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Sustainable Development in Rural Ghana

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Author's Note

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Abstract

Since 2004, Columbia students have been partnering with Obodan, a rural farming village in western Ghana, to develop and implement engineering solutions to problems like water distribution and sanitation. The overarching organization, Engineers Without Borders USA (EWB), has been supervising both the technical details of the projects as well as the community development and adoption thereof, as it does for hundreds of similar projects around the world. Working in Obodan with my classmates and EWB has been the defining experience of my time as an undergraduate, as we learn the possibilities and limitations of engineering, the joys and pitfalls of development work, and how we can carry these lessons throughout our personal and professional lives. This photo essay aims to describe the activities of a typical EWB trip and reflect on the role our work plays in sustainable development.

Introduction

In 2002 an American civil engineering professor from the University of Colorado, Boulder and a landscaper from Belize met by chance, teamed up, and built a much-needed water distribution system in the landscaper's home village of San Pablo, Belize. The success of the project and its immediate improvement of the villagers' daily lives inspired the creation of Engineers Without Borders USA (EWB). EWB set out to bring together the skills and resources of engineers with the needs of developing communities to produce sustainable engineering solutions and lasting transnational ties. Engineering students and professionals across the country took interest in the program, which has since spread to over 350 small-scale engineering projects in 45 countries. Partnering with local NGOs and community leaders, EWB chapters work on projects like footbridges, rainwater harvesting systems, and agricultural processing machines. The projects ensure sustainability not just through eco-friendly design but also through securing community adoption and developing long-term maintenance plans.

The Columbia University EWB student chapter was founded in 2004 when the community of Obodan, Ghana, with the help of the NGO SuDeX (Sustainable Development Extension Services), reached out for help with its sanitation and water infrastructure. Obodan is a rural farming village an hour northeast of the capital Accra. At the time of Columbia's first encounter with Obodan, the villagers were using hand-dug pit latrines for human waste. These pits posed a serious hazard to

human health, especially during the rainy seasons when they were prone to flooding. For household water, the villagers were spending hours waiting to collect water from hand-pumped boreholes and then carrying heavy buckets home. The Columbia EWB team focused first on sanitation and built a ventilated pit latrine in 2005 and proceeded to construct six source-separated composting latrines in 2011. Currently, the team is focusing on designing a water distribution system to relieve the community members, particularly women and children, of the tedious walks, long waits, and heavy burdens associated with the hand-pumped boreholes.

Figure 1: A midday scene from the center of Obodan

This past May, I traveled as part of the EWB Columbia Ghana team to Obodan, Ghana. In this midday scene, the village center is hot and quiet. Villagers take refuge under a canopied bus stop along the road. This road bisects the town and is Obodan's lifeline to the rest of Ghana. It is the road along which agricultural products grown in the hills are transported to nearby towns and commuters can take buses to their places of work.

Figure 2: A Columbia student and an Obodan woman inspect one of the composting latrines.

On this trip, the EWB Columbia team completed some composting latrines that were started last year. Most of the outer structures had already been built but lacked important details, such as doors and plumbing. These sturdy, concrete huts, like the one pictured above, provide privacy for the users and protection from runoff waste, vastly improving upon the existing hand-dug pit latrine system. By keeping the waste contained, these latrines prevent groundwater contamination and spread of disease. Moreover, the composting process renders the waste safe to handle and useable as a soil substrate, so that unlike with conventional latrines, the villagers do not have to pay an outside service to pump out the waste, but can safely dig it out themselves.

Figure 3: A Columbia student stabilizes a ladder while an Obodan man prepares the latrine roof for ventilation installation.

Figure 4: Columbia students take surveying data along a proposed pipeline for the water distribution system.

The design phase of an engineering project requires extensive data collection, and the EWB Columbia water distribution project is no different. Here, Columbia students measure elevations using a tripod, a scope, and a stadia rod, which is a large measuring stick. Since the water distribution system is designed to be gravity-fed, it is important that there is enough head (elevation difference) along the piping path line.

