COMMUNITY WATER SYSTEM GOVERNANCE IN HONDURAS

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ABSTRACT

In 2003, the Honduran national government mandated the devolution of water and sanitation services to municipalities. Due to the decentralization, community water boards (CWBs) have shouldered the burden of water treatment and distribution in rural areas, but lack both financial and technical resources to build and operate the treatment systems. My research explores an innovative approach to water system design and governance. The AguaClara-Agua Para el Pueblo (APP) program has embraced the CWB model as an opportunity to promote community governance and build social capital. The program fills the leadership and technical expertise gaps critics have identified by providing affordable plants and technical assistance to CWB members.

Nevertheless, the impacts of community resource management are complex. In addition to the benefits to participation, there are real financial, time, and social costs to participating, especially to taking leadership roles. These costs can act as barriers to participation or cause participation fatigue. This, in turn, can affect the quality and diversity of participation, degrading some of the community benefits of community resource management.

My analysis relies on a series of interviews, observations and conversations with CWB and community members and technical assistance providers in Honduras conducted in January 2012. My analysis finds the governance commitments affect men and women, young and elderly citizens, wage and agricultural workers differently. My research raises critical questions regarding the governance burden of community-based water systems. The concern is that as community governance models seek to increase inclusivity, they may overburden those the models seek to empower. I offer recommendations to alleviate some of these burdens to promote inclusive, widespread, and ongoing participation.

BIOGRAPHICAL SKETCH

Born and raised in Philadelphia, PA, Maren arrived in Ithaca by way of Bolivia and New York City. Growing up in Northwest Philly, she was surrounded by a supportive community with a strong commitment to social justice. Her upbringing inspired her to participate in solidarity work, prisoner rights, Middle East justice, and anti-war groups in New York City. Traveling to Chiapas, Mexico as a human rights observer for Zapatista communities during college, Maren began her love affair with Latin America and its radical community-movements. Upon graduating from Barnard College, Maren headed to Bolivia where she discovered creative, community driven neighborhood development in rapidly developing Altiplano. These experiences coupled with her love of cities—and walking and biking through them—ultimately led her to City and Regional Planning.

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So many people both directly and indirectly contributed to this project. Among those I'd like to recognize who directly contributed to this project are: Mildred Warner, my thesis advisor and a kindred spirit; the SMART AguaClara team (Ben Koffel, Kris Goddard and Stef Levner); Monroe Weber-Shirk and his enthusiastic team of undergrads; Mickey Adelman; Karim Beers; the staff of Agua Para el Pueblo; the community and water board members who took time to speak with me in Honduras; David Pelletier; Tina Nelson; the Department of City and Regional planning that helped fund my research trip. Additionally, those who contributed to my formation as a planner are: Marcela Gonzalez Rivas, who mentored me through my exploration of planning in Latin America; Ben Kohl, a Cornell alum and mentor to many, whose vision of a social justice driven planning profession convinced me planning was the right path for me. This project also owes a lot to my parents and brother who taught me the value of community decision making and particularly to my mom who illustrated for me the many roles we still expect women to play. Finally, I'd like to thank Ben for keeping me sane through this entire process.

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Introduction

Water treatment and delivery is most commonly run by decentralized community-based organizations (Lockwood & Smits, 2011). As central governments decentralize and devolve water services to local governments and NGOs, the community water management systems multiply (Ibid.). The expansion of community-based management puts resources in the hands of communities, but it also exposes the deficiency of skills, finances, and resources available to them.

In Honduras, the AguaClara and Agua Para el Pueblo (APP) partnership provides inexpensive technological solutions and technical assistance to community water boards (CWBs) facing the withdrawal of government support. In this report, I examine how participation in AguaClara-APP community-based water management systems—what I refer to as CWBs—both benefit and burden community members.

AguaClara is an engineering research team based at Cornell University. Founded in 2005 with the goal of addressing the need for sustainable municipal-scale water treatment in resource poor communities in Honduras, the team has researched, designed, and invented a series of technologies that produce safe drinking water without using electricity. The gravity powered AguaClara water treatment plants meet—and often surpass—World Health Organization standards for potable drinking water (AguaClara website).

Monroe Weber-Shirk, Director and Founder of AguaClara, conceived of and created AguaClara through his friendship and collaboration with Jacobo Nuñez,

Executive Director of Agua Para el Pueblo (APP)—a Honduras based non-profit organization dedicated to building water service systems. Shortly after Monroe formed AguaClara, APP became the implementing partner for the technology in Honduras.

The AguaClara-APP partnership relies on a community governance system to engage towns, garner popular and financial support, implement, maintain, and operate the AguaClara water treatment systems. The program fills the leadership and technical expertise gaps critics have identified by providing open source technology, affordable plants and technical assistance to CWB members.

The technical assistance comes in the form of meetings, trainings, and community organizing. In addition to participating in APP run events, CWB members run their own meetings, attend community assemblies, and participate in community organizing activities to ensure community support for the water system. Community members attend these events, vote and deliberate in assemblies, and pay water usage fees.

This paper explores the benefits and challenges of CWBs. Based on interviews with community members, CWB members, AguaClara-APP employees it assesses participation in the AguaClara-APP program for building capacity through the governance of the water system. It strives to provide a useful analysis that will contribute to the social justice goals of supporting equitable and inclusive participation and leadership. I build on previous research on the AguaClara-APP model compiled by Karim Beers (2012). The paper accepts the conclusions Beers reached, namely that the model has particularly strong social and physical

infrastructure components. It also accepts that the community-based resource governance model is a desirable model of governing water.[1]

This report focuses on the benefits and costs of participating in the AguaClara-APP program accrued to community members, particularly to those assuming leadership positions. The first section details how and why the research developed. The second section examines literature on water system governance, building social and human capital, participation, and specifically issues of gender in participation. In the third section I examine the Honduran context in which CWBs have developed and the relationship between AguaClara and APP. This section also analyzes how the AguaClara-APP program provides benefits to the CWB members and the costs of assuming these leadership positions. I conclude that the model promotes community participation and follows many of the best practices highlighted in community water governance literature. In the final section I offer recommendations to strengthen participation and inclusivity, concentrating on mitigating barriers to participation.

[1] Beers report gives an in depth discussion of the AguaClara model in relation to the six capitals: physical, social, human, financial, political and natural capitals. It provides an analysis of local, organizational and national requirements for creating a successful water system.

Methodology

My report examines how participation in the AguaClara-Agua Para el Pueblo community water management system builds capacity and whether this participation also burdens the community. My analysis relies on a series of interviews, observations and conversations from a trip to Honduras in January 2012.

In January 2012, I traveled to Honduras as a participant in the Student Multidisciplinary Applied Research Team (SMART) program through the Cornell International Institute for Food, Agriculture and Development (CIIFAD). The program seeks to provide students with consulting experience in developing countries while simultaneously assisting organizations with inexpensive consulting solutions for issues they have identified.

AguaClara, a Cornell based engineering research and design team, was our client during the SMART program. According to our terms of reference, our four person student team agreed to "work with AguaClara to create a sustainable strategy for public relations to support AguaClara's growth and provide access to more funding resources." AguaClara essentially contracted us to create a marketing plan and develop marketing materials for the web and for print, in the form of videos, written profiles, and brochures. In the process of collecting these marketing materials, we discovered the strong community governance component of the AguaClara-APP model.

My teammates and I spent approximately two weeks in Honduras performing interviews, attending meetings and touring water treatment plants in Honduras. We traveled with the director and founder of AguaClara, Monroe Weber-Shirk, and 22 undergraduate Cornell University Engineering students who contribute to the AguaClara research and design. Additionally, employees of APP accompanied us on our trip.

Between January 7 and January 20, 2012, I toured five AguaClara plant operations in Honduras and interviewed more than 25 staff, water board, and community members. My paper relies on qualitative data from these video and tape-recorded interviews. Preceding each interview we asked interviewees for their consent for participating in the interview and their permission to video or audio record the interview as well as to reproduce their images and words on the AguaClara Website and in marketing materials. Their replies are recorded at the outset of each interview recording. All audio and visual materials are housed in the AguaClara archives.

Additionally, I draw on field notes from informal conversations with residents, students and APP staff, as well as from meetings with health professionals, and AguaClara-APP promotional meetings. Tours of non-AguaClara plants in Honduras were also invaluable, serving as a contrast to the AguaClara-APP model.

Although I depend on many sources, my key collaborators and informants are Monroe Weber-Shirk, Director and Founder of AguaClara; Jacobo Nuñez, Executive Director of APP; Arturo Diaz, Assistant Director of APP; Antonio Elvir

Rodriguez, APP technical assistance circuit rider; Antonio Andara Lira, Vice-president of the CWB for Alauca and President of the CWB for Jicaro; Juan Ramos Ramirez, President of the CWB for Tamara; Jorge Manuel Lozano, President of the CWB for Cuatro Comunidades; Pedro Antonio Gomez, Secretary of the CWB for Cuatro Comunidades.

Table 1: AguaClara-Agua Para El Pueblo Participant Communities in Honduras

Community	Year Built	Interviewed Board	Visited Plant
"La 34"	2004	No	No
Ojojona	2006-7	No	No
Támara	2008	Yes	Yes
Marcala	2008	No	Yes
Cuatro Comunidades	2009	Yes	Yes
Agalteca	2010	No	No
Alauca	2011	Yes	Yes
Atima	Under construction (2012)	Yes	Visited plant site

Table 1 illustrates the plants I visited and the CWBs I interviewed during my trip to Honduras.

The high quality of my access while in Honduras, both the sheer quantity of interviews I performed as well as the openness of the interviewees, is a byproduct of the strength of the AguaClara-APP model and the leadership of the organizations. People's willingness to donate their time reflects the history of Monroe and Jacobo and their engagement practices. Both directors have cultivated relationships with individuals and communities in Honduras over the span of several decades.

Monroe Weber-Shirk and Jacobo Nuñez met in Honduras in 1982. Monroe spent a year volunteering with the Mennonite Central Committee (MCC) in refugee camps in Honduras for Salvadorans escaping the civil war in El Salvador between 1982 and 1983 (CEE website). Jacobo was responsible for installing all of the water service systems for the El Salvadoran refugee camps at that time and developed a friendship with Monroe and his brother (Interview with Jacobo Nuñez, 1/13/2012). Monroe's experience working for the MCC in Honduras exposed him to the dangers of poor water and sanitation conditions in developing countries. The trip also convinced him of the dearth of appropriate water supply and sanitation technologies.

In 1985, inspired by the abysmal water and sanitation conditions in Honduras, Jacobo joined a group of professionals to establish Agua Para el Pueblo (APP), a non-profit dedicated to improving water systems. They sought to "to help alleviate the necessities of the poorest communities in Honduras in order to improve their potable water and basic treatment systems." (APP website)

Since its inception, APP has dedicated itself to social justice and equality, focusing on marginalized communities in rural and peri-urban areas. APP constructs potable water and sewage systems, digs wells, and implements various conservation programs. APP has and continues to provide technical assistance for the construction, management, and maintenance of water treatment systems. In addition to physical infrastructure improvements, APP now specializes in training CWBs, the organizations responsible for managing the water systems in most rural and peri-urban areas in Honduras.

