Final Evaluation Improved Health Through Clean Water Project

Funded by the
Howard G. Buffett Foundation

CARE International Yemen

September 2009

Marta Colburn
Colburn Consulting International, LLC

Table of Contents

Annexes

Tables

Acronyms

BMZ	Federal Ministry for Economic Cooperation and Development (German)
CARE	Cooperative Assistance and Relief Everywhere
FAO	Food and Agriculture Organization
GARWSP	General Authority for Rural Water Supply Projects
GDP	Gross Domestic Product
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit
H^2O	Water
HH	Household
IGA	Income Generating Activity
km	kilometers
IHTCW	Improved Health Through Clean Water
LC	Local Councils
M&E	Monitoring and Evaluation
MDG	Millennium Development Goals
MSAL	Ministry of Social Affairs and Labor
OD	Organizational Development
RWA	Rural Water Authority
RWSS	Rural Water Supply and Sanitation Project
SFD	Social Fund for Development
SWOT	Strengths Weaknesses Opportunities Threats
TTC	Thermotolerant coliform
UN	United Nations
UNDP	United Nations Development Program
US	United States of America
WA	Women's Association
WMU	Water Management Unit
WHO	World Health Organization
YR	Yemeni Rials

I. Executive Summary

This final evaluation was designed to assess the performance and impact of the Improved Health Through Clean Water (IHTCW) Project implemented by CARE International Yemen in four villages in Hajja governorate (Bani Buram, Al-Otum, Beit Abu 'Orej and Al-Sharqi) from November 2007-October 2009. This project was funded by the Warren G. Buffett Foundation. The evaluation assessment was conducted from September 4th through 14th and consisted of: survey of approximately 10% of project beneficiaries (33 households 48% female); stakeholder interviews (seven); project site field visits utilizing a combination of individual and focus group discussions (23 women) from the four villages; and review of all project documentation.

Hajja governorate is located northwest of the capital of Yemen Sana'a, and Hajja City (the governorate capital) is 1,900 meter above sea level (6,233 feet) situated on the western escarpment rising from the Red Sea coast to the mountain highlands. The governorate has high levels of illiteracy (82.7% of rural women over the age of 10 are unable to read and write) and in rural areas only 12.31% have access to potable water, 13.9% to sewage facility, 19.2% to electricity and the incidence of poverty is 50% (in contrast to the national rural average of 40%). These dire statistics form the compelling context of need for the IHTCW project which was built on achievements of two earlier CARE projects in the area ("Western Highlands Rural Community Development Project" and "Food Security and Women's Empowerment Project," both funded by the European Commission). Among other activities, both of these initiatives improved drinking water supplies in the four villages of IHTCW and established and trained Women's Associations (WA) who operated Income Generating Activities (IGAs) and offered literacy classes.

Project management for IHTCW was very lean consisting of a small team of national staff (four full-time and one half-time) based in Hajja city supported by various members from the CARE country team in Sana'a. Over the course of this 24 month initiative the project team conducted an impressive number of field visits to all project sites – 487 visits through August 2009 covering a total of 15,237 km (9,467.8 miles), much of it over very rough unpaved roads. Cost benefit ratios for key inputs were low: water system improvements were $30.30 (far below the average costs of similar projects in Yemen); colloidal silver impregnated ceramic water filters were US$4.27; training investments were US$5.37; and awareness raising activities were a mere US$1.03 per beneficiary. In the view of the evaluator the overall project management for the IHTCW project was highly effective and extremely efficient with limited resources. The project team was very experienced, knowledgeable of the local context and had excellent skills to appropriately address the numerous challenges encountered.

Project Overall Objective: Improved health for the population of four rural Yemeni villages through improving the availability and use of clean water managed and assured by Women's Associations. The three primary project indicator targets are as follows:

- **Project Target #1:** 80% reduction of diarrhea in children under the age of 5 in households adopting H^2O purifying technologies: **Project Achievement: 84% reduction = Target exceeded by 4%**.
- **Project Target #2:** Thermotolerant coliform (TTC) in household drinking H^2O is reduced to 0 in households adopting purifying technologies: **Project Achievement: 71% of HH reduced to 0 and a 90% reduction in average bacteria count in all project areas**.
- **Project Target #3**: 50% reduction in reported cases of diarrhea among children under the age of 5 within target villages: **Project Achievement: 66% reduction = Target exceeded by 16%** (see table 12 below for details).

Two out of the three primary project indicator targets were exceeded and one was met at 71% of the target. Target numbers one and two relate to the individual or household level impact of the project and indicator number three is at the village level of project impact.

Of the 13 results indicators for the above four results in the project framework IHTCW achieved 100% on six indicators and 75% on five indicators (1.1., 1.3., 2.1., 2.2. and 4.1.), due to the fact that one of the four project areas refused to have a household water distribution network installed. There was insufficient information to clearly measure two of the 13 indicators (3.3 and 4.4). These results are impressive given the challenges faced in the project.

Summary of Project Result Indicators and Achievement	
Project Result #1: ***Households in target villages are accessing potable and safe water for drinking and eating.***	
Result Indicators	**Project Achievement**
1.1.% households in target villages getting the H^2O for drinking and eating from improved water source	75%
1.2. % of households purifying H^2O for drinking/cooking purposes.	100%
1.3. One technical improvement has been implemented in each of the four villages with local contributions.	75%
Project Result #2: ***Women's Associations are successfully managing water quality maintenance.***	
2.1. Village men & leaders & the Local Councils accept women's involvement in maintaining H^2O quality.	75%
2.2. Target WAs have agreed maintenance & sustainability plans village H^2O supplies & quality including tariff scheme for operation & maintenance.	75%
2.3. WA members have the skills to test and assess H^2O quality & understand the technology & maintenance Silver Filters.	100%
Project Result #3: ***Active awareness of households and village leaders of need for proper water and sanitation facilities.***	
3.1. Household practices show understanding of need to purify and maintain H^2O quality.	100%
3.2. Villagers aware that H^2O is a scarce commodity & pay for services related to their H^2O source.	100%
3.3. Village leaders are lobbying the Local Council for better sanitation systems.	Insufficient Information
Project Result #4: ***Project replication promoted in non targeted villages.***	
4.1. Women's Associations, Local Councils and the RWA support and promote the water management system piloted in the project.	75%
4.2. Project has identified appropriate household water purifying systems for this context.	100%
4.3. Other villages and WAs are requesting similar services.	100%
4.4. Local Councils lobbying donors for project replication.	Insufficient Information

In the assessment of this evaluation the immediate project results of reduced incidence of diarrhea and levels of TTC in drinking water are impressive and exciting. However, the long term impact of the project goes far beyond these results to include changes in beneficiary attitudes and behaviors towards water, cleanliness and disease. This understanding, and the consequent new behaviors, is

foundational for Yemen to improve the health status of its citizens. Such changes hold the potential to dramatically alter health outcomes for generations to come.

Furthermore, in the assessment of this final evaluation there have been changes in gender dynamics within the four targeted villages as a result of the project. In highly conservative and traditional communities even small adjustments in gender attitudes can produce substantive improvement in the situation of girls and women. Most men now accept the new role of the strengthened WAs in resource management and women have gained confidence in leadership, thus establishing a precedent for more gender equitable relations. During this evaluation the Project Manager noted that there has been a dramatic change in the way that women in the village interact with male project team members. He observed that when they first started working in the villages women were shy to deal with males from outside their communities. 24 months later, women in the WA are noticeably more confident and able to deal directly and professionally with men from outside their families.

While this evaluation was unable to quantify the long term impact of IHTCW on attitudes and behaviors with regards to water, cleanliness and disease as well as gender equity, they are empirically evident. One improvement to the Monitoring and Evaluation system would have been to have included a few questions in the baseline survey that attempted to assess attitudes on these two issues that could have then been measured against. However, despite the absence of metrics quantifying impact this assessment has no doubt that change has occurred.

Sustainability is a concern in all development endeavors, seeking to ensure that investments will continue beyond the duration of the project. Internationally, it is an elusive concept and one that is difficult to achieve particularly in very poor countries such as Yemen for basic services. Having noted this difficulty, in the assessment of this final evaluation IHTCW contains a number of elements that significantly contribute to project sustainability. Firstly, the system of fees/tariffs for the household water connection includes setting aside 20% of revenues for future system maintenance. If maintained this reserve will go along way towards offsetting future maintenance costs. Secondly, broad community engagement, successfully enlisting the support of local councils to help pay for project investments and solid Water Management Unit (WMU) bylaws will all contribute to the long-term sustainability of IHTCW. However, in the analysis of this final project assessment it is changed attitudes and behaviors that will contribute most to project sustainability as residents in the targeted villages have seen the value and benefit of improved water quality and the health and financial consequences.

II. Introduction

This final evaluation is designed to assess the performance and impact of the Improved Health Through Clean Water (IHTCW) Project implemented by CARE International Yemen in four villages in Hajja governorate from November 2007-October 2009. This project was funded by the Warren G. Buffett Foundation.

The final evaluation terms of reference outline the following areas that this assignment is tasked to examine:

- Oversee the post-baseline survey conducted among 10% of beneficiary households in each of the four villages to track changes in project targeted outcomes.
- Assess project activities including: implementation approach; program design; quality of relationships; and compliance with CARE International program principles and standards.
- Measure project impact on the sustainable running of local partner women's association with regards to: targeted beneficiaries (scale, depth, coverage, multiplier effect and sustainability); and project achievements in relation to objectives and targets, including any unintended achievements (positive and negative).
- Evaluate project replicability and identify lessons learned and successes and the factors leading to success (or failure).

1. Evaluation Methodology

This final evaluation was conducted from September 4th through 14th and consisted of the following tools:

- Post-baseline survey administered by external enumerators (one male and one female) to 33 households (approximately 10% of project beneficiaries)[1] in four project locations (48% female – see annex 1 for summary of the survey tool);
- Stakeholder interviews conducted with seven individuals with relevance to the project (see annex 2 for interviewees and focus group discussion participants);
- Project site field visits which utilized a combination of individual and focus group discussions with 23 women in the four villages;
- Review of all project documentation (see annex 3 for resources consulted).

On September 9th, the consultant presented preliminary findings to CARE Country Director, Director of Program Coordination & Government Liaison and the IHTCW Project Manager at the CARE office in Sana'a. This final report incorporates their feedback and insights on the project review.

The findings and results of this final evaluation incorporated an approach which examines the various levels of impact and achievements at four levels: individual and household; organizational; community; and beyond the immediate project borders. These levels of analysis are integrated into the project framework.

2. Acknowledgements

It was a pleasure working with CARE staff both in Hajja and in Sana'a. Special thanks in Hajja goes to Ali Taweel, the IHTCW Project Manager who facilitated the final evaluation process by opening to the evaluator the project archives, communities in targeted villages and his home. Also in Hajja,

[1] Final evaluation surveys administered were: Bani Buram=10; Al-Otum=6; Al-Sharqi=11; and Beit Abu 'Orej=6.

the evaluator is indebted to Amat Al-Gafour Al-Hawri, IHTCW Community Facilitator, and the two enumerators in the final evaluation survey Eman Faraj and Murshed Muhsen Awad, who accompanied the evaluator on an intense schedule of field visits. All members of the Hajja CARE office were gracious and assisted in ensuring thorough results, despite the timing of the visit during Ramadan. Additionally, the evaluator is grateful to the beneficiaries in the four project areas opened their homes and graciously shared their time and insights on project challenges and achievements. Finally, in Sana'a Mohammed Saad, CARE Yemen Director of Program Coordination and Government Liaison who throughout IHTCW supervised its management, greatly facilitated this final evaluation by providing documents, analysis and thoughtful reflection on the project. Numerous others contributed to this final evaluation, but a group thank you to all those whose contribution to this effort will have to suffice in the interest of brevity.

III. Project Context and Background

1. Context of Need[2]

In 2007-2008, the Republic of Yemen ranked 153 in the United Nation's (UN) Human Development Index (out of 177 countries). According to the 2004 census 73% of Yemenis reside in rural villages or clusters of homes often in mountainous terrain with limited infrastructure and services (roads, health care, education, water and electricity). Throughout Yemen only 19.1% of citizens have access to adequate sanitation facilities, 31.5% to safe drinking water and women and children spend an average of four hours daily collecting water for household use. Yemen's per capita water consumption at 125 m^3 annually is one of the lowest in the world.[3] Although infant and child mortality rates have decreased in recent years they remain high with 55 deaths per 1,000 live births, under five year olds 73 deaths out of 1,000 and 42% of children under the age of five are underweight.[4] Additionally, school enrollment and literacy rates are disturbingly low, particularly among females with only 31.4% of adult women being literate. While urban poverty has declined from 32% in 1998 to 20.7% in 2005, more than 40% of rural residents are poor.

Hajja governorate is located northwest of the capital of Yemen Sana'a, and Hajja City (the governorate capital) and is 1,900 meter above sea level (6,233 feet) situated on the western escarpment rising from the Red Sea coast to the mountain highlands. The population of the governorate is 1,480,897 divided into 31 districts.

According to the 2004 Census, the proportion of illiterate citizens in Hajja governorate is 56.3% (74.2% female and 40% male), the 2nd worst governorate in the country (Al-Jawf is the worst with 83.6%), with 82.7% of rural women over the age of 10 being unable to read and write. Among rural residents of Hajja only 12.31% have access to potable water, 13.9% to sewage facility (3rd highest in the country) and 19.2% to electricity (3rd lowest in the country). The Yemeni Government's Poverty Reduction Strategy notes that only 4.4% of families in Hajja are linked to paved roads and the incidence of poverty is 20.90% (urban) 50% (rural) in contrast to the national average in rural areas of 40%.

