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Thursday, Nov. 6
3:30 PM – 5:00 PM
SESSION 83: Tools for Contemporary Water Challenges

Creating a 'Water BRAC' Commission to Evaluate Existing Water Projects - Daniel McCool, University of Utah, Salt Lake City, UT

Creating a "Water BRAC" Commission to Evaluate Existing Water Projects Daniel McCool The Army Corps of Engineers and the Bureau of Reclamation have constructed nearly 700 dams, 108 hydropower projects, 275 locks, 926 harbors, 12,000 miles