In 2004, more than a decade after returning from his second MCC volunteer stint in Honduras, a fellow Cornell professor prompted Monroe to return his energies to water treatment in Honduras and renew his connections. Monroe suggested Honduras to the professor who wanted to work on water supply in Latin America. He and the group at Cornell collaborated with Agua Para el Pueblo on a project creating software using Global Positioning Systems (GPS) to collect information pertinent to water supply systems.

The group did not successfully write a software package, but Monroe and Jacobo forged a long-term partnership through the project. During their initial collaboration, Jacobo asked Monroe how APP could improve the quality of drinking water it supplied to the small towns it served (Interview with Monroe Weber-Shirk, 2/1/2012). Determined to find a solution to Jacobo's dilemma, Monroe attacked the problem through a new class at Cornell, Sustainable Small Scale Water Supply.

Monroe, AguaClara student researchers, and APP staff engage in an iterative process to constantly update and improve water treatment technologies. The process requires continuous communication from the field. APP staff regularly visit the plants and discuss issues with residents and CWB members. AguaClara student researchers have the opportunity to travel to Honduras annually to tour the plants and to receive additional feedback. Since forming the partnership several AguaClara Cornell graduates have become Fulbright Scholars working with APP in Honduras. In the words of many of the students, staff, and community members, the iterative process increased trust, transparency, and understanding.

Driven by their desire to provide clean, safe drinking water to impoverished towns with little access to financial resources, Monroe and Jacobo have developed a program where participants tend to feel valued. The community governance model emerged from the emphasis both men and their organizations place on social justice and equity. The model requires both directors and staff to visit and speak with community members. They have built relationships and trust with the communities for years. Monroe and then, by extension, Jacobo offered me an irreplaceable entre into the communities, one I most likely would not have been afforded had I gone on my own.

The emphasis on iterative research and decision-making encourages participants to air both concerns with and strengths of the program. Staff members and CWB members appeared to speak candidly about their experiences. They generously donated time for interviews, sometimes spending an entire day to answer questions and tour the plant. Dedicating this time had potentially high opportunity costs for many of my informants, an issue I will return to when I discuss the costs of time in my analysis. The CWB members also introduced us to other residents, vouching for strangers based on the strength of the board members' relationships with AguaClara and APP.

In this paper, I hope to honor the collaborative manner in which Monroe, Jacobo, and the water boards engaged with me. I adopt a relational approach to my reporting which seeks "to confirm, support or even celebrate people who are defined as 'friends'" (Miles & Huberman, 1994). In instances where there is no harm or risk to my collaborators, I choose to use their names when they describe

events, opinions, and processes. While mitigating risks, this promotes the concept of respect in qualitative research: protecting the autonomy of people as individuals (Miles & Huberman, 1994). Naming individuals situates them as equal participants in the research process, rather than faceless informants.

The embeddedness of my research experience is one of the greatest strengths of my research. However, this model has its own limitations. First, we were traveling with AguaClara and APP representatives, which, although they were not present during interviews, may have constrained interviewees' speech. Secondly, our initial interview purpose—to gather information for marketing materials and evaluate the potential for scaling up—meant that interviews could be made public which may have led to self-editing. The original purpose of the interviews may also have biased how interviewees portrayed the organizations. Furthermore, although we did seek out residents who had opposed AguaClara-APP projects, as well as those who supported them, our interview sample was limited by the contacts available to us.

My own positionality biases my impression of organizations and people as well as my interpretation of interviews and events in ways that I am not aware of. Traveling to rural Honduras as an urban, white, American, student researcher not only were my perceptions unique, but arguably the manner in which interviewees both perceived and reacted to me influenced how they answered questions.

As a graduate student of City and Regional Planning, I approached the AguaClara engineering program with suspicion. I was wary of engineering development projects that seek to solve issues without considering social concerns

and community practices. During the trip, as the project unfolded before me I learned about the community organizing efforts of partner organization APP and the iterative process between the communities, APP, and AguaClara. I began to appreciate the both the understanding of, respect for, and sensitivity to the communities that AguaClara-APP practiced. I also appreciated the benefits of the projects expressed by community members. However, speaking with board members, I once again developed concerns about the project, albeit different ones. There were real financial, time, and social costs to this program. My report is borne out of these often conflicting costs and benefits.

In the following sections through my literature review and analysis, I address the questions what makes a strong community water system, and what are the necessary components to maintain one; what are the individual costs and benefits associated with this system and who accrues them; should the program make an effort to include more participants in the governance processes, particularly women; how can the program make participation conditions more conducive to active participation.

Literature Review

More than 1.2 billion people lack access to safe drinking water worldwide (Spronk, 2010: 156). Rural areas suffer from a dearth of clean water at higher rates than urban areas; 84 percent of people without improved drinking sources live in rural areas (Smits and Lockwood: 2011) Even when communities have water systems, they are often poorly functioning (Spronk, 2010). Despite billions of dollars invested in rural supply systems, at any given time thirty- to forty-percent of water systems are not operating (Lockwood and Smits, 2011). Governments and nongovernmental organizations alike have searched for ways to improve service delivery and cut costs.

Over the last several decades, these organizations have also responded to a demand for more public participation in decision-making across a wide range of development activities (Cornwall, 2008). Public institutions have also sought local citizen participation in their development and infrastructure programs to improve operation (Cernea, 1992). This shift towards participation has coincided with an increasing shift in responsibility from centralized national agencies to decentralized organizations and local governments. Governments have devolved service provision under pressure from international financial institutions, dwindling budgets and the assumption that decentralized governance is more efficient, equitable, and democratic than large central governments (Kohl, 2003).

As national governments dismantle centralized agencies and service providers, a variety of institutions have stepped forward to offer an array of

service provision models. Private entities, NGOs, local governments, and community governance entities have provided services ranging from natural resource management to waste removal to budgeting. Despite the move from central governments to the hands of mainly local actors, participation in these services has been mixed (Cornwall, 2008).

Throughout the decentralization process, commercialization of public services has been pervasive and influential, driven by a fiscal crisis of the state and capital demands imposed on it (McDonald & Ruiters, 2007). States sell off their assets, such as water, to private entities or adopt market principles such as cost recovery into their service delivery models (2007). Communities and activists often react strongly to the privatization of water when the state sells rights to multi-national corporations, however they have not reacted as vehemently to other forms of privatization. McDonald and Ruiters argue that there is a continuum of privatization scenarios, from one-person contractors to NGOs to multi-national corporations providing or controlling all or some of the water system process (2007). The CWB model falls on this continuum.

The state relinquishes its responsibility and control through decentralization of water management to NGOs or communities with varying degrees of support from the local government. The devolution of service responsibilities to NGOs or communities appears harder to classify as a form of privatization than the transfer of power to profit-driven companies; these communities and NGOs may not have the same economic or institutional motivations, it is, nonetheless, a shift in responsibility from public (the state) to

private (individual or community) (McDonald & Ruiters, 2007: 10). Community/NGO provision is often ignored as a form of privatization although it is particularly common in low-income settlements in Global South (Ibid).

Critics argue that decentralization has not been a panacea for the shortcomings of government (Anderson, 2000). Although co-management and participation often accompany decentralization (Ibid.), there are still issues of corruption, mismanagement and inequality. Many local actors are stymied by their lack of technical expertise and capacity to effectively manage their new responsibilities. While some community-based programs have flourished, others have floundered or failed. Additionally, women usually carry the burden of this type of privatization, the community/NGO provision (McDonald & Ruiters, 2007).

Community Water Governance

Literature on community managed water systems normally focuses on what causes them to fail and how these factors can be mitigated by proper program planning and support. Many communities do not have the funding, training, and support, and this results in breakdowns, unreliable service, and low quality water (Lockwood & Smits, 2011).

Carter et al. (1999) define sustainable and thus successful community water systems as those that continue to deliver the same (or better quality) benefits to society over time. Three recurrent roots of failure for community managed water systems are lack of financial, social, and technological support. Inequitable distribution of water and of power is the fourth root of community water governance failure (Cleaver & Toner, 2006).

For many years, scholars and officials focused on expanding access to water system technology (Lockwood & Smits, 2011). Small, poor communities have difficulty raising large initial capital investments to build the water system (Lockwood & Smits, 2011; Bakker, 2008; Spronk, 2010). Nevertheless, there is often funding available from international NGOs and national governments to build the water treatment physical infrastructure (Lockwood & Smits, 2011). In the 1990s, there were many initiatives to install physical infrastructure in the form of water treatment systems that could produce high quality water (Ibid). However, NGOs and governments did not always install place or context appropriate physical infrastructure, leading to dis- or misuse. In turn, the reduced quality leads to less interest and investment in the system.

Failure of community water treatment systems can often be traced to its founding, however even those community water systems that start out strong are in danger of failing. Lack of funding commonly leads to breakdowns in community managed water systems (Bakker, 2008). Communities frequently face financial problems after they construct their plant, because they do not plan for lifecycle costs. Community management bodies undercharge for water service (Spronk, 2010) and are unable to cover maintenance and repair costs (Lockwood & Smits, 2011). Disrepair and mismanagement lead to lower water quality or discontinuance of the project (Spronk, 2010).

Communities do not believe and are never convinced of the value of the plant (Carter et al., 1999). Educational efforts, however, stop long before attitudinal and behavioral shifts occur, and interest in the project wanes (Ibid.).

The community does not feel pride in or ownership over their water system, and therefore does not invest in maintenance, which can lead to quality deterioration (Ibid.).

Even when there is continued enthusiasm, community members may not have the technical capabilities or the time necessary to effectively govern their water system. Private citizens assume volunteer positions that whole departments manage in cities. If they struggle to fulfill their responsibilities, outsiders often attribute difficulties to an absence of competency, rather than task overload (Flora, 2004). Lack of technical support and community resources can lead to system failure.

Scholars have begun to address these pitfalls, focusing on the long-term functioning of the water system, after the initial implementation (Lockwood & Smits, 2011; Bakker 2008; Flora, 2004). Lockwood and Smits advocate for a service delivery model predicated on both "hardware" and "software" elements that provide for physical infrastructure as well technical capacity and social support (2011). They define nine building blocks for water system success:

1. Professionalization of community management
2. Increased recognition of alternative service providers
3. Sustainability indicators and benchmarks
4. Post construction support
5. Capacity support
6. Learning and sharing experience
7. Planning for asset management
8. Financial planning for life-cycle costs
9. Regulation of services and service providers

The majority of the building blocks relate directly or indirectly to technical service provision and social capital construction. Partner organizations help community managers professionalize by developing regularized documentation, service delivery, and fee collection. Organizations and government entities provide or develop benchmarks to measure change and success. Both post construction and capacity support require the direct assistance of an outside agency or organization, while they may just assist in the creation of financial plans and asset management.

Flora (2004) discusses the six capitals for community managed water system success: natural, cultural, human, social, political, and financial/built. Flora (2004) outlines the elements of participation that communities and their partners should consider to design a water system, focusing on the human and social aspects. These include embracing diverse perspectives, creating a collective vision, monitoring, sustaining systematic learning, and designing for a specific context. Training impartial agents, such as CWBs, who make decisions about the water system, fees, repairs, and expansion, is particularly important (Ibid.). Although these tasks may appear purely technical, they are often the most contested aspects of community water governance (Flora, 2004; Cleaver & Toner, 2006).