CARE is one of the few international development organizations working in Hajja governorate on a consistent basis.[5] In addition to government ministries (which lack resources and suffer from a range of implementation challenges), for over a decade the Social Fund for Development (SFD) has been a key actor in the area and in 2009 it opened a new branch office in Hajja to more directly address needs.[6] Additionally, there are 79 local associations and foundations (i.e. Non-Governmental Organizations – NGOs) registered in the Ministry of Social Affairs and Labor (MSAL) in the Hajja office, although their efforts are usually limited to one or two villages and the quality and range of

[2] Statistics in this section are compiled from the "2004 Census," "Yemen Poverty Assessment: 2007" and the government's "Poverty Reduction Strategy Paper 2003-2005."
[3] The global average is 1,240 m^3, the US is 2,480 m^3 and the global water poverty line is 500 m^3.
[4] UNICEF, 2007 at: www.unicef.org.
[5] Such organizations include: Vision Hope International, a German development organization that works extensively in Hajja (www.vision-hope.org) and GTZ, which works primarily in the education sector in the area. Other organizations have had programming in the area but no project offices.
[6] Previously SFD Hajja investments were administered by the Amran Branch, which served three governorates (Amran, Hajja and Sa'adah).

services they offer varies significantly.[7] Despite these development efforts, the dire statistics presented above form the compelling context of need for CARE's IHTCW project in Hajja governorate supported by the Howard G. Buffett Foundation.

2. Project Background

The IHTCW project was designed to build on achievements of recently completed CARE activities in the governorate that were implemented from 2004 to 2007: the "Western Highlands Rural Community Development Project" and the "Food Security and Women's Empowerment Project." Both projects were funded by the European Commission. Among other activities, both of these CARE initiatives established and trained Women's Associations (WA) who in turn operated project sponsored Income Generating Activities (IGAs) and offered literacy classes.

Additionally, these projects provided water systems to the four targeted villages which included improving sources, building water storage tanks and piping water from the source to the storage tanks.[8] These water system improvements not only impacted water quality, but also significantly reduced the amount of time spent transferring water from the communal tanks to the household (HH). CARE's presence in the four project areas of the IHTCW began with the Western Highlands Project in Al-Otum, Bani Buram and Beit Abu 'Orej and the Food Security Project in Al-Sharqi

Over the course of these two projects, and other CARE activities in Yemen in the water sector, the organization has developed a strong working relationship with the Rural Water Authority in Hajja and nationally with the Rural Water Forum (consisting of government agencies, donors and international NGOs working in rural water supply). The IHTCW project expanded on these strategic partnerships and incorporated the benefits of this collaboration into the Women's Associations (WA) in the targeted project areas.

The IHTCW project contributes to Yemen's performance on the UN 2000 declared Millennium Development Goals (MDG) adopted by all Member States. These goals have since become a universal framework for development and facilitated host countries and donors to work together in pursuit of common goals. The MDGs of interest for this project are numbers four "Reduce by two thirds the mortality rate among children under five" and seven "Reduce by half the proportion of people without sustainable access to safe drinking water."[9]

[7] In CARE Yemen's two earlier projects in Hajja governorate they worked with a total of 42 local NGOs out of the 79 registered at the MSAL.

[8] Water system improvements in the four IHTCW targeted villages included improving the water source in each area, installing 3,580m of pipe from sources to storage tanks and constructing four water storage tanks for a total of 393m^3.

[9] "Evaluating the Health and Socioeconomic Impacts of Colloidal Silver Impregnated Ceramic Filters in 4 Villages in Amran Governorate (Final Report)." Dr. Khaled A. Al-Moyed and Dr. Belkis A. Zabara Sana'a University. Water and Environment Center. August 2008. Pg 3.

IV. Project Management and Design

1. Management Structure

The IHTCW project team took over the Hajja office from the CARE Food Security and Women's Empowerment Project, which closed at the end of 2007. The immediate availability of this office space and staff that were absorbed in the new initiative facilitated the quick launch of field activities.

From project inception in November 2007 to conclusion the project team for IHTCW consisted of the following members:

- Mr. Ali Taweel, Project Manager (full-time);
- Mr. Mujeeb Sailan, Community Facilitator and Documentor (full-time);
- Ms. Amat Al-Gafour Al-Hawri, Community Facilitator and Documentor (full-time);
- Ms. Safah Miftah, Accountant (part-time at 50%);
- Mr. Mohamed Al-Sharafi, Driver (full-time).

CARE's Director of Program Coordination and Government Liaison was the senior staff at the organization's headquarters in Sana'a responsible for supervising the project. In this capacity he visited Hajja and project sites on a monthly basis during the first year of the project and subsequently every other month.

Throughout the project the core implementation team was supported by other CARE senior staff in a variety of capacities including supervision, monitoring, reporting, coordination, training and facilitating activities at both the governorate and national levels. Additionally, the Project Manager regularly travelled to Sana'a to share and address challenges encountered and discuss lessons learned with CARE senior management. Over the course of this two year project there were also numerous field visits by Sana'a-based CARE staff to the project office and field sites for monitoring, compliance and supervision purposes.

Another important project activity was that the CARE team cooperated extensively with local communities in cultivating relationships with government and elected representatives of the area. This included working with the Hajja office of the Rural Water Authority (RWA) in a variety tasks including registering the WA and having the by-laws of the Water Management Units (WMU) in each area approved. Additionally, the MSAL were important partners as all the WA were legally registered under their authority. Additionally, the elected Local Councils were a key component in government decentralization efforts and thus their support and involvement was critical to project achievements. Local Council support was not only expressed through non-material assistance, but also with contribution of money providing 10% towards the total cost of the household water network in two villages (Al-Sharqi = 120,000 YR and Bani Buram = 800,000 YR for a total of 920,000 YR, or US$4,538.73).

1.1. Project Site Selection

Preliminary villages identified in the project proposal were selected based on a number of criteria including: investments made in previous CARE projects and thus a presence of a water storage tank; compelling need and sufficient water quantity for the village household needs; sustainability of the WA in the areas; village leadership willingness to participate in the project; and selecting areas in diverse locations in Hajja governorate. The four villages initially proposed were Bani Buram, Al-

Otum, Al-Otor and Beit Abu 'Orej. Two additional villages, Al-Sharqi and Beit Al-Gaysh were included in baseline surveys and initial community mobilization as alternate locations.[10]

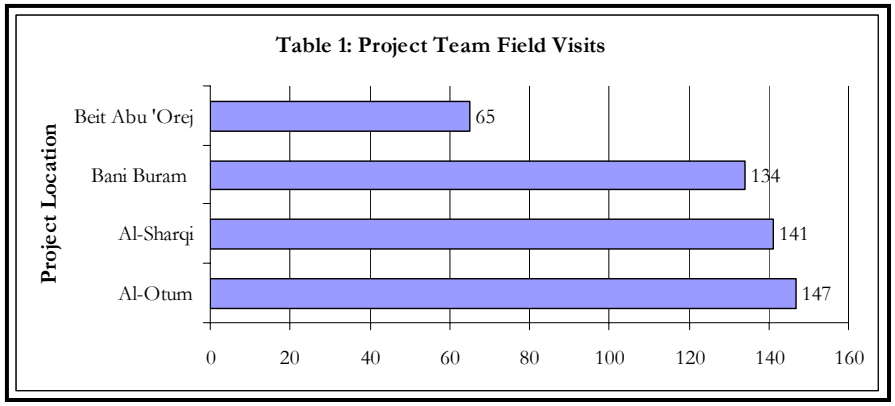
During these initial engagements with the selected communities it became apparent for a variety of reasons that Al-Otur's preliminary commitment to participate in the project would not materialize.[11] The project team worked to address their concerns, but representatives of the village continued to refuse to participate. Consequently, the village of Al-Sharqi was selected as a replacement project site and implementation agreements finalized with community leaders.

1.2. Project Monitoring, Evaluation and Reporting

The inception phase in the four project sites included conducting a comprehensive baseline survey with the aim to understand the village level context and to compile information to later measure project achievements and impact.[12] The survey questionnaire gathered information at three levels – village, WA and household – and was administered by enumerators to 335 households in the four targeted villages.[13] The results of this comprehensive survey were then compiled, analyzed and a summary translated into English (see annex 4 for team reflections on challenges and lessons learned in the baseline survey process).

Also during the inception phase a detailed Monitoring and Evaluation (M&E) plan was designed under the leadership of CARE Yemen's Technical Advisor for Design, Monitoring and Evaluation (see table 3 below for summary of results indicators and project achievements). The M&E plan was designed to monitor both process and impact indicators. In the assessment of this evaluation the M&E plan was generally strong, however two of the 13 results indicators did not specify clear measurement mechanisms (numbers 3.3. and 4.4.). This means that this evaluation was only able to assess 11 of the 13 project results.

As part of the project implementation and monitoring processes, the project team conducted an impressive number of field visits to all project sites. Through August 2009, 487 visits were conducted by the project team to the four locations (see table 1 for details).[14] The total visits



[10] Members of the administrative committee of the WA in Beit Al-Gaysh, Al-Mustaqbal Association, participated in two project trainings, the NGO Board Training (12 members) and the NGO Law Training (12 members), although not included in training outputs in annex 4)

[11] Reasons given included: that beneficiaries did not want to pay for household water service; scarcity of water; scattering and isolation of beneficiary homes; households located above the water tank thought that all the water will go to houses below and would not reach them.

[12] Baseline surveys were conducted according to the following schedule: Al-Otum January 2008; Beit Abu 'Orej in February 2008; Bani Buram March 2008; and Al-Sharqi in April 2008).

[13] The baseline survey was also administered in the villages of Al-Otur (which later dropped out) and Beit Al-Geish (49 households) as an alternative village in case of further changes in project location.

[14] Team member visits included were the Project Manager and the two full-time Community Facilitators.

multiplied by the distance from Hajja City to each project site totaled a remarkable 15,237 km (9,467.8 miles), much of it over very rough unpaved roads.[15]

Project reporting included a monthly progress report from the Project Manager to CARE headquarters in Sana'a, as well as compiling project bi-annual and annual reports for submission to the donor. As part of the IHTCW M&E system the project team periodically reflected on challenges and successes through a SWOT (Strengths Weaknesses Opportunities Threats) analysis which facilitated monitoring project progress and addressing challenges as they arose (see annex 4 for team SWOT analysis results).

1.3. Project Cost Benefit

Table 2 below gives details on key project intervention costs per beneficiary for four activities. Per beneficiary costs for all categories were very low and demonstrate the efficient use of resources in project management and delivery of services to the targeted communities.

Table 2: Cost Benefit Analysis

Expense Category	# of Beneficiaries	CARE Budget (US$)[16]	Per Beneficiary Costs (US$)	Per HH Cost (US$)
Water System	1,548	46,906	30.30	158.47
Training	1001	5,377	5.37	
Silver Filter	1,805	7,716[17]	4.27	22.69
Awareness Activities	730	754	1.03	

The project per beneficiary cost for the water system improvements of US$30.30 is far below the average per capita costs of two significant national rural water supply development programs: General Authority for Rural Water Supply Projects (GARWSP) at $75 and Rural Water Supply and Sanitation Project (RWSS) at $85. Additionally, it compares favorably with Social Fund for Development (SFD) costs at approximately $22, which includes 25% community contributions.[18]

1.4. Project Challenges

Over the course of IHTCW numerous challenges were encountered that impacted project implementation including:

- Ambitious targets within a limited budget and small implementation team;
- High inflation in Yemen during project implementation (this particularly affected transportation costs and materials for the water system improvements)[19];
- Replace Al-Otur village as a target community with the village of Al-Sharqi;
- Lower than expected management capacities of the women's associations that served as the local project partner in the four targeted communities;
- Unanticipated high levels of conflict within communities (see section V.3 page 28 below for more details); and

[15] Distances from Hajja city to villages are as follows: Al-Otum=12 km/7.46 miles; Al-Sharqi=19 km/11.8 miles; Beit Abu 'Orej=30 km/18.6 miles; and Bani Buram=66 km/41 miles).

[16] Figures do not include beneficiary and community contributions (see table 7 below for such data). Exchange rate used: US$1=202.7 YR.

[17] Silver filter costs do not include transportation of the filters to project sites or the 400YR per filter beneficiary contribution to the purchase price.

[18] "Project Evaluation – Final Report: Hajja Governorate Food Security and Women's Empowerment Project, Yemen." Said R. Al-Shaybani. September 2007, pg 33.

[19] Inflation was 7.9% in 2007, 18.9% in 2008; and expected to be 12% in 2009. In 2008 as a result of the global food crisis Yemenis paid a 120% increase in the cost of bulk flour (see page 28 below for further discussion of this issue).

- Very rough unpaved roads to reach two of the four selected project areas (Bani Buram and Beit Abu 'Orej).

Some of these challenges were realities that could not be changed. For other issues the project implementation team with management support from CARE headquarters in Sana'a strove to address them as they arose.

In conclusion to this section, in the assessment of this final evaluation the overall project management for the IHTCW project was highly effective and extremely efficient with limited resources. The project team was very experienced, knowledgeable about the context and had excellent skills to address challenges appropriately.