Figure 5: Columbia students perform a slug test on one of the boreholes in Obodan.

The EWB Columbia team also collected data on the capacity of the boreholes. The boreholes draw water from an underground aquifer, which is finite in capacity in terms of number of liters that can be withdrawn per day. Since the water distribution system would ease the collection of water, EWB Columbia predicted that the water consumption per household would also increase. Thus, EWB Columbia needed to test the capacity of the aquifer to ensure that the design would not lead to the overconsumption of water and subsequent diminishing of the groundwater source. Here, the students and their mentor perform a slug test, a simple field method for determining the capacity of the aquifer. The activity drew a lot of attention from curious local children.

Figure 6: Columbia students and Obodan schoolchildren spend a lunch break horsing around.

EWB Columbia has been coming to Obodan for over seven years, and the community members - especially the children - continue to be friendly and welcoming. One surprise for the EWB Columbia travel team was that once school let out for the day, children swarmed the project sites and bombarded the Columbia students with questions, suggestions, and demands.

Figure 7: The EWB Columbia team returns on foot to Obodan after an afternoon of working on a latrine in a nearby satellite village.

Upon returning from a worksite one village away, the Columbia students noted that a year ago, the road above was unpaved and there were neither the electricity lines nor the sign for Obodan. A lot has changed in Obodan since EWB Columbia's first project in 2005. However, much of the change is not due to the direct efforts of EWB Columbia, but to the motivated and compassionate community leaders who want to raise the standard of living in the village.

Figure 8: Community leader Samuel Gamson (left) converses with fellow development worker and old friend Steve Forbes (right).

The EWB Columbia team could not have done any work without constant cooperation from Sammy and Steve. Samuel Gamson, left, is the assemblyman for Obodan. Much of his ambitious vision for the village (such as a police station and electricity) has already been implemented, without EWB involvement. He is the key community contact for EWB Columbia. Steve Forbes, right, has been working in Obodan with his NGO SuDeX (Sustainable Development Extension Services) and as a mentor for EWB Columbia students. The community has rewarded his efforts by making him a chief. The project was group effort. Obodan would have more difficulty addressing their sanitation needs without the skills and resources of EWB Columbia engineers, and EWB Columbia engineers could not have built any latrines without the guidance and local knowledge of Sammy and Steve.

Figure 9: High school girls wait on line to fill their water buckets from the borehole.

One afternoon, the EWB Columbia students noticed an unusually large crowd of young women surrounding the borehole. The young women informed us that the electricity had gone out at their nearby girls' high school, so the pump at their borehole was not working. The students had to carry their buckets to one of Obodan's hand-pumped boreholes in order to fetch water for dinnertime cooking and washing. They also said that this was not an infrequent occurrence since the electricity lines were unreliable. The continued need in Obodan can be upsetting. These girls served as a reminder that reliance on a shoddy electrical grid and a hand-pumped water source was an inconvenience that took away from time better spent in school, and that the water distribution system project undertaken by EWB Columbia would vastly improve the quality of life in Obodan.

Figure 10: While waiting for their turn to collect water, high school girls made friends with the EWB Columbia students.

Communication, whether through attending chiefs' meetings or holding casual conversations as pictured above, is the best way to determine community needs, measure project success, and strengthen the bond between Obodan and EWB Columbia. Asking the villagers what they wanted yielded straightforward answers. A private bathroom. Access to water in their own homes. A semblance of a wealthier, more urban life. We can't deliver everything, but we will continue to collaborate and develop meaningful infrastructure that will last as long as the transatlantic friendships and memories. EWB is much more than just the projects it completes. It is both a model for development and a method of teaching the next generation of engineers about how we can use our skills to address the needs of communities everywhere. EWB is not a perfect model of development.. But EWB is a way for us, a team of budding engineers, to learn hands-on the joys and failures of engineering development work so we can continue to seek a better, more sustainable future.