Professionalizing community management by creating rules, supports, regular processes, and enforcement mechanisms eases tension. Community managed water systems, because they are no longer run by the government, are often no longer cross subsidized by other services or taxes (McDonald & Ruiters, 2007). Privatization of services means communities are collectively responsible for

financing the water system, but if community members cannot pay then they will not pay, hurting the entire community. Carter et al. list regular fee collection as a best practice (1999). Cleaver and Toner found that the most successful communities in Tanzania developed payment schemes to provide for the whole community (2006). CWBs employed a variety of strategies such as giving a free allocation of water to the poorest, charging a monthly fee at public taps rather than paying per bucket, and reducing the price per bucket.

Water managers and governments have explored various tariff structures. Often these governing bodies utilize sliding scale fees designed to limit water usage for sustainability purposes (Ward & Pulido Vazquez, 2007; González-Gómez et al., 2012) or to recover costs of investment and operations (Foster & Yepes, 2006; Ying et al., 2010). Increasing prices on usage marginally decreases usage, leading to water conservation (Ward & Pulido Vazquez, 2007; Arbués & Barberán, 2004). However, water managers have addressed cost and equity concerns through diverse tariff structures as well (Foster & Yepes, 2006; Ying et al., 2010).

Privatized water systems often sacrifice affordability and equity in favor of cost recovery and conservation, making water unaffordable for the lowest income population (Spronk 2010). Tariffs that cover cost recovery needs represent a significant affordability issue for over 50 percent of the population in Latin America's lowest income countries (Bolivia, Honduras, Nicaragua, Paraguay), while the burden rests on the lowest income quintile in all countries (Foster & Yepes, 2006). States and organizations have begun employing new tariff structures in hope of addressing these equity issues. The most commonly used structures are

fixed fees and water use charges while flat fees are rarely used (Ying et al., 2010). Fixed fee structures base charges on pipe size; location, number of rooms, etc. whereas water usage fees are a volumetric use tariff. Within water use tariff structures are block tariffs where lower uses are charged at a lower rate increasing by block and linear tariffs that increase incrementally at a uniform rate (Ibid.). Unmetered systems cannot employ usage fees and more often rely on flat or fixed fee structures. System managers must decide whether they will include much larger consumers such as industrial operators.

Literature suggests that defining community is a necessary component to success (Cleaver & Toner, 2006; Bakker, 2008). Communities may define both whom the water system will serve and also who will participate in decision-making processes. Carter et al. (1999) assert that involving women in community institutions and decision-making are activities that are necessary to create local capacity to manage.

Social and Human Capital

Over the past several decades many have argued in favor of community governance and control, as an efficient and effective means for managing community needs (Ostrom, 1994; Putnam, 1993). As Pretty and Ward (2001) point out, collective action and community governance is not a new phenomenon; as long as people have managed resources, they have participated in collective action. Many community-governed institutions have disappeared in the last century, however in recent years, new and old community governance models have

emerged or reemerged. The challenge now is creating strong community governance systems.

In her seminal article *Neither Market Nor State: Governance of Common-Pool Resources in the Twenty-first Century*, Elinor Ostrom identifies eight design principles for well-managed common pool resources (Ostrom, 1994):

1. Clearly defined boundaries
2. Agreement between use rules and provision requirements and local conditions
3. Most users affected by rules can participate in changing rules
4. Monitors are beholden to users and may be users themselves
5. Sanctions are socially reinforced and violators are subject to graduated sanctions
6. Users and their officials have access to conflict resolution mechanisms
7. The government allows local group to govern, does not impose its own rules
8. Rules, monitoring, enforcement, are organized in multiple nested organizations

Development scholar Arturo Israel, declared, "it is easier to build a road than it is to build an organization to maintain that road" as quoted in Putnam (1993: 10). Ostrom agrees, identifying social and human capital as the glue maintaining physical capital. She defines physical capital as product of construction and building materials and resources. Human capital is individual knowledge and skills built through experience and training. Social capital is shared knowledge and interactions of a group (Ostrom, 1994).

Social capital is a network of ties among individuals, which are trusting, reciprocal and emotionally positive (Paxton, 2002). Ostrom's (1994) nested organizations are a form of these linked relationships at a community level. Ward and Pretty (2001) add to this definition common rules, norms and sanctions as well as connectedness in institutions. It is the renewal and maintenance of both weak ties (e.g. acquaintances) and strong ties (e.g. family). The strength of social capital should not be measured by the strength of its strong ties, but the quality of its numerous weak ties (Putnam, 1993).

Social capital does not wear out with use, but rather with disuse (Ostrom, 1994). Those that have social capital gain more social capital. Human capital functions similarly. When people contribute their knowledge, and that knowledge is further developed throughout the process of planning and implementing a development project, they are more likely to continue to contribute to the project (Pretty and Ward, 2001). Human capital investment allows for the professionalization of CWBs (Lockwood & Smits, 2011).

Warner identifies three elements to social capital construction: returns on investment, autonomy, and linkage (Warner, 1999). Warner explores Bourdieu's assertion that investment costs and returns are integral to building social capital. Simply put, if individuals or communities do not expect to garner any social, cultural, or economic returns from network building, then there is no incentive to participate (Ibid.). As community level benefits are harder to measure, the costs associated with them are often harder to justify than individual or family benefits. Especially for poorer residents, the restrictions on economic mobility, freedom of

speech or exit imposed by social capital may outweigh the perceived benefits. CWB leaders because they invest more than other community members, may find the community level benefits insufficient to justify their time. Although in certain circumstances groups may receive direct returns on investment, usually benefits are indirect, dependent on generalized reciprocity (Warner, 1999).

Investment by the community or CWBs in community social capital can bring returns in the form of autonomy and linkage; however, autonomy and linkage are also integral in constructing social capital (Ibid.). Warner defines autonomy as "the power to effectively express a position or carry out a program in the context of broader community or governmental systems" and linkage as the connections between community members and between the community and other entities (Warner, 1999: 377). Organizational and individual autonomy enables action, but too much can cause isolation from the government, other organizations or individuals (Warner, 1999).

Linkages develop at the individual level through personal or professional contact, transactions, and social interactions (Ibid.). Weak ties, those that are not characterized by family or close friendships, tend to be more important than strong ties in sustaining community cohesion and collective action (Warner, 1999; Putnam, 1993:). By developing informed and educated CWB members through human capital investment, communities invest in autonomy of their CWB, allowing for more horizontal linkages.

In his study of Italy Robert Putnam noted that overcoming collective action problems is easier in communities that have substantial existing social capital in

the form of norms of reciprocity and networks of civic engagement (Putnam, 1993: 166). Putnam explains the idea of generalized reciprocity as the understanding between community members providing favors for others, including strangers, without the immediate expectation of anything in return, but with the confidence that someone else will repay the favor in the future (Putnam, 2000). Participation in voluntary associations and reciprocity strengthen social capital and generalized reciprocity (Putnam, 1993), as does participatory management of resources (Pretty & Ward, 2001).

The principles of social capital linkage hold true at the group or organizational level as well (Woolcock and Narayan, 2000). Communities that build social capital at the individual and household levels, but remain isolated at the group level—without links to other organizations or agencies beyond their community—will not recognize the full benefits of social capital (Woolcock and Narayan, 2000). Groups with links to other organizations—or participants in nested organizations—enjoy resources such as technical assistance or funding that would otherwise not be available to them. These linkages allow the local group to avoid going it alone, because, as Woolcock and Narayan suggest, no single government, organization, or community has the capacity to foster sustainable development alone (2000).

Collaborating groups can often achieve more together than on their own (Warner, 1999) Government can play a hand in the construction of social capital and linkage between different organizations or levels of organizations (Warner, 1999; Woolcock & Narayan, 2000). The state, as the "ultimate provider of public

goods" is positioned to foster and facilitate long-term alliances (Woolcock & Narayan, 2000: 12). State support in the form of funds, networks, and/or technical assistance alleviates the burden-shift identified by Ruiters and McDonald (2007). In the case of CWBs, this linkage increases the likelihood of survival and success (Smits & Lockwood, 2011).

Participation

Participation in community governance creates horizontal networks, links between people working on a common problem. When defining participation, many models function on a normative continuum moving from bad (less participation) to good (more participation)(Cornwall, 2008). One of the most famous is Sheryl Arnstein's (1969) ladder of participation, which starts with 'Manipulation' and moves up eight rungs to end in the desirable 'Citizen Control'. Crocker (2007) defines seven levels of participation in development policy. His scale ranges from nominal participation to deliberative participation. Jules Pretty (1995) identifies seven steps of participation, ranging from manipulative to self-mobilization.

Cornwall (2008), however, suggests participation does not operate on a continuum from bad to good participation. Participation is more complex and should be viewed in its context. Information flow, what Pretty (1995) refers to as passive participation and Arnstein (1969) as informing, may be a lesser form of participation in certain circumstances, it may open up a huge door in others (Cornwall, 2008). In water management information flow is critical. Arnstein (1969) and Pretty (1995) assume participation in a paternalistic organization or

structure, but in the decentralized CWB structure CWB participation is not controlled, but rather left to its own devices. Cornwall's (2008) continuum of participation is helpful for understanding participation decisions in this context.

Participation can be deep or shallow (i.e., involve community decision making at each step or rarely) and narrow or wide (i.e., involve only a few community members as decision makers or many community members as decision makers) (Cornwall, 2008). None of the combinations of participation types is optimal at all times; each combination has a time when it is most appropriate.

Deep, wide participation may not always be desirable. The leadership of the CWB may have deep, narrow participation while the majority of community members engage in shallow, wide participation. Narrow, deep participation is not necessarily exclusive. Inclusion and exclusion are contextual; a small elite group constituted by outsiders is different than a small elite group elected to speak for the community, as in the case of the CWBs (Cornwall, 2008).

Participatory processes can further entrench exclusion of certain groups if particular effort is not made to include these groups (Greenwood & Levin, 2007). In participatory processes, it is important to identify, acknowledge and potentially rectify salient absences (Ibid.). However, Cornwall suggests that when evaluating participation we consider whether the participant category groups (e.g. women, the poor, youth) are culturally relevant and representative. Participants and non-participants may not identify with the group they are assumed to represent (Ibid.). Sometimes aggregating a class of people misses the nuances and differences of

their other identities (e.g. categorizing someone as a representative woman may obscure her class, racial or age identities) (Ibid.).

Once the relevant participant categories are established, people's motivations for not participating in leadership positions should be considered. Some would be participants self-exclude because they are unable to take part because of timing, duration, or transportation. Others may lack confidence because they are accustomed to being marginalized (Cornwall, 2008). In these cases the community can look for ways to enable participation: change meeting times, provide transportation, assign outreach coordinators (Greenwood & Levin, 2007).

Participatory initiatives are premised on the idea that everyone would want to participate to the fullest extent if they could. The active choice to not participate, especially in leadership capacities such as the CWBs, is usually not recognized; for some, opportunity costs do not outweigh benefits (Cornwall, 2008). Participation fatigue accounts for more and more self-exclusion, which may be a practical choice (Ibid.).

