ENGINEERS WITHOUT BORDERS
university of pennsylvania

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Welcome to the 3rd edition of Penn Engineers Without Border's newsletter! It's been one year since our last publication. Since then, we've been busy at work bolstering our portfolio of projects. I'm happy to announce that we've just completed a site assessment for our next international partnership with the community of Gundom, located in Cameroon. This will be our third community commitment and our fourth international project.

Now that we've developed an internal rhythm for identifying and developing projects, we've decided to spend some time growing our network, both on campus and off. In April 2008, we were invited to attend the EWB-USA conference in Seattle and present the lessons we'd learned during our projects, to serve as a primer for new student chapters. In October 2008, we were invited to speak at the Philadelphia screening of the critically acclaimed documentary, For Love of Water, on water privatization and its impact on developing communities. Inspired by the film, and encouraged to network with other student organizations, we worked with Penn International Business Volunteers to host a panel discussion with representatives from academia, a development NGO (Philadelphia Global Water Initiative), municipal water utility, and government regulatory body (EPA).

In additional to our traditional infrastructure development projects, we have recently expanded into design-oriented projects, which spend most of their time in the laboratory instead of the field. An integral part of the *ethos* of sustainability is the usage of appropriate technology. These technologies are designed with special consideration given to the context in which they will be used. As such, they are usually low cost and easy to maintain. While some things like pipe systems and concrete tanks are age-old appropriate technologies, there is still room to innovate. Today, PennEWB is working with the University of Edinburgh to design a sensor that uses biological agents to test for the presence of dangerous levels of arsenic in the water, a major problem in places like Bangladesh and Thailand.

As one of the largest student run organizations on campus focused on development work, PennEWB is working with a consortium of other likeminded groups to lobby the university administration to make Penn the "Development Ivy". Using the class that we've set up for our members to take prior to an implementation trip as a model, our coalition is pushing for the university to add a multi-disciplinary minor available to all students. By combining our efforts, we hope to make Penn's course offering more appropriate to address the global challenges in development that face our generation.

I'd like to thank all of you for supporting us and taking the time to read this installament of our newsletter. We look forward to seeing you throughout this exciting upcoming year.

Jay Parekh
President, PennEWB

Congratulations and Welcome to the 2009 Board

President: Alex Yen, 2010
VP International: Davesh Shah, 2010
VP Local: Marija Mircevska, 2011
VP Public Relations: Galina Grigoriev, 2010
VP Design and Implementation: Matt Owens, 2009
Treasurer: Rikki Irwin, 2012

International Committee Update

Haresh Tilani

In 2008 the International Committee established a new project in Cameroon, and simultaneously laid the groundwork for a number of future collaborations and projects. Over the recent winter break, a team of two students and two mentors traveled to the Bome Valley in Cameroon. The purpose of the trip was two-fold: firstly, the team conducted a follow-up site assessment of our water distribution project in the village of Kob, Cameroon, that was constructed during an implementation trip during the winter break of 2007. Progress has continued since we left – the tanks and main pipelines are now in place, and the system will begin operating once the final phase of construction is completed in the near future. In keeping with our aim of promoting sustainable development, PennEWB has been and will continue to maintain contact with the community of Kob to ensure the completion of this project.

The team also conducted an assessment for our new project in the neighboring village of Gundom. Consisting of only thirty households that rely on subsistence agriculture, the village is one of the poorest in the region, and is currently unable to meet the basic water needs of its residents, especially during the dry season. In order to provide a sustainable solution, PennEWB aims to channel water from two existing springs and supplement this distribution with a rainwater harvesting system. The construction of this system will be the first phase of a larger project that addresses water and sanitation needs for a total of eleven villages in the Bome valley, where Gundom is located. This goal will be achieved through the construction of sustainable water systems coupled with long-term sanitation education and intervention programs to augment the beneficial effects of a clean water supply.

Looking to the future, PennEWB is exploring the feasibility of a micro-hydroelectric project in Zambia that aims to provide a sustainable energy source for a remote community. A future collaboration with the Penn Global Health Initiative (Penn GHI) that is already established in Guatemala is also in the works. All in all, this year looks even more promising than the last, which ultimately means there are even more opportunities for you to get involved! We look forward to working with you in 2009.

Local Committee Update

Matt Nakatsuka

This past semester the Local committee of PennEWB took on its most challenging and expansive project to date, collaborating with W.B. Saul High School of Agricultural Sciences in designing and implementing a biodiesel processor. The overarching goal of the project is to design a complete system to turn waste vegetable oil collected from the Thai Singha House restaurant into usable biofuel. To accomplish this goal, several groups have been established to bring together many separate elements.