V. Final Evaluation: Project Results Framework Findings and Analysis

The following project results framework was developed by CARE Yemen's Technical Advisor for Design, Monitoring and Evaluation working closely with the IHTCW implementation team. This input integrated international best practices not only in the results framework, but also in the mechanisms to monitor and measure project progress. Thus, the project team was oriented to the importance of this management tool and throughout implementation they consistently reported against the framework to monitor progress.

Project Overall Objective: Improved health for the population of four rural Yemeni villages through improving the availability and use of clean water, managed and assured by Women's Associations.

The three primary project indicator targets are as follows:

Project Target #1: 80% reduction of diarrhea in children under the age of 5 in households adopting H^2O purifying technologies: **Project Achievement: 84% reduction = Target exceeded by 4%** (see table 3 below for details).

Project Target #2: Thermotolerant coliform (TTC) in household drinking H^2O is reduced to 0 in households adopting purifying technologies: **Project Achievement: 71% of HH reduced to 0 and a 90% reduction in average bacteria count in all project areas** (see table 4 below for details).

Project Target #3: 50% reduction in reported cases of diarrhea among children under the age of 5 within target villages: **Project Achievement: 66% reduction = Target exceeded by 16%** (see table 12 below for details).

Two out of the three primary project indicator targets were exceeded and one was met at 71% of the target. Target numbers one and two relate to the individual or household level impact of the project and indicator number three is at the village level of project impact.

In addition to providing information on the three project indicators, this section will examine four levels of project impact tied to the results indicators and provide additional information on project activities at each level.

1. Individual and Household Level Impact: ***Households in target villages are accessing potable and safe water within their households for drinking and food preparation.***
2. Organizational Level Impact: ***Women's Associations are successfully managing water quality maintenance.***
3. Community Level Impact: ***Active awareness of households and village leaders of need for proper water and sanitation facilities.***
4. Broader Project Level Impact: ***Project replication promoted.***

Of the 13 results indicators for the above four results in the project framework IHTCW achieved 100% on six indicators and 75% on five indicators (1.1, 1.3, 2.1, 2.2 and 4.1), due to the fact that one of the four project areas refused to have a household water distribution network installed. There was insufficient information to clearly measure two of the 13 indicators (3.3 and 4.4). These results are impressive given the challenges faced in the project (see section IV page 8 above).

Table 3: Summary of Project Result Indicators and Achievement	
Project Result #1: ***Households in target villages are accessing potable and safe water for drinking and eating.***	
Result Indicators	**Project Achievement**
1.1.% households in target villages getting the H^2O for drinking and eating from improved water source	75%
1.2. % of households purifying H^2O for drinking/cooking purposes.	100%
1.3. One technical improvement has been implemented in each of the four villages with local contributions.	75%
Project Result #2: ***Women's Associations are successfully managing water quality maintenance.***	
2.1. Village men & leaders & the Local Councils accept women's involvement in maintaining H^2O quality.	75%
2.2. Target WAs have agreed maintenance & sustainability plans village H^2O supplies & quality including tariff scheme for operation & maintenance.	75%
2.3. WA members have the skills to test and assess H^2O quality & understand the technology & maintenance Silver Filters.	100%
Project Result #3: ***Active awareness of households and village leaders of need for proper water and sanitation facilities.***	
3.1. Household practices show understanding of need to purify and maintain H^2O quality.	100%
3.2. Villagers aware that H^2O is a scarce commodity & pay for services related to their H^2O source.	100%
3.3. Village leaders are lobbying the Local Council for better sanitation systems.	Insufficient Information
Project Result #4: ***Project replication promoted in non targeted villages.***	
4.1. Women's Associations, Local Councils and the RWA support and promote the water management system piloted in the project.	75%
4.2. Project has identified appropriate household water purifying systems for this context.	100%
4.3. Other villages and WAs are requesting similar services.	100%
4.4. Local Councils lobbying donors for project replication.	Insufficient Information

1. Individual and Household Level

This level of impact was central to IHTCW as two project targets are designed to assess health outcomes in the target population at the household level. As noted the project exceeded by 4% Project Target #1 and for Project Target #2 achieved a 71% reduction in HH levels of bacteria in drinking water and a 90% reduction in average bacteria count in all project areas.

Regarding the three results indicators at this level the project achieved 100% for 1.2. and 75% for 1.1. and 1.3. because the Beit Abu 'Orej (one of the four project areas) refused to have a household water distribution network installed. Thus, only 75% was achieved because of any fault on the part of CARE, but as a result of community challenges that the project team was not able to overcome. However, it was noted that the village of Beit Abu 'Orej has recently come to the project management team and stated that they now (at project conclusion) would like a household network installed!

Project Target #1: 80% reduction of diarrhea in children under the age of five in households adopting H^2O purifying technologies: **Project Achievement: 84% reduction = Target exceeded by 4%**.

Table 4 below provides the data used to calculate the household level achievement of Project Target #1. Such data is derived from baseline and final evaluation survey results.

Table 4: Household Level Change: Incidence of Diarrhea in Children Under Five			
Project Location	***Baseline Data* % of HH with Children under 5 with Diarrhea**	***Final Evaluation Survey Results* % of Children under 5 with Diarrhea[20]**	**% Change in Incidence of Diarrhea**
Bani Buram	0.81	0.07	-0.91
Al-Otum	0.90	0.15	-0.83
Al-Sharqi	0.73	0.15	-0.79
Beit Abu 'Orej	0.85	0.13	-0.84
Averages:	**0.82**	**0.13**	**-0.84**

Project Target #2: Thermotolerant coliform (TTC)[21] in household drinking H^2O is reduced to 0 in households adopting purifying technologies: **Project Achievement: 71% of HH reduced to 0 and a 90% reduction in average bacteria count in all project areas**.

The water purifying technology selected for use in IHTCW was Colloidal Silver Impregnated Ceramic Water Filters (henceforth referred to as Silver Filters, the trade name for the product in Yemen). This technology has been highly effective internationally in reducing water borne bacteria.[22] In 2007, silver filters were introduced in Yemen by Potters for Peace and Potters Without Borders, subsequently GTZ supported an initiative for local manufacturing and now they being produced and distributed by a local private business The Silver Filter Company Ltd.[23] The impact of Silver Filters in Yemen has been impressive with 100% removal of total and faecal coliforms from filtered water in various locations.[24] For example, one study found a sharp decrease of diarrhea episodes among children "from 63.9% before using of filter to 14.4% after 1 month of using it…25% of adults were suffering from diarrhea before using of filter which sharply decreased to 0.0% after 1 month of using the filter."[25]

During the course of this evaluation Silver Filters in households were observed in all project location. In all homes it was found that families cherished the filters and had gone to considerable effort to protect them. This included wrapping the filter in cloth to cool the water, as well as

[20] This result is arrived at by dividing the # of children with diarrhea by the # of children without diarrhea X % of the village population under the age of 5.
[21] The specific TTC tested for in the two tests was E. Coli bacteria.
[22] Silver filters were first introduced by Potters for Peace, a US-based NGO, in several countries after Hurricane Mitch devastated Central America in October 1998.
[23] www.silverfilter.org.
[24] "Evaluating the Health and Socioeconomic Impacts of Colloidal Silver Impregnated Ceramic Filters in 4 Villages in Amran Governorate (Final Report)." Dr. Khaled A. Al-Moyed and Dr. Belkis A. Zabara Sana'a University. Water & Environment Center. August 2008. Pg 3.
[25] Ibid. Pg 13.

covering the filtration unit with plastic for protection to minimize contamination and potential damage. One mother whose small child had broken their filter months earlier, sadly noted the tragedy and during the interview the child in question was repeatedly referred to as "the breaker" (fortunately the household has been able to share a filter with the extended family).

Table 5 below provides the data used to calculate the achievement level of Project Target #2. While the project did not fully achieve the target for this indicator, project team observations and evidence from prior studies in Yemen note that continuing bacterial content is probably due to cleaning of the filters using contaminated water and thus compromising the results.

Table 5: Improved H^2O Quality Using Silver Filter					
Project Location	**1. Baseline HH[26] Bacteria Level (Average E. Coli bacteria count)**	**2. 2nd Test[27] After Bacteria Level (E. Coli bacteria) # of HH with 0**	**3. 2nd Test % 0 of HH H^2O tested after filtration (E. Coli bacteria)**	**4. 2nd Test Bacteria Level (Average E. Coli bacteria count)**	**5. % Difference in Water Quality (between column 1 & 4)**
Bani Buram	59.62	8=0 (out of 11)	72%	13.36	-0.78
Al-Otum	48.2	6=0 (out of 6)	100%	0	-1.00
Al-Sharqi	56.4	2=0 (out of 7)[28]	28%	1.75	-0.97
Beit Abu 'Orej	57.63	10=0 (out of 12)	83%	6.14	-0.89
Averages:	**55.46**		**71%**	**5.31**	**-0.90**

Project Result #1: Households in target villages are accessing potable and safe water for drinking and eating.

One weakness in the household level project results framework is the redundancy or lack of distinction between results 1.1 and 1.3. The goal of 1.1 could be interpreted as the improved water source installed from the earlier CARE projects, but if that was the intention it should not be included as a result of the current project. Therefore, in this assessment they will be treated as the same desired result with a similar achievement level of 75%.

1.1. **75%** households in target villages getting the H^2O for drinking and eating from improved water source.

Three of the four villages targeted by IHTCW had household level water supply networks installed.

1.2. **100%** of households purifying H^2O for drinking/cooking purposes.

[26] Total of *E. Coli* bacteria in 100ml of water. *E. Coli* is a faecal thermotolerant coliform (TTC) with the following risk classification: 0=conformity with WHO guidelines for safe drinking water; 1-10=low risk; 11-100=intermediate risk; 101-1,000=high risk; >1,000=very high risk (from "Improved Health Through Clean Water Project: Water Test Results – Follow Up Sampling." Said R. Al-Shaybani. August 2009). H^2O samples were taken from plastic bottles or house storage tank.

[27] 2nd test was conducted approximately six months after filter distribution (March-April 2008) on H^2O sample after filtration using silver filter.

[28] There are numerous reasons that possibly contributed to continuing high levels of bacteria in the villages, particularly Al-Sharqi. The most common culprit is improper cleaning of the filter using impure water and thus polluting the H^2O and the test results.

A total of 340 Silver Filters were distributed to residents in the four project villages (columns 1 and 2 in table 6 below). Households paid 400YR towards the cost of each filter (wholesale price was 5,000YR for each filter). It is important to note that while 400YR (equivalent of approximately $2) seems very affordable, in relation to income it is not insignificant. Seven million Yemenis live on less than the official poverty rate of $2/day and GNP per capita is $2,400 (estimated 2008, 176th out of 229 nations). The CARE cost benefit ratio per beneficiary was US$4.27 (or US$22.69 per household see table 2 above). This project investment had a significant health impact on beneficiary households and is responsible for the significant reduction of diarrhea at both the household and village levels (project targets #1 and #3 respectively).

In August 2008, the WA Water Management Units (WMU) in three of the four targeted villages conducted a community survey on filter usage (columns 3 through 6 in table 6 below). This exercise proved to be a positive learning experience for the women as they learned about patterns in household filter use. One question of the evaluation is why the cleaning frequencies in the survey were every 15 days and once monthly, when the manufacturer recommends cleaning the filters at least once weekly? The WA in Beit Abu 'Orej was repeatedly encouraged to administer the same survey, but they failed to do so. However, the positive test results in the village of household bacteria levels demonstrate that families are purifying their water for drinking and cooking purposes (2nd out of 4 villages in the number of households with 0 – see table 5 above).

Table 6: Filter Use in Targeted Villages

Project Location	1. # Filters Distributed	2. % Coverage in Village	3. % of Filters Broken	4. % Use Filters	5. % HH Cleaning Filters At Least Every 15 days	6. % HH Cleaning Filters Once Monthly
Bani Buram	99[29]	100%	0.05%	100%	56.30%	43.60%
Al-Otum	69[30]	100%	0	100%	60.50%	39.50%
Al-Sharqi	128[31]	100%	0.05%	100%	86.20%	13.80%
Beit Abu 'Orej	44	100%	No Data Available			
Totals:	**340**	**Averages:**	**0.03%**		**67.67%**	**32.30%**

1.3. **75%** of targeted villages have had one technical improvement implemented with local contributions.

As noted earlier, CARE previous projects implemented in the four villages had improved the water sources of the villages, constructed storage tanks and installed pipes from the source to the tanks according to the following details: Al-Otum 1,400m of pipes from source to storage tank, with a capacity of 165m^3; Al-Sharqi 280m of pipes from source to storage tank, with a capacity of 20m^3; Beit Abu 'Orej 500m of pipes from source to storage tank, with a capacity of 112m^3; and Bani Buram 1,400m of pipes from source to storage tank, with a capacity of 96m^3.

[29] In Bani Buram data was only collected for 82 out of the 99 households that received filters.
[30] In Al-Otum data was only collected for 43 out of the 69 households that received filters.
[31] In Al-Sharqi data was collected for all 128 households that received filters.

IHTCW project built on this infrastructure by extending the water services to the household level. The most expensive investment of IHTCW project was the installation of household water distribution networks in three of the four targeted villages. Table 7 below provides details on such investments, their cost and local contribution information.