Self-governance is a very demanding and time-consuming practice, as it becomes more decentralized, it becomes more time consuming (Walzer, 1977). Leadership positions require a willingness to attend lots of meetings and put personal needs aside. There are many who do not want to dedicate themselves to the meetings governance entails. Oscar Wilde famously wrote about socialism, although the sentiment easily extends to other forms of government, "it would take too many evenings" (Walzer, 1977: 129). Nevertheless, there are others who relish the opportunity and sense of duty to assume leadership. A 'small and interested

few' can manage power, but a larger assembly should check their power and decisions (Walzer, 1977).

Cornwall's (2008) varying roles of participation speaks to the roles of the 'small and interested few' vs. the roles of the larger community. While precaution should be taken to enable those who would like to participate, specific participatory roles should not be forced on those who don't. As the resurgence of participatory process has expanded the number of seats at the table, it has also increased the costs for those that fill them (Cornwall, 2008). The challenge for community governance initiative is to enable people to take seats while giving support needed (Ibid.).

Gender and Participation

As governments and non-governmental organizations continue to expand community participation programs, many look to strengthen participation and increase inclusivity (Cornwall, 2008). Women have been a frequent target population for inclusion. Organizations such as the International Labor Organization (ILO), the United Nations (UN), the World Bank and myriad other development organizations have added gender equality to their goals. In order to accomplish gender equality, organizations have developed quotas, created nested women's programs and adopted gender-mainstreaming policies. Gender mainstreaming differs from the other two strategies because is not woman specific.

The most frequently cited definition of gender-mainstreaming is from the United Nations Economic and Social Council:

> The process of assessing the implications for women and men of any planned action, including legislation, policies or programmes, in all areas and at all levels. It is a strategy for making women's as well as men's concerns and experiences an integral dimension of the design, implementation, monitoring and evaluation of policies and programmes in all political, economic and societal spheres so that women and men benefit equally and inequality is not perpetuated. The ultimate goal is to achieve gender equality. (Tiessen, 2007: 12; UNECOSOC, 2002: 1)

Gender is not women or men alone, but refers to both as well as the relationship between them (UN, 2001: 1). Promotion of gender equality through gender mainstreaming does not imply the same policies for all; rather it engages both men and women stressing the issues that affect both together and separately. Gender mainstreaming makes gender equality "central to all activities" (Tiessen, 2007; 2).

As Tiessen (2007) explains, gender mainstreaming may target women for equal participation, or it may just address program and policies that reinforce gender roles or exclude women. These policies and practices occur in both the field and in organization headquarters. Efforts to overhaul gender equality should not just be directed to the field, but to the offices of development workers as well (Ibid.)

Too often, organizations commit to "quick fixes" which focus on numbers such as increasing the number of female employees, recruiting women to management positions, and increasing gender-sensitive programs (Ibid.). These quota systems and numbers games often shy away from complex gender issues, taking a superficial stab at gender inequality. The discussion on how and why people do or do not participate (Arnstein, 1969; Cornwall, 2008; Walzer, 1977) is apropos when considering gender mainstreaming programs.

Women generally work longer hours than men regardless of whether they live in a developing or developed country (UNICEF, 2007). When women and men both work in a household, women tend to do more domestic work (Valenzuela and Martinez, 2009), in some cases working the equivalent of a second fulltime job (Ferranti, 2004). Girls tended to contribute more to household tasks helping their mothers than boys do (Ibid.). Hochschild & Machung (1989) refer to the second burden women carry of household chores as the "second-shift". Their responsibilities leave women with less time for leisure. Inclusion and gender mainstreaming initiatives are more effective when they incorporate these distinct considerations rather than employing quick fixes.

In this section, I have highlighted the theoretical challenges and limits of community management. I demonstrated the importance of social and human capital development. Although participation is necessary for building social and human capital, I showed the nuances of participation, differentiating participatory roles. Finally I turned to gender participation, relating the general concepts of participation to gender equality and the limitations of a narrow approach to expanding women's participation. Next I turn to the AguaClara-APP program itself. I employ concepts from the aforementioned literature to analyze the program and offer recommendations.

Analysis

In this section, I lay out the benefits that board and community members gain by participating in the AguaClara-APP program, and the costs participants, particularly the CWB leadership, pays to participate. I begin by contextualizing the conditions in which AguaClara-APP and the CWBs operate. I describe the general and specific benefits CWB and community members enjoy through participating in the program. I trace the specific costs of participation through three phases of the program: pre-construction, construction, and post-construction. Each phase requires actions by the CWB and the community, which present unique community governance opportunities and challenges.

The Honduran Context

According to the United Nations definition of improved water supply — household connections, public standpipes, boreholes, protected dug wells, protected springs, or rainwater collection—87 percent of Hondurans enjoy access to improved water supplies (UNDP, 2003). Despite what this statistic suggests, the majority of Hondurans do not have access to water that meets World Health Organization standards; many improved supplies are untreated or contaminated water (ibid.). Only 51 percent of urban water systems in Honduras are disinfected. Conditions are even worse in rural areas.

Over the past decade, the national government of Honduras has dismantled its water company, the National Autonomous Water and Sewerage Service (Servicio Autonomo Nacional de Acuaductos y Alcantarillados – SANAA). The

Congress of Honduras passed the Framework Law for Drinking Water and Sanitation Sectors (*La Ley Macro del Sector Agua Portable y Saneamiento*) in 2003. The law mandates the transfer of water and sanitation provision from SANAA to the municipalities by 2008 (Sano, 2009). Due to the devolution of services, *Juntas Administrativas de Agua y Saneamiento,* or CWBs as I refer to them, shoulder the burden of water treatment, disinfection, and distribution in many areas rural and peri-urban areas.

CWBs have existed in most Honduran communities since the 1950s, however they received new life and responsibilities after Congress passed the law in 2003 (Interview with Arturo Diaz, 1/9/2012). However, with the program of decentralization and privatization of services, now the CWBs have legal authority to manage and operate the water systems in most rural areas (Sano, 2009).

The boards are non-profit entities consisting of members elected through a community assembly every two years. According to national law, members must work on a voluntary basis, and they cannot serve more than two terms. The boards have the right to set and collect fees, purchase materials, perform audits, and hire contractors. Many of these regulations are not enforced. In several interviews, CWB members running AguaClara plants had served more than two terms, one president admitted to serving four terms.

Outside of the requirements dictated by the state, CWB composition, and resources vary from one municipality to another. Whereas some have developed strong linkages to municipal governments and NGOs, others remain isolated. The number of members differs, APP assistant director, Arturo Diaz, sets the number of

CWB members at seven, however the plant in Cuatro Comunidades reports having eight CWB members and the plant in Atima has only six. In some cases there are *vocales,* or non-voting members, that represent interests in the municipality such as the Catholic Church, the mayor's office, or nonprofits (Interview with Arturo Diaz, 1/9/2012). Minimally, a president, vice-president, treasurer, and secretary comprise CWBs.

The knowledge and resources available to the boards are at the crux of criticism of the CWB system. They do not have the social and human capital to undergo large-scale projects. Many rural and peri-urban areas lack both financial and technical resources to build and operate a water treatment system. Often these municipalities opt instead for chlorination alone to disinfect water and look for ways to improve quantities of water. However, disinfecting water does not reduce turbidity or fecal coliform in the water and the mixture of chlorine and coliform can lead to *more* health problems than untreated water alone, which is dangerous is still dangerous (Interview with APP circuit rider, 1/19/2012).

Aldea Nueva, a small town sitting just outside the tourist jumping off point for the Copan Ruins, has encountered financial limitations as the CWB has assumed financial responsibility for the water system. In the past the town had received point of use filters and storage tanks through SANAA, however now they lack the funds to invest in more. The majority of town residents resign themselves to collecting water from a natural well whose water is often muddied (Meeting with Aldea Nueva CWB President, 1/9/2012). They are autonomous to the point of

being isolated, missing the organizational links that could enable them to overcome these barriers.

Some communities have received aid from international organizations to build plants, however the CWBs do not have the technical skills to run these complex water treatment systems. Frequently, organizations donate package plants that are pre-engineered and pre-fabricated in other countries, shipped to Honduras in containers and reassembled in country (Tour of water treatment plant in Siguatapeque, 1/11/2012). When operated appropriately, the plants produce high quality water, both disinfecting and filtering water before it is distributed to the community. However, in addition to costly maintenance, the plants demand a higher level of education than most local plant operators have.

The town of Siguatapeque, Honduras, exemplifies the technical capacity challenge CWBs face. A Spanish non-profit organization donated a package plant to the town; several years later the plant is in disrepair, functioning sub-optimally. Despite the massive investment in physical infrastructure, an investment in technical skills did not accompany the construction of the plant. Plant operators searched the Internet for instructions on how to run and repair their plants. However, when they could not repair plants or maintain part of the system, they would disregard it (Tour of water treatment plant in Siguatapeque, 1/11/2012). These practices degrade the quality of water distributed.

Financial and technical capacity limitations plague many towns throughout Honduras. They go it alone, without support from government. These limitations hinder CWB actions. Some, such as Nueva Aldea, struggle to maintain their current

level of water quality without the assistance and oversight from the federal government.

The AguaClara-APP partnership has embraced the CWB model as an opportunity to promote community governance. The AguaClara-APP program seeks to fill the leadership and technical expertise gaps critics have identified due to the devolution of water services. The program provides affordable, accessible plants that are easily operated, as well as technical assistance to operators and CWB members so that they build the necessary skills to manage their own water system successfully. APP and CWBs create strong ties that enable the CWBs to work independently, but also collaborate and exchange information. Additionally, APP often plays a bridging role, connecting CWBs to other local, national, and international organizations.

AguaClara-APP Partnership

The AguaClara-APP partnership rests on the principle stated by Nobel Laureate Elinor Ostrom, and quoted on the AguaClara website: "combining knowledge of local circumstances with modern science and technology is a crucial prerequisite for developing more efficient, sustainable infrastructure."

AguaClara strives to develop water treatment technologies that are effective and feasible. The research team invents what they call sustainable tech: technologies that do not require the high electrical and mechanical inputs that many high tech plants do, but can provide high quality service (Interview with Monroe Weber-Shirk, 2/2/2012). Monroe, student and graduate researchers continue to improve upon water treatment technologies at the labs in Cornell.

However, the process is iterative and relies on frequent communication with the field, particularly with its implementation partner Agua Para el Pueblo. The research team learns from what has been built in the field.

Through feedback from APP, AguaClara develops technologies appropriate for the rural and small town Honduran context. The research team designs the plants to be affordable and accessible. To reduce costs, the plants have few moving parts and valves, use generic parts, operate without electricity, and use locally available construction materials. One person can maintain the plant, the operator does not need sophisticated math skills, and only needs a couple months of training.

Agua Para el Pueblo communicates issues, successes, and problems to the AguaClara team. These communications allow the research team to amend the designs to better serve the towns. Furthermore, APP contributes the onsite expertise of a structural engineer, a deep knowledge of the local Honduran context, and a close relationship with each individual town where AguaClara-APP builds a plant.

In each town, APP works for months with the CWB before they sign an agreement (Interview with APP circuit rider, 1/12/2012). APP draws up the actual construction plans and provides project management during the construction period. After constructing the plant, APP continues to provide training to the plant operator and CWB. Both AguaClara and APP recognize that their program is much more than a technology or an infrastructure improvement. APP provides a crucial role in information flow, transfer of knowledge, and construction of social capital.

