable communities to administer and operate their own water supply systems over time without significant levels of external support. To this end, the CAPSs were involved as far as possible in the process of planning, implementation, and evaluation of community projects. In more general terms, the establishment of these types of structures also leads to a strengthening of leadership capacity within the community. In addition, as evidenced in a number of the PVO projects, new forms of access for women to leadership structures can be provided within a culture that traditionally limits such opportunities.

3.3.1.1. Application of Community Organization Strategy

All implementing PVO partners but ARC worked with both CAPSs and other community groups; ARC, however, focused exclusively on CAPSs, with the intention that they would provide a multiplier effect within the community. EHP/Nica worked in 289 individual communities, involving over 34,000 participants in organizational and technical training events and forming 242 new CAPSs, with a total of 1,342 members. The most common modalities used in the community organization processes were these:

- *Community assemblies and meetings* to introduce the projects, inform community members, and elect CAPS members

- *Household visits* to motivate end users and reinforce key messages about participating in communal events and paying tariffs

- *Practical demonstrations and on-the-job participation* to involve community members in construction of systems, maintenance and cleaning, tariff collection, and bookkeeping

- *Formation of work groups* to carry out specific tasks, such as environmental cleanup, latrine inspection, and drainage improvement

The qualitative evaluation of the community organization strategy that EHP/Nica carried out as an internal lesson-learning exercise demonstrated that the seven participating PVOs had generally been successful in promoting the conscious participation of communities in project development. The communities had a clear enough idea regarding the work carried out by the CAPSs in the infrastructure

construction phase, but their role after this stage is completed was less well understood. It was apparent that two factors in particular contributed to motivating the CAPSs to remain active in the postconstruction period: (1) tariff collection activities and (2) home visits to monitor changes in hygiene-related habits.

The PVOs encouraged women's active participation in the various project phases, thereby changing how community women perceived their own roles and increasing their self-esteem. Men were also encouraged to reflect upon the capacities and skills demonstrated by women in (physically demanding) construction tasks. As a general result, women's leadership functions tended to be strengthened through the community organization process.

3.3.1.2. Community Organization and Construction of Physical Works

All of the PVOs except Plan Nicaragua relied heavily upon community labor inputs in the construction of facilities both for water supply and for sanitation (latrines). Plan Nicaragua made much greater use of private contractors in the construction of family wells. As part of the mobilization process, work groups were formed to provide labor, either working either under PVO supervisors on both skilled and unskilled tasks or working alongside masons and builders paid by the project. In many cases, because of the very narrow time frame involved, the community labor inputs exceeded those under normal conditions, and physical work progressed quickly. Through organizing work groups and participating in the construction process, community members benefited from learning about technical issues as well as about organizing themselves to achieve common goals. In areas where men traditionally migrate for seasonal paid employment, a large part of the physical labor was organized and carried out by women from the community: for example, in the departments of Nueva Segovia and Madriz, where both ACH and ADRA implemented projects.

Through regular field visits and project monitoring, the EHP/Nica staff determined that a range of approaches to community participation in the construction process were being applied, each having distinct advantages and disadvantages. Some of the more interesting examples are provided in the box entitled "Modalities of Community Organization for Physical Construction," below.

3.3.1.3. Constraints on Community Organization

Efforts to organize communities and motivate people to participate in projects encountered a number of significant issues during both execution and postconstruction phases. Undoubtedly the greatest constraint facing PVOs was that of limited time and physical presence within the communities—a factor noted by every PVO at both field and management levels and also cited as the principal weakness by ENACAL-GAR officials commenting on EHP/Nica as a whole.

This lack of time, particularly before and after construction of the works, was viewed as negatively affecting the degree to which communities were truly involved as participants in the process. The fact that all PVOs had to "jump-start" their projects from the beginning in order to meet strict deadlines limited their opportunities for

Modalities of Community Organization for Physical Construction

- Plan Nicaragua relied heavily upon the use of private contracting firms for many aspects of WSS construction, resulting in rapid progress and high quality of finish work; on the downside, this approach limited the knowledge and skills transferred to community members, who provided only unskilled labor. Recognizing this weakness, the PVO carried out additional technical training events after the construction of the physical works.

- Save had a very strong focus on community participation and implemented works on the basis of self-construction, whereby each family was responsible for constructing its own wellhead and latrine, including more-skilled tasks. In a significant number of cases this led to quality control problems (poor drainage, poor finish work, incomplete seals, etc.), which had to be rectified afterward under closer supervision by PVO staff. Positive aspects of this approach are the very high levels of participation in and ownership of projects.

- ADRA also employed the approach of self-construction, but it provided very close supervision and technical guidance, as well as financial incentives, which resulted in generally high-quality work with corresponding high levels of community participation.

- Alistar/Raya Ka Laya adopted a mentoring approach to the construction process because of the extreme isolation and lack of skilled workers. As well as relying on community participation for construction, the project took on several members of each community and involved them in the construction of a number of systems; thus, they became proficient in design, masonry, and plumbing. These individuals then returned to their home communities and are responsible for long-term O&M tasks.

open dialogue with a range of communities to determine the real level of demand for interventions. Conversely, after the end of the construction period, there was limited opportunity to provide meaningful follow-up to support communities in the transition to independent management and operation of their systems. Although most of the PVOs understood the reasons for the time constraints, they were critical and suggested that a program of this nature should be carried out over a total of 24 to 30 months, allowing for a considerable period of community follow-up after construction of the physical facilities.

Other significant constraints on effective community organization include the following:

- Imposition of extraneous leadership structures, such as CAPSs, onto communities with distinct sociocultural forms of organization (Alistar/Raya Ka Laya's experience with indigenous populations)

- The generally negative impact of extreme poverty and long-term unemployment on individual motivation and attitudes toward payment of tariffs

- Extreme political polarization within individual communities

- The impact of other projects with different, and potentially conflicting, operational approaches (i.e., payment of incentives) in the same geographic areas

3.3.2. Establishment of Tariffs for Community WSS Projects

Regular collection of tariffs to cover system running costs and repairs is a critical component in sustaining physical infrastructure and health benefits over time. However, in the context of rural Nicaragua, where poverty levels are particularly high, tariff collection has been problematic for many years. Generally speaking, this is due to a lack of motivation on the part of end users and a cultural perception that water is a common right rather than one bearing a financial cost.

To its PVO partners EHP/Nica stressed the importance of establishing tariff systems, especially as these relate to sustaining project benefits over time. For example, it was strongly suggested that tariff payment be presented to communities in terms of paying for system maintenance rather than for the right to access drinking water.

In practice, however, there has been only moderate success in setting up regular tariff collection mechanisms. In some cases there are context-specific reasons for this: For example, in the indigenous communities where Alistar/Raya Ka Laya operates, hardly any currency is in circulation, with most transactions taking place via bartering. In other cases, such as the resettlement communities of ARC and ADRA, the extreme poverty and loss of personal belongings during Hurricane Mitch makes it virtually impossible for people to pay.

On the basis of the EHP/Nica internal evaluation, it was found that only about 50% of communities were collecting any tariffs, and a lesser number were doing so on a regular basis. On the positive side, several communities (most notably, those with projects executed by ACH) had established savings accounts in the name of the CAPS.

This is an area of the program where EHP/Nica could have done more to motivate and encourage PVOs in their work with communities. However, in broader terms this is a challenge facing all implementing agencies in Nicaragua, and one clearly needing further research and thought. The motivation of both CAPS and community members is an essential component of this work, and flexibility of approach is vital; for example, in communities that depend heavily upon agricultural production, tariff collections following each harvest may be a much more viable option than a monthly payment system. Metering of supply in communities with more periurban characteristics is another possibility that could be explored.