Currently, the laboratory team has been working to perfect the biodiesel chemical reaction, as well as working to adapt the laboratory procedures into a process that can be used on-site at the school. The team can currently process batches of up to three liters of oil at one time in our custom-designed small scale processor. In the coming semester, the team plans on further improving product quality while increasing the amount that can be handled at one time.

To further product quality, another team has formed with the goal of improving our washing techniques, as well as automating and integrating the washing procedure with the processor. This team's goal will be to allow for a seamless transition between production, washing and storage.

The implementation team worked hard this semester at laying a strong foundation at W.B. Saul High School, educating the students about the chemistry and benefits of the biodiesel project, as well as working with them to replicate the results achieved by the laboratory team. Future efforts will be focused on designing and building a much larger processor at the school, enabling the project to continue expanding in scope.

Design Committee

Matt Owens

The design committee is tasked with researching in detail a challenge faced by developing communities and exploring new approaches to solutions that could eventually be incorporated into an international project. This past semester the focus has been on arsenic contamination of drinking water. Globally millions are exposed to arsenic-contaminated water, and the problem is particularly severe in regions of Southeast Asia such as Bangladesh where close to two-hundred thousand deaths are expected from the last few decades of exposure. Years of drinking arsenic contaminated water causes various skin lesions, which lead to skin cancer; Bowen's disease; and cancer of the lungs, liver, colon and bladder. Our committee has been investigating the problem from two perspectives remediation and detection.

Removing Arsenic from drinking water can be accomplished in several ways, one of which is the use of absorbents such as iron particles. We have partnered with Innova Materials, a recent Penn spinoff company, to explore new ways to coat materials with absorbents to make filters which are more affordable, portable, and easily distributable than those currently in use.

Even with an effective way to remove arsenic, however, there is still pressing need for improved field detection methods. We have in the past semester reached out to a research group in Scotland which has developed genetically modified bacteria able to cause color change of an indicator chemical in the presence of arsenic. We have considered the challenges involved in translating such a discovery into a viable field kit and are currently seeking graduate students with experience in microbiology to continue the project further.

In the coming semester the design group will continue to explore the projects above and consider other aspects of global access to water by rural communities.

PennEWB at Greenfest

Galina Grigoriev

This past fall, Penn EWB participated in Green Fest, a biannual celebration of environmental sustainability sponsored by Penn Environmental Group. Organizations that work to promote environmentally friendly initiatives including Farmecology, Philly Car Share, Habitat for Humanity, and Neighborhood Bike Works, joined us on college green for the event. Together we spread the word of sustainability and green alternatives to the campus population. The event featured locally grown food, distribution of energy saving light bulbs, and ink cartridge recycling. All of this was supplemented by spontaneous musical performances. EWB helped out with the s'more making, which was a big hit. In addition to introducing the delicious snack to those who have been missing out, we educated the campus about our cause and upcoming projects. The event was also a great opportunity to interact with other groups with similar objectives, which may lead to future collaboration.

FLOW Screening at Penn

Dorsey Standish

Last November, Penn's EWB hosted the FLOW (For Love of Water) screening event to raise awareness about the shortage of safe drinking water. The local, national, and public relations groups collaborated to put on the event open to all Penn students and faculty.

In order to garner extra support and attendance at the FLOW screening, the PR group put together eye-catching fliers and even organized a raffle. The raffle prizes, which included Q'doba burrito cards, a White Dog Cafe gift certificate, and sleek reusable water bottles, attracted even more excited students to discuss the importance of water awareness.

Penn's EWB took a field trip to see FLOW earlier in the year, and rave reviews, from both Quakers and critics, inspired the organization of a free screening date for all of Penn. In the film, Irena Salina investigates the "World Water Crisis," asserting the importance of the issues, especially as we enter into the 21st century. Salina explores the water crisis by focusing on politics, pollution, human rights, and the emergence of a domineering world water cartel, and expert scientists legitimize her claims. Furthermore, Salina does not simply state the problems—she provides simple solutions for viewers that can ease the predicament.

All FLOW viewers, whether EWB members or not, responded positively to the film. One non-member, Iris, who had simply seen a flier and come, reflected, "I can't believe those water executives can deny those impoverished children water. It seems so inhumane—I never even realized lack of water was a serious issue." Others echoed her views; the unabridged documentary exposed the hidden water crises, shocking the audience.

The screening had the desired effect in that everyone left reconsidering the value of water, eager to help those that don't have endless packs of bottled Deer Park stacked in their dorm rooms. In the movie's spirit, EWB served Brita-filtered water at the event, encouraging others to follow suit. Later that week, EWB collaborated with PIBV for a Water Discussion Panel that wrapped up a successful event.