Dan Smith, a former Cornell AguaClara student and Fulbright Engineer with APP, describes AguaClara as a "development program that improves water quality" (Interview with Dan Smith, 1/10/2012). Arturo Diaz, APP Assistant Director, says that the job of AguaClara and APP is to construct a relationship between the user, the CWB and the technology (Interview with Arturo Diaz, 1/10/2012). The AguaClara-APP program acts as a development program by educating community members about water treatment and health impacts. The educational aspects particularly affect CWB members who receive training in management, basic math, and community organization (Interview with APP circuit rider, 1/19/2012).

The AguaClara-APP model not only requires that CWB members actively participate on an ongoing basis, it demands the participation of other community members as well. Community members elect the water board members in a general assembly. Then throughout the AguaClara process, they meet with CWB members, learn about water treatment, vote on decisions such as service fees, and deliberate on the value of building or improving a plant.

Benefits of Community Governance and Participation

Communities acquire many health benefits when they gain access to potable water supplies. AguaClara offers additional benefits such as water quality that matches and surpasses World Health Organization standards (many water systems in the developing world do not) and lower maintenance costs. AguaClara has won awards for its technological innovations, however it has not been recognized yet for its effective community governance model and technical assistance program.

Information available prior to this study suggested that community governance and the service delivery approach are also great strengths of the AguaClara-APP model (Beers, 2012), I seek to explore that further. Through participation in the AguaClara-APP program users and CWB members feel ownership over the plants; plants provide more regular and effective service; communities cultivate social capital within their town and between other towns; CWB members develop new skills and knowledge.

Community Ownership

The AguaClara and APP leadership and staff believe it is critical that the communities themselves are empowered to run and govern their own system. One CWB secretary said "I feel like the owner of the plant, along with my fellow *compañeros*." (Interview with Pedro Antonio Gomez, 1/12/2012). Community members know the decision making process, they contribute to the decision-making process and they also physically help build the plant. They become more autonomous even while forming deeper bonds with external organizations.

The community members also demonstrate their feeling of ownership through their willingness to pay for the service. Many pay triple or quadruple the fee they paid before the community built the plant, but so far the highest rates are still less than $4.50 per month. Water services were undercharged before plant installation. Late payment rates at the Cuatro Comunidades plant dropped from sixty percent before the AguaClara plant was built to 7 percent in the first two years of operation as the residents saw the value of clean water (Interview with Jorge Manuel Lozano, 1/12/2012). Although the fee has rapidly increased, in the

majority of cases, user tariffs comprise 1.5 percent of family income at most, and often much less. Table 2 illustrates the financial costs of building each plant.

Table 2: AguaClara Plants in Honduras

Community Name	**Construction Start date**	**Inauguration Date**	**Residents Served**	**Capital Costs**	**Tariff** (HH/mo.)
"La 34"	2004	--	--	--	--
Ojojona	June 2006	January 2007	2,000	$68,028	$2.83
Támara	January 2008	June 2008	3,500	$61,594	$4.44
Marcala	Fall 2007	July 2008	9,000	$64,000	$3.18
Cuatro Comunidades	October 2008	March 2009	2,000	$49,063	$3.18
Agalteca	October 2009	June 2010	2,160	$58,279	$2.65
Marcala (Expansion)	November 2010	May 2011	6,000	$83,382	$3.18
Alauca	May 2011	February 2012	3,600	$82,375	$2.88
Atima	December 2011	May 2012	4,000	$76,530*	$2.62-$10.48+

*Includes Agua Para el Pueblo staff time.
+Fees pending

Source: AguaClara Website; Beers, 2012: 47.

Many community members have visited their plants. They have seen how the water flows into and out of the plant. They have attended groundbreakings, openings, and improvement celebrations. Even more importantly they have physically built the plants through contributions of labor, materials, and money as construction costs are kept low through in kind contributions of unskilled labor from community members (estimated to reduce costs 40%). "People come and visit and want to live in the towns [served by the Cuatro Comunidades plant]. The

most valuable thing we have in Cuatro Comunidades is the plant." (Interview with Jorge Manuel Lozano, 1/12/2012)

High Quality of Service

Both community and CWB members take care of the plants because they feel like they own the plants. CWB members take an active role in aiding APP in the monitoring and evaluation of the quality of the water. The community members also hold the board members accountable, as Ostrom (1994) recommends. Even though many used to drink untreated water, that was occasionally so filthy it obscured the bottom of the basin, they will now call water boarder members or operators if they suspect there is a glitch or if there is a water stoppage. Water stoppages are common throughout Honduras, but uncommon in the community governed AguaClara plants (Goddard et al., 2012).

When services are not managed by the CWBs, but by the municipality, service appears to decline (Beers, 2012). Not only is service less regular, but the plant also appears to suffer because the community is not invested. For example, the chemicals for the plant in Marcala, the only plant run by a municipality, are frequently left at the bottom of a steep hill far away from the plant, not delivered properly to the operator (Beers, 2012: 71). In other towns, CWBs take care to deliver chemicals directly to the plants.

Social Capital

There are some signs that social capital has developed in the participant communities through the community governance process. Communities continue

to take collective action and make improvements based on the trust they have acquired through working with other community members. In the town of Tamara, the CWB gained trust through their transparency, completion of the plant, and effective management. “The board earned credibility through this project.” (Interview with Juan Ramos Rivera, 1/12/2012) Many community members had initially complained when they implemented new fees, now most community members are less resistant when the board asks for more financial support from the community. Such observations suggest the formation of social capital and a strengthened sense of generalized reciprocity have promoted more collective action.

Through participation in community governance, it appears that trust has not only grown within communities, but between communities. The Cuatro Comunidades and Alauca plants each serve four distinct communities. The communities did not have the financial resources or population to construct a plant individually. The towns had to coordinate to pay for and build the plant. Initially there was political rivalry between the towns building the Alauca plant (Interview with Antonio Andara Lira, 1/15/2012). They fought, each representing their own interests. However, through their collaboration, they have overcome their rivalries, building links and social capital between the four towns. They have discussed working on more projects together such as reforesting the area surrounding the water plant (Ibid.).

Desire to collaborate with other towns that do not currently participate in the AguaClara-APP program has grown through the program as well. The town of

Atima has hosted meetings with other town water boards to share the AguaClara technology and their town's experience (Meeting in Atima, 1/12/2012). The board president of Cuatro Comunidades reflects that the need for clean water in other towns complicates their feelings of achievement. He says although only four towns receive water from the plant, they share a health clinic with other towns. "Water is the primary material of the home. It's where you wash the fruit, prepare the food, but it's [also] where illness enters. As the board, we don't want this. We want to help them, those that don't have [plants]. Our plant only covers the four communities, but the Amarateca [the region] is large" (Interview with Jorge Manuel Lozano, 1/12/2012). He says the CWB tries to share the knowledge it has gained through APP trainings about chlorination and invisible contaminants with neighboring water boards. The CWB redistributes the specific benefit it receives, contributing to the general community benefit and building reciprocity in its region.

CWBs have also begun to take more collective action beyond the management of their plant, enabled by increasing social capital. In Jicaro, a town served by the Alauca plant, the community is developing a plan to deal with coffee farmers who are de-pulping cacao and washing the beans in the river. This process has caused additional contamination. "We are going to fight this. If they sell the coffee somewhere else, maybe they can de-pulp the coffee somewhere else. We can't just kick them out…but we can give them other options. We'll look for a solution." (Interview with Antonio Andara Lira, 1/15/2012)

In addition to environmental issues such as reforestation and contamination, many CWBs have begun to work closely with community healthcare workers and clinics (Interview with Community Health Promoter, 1/12/2012; meeting in Alauca, 1/16/2012). In Alauca the health clinic collaborates with the CWB to collect data on water borne diseases. The have launched a campaign to educate community members about how users can contaminate their household water supplies by drawing water for washing with dirty hands (Meeting in Alauca, 1/16/2012). In the towns serviced by Cuatro Comunidades, the health promoters and the CWB have collaborated on several projects including a comparative health study, educational campaigns, and advanced water quality monitoring (Interview with Community Health Promoter, 1/12/2012). The horizontal organizational links enable the CWBs to undertake new projects.

The communities served by the Alauca and Cuatro Comunidades have also begun incorporating programs about water and water usage into their education systems. A teacher in Jicaro, Orlando Adita Colindres, states "…now we have potable drinking water. We have 171 students thinking about and learning about water usage." (Tour of Jicaro, 1/15/2012) In Cuatro Comunidades the community has adopted youth programs that teach about the plant, water treatment and water usage (Interview Pedro Antonio Gomez, 1/12/2012).

The CWBs' ties to the municipal government, schools, or clinics strengthen ties within the community. As Warner (1999) suggests, these links have provided the CWB with more financial and technical resources and often provide the

collaborating partner with more information, access, or legitimacy. By exercising its social capital, the communities strengthen community level social capital.

Human Capital

Human capital is an input into the management of the AguaClara-APP program. Operators have to carefully manage the technical operations of the plant, APP employees must have the requisite knowledge and skills to perform trainings, and AguaClara students design plants. In the community governance model, human capital is also an output. Whereas social capital refers to the collective benefits and the relationships between community members, individuals benefit from enhanced skills and knowledge as well.

CWB members and community members admit that they knew very little about water use and water treatment before their town began building an AguaClara plant. Through training and workshops given first by APP staff and subsequently by CWB members, knowledge about the transmission of water borne diseases has grown. The board members experience a form of specific reciprocity (e.g. training) in exchange for donating their time.

Through trainings with APP, CWB members have gained additional knowledge such as math skills, bookkeeping, and budgeting. Many board members share the sentiment Jorge Manuel Lozano expressed, "When we go to trainings we feel proud. We get to learn new skills and new ideas (Interview with Jorge Manuel Lozano, 1/12/2012)." The APP technical assistance circuit rider says that this enthusiasm has caused board members to want more training. Whereas initially APP staff solicits participation, after just two training sessions, some CWB

members begin to look for him to request more (Interview with APP circuit rider, 1/19/2012).

Education not only occurs vertically, but horizontally. The town elected Antonio Andara Lira, who describes himself as "coming from a humble family", to the CWB of Jícaro when he was under the age of 30 (Interview with Antonio Andara Lira, 1/15/2012). He'd never participated in any social or political issues in his community before, but he said he was honored that the community had chosen him and he sought the help of the older members on the board. He said they transmitted their knowledge to him. This horizontal knowledge transfer contributes to generalized reciprocity, a well-trained CWB member will help train others in the future and maintain the high quality of the plant. He became president of the CWB of Jícaro, and vice president of the central water board, which draws from the four communities served by the plant.

AguaClara and APP recognize the strength of their model. They want to expand the water-treatment and governance model to other countries (Interview with Monroe, 1/28/2012), within Honduras (interview with Jacobo Nuñez, 1/10/2012), and to a broader set of participants who are involved, especially to female representatives (Interview with Arturo Diaz, 1/9/2012). In addition to health benefits from access to safe drinking water, AguaClara-APP hope to replicate the community support, skills development and social capital embedded in their model. The community governance model uses social capital and human capital at the same time as it builds them.