3.3.3. Institutional Capacity Building

3.3.3.1. Capacity Building of PVO Implementing Partners

One of the expected results of the program design (and of the task order agreement with USAID) was an increase in the capacity of organizations outside of the GoN to plan, design, implement, and monitor high-quality, sustainable rural WSS projects. PVOs participating in EHP/Nica had a range of familiarity with WSS projects before this experience; however, only ACH and Alistar/Raya Ka Laya had executed programs of this complexity and magnitude. Some of the PVOs had ongoing health projects and were therefore conversant with the hygiene promotion and community mobilization aspects of the work, but not as familiar with the engineering and project management aspects. For others, the reverse was true, and there were early difficulties for some of the PVO staff in accepting the health focus and community participation philosophy of EHP/Nica's approach.

Although it is difficult to quantify systematically the PVOs' gains in institutional capacity, a number of examples show clearly how far some of them came. In purely quantitative terms, a total of 55 professional PVO staff were engaged in these projects, received technical training and orientation, and benefited from almost two years of project implementation experience. These staff included social promoters, technicians and engineers, project and field coordinators, skilled masons, drilling-rig operators, and more senior project managers. Some anecdotal evidence with respect to capacity building within ADRA is given in the box entitled "Capacity Building within a Program PVO," below.

Although not all PVOs and all staff operated without problems in certain areas, for the most part the projects were successfully implemented, given the very limited time frame involved. From the various lesson-learning forums EHP/Nica held over the two years and from interviews with field and head-office staff, it is possible to identify some of the more successful aspects of increased PVO institutional capacity building:

- *Increased exposure to, and understanding of, health-focused projects with strong hygiene promotion components:* Plan Nicaragua and ADRA will incorporate hygiene promotion into their new projects.

- *Enhanced M&E systems:* ACH has incorporated the EHP/Nica level II monitoring indicators for use in a new WSS program funded by the European Union.

- *Improved project cycle management:* Alistar/Raya Ka Laya has benefited from the application of a more systematic approach to projects, which has made staff more aware of the components and timing of projects; it will continue to use this model in the future.

- *Improved training methodologies:* ACH has benefited from being required to document and systematize its training program and components.

- *Greater project management capacity:* Save now considers itself a major player in the rural WSS subsector, with solid experience of managing a large program.

- *Expanded technical knowledge:* ADRA now has the capacity to design and construct piped systems and has coexecuted several large-scale systems with ENACAL-GAR.

- *Expanded water quality monitoring capacity:* PVOs that did not already have testing equipment received funding for portable water quality testing kits to monitor the presence of fecal coliforms.

Capacity Building within a Program PVO

Extracts from interviews with an EHP consultant, November 2001:

- *ADRA Field Staff, Ocotal, Nueva Segovia:*

  We had very little experience of rural WSS projects, and it was difficult to be a part of [EHP/Nica], especially in the beginning . . . . Now we feel much more capable and experienced and have a greater credibility with the members of the communities. Before this program we did not really have any relations with either ENACAL-GAR or MINSA. Now we know who they are, and we have good working relations with them and also the alcaldía.

  The monitoring system for the projects was very useful, and we now can see that providing good-quality physical works is not enough. We have to teach the people how to use them properly and also maintain them.

- *ADRA Director, Managua:*

  ADRA had very little experience, and we had a difficult start-up period for a project of this magnitude. EHP/Nica helped us to identify some of the problems and made some helpful suggestions; then we changed the administration and some of the personnel. Now we feel very capable in WSS projects of this type, and we have good relations with ENACAL-GAR and MINSA.

  We are going to use some of the same methodologies learned in the EHP/Nica program for our new DAP projects. We have also just submitted a proposal for funding under FISE (World Bank) for a contract to provide latrines.

- *Director, Subregional ENACAL-GAR Office, Region I, Ocotal:*

  The PVOs have complied with our technical and social norms and with the project methodology . . . . They always presented their plans and designs for approval, and we were also involved in the initial selection of communities. Their work has helped to increase our coverage in very difficult areas. EHP/Nica has played a positive role in bringing together the work of the PVOs and ENACAL.

  Now I am concerned about long-term follow-up; we will include all these new projects in our UNOM (Operation and Maintenance Unit), but we have only two promoters: One has 170 communities to look after, and the other, 230.

3.3.3.2. Building the Capacities of Other Institutions

Apart from the PVO implementing partners, EHP/Nica focused a limited amount of resources directly on institutions. EHP/Nica continued to provide staff time and other resources to its ongoing collaboration with JHU on the "Estrella Azul" campaign; however, this can be considered more as a collaborative effort than as institutional building per se.

3.3.3.3. ENACAL-GAR

A principal stakeholder in the rural WSS subsector is ENACAL-GAR, with which EHP/Nica maintained close working relations over the entire two-year effort, both at central level and in the regions. Specific Program Result 10 from the original task order addressed the issue of management and monitoring capacity within ENACAL-GAR. As part of the program EHP/Nica provided resources to ENACAL-GAR to upgrade and expand its National Water and Sanitation Information System (SINAS) and to increase its processing capabilities and usefulness. The primary improvements to SINAS included an upgrade in the Microsoft Access and Visual Basic programming software to more recent versions and incorporating population projection capabilities into the system. In addition, further data fields were added relative to water quality parameters, household latrines, and advances in social aspects of projects (training, etc.).

At the outset of the program (in the start-up workshop), ENACAL-GAR's senior management expressed certain expectations about the level of support, focusing on funding and human resource issues as well as long-term backup for rural systems. USAID/Nicaragua regulations prohibited any direct funding to ENACAL-GAR under this program; however, EHP/Nica maintained a consistent approach to working within the framework of government norms and guidelines and promoting strong coordination between the PVOs and the regional ENACAL-GAR offices. For example, those regional offices were closely involved with many aspects of implementation and were encouraged by PVO partners to supervise work in the field. Indeed, in several cases in Nueva Segovia, the regional ENACAL-GAR offices coexecuted several of the more complex gravity-fed piped systems with ADRA.

Therefore, despite its lack of direct funding opportunities to support the additional work of this state agency, EHP/Nica was supportive in other, indirect ways. The fact that ENACAL-GAR was not able, or willing, to provide a permanent liaison officer for a program of this magnitude is a reflection of the serious constraints facing the institution more generally.

One of ENACAL-GAR's greatest concerns is for postproject follow-up and monitoring of these new systems. The coverage increases achieved under EHP/Nica imply a greater caseload for ENACAL-GAR's already overstretched regional O&M unit. The lack of sufficient GoN resources for long-term O&M is clearly a problem, and further work is needed in this area to identify strategic solutions. It is worth noting that many of the PVO partners plan to continue working with the same target

populations, albeit under programs other than EHP/Nica, which will allow for some continuity with the beneficiaries.

Finally, it is interesting to note that despite ENACAL-GAR's frustrations due to lack of direct support, the agency does clearly recognize EHP/Nica's positive contribution toward increasing an alternative implementation capacity. ENACAL-GAR's national director stressed the point that PVOs' increased capacity, plus their exposure to GoN norms and standard approaches, is fully in line with the continuing institutional changes within ENACAL-GAR itself. Over the next 12 months, ENACAL-GAR will gradually start to implement a new strategy that will see it withdrawing from direct execution (in a long-term, phased manner) to concentrate on planning, facilitation, and coordination functions.

3.3.3.4. Municipal Authorities

Throughout EHP/Nica's program life there was an emphasis on involving municipal authorities, or alcaldías, in the process of project planning, implementation, and monitoring. This work was carried out in direct support of Specific Program Result 11 in the original task order, with the aim of increasing local- or municipal-level capacity to manage and provide goods and services related to long-term O&M of rural systems.

Although there was little, if any, direct funding for the alcaldías, PVO partners involved them as institutions in every step of project implementation, from planning and formulation onward. In the majority of cases, the alcaldías were engaged in the process of project handover, along with ENACAL-GAR, MINSA, and the communities. In the Somoto region, ACH worked with the alcaldía in providing legal recognition to the new systems by registering communities in the name of the municipal authority. In several other cases—for example, Save in El Viejo and Plan Nicaragua in Puerto Morazon—PVOs worked with the alcaldías to identify a member of the municipal staff to carry out a liaison and follow-up function with communities.