Table 7: Project Water Network Improvements				
Project Location	**1. Type of Technical Improvement**	**2. CARE Investment (actuals as of 8/09)**	**3. Local Contribution**	**4. % of Local Contribution**
Bani Buram	Household H²O delivery network & other misc improvements[32]	4,508,280	883,208	16%
Al-Otum	Household H²O delivery network & other misc improvements	1,442,449	82,733	5%
Al-Sharqi	Household H²O delivery network & other misc improvements	3,557,130	620,000	15%
Beit Abu 'Orej	Beit Abu 'Orej refused HH water delivery network			
	Totals (YR):	**9,507,859**	**1,585,941**	**14%**
	Totals (US$):	**46,906**	**7,824**	**54,730.14**

While it will be discussed in subsequent section, it is worthy of note here the significance of local contribution to the network which totaled 14% of infrastructure costs (8% coming from the Local Councils and 6% coming from the WA). This substantial cash contribution does not of course include any local labor and represents a clear indicator of community engagement in the project and thus sustainability of the network.

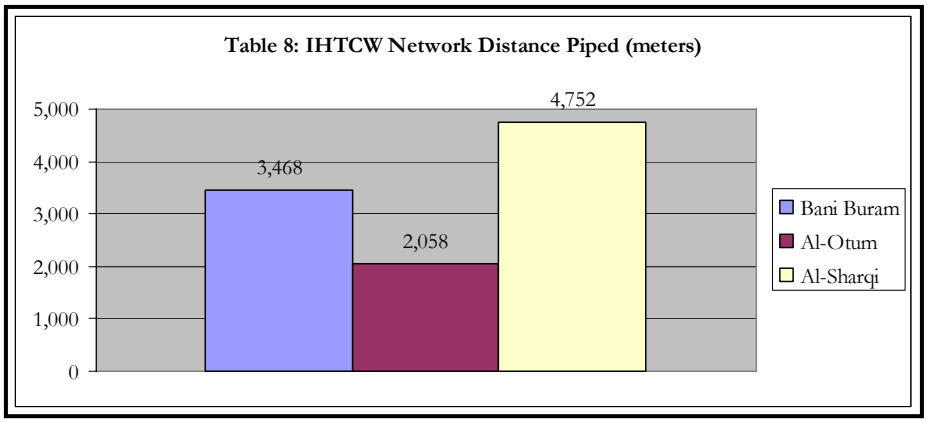


Table 8 (adjacent) provides details on the length of pipes installed in the household network. In the three project locations with improved water systems a total of 10,278 meters of pipes were installed (equivalent to 33,720 feet).[33]

One of the indirect results of this project at the household level is the reduction of time that women and children spend carrying water. The final evaluation of the "Western Highlands Rural Community Development Project" found that: "Water tank construction activities reduced the burden on the women and girls who spend 3-5 hours/day to fetch water in rugged mountainous paths." This project's baseline survey found that the time spent bringing water was from 5-30 minutes (depending on the location of their homes), with households averaging 3-5 trips daily. As a result of the household network delivery the daily time carrying water eliminated between 15 minutes (3 trips X 5 minutes) to a maximum of 2.5 hours (5 trips X 30 minutes). Water transferring

[32] Bani Buram costs also included improvement to the village irrigation system (see textbox on page 29 below).
[33] The Al-Sharqi site actually comprises two villages – Al-Sharqi and Ashriba – that were connected with one system.

is almost exclusively a task for women and children (either using containers on their heads or donkeys).[34]

The consequent time savings for women means that they have more time available for their other responsibilities both productive (agriculture, gathering fodder for livestock and income generating such as sewing) and reproductive (household chores such as fetching wood, cooking, washing clothes, cleaning and caring for children). Additionally, it means they may have more time for activities such as literacy classes, gathering with other women or supporting activities of the WA. While no quantitative information is available on how women use their extra time as a result of IHTCW, during this evaluation there was significant antidotal evidence that women are highly appreciative of the extra time they had, particularly for completing their other chores.

1.1. Other Project Impacts at the Individual and Household Level

In a number of CARE reports for IHTCW it was mentioned that one of the major causes of diarrhea in children under five years of age identified in the baseline survey was the result of parasites and worms. While it was suggested that the project would seek curative treatment for children suffering from such problems, to date additional funding has not been secured for such an activity, although its cost would be minimal (it was estimated that at US$5/treatment for deworming medicine a total of US$2,500 would treat 500 children in 181 households).

It is clear from this evaluation that the most significant attitude change as a result of IHTCW was that beneficiaries in the targeted villages realized the connection between clean water and improved health. This adjustment in attitude resulted in behavior change which had a measurable impact on the bacteria levels in drinking water and consequently a reduction in the incidence of diarrhea. Evidence for this change in attitudes and behaviors was also clear in the care they lavish on the water filters in their homes. Such changes may well be the most enduring aspect of this project; the handling of water and understanding the connection between hygiene and disease holds the potential for transmission to future generations in the targeted villages. This new behavior will outlast the filters themselves and it is hoped that in the future families will recognize the value of clean water and purchase replacement filters.

The Expense of Treating Diarrhea

Treating diarrhea is expensive and a cost that most rural households in Yemen can ill afford. In the 2008 Amran study on Silver Filters it was found that in the three months prior to their introduction 35.6% of families had spent more than 5,000 YR on treating diarrhea. In the final month of the study, after six months of using the filters no households recorded expenses over 5,000 YR for treating diarrhea.* This finding was substantiated in interviews of two beneficiary families conducted by the IHTCW Project Manager. This anecdotal feedback found that in the year prior to introducing the filters families averaged one medical treatment per month for diarrhea (ranging in cost from 3,000 YR to 8,000 YR = $15 to $40). In the year after receiving the filters one family had no cases of diarrhea requiring medical attention and the second family had only one case.

* "Evaluating the Health and Socioeconomic Impacts of Colloidal Silver Impregnated Ceramic Filters in 4 Villages in Amran Governorate (Final Report)." Dr. Khaled A. Al-Moyed and Dr. Belkis A. Zabara Sana'a University. Water & Environment Center. August 2008. Pg. 14.

[34] The baseline survey for this project found that 88% of water transfer from the tanks to homes was done by either adult women or female children and 96% was transferred by adult female and children of both genders (adult female=.69%; adult male=.04%; female children=.19%; male children=.08).

2. Organization Level

This level of analysis of evaluation findings looks at the impact of the project on the WA in the targeted villages. Working through and building the capacity of community-based organizations is of critical importance to the elusive concept of sustainability. Additionally, this aspect of the project was by far the most significant element contributing to gender equity. Through the very real leadership that the WAs have provided in water resource management changes in gender dynamics in the targeted villages have emerged.

Project Result #2: Women's Associations are successfully managing water quality maintenance.

Upon final site selection the project team used the Organizational Development (OD) tool, developed by CARE Yemen's Gender Coordinator, to asses the management capacity of the four WAs. This step was necessary in order to understand each group's strengths and weaknesses and to plan capacity building activities accordingly. The tool was developed with WAs themselves and identifies criteria for the "maturity" of an association (Level 1 "Just born" organization; Level 2 "Youngster" organization; Level 3 "Adolescent" organization; Level 4 "Respected adult" organization). With facilitation from CARE staff, local groups of men and women in the four target villages used the tool to self-evaluate WA capacities in four areas: organizational management; management of IGA projects; management of literacy classes; and involvement in village water resources. Results were compiled in a report and major findings included:

- WA members had a weak understanding of their own governance structures and processes, without being able to articulate the roles and responsibilities of general and administrative committee members;
- Literacy classes had often been discontinued due to internal conflicts and inability to agree upon solutions; and
- Management of income generation activities and village water resources was dominated by men.

Based on these findings the project team in cooperation with the WA developed the training plan for the project (see annex 5 for training outputs). Ideally the same tool could be re-administered to the WA at the project conclusion to assess the impact of project training and practical experience gained through implementing the project.

Additional challenges faced by the WA identified in the project progress report (November 2008-April 2009) included:

- Need to conduct elections of board members and train newly-elected board members;
- Filling leadership roles when women move away or marry outside the village;
- Weak cooperation with the branch office of the MSAL;
- Training needs in organization and project management and bookkeeping; and
- Training needs in problem solving and conflict resolution.

Throughout the project the IHTCW team supported the WA as their primary project partner and in an effort to contribute to meeting project objectives.

2.1. **75%** of village men and leaders and the Local Councils accept women's involvement in maintaining H^2O quality.

The leadership of the WA in managing the water systems installed has been successfully achieved in three of the four villages. This achievement was by no means an easy process in communities that are quite conservative and where women do not traditionally have a management role of water resources. While women throughout Yemen shoulder almost exclusive responsibility for ensuring households water supply by transporting such a precious commodity from source to the home, they rarely have a decision making role in its allocation or management. This is traditionally almost always the mandate of men and male village leadership (see text box on page 29 below on the situation in Bani Buram).

The IHTCW project team invested time and energy in encouraging communities to accept the role of women in managing this resource. While discussing the issue was part of the facilitation process the various trainings that the women received over the course of the project also encouraged such acceptance. The gender equity training conducted in all four villages with 181 participants (52% female) contributed to community acceptance of women managing water resources.

Another training activity that contributed to the acceptance of men that women play a leading role in water management were the two day exchange visits organized by the project to a similar CARE project managed by a WA in the nearby governorate of Al-Mahweet. Representatives from three villages participated in this activity with 29 individuals (48% female) benefiting from the exchange experience. The aim of this visit to Al-Dahabisha village was for residents of the two areas to exchange experience and for the IHTCW participants to see a WA managing a water supply project. The Al-Dahabisha community is also conservative and since the CARE project began there in 2006 they have faced challenges to women's leadership in water resource management similar to those encountered in the Hajja WAs. The men and women from Hajja returned from the visit with practical strategies and a vision for how their organization and communities could deal with challenges. A critical component to planning this visit was including men in the activity which facilitated subsequent male support of women's leadership in water resource management. During this evaluation interviews with women that had participated clearly emphasized the positive impact that the exchange visits had on the IHTCW initiative.

Increasing Beneficiary Confidence
During a field visit to Al-Otum by CARE senior staff in May 2008, members in the WA gathered after recently completing their H^2O testing training. One woman shared that "the pH and turbidity values in our water is suitable but bacteria is very high." Thus, demonstrating her increased skills, knowledge and comfort with this new technical role.

Finally, the fact that households are now paying fees for the water they receive in their homes in the three villages is clear evidence that demonstrates the realization of this project result (see result 3.2. below for payment details). This innovative aspect of the project contributed in real ways to improving gender dynamics in the project areas as women have proven to themselves and men in their communities that they are capable of contributing to the management of a scarce resource such as water.

2.2. **75%** of targeted WAs have agreed maintenance & sustainability plans village H^2O supplies and quality including tariff scheme for operation & maintenance.

In the three villages with household water networks in place the management of such systems have been fully developed. Activities during the project which contributed to achieving this result

included conducting a series of meetings with the RWA and Local Councils to coordinate work in the villages and bring stakeholders together including the WA. These meetings resulted in the election of a Water Management Unit (WMU) in each village (consisting of five members – two men and three women from the WA) and the preparation and approval of the WMU by laws. Subsequently, all WMUs were registered with the RWA. The by laws include a variety of mechanisms governing the WMU including:

- Design of the system;
- Guidance on who should be involved in the design;
- Implementation planning; and
- Management of the system.

These by laws also included regulations on issuing bills for water, collecting fees, paying operating costs, setting aside 20% of revenues for future system maintenance and provisions for making changes to the WMU regulations.

The involvement of Local Councils in the process of developing the WMUs was important in ensuring local ownership of the systems and encouraged their engagement. As mentioned earlier, this participation also included their financial contribution of 8% towards the cost of the systems. The Bani Buram water system received the most Local Council support where they covered 15% of the system costs.

> Woman Leader Al-Sharqi
> "The CARE project not only brought water into our homes, but also motivated us to teach our children about washing their hands and the connection between clean water and health. The men in our village now listen more often to our ideas and take us seriously. They even have begun looking to our women's association as a community asset rather than just something to keep their wives "busy!"

Also contributing to this result were two days of training during the third project quarter (November 2008 to April 2009) for the WMUs in each of the three villages on the regulations governing their body and technical needs. 18 members of the WMU were trained (12 women and 6 men – 67% female) to ensure their sustainability after the project.[35]

2.3. **100%** of WA members have the skills to test and assess H^2O quality and understand the technology and maintenance Silver Filters.

Three trainings were conducted during the course of the project in various technical and practical aspects of water management which contribute to this result:

- H^2O Testing Training = 244 participants from four villages (69% female);
- Silver Filter Training = 199 participants from four villages (55% female).

The training in H^2O testing was conducted by a local water expert. In the training participants were instructed in the use of the "Delagua" water testing kit.[36] This relatively simple kit tests turbidity, pH value[37] and bacteria (measured as thermo-tolerant coliforms - TTC). CARE Yemen has two kits and the IHTCW consultant water expert used one to train project staff and later selected project participants to measure water quality baseline and follow up. While the Delagua methodology is

[35] Additionally, 12 individuals from Beit Al-Gaysh were also training in the same course though not counted in the final project training results.
[36] Oxfam UK developed this tool for international use see: www.eihms.surrey.ac.uk/robens/env/rcpeh.htm.
[37] pH is a measure of the acidity or basicity of a liquid solution.

simple enough for use in village, it cannot be safely stored there as the chemicals require refrigeration and targeted villages do not have any or reliable electricity. Therefore the aim of training community beneficiaries was to create awareness on the water testing process, water quality categories and interpretation of test results. The water quality test training was participatory in nature, with training participants helping to collect the data, thus furthering understanding of the importance of testing water and reinforcing concepts such as "clean" and "dirty" water.

