Abstract

Chicorral is a small, indigenous community in rural highlands of Guatemala. As with many rural communities in the country, Chicorral suffers from a severe lack of infrastructure: over half of the approximately 200 residents do not have access to an improved water source. These residents must climb down a steep, 100-meter ravine to reach the community's main reliable water source. Women and children bear the responsibility of taking this trip up to 5 times a day, carrying up to 10 liters in each trip. The community requested support in having water pumped up to the communal center. In 2006, EWB-USA JHU made the first assessment trip and proposed to design and build a photovoltaic-powered system that would pump water from the ravine to a communal tap. Continuing social assessments revealed, however, that expanding the system to include household water distribution was important for three reasons: (1) household distribution would be more equitable, and residents would thus be more willing to pay a water usage tariff; (2) by having household distribution for at least 85% of its residents the community could be recognized as an independent village (aldea) rather than a semi-independent community (paraje), which is an important goal for residents; and (3) a design that includes household distribution could be integrated into regional water plans and allow the project to receive funding from the Municipality of San Bartolo, to which it belongs. Therefore, in 2012, the team agreed to extend its original design. The project now entails pumping water to a distribution tank 170m above the ravine, from which water will be distributed by gravity into each of the 22 participating households.

Our team has designed the water distribution system to meet World Health Organization guidelines[1] for improved drinking water sources. This includes protecting the water source from outside contamination and providing a minimum of 50 liters of water/person/day for household consumption and sanitation use. With this design basis, our team expects that the households participating in this project will benefit in regard to the following two metrics:

1. Per capita water consumption (as needed for hygiene as well as drinking);
2. Time spent collecting water.

To further community involvement in the project, EWB-USA JHU helped residents create a legal body, the Water Committee of Chicorral, to manage and provide oversight of the overall project sustainability. The committee is comprised of one member from each of the 22 involved households and has an Executive Board, or Junta Directiva. It has acquired the rights to the water source and all other property where system infrastructure will be placed, and has overall ownership of the project. The Water Committee will oversee the project's implementation and be responsible for long term maintenance. Recognizing the importance of community involvement in the project, we have conducted informative meetings with the Water Committee on each of our trips.

Furthermore, the team and community have developed working relationships with the Municipality of San Bartolo, which has agreed to lend its financial and political power to the project, and Agua del Pueblo, a Guatemalan NGO with over 40 years of experience in rural water projects in the country. In 2013, the team and these three partners signed a formal Memorandum of Understanding (MOU) outlining each party's responsibilities throughout the system's life.

During implementation, the Water Committee will be principally responsible for providing lodging and the required unskilled labor for construction. After implementation, the EWB-USA JHU team and Agua del Pueblo

Commented [CU1]: What was the purpose of these meetings? To brief the Water Committee on project progress? What kind of input did you seek from the Water Committee at these meetings? Concurrence/approval on the direction of the project? Something else?

[1] World Health Organization. *Guidelines for Drinking-quality Water*. Rep. 4th ed. Malta: Gutenberg, 2011.

will train the residents to use and maintain the system. Agua del Pueblo specializes in community organization and training; with their assistance, the team will develop an education program focusing on water quality and use of the system. The maintenance program will focus on procedures for routine cleaning and troubleshooting problems and will train a community maintenance team in charge of conducting basic maintenance on all parts of the system. This will include work such as routine cleaning of parts and repairing small leaks. For serious emergencies the community maintenance team will be instructed to call Agua del Pueblo for advice or, if necessary, to send out the proper response team from Agua del Pueblo's headquarters, located approximately 2 hours away from Chicorral.

In addition to supporting the community maintenance team, the Water Committee will also be responsible for collecting a water tariff which will be used for system maintenance. Over the long term, the Municipality of San Bartolo has agreed to support the system by paying for the replacement of pumps if they fail, saving the community significant maintenance costs. The water tariff will cover the rest of O&M costs, including trips by our in-country partners at Agua del Pueblo and Alternativas Energeticas Renovables for technical checkups or to resolve non-routine issues.

The schedule for implementation of the water distribution system has been divided into 3 phases. Phase 1 of the system consists of the construction of the spring box and the pump tank, the installation of one pump, the construction of the storage tank, the layout of the piping from the pump tank to the storage tank, and the installation of the photovoltaic array and all its electrical components necessary to support the first pump. Phase 2 consists of the distribution network extending from the storage tank; however, this part of the system will be constructed and financed by a third party (the Municipality of San Bartolo). Phase 3 consists of the completion of the system by installing the second pump and associated photovoltaic and electrical components to provide enough capacity to last the community for 20 years. This number is based on a usage of 50L of water per day per person, with a population growth of 3%.

In April 2014, the team and its in-country partners began construction on the system and have now completed the spring box water capture tank and pump tank. Construction is now shifting to laying the piping and construction of the distribution tank, which is expected to be completed by November 2014.

In addition to the three partners mentioned above (Water Committee of Chicorral, Municipality of San Bartolo, and AdP), EWB-USA JHU receives professional and financial help from partners such as Dr. Debora Ley, Alternativas Energeticas Renovables (AER), and the Baltimore Rotary Club. Dr. Ley first introduced EWB-USA JHU to the project. She is an expert in rural renewable energy systems, and has assisted the team throughout the entirety of the project. AER is a Guatemalan firm specializing in rural photovoltaic projects and will be supplying all electrical components for the system. The company's owner has also provided technical assistance to the system's electrical design and has received training on US codes and standards for solar systems. The Baltimore Rotary Club has assisted the project financially since 2013 and is now working with the Towson and Quetzaltenango Rotary Clubs to apply for additional support through the Rotary International Global Grant Program.

To date, the team has raised approximately $51,000. As previously described, funding has largely come from the individual donors, the Davis Project for Peace, the Johns Hopkins University Alumni Association, and the ERM Group Foundation. An additional $13,000 in emergency funds held by the EWB-USA JHU chapter is available to the project, if deemed absolutely necessary, bringing the total available funds up to as much as approximately $64,000. This past year, the team has spent $50,000 of the $51,000 to pay for one trip to the community and all construction costs related to the concrete structures and piping for Phase 1. The team still needs to raise money for the key electrical components so that the system can be functional for the community.