These developments are fully in line with the broader transition in Nicaragua from heavily centralized to more decentralized provision of (social) services at the municipal level. It is also worth noting that some of the larger PVO partners had, and will continue to have, a long-term presence in the same geographic areas, so this program helped them to cement long-standing relations with local administrations.

3.3.4. Well-Drilling Capacity

As part of the original assessment of the subsector, EHP/Nica recognized the limited availability of well-drilling equipment for Nicaragua's poor rural communities seeking to improve their drinking water supply. Before this program, the alternatives were limited to the private sector, on the one hand, with prohibitively expensive drilling charges and largely obsolete machinery, and the services of the ENACAL drilling unit, on the other, which has limited capacity and is constantly overscheduled with work on GoN-executed projects. Therefore, the purchase and the establishment

of two drilling rigs were incorporated into the design document, with the dual objective of meeting immediate drilling requirements under EHP/Nica, as well as contributing to subsector capacity in the medium to long term.

EHP/Nica brought in drilling specialists to research the requirements and likely operating conditions for rigs in the field and developed the specifications needed for the issue of a limited tender for procurement. This process was completed in the first five months of the project start-up period, and the rigs were delivered and commissioned in June 2000. The drilling rigs, manufactured by Ingersoll-Rand, were supplied with multiple spare parts, tools, supplies, and support equipment (compressor, crane, soldering machine, etc.), at a total cost of approximately U.S.$1.18 million.

Following a limited invitation to PVOs to submit proposals for the operation and administration of the rigs, Save the Children USA and CARE Nicaragua were selected to oversee day-to-day management of the rigs. CARE had had a long history of managing less sophisticated drilling rigs, whereas Save was new to this type of work. Both PVOs provided staff to operate the drilling equipment and received hands-on training from representatives of the vendors in Nicaragua. Over the course of program implementation, both PVOs gained experience in the proper O&M of the rigs. EHP/Nica provided ongoing oversight to this process and was satisfied that both organizations managed the rigs appropriately.

As part of the drill management agreement, the two PVOs provided drilling services at subsidized rates both to their own projects and to other PVOs working with EHP/Nica. The original target, 160 wells to be constructed by August 2001, was subsequently raised to 190 wells by December 2001 through an amendment to the task order. Under this arrangement every "client" paid a nominal sum to the drilling operators in order to establish sound management practices and prepare the PVOs to operate the rigs on a more autonomous basis.

Toward the end of the program period, both PVOs had demonstrated their ability to seek out and contract new work for the rigs and had provided services to other USAID contractors, other international organizations, municipal authorities, and individual communities. In the case of CARE, over 15 separate clients had already been provided with drilling services, and they reported that demand now exceeded their own capacity. In terms of the original EHP/Nica agreement, both PVOs exceeded the originally planned target number of wells that they had contracted to construct, with a final total of 295 wells constructed that serve over 16,000 beneficiaries. It is also worth noting that the overall effectiveness of the drilling teams (positive boreholes sunk resulting in functioning supply systems) was just under 85%, whereas the current norm in Nicaragua for productive drilling is about 70%.

Despite this encouraging result in terms of output, both rigs required repairs for a variety of problems, and there were some delays in obtaining further spares due to lengthy importation procedures. However, most of these problems were relatively minor and were expected in the operation of this type of heavy and sophisticated

machinery. Some of the early problems reflected shortcomings in O&M; therefore, EHP/Nica arranged for a further round of follow-up training after the first few months of operation.

3.3.4.1. Future of the Drilling Rigs after EHP/Nica

As part of the longer-term strategy, Save and CARE gained title to the drilling rigs. This legal transfer was carried out in conjunction with the drawing up of a contract to govern use of the rigs. This contract seeks to maximize the benefit to poor rural communities needing access to drinking water at affordable prices, while minimizing unfair, direct competition with legitimate private-sector operators.

Both PVOs have developed management and maintenance plans for the rigs and have committed internal funds as part of guaranteeing the viability of drilling-rig operations in the medium term. In both cases they anticipate that the majority of their drilling services will be provided to external clients rather than exclusively to their own WSS projects.

EHP/Nica's final evaluation process indicated a very considerable demand for drilling services, with several large programs coming on line, including a four-year European Union–funded program in the Jinotega and Matagalpa region. The general feedback from sector players, including ENACAL-GAR, is that EHP/Nica established a significant alternative drilling capacity, using modern technology, in a relatively narrow time frame. However, there are some concerns about establishing common pricing structures between CARE and Save and also with the existing ENACAL-GAR drilling unit to avoid major disparities. These issues were addressed by EHP/Nica as part of the program closeout activities.

3.3.5. Coordination and Policy Dissemination

Recognizing the importance of coordination between PVOs and other actors and also of disseminating best practices, the original task order included a result (Specific Program Result 9) concerning policy dissemination. EHP/Nica addressed these two elements in a number of concrete ways throughout the life of the program:

1. Policy dissemination:

   - Providing technical norms, project cycle documents, and ENACAL-GAR policies to all PVOs from program outset

   - Providing technical guidelines describing best practices for community-managed rural WSS projects to all PVOs from the outset

   - Providing formats for project data for SINAS and facilitating orientation and guidance sessions for all PVOs in completing and submitting these forms

   - Providing USAID environmental-impact and monitoring guidelines to all PVO partners and orientation sessions in the application of these guidelines

2. Coordination:

   – Participating in RRASCA

   – Collaborating and coordinating with ENACAL-GAR and MINSA at the national level

   – Facilitating water quality testing, including arsenic analysis, and disseminating the results

   – Facilitating three lesson-learning forums during the life of the program, with the aim of sharing experiences and promoting learning among PVO partners and others involved with the program

   – Facilitating a specialist workshop on sanitation technology for areas of high groundwater and coordinating among organizations

   – Participating in the regular USAID/Nicaragua coordination meetings for U.S. government agencies involved in the Hurricane Mitch SpO

One of EHP/Nica's most important features—and one so far in Nicaragua unique to the rural WSS subsector—was that a group of executing organizations (seven PVOs) worked under the guidance of a single overarching agency in an investment program of this magnitude. Furthermore, because this agency (EHP/Nica) was responsible for disbursing funds, it was possible to ensure a high level of oversight, technical guidance, and sharing of information and lessons learned.

The fact that EHP/Nica was able to operate at one level removed from the physical implementation of projects, but at the same time maintain constant access to the processes and players involved, allowed it to play a key role in information sharing, dissemination, and lesson learning (see Section 4.4).

4 Program Management

4.1. Program Management and Technical Assistance

In the original task order CDM/EHP was asked to generate a number of concrete deliverables with respect to the management and reporting of program progress. Throughout the course of the two-year effort, EHP/Nica met these reporting requirements with the following specific outputs (see Annex IV for a listing of documentation and reports produced during the lifetime of the program):

- *Work plans:* One detailed work plan was prepared and submitted in each year (1999–2000 and 2000–2001), describing every subcomponent of the program, with a description of activities and targets.

- *Quarterly reports:* Eight quarterly reports were prepared and submitted to USAID/Nicaragua; in the middle of the first year, EHP/Nica requested that these quarterly reports replace the semiannual reporting requirement, and this request was approved.

- *Field reports:* In addition to the regular monitoring system, EHP/Nica staff prepared field reports following every visit made to PVO project sites and offices.

- *Web site:* EHP/Nica designed and posted a World Wide Web site for the program, which was updated monthly and included the latest progress of the PVO projects, pictures, and documents that could be downloaded. This monthly updating was accepted by USAID/Nicaragua in lieu of the monthly reporting requirement as set out in the original task order.

- *Monthly financial reports:* EHP/Nica provided financial reports to USAID/ Nicaragua on the status of management costs, grant disbursements, and PVO expenditures.

In addition to meeting USAID's narrative and financial reporting requirements, EHP/Nica was also expected to carry out a series of management tasks and functions described in the original task order. EHP/Nica met these demands, the most significant of which are described in the box entitled "Summary of EHP/Nica Management and Technical Assistance Tasks," below.