Training participants were chosen based on their current and possible future involvement in managing village water resources. Selected men were already involved in village water resource management and were constantly present in the village (rather than those that work in other towns or cities in Yemen and only return occasionally). Women participants were WA members and other women who are likely to play a role in the future water management structure.[38]

2.1. WA Income Generating Activities

As mentioned in section III above, the earlier CARE programs in the area initiated income generating activities (IGAs) operated by the WA in each of the four project sites (see table 9 below). However, at the time that the project baseline survey was conducted only one of the four IGAs was still operating (Al-Sharqi).

Table 9: WA IGA Activities

Location	Name of WA/Year of Establishment	Earlier IGA	Earlier CARE Project
Bani Buram	Al-'Elm Association	Chicken Farm (egg)	Western Highlands Rural Community Development Project
Al-Otum	Al-Wafa' Association	Chicken Farm (meat)	
Beit Abu 'Orej	Beit Abu 'Orej Association	Rearing goats & selling cell phone cards	
Al-Sharqi	Al-Sharqi Association	Chicken Farm (meat)	Food Security & Women's Empowerment Project

During the course of the project the team supported the WA through a variety of ways to reactive their IGAs, and Bani Buram transformed their original egg activity to meat production. This included infusing resources into the IGAs, providing support and on-the-job training of individuals involved in these activities. This evaluation asked beneficiaries during the field visits about these activities and also visited the chicken hangers in two of the villages. Women were generally enthusiastic about the activity (except Beit Abu 'Orej) and had utilized the income earned for contributing the project and other agreed upon activities. In Al-Otum the WA had earned over 300,000 YR by selling water from the tanks to road construction crews for improvements that were recently made.

There are many factors that contribute to a successful IGA (e.g. demand for the service or product being offered, leadership, management efficiency, location, facility availability, etc…). Based on information gathered during this final evaluation it appears that the IGAs initiated by earlier CARE

[38] November 1, 2007 – October 31, 2008 "Annual Report on Improved Health Through Clean Water Hajja Governorate, Yemen." Pg. 4.

projects had solid ideas, but had lapsed in their activities due to weaknesses in the WAs. IHTCW helped to reinvigorate the WA and their IGA efforts, thus strengthening their outcomes and impact.

2.2. Other Project Impacts at the Organizational Level

IHTCW invested considerable time and resources in formal training courses to achieve project objectives at a per beneficiary cost of US$5.37. A total of 1,001 individuals (63% female) participated in 38 days of formal training for a total of 38,038 total training days (see annex 5 for complete details on training activities). These trainings not only transferred skills to participants but enabled participants to gain confidence in their own abilities and also built community trust in the WA ability to manager H^2O resources.

According to Yemeni law, associations must conduct formal elections for administrative committee members every three years. These elections are officially monitored by a representative of the MSAL and are required for local NGOs to maintain their legal status. In 2008, CARE staff facilitated elections in three WA and trained the newly elected staff in their roles (see table 10 below for election information, noting that the WA in Beit Abu 'Orej failed to hold the requisite elections). Data in this table of note include the percentage of members attending the election (column 2), with high turnout in the Al-Otum election (75%) and relative positive attendance in the other two areas. Additionally, columns 4 and 5 are important as they reflect member satisfaction levels with incumbent WA leadership, Bani Buram having the least number of new members elected to the administrative committee.

Table 10: Women's Association Administrative Committee Election Results

Local Women's Association (Election Date)	1. # of Members Attending Election	2. % of Members Attending Election	3. # of Members on Admin Committee	4. # of New Members Elected	5. % Turnover in Committee
Al-Otum (Feb 08)	50	75%	13	5	38%
Al-Sharqi (Mar 08)	46	58%	12	5	42%
Bani Buram (Apr 08)	36	55%	11	2	18%

An indirect impact of IHTCW at the organizational level is in regards to membership in the WAs in the targeted villages. Table 11 below shows 22.38% increase in membership in the four WAs over the course of the project. This is a significant rise given the limited number of women in each of the areas (column 4 highlights this point). It is interesting to note that the WA in Beit Abu 'Orej, which in the opinion of this evaluation had the weakest community support, has the highest percentage of women participating in it, although Al-Otum comes in a close second with 39% of women in the village being members in the WA.

Table 11: Women's Association Membership

Local Women's Association	1. # Members @ Baseline	2. Current # of Members (Aug 09)	3. % Change	4. % of Female Residents' Membership in WA
Al-Otum	61	67	9.84	39%
Al-Sharqi	66	80	21.21	25%
Bani Buram	54	65	20.37	26%
Beit Abu 'Orej	42	58	38.10	43%
	223	**270**	**22.38%**	**31%**

A further impact of IHTCW on the WA in the project areas was reactivating literacy classes for women launched during the earlier CARE projects. In the project baseline only Al-Otum had ongoing literacy classes while at the time of this evaluation all WA were offering such a service except Beit Abu 'Orej. This project result arose out of the revitalized activity levels of the WA and increased confidence in their activities.

3. Community Level

Project Target #3: 50% reduction in reported cases of diarrhea among children under the age of 5 within target villages: **Project Achievement: 66% reduction = Target exceeded by 16%**.

Table 12 below provides the data for the calculation of the project achievement of an impressive 66% reduction in diarrhea at the village level in the four project areas. This data is consistent with information from other studies in Yemen on reduction of diarrhea in households utilizing the Silver Filters.[39]

Table 12: Village Level Change: Incidence of Diarrhea in Children Under Five

Project Location	Final Evaluation # HH Surveyed	# of Individual in HH	# Children under 5 w/Diarrhea	% of Children under 5 w/ Diarrhea[40]	% of Village w/Children Under 5 w/Diarrhea[41]	% Change in Incidence of Diarrhea (between baseline & final evaluation)
Bani Buram	10	79	7	0.02	0.16	-0.77
Al-Otum	6	35	7	0.06	0.16	-0.66
Al-Sharqi	11	91	13	0.04	0.20	-0.53
Beit Abu 'Orej	6	50	8	0.06	0.10	-0.66
					Average Change:	**-0.66**

Project Result #3: Active awareness of households and village leaders of need for proper water and sanitation facilities.

3.1. **100%** of household practices show understanding of need to purify and maintain H^2O quality.

Two factors demonstrate the IHTCW project achievement of this result both of which were covered above. Firstly, information in table 5 "Improved H^2O Quality Using Silver Filter" illustrates that households in the four project areas understand the direct connection between water quality and health (11% of households that had received Silver Filters were tested in both the baseline and 2nd test). Table 6, column 5 shows that 67.67% of households in three of the four communities clean

[39] According to Silver Filter Company literature, studies in Yemen found that "Over a six month period Silver Filters reduced incidents of diarrhea in children and adults by up to 77%" (www.silverfilter.org.)

[40] This result is based on a calculation of the # of children under 5 with diarrhea (in final evaluation survey) divided by the # of individuals in the HH (in final evaluation survey) X % of the population under the age of 5 (baseline: Bani Buram=.25.8%; Al-Otum=28.4%; Al-Sharqi=29.6%; and Beit Abu 'Orej=35.4%).

[41] This result is based on a calculation of the % of children under 5 with diarrhea (final evaluation survey) X # of HH surveyed (final evaluation survey) X % of HH with children under the age of 5 (baseline: Bani Buram=69%; Al-Otum=46%; Al-Sharqi=44%; and Beit Abu 'Orej=.29%).

their filter at least once every 15 days, providing further evidence that they understand the practices required to maintain water quality. The reduction in the incidence of diarrhea in children under the age of 5 in all four areas at both the household level (tables 4) and at the village level (table 12) shows provides further information that families are practicing improved water handling and purifying techniques.

Secondly, a further indication that household understand the need to purify and maintain H^2O is in all project areas is the household contributed of 400 YR towards the cost of purchasing their filter for a total of 136,000 YR or US$670.94 (see section 1.2 above for further discussion of this issue).

3.2. **75%** Villagers aware that H^2O is a scarce commodity and pay for services related to their H^2O source.

In the three communities with improved water sources WA began collecting monthly fees from each household connected to the distribution network as per the following: Bani Buram from May; Al-Sharqi from May; and Al-Otum from July.

Household monthly fees paid for the new water systems vary between the three villages: Bani Buram = WMU Fee 40 YR + Participation Fee 100 YR = 140 YR; Al-Otum = WMU Fee 50 YR + Participation Fee 200 YR = 250 YR; Al-Sharqi = WMU Fee 100 YR + Participation Fee 300 YR = 400 YR. Additionally, users pay monthly for water based on meter readings. According to the by-laws developed for the WA 20% of these revenues are saved for maintenance of the system and 80% cover expenses for the operating the service.

The first month that the water was connected in one of the villages there was one household that became extravagant in their water usage. However, when they received their first bill for the service they quickly controlled consumption. The issue of increased consumption of a scarce resource as a result of household network connections was a concern expressed in all villages before the project began. The key to addressing this concern was by installing meters at each house to ensure that families paid for their consumption and thus moderated their usage of a finite community held resource.

Table 13: Participation in Health and Environmental Awareness Campaigns

	Health Awareness			Environmental Awareness			Village Clean Up			
Project Location	**Men**	**Women**	**Total**	**Men**	**Women**	**Total**	**Men**	**Women**	**Teachers & Students**	**Total**
Bani Buram	23	20	**43**	12	26	**38**	20	30	124	**174**
Al-Otum	20	35	**55**	14	27	**41**	28	36	134	**198**
Al-Sharqi	20	35	**55**	9	28	**37**				
Beit Abu 'Orej	20	32	**52**	8	29	**37**				
	83	**122**	**205**	**43**	**110**	**153**				
	40%	**60%**		**28%**	**72%**					
Total Beneficiaries:				**730**						

Each of the three villages has appointed a man that is responsible for collecting these fees and who is compensated for his services (in Al-Sharqi he is paid 7,000 YR/month). The employment of a male to perform this service was agreed on with the WA in order to facilitate the

During this final evaluation interviews with WA treasurers noted that nearly all households have paid their monthly fees and water bills, with a few exceptions of a small number of households with extenuating economic circumstances.

3.3. Village leaders are lobbying the Local Council for better sanitation systems **Insufficient Information.**

The baseline survey gathered information on sanitation and waste water disposal in the four villages. This survey found that 40% of homes **do not** have toilets (335 families 201 bathrooms with toilets). Additionally, the survey noted that sewage disposal is a serious environmental and health issue. The survey found that disposal of sewage for families with toilets were: 11% dispose of it next their house; 32% channel it down the mountain side; 5% have cesspits; and two families in Al-Sharqi have bio gas units. Garbage disposal is also a serious issue in rural Yemen. In three of the four targeted communities garbage is simply dumped in the vicinity of their homes or on the mountain. The exception is in Al-Sharqi where they burn their garbage as a result of an awareness campaign which was conducted by Vision Hope International shortly before IHTCW began.

Given this context, project result 3.3 is highly commendable, however for purposes of this final evaluation there was insufficient information to measure progress on this project result. Nevertheless, the project invested considerable efforts in raising awareness on environmental and health issues through a variety of activities noted in the following section. In the future as Local Councils begin taking on more leadership in areas such as rural sanitation it is hoped that the experience of IHTCW will contribute to finding solutions.

3.1. Community Awareness Campaigns

An important aspect of the project was mobilizing communities around environmental and health issues. A number of formal training opportunities contributed to these campaigns, such as the training on Silver Filter use and the water testing which included significant messages related to hygiene and health. Additionally, during the third project quarter (November 2008-April 2009) the project team worked with the WA and village leaders to raise awareness of the relationship between the environment and health, as well as conducted clean up campaigns of the village environs. A total of 730 individuals participated in such awareness raising activities (see table 13 for details). During the health and environment campaigns the project team used a variety of awareness raising tools including multi-media shows, radio programs, brochures, and megaphone broadcasts.

Furthermore, village clean up and garbage collection campaigns were conducted in two villages areas (Al-Otum and Bani Buram) lasting for 10 days. These events included two days of training for women's association members, men from the community, school children and teachers and the mosque Imam. Subsequently, the Friday mosque *khutba*[42] encouraged villagers to keep their village clean and cooperate in the collection of garbage.

[42] i.e. the Friday sermon.

Additionally, under the auspices of community awareness raising on environment and health the project produced two Arabic language brochures. One brochure was on the project explaining its objectives, activities, the responsibilities of the Water Management Unit and maintenance of the household water network. The second brochure discussed the importance of health, hygiene, cleanliness at the household level and the village environment, as well as the connection between disease and unclean water.

The cost of project awareness raising campaigns was a mere US$1.03 per direct beneficiary (see table 2). This very cost effective use of project resources had a significant impact and during the field visit interviews for this evaluation, community members in Al-Otum mentioned the village community campaign as one of the positive impacts of the project. It was observed during this final evaluation that the environment in targeted villages was notably cleaner than in many other rural communities in Yemen.

