Researchers look at water-energy impacts of climate change

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(PhysOrg.com) -- Climate projections for the next 50 to 100 years forecast increasingly frequent severe droughts and heat waves across the American Southwest, sinking available water levels even as rising mercury drives up demand for it.

Declining water supply will affect more than just water flowing from taps and spraying from hoses and sprinklers. It will also strongly impinge on power generation, testing the capacity of sources like Hoover Dam, with its roughly 1.3 million customers in Nevada, Arizona and California, to generate adequate power with less water.

Now, Patricia Gober and David A. Sampson of the Decision Center for a Desert City at Arizona State University are teaming with David J. Sailor of Portland State University on a $65,000 grant to wade into this deep problem.

Their research will focus initially on water and electricity supply and demand in the greater Phoenix metropolitan area, and the effects of extreme heat and drought on them.

“Water and energy are inextricably linked,” says Sampson, a DCDC research scientist specializing in simulation and modeling. “Energy is required to transport and purify water, and water is used in energy production.

“Further reductions within the Colorado River Basin threaten not only

water supplies but also energy production and tourism, with a potential economic impact amounting to billions of dollars in lost revenues."

According to Sampson, Lake Powell currently stands at 62 percent capacity and Lake Mead, which provides the water that drives the Hoover Dam's hydroelectric plants, is currently at 43 percent capacity and could drop as low as 40 percent.

Such levels raise questions about how providers will supply safe, affordable water to the 27 million residents relying on the Colorado River supply, especially in light of continued development and population growth.

The researchers will attack the complex problem from a number of angles.

The energy research will assess the current sensitivity of electricity supply and demand to weather fluctuations, while also projecting future scenarios of population demographics and climate. Researchers will also develop models that predict and gauge the vulnerability of the electricity generation infrastructure to changes in climate and population.

With respect to water, the researchers will use WaterSim (watersim.asu.edu/), DCDC' s systems dynamics model and decision tool, to investigate how changing climate conditions will affect runoff, which provides the lion's share of surface water used to supply Phoenix. Adapting WaterSim to a more localized scale, they will also perform a sensitivity analysis of climate change versus future population growth, to determine their relative impacts on water shortages, while also analyzing vulnerability at the water-provider level.

The researchers will feed their results into two different scenarios, a business-as-usual policy and one reflecting a groundwater-sustainability

approach. These results, in turn, will provide a foundation for future study of implications of climate change and policy scenarios.

“This research is very much in line with the DCDC’s purpose and goals,” says Gober, co-director of DCDC and a professor in the School of Geographical Sciences and Urban Planning and the School of Sustainability. “Figuring out how all the pieces fit together, identifying sensitivities, and making useful predictions and recommendations in the face of climatic uncertainty.”

The National Commission on Energy Policy (NCEP), a commission established by the William and Flora Hewlett Foundation that takes a bipartisan approach to energy policy, balancing science and politics, funds the project. Energy infrastructure adequacy and siting is one of its three current focus areas, along with oil security and climate change.

Provided by Arizona State University (news : web)