Geophysical Research Abstracts
Vol. 19, EGU2017-2399, 2017
EGU General Assembly 2017

Robust Water Supply Infrastructure Development Pathways: What, When and Where Matters the Most? (INVITED)

Patrick Reed (1), Harrison Zeff (2), and Gregory Characklis (3)

(1) Cornell University, Civil Engineering, Ithaca, United States (patrick.reed@cornell.edu), (2) University of North Carolina, Chapel Hill, United States (hbz5000@gmail.com), (3) University of North Carolina, Chapel Hill, United States (charack@email.unc.edu)

Water supply adaptation frameworks that seek robustness must adaptively trigger actions that are contextually appropriate to emerging system observations and avoid long term high regret lock-ins. As an example, emerging water scarcity concerns in southeastern United States are associated with several deeply uncertain factors, including rapid population growth, limited coordination across adjacent municipalities and the increasing risks for sustained regional droughts. Managing these uncertainties will require that regional water utilities identify regionally coordinated, scarcity-mitigating infrastructure development pathways that trigger time appropriate actions. Mistakes can lead to water shortages, overbuilt stranded assets and possibly financial failures. This presentation uses the Research Triangle area of North Carolina to illustrate the key concerns and challenges that emerged when helping Raleigh, Durham, Cary and Chapel Hill develop their long term water supply infrastructure pathways through 2060. This example shows how the region's water utilities' long term infrastructure pathways are strongly shaped by their short term conservation policies (i.e. reacting to evolving demands) and their ability to consider regional water transfers (i.e. reacting to supply imbalances). Cooperatively developed, shared investments across the four municipalities expand their capacity to use short term transfers to better manage severe droughts with fewer investments in irreversible infrastructure options. Cooperative pathways are also important for avoiding regional robustness conflicts, where one party benefits strongly at the expense of one or more the others. A significant innovation of this work is the exploitation of weekly and annual dynamic risk-of-failure action triggers that exploit evolving feedbacks between co-evolving human demands and regional supplies. These dynamic action triggers provide high levels of adaptivity, tailor actions to their specific context, and motivate the value of joint human—natural system observation systems. The insights from this work have general merit globally for urban regions where adjacent municipalities can benefit from cooperative planning.