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TTU PROFESSOR PRESENTS RESEARCH ABOUT EFFECT OF DAMS ON CLIMATE TO CONGRESS

Posted by Lori Shull - Monday, August 15 2011
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As the U.S. government makes decisions on high-profile environmental issues, Faisal Hossain's influence on those decisions is growing—attesting to the fact that a researcher at a mid-size university in a rural area can have a powerful national, even international, impact.

Hossain, a civil engineering professor at Tennessee Tech University, is leading a team of researchers who are beginning to influence how the United States and the world operate and build large infrastructures, such as dams, that manage a precious resource, water.

Hossain traveled to Washington, D.C., this summer at the invitation of a senior staff member in the U.S. House of Representative's Subcommittee on Water Resources and the Environment. This visit, encouraged and supported by TTU President Bob Bell and College of Engineering Dean David Huddleston, followed Congressional testimony by colleague Roger Pielke Sr., senior research scientist at the University of Colorado at Boulder, that referenced research led by Hossain on how large dams can affect local climates.

"Our government needs to plan now about where we would like to go in the next 10-15 years in the operation of all big water structures," said Hossain. "The decision made will affect dams and the many purposes they serve, including water supply, irrigation and hydropower."

The U.S. Bureau of Reclamation under the Department of Interior, the Army Corps of Engineers and Tennessee Valley Authority handle 90 percent of the nation's dams.

Hossain says those agencies are looking to bring in research and integrate his team's findings into their daily operations, using more intelligent and variable data on a dam-by-dam basis. He says the operations manual for each dam is too rigid.

"The current operations guide is not appropriate given what we know, and it should be flexible," said Hossain.

Hossain says operations should be influenced by recent scientific and engineering documentation that large dams have a clear, strong influence on the climate around artificial reservoirs. This local effect, in turn, has a complex interaction with the global effect of warming of our planet.

A change in the amount of water available for evaporation can change humidity, temperature and other aspects of the climate system around a reservoir. Under the right circumstances, all of these play an important role in changing rainfall.

"Storms and flooding can be impacted by large dams, and this could alter the way you operate a dam," he said.

Hossain said his discussions in Washington focused on how changes could be made in the operation rules for reservoirs to account for more available water that comes as a result of more frequent heavy rainstorms and climate change. He said compromises also come with those types of decisions.

"If you have more space allocated and store more water, you might have to compromise on other things, such as a little less power generation. If you store less water, that means a little less for the water supply."

While Hossain's suggestions will affect mostly the operations of U.S. dams, they also will apply to newly built dams in areas such as Asia and Africa.

He says now dams are built to last 50-100 years and are always built for extreme conditions, but in the future, adaptability will be the goal. For example, some new dams in Asia show the need for more flexible planning.

"As a dam ages, more and more water gets into the surrounding lake and carries sediments that build up," he explained. "We see dams in China building up and filling within 10 years, for example.

"We have a lot to learn from the old dams and want to research how we can design better ones in the future in the big

scheme of infrastructure design and maintenance.

Hossain notes that U.S. infrastructure is currently rated poorly by the American Society of Civil Engineers. He says the solution is to initiate a new form of civil engineering education, starting at his own university, where students are taught the implications of what they build, operate and work with on climate, weather and water availability.

“Basically, we will need to teach ourselves that the ‘buck’ doesn’t stop with what we build and that the long-term impact of our infrastructure on climate can affect its long-term resilience as well.”

Hossain and his colleagues at TTU’s civil engineering department are currently putting forward various plans for 21st century civil engineering education to the Department of Education and the ASCE that he says he believes will make TTU stand out nationally on engineering education.

“We have just attracted a self-supporting international graduate student in our program from Russia’s premier most engineering institution - Moscow State University of Civil Engineering. According to the student, he had several options to enroll in a larger water resources program in Colorado, Georgia or California. But he chose TTU after carefully reviewing its program quality, cost and reputation.”

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