However, the impacts of community-based resource management are complex. In addition to the benefits to participation, there are real financial, time, and social costs to participating, and especially to taking leadership roles. These costs and challenges can act as barriers to participation and cause participation fatigue. This in turn can affect the quality and diversity of participation, degrading some of the community benefits of community resource management. It is to this concern, raised by AguaClara-APP, to which I now turn.

Challenges of Community Governance

In this section, I identify some of the costs and challenges to participating in the AguaClara-APP model. I have divided these costs according to when they take place in the AguaClara plant construction process: pre-construction, during construction or after construction. Although there are many other ways to categorize costs, such as by type (money, time, social capital), I have grouped the costs by their sequence in the chronological progression of the AguaClara-APP program. The progression demonstrates the concurrently developing community investments in the process and the increased burdens.

The inventory of costs and challenges is not insurmountable. This is not meant to be a criticism of the community governance and participation model, per se. Rather, the inventory of costs should serve as a reference for AguaClara and APP as they expand their model. The model has changed and grown since AguaClara and APP completed their first official plant in 2005, the following issues could be considerations in the governance model's continued evolution.

Community members participate in three phases of the plant construction and implementation process: pre-construction, construction, post-construction. Each phase offers benefits to the community, and particularly to the CWB members, and each demands unique costs, commitments and challenges. See Figure 1.

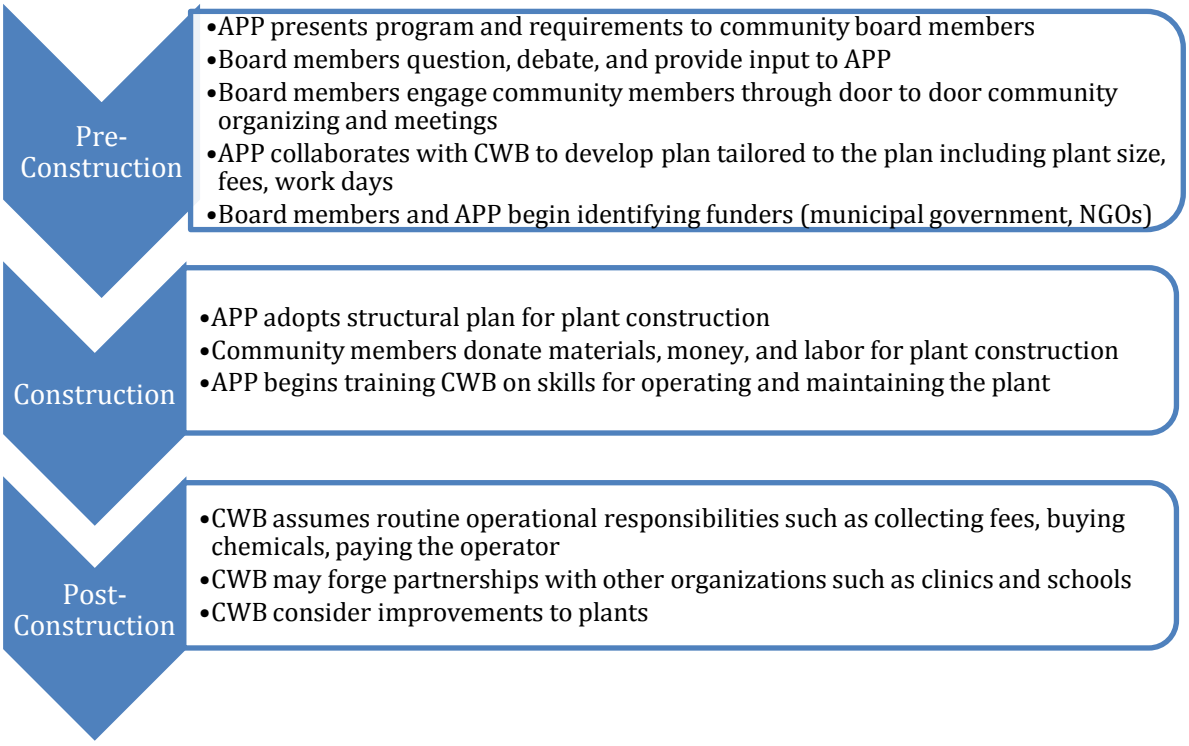

Figure 1: AguaClara-APP Program Process

Pre-Construction Phase: Socialization

Before a shovel breaks ground, APP engages in a several month—occasionally, but rarely, multi-year—community engagement process (Interview with APP circuit rider, 1/18/2012). The first step focuses on what APP calls

socialization (Interview with APP circuit rider, 1/18/2012; Arturo Díaz, 1/9/2012). Socialization is a process of exposure and education whereby both the community representatives from the town and community members learn about the AguaClara technology, understand the requirements and benefits of the program, support the implementation of the program, and then fund the program.

The socialization process is two-tiered: first the information, debate, and questions pass between the APP technical assistance circuit rider and the water boards. Then the information, debate, and questions repeat between CWB members and their constituents in the community. These two-tiers repeat at each step of socialization.

The introductory stage of the socialization process requires that the community representatives, often mayors and CWB representatives, attend a meeting with Agua Para el Pueblo to learn about water quality in Honduras and its impacts on health as well as about the AguaClara-APP process and technology. The meetings are daylong affairs. They involve multiple presentations and question and answer rounds. Community leaders and/or NGOs solicit these meetings. Sometimes a participant in the AguaClara-APP program invites boards from neighboring municipalities to an APP led meeting or on a tour of their plant.

The technical circuit rider or the assistant director presents the APP argument for investing in water treatment and showcases some of the technology they employ. However, APP clarifies, "AguaClara is not a only a technology, but a comprehensive program. During the process, APP and AguaClara have to construct a relationship between the user, operator [CWB] and the technology," that takes

additional time and resources (APP presentation in Atima, 1/10/2012). They stress the formation of a bond between the three organizations: APP, AguaClara and the CWB.

At this juncture, APP staff also explain that they are not in the business of donating plants. Plants require community member work, money, and time. Normally they also require external financial support from an NGO, foundation, or municipal government, oftentimes some combination of these three. Sometimes AguaClara-APP can provide links to these organizations or in communities with strong social capital where the CWBs already have ties.

After the initial informational meeting, the technical assistance circuit rider follows up with water boards that want to learn more about AguaClara-APP. In addition to supplemental information about water and health, the CWB receives an in depth overview of the AguaClara-APP program. The technical assistance circuit rider collaborates with the CWB members to develop a plan tailored for their town. This includes a technical evaluation process with an engineer to ensure that the town water source meets the specifications required to run an AguaClara plant.

Once the CWB members agree that they want to build an AguaClara plant, the socialization process begins with the town members. This process differs from town to town, however of the four water boards I spoke with, all four identified this as the most taxing part of the AguaClara-APP program. APP staff concur that the socialization phase is typically one of the greatest challenges of building a plant, because often the board cannot rely on existing social capital but must build it.

During socialization, the CWB presents its plan to install an AguaClara plant to the community. Initially the CWB holds a series of meetings open to the public. During the meetings CWB members pass on what they have learned from APP, they discuss the impacts on health in the community, and then they discuss cost. This is the largest point of contention for the community.

In the past, town members paid only a nominal fee to the water boards for untreated or ineffectively treated water. After the installation of an AguaClara plant, their monthly rates often triple, sometimes quadruple or more. In addition to the fee hike, the CWB asks the community to contribute another one time fee for the construction of the plant. In addition to the town meetings, board members often go door to door, pleading their case. In Tamara, the second oldest AguaClara plant, CWB president of eight years, Juan Ramos Ramirez said "we had to go from house to house explaining: we're going to improve the water system, this is how we're going to do it." (Interview with Juan Ramos Ramirez, 1/12/2012). Convincing town members that they will receive a return on their investment in the form of improved water, and then delivering that benefit, is an essential part of building trust and social capital. Although both the CWB and community members will experience higher water quality, the CWB leaders invest more time and receive a lower rate of return on their investment.

Even individual solicitations for support for building the water treatment plant and explanations of its potential health benefits are often initially rebuffed. Antonio Andara Lira, president of the Jícaro CWB explains: "To fight with people is not easy. To convince people, to change the minds of other human beings has not

been easy. This project has been a great amount of work…there are people who say, "I'm not going to do this. I'm accustomed to doing things this way. I've lived here for a long time and I've never died from drinking the water." (Interview, 1/15/2012). The former president of the Jícaro CWB quit during the socialization process, because "he grew tired of the work." This suggests that if CWB members invest but do not feel that they will recuperate their investments through generalized reciprocity, they will cease to contribute.

In Cuatro Comunidades the board spent more than nine months convincing community members to build a plant. Pedro Antonio Gomez, secretary of the water board, says, "It was very hard in the beginning, we only had a budget of 1,300 lempiras. Through meetings and workshops we convinced people that the water they were drinking was contaminated…The board had to win their trust." However, even after the board felt they had won the trust of community members, they spent another year struggling over the details of fees and responsibilities. After a year and nine months of negotiation, the CWB agreed to provide water to the community for free for three months after construction (meeting with Cuatro Comunidades water board, 1/12/2012).

The difficulty, in part, stems from the democratic nature of the process. The CWB does not pass down mandates to the community. These deliberations raise issues that the CWB may not have addressed. Through conversations, presentations, and meetings the town reaches a decision, and votes in the assembly. The communities do not want to leave anyone out. However, several towns admitted that even after the socialization process, they had to leave several

houses out of the new water system that were unwilling to pay the increased fee (Tour of Tamara Plant, 1/13/2012).

Several CWB members and residents said that women were far easier than men to convince to support the construction of a plant. Women community members conjectured that women's unique relationship with water made them understand the value of treated water arriving directly to their houses. Although, the relationship with water varied from woman to woman, and especially from community to community, women expressed a day-to-day awareness of water quality and quantity that men did not.

In the rural, agrarian town of Jícaro, a seamstress described the meetings during the socialization process, "At the meetings it was about half men and half women. The women were easier to convince because we would walk to bring the water from the river." She went on to admit that she only attended the first meeting, but that she sent her husband to all subsequent meetings.

Several other women in Jícaro who bake small batches of rosquillas, a traditional Honduran donut shaped cracker, to sell in local stores and neighboring town markets, also said they needed no convincing. Clean water in their houses meant that they did not have to spend time boiling water before baking their rosquillas. Reina Diaz Amador, a caterer in the relatively more affluent and urban town of Tamara, shared the same appreciation for the timesaving benefits of piped potable water (Interview with Reina Díaz Amador, 1/13/2012). She added that she believed the taste of her food had improved with the treated water.

Allison Valle, another Tamara community member, said that the water she used was a yellowish color before the town built its plant (Interview with Alison Valle, 1/13/2012). She complained that her two sons would frequently suffer stomach problems with the rotavirus and that she would have to care for them. Furthermore, she would have to collect rainwater to wash clothes so the family did not suffer from skin allergies from the dirty water. Her husband, a worker at the nearby Pepsi plant, initially objected to the increased fee for water, however Allison argued that their family spent nearly 60 lempiras (US$2.96) on bottled water each month, so the fee increase was actually a net decrease in expense for their family.