One notable aspect of the program was the intense scrutiny applied by USAID as the donor agency, as well as by the U.S. government through the General Accounting Office, on behalf of the U.S. Congress. In its role of financial monitor, EHP/Nica

Summary of EHP/Nica Management and Technical Assistance Tasks

- Developing an administrative mechanism for the PVO grants program and assisting PVOs in proposal preparation
- Disbursing program funds to PVO partners and tracking expenditures on a monthly basis
- Providing logistical support and procurement services for PVOs
- Specifying and procuring specialized equipment, such as two Ingersoll-Rand drilling rigs, support vehicles, and spare parts
- Providing ongoing technical assistance and guidance to PVO implementing partners in such areas as the development of hygiene promotion and behavioral change messages, design and construction, implementation methodology, and monitoring
- Developing and implementing a performance-monitoring plan for the program, including the establishment of baseline data needs, indicators, and program targets
- Executing regular field monitoring visits and evaluations of subprojects as necessary throughout the life of the program
- Facilitating and coordinating among the PVO partners involved in the rural WSS program as well as with other USAID/Nicaragua–funded SpO programs
- Promoting improved coordination and collaboration between this USAID/Nicaragua–funded program and other key actors in the sector, including PVOs, GoN (principally ENACAL-GAR and MINSA), and the private sector
- Monitoring PVO progress to ensure the application and compliance of U.S. government environmental guidelines
- Facilitating and monitoring the completion of individual audits for PVO implementing partners
- Promoting and disseminating key lessons learned during the course of program implementation, both among the different PVO partners and externally
- Preparing and executing a comprehensive inventory and closeout plan, including the transfer of the two drilling rigs to PVO partners

provided an added value to USAID/Nicaragua by applying a continuous level of oversight and monitoring rigor to all aspects of PVO administration.

As well as promoting transparency and financial propriety at every stage of the grant procedure, this monitoring also was a lesson-learning experience for the PVOs concerned—an observation borne out by the fact that every one of the PVOs (five of seven) audited under the most recent review passed with flying colors. (The audit was conducted by the private firm KPMG.) Only one PVO has suggested that the level of

scrutiny in this program was excessive and that it took a disproportionate amount of management time.

A key function for EHP/Nica above and beyond a management role was to provide ongoing technical support and guidance to the PVO implementing partners. Feedback received from both PVO field staff and management has been very positive, pointing to a number of important aspects of EHP/Nica's own performance:

- High level of staff professionalism (both technical and social fields)
- Continuity, number, and duration of contacts and visits, including field visits to far-flung projects (not stopping at the PVO field office level)
- Positive engagement: constructive criticism and problem solving in tackling difficulties in the implementation process, rather than taking on a "policing" role and pointing out only weaknesses
- Rigorous monitoring without micromanagement

In summary, many PVOs have stated that they viewed EHP/Nica as a true partner in the process of implementation and not just as managers of a complex program.

4.2. Grant Management Process

The disbursement of subgrants to the PVO implementing partners was one of EHP/Nica's major administrative tasks, accounting for approximately 65% of the entire program budget. To ensure that a successful, well-monitored, and fiscally responsible grant program was implemented, EHP/Nica established a detailed grant management plan. This plan, defined during a consultancy from September to October 1999, contained two documents:

1. "Grant Management Program Plan for the Nicaragua Rural Water Supply and Sanitation Program" (McGahey 1999b)
2. "Grant Management Program Handbook for the Nicaragua Rural Water Supply and Sanitation Program" (McGahey 1999a)

The first of these documents contained a comprehensive overview of the EHP/Nica grant program, including priority project activities, geographic target areas, and application procedures. The handbook focused on helping grant applicants and recipients establish reliable management systems, including monitoring and reporting of the progress achieved in grant expenditures and project outputs. The grant program was introduced to potential applicants during the start-up workshop in November 1999. Shortly after this introduction, EHP/Nica issued a public request for applications and entered into the preaward process as described in the Grant Management Program Plan. EHP/Nica was able to award grants and begin field activities in early 2000.

In addition to providing a management tool for EHP/Nica, there were two other important reasons for developing such a comprehensive set of plans and guidelines: the need to comply with the rigorous demands of USAID's financial procedures and the need for transparency in the process of evaluating and selecting PVO proposals. PVO staff interviewed as part of the final review and evaluation process indicated that, by and large, they were satisfied with the grant management process and the level of transparency and considered the reporting requirements stringent, but not excessive.

4.3. Monitoring and Evaluation Systems

EHP/Nica's M&E system was designed to provide the program with a continuous data stream for monitoring and measuring the effectiveness of its rural WSS intervention efforts. In designing its M&E system, EHP/Nica used three operational criteria to set parameters in the definition of the scope and depth of planned activities:

1. *Simplicity of design:* allowing for quick and efficient data collection

2. *Cost-effectiveness:* ensuring that the M&E system could be carried out within the constraints of the existing budget

3. *Avoidance of duplication:* ensuring that existing relevant data from similar USAID-funded programs were used by EHP/Nica, thereby avoiding data collection redundancy

The original M&E system was developed on the basis of input from a short-term consultancy carried out in October 1999, which included a review of existing M&E and data collection systems operated by key players in Nicaragua. The EHP/Nica system consisted of three levels:

- *Level I:* Macro-level data collection of primary performance indicators, such as the number of new completed wells or latrines. PVOs reported this information in their monthly reports to EHP/Nica, the material then going to USAID/Nicaragua in a consolidated form every month.

- *Level II:* Project monitoring of secondary project performance indicators to assess beneficiaries' improvements in behavioral habits and understanding of hygiene practices. These data were also collected by the PVOs, with updates submitted to EHP/Nica quarterly. Special questionnaires were developed for use in collecting this information, focusing on 11 key indicators. Although this level of monitoring was not designed to be statistically reliable, it did provide a comprehensive picture of the situation (collected in every project intervention) and was useful in highlighting the tendencies of program progress and areas of strengths and weaknesses.

- *Level III:* Community case studies focusing on five specific intervention communities and five corresponding "control" communities (those receiving no interventions). These case studies presented more qualitative information concerning the WSS projects' effects on the lives of beneficiaries, including attitudes, knowledge, and perceptions relating to key hygiene practices and behaviors. This information was collected from focus groups as well as from individuals and families. A local EHP/Nica consultant team collected data in each of the selected communities both before project initiation and after project completion. A final report documenting the results from each community, as well as providing personal and family "histories" and photos of how lives had been affected by Hurricane Mitch and by the EHP/Nica water and sanitation program, was finalized in December 2001.

The information collected at Levels I and II by the PVO partners was entered into an Epi Info database specifically designed for this program and managed by EHP/Nica in Managua. The data were then organized and analyzed to determine the status of projects on a variety of levels and against a variety of criteria. EHP/Nica staff were also responsible for feeding back information and recommendations to the PVOs so that they could modify and improve field operations by focusing on areas of weakness and, in turn give feedback to the CAPSs and other community representatives. In consultation with its PVO partners, EHP/Nica identified 11 main indicators for the level II monitoring system within four key focus areas:

1. Water supply, manipulation, and storage

2. Use and maintenance of sanitation facilities (household latrines)

3. Hygiene practices and behaviors

4. Community training and retention of key messages

Table 7 (Section 3.2.3) lists the M&E indicators developed by EHP/Nica, along with targets set by the program at the outset and the final results of level II monitoring. The information for the level II monitoring effort was collected in each community at three distinct points in the project cycle: as a baseline prior to intervention, during intervention, and after project completion. The level II monitoring system was never supposed to be statistically reliable but rather was designed to highlight key tendencies in terms of strengths and weaknesses of individual PVO projects. EHP/Nica staff recognized some weaknesses relative to the coherence of data collection and reliability of sampling procedures that could be improved in future.

4.4. Facilitation and Lesson Learning

As discussed in Section 3.3.5, the EHP/Nica model of program management—a large-scale investment executed by a number of organizations across a wide geographic area and managed and facilitated by a single dedicated agency—is thus far unique in Nicaragua. Furthermore, this process of management was much more

than an administrative exercise in that EHP/Nica, with ongoing and direct support from EHP/Washington, brought on board a world-class technical capacity and expertise in such key areas as hygiene promotion, community mobilization methodologies, M&E, and appropriate technologies. In this regard it is important to recognize the added value that EHP/Nica was able to contribute over the course of the two-year effort, much of which could be seen in its facilitation role and the promotion of lesson learning.