3.2. Other Project Impacts at the Community Level

One contextual issue at the community level that warrants mentioning is the general trend during project implementation of increasing economic hardship in rural Yemen. Yemen's economy has grown reasonably over the last few years (on average 3.9% GDP growth for the period 2001-2007, 4.66% in 2008 and an estimated 5% in 2009).[43] However, inflation has also been high: 2007 = 7.9%; 2008 = 18.97%; and 2009 expected to be 12%.[44] Unfortunately, such statistics do not adequately reflect the challenges felt by families in rural Yemen who as a result of the global food crisis in 2008 paid a 120% increase in the cost of bulk flour.[45] These economic challenges have contributed to a pattern observed over the life of the project that men are increasingly leaving their villages to seek employment in Yemeni cities, attempting to smuggle themselves across the Saudi border in search of work or even joining the military. Consequently, communities have seen a decrease in support for development activities with fewer local men around to participate and women shouldering the burden of coping with an increased workload in the absence of their male family members. Project staff estimated that in Al-Otum and Al-Sharqi the majority of men are soldiers and that in all four villages 50-60% of the men work in Taiz or Sana'a only coming home for religious celebrations and holidays. This is problematic as women often do not have the authority to make decisions in the absence of their husbands.

Community Conflict

As mentioned in the section on project management, conflict within the communities presented a significant challenge to project implementation. Such conflict was encountered at all stages of the project from inception to conclusion. The sources of such conflict were complex, often intertwined with dynamics between various tribes and families. The Project Manager and all the team spent considerable efforts in addressing conflict in the targeted communities. Over the course of the project many of the 223 field visits by the Project Manager to targeted communities[46] were aimed at was invested in helping to resolve dissention and conflict. The project team estimated that 60-80% of the time they spent in the field was working to resolve conflicts. In a number of cases such

[43] Economist Intelligence Unit (2008) Yemen Country Report.
[44] www.economywatch.com/economic-statistics/country/Yemen.
[45] "Hunger Pangs: A Full Plate Today, Uncertainty Tomorrow." Washington Post. By Faith D'Aluisio & Peter Menzel. Sunday, April 27, 2008.
[46] With the following breakdown: Al-Sharqi = 71; Bani Buram = 70; Al-Otum = 59; Beit Abu 'Orej = 23.

conflict resolution activities sought the assistance of local council members, powerful sheikhs, government officials and other influential individuals.

The baseline survey found the following sources, or issues, of conflict in the targeted communities:

- Distrust in women as managers of water resources and general distrust between villagers.
- Disagreements over election results and leadership within the WAs (in Beit Abu 'Orej two sisters had been officers in the administrative committee, thus leading to accusations of nepotism and conflict of interest).
- Irregularities within the WA such as not keeping meeting minutes or accusations of mismanaged money particularly regarding income from IGAs.
- Jealousy between women within the WAs and the administrative committees over issues of compensation for the literacy teachers and those operating the IGAs.
- Interference of men in the activities and leadership of the WA which can also result in conflicts between women as they take sides with their men.
- Conflicts between the various tribes or families in an area that may even include blood feuds (i.e. conflict between families or tribes related to blood money[47]).
- Differing water rights for elements within one community that have evolved over time and when contemporary elements such as pipes or pumps are introduced they require extensive negotiations to develop new understandings.

Over the course of the project other conflicts arose, sometimes directly linked to project activities and sometimes related to the broader context of conflict in the communities. Examples of such conflicts include:

- In one village the family of the Sheikh is involved in a blood feud with another family in the community. Since Ramadan 2008 these two families have not met, even their women are not allowed to meet in WA gatherings. This constraint has to be worked around in order to continue project activities, often requiring extra effort on the part of the project team.
- Al-Otum comprises two tribes Bani Shoumi and Al-Hajawara (nomads that settled in the area between 70-80 years ago) that generally are clustered in two separate areas, although it was noted that there has been intermarriage between the two groups over the years. The recent transplants (Al-Hajawara) only have very limited access to spring. There has been a court case pending for 12 years over the issue. The project team worked to mediate this conflict and eventually arrived

Negotiating Village Water Needs

When the IHTCW project team began serious discussions with leaders in Bani Buram village men were reluctant to connect the water supply to households as the spring is also used for irrigation. Additionally, village men were hesitant to allow women a role in managing this precious resource. Through extended negotiations it was eventually agreed that the project would install 1,400 meters of pipe instead of the dirt-lined open irrigation channel and that the time allotted for pumping water to homes would be three hours daily. Only after the agricultural needs of the village had been guaranteed did the men agree that the women should be managing H^2O for the homes through the WA. This major accomplishment was the result of significant efforts on the part of the CARE team in creative problem solving and the availability of resources to address community concerns.

[47] This is indemnity money paid to the victim, or his family, by the party that caused the bodily injury. In Arabic this term is *diya* and it is an Islamic legal practice observed in many countries as a form of social security insurance for families. In Yemen the rate of *diya* is periodically adjusted for inflation and the amount paid depends on the circumstances surround the death.

at agreement between the parties that the Al-Hajawara tribe can only use the water for drinking and household use, nothing for agriculture.

- Another type of conflict that arose between community members was over beneficiary selection. Some members felt that the project should only help people who reside within the four villages, while others believe it should also serve residents along the outskirts of the villages as well.
- In all the project areas there were multiple families and/or tribes which sometimes contributed to conflicts and exacerbated implementation. For example, in Al-Sharqi the project location included two villages – Al-Sharqi and Ashriba – sharing one water supply network.

The lack of participation in Beit Abu 'Orej was a significant challenge for the project and was tied to community conflict. Early in the project the WA and the local community went back on the initial commitment to connect houses directly to a water supply. They chose instead to continue using water from the communal taps at the shared storage tank for the following reasons:

- Water resources in the village are insufficient for all houses;
- Such a system would be closed to people from other villages facing dry seasons, who would be excluded from a traditionally shared resource;
- The current storage tank taps are very close to all the houses of the village, the farthest away being 20 minutes walk;
- The villages chose to focus on water handling; and
- The WA from its own resources managed to improve their rain water roof harvesting system with support from another, German-funded project in Hajja.

However, it was also clear in interviews and the informal focus group discussion with women that the underlying cause for this refusal was conflict within the WA and the broader community. In discussing the project with women from the village and leaders of the WA they stated that one focal point of conflict that had paralyzed the organization was over payment of teachers for the literacy classes. The women were quite clear that they have been unable to resolve this issue and thus literacy classes have stopped. However, IHTCW staff noted that this specific conflict was a symptom of community dynamics between competing families and/or tribes in the community rather than the cause of the conflict. While a more thorough investigation would be necessary to understand this conflict and other disputes encountered by the project, one observation is that this stalemate has produced a sense of apathy and helplessness among the women in Beit Abu 'Orej. This attitude was quite striking during the informal focus group discussions. While the women recognized their own inadequacies in solving the issue of the literacy classes it was also apparent that they felt they had little control over the situation.

Consistently throughout the project conflict was identified as a threat to the success of the initiative. Conflicts delayed project progress at various points and in the case of Beit Abu 'Orej prevented technical improvements to their water system. Interestingly, for two years conflict prevented installing household level water supply network in Beit Abu 'Orej. Recently the disputing parties have come to some sort of truce and they approached the IHTCW Project Manager requesting that the project provide them with the offered network!

Water is a tremendously valuable resource throughout Yemen. Even in areas where there is significant rainfall such as Hajja (ranging between 500-800 mm annually depending on the location in the governorate = 19.5 to 31.5 inches), water is a scarce resource with 90% of Yemen's available water used in agriculture leaving limited water for household consumption. With Yemen's growing

population, increasingly stressed water resources and weakening indigenous traditions in conflict management it can safely be predicted that conflict over water will only increase with time. It has been estimated that 60% of conflicts in Yemen relate to water. It is the opinion of this evaluation that given this situation it is imperative that projects such as IHTCW more directly transfer conflict management skills to all communities working in water resource management. While IHTCW worked to resolve conflicts encountered during project implementation, conflict mitigation practices and skills could have been directly cultivated in the project areas.

4. Beyond Project Borders

Project Result #4: Project replication promoted in non-targeted villages.

4.1. **75%** Women's Associations, Local Councils and the RWA support and promote the water management system piloted in the project.

The project achieved 75% on this result (as Beit Abu 'Orej did not implement a new water system for the WA to manage). Evidence of the support by the WA for the project was the fact that they contributed 6% towards the total cost of the household water network in the three villages (Al-Sharqi = 500,000 YR; Bani Buram = 83,208 YR; and Al-Otum = 82,733 YR; total = 665,941 YR or US$3,285.35). Illustrating the support of Local Councils to the project was their contribution of 8% towards the total cost of the network in two villages (Al-Sharqi = 120,000 YR and Bani Buram = 800,000 YR; total = 920,000 YR or US$4,538.73). Together these local contributions totaled 14% of the total costs of the improvements to the water systems in the targeted communities.

The issue of the RWA support and promotion of the project is demonstrated by the individual that they assigned to the project, Abdul Majed Asnayan. This staff person of the Hajja RWA accompanied the project team on many site visits and participated in a wide range of project activities. While the evaluator did not interview this individual, his supervisor testified to the fact that he benefited greatly through his involvement in the project, providing him with skills, training and experience in many areas that he would not otherwise have encountered.

4.2. **100%** Project has identified appropriate household water purifying systems for this context.

The project produced very positive results with regards to improved water quality and the reduction of diarrhea at both the household and village levels through the use of Silver Filters. Therefore, in the opinion of this final assessment this result was achieved 100%. It is highly recommended that all CARE projects utilize these locally manufactured filters in all initiatives implemented in rural Yemen.

4.3. **100%** Other villages and WAs are requesting similar services.

At the time of this final evaluation the IHTCW office in Hajja had received eight requests for similar projects from villages and WA. Such requests are kept on file in case funding opportunities arise that would support such initiatives.

4.4. LC lobbying donors for replication **Insufficient Information**

At the time of this final evaluation the IHTCW office in Hajja had received one formal request from a Local Council for a similar project. This result is rather weak from a number of perspectives. Firstly, the decentralization of LC is still evolving and thus very few of such bodies have direct access to donors. Secondly, there is no way to track such activities. Thirdly, while the project was

very successful at many levels, it is by no means a foregone conclusion that household networks should be a priority for rural communities in Yemen. One could argue that the positive outcomes of this project had very little to do with the improved services and had much more to do with strengthening of the WA and the health outcomes.

There were a number of unique aspects of the IHTCW that are worthy of note. This project piloted a model of resource management that supported the complete cycle of drinking water – source → storage → household – both in terms of quality and management systems. Also, in contrast to many water investments in Yemen although technical water improvements a very strong emphasis was on the social capital both in terms of changing individual attitudes and behaviors as well as strengthening the capacity of community organizations to manage their natural resources. Finally, this model promoted gender equity through empowering the WA in the four project areas to take a leadership role in water management. In Yemen women are responsible for the provision of water for household use, but are rarely in a position to contribute to decision making or management of such resources. This project achieved such a result and generally had a very positive impact on gender relations in the communities.

It was noted in the interview with CARE Yemen's Director of Program Coordination and Government Liaison that in June 2009 they began implementing a similar 30-month project in Amran funded by BMZ (German government's Federal Ministry for Economic Cooperation and Development). This new initiative working with three WA will be implemented in four villages in cooperation with SOUL, a local NGO. The design for this improved drinking water management initiative benefited greatly from the experience and lessons learned from IHTCW project in Hajja. Additionally, CARE is currently seeking donor support for a similar initiative in Abyan that would utilize the model piloted in IHTCW.

VI. Recommendations and Conclusion

1. Recommendations

IHTCW project will conclude at the end of October 2009. Given this time constraint this evaluation has the following two recommendations for the remainder of the project:

- During the project's inception phase a participative tool was utilized by the project to assess strengths and weaknesses of the four targeted WA. It is recommended that this tool be re-administered to assess the impact of project training and practical experience gained through implementing the project.
- Given the significant conflicts that were encountered throughout the project it is recommended that before the project team is dispersed that CARE provide a facilitated session to focus specifically on better understanding this challenge. Such a session could provide an important forum for CARE to reflect on and analyze the various dimensions of conflict encountered during the project's 24-months. Such a process could be of great benefit for future similar endeavors.

Additionally, the following recommendations are designed to contribute to future program development priorities of CARE International Yemen and given that the project is in its final wind down they are not intended to be acted upon before the end of the project.

1.1. National Distribution of Silver Filters

The cost effectiveness of the US$4.27/beneficiary for each silver cordial filter is undeniable. It could be argued that this single project investment produced the impressive results in the three project indicator targets, possibly in combination with the accompanying training for slightly more than US$5/beneficiary. If Silver Filters were distributed throughout the country, this one very modest per capita investment could have a substantial impact on the lives of rural Yemenis. Additionally, this one investment in combination with a public awareness campaign promoting its use could potentially achieve Yemen's MDG performance related to mortality rate among children under five (reduce by two-thirds) and access to safe drinking water (reduce by half those that don't have access).

Currently, Silver Filters are retailing at only two locations in Yemen (Sana'a and Amran), thus they are unavailable to average citizens. In a number of villages during this final evaluation individuals that did not originally get filters from the project or whose filters broke searched in the market for the Silver Filters and could not find them. They noted that they ended up buying more expensive and less effective ones in the market. Therefore, it is recommended that CARE could support a wider national distribution network, ideally selling the filters at a subsidized price. If improved health outcomes through potable water is desired, this one investment could have a revolutionary impact on infant and child mortality (see annex 6 Case Statement on Nationwide Silver Filter Distribution).

