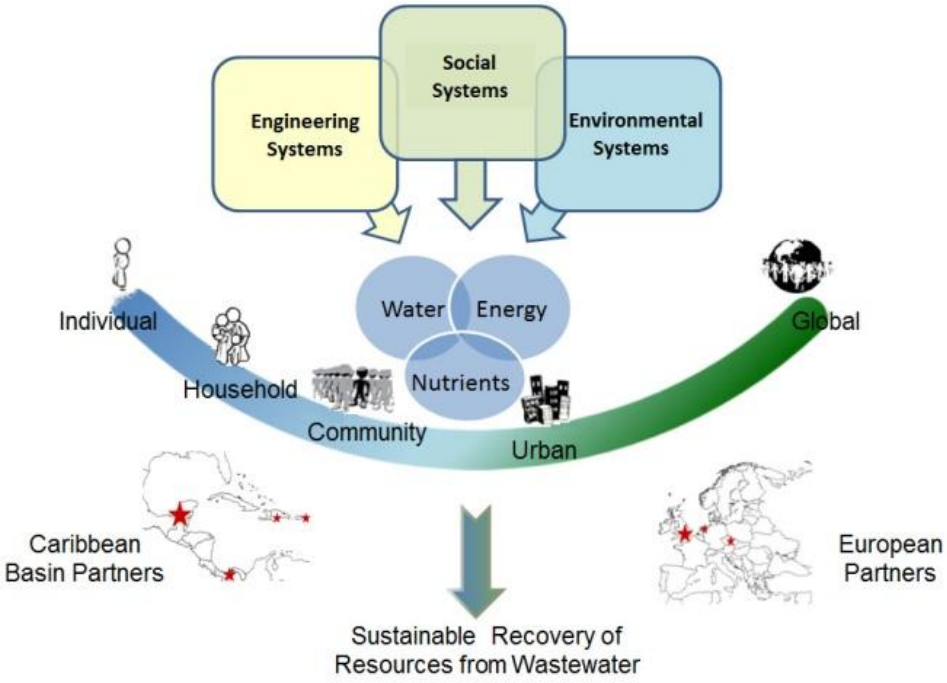
USF Researchers Awarded $3.9M NSF Grant Project Scientists and students set goal of turning wastewater into renewable resource in game-changing project

Written by Vickie Chachere, USF News and Janet Gillis, College of Engineering

TAMPA, Fla. (January 18, 2013) – An international team of researchers led by the University of South Florida will spend the next five years designing, implementing and teaching about a revolutionary attempt to turn wastewater into usable water, energy, and nutrients under a $3.9 million project funded by the National Science Foundation. As USF's largest-ever sustainability grant, this project sets new standards for interdisciplinary research in water and energy.

The coalition of nearly three dozen faculty and researchers will include about 100 undergraduate and graduate students from institutions in the United States, the Caribbean and Europe. Included in the effort also are USF's master's degree students who are part of a unique graduate program with the Peace Corps where they are already working and conducting research in developing nations. USF is joined in the project with the University of Virgin Islands and the University of Belize. European partners are the University of Exeter, the UNESCO-IHE Institute of Water Education in the Netherlands, and the Institute of Chemical Technology in the Czech Republic.



"What makes the USF project unique is that we are working together from the start in the research enterprise, rather than farming out parts of the study to disciplinary specialists along the way," says Christian Wells, co-PI and associate professor of anthropology. "By bringing together sustainability scientists from all across USF we can begin to address global problems from a more holistic perspective."

The project's overarching research question, said professor of civil and environmental engineering James Mihelcic is: Can effective, geographically-appropriate, and culturally relevant engineered systems be established that utilize wastewater as a resource for recovery of energy, water, and nutrients?

Mihelcic, who leads USF's Master's International Peace Corps program, said the project seeks to find new ways to convert wastewater into a renewable source of water, energy and nutrients and to change the way the world thinks about wastewater to be "not as waste, but a resource."

"This is the most significant sustainability research project that USF has landed," Mihelcic said. "NSF is funding this work because it can be transformational in tackling complex problems currently facing the Tampa Bay region."

The effort is funded as part of the NSF's Partnerships for International Research and Education (PIRE), an agency-wide program supporting international projects in the science and engineering communities. Specifically, the project comes under the NSF's efforts to advance sustainability science, engineering and education as an approach to global challenges associated with population growth and the strain on limited natural resources.