From discussions with PVO staff, government agencies, and other program partners, as well as from the analysis carried out during the wrap-up forum, it is possible to summarize this added value with some concrete examples from the program:

- Facilitating and reinforcing the linkages between the PVOs and ENACAL-GAR, some of which had no prior relations with the government in the water sector

- Promoting strong linkages from the outset of the project cycle (planning and feasibility studies) with local municipal authorities in order to foster long-term relationships among communities, local government, and civil society groups

- Maintaining the program's "philosophical" focus with the aim that the PVO partners integrate, or internalize, these issues as part of their everyday work (viewing WSS as a primarily health-orientated intervention, using integrated approaches, strengthening community management structures, and stressing the importance of sustaining project benefits over time)

- Facilitating a continuous lesson-learning process, both within the group of PVO partners and externally with other agencies at the national and regional levels

- Promoting lesson learning within EHP/Nica itself by being open to new ideas and experiences, maintaining a flexible approach to successes and failures, and continually improving and refining its own approaches

More could have been done in the areas of facilitation and lesson learning. For example, during the final forum participants suggested that EHP/Nica could have tried to document in a more structured, or formal, way best practices from PVOs with positive experiences in a particular area of work, allowing these to be shared with other partners that may have been struggling with the same issues.

From a process perspective, and with the benefit of hindsight, it is apparent that the start-up workshop held in the first months of the program was an extremely important step in establishing a common conceptual framework and in identifying the potential constraints on implementation. The fact that this process was carried out in a participatory manner, together with the stakeholders, from the outset allowed EHP/Nica to address these potential constraints strategically throughout the life of the program. The importance of this process was again highlighted by the PVO partners at the wrap-up forum, and it should serve to validate this approach to program design and implementation for senior management at EHP/Washington.

5 Lessons Learned

Throughout the two-year course of EHP/Nica, many useful lessons were learned from successful experiences as well as failures in a variety of areas, from technical issues to the design and delivery of project software and overall program management. The more detailed conclusions and lessons are presented in this chapter, and they focus on the three principal components of the HIF. However, it is also possible to identify a number of very important global conclusions arising from the work of the past two years; these are presented in Section 5.1.

5.1. Global Lessons Learned

5.1.1. Time Constraints and Quantity versus Quality

One source of underlying tension for EHP/Nica was the very narrow implementation time frame, which was imposed by the U.S. Congress as part of the special funding requirements for a postdisaster intervention of this nature. From the very outset this constraint was recognized, both by EHP in the design phase and by the PVOs during subsequent project execution in the field. All parties were particularly concerned about the effects of a narrow time frame on the "quality" of the project's software components (community organization, hygiene promotion and behavior change, tariff collection, etc.). Global experience strongly suggests that these concerns were well-founded, particularly with regard to sustaining project benefits over time.

In practice, however, EHP/Nica's results have been for the most part extremely encouraging, with progress made in key software areas as well as in meeting (and in most cases surpassing) physical output targets. To date community management structures have been established or strengthened, hygiene promotion has helped improve critical behaviors, and retention of hygiene-related messages has been high. The overwhelming majority of the physical facilities are to a high standard of construction and in line with ENACAL-GAR norms. The program provided access to safe WSS facilities for well over 200,000 people in areas severely affected by Hurricane Mitch. In addition, the program had a strategic impact on the subsector in Nicaragua by greatly increasing the institutional capacity of partner PVOs.

In summary, EHP/Nica demonstrated that it is possible to implement a large-scale rural WSS program *and* to achieve relatively high-quality results within a narrow time frame. Some of the key elements for this success story can be identified as follows:

- Sound understanding of the rural WSS subsector in Nicaragua during the design phase, including prior knowledge of key institutions involved, topical issues, and policy, in order to inform decision making
- Definition of clear and focused objectives and planning timelines
- Constant monitoring, assessment, and reassertion of planning targets and key goals throughout the program
- Definition and maintenance of a clear and comprehensive conceptual framework (the HIF) and implementation approaches
- Employment of highly professional and knowledgeable local staff across the various disciplines

5.1.2. Program Management and Added Value

Another key lesson, very much linked with the above, is that a WSS program of this magnitude and complexity benefited enormously from having the continuous and proactive program management and technical expertise of EHP. If EHP had not been contracted to manage this program, USAID/Nicaragua would of course still have had to incur costs directly in the disbursement of grants, monitoring, etc. However, considering the significant costs involved in providing this level of oversight, the key question for USAID/Nicaragua must be one of whether it was a worthwhile investment.

The overwhelming evidence would suggest that EHP/Nica provided a whole range of functions and services beyond those of conventional program management and administration and that there was a significant added value to the program on the basis of EHP's involvement. Some the most relevant aspects of this added value can be summarized as follows:

- World-class technical expertise and capacity in key areas of rural WSS
- A facilitation and coordination function that fostered a true partnership approach and a culture of lesson learning and continuous improvement throughout the program
- Institutional linkages, both in country and internationally, which allowed for synergy between EHP/Nica and other programs

- Rigorous monitoring, oversight, and management systems, both internally and within the PVO partners

5.1.3. Providing a Health Focus

One of EHP/Nica's most significant aspects was its strategic impact in terms of reframing WSS project interventions to emphasize a true health focus. Over its two-year course, the program consistently reinforced this conceptual shift from a water and sanitation intervention that includes a health component to a health intervention with water and sanitation infrastructure components, among others.

The impact of this change in approach was clearly recognized and welcomed by key players, including the environmental health director of MINSA, who spoke of a "new paradigm" for water and sanitation interventions, placing them at the center of preventative health efforts.

5.2. Water Supply and Sanitation Infrastructure

The construction component yielded important lessons relative not only to the construction itself, but also to design and planning of installations.

- *Quality of construction:* The quality of the construction works is critical to sustainability, not only for the obvious physical reasons but also because high-quality facilities were more readily accepted and appropriated by communities and therefore more likely to be properly maintained and paid for.

- *Self-construction:* Communities and families can build their own water supply systems and household latrines without external skilled labor inputs. However, unless very rigorous levels of supervision and control can be guaranteed, there is a risk of producing lower- or poor-quality physical works that in turn threaten acceptability and sustainability.

- *Fiberglass latrine materials:* The use of integral fiberglass pedestal and pit covers is a successful innovation in construction materials. Despite early concerns about the structural strength of such material (proved wrong by factory testing as well as field experience), it has gained wide acceptance due to its light weight, ease of handling and transport, ease of cleaning, and more "modern" look.

- *Alternative latrine designs:* Both composting latrines and water-seal latrines were incorporated into the program on a pilot basis, each responding to specific demands (high water tables and periurban conditions, respectively). However, both approaches require very high levels of social motivation and training if they are to succeed in the medium to longer term and can be therefore considered as a costly alternative.

- *Areas of chronic high groundwater levels:* In areas suffering from chronic high groundwater levels, there may be a point of diminishing returns vis-à-vis financial investment and human resources in providing viable hardware options (such as alternative latrine designs). While such options can work, it may also be prudent to focus resources on hygiene promotion and behavior change to achieve health improvements, rather than building latrines that prove difficult, or impossible, to sustain without significant external support.

- *Safety issues for elevated latrines design:* The door opening and design of the access steps in elevated latrines should be modified to reduce the risks for younger children and the elderly. At present, most latrines have been built with the steps meeting the structure at a right angle, requiring the user to climb to the top step to reach the door and then to step back down to open it; these actions are awkward and even impossible for some people. The steps should be constructed parallel to front wall of the latrine, approaching the open side of the doorframe, enabling the user to open the door without having to step back.

5.3. Hygiene Promotion

As they carried out hygiene promotion and behavioral change activities, EHP/Nica implementing partners were themselves learning; their lessons within the hygiene promotion component related primarily to messages and materials, staffing, and follow-up.