1.2. Improving Rural Sanitation and Sewage

Although the project achieved a significant reduction in the incidence of disease among children future CARE investments in community-based water quality and access initiatives could look at a wider range of activities to improve the general environment in rural areas and thus affect health outcomes. Sanitation is a major part of the part of it, since during the baseline survey it was found that in the four project areas **41**% of homes **did not** have toilets (340 families 201 bathrooms with toilets). The SFD has an innovative program piloted by the Water and Environment Unit in a

number of areas called Community-Led Total Sanitation (CLTS) approach designed to mobilize communities to completely eliminate open defecation.[48] This program is patterned on an initiative pioneered in Bangladesh and since its introduction in Yemen in 2008 it has had considerable success.

Animals are an important aspect of rural life throughout Yemen and present a serious sanitation challenge for communities. In 2001, Hajja governorate was home to over 1.3 million goats, sheep, cows and camels (not to mention donkeys and chickens), giving a ratio of roughly one animal to every resident in the governorate.[49] Such livestock significantly contribute to family nutrition and are an important source of income (through sale of meat, eggs, milk, *haqeen*,[50] *samn*,[51] etc...). However, such a large number of animals living in close proximity to humans produce high levels of animal waste that in turn attracts and breeds flies which contributes to the spread of disease. While the need for potable water remains imperative to public health, there is also a need to explore ways to break the cycle of animal excrement/flies/disease. Traditional practices such as making dung cakes (*kuba'a*), address the need for fuel (i.e. mitigating deforestation) and remove cow manure from the streets. A contemporary solution such as bio-gas units could also contribute to addressing the issue of animal waste.

1.3. Replicablity

CARE has had a long standing presence in Hajja, dating back five years. This has served to facilitate implementation (quick roll out of office and team), but conversely it has also created expectations among targeted communities for more significant investments. In interviews it was necessary to continually re-emphasize that the evaluation was looking at IHTCW and not earlier CARE investments. While the WA established under the earlier projects did receive considerable training, they were still very weak when project implementation began. If CARE were contemplating project activities that focused more on the water quality leading to health outcomes and less on access to water it might be easier to keep expectations in line with project investments. It is interesting to note that in the cost benefit analysis the most expensive investment was the installation of the household network and yet there is no demonstrable relation between the network and the very impressive project health outcomes.

2. Conclusion

The overall objective of the IHTCW project was: improved health for the population of four rural Yemeni villages through improving the availability and use of clean water, managed and assured by Women's Associations. IHTCW improved the availability of H^2O through installing a household supply network in three villages benefiting 1,548 individuals (296 families) at a cost per beneficiary of US$30.30 (or US$158.47 per household) and dramatically improved the quality of water through the distribution of 340 Silver Filters to families in four villages at a cost of US$4.27/beneficiary (or US$22.69 per household).

In the assessment of this evaluation the immediate project results of reduced incidence of diarrhea and levels of TTC in drinking water are impressive and exciting. However, the long term impact of

[48] For more details see: www.communityledtotalsanitation.org.
[49] According to Ministry of Agriculture 2001 agricultural census Hajja had: 123,882 cattle, 1,208,438 sheep and goats, 9,020 camels and 252,996 chickens.
[50] *Haqeen*, is a fermented dairy product (similar to buttermilk) that is often smoked and widely used in Yemen.
[51] *Samn*, is ghee, or clarified butter, that is often smoked and widely used in Yemen.

the project goes far beyond these results to include changes in beneficiary attitudes and behaviors towards water, cleanliness and disease. This understanding, and the consequent new behaviors, is foundational for Yemen to improve the health status of its citizens. Such changes hold the potential to dramatically alter health outcomes for generations to come.

Furthermore, in the assessment of this final evaluation there have been changes in gender dynamics within the four targeted villages as a result of the project. In highly conservative and traditional communities even small adjustments in gender attitudes can produce substantive improvement in the situation of girls and women. Most men now accept the new role of the strengthened WAs in resource management and women have gained confidence in leadership, thus establishing a precedent for more gender equitable relations. During this evaluation the Project Manager noted that there has been a dramatic change in the way that women in the village interact with male project team members. He observed that when they first started working in the villages women were shy to deal with males from outside their communities. 24 months later, women in the WA are noticeably more confident and able to deal directly and professionally with men from outside their families.

While this evaluation was unable to quantify the long term impact of IHTCW on attitudes and behaviors with regards to water, cleanliness and disease as well as gender equity, they are empirically evident. One improvement to the M&E system would have been to have included a few questions in the baseline survey that attempted to assess attitudes on these two issues that could have then been measured against. However, despite the absence of metrics quantifying impact this assessment has no doubt that change has occurred.

Sustainability is a concern in all development endeavors, seeking to ensure that investments will continue beyond the duration of the project. Internationally, it is an elusive concept and one that is difficult to achieve particularly in very poor countries such as Yemen for basic services. Having noted this difficulty, in the assessment of this final evaluation IHTCW contains a number of elements that significantly contribute to project sustainability. Firstly, the system of fees/tariffs for the household water connection includes setting aside 20% of revenues for future system maintenance. If maintained this reserve will go along way towards offsetting future maintenance costs. Secondly, broad community engagement, successfully enlisting the support of local councils to help pay for project investments and solid WMU bylaws will all contribute to the long-term sustainability of IHTCW. However, in the analysis of this final project assessment it is changed attitudes and behaviors that will contribute most to project sustainability as residents in the targeted villages have seen the value and benefit of improved water quality and the health and financial consequences.

"We Made From Water Every Living Thing."
Holy Quran Surat Al-Anbiya' 30

"Don't waste water, even if you are beside a river."
Hadith Sharif

Annex 1: Post-Baseline Household Survey

Number of family	
Date of visit	/ / 2008

General Information:

- Location: District, Uzla, Village, Sub-Village.
- Name of household head:
- Family members: ( ) individuals ( ) female ( ) male
- # of children under 5: ( ) female ( ) male
- # of family members between age of 7 and 15: ( ) female ( ) male
- Family education: # of males & females (literate, primary, secondary, university)
- Are there members of WA in the house? Yes ( ) No ( )
  - If yes, how many members of WA are in the house? ( )

Household Water and Sanitation:

- How much water does the family consume daily?
  ( ) liters or ( ) jerry can with a capacity of 20 liters
- Is there a bathroom in the house? Yes ( ) No ( )
  - If yes: # of bathrooms and type of: Toilet ( ) Traditional toilet ( )

Incidence of Disease (among children under 5):

- Has any one of the family members had bilharzias? Yes ( ) No ( )
  - Has he/she taken a medicine? Yes ( ) No ( )
  - Has any one of your relatives had blood during urination? Yes ( ) No ( )
- Has any one of your relatives had blood in the stool? Yes ( ) No ( )
- Has he/she a fever during discharging blood? Yes ( ) No ( )
- Has any child a diarrhea during this year? Yes ( ) No ( )
  - If yes: How many times? ( ) When was the last time? .....
  - Was it repeated more than once during last two months? Yes ( ) No ( )
- Do you notice that your children have anal itching? Yes ( ) No ( )
  - If yes, do small warms go out with the stool? Yes ( ) No ( )
- Do big worms go out with the vomit and with the stool? Yes ( ) No ( )
- Does any child suffer from grips recently? Yea ( ) No ( )
  - If yes: Without diarrhea, mucus or fever ( ) With diarrhea, mucus or fever ( ) With diarrhea and fever ( ) With diarrhea and mucus ( )

External Household Appearance:

- House: construction type, size
- Rooms: number, cleanliness
- Yard: shape, cleanliness
- Livestock: kinds, fenced, waste management
- Other observations

Enumerator: Name and Signature

Annex 2: Interviews and Focus Group Discussions Conducted

No.	Date	Location	Individual	Organization/Position
1	Sept 5	Hajja	Adnan Mohammed Muzahim	Rural Water Authority, Head Hajja Branch
2			Ali Ahmed Al-Taweel	CARE, Project Manager Improved Health Through Clean Water
3			Sheikh Fahd Tahshoush	Hajja Governorate, Deputy Governor
4			Amat Al-Gafour Sharaf Al-Hawri	CARE, Community Facilitator Improved Health Through Clean Water Project
5		Al-Otum	Selwa Ali Hizam As-Shoumi	Wafa' Association, Chairwoman
6			Sahira Hadi Al-Arbaji	Wafa' Association, Treasurer
7			Asia Ali Mohammed Yahya	Wafa' Association, General Secretary
8			Fatin Ali Sagrir As-Shoumi	Wafa' Association, Monitoring & Follow Up Officer
9			Rada Ali Ahmed Al-Hajouri	Wafa' Association, Member
10			Ghalia Shoay Al-Hajouri	Wafa' Association, Member
11	Sept 6	As-Sharqi	Hayzara Mohammed Nawi As-Shoumi	As-Sharqi Association, Chairwoman
12			Salam Saleh Hassan Salem As-Shoumi	As-Sharqi Association, Treasurer
13			Shouya Ahmed Nasser As-Shoumi	As-Sharqi Association, Member
14			Fatima Ghassim Ahmed As-Shoumi	As-Sharqi Association, Member
15		Beit Abu 'Orej	Nabila Ahmed Saleh Abu 'Orej	Beit Abu 'Orej Association, Chairwoman
16			Asia Abdullah Homoun Abu 'Orej	Beit Abu 'Orej Association, General Secretary
17			Amat Al-Rahma Abdullah Hamour	Beit Abu 'Orej Association, Member
18			Bilquis Saleh Al-Marbabi	Beit Abu 'Orej Association, Member
19			Samira Hassan Abu 'Orej	Beit Abu 'Orej Association, Member
20	Sept 7	Bani Buram	Amira Hussein Hadi Mujamal	'Elm Association, Chairwoman
21			Noura Abdullah Hassan Al-Huthi	'Elm Association, Treasurer
22			Safia Ali Al-Jateem	'Elm Association, Monitoring & Follow Up Officer
23			Dawla Abdullah	'Elm Association, Member
24			Afrah Hussein Hadi Mujamal	'Elm Association, Member
25			Amira Saleh Al-Jalal	'Elm Association, Member
26			Amat Al-Rahman Al-Huthi	'Elm Association, Member
27			Arwa Ahmed Jaber	'Elm Association, Member
30	Sept 8	Sana'a	Mohammed Saad	CARE Yemen, Director of Program Coordination & Government Liaison
31		Sana'a	Richard A. Boni	Silver Filter Company Ltd, General Manager
32	Sept 9	Sana'a	Tim Kennedy	Independent Water Engineer Consultant & former CARE Country Director

Annex 3: Resources Consulted

Improved Health Through Clean Water Project Documentation

- Project Proposal "Improved Health Through Clean Water." 2007.
- Project Monthly Progress Reports – November 2007 through June 2009.
- November 1, 2007 – April 30, 2008 "Semi-Annual Report on Improved Health Through Clean Water Hajja Governorate, Yemen."
- "Baseline Survey Report Improved Health Through Clean Water." May 2008.
- November 1, 2007 – October 31, 2008 "Annual Report on Improved Health through Clean Water Hajja Governorate, Yemen."
- November 1st, 2008 – April 30th, 2009 "Third Semi-Annual Progress Report on Improved Health through Clean Water Project Hajja Governorate, Yemen."
- "Improved Health Through Clean Water Project: Water Test Results – Follow Up Sampling." Said R. Al-Shaybani. August 2009.

Other CARE Reports

- "Community Management of Local Natural Resources Al-Mahweet Governorate Yemen Evaluation Report." Adam Taylor-Awny. May 2002.
- "Poverty Alleviation in Al Mahweet Base line survey report." Submitted to the British Embassy. October 2003.
- "Western Highland Rural Development Project, Final Project Progress Report." Tim Kennedy. 2006.
- "Project Evaluation – Final Report: Hajja Governorate Food Security and Women's Empowerment Project, Yemen." Said R. Al-Shaybani. September 2007.
- "Project Evaluation – Draft Report: Sustainable Literacy Services in Abyan." Said R. Al-Shaybani. July 2008.

Other Documents

- "Poverty Reduction Strategy Paper (PRSP) 2003-2005." Republic of Yemen. May 2002.
- "Livestock Dynamics in the Arabian Peninsula." Food and Agriculture Organization. January 2003.
- "2004 Census." Republic of Yemen, Central Statistical Office. 2004.
- "Rainwater harvesting cisterns and local water management; A qualitative geographical / socio-anthropological case study and ethnographic description from the districts of Hajja, Mabyan and Shiris, Governorate of Hajja, Yemen." Eirik Hovden. 2006.
- USAID. "Yemen: Civil Society Sector Assessment – Final Report." Prepared by ARD. 2007.
- "Yemen Poverty Assessment." The Government of Yemen, World Bank and UNDP. 2007.
- "Rainfed Agriculture and Livestock Project." International Fund for Agricultural Development. September 2007.
- "Evaluating the Health and Socioeconomic Impacts of Colloidal Silver Impregnated Ceramic Filters in 4 Villages in Amran Governorate (Final Report)." Dr. Khaled A. Al-Moyed and Dr. Belkis A. Zabara Sana'a University. Water & Environment Center. August 2008.
- Economist Intelligence Unit (2008) Yemen Country Report.
- "Final Field Visit to Four Villages in Amran Governorate One Year After Introducing the Silver Filters." Bashir Yahya Al-Nasiri. March 2009.
- "Dahabisha." Carolyn McIntyre. Yemen Today, September 2009, pg 22-24.

