



Managing Environmental Financial Risks in Coupled Natural Human Systems

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Abstract:

Extreme environmental events such as droughts, floods, heatwaves and violent storms impose global costs that approach \$500 billion per year. These events impact the costs and/or revenues of both public- and private-sector actors giving rise to financial instability that can be disruptive and influence their decisionmaking in many ways. Understanding the nature of the financial risks posed in terms of the frequency and severity of losses requires integrated modeling of natural (e.g., hydrologic), engineered (e.g., reservoirs, levees) and economic/financial (e.g., water/electricity markets) systems. Once environmental financial risk has been characterized, it must be managed, and this is often achieved via a combination of actions/tools that involve risk reduction (e.g., infrastructure), risk retention (e.g., cash reserves, loans) and risk transfer (e.g., insurance). Risk transfer via more sophisticated financial instruments can be especially effective in enabling more advanced risk management strategies that offer the promise of adaptable, lower cost solutions. A general approach to characterizing financial risk in coupled natural-engineered-economic systems will be discussed, followed by a description of several ongoing studies. Examples will include evaluating strategies for managing the financial risk of hydrologic variability for urban water utilities, electric power utilities, agricultural producers and inland navigation.

Speaker Bio: Dr. Characklis serves as William R. Kenan, Jr. Distinguished Professor in the Department of Environmental Sciences and Engineering at the University of North Carolina at Chapel Hill. He is also the Director of the Center on Financial Risk in Environmental Systems (CoFiRES) an entity that bridges the Gillings School of Global Public Health and the UNC Institute for the Environment. Dr. Characklis' primary research interests involve developing solutions to environmental challenges through systems-based approaches that integrate consideration of both engineering and economic principles. He is currently engaged in projects funded by NSF, DOE and the North Carolina state government to quantify the financial risks of extreme environmental events in a range of economic sectors, including water utilities, power utilities, agriculture, inland navigation (e.g., Great Lakes) and real estate. Dr. Characklis serves on the Editorial Board of Water Security and was previously on the editorial staffs of Water Resources Research and Hydrology and Earth Systems Sciences. In 2019 he was elected to the Board of the Consortium of Universities for the Advancement of Hydrologic Sciences Inc. (CUAHSI). In 2012, he was elected to the Board of the Association of Environmental Engineering and Science Professors (AEESP) and was subsequently elected AEESP President (2015-16). In 2014, he was selected as a Fellow by the National Academy of Sciences' Kavli Frontiers of Science, and in 2010 he was named an Aldo Leopold Leadership Fellow. Prior to joining UNC, Dr. Characklis served as Director of Resource Development and Management at Azurix Corp. (a subsidiary of Enron Corp.) where his responsibilities centered around assessing the technical and financial merits of water supply development projects. Before entering the private sector, he spent two years in Washington, D.C. as a Fellow with the National Academy of Engineering. Dr. Characklis holds a Ph.D. and an M.S. in Environmental Science and Engineering from Rice University and a B.S. from Johns Hopkins University.