- *Limited number of key messages:* Individual PVO projects must contain very clear strategies and methods for hygiene promotion and also ensure that interventions focus on a limited number of basic messages that will have the greatest impact on health. Too many messages about a wide range of issues or involving very complex changes in behavior may not be effective.

- *Unified or common messages:* The impact of hygiene promotion messages upon behavior changes can be greatly enhanced by having common messages delivered by different organizations and through various communication media. The collaboration between EHP/Nica interventions and the JHU Estrella Azul and Bus Azul campaigns was very effective in delivering the same basic messages of handwashing, latrine use, etc., through different but complimentary means: face-to-face, community meetings, radio, and entertainment events.

- *Motivated and properly trained operational staff.* To deliver hygiene promotion messages effectively, operational staff, including local project managers, must be adequately prepared and motivated. This training should be aimed at improving staff's technical understanding of hygiene promotion and social communication issues and also of the conceptual reasons for their importance—the HIF.

- *Appropriate educational and promotional materials for households:* As well as using hygiene promotion materials with the CAPS and in community events, future programs should concentrate more on individual beneficiary families at household level. There is a clear need to develop appropriate and accessible materials that could be left in homes to reinforce key messages and, where possible, facilitate a form of self-monitoring in the long term. These materials should be researched carefully to reflect the local environment and should be aimed primarily, although not exclusively, at mothers and other important caregivers.

- *Long-term follow-up:* EHP/Nica proved that it is possible to carry out hygiene promotion and bring about changes in behavior within a narrow time frame. However, it is still questionable whether these improvement will be sustained over time without some form of consistent follow-up and ongoing support. To maximize the impact of these short-term benefits, it would be helpful for beneficiary communities to receive such support, either from the PVOs themselves or from MINSA or some other agency.

5.4. Enabling Environment

EHP/Nica used several approaches to maximize the benefits of individual projects and also improve chances of sustainability. Broadly stated, EHP/Nica's efforts at promoting an enabling environment focused on capacity building, coordination, and policy dissemination. The following lessons emerged from those efforts.

- *Community organization:* When mobilizing communities and establishing or strengthening structures for the long-term management of water supply systems, it is essential to consider indigenous social and cultural factors, especially those having to do with leadership and decision making. In some beneficiary populations the conventional committee model may not be the most appropriate or acceptable and may thus require modification.

- *Norms and standards for household-level water supply systems:* Under certain conditions (population density and distribution, accessibility of groundwater, etc.), water supply projects are often based around the household, or family, as the accepted and desired level of service. Obviously, this particular focus bears important implications in many aspects, such as cost per unit and coverage, organization of beneficiaries, function of CAPS, hygiene promotion approaches, and tariff collection and financing. From EHP/Nica's experience, it is apparent that norms, standards, or guidelines for such a beneficiary population have not yet been clearly defined. Therefore, further research and thinking should be done in support of ENACAL-GAR to address this gap.

- *Tariff collection:* The contribution by project beneficiaries to a fund for the maintenance, upkeep, and repair of their water supply system is one of the most important aspects of sustaining project benefits over the long term; in rural Nicaragua, tariff payment has been very problematic. Therefore, the issues of tariff, user motivation, and efforts to overcome the culture of nonpayment should be given greater emphasis in future programs and should be addressed from the very beginning of the project cycle: during initial dialogue. In addition, program designers should look at ways to present tariff collection more flexibly in societies where there is little surplus cash or where local economies depend heavily upon agriculture.

- *Institutional support to ENACAL-GAR:* Under this program, direct (financial) support to the government was not allowed because of USAID's funding requirements. However, ENACAL-GAR will inherit an increased caseload for support to O&M in the rural communities with new systems. Future program designs should look at innovative ways to provide indirect support to the government in this regard.

- *Policy dissemination:* One of the strengths of working under an umbrella approach such as EHP/Nica employed is the ability to promote policy and disseminate best practices within the group of implementing partners; this process was indirectly supportive of ENACAL-GAR by reinforcing sector standards.

As with most experiences of any duration, the best development projects learn as they go. This seems to have been the case with EHP/Nica, whose implementers have, as a matter of policy, searched out the nuggets, reflected upon those lessons and insights as they emerged, and then recorded them as well.

Thus, EHP/Nica's lessons—which fall into several areas and were gained not only from successes but also from failures and experiences lying somewhere between—now join the growing body of knowledge and experience that can help organizations worldwide plan and execute WSS projects that are more responsive, more effective, and more sustainable.

Annexes

Annex I. Projects and Beneficiaries, by Municipality

PROJECT SUMMARY SHEET FOR CURRENT PVO GRANTEES

(Action Against Hunger; ADRA; Alistar Nicaragua; Plan International; Save the Children US; American Red Cross)

EHP/NICARAGUA

DEPARTMENT	MUNICIPALITIES	NUMBER OF COMMUNITIES	TOTAL BENEFICIARIES	PROJECT TYPES								
				DRINKING WATER					SANITATION	ENVIRONMENTAL		
				GPF	PP	HDW - H	BH - H	H - F	LATRINES	SEEP PIT	S. WASTE	NURSERIES
	PUEBLO NUEVO	25	7,165	4		11	12		481			27
	S. J. LIMAY	6	777	1	1	1	1		100			4
ESTELI	SUB - TOTAL	31	7,942	5	1	12	13	0	581	0	0	31
	PALACAGüINA	11	1,765			3	5		137	1		8
	YALAGüINA	11	1,189		1	4	3		152	1		8
	TOTOGALPA	2	174			2			17			2
	SAN LUCAS	20	2,660	1		10	3		273			14
	S. J. DE RIO COCO	3	715	3					154			3
	TELPANECA	3	156	1		1			26			2
	S. J. CUSMAPA	2	144	2			1		12			2
	SOMOTO	7	1,313			3	2		193	1		5
MADRIZ	SUB - TOTAL	59	8,116	7	1	23	14	0	964	3	0	44
	MOZONTE	8	1,463	1	1	3	1		117			6
	DIPILTO	7	1,682	2					216			2
	MACUELIZO	9	1,266	3					159			3
	SANTA MARIA	6	1,067	1					112			1
	CIUDAD ANTIGUA	16	3,274	1	3	10	2		129	1		16
	SAN FERNANDO	6	2,082		3	1			132			4
	JICARO	19	2,657	1		11	7		207			19
	QUILALÍ	4	793			2			100			2
	MURRA	3	390				1		44			1
	JALAPA	4	222	1		2			42	2		3
	OCOTAL											
NUEVA SEGOVIA	SUB - TOTAL	82	14,896	10	7	29	11	0	1,258	3	0	57

DEPARTMENT	MUNICIPALITIES	NUMBER OF COMMUNITIES	TOTAL BENEFICIARIES	PROJECT TYPES							
				DRINKING WATER					SANITATION	ENVIRONMENTAL	
				GPF	PP	HDW - H	BH - H	H - F	LATRINES	SEEP PIT	S. WASTE	NURSERIES
	CIUDAD DARIO	2	1,008		1		1		49	1		2
	MATAGALPA	1	300		1				50			1
MATAGALPA		3	1,308	0	2	0	1	0	99	1		3
	TIPITAPA	1	1,200		1							1
	MANAGUA	1	606						101			
MANAGUA	SUB-TOTAL	2	1,806	0	1	0	0	0	101	0	0	1
	WASPAN	2	927	2					116			2
RAAN*	SUB-TOTAL	2	927	2	0	0	0	0	116	0	0	2
	WIWILÍ	2	65,650	2					140			2
	EL CUA - BOCAY	10	2,893	5					136			5
	SAN JOSE DE BOCAY	2	654	2					301			2
JINOTEGA	SUB - TOTAL	14	69,197	9	0	0	0	0	577	0	0	9
	EL REALEJO	12	6,530			123			1,044	297	3	123
	EL VIEJO	12	7,550			939	27		946	503	4	960
	PUERTO MORAZAN	24	9,339			1,234	72	1,110	1,269		2	1,306
	VILLANUEVA	2	3,032		2			232	76			2
	CHINANDEGA	8	2,120			147			195		2	147
CHINANDEGA	SUB - TOTAL	58	28,571	0	2	2,443	99	1,342	3,530	800	11	2,538
TOTAL		**249**	**130,957**	**33**	**14**	**2,507**	**138**	**1,342**	**7,226**	**807**	**11**	**2,685**