Through their everyday experiences, many women arrived at the same conclusion that many men arrived at only after the socialization process; there are many benefits to treated water: time, health, and financial savings. In part, they identified the plant as a means of alleviating the "second shift." Despite their support for the plant, women's representation on the water boards remains much lower than men's. Of the four boards we interviewed, only two had women members. Although women's leadership remains scarce, women do play the roles of advocate and participants. Women may choose to participate in a shallow, widespread rather than deep, narrow manner because they do not want the additional time burdens associated with leadership. Cultural norms and practices may also influence how women participate.

Construction Phase: Building the Plant

Once the town approves the plant and has raised funds for the plant construction, the APP structural engineer takes the design for the plant from the AguaClara design team and draws up a plan for the plant that he[2] adapts for the site's landscape. Between the structural engineer and the Project Manager for the plant, they come up with a list of materials and tasks that they will need to build the plant (Interview with Santiago Garcia, 1/11/2012).

The technical assistance circuit rider takes the estimates to the water boards and they figure out how many days of manual labor each household needs to contribute. The CWB and the circuit rider determine the one-time fee that residents must pay to cover the costs of plant construction after subtracting donations from government, NGOs, and foundations. During the construction phase it is the task of the CWB to deliver the work, materials, and money promised.

The secretary of the Cuatro Comunidades CWB said the "The board asked community members to donate 500 lempiras (approximately US$25) and several days of work in order to buy and build the plant (Interview with Pedro Antonio Gomez, 1/12/2012). Some boards develop more complex schemes.

For the Alauca plant, the four contributing communities divided the labor evenly by town; each town had to meet its quota. Towns with a smaller population worked more days than those with a larger population. Each family in Jícaro labored 4 days, in Manzanilla 7 days, in Matapalo 5 days, and in Alauca 2 days. The

[2]Currently—as well as at the time of my visit—the structural engineer is Santiago Garcia. He is responsible for the design and construction of physical infrastructure of all AguaClara-APP built plants.

issue with this division is that the smaller towns are often poorer and rely on agriculture more. Therefore, work was disproportionately passed off to the poor and to the farmers.

The hardship of donating days of work is different for wageworkers than for farmers. In Honduras wageworkers are guaranteed a 24-hour rest period for every six days of work (UN, 1959). They are also guaranteed progressively more paid vacation with each year of work, starting with 10 days after the first year, up to 20 days after the fourth year (ibid.). When community members who are wage laborers work a day to construct the plant they sacrifice their day of rest or a vacation day. This is no small sacrifice for people who may only receive one day of rest per week. However, the cost is magnified for those who are subsistence farmers. Self-employed farmers do not get vacations, let alone paid vacations.

The president and vice president of the Alauca CWB illustrate the difference between the sacrifices made by wage laborers and agrarian laborers. The president, worked at Hondutel, the national telephone company, for many years (Interview, 1/15/2012). As a retiree, he is entitled to social security payments (Secretaria de Gobernación y Justicia, 2009). He jokes that now that he is retired he likes to sit in the hammock all day. The vice president, on the other hand, is a subsistence farmer. He and his wife grow corn and beans, and also have a milking cow. They do not harvest any produce to sell (Interview 1/16/2012). The vice-president, who calls being a CWB member "the greatest honor", tears up as he describes the toll that giving up days of work on the farm has had on his family. He says the CWB work has impeded his ability to provide food for his family

(Interview 1/16/2012). Generalized reciprocity, although no small benefit, is not sufficient to cover the time and effort investments contributed by some CWB members.

The board president of Alauca does not represent the average community member in Alauca, but the vice-president most likely does. In Alauca, the most common form of employment is farming and the average rural family income is 1,605 lempiras (US$80.6) per month, well below the poverty line (Secretaria de Gobernación y Justicia, 2009). Therefore, many who comprise the constituency of the water treatment plant face similar barriers to participation that the vice president does.

During the construction process, the board also begins its training process. The APP technical assistance circuit rider travels to the community to perform training modules for CWB members and plant operators (Interview with APP circuit rider, 1/19/2012). APP customized the training process to each community. There are approximately four training modules and each lasts three full days.

The APP technical circuit rider explains, either because of their multiple jobs or because their position as CWB members is unpaid, many board members do not always feel the need to attend workshops. “Let’s just say that a day in the workshop is a day of work for the board. We have to use lots of strategies [to get them to participate]” (Interview with APP circuit rider, 1/19/2012). The varying reactions of the board members to participating in daylong workshops—some seeking more while others avoiding it—may relate to the varying levels of sacrifice required of them to dedicate one day to training. The Vice President’s testimony

again speaks to circuit rider's observation that some board members only reluctantly attend workshops. For him, attending a workshop is not equivalent to giving up a day of rest; it is equivalent to giving up a day of his livelihood.

Although the Honduran government does not allow CWB members to receive compensation, it may be appropriate to compensate them for their time to attend meetings. Poorer board members are more likely to feel the burdens of participation; their leadership provides generalized community returns on their investments in the form of high quality water and service. However, if AguaClara-APP could find ways for communities to provide specific reciprocity to leaders for their investments, it might enable wider participation.

Post-Construction Phase: Management and Maintenance

After the town constructs the plant, the CWB continues to have both ongoing routine and non-routine administrative responsibilities. APP assistant director Arturo Díaz identifies running the plant as one of the most difficult challenges of the AguaClara-APP program (1/9/2012). The CWB collects monthly service fees, buys chemicals for the plant, pays the operator, holds community meetings, meets with municipal and health advisors, attends trainings, and approves plant expansions and improvements. With the assistance of APP, the CWB moves towards professionalization.

The tasks of collecting service fees, buying chemicals, and paying the operator are routine activities. However, the board members may suffer non-routine burdens regularly. The board treasurers often spend time pursuing arrears each month. When the plant opened in Cuatro Comunidades, sixty percent of

residents paid their bill late. The treasurer went to people's houses collecting payments. The CWB invested more of their time in educational workshops for community members to share with them the costs of operating the plant, and explain why the board needs to receive the payments on time in order to provide quality, uninterrupted service. Two years after the plant opening, the board's time investment appears to be successful, now Cuatro Comunidades suffers only a seven percent late pay rate. People have accepted the improved water system as an adequate return on their investments.

In addition to the time burdens the treasurer and other board members experience, they may experience social burdens as well. In Cuatro Comunidades, they now have a rule that if someone does not pay their bill, they cut off their water and charge them a 200-lempira (US$9.87) fine (Interview with Cuatro Comunidades, 1/9/2012). In these towns where community members know each other and have spent months, if not years, building the plant, the decision to cut off water is not easy.

Cutting off a neighbor's water can harm the CWB members' relationship with that particular resident, but it can also weigh emotionally on the board members. Board president, Jorge Manuel Lozano, expresses deep pain over seeing neighboring communities that do not have access to clean water and associated health benefits (Interview 1/9/2012). The community health promoter for one town calls it a crime to not provide clean water to communities (Manuel Lozano, 1/12/2012). Taking away that right to clean water from members of his own community is painful for Jorge and difficult for most community members.

Many participant communities in the AguaClara-APP program struggle with the ethics and tasks of sanctioning residents who will not or cannot pay. In the newer plant in Alauca, the treasurer and president of the board of Jícaro —one of the four communities served by the plant—say that if someone cannot pay they will not turn off their water. "We will not cut off someone who can't pay because they are poor. The project is for everyone. We will talk with community members to subsidize [those who cannot pay]." (Interview, 1/15/2012) Although procuring these subsidies requires greater time costs of garnering community support, the emotional and ethical costs of depriving a neighbor of clean water outweigh the monetary and time costs of providing subsidy.[3] This tension between social equity and financial viability of the water system show the value of community control—to internalize and balance competing goals.

These social costs may be alleviated in part by the further professionalization of the CWBs, with support from AguaClara-APP. By developing mechanisms to support equity concerns, such as sliding scale fees, or to alleviate social pressure, such as official adjudication processes, AguaClara-APP can assist CWB members. These mechanisms contribute to the professionalization, smooth functioning, and sustainability of the CWB and water systems.

Water boards also spend time buying and delivering chemicals to the plant as part of their management duties. Even in the routine scenario, members have to

[3] In Jícaro, if all households contribute to the subsidy for the household that cannot pay, the value of the increase would be less than one lempira, or US$0.03, per month. Although this increase seems trivial, for many families the monthly fee is already a stretch. Subsidizing another when their own family can barely cover costs is a difficult choice.

budget time to receive the chemicals, but when chemicals are not properly delivered to the plant, board members have to scramble to get them.

As AguaClara continues to develop new technologies, communities consider adding improvements to their plants. Continuing to invest in the AguaClara technology demonstrates the boards' belief in the technology and commitment to the ongoing process. In October 2011, the town of Tamara installed the first stacked rapid sand filter, an innovation of the AguaClara engineering team. The Tamara plant became not only the first plant in Honduras, but in the world to include this technology. In January 2012, the town celebrated the inauguration of the stacked rapid sand filter, an event replete with a mariachi band and plates of food. The CWB and the attending community members celebrated their accomplishment.

Before installing the stacked rapid sand filter, the board had to return to the community for support. Although the process is admittedly less difficult, installing and paying for improvements requires another socialization process. Juan Ramos Ramirez, president of the Tamara board, remembered "When we decided to install the filter we went to the people and said we're going to need to raise the price so that we can hire someone to do follow-up, because the operator we have now does not have the capacity to be here day and night overseeing the water system. So we made an incremental increase of 15 lempiras [per family per month] to cover the costs of hiring a second operator…"

Through community meetings and casual conversations, the CWB successfully convinced the community to pay for the installation. Many residents,

already convinced of the value of the plant during the first socialization process and satisfied with the quality water, supported the installation. The CWB could rely on and use the social capital developed through the AguaClara-APP process. Nevertheless, others opposed new expenses. The water fee had gone up from 15 lempiras (US$0.76) before the plant construction to 90 lempiras (US$4.44) over the course of three years.

The financial burden of an additional US$0.76 per month for residents of Tamara, where few rely on farming or livestock for their livelihoods, is not severe. Nevertheless, in other more agrarian communities served by AguaClara plants, increases in water service fees are a greater burden. The rural minimum wage is not enough to cover the basic family food needs of the average rural family, and many self-employed farmers earn even less than rural minimum wage. [4]

Analysis summary

In addition to the much-needed physical infrastructure assistance, AguaClara and APP promote a strong community governance model. Building off the government-mandated framework for water governance in Honduras, the AguaClara-APP program provides technical assistance and leadership training for CWB members. CWB members gain human capital. CWB and community members also enjoy a sense of community ownership over the water system, increased

[4] In Honduras, the monthly minimum wage is set by industry and size of the employer (http://www.hondurasnews.com/2012-minimum-wage-honduras/#.UTZOy3zBL5k). The cost of the *canasta basica,* or basic food needs, of a rural family in Honduras is 1,049.58 Lempiras (US$51) per person per month. The average rural family contains six family members, making the average rural *canasta basica* 6,297.51 lempiras (US$310) (Instituto Nacional de Estadistica de Honduras, http://www.ine.gob.hn/drupal/node/95)

social capital, and higher service quality. The community builds social capital, trust and generalized reciprocity through interactions, deliberation, and high performance. Social capital has become stronger with use.

