



Princeton University Chapter of Engineers Without Borders

129 Guyot Hall

Princeton Environmental Institute

Princeton University

Princeton, New Jersey 08544, United States of America

ewb@princeton.edu | +1 (917) 822-1918 | ewb.princeton.edu

This past year has been an exciting one for the Engineers Without Borders - Princeton University Chapter. Over the summer, our chapter implemented a rainwater catchment system in Kenya, which is providing clean drinking water to school children and completed assessment trips for water distribution systems in Peru and the Dominican Republic.

Kenya Program

The Princeton University Engineers Without Borders Kenya team is beginning their fourth year working with communities in the Kuria West district, in the southwestern region of Kenya. The team's mission is to provide sources of readily accessible, potable water to their partner communities. Over the duration of their project (program?), we have designed and implemented three rainwater catchment systems—two in the village of Muchebe and one in the village of Komosoko. The rainwater catchment systems direct rainfall onto the roof of community buildings through a filtration system and into storage tanks, where it is readily available to local inhabitants. The rainwater catchment systems that have been implemented by the Kenya team provide 187,500L of water storage capacity in total. The team has also worked to teach each community about good maintenance and water management practices that will allow them to preserve their current water sources. Each rainwater catchment system is partially purchased by the community, and locals provide much of construction labor. A committee of locals are responsible for ensuring the sustainability of the project, ensuring that they feel a sense of ownership over their systems.

This year the Kenya team will be partnering with the community of Kubweye to implement a borehole. In-country assessment at the primary school has shown that it has excellent hydrogeological conditions for drilling, so the borehole has the potential to provide a robust source of water for the community. They will be opening a boarding school in the next year, which will result in a significant increase in the number of children living locally. The borehole will be located such that it will serve the school closely. In addition to this new implementation, the team will continue to monitor the three previously installed rainwater catchment systems to ensure that they are functional and well maintained.



Grace Lynch '18 works with Komosoko natives to trench for the rainwater catchment system.

Peru Program

The Peru team of Princeton University's chapter of Engineers Without Borders works in the La Libertad region of northern Peru. The team's first program began in 2005, in the community of Huamanzaña, where they worked on the design and construction of latrines, solar lighting systems, cookstoves, and a water system, in order to address the most pressing needs of this community. From 2010 to 2015, the team built two gravity-fed water pipelines within the upper and lower parts of La Pitajaya.

The team established its most recent partnership this past year with the community of Pusunchás which is comprised of 97 families who lack access to clean drinking water. The team traveled to Pusunchás this summer and conducted a thorough technical assessment, including an analysis of flow rate measurements, water quality testing from several natural springs, and a topographic study of various pipeline routes. The legal aspect of the assessment involved obtaining the permission of landowners to put a pipeline through their land and of the Peruvian government and source owner to use the preferred water source. Our financial study included obtaining prices for materials from local hardware stores and discussing labor costs with a trusted mason.

One key task for the coming year is to determine the final optimized layout of the pipelines and the location of necessary pressure breaks. Because this project will be several times larger than previous projects, we are interested in identifying and utilizing water distribution modelling software. Another goal is to calculate precise dimensions and determine material requirements of our system components, including our source capture, reservoir, pressure breaks, and tapstands. We are therefore looking for a professional mentor with hydraulic or structural experience to assist us with these challenges. Less technical goals for the year include completing documentation for EWB-USA's review; writing a user manual for the JASS, or water committee, in Pusunchás; and creating educational material to teach the children at school about the project and safe water practices in general. Our broad, long-term goal for this project is to establish not only a functional water system but also an experienced and capable community leadership that can sustain it for the years to come, beyond our 3-5 year involvement.



Leoncio, the president of the JASS in Pusunchas, talks with 2015 Project Manager Kasturi Shah '16 and 2016 Project Manager Corrie Kavanaugh '17 about their vision for the pipeline.

Dominican Republic Program

This summer, our travel team spent 17 days in the Dominican Republic carrying out an assessment of our partner community, El Cajuil. The primary activities undertaken included water testing, mapping of the pipeline, and conducting a community wide census. We conducted laboratory biological and home chemical testing throughout the existing water system and found that the only health-risk present was fecal coliform. The existing pipeline was mapped with the use of a handheld GPS and a GPS station, including all pertinent elevation and sizing data. With the help of the community, we were able to locate a secondary source, a mountainous spring which could add water to the system, and to map a pipeline from the source to the existing pipeline. Our final task was a community census. We went house to house, conducting a survey regarding household demographics and water use patterns. Through this we were able to determine roughly how much water the community needs, how many people are in the community, and how much growth is to be expected in the coming years. The collected information was validated through meetings with the local water committee.

In conclusion, although there is enough water in the primary tank to fulfil the community's needs, the existing distribution system is defective. For the next year, the team will begin designing multiple additions to the system, including: control valves to reduce water loss from the tanks; water meters to monitor and encourage a reduction in water usage; an automatic chlorination system to adequately remove harmful pathogens; an additional collection tank to increase storage capacity and increase mid-system water pressure; and a new transmission line to increase water flow in the system. Adding a secondary source will be a long term goal, as the immediate issue is distribution, not capacity. Our proposed solution will also include a significant education factor, as the community will need to re-learn how to use and conserve water, as well as learn about the improvements that we put in so that they can properly maintain the new components.

This summer the Dominican Republic team will be working on an existing system that needs to be improved. In order to do that, ideally we would need a mentor with experience in water systems design as well as systems engineering. If this is not possible, a pure systems engineer would be most useful. Our project will likely involve a combination of small fixes throughout the system, and we need a mentor to assist in the process of determining which fixes would have the largest impacts. Additionally, someone with experience in working with active systems would be ideal, as we will need to make adjustments to the water system while it is still supplying water to the community.



EWB-Princeton and the local water committee ratify the Project Partnership Agreement.

Recognition

The **Princeton University Chapter** has been recognized as EWB-USA's 2016 Premier Chapter. The Premier Chapter Award recognizes chapters that strive to meet the ideals of a successful EWB-USA chapter. These ideals highlights projects that deliver high quality, sustainable solutions to help meet the basic needs of partnering communities abroad.

Below is EWB-USA's praise for the chapter:

The EWB-USA Princeton University Chapter continuously dedicates themselves to the empowerment of both their volunteers and partnering communities in Peru, Kenya, and the Dominican Republic. Their Kenya program was an EWB-USA Premier Project Award winner last year. In addition to their work abroad, their on-campus Sustainable Engineering and Development Scholars (SEADS) program has gained national attention. We are proud of this chapter's hard work and dedication EWB-USA!