Annex II. Environmental Guidelines and Environmental Assessment Matrix for Water Supply and Sanitation Projects (in Spanish)

PROYECTO RURAL DE AGUA POTABLE, SANEAMIENTO Y SALUD AMBIENTAL
MATRIZ DE MONITOREO AMBIENTAL

INTRODUCCIÓN

El Documento "Pautas Ambientales para PVO y ONG: Proyectos de Agua Potable y Saneamiento" identificado en su versión en español como WASH No. 383, del conocimiento de las PVO favorecidas con Convenios de Donación (CD) de EHP - Nicaragua, es de uso y aplicación obligada para proyectos de agua potable y saneamiento, y que ha sido incluido en los términos del concurso y aceptado en las propuestas presentadas. Es compromiso de las PVO dar cumplimiento con normas, procedimientos y consideraciones técnicas establecidas.

En consecuencia, el formulario anexado "Matriz de Monitoreo Ambiental", es una herramienta para monitorear y evaluar el impacto ambiental de cada proyecto de agua y saneamiento financiado por USAID, durante las etapas de diseño, construcción y operación inicial y posterior a la entrega del proyecto a la comunidad.

GENERALIDADES / CONSIDERACIONES

a. Conservando la calidad integral de los proyectos de agua potable y saneamiento, la Matriz se elaboró basada en este sentido.

b. Cada PVO deberá asignar a una persona en especial (Auditor Ambiental) que será la encargada del monitoreo de cada proyecto y de diligenciar el formato; a demás, será el contacto en cada PVO para discutir temas relacionados con el medio ambiente.

c. La Matriz recoge los aspectos señalados en las Pautas Ambientales por cada tipo de proyecto.

d. El método de respuesta es directo SI, No o No Aplica (N/A). Cabe mencionar que se establece la columna N/A, para aquellas preguntas que no son de la competencia del proyecto monitoreado.

e. Un proyecto para ser aceptable ambientalmente debe responder a la totalidad de respuestas SI, exceptuando a aquellas N/A que apliquen conforme lo enunciado en el numeral anterior.

f. En caso de una respuesta negativa, se considerará que el proyecto no puede ser aceptado ambientalmente y que por consiguiente se deberá a realizar las medidas correctivas pertinentes hasta cumplir con la exigencia y se deberán hacer los comentarios respectivos.

g. Se ha incluido para cada tema principal la línea "Otros Especificar", que se deberá emplear para aquellos casos atípicos o que a consideración de la PVO debe tenerse en cuenta y valorarse para un proyecto o comunidad en especial.

h. La Matriz se entregará final de cada proyecto junto con el informe mensual a EHP/Nicaragua, firmada por el Auditor Ambiental, con su respectiva evaluación descriptiva final. No se requiere documentos extensos, es conveniente algo preciso y objetivo. Queda entendido que cada PVO será responsable de la veracidad de la información suministrada en cada formato.

ii EHP/Nicaragua en coordinación con USAID, realizarán, de considerarse necesario, la verificación de la información y resultados entregados ya sea directamente con la oficina respectiva y/o visita al proyecto.

MATRIZ DE MONITOREO AMBIENTAL
PROYECTO RURAL DE AGUA POTABLE, SANEAMIENTO Y SALUD AMBIENTAL

ORGANISMO: _____

DEPARTAMENTO: _____ MUNICIPIO: _____ COMUNIDAD: _____

PROYECTO: MABE ☐ MAG ☐ PEM ☐ PPBM ☐ LETRINA ☐ MPF ☐

ITEM	CONCEPTO	SI	NO	N/A
1.0	**AGUA POTABLE**			
1.1	El caudal de la(s) fuente(s) es mayor que la demanda de agua en la época seca?			
1.2	Se mitigaron los efectos de la degradación de los habitats terrestres y acuáticos?			
1.3	**CALIDAD DEL AGUA**			
1.3.1	Se evaluó la calidad física, química y bacteriológica del agua a utilizar como fuente de abastecimiento?			
1.3.2	El agua cumple con los parámetros establecidos por la normas técnicas CAPRE/ENACAL, para uso de consumo humano?			
1.3.3	Se tomaron las medidas pertinentes para garantizar la calidad del agua para consumo?			
1.4	No se presentan fugas o desperdicio de agua en:			
1.4.1	La Captación			
1.4.2	El Almacenamiento			
1.4.3	La Tuberia			
1.4.4	Puestos públicos			
1.4.5	Conexiones domiciliarias			
1.4.6	En el área del pozo			
1.5	Se construyó sistema de desagüe para:			
1.5.1	La Captación			
1.5.2	El Almacenamiento			
1.5.3	Puestos públicos			
1.5.4	El Pozo			
1.5.5	Lavanderos			
1.6	Se previeron obras de control de erosión en:			
1.6.1	La Captación			
1.6.2	El Almacenamiento			
1.6.3	Puestos públicos			
1.6.4	El Pozo			
1.6.5	Lavanderos			
1.7	Otro (especificar):			
2.0	**SANEAMIENTO**			
2.1	Las letrinas se construyeron cumpliendo la norma de distancia mínima entre estas y:			
2.1.1	El Nivel freatico (1.5 m)			
2.1.2	La Vivienda (10.0 m)			
2.1.3	La Fuente de Abastecimiento de agua (30.0 m)			
2.2	Los pozos sépticos o sumideros no representan un riesgo de contaminación del suelo y las fuentes de agua superficiales y subterráneas?			
2.3	Se construyeron obras para la eliminación de las aguas residuales?			
2.4	Otro (especificar):			

ITEM	CONCEPTO	SI	NO	N/A
3.0	**MEDIO AMBIENTE**			
3.1	Se ejecutaron obras de protección de la (s) fuente(s) de abastecimiento de agua de:			
3.1.1	Protección forestal			
3.1.2	Reforestación			
3.1.3	Cerramiento			
3.1.4	Obras civiles			
3.2	No se presentan estancamientos indeseables de agua por efectos del proyecto?			
3.3	Se repuso el material vegetal afectado durante la construcción del proyecto?			
3.4	El material de construcción y desecho ha sido dispuesto en un lugar adecuado y seguro?			
3.5	Otro (especificar):			
4.0	**ORGANIZACIÓN Y CAPACITACIÓN COMUNITARIA**			
4.1	El proyecto cuenta con un Comité de Agua Potable y Saneamiento (CAPS)?			
4.2	La comunidad fue debidamente capacitada en:			
4.2.1	Uso y conservación de las obras de agua y saneamiento			
4.2.2	Manejo y disposición de desechos sólidos			
4.2.3	Salud basica preventiva			
4.2.4	Educación sanitaria e Higiene			
4.3	Otro (especificar):			
5.0	El proyecto está términado completo y operando			

COMENTARIOS/EVALUACION FINAL

AUDITOR DE MEDIO AMBIENTE: _____

FIRMA: _____ **FECHA:** _____

Annex III. Disaggregated Level II Monitoring Results, by Private Voluntary Organization

