University of Houston Cullen College of Engineering
Cluster Project Overview
Sustainability

Complex systems and environmental-related research account for over a third of the college's FY10 research expenditures. More than $7 million was invested in solving the many environmental challenges in the Greater Houston area and beyond as well as issues surrounding the country's aging infrastructure, one of the National Academy of Engineering's Grand Challenges of the 21st century. Core research projects impacting sustainability include:

Research Expenditures

- BME
- Sustainability
- Education
- Energy
- Materials
- Other
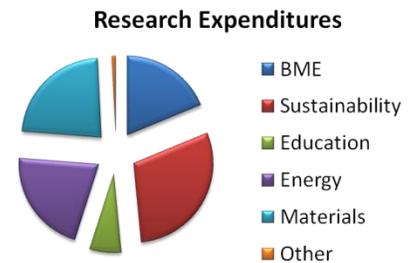
Emissions Testing and Retrofit Technology
Michael Harold (ChBE), Texas Diesel Testing and Research Center
Funded by the Environmental Protection Agency (EPA), National Science Foundation (NSF), Texas Commission on Environmental Quality (TCEQ)

The Texas Diesel Testing and Research Center was established in 2004 through a partnership with the City of Houston to test emissions for the city's fleet of diesel vehicles. Since Houston is a non-attainment area, emissions in the industrial region of Houston must meet state emissions regulations and the moving fleet of diesel vehicles is a huge contributor to the problem. In addition to testing vehicle emissions, Harold and center researchers have a variety of projects aimed at testing and implementing retrofit technologies, which work by cleaning NOx toxins emitted from diesel vehicle engines. The center is working to provide the EPA with data on the performance of these technologies and is working with specific companies to test and retrofit their systems on various diesel vehicles, including a fleet of local school buses.

Urban Ground Watershed Modeling and Severe Storm Management
Hanadi Rifai (CEE), Severe Storm Prediction, Education, Evacuation from Disasters (SSPEED) Center
Funded by the Environmental Protection Agency (EPA), Texas Commission on Environmental Quality (TCEQ)

To determine pollution levels in local water bodies, including retention ponds and the Houston Ship Channel, Rifai and her team develop sophisticated watershed models to discover toxins in the water and where they originate. Much of the data generated by Rifai is being used by the EPA determine who is responsible for reducing the pollution. In addition, she works in collaboration with Rice, TAMU, LSU and TSU as part of the SSPEED Center, an effort focused on disaster preparedness, mitigation and evacuation.

Airborne Laser Mapping
Ramesh Shretha (CEE), NSF National Center for Airborne Laser Mapping (NCALM)
Funded by the National Science Foundation

Research at NCALM is focused on mapping terrains with laser surveying instruments to provide critical data to scientists and government agencies about the changing surface of the earth. Everything from erosion and drainage patterns to the devastating effect that natural disasters have on the environment

can be topographically mapped and modeled for study. The NCALM team is currently working to develop a next generation Light Detection and Ranging (LiDAR) system to provide some of the most accurate, high-res observations available via laser mapping. The system will also be able to penetrate shallow water depths, which is currently not available with existing technology. Less expensive than current commercial units, the technology has commercialization potential, making it more readily available for widespread research.

Concrete Structure Shear and Torsion Design
Thomas Hsu and Y.L. Mo (CEE), Structural Research Laboratory
Funded by the National Science Foundation, U.S. Department of Education

In the Thomas Hsu Structural Research Laboratory, both Hsu and Mo conduct reinforced concrete research on the Universal Element Tester, an instrument designed to test large steel-reinforced concrete panels under various 2D and 3D forces. It's the only instrument in the world capable of performing cyclic loading tests on reinforced concrete, emulating earthquake-like conditions. Some of this research has provided a basis for shear and torsion design for the American Concrete Institute Code.

Biofiltration
Shankar Chellam (CEE)
Funded by the National Science Foundation , U.S. Department of Interior, Texas Hazardous Waste Research Center

Much of the research conducted by Chellam and his team is focused on water purification, specifically the biological fouling of membrane filters and microbial transport affecting municipalities. Recent work has been devoted to characterizing biofilm formation in such large-scale water purification systems in an attempt to stop the rapid colonization of bacteria on a filter substrate. By doing so, the life of water purification filters can be extended, providing a positive economic and environmental impact.