"This project epitomizes the translation of USF goals and strategic initiatives into action - world class research, outstanding student recruitment, global collaborations and connections, and enhancing our interdisciplinary base here at USF," said Linda Whiteford, professor of anthropology. "This combination of engineering and the socio-behavioral sciences is truly a cutting-edge framework for the future."

The goal of the program is to catalyze the best new ideas and practices on reusing wastewater as a resource while incorporating educational opportunities that broaden students' participation in science, technology, engineering and math courses related to sustainability, such as seminars and undergraduate research experiences.

"This project is unique in terms of its systems approach. It focuses not only on one stage of a new system, but the entire life of the system (cradle to grave) to avoid problem shifting across the life cycle stages. It looks at not only technological aspects of new systems, but across environmental, economic and social systems and their interactions to avoid unintended consequences. Such systems thinking and analysis are critical for the sustainability of new innovations and the sound training of future engineers," said Qiong (Jane) Zhang, an assistant professor of civil and environmental engineering who will lead the system analysis of the project.

The PIRE will introduce a very exciting partnership with the University of the Virgin Islands (UVI) that allows their undergraduate students to complete dual bachelor's degrees in science and engineering said Associate Professor Maya Trotz, is also co-PI. Known as a 3+2 program, USF established this relationship with Bethune-Cookman University in 2006 where science students complete three years there followed by two years in USF's College of Engineering. Given the student demographic at UVI, we expect this partnership to increase the diversity of the college.

The project looks at social and cultural shifts which need to occur to ensure that the new systems created are understood, used and accepted by communities – including addressing the perceived risks of reusing wastewater. Tampa, a community that has struggled with how it can effectively reuse treated wastewater, will be one of the study sites.

“This grant will provide great opportunities for graduate students to not only be part of an international team of experts addressing the conversion of wastewater into usable forms but also to learn how to effectively collaborate with researchers across disciplines and boundaries.”

Whiteford, Wells and Rebecca Zarger (assistant professor of anthropology) recently returned from Belize where they established relationships with partners there. “We found a wide range of ways in which people are using—or trying to use—local resources to solve global problems,” said Wells. “Our work will help these communities navigate some of the challenges associated with managing sanitation systems and accessing clean water while creating new sources of energy in the face of changes to the global economy. A major contribution to emerge from this work will be identifying the broader causes and consequences of human decision making in the face of environmental change.”

The project will attack the challenge of converting wastewater into usable resources through various fronts – not only engineering new systems, but addressing environmental and social challenges associated with a radically new approach to wastewater management. The proposal includes several new systems for cleaning wastewater and managing the waste portion of the product in a safe manner that does not create another environmental or human health challenge.

Mihelcic said students and faculty will be trained to work not only in these interdisciplinary teams, but also understand how to function in global problem solving teams, learning about best practices and solutions that can be transferred across geographical and cultural boundaries.

“The ability to work in teams is absolutely critical for today’s graduates and projects such as this greatly help prepare students for future leadership positions. Graduate students have become greatly interested in pursuing careers in sustainability and the experience afforded by this project will bring the involved students closer to their goal of leading sustainability efforts globally,” said Karen Liller, dean of the USF Graduate School and associate vice president for Research and Innovation.

The USF team is comprised of:

- From the College of Engineering: James Mihelcic, Maya Trotz, Sarina Ergas, Daniel Yeh, Qiong (Jane) Zhang, Delcie Durham, Yogi Goswami and Bernard Batson.
- From the Department of Anthropology: Christian Wells, Rebecca Zarger and Linda Whiteford.
- From the College of Marine Science Frank Muller-Karger, and
- From the College of Education Allan Feldman.

“The research is important because it addresses very complex issues of water scarcity and supply, energy production, wise use of finite natural resources, protection of the environment and mitigation of climate change – all critical issues that will protect the environment while also improving economic and social well-being of residents of Florida, the United States and the world,” said Mihelcic.

“The knowledge we create will assist local, regional, and global management of water and energy resources. Our students and faculty will be placed in interdisciplinary teams: Imagine now that engineers who are focused on technological solutions will be able to integrate issues of culture and behavior into the solutions, while also having command for how decisions they make in design and planning impact large environmental systems.”

For more information about NSF’s PIRE program and the 12 projects it funded click here.