CONSOLIDADO FINAL DE INDICADORES MONITOREO NIVEL II
EHP/NICARAGUA- PVO, NOVIEMBRE 2001

	ADRA					Accion Contra el H					Save the Children					Plan Internacional					Alistar Nicaragua					Meta	Total
	Meta	Linea Base	1er. Monit.	2do. Monit	3ro Monit	Meta	Linea Base	1er. Monit.	2do. Monit	3ro Monit	Meta	Linea Base	1er. Monit.	2do Monit	3ro Monit	Meta	Linea Base	1er.. Monit.	2do Monit	3ro Monit	Meta	Linea de Base	1er. Monit	2do Monit	3ro Monit	EHP	EHP
INDICADORES DE AGUA																											
1. Porcentaje de familias que utilizan agua de una fuente adecuada para cocinar y beber.	80.0%	41.7%	44.6%	75.4%	80.0%	75.0%	92.0%	99.0%	100.0%	98.6%	85.0%	47.5%	65.5%	78.9%	97.1%	75.0%	43.6%	52.0%	97.0%	97.0%	100.0%	1.8%	30.2%	66.7%	76.9%	75.0%	89.9%
2. Porcentaje de familias que disponen de agua para beber y cocinar que recibe algún tipo de tratamiento adecuado; ya sea en la fuente o en el hogar, que la hace apta para el consumo humano.	60.0%	78.0%	79.7%	69.5%	80.0%	50.0%	53.2%	92.5%	78.0%	89.3%	80.0%	53.3%	55.0%	41.0%	78.5%	75.0%	62.6%	66.0%	85.4%	81.0%	40.0%	88.8%	47.8%	80.0%	36.5%	75.0%	72.8%
INDICADORES DE SANEAMIENTO																											
3. Porcentaje de hogares que poseen letrinas adecuadas de acuerdo a su estado físico, higiene y limpieza .	100.0%	78.0%	89.5%	95.8%	98.0%	75.0%	74.9%	76.0%	100.0%	94.1%	95.0%	70.0%	89.0%	96.0%	93.4%	75.0%	33.1%	56.0%	88.2%	93.0%	75.0%	39.5%	43.3%	77.8%	87.7%	75.0%	93.0%
4. Porcentaje de hogares donde se practica una disposición adecuada de las excretas.	75.0%	78.8%	87.2%	95.0%	93.0%	60.0%	64.0%	81.0%	100.0%	85.2%	90.0%	58.0%	88.6%	85.0%	86.8%	75.0%	74.6%	76.6%	85.6%	85.0%	70.0%	34.0%	66.0%	74.8%	80.8%	85.0%	85.7%
INDICADORES DE HIGIENE																											
5. Porcentaje de hogares donde la persona entrevistada reporta que se lava las manos al menos durante las ocasiones críticas en 24 horas	50.0%	85.0%	96.0%	98.8%	95.5%	75.0%	73.0%	63.0%	70.0%	74.5%	85.0%	93.0%	70.0%	82.0%	89.5%	65.0%	76.6%	79.0%	90.0%	90.0%	60.0%	76.0%	78.0%	60.5%	92.4%	80.0%	87.6%
6. Porcentaje de hogares donde niños de 4 años o menos han tenido diarrea en las últimas dos semanas.	10.0%	12.7%	2.7%	17.0%	16.0%	15.0%	5.9%	12.3%	38.0%	5.9%	5.0%	10.9%	3.6%	10.0%	0.0%	45.0%	29.3%	25.6%	16.6%	11.6%	30.0%	43.0%	56.0%	26.5%	29.7%	15.0%	13.0%

INDICADORES DE SALUD	ADRA					Accion Contra el H.					Save the Children					Plan Internacional					Alistar Nicaragua					EHP	EHP
	Meta	Linea Base	1er. Monit.	2DO Monit	3ro Monit	Meta	Linea Base	1er. Monit.	2do. Monit	3ro Monit	Meta	Linea Base	1er. Monit.	2do Monit	3ro Monit	Meta	Linea Base	1er. Monit.	2do Monit	3ro Monit	Meta	Linea Base	1er. Monit.	2do Monit	3ro Monit	Meta	Total 3er M
INDICADORES DE HIGIENE																											
7. Porcentaje de hogares donde se practicó una Técnica de Modelaje para lavado de manos de una forma adecuada, cumpliendo con los cinco elementos básicos.	60.0%	59.3%	85.8%	82.0%	86.0%	55.0%	55.7%	70.0%	89.0%	98.1%	75.0%	57.6%	39.4%	85.0%	81.0%	70.0%	30.0%	35.0%	77.3%	87.0%	40.0%	63.2%	50.0%	94.4%	78.2%	65.0%	86.0%
8. Porcentaje de niños menores dde un año que reciben lactancia materna.	80.0%	24.7%	23.6%	95.7%	64.0%	50.0%	22.1%	16.6%	31.0%	41.0%	70.0%	17.0%	16.7%	53.0%	84.4%	15.0%	67.0%	69.0%	60.0%	60.0%	n/a	73.7%	52.0%	50.0%	80.3%	50.0%	66.0%
INDICADORES DE CAPACITACION																											
9. Porcentaje de hogares donde se refiere que en los últimos seis meses una persona de la familia o más han recibido algún tipo de capacitación relacionada con uso y manejo del agua de beber.	75.0%	48.7%	75.7%	61.0%	75.0%	60.0%	27.1%	67.7%	84.0%	95.9%	70.0%	48.5%	44.8%	71.3%	69.6%	65.0%	47.0%	62.0%	81.0%	89.0%	80.0%	66.7%	52.9%	55.6%	86.2%	70.0%	83.0%
10.Porcentaje de hogares donde se refiere que en los últimos seis meses una persona de la familia o más han recibido algún tipo de capacitación relacionada con saneamiento básico	80.0%	49.7%	79.1%	81.4%	82.0%	60.0%	26.6%	60.3%	88.0%	97.9%	70.0%	47.9%	41.7%	77.8%	91.5%	65.0%	47.0%	60.0%	81.8%	94.0%	80.0%	4.4%	49.0%	55.6%	82.4%	70.0%	90.0%
11. Porcentaje de hogares donde se refiere que en los últimos seis meses una persona de la familia o más han recibido algún tipo de capacitación relacionada con higiene (personal, ambiental)	80.0%	47.5%	85.7%	78.8%	80.0%	70.0%	26.6%	58.4%	85.0%	85.1%	70.0%	40.3%	83.9%	81.3%	96.4%	65.0%	42.6%	62.0%	83.2%	95.0%	80.0%	1.8%	49.0%	55.6%	83.2%	70.0%	88.3%

INDICADORES DE SALUD	METAS EHP	LINEA DE BASE	1ER. MONITOREO	2DO MONITOREO	3er MONITOREO
INDICADORES DE AGUA					
1. Porcentaje de familias que utilizan agua de una fuente adecuada para cocinar y beber.	75	45	58	84	90
2. Porcentaje de familias que disponen de agua para beber y cocinar que recibe algún tipo de tratamiento adecuado; ya sea en la fuente o en el hogar, que la hace apta para el consumo humano.	75	67	68	65	73
INDICADORES DE SANEAMIENTO					
3. Porcentaje de hogares que poseen letrinas adecuadas de acuerdo a su estado físico, higiene y limpieza .	75	59	71	93	93
4. Porcentaje de hogares donde se practica una disposición adecuada de las excretas.	85	62	80	89	86
INDICADORES DE HIGIENE					
5. Porcentaje de hogares donde la persona entrevistada reporta que se lava las manos al menos durante las ocasiones críticas en 24 horas	80	81	77	90	88
6. Porcentaje de hogares donde niños de 4 años o menos han tenido diarrea en las últimas dos semanas.	15	20	20	15	13
INDICADORES DE HIGIENE					
7. Porcentaje de hogares donde se practicó una Técnica de Modelaje para lavado de manos de una forma adecuada, cumpliendo con los cinco elementos básicos.	65	53	56	81	86
8. Porcentaje de niños menores dde un año que reciben lactancia materna.	50	41	36	70	66
INDICADORES DE CAPACITACION					
9. Porcentaje de hogares donde se refiere que en los últimos seis meses una persona de la familia o más han recibido algún tipo de capacitación relacionada con uso y manejo del agua de beber.	70	48	61	71	83
10.Porcentaje de hogares donde se refiere que en los últimos seis meses una persona de la familia o más han recibido algún tipo de capacitación relacionada con saneamiento básico	70	35	58	80	90
11. Porcentaje de hogares donde se refiere que en los últimos seis meses una persona de la familia o más han recibido algún tipo de capacitación relacionada con higiene (personal, ambiental)	70	32	67	81	88

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