The AguaClara-APP model follows best practice guidelines for sustainability remarkably well. APP works with communities to develop leadership and professionalize services. The CWB, in conjunction with the community, makes decisions about how to build and run their water treatment system, fostering a sense of community ownership. The high quality of the water and service AguaClara plants deliver to households promote confidence. Coupled with the feeling of community ownership, the high water quality encourages participation and investment, solidifying social capital. The governance model thus far appears to build and reinforce internal and external community connections, developing social capital. The AguaClara-APP commitment to sustained learning and training supports human capital. These components not only contribute to the smooth functioning of current operations of the water systems, but according to relevant literature, provide the conditions for lasting or sustainable service.

Nevertheless, there are participation costs embedded in the AguaClara-APP model. CWB members pay especially high opportunity costs for assuming leadership roles in the governance structures. Board members participate in many one-time and regular meetings, trainings, and events. They also spend time community organizing, going door to door and providing explanations during their free time. These time commitments represent opportunity costs for board members. The costs often weigh especially heavy on the board members with the

fewest financial resources. The CWBs also face social and emotional pressure of developing and enforcing user fees and sanctions cause additional stress. Finally, despite the unique relationship women in the towns have to water, women undertake leadership roles at a much lower rate than men. Although both community and CWB members reap the benefits of increased social capital and high quality water, the CWB leaders invest so much more and receive few additional benefits to offset their investments.

The AguaClara-APP program faces the challenge of continuing these best practices while addressing the issues surrounding leadership participation within the constraints proscribed by the Honduran national government, such as the requirement that board positions remain unpaid positions. In the following section, I provide recommendations designed to support diverse participation in leadership roles by alleviating costs associated with them, while not disrupting the positive community benefits engendered through the AguaClara-APP model.

Conclusion

The purpose of my report is to examine how participation in the AguaClara-Agua Para el Pueblo community water management system builds capacity and how this participation may burden the community or CWB members in Honduras. Community governance is an effective and often enabling solution to the vacuum left by retreating national governments.

Cases studies have shown that community governed systems are often more reliable, effective, and efficient (Ostrom, 1994). Additionally, community governance encourages the development of community ownership, and social and human capital (Pretty & Ward, 2001. The AguaClara-APP systems appear to be remarkably well governed. They adhere to the best practices of community governance. Water service is regular and water quality is high. CWB and other community members express a high level of trust in one another and pride in their water system. The AguaClara-APP program fosters the development of social and human capital.

The governance system is relatively flexible. There is an interested few (the water board) who takes on the bulk of responsibility. Then there are others who donate time to assemblies and meetings. Then there are still others who pay their dues and nothing else. AguaClara and APP should not lose this flexibility in the range of participation.

Participation is more taxing for some board members and can lead to the exclusion of potential board members. AguaClara-APP also worries that the

current program does not include enough women. Therefore AguaClara-APP should explore way to mitigate these costs and engage women.

Recommendations

The main cost to board members is the time commitment opportunity costs of taking a leadership role, although there are also social costs to imposing fees and sanctions on other community members. Taking a leadership role means that board members have less time for both work and leisure, which, as explained in the previous section, often burdens poorer members and women disproportionately. It is important to acknowledge the general benefit the board members create for the community while paying very specific costs through their leadership. I identify some of the leadership costs and recommend strategies for defraying them.

Reducing Opportunity and Financial Costs

CWB members, pursuant to Honduran legislation, do not receive monetary compensation. AguaClara-APP and the communities, however, can compensate CWB members in other ways to ease the burden, which is especially important for poorer board members. The immense contributions they add encourage community trust in generalized reciprocity. The idea of compensation relates to the concept of specific reciprocity; CWB members need to recover some of their investment; although the community level benefits may be enough for some, it is not for others.

Developing a system and training module for closed loop budgeting can help acknowledge and defray some of the CWB member identified costs of participation. Closed loop budgets not only include capital and operating costs, but they monetize the costs of time and resources paid by CWB and community members. Closed loop budgets provide the resource capacity to meet all the regular demands that the CWBs face and offer a sufficient buffer for unexpected costs. AguaClara-APP could counsel communities on creating budgets that not only cover the costs of operation and maintenance, but that also consider and cover the human resources invested in the AguaClara-APP model. The budgets could include additional user fees to cover board member costs such as transit and food. Although the expense of transit and food while away from home do not represent the opportunity costs of losing a day of work, they acknowledge that the board member is serving the community at a cost to him or herself. Additionally, providing discretionary funds for transportation may allow board members to utilize faster modes transportation to collect fees or arrive to meetings, reducing the time away from home. In addition to covering cost incurred by board members, AguaClara-APP may employ creative methods of providing board members with compensation for their extra time investment while respecting the law that forbids payment, such as waiving board member water tariffs.

These measures will likely not disrupt the principles of generalized reciprocity because they still do not cover the costs of leadership, however, they acknowledge the unique sacrifices of board members, and grant them some specific reciprocity for their work. Board members already receive some specific

reciprocity for their time, such as respect and education, additional support is meant to complement not detract from these benefits.

Additionally, AguaClara could develop a closed loop budget or reference that represents the true costs for building and maintaining a plant. This includes, capital costs, APP staff time, CWB and community member time, labor, and monetary contributions, research and development costs, graduate student and Monroe Weber-Shirk's time. Often budgets for AguaClara-APP only show a sliver of the real investment required to build and operate a plant.[5] These issues will become even more important as the model attempts to scale up.

Alleviating Social Costs

Requiring everyone in the community to buy into the water system through monthly user fees is one of the components for successful community water governance systems. However, lack of expertise, social pressure and concerns for equity make the effective creation and implementation of user fee schemas more difficult. Designing a sliding scale fee system that satisfies a closed loop budget and allows for low-income users to contribute without overburdening them requires technical skill. AguaClara-APP could provide more technical assistance on developing and applying user fee schemas.

Charging appropriate user fees, ones that will not only allow for daily operation and maintenance, but for the long term lifecycle costs of a plant is

[5] AguaClara-App set their capital costs at approximately $80,000 per plant (see Table 2), however the real capital construction cost estimates for each plant double when overhead for APP engineers, technical assistance and oversight, and community contributions are accounted for. For more discussion on AguaClara's costs please see Rivas et al, 2013.

necessary for its continued operation. Learning how to set water fees and employ sanctions when users fail to pay is imperative for water boards. Nevertheless, water boards should ensure that their fee scales do not exclude the poorest and most marginalized. To safeguard equity and to aid the long-term operation of the water treatment plants, AguaClara-APP should develop comprehensive training modules for devising fair fee scales.

Many sliding scale tariff structures require metering. AguaClara-APP water connections are unmetered, and the cost of metering if even possible would likely offset any of the benefits. As a preliminary step, AguaClara-APP could develop a three-tiered flat fee to cover costs and protect low-income households. The top tier could be reserved for industry and businesses with a certain number of employees, the second tier for residences, and the lowest tier for families that have difficulty paying such as unattached elderly, single parent households, and the unemployed. The lowest tier can be decided on an application basis reviewed by the CWB or the entire community assembly. The benefits to this system over a more complex or rigorous sliding scale system is that it affords a level of privacy and does not require a high level of paperwork or investigation; applications can be decided based on general community knowledge of specific household need. It will allow

Coupling a sliding scale training module should, together with a module on establishing rules for cutting off service, reduce some of the social and emotional costs for board members. Currently communities have varying rules for cutting access to water for people who have not paid. While the rules may remain flexible from one community to another, each board should develop set rules for

discontinuing service and a mechanism to address grievances. These rules could be discussed and agreed upon during the community socialization process. The rules remove pressure from the individual, and redistribute it to the community as a whole who have agreed to the rules. As sanctions are more rigorously applied, water boards may need to develop more formal internal adjudication processes and arbitration mechanisms.

Flexible APP-AguaClara training modules on developing and implementing these mechanisms will allow communities to design them to fit their values. The sanctions, adjudication and arbitration will remove some board member discretionary decision-making, but the community may decide on the degree of discretion. Arbitration and adjudication procedures may be public or private, they may be internal or external; communities can decide whether they value privacy or transparency, community or external judgment. Instituting equitable sliding scales may also help board members enforce sanctions because they will have a system to provide for community members; and lack of payment is less likely to be a product of need.

Most users do pay their fees, despite imperfect fee and sanction systems. AguaClara found that users are motivated by a visible and qualitative shift in the service and in quality of the water itself. As people become accustomed to high quality water, the benefit becomes invisible. Interest can wane, and this can result in decreased user fee payment and governance participation rates. Sanctions will dissuade users from stopping payments; however finding a way to maintain interest in and exhibit continuing utility of the water system to users, will also

discourage arrears. AguaClara-APP communities have begun to imagine and design projects to maintain interest, such as connected reforestation and youth education programs mentioned in the previous sections. Sharing best practices through AguaClara-APP with examples of keeping the water system visible will provide communities with an arsenal of tactics while encouraging continued creativity.

Engaging Women

Lastly, AguaClara-APP wants to include more women in leadership roles. Although women account for half of users, making many of the household decisions about water use, they account for only a small fraction of board members. When we exclude the position of secretary, the number of women serving is more drastically reduced. Nevertheless, many of the women users expressed the same sense of ownership that their male counterparts expressed. Why then are they not participating?

The first step toward increasing inclusivity is to ask women why they are not participating. Women may feel like they are participating. Others may feel that they do not need to participate because they already understand the value of high quality water, as many female interviewees expressed. Still others may identify barriers, social or logistical, that prohibit them from participating and taking on leadership roles in water system governance. Asking women why they do not participate in a safe environment gives them a voice to express how and if they want to participate. Proscribing how and how many women should participate may serve to disempower women. Many women in Honduras are already working a double shift, adding a third shift by requiring participation may be oppressive

rather than empowering. Soliciting their input will contribute to a more robust and inclusive governance model.

Secondly, as Tiessen (2007) points out, gender exclusion and barriers can exist both in the field and within the program. If there are cultural barriers to women taking on leadership roles, hiring more women in leadership roles can help to overcome these barriers and acculturate men to collaborating with women in leadership positions. At the time of the study, there was only one woman, a former Cornell student, providing technical assistance in the field for APP, though the majority of Cornell students contributing to AguaClara design and research are women. Supporting women leaders who work in the field, demonstrates the organization's commitment to gender equality and provides an example of female leadership.

Finally, ensuring that logistically women can participate may increase the likelihood that women will participate. Women often have distinct roles from men. They are more likely to work within the home, perform household chores, and take responsibility for childcare (World Bank, 2004). Since meetings are often held when children are not in school (on the weekend or in the evening), by speaking with women community members AguaClara-APP can identify times of day and locations that will allow women to participate and then schedule meetings accordingly. Providing childcare may also increase the likelihood of women's participation. Providing women with means to stray from the home increases their likelihood of doing so.

Conclusion

Community governance is the other half of the AguaClara technology; neither the governance model nor the technology functions properly alone. AguaClara and APP have developed a model that provides access to affordable technology to deliver high quality water. They deliver this service by harnessing social capital and human capital through community participation and governance. They enhance these capitals by providing continuing training and support. They actively cast a wide net, striving for equality and empowerment through participation. This report details the strengths of the program and aims to augment them by providing analysis of participation barriers and recommendations for alleviating them.

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