Annex 4: Lessons Learned[52]

BASELINE SURVEY

Challenges and Difficulties:

- Too many questions in the survey.
- Some families were embarrassed to reveal the information about common and endemic diseases.
- Takes too much time in each village.
- The absence of male family members during the survey process resulted in women being reluctant to disclose information.
- Disagreement between families in targeted villages caused difficulty in gathering beneficiaries in one place to complete the survey.
- Difficult to differentiate between symptoms and causes in diarrhea.
- Change one of targeted communities after considerable effort, time and money during the survey and preliminary studies.
- Remove the question asking about washing hands because it is difficult to measure.
- Exaggerations in answering some questions and understatement in answering others.
- Difficulty in observing any notes.
- Difficulty in determining the age of children (who is under and who is above 5)
- Some WAs have not maintained their registration with the MSAL for a variety of reasons (no elections, not filing paperwork, etc…).

Some recommendations and suggestions:

- Take into consideration that the number of infections is the number of infected families not the number of infected children (may be in a family there is more than one child)
- Infected children will be counted in the follow up survey (after implementation of the network)
- Reactivate income generation projects.
- Reopen closed literacy classes and encourage women to attend.
- Coordinate with health office to find a solution to eradicate endemic diseases.
- Quickly implement the network.
- Implement a health awareness campaign about diseases and ways of prevention.
- Support the financial and administrative positions of WAs.
- Promote safe water.
- Distribute deworming medicine for children with the cooperation of Yemeni Ministry of Health.

SWOT ANALYSES[53]

After the first six months, the project team held a reflection meeting facilitated by the Technical Advisor for Project Design and Monitoring and Evaluation. During this meeting, the team did a "SWOT" analysis (Strengths/Weaknesses/Opportunities/Threats) to identify learning so far. The table below demonstrates the findings:

Strengths	**Weaknesses**
▪ Project builds on established relationships with the communities;	▪ Community and family internal problems could negatively affect

[52] "Baseline Survey Report Improved Health Through Clean Water." May 2008. Pg 17-18.

[53] Taken directly from the November 1st, 2008 – April 30th, 2009 "Third Semi-Annual Progress Report on Improved Health through Clean Water Project Hajja Governorate, Yemen." Pg. 8-10.

▪ The project is designed well and follows a clear logic; ▪ The project's objective and its linked indicators are clear and realistic: Reduce cases of diarrhea among children under the age of five through the provision of clean water; ▪ The specific targeting of children draws in the commitment and motivation of community members in the target villages; ▪ Through the focused approach of the project there is a clear opportunity for change to happen.	the formation and operation of the envisaged Water Management Units; ▪ New activities were identified as necessary and there is no budget for them.
Opportunities for change ▪ Change the awareness of the target group on hygiene and health issues related to water; ▪ Women can get the chance to have an important role in village water management; ▪ Through this project some women will have the chance to become leaders and to develop their leadership skills – potentially beyond the borders of their villages; ▪ Administration of the women's associations can improve; ▪ Women will save time formerly spent on fetching water and will have more free time to invest in other activities.	**Threats to the success of the project** ▪ Conflicts within families and between families could lead to a breakdown of village solidarity and cooperation willingness in regards to the project; ▪ Men are controlling women's "affairs" (women's association elections, water management) and make decisions for them; ▪ Illiterate women might feel left out.

The findings of the SWOT analysis, particularly those classified as "threats", were discussed and addressed as much as possible in the formation of the newly-adapted work plan.

In the second six-month reporting period, another SWOT analysis meeting was held with the project team and the CARE Yemen Program Director to review the work in the four villages. This meeting's purpose was to achieve effective working relationships with rural communities, especially with women. Included in the findings was the need for more time at the beginning of each project period to allow the project team to study the social contexts within communities. Given more time, the team would be in a better position to resolve problems that arise, leading to more stable communities and better implementation of project activities. In the fourth quarter a final SWOT analysis will be conducted parallel with the final evaluation of the project.

Strengths ▪ Project designed in stages; ▪ Limited (focused) interventions; ▪ Limited (focused) number of communities; ▪ CARE's good relationship with all project stakeholders in Hajja.	**Weaknesses** ▪ Internal problems in community and family could negatively affect the formation and operation of Water Management Units; ▪ Project is of limited duration.

Opportunities for change	Threats to the success of the project
▪ Acceptance by community of project team; ▪ Literacy activities in villages where there are literacy classes (women's associations activity not directly under this project); ▪ Community leaders' capacity will improve, particularly in problem solving.	▪ Conflicts within families and between families could lead to a breakdown of village solidarity and motivation to cooperate; ▪ The new parliamentary election might delay field activities for the four months of election-related activities.

The findings of the second SWOT analysis were addressed in different ways. First, more community awareness activities led to a closer working relationship with the local authority to ensure follow-up and sustainability. Secondly, more involvement of men in training allows men to understand and aid in the women's movement. Thirdly, a recommendation for future CARE projects is to consider incorporating a community preparation period of at least one year prior to project intervention to allow them time to develop and prepare for project implementation.

Annex 5: Project Training Outputs

Training Topics	Bani Buram				Al-Otum				Al-Sharqi				Beit Abu 'Orej			
	Male	Female	Total	Days	Male	Female	Total	Days	Male	Female	Total	Days	Male	Female	Total	Days
H²0 Testing	23	46	69	1	12	31	43	1	20	60	80	1	20	32	52	1
Gender Equity Training	20	16	36	1	12	26	38	1	29	30	59	1	26	22	48	1
Association Organization Training	20	18	38	2	15	35	50	2	25	40	65	2	40	41	81	2
Water Filter Training	9	45	54	1	24	20	44	1	30	20	50	1	27	24	51	1
NGO Law Training	0	13	13	1	0	15	15	1	0	18	18	1	0	0	0	0
NGO Board Training	0	16	16	1	0	12	12	1	0	22	22	1	0	0	0	0
Exchange Visits	5	5	10	2	4	5	9	2	6	4	10	2	0	0	0	0
WA H²0 Management Unit Training	2	4	6	2	2	4	6	2	2	4	6	3	0	0	0	0
	7	**163**	**242**	**11**	**69**	**148**	**217**	**11**	**112**	**198**	**310**	**11**	**113**	**119**	**232**	**5**

Total Male: **373**
Total Female: **621**
Total Participants: **1001**
% Female **63%**
Total Days: **38**
Total Training Days: **38,038**

Annex 6: Case Statement for Nationwide Silver Filter Distribution

Compelling Need

In 2007-2008, the Republic of Yemen ranked 153rd in the United Nation's Human Development Index (out of 177 countries). Only 31.5% of citizens throughout Yemen have access to safe drinking water. Although infant and child mortality rates have decreased in recent years they remain high among infants (55 deaths per 1,000 live births) and among children under the age of five (73 deaths out of 1,000) with 42% of children under the age of five being underweight.[54] According to the World Health Organization, 16% of deaths in Yemeni children under the age of five are caused by diarrheal diseases. Additionally, diarrhea is the number two cause of death of Yemenis of all ages, causing 11% of deaths.[55] Such statistics are not surprising given the highly rural population, limited health service coverage and so few citizens having access to potable water. In fact, the percentage of the rural population that has access to water from improved sources is actually declining from 68% of the population in 1990 to 65% in 2004.[56]

In 2000, the United Nations Millennium Development Goals (MDG) were agreed upon by all Member States. Since that time, MDGs have become a universal framework for development that host countries and donors often cooperate on in pursuit of common goals. The MDGs relevant here are goal number four "Reduce by two thirds the mortality rate among children under five" and number seven, "Reduce by half the proportion of people without sustainable access to safe drinking water."[57] According to the last MDG report on Yemen in 2003, it was noted that by 2015 it was "Possible" that the country may meet the target related to reducing mortality among under five year olds, but "Unlikely" that they'll reach the target of 67.4% of the population having access to potable water.

Colloidal Silver Impregnated Ceramic Water Filters in Yemen

Colloidal Silver Impregnated Ceramic Water Filters (henceforth referred to as Silver Filters the trade name for the product in Yemen). This technology has been highly effective internationally in reducing water borne bacteria.[58] In 2007, silver filters were introduced in Yemen by Potters for Peace and Potters Without Borders, subsequently GTZ supported an initiative for local manufacturing and now they being produced and distributed by a local private business The Silver Filter Company Ltd.[59] The impact of Silver Filters in Yemen has been impressive with 100% removal of total and fecal coliforms from filtered water in various locations.[60] One study found a sharp decrease of diarrhea episodes among children "from 63.9% before using of filter to 14.4% after 1 month of using it…25% of adults were suffering from diarrhea before using of filter which sharply decreased to 0.0% after 1 month of using the filter."[61]

---

[54] UNICEF, 2007 at: www.unicef.org.
[55] www.who.int/whosis/mort/profiles/mort_emro_yem_yemen.pdf.
[56] www.who.int/water_sanitation_health/monitoring/jmpfinal.pdf.
[57] "Evaluating the Health and Socioeconomic Impacts of Colloidal Silver Impregnated Ceramic Filters in 4 Villages in Amran Governorate (Final Report)." Dr. Khaled A. Al-Moyed and Dr. Belkis A. Zabara Sana'a University. Water and Environment Center. August 2008. Pg 3.
[58] Silver filters were first introduced by Potters for Peace, a US-based NGO, in several countries after Hurricane Mitch devastated Central America in October 1998.
[59] www.silverfilter.org.
[60] "Evaluating the Health and Socioeconomic Impacts of Colloidal Silver Impregnated Ceramic Filters in 4 Villages in Amran Governorate (Final Report)." Dr. Khaled A. Al-Moyed and Dr. Belkis A. Zabara Sana'a University. Water & Environment Center. August 2008. Pg 3.
[61] Ibid. Pg 13.

A further example from Yemen demonstrating impressive results using silver filters was CARE International's Improved Health Through Clean Water Project (2007-2009) which worked in four villages in Hajja governorate[62] and was funded by the Warren G. Buffett Foundation. This project documented an 84% reduction in diarrhea in children under the age of five at the household level, a 66% reduction at the village level and a 90% reduction in the average bacteria count in the project areas.[63] These dramatic results can primarily be attributed to the use of the Silver Filters, as the only H_2O purifying technology utilized in the project.

In this CARE project the cost effectiveness of the US$22.69 per household (or US$4.27 per beneficiary) for silver cordial filter was undeniable.[64] The project also invested a further approximately US$5 per beneficiary in accompanying training on a variety of topics and US$1 per beneficiary in awareness-raising activities. It is important to note that households contributed 400YR towards the cost of each filter, thus improving ownership and demonstrating the value that families placed on them. It is important to note that while 400YR (equivalent of approximately $2) seems very affordable, in relation to income it is not insignificant. Seven million Yemenis live on less than the official poverty rate of $2/day and GNP per capita is $2,400 (estimated 2008, 176th out of 229 nations).

Currently, the Silver Filter Company Ltd. in Yemen has the capability to produce 20,000 filters annually, but has only two retail locations in Sana'a and Amran (Silver Filters are usually distributed through development projects). The Yemeni potter from Raymah who leads the production is on contract with the Silver Filter Company Ltd, to produce the filters with the company providing supervision for quality control. This arrangement ensures that the local potters are benefiting in the greatest possible fashion. The lack of retail outlets means that this inexpensive and highly effective water purifying technology is unavailable to the average Yemeni.

Guaranteeing Access to Clean Drinking Water

Providing filters for the 2,755,833 households in Yemen (2004 Census) would result in a dramatic reduction in diarrhea and thus improve health of Yemenis. Costs associated with a national distribution of silver filters would have a remarkable impact on the lives of rural Yemenis. Not only would families see improvement in health, thus reducing mortality rates among infants and children, but such an investment would also have a financial benefit. Treating diarrhea is expensive and a cost that most rural households in Yemen can ill afford. In the 2008 Amran study on Silver Filters[65] it was found that in the three months prior to their introduction 35.6% of families had spent more than 5,000 YR treating diarrhea. In the final month of the study, after six months of using the filters no households recorded expenses over 5,000 YR for treating diarrhea.

According to costs for the CARE water project in Hajja, per capita investments for Silver Filters, training and awareness would be modest. While the manufacturing and distribution network for the silver filters would need to be substantially expanded, the current local producer is interested in exploring such options. The substantial increase in production that would be necessary would also

[62] Bani Buram, Al-Otum, Beit Abu 'Orej and Al-Sharqi.

[63] 340 households received silver filters through the project for a total of 1,805 beneficiaries. For this result 11% of households that had received silver filters were tested in both a baseline and subsequent test approximately six months after receiving the filters.

[64] I suggest that CARE also calculate the cost of transportation for the project for this proposal.

[65] "Evaluating the Health and Socioeconomic Impacts of Colloidal Silver Impregnated Ceramic Filters in 4 Villages in Amran Governorate (Final Report)." Dr. Khaled A. Al-Moyed and Dr. Belkis A. Zabara Sana'a University. Water & Environment Center. August 2008.

have a significant job creation result; the current facility has a production of 20,000 and fully employs 8-10 potters and production facility and four support employees.

A distribution campaign would have to be accompanied by a public awareness campaign promoting the use of the filter that could work in partnership with Yemeni civil society organizations. Such a campaign could include broadcasting messages on TV and radio about proper use and cleaning of the filters. Such a campaign would positively contribute towards achieving Yemen's MDG targets related to reduced mortality rate for children under five (reduce by two-thirds) and improved access to safe drinking water (reduce by half those that don't have access).

Therefore, it is recommended that CARE could support a wider national distribution network, ideally selling the filters at a subsidized price. If improved health outcome through potable water is desired, this one investment could have a revolutionary impact on infant and child mortality.