Water for Sale Panel Discussion

Galina Grigoriev

As a supplement to the screening of *For Love of Water*, EWB worked with PIBV to organize a panel discussion on water related issues. The afternoon opened with an introduction by Dr. Christian Morssink, a member of Penn Medicine's Department of Public Policy and Health. Additionally, he is on the board of the Philadelphia Global Water Initiative. He discussed the gravity of the water issues currently facing the world and the need for urgent action to address these concerns. He also emphasized that these are the problems that will be facing us as future engineers. Dr. Waheed Hussain, an assistant professor in the Department of Legal Studies and Business Ethics, moderated the panel discussion that followed. Panelists included EPA Deputy Director Mr. John Armstead, Director of Regulatory Affairs of the North Wales Water Authority Mr. Tom Bradbury, Program Organizer of the Philadelphia Clean Water Action Ms. Anne Misak, Consulting Historian of Technology at Penn Dr. Fredric Quivik, and Dr. Morssink. Based on the expertise of the panel members, the discussion focused primarily on national water issues.

One major topic of conversation was the privatization of water. The experts deliberated over the declaration of water as a right rather than a commodity. The general consensus was that all people should have access to clean drinking water; however the availability of this source may have to come with a price. The purification of water requires basic infrastructure and monetary investment. The question lies in who will supply the investment necessary to make this temporarily ubiquitous resource available for consumption.

The experts also emphasized that tap water is entirely safe for consumption due to the stringent government regulations it must meet. Meanwhile, although bottled water should also be safe for drinking, it is not held to the same standards as tap water. Bottled water is not regulated and there is no evidence that the privatized companies process the water in the ways that they claim to.
This conversation led to further discussion of the currently pressing issue of pharmaceuticals in water. Miniscule traces of pharmaceuticals have recently been found in purified water. Although these are very tiny amounts, it is not yet known if these traces may have a significant effect on the consumer. The main concern is that substances such as hormones, which are commonly taken by prescription, are made to work in small doses. Therefore, the tiny amounts found in the water may lead to considerable consequences. According to Mr. Bradbury, water purification plants are now focusing on filtering out these potentially dangerous substances. However, this technology may prove to be incredibly expensive and research is still ongoing.

The conversation followed with a short question and answer session with the audience members. Dr. Quivik closed the event with a brief description of the importance of water through the course of history. This highlighted that the water issues discussed will not resolve on their own. Once again, he mentioned the fact that the current generation will bear the burden of these water problems and will have to develop creative solutions.

Overall, the panel was a very enlightening addition to the Water for Sale event.

Gundom Assessment Trip

Davesh Shah

Penn EWB's previous efforts in the villages of Kob and Tudig turned out to be a great success thanks to the immense teamwork efforts between students, mentors, and our friends in Cameroon. In an attempt to build upon these relationships fostered with the Bome Valley community in Cameroon, an assessment team comprised of two students and two professional mentors went back in early January to explore the feasibility of a new clean water distribution project in the village of Gundom, Cameroon. In addition, the assessment allowed for the opportunity to follow up on our ongoing water project in the villages of Kob and Tudig.

The team consisted of students Davesh Shah (MEAM '10) and Paul Masafu Mwasame (CBE '12). Davesh was a part of Penn EWB's implementation team for last years' project in Kob and Tudig. Paul is a new member who has taken the initiative to help lead the assessment team towards a third community partnership for Penn EWB, and second in Cameroon. The two mentors on the trip were Dr. John Keenan, professor and mentor within SEAS, and Vince Uhl, a principal hydrogeologist. Both have previously mentored the Penn EWB team that traveled to Cameroon in 2007-2008.

Gundom is a small community of about 300 people that is far isolated from the Bome Valley in the Northwest Province of Cameroon. The isolated location of the community posed a particular challenge in that home base for the assessment team was several kilometers away and at the bottom of the Gundom mountain. Since road conditions prevented the use of cars, the students had to hike up the mountain daily. The topography of the location contributes to the technical challenges of designing a water project that can serve many people including the local Church and school.

Overall, two springs were successfully identified and analyzed for a potential water system that a team of students and mentors can implement in summer 2009. Careful planning will be needed to address the technical and geographical obstacles that this project presents. Additionally the team will develop sanitation and education initiatives that will be essential to securing long-term sustainability. Given the lessons learned from our friends in Honduras and Cameroon on PennEWB's previous projects, we believe that the village of Gundom will be able to gain safe access to clean water that will improve the agro-economy and the overall health of the village.