

Mines has taken the lessons of history and designed a one-of-a-kind humanitarian engineering program.

By Doug McPherson

Humanitarianism Reengineered



Clockwise, beginning top left: The people of Colinas de Suiza, Honduras, bury 4-inch pipe for their town's new water system; senior Alison Bratrsovsky shows teachers at the Wanyange Girls School in Jinja, Uganda, how to operate a GPS; seniors Natalie Wagner, Michael Gulsvig, Shannon McNamara and Michael Hoban plan for the next day's work in Colinas de Suiza; Geophysics graduate student John Jackson prospects for water in Makondo, Uganda.



Twenty five years ago, the United Nations declared the 1980s to be the decade of water supply and sanitation and set out to install clean water systems in numerous poorer countries. It made sense. And the intentions appeared as pure as the water they hoped to deliver.

The U.S. Agency for International Development funded a prestigious U.S. engineering firm to set up the water and sanitation systems. And the firm delivered, installing systems that brought water to over 1.2 billion people and sanitation to nearly 770 million around the globe by 1990.

Back then it was easy to say the mission was accomplished.

Yet, by just about any measure, the effort failed. In less than 10 years, 88 percent of the systems were no longer operating. Why did this noble endeavor evaporate?

Several reasons, says Jon Leydens, writing program administrator in the Division of Liberal Arts and International Studies, who studied and taught on the United Nations effort.

First, he says the engineers didn't factor in the perspectives, needs, values and aspirations of the people in the communities they were trying help. "They just went

in, installed the systems and left," Leydens says. "They were paid for how many systems they installed, not for how sustainable the systems were over the long term."

What's more, Leydens says the communities had no sense of ownership or investment in the projects, and no one shared how to operate or maintain the systems.

The United Nations came away from the project having learned a costly lesson: if humanitarian relief efforts are to be sustainable, the skills, knowledge and resources of the local community must be factored in.

"Technology and socio-cultural realities

are intertwined in subtle and complex ways," Leydens says. "The world is changing profoundly, and engineers, when properly educated, have tremendous potential to contribute to sustainable, humanitarian projects."

At Mines, this potential is being realized through the Humanitarian Engineering Program. One of the first of its kind in the country, the program provides a minor that complements the technical curriculum with humanities and social science courses designed to cultivate ethical maturity, cultural awareness and a

fundamental understanding of economics, says David Muñoz, associate professor in the Engineering Division and director of the program.

Assisted by a \$1.17 million grant from the William and Flora Hewlett Foundation, Muñoz and a team of colleagues from the Division of Liberal Arts and International Studies, the Engineering Division and Engineering Physics launched the program five years ago. "The curriculum reflects the complexity of humanitarianism," says Muñoz. "We now know it's not as simple as going in and building systems; we have to build

relationships, seek indigenous knowledge, look for ways to build capacity and promote ownership.”

Muñoz believes the program is not only about changing the way engineering is taught, but also about nudging “society to reconsider the type of student it encourages to enter the field of engineering.”

Natalie Wagner, a civil engineering major who is earning a minor in humanitarian engineering, says the program actually motivates her to finish her degree. “Honestly, it’s the only way I can see myself getting through engineering school. The academics are rigorous, so I need to see that there’s potential for my work to make a positive impact on other people’s lives when I graduate,” she says. Wagner calls the program unique and adds that she feels “very blessed to have found it.”

Some of the courses Wagner and other students in the program take include groundwater mapping, design of small renewable energy sources, ethics in engineering, political philosophy and engineering, engineering cultures in the developing world, and proposal writing. In the proposal writing course, taught by Leydens, students have written proposals to fund projects involving drinking water for Haitian villages, medical supplies in Darfur and schools in Nicaragua.

Muñoz says another popular course is



Environmental science and engineering graduate student, Ana Ruiz, talks with Doña Reyna about her new passive gray water system in Colinas de Suiza.

senior design, in which students taking the minor design humanitarian engineering solutions for underserved communities. And these practical projects have yielded dramatic results.

In the five years since the humanitarian program was launched, over 200 students have worked on over 50 projects in 10 countries spread across four continents, ultimately helping tens of thousands of people enjoy more comfortable lives. They’ve helped with bridge building, water irrigation systems, hydro-electric projects, solar-powered electric programs, village lighting,

easy-to-use water systems, and even durable and affordable wheelchairs.

One of the program’s largest undertakings has been to install a complete potable water and sanitation system for a remote Honduran village.

The story begins when Hurricane Mitch left thousands homeless in 1998. As part of the relief efforts, the government made land on higher ground available to 10,000 of those displaced in the Sula Valley. However, their new town site did not have a water supply. In fact, the residents had to pay for water to be delivered from the valley below by water tanks mounted on trucks. Meanwhile, the pit latrines they were all using threatened to contaminate their down-slope water supply.

After learning of the problem, Muñoz led students to the new village of Colinas de Suiza, where they surveyed the needs, forged relationships and formulated preliminary plans for a 250,000 gallon water storage tank and a village-wide distribution system. Muñoz and the students found that the villagers were eager to help with the work and to help pay for it with contributions of \$100 per household. “Ultimately, the community members will have to maintain the systems, so it is imperative that they own it.”

Today, the locals are very thankful for the School’s work. Don Francisco Mazariago, president of Colinas de Suiza’s town council, says the community’s vision is “to continue to improve so that children can have a better future.” Adding, “This service is helping us meet the needs of the entire community.”

Wagner, who’s been working on the project since 2005, and who’s currently part of a team developing composting toilets for the project, says the key lesson she has taken away is securing local involvement. “You have to get input from the community,” she said.

Today, the project is nearing its end, and Muñoz expects water to flow this summer. Reflecting on the outcomes, he views the project as a win-win for all concerned. The village will have a potable water supply and sanitation system that they can maintain on their own. The 25 Mines students who have been involved in the project come away with an invaluable learning experience. And an important cross-cultural exchange of ideas and knowledge has taken place. 

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Alumnus arranges donation of 27 miles of pipe ‘Felt like the right thing to do’

When David Chasis, a 1961 Mines geological engineering graduate, heard about Mines’ work on a water purification and sanitation system for a remote village in Honduras, he knew he had to help.

“It just felt like the right thing to do,” says Chasis, president of Chasis Consulting Inc., a firm specializing in plastic fluid handling systems in Austin, TX.

After talking with David Muñoz, associate professor in Mines’ Division of Engineering who heads up the effort, Chasis assisted in arranging for pipe, fittings, valves and cement worth over \$125,000 to be donated by 11 companies, all members of the Plastic Pipe and Fittings Association.

Chasis also helped arrange for a supervisor to visit the site and help install the pipe. “I feel opening students’ minds to the basic needs of communities throughout the world is priceless and very worthwhile,” Chasis says.

The Honduran project is part of Mines’ humanitarian engineering minor—a program that was funded for its first five years by the William and Flora Hewlett Foundation. The Hewlett funding runs out this year, however, and additional funds are needed to complete the Colinas de Suiza project mentioned in the adjacent article. For more information on how you can support Mines’ humanitarian engineering program or to request a compelling DVD about the program, please call 303.273.3658.

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Rocky Mountain Steel Mills Human Resources Department
2100 S. Freeway, Pueblo, CO 81004 719-561-6274
www.osm.com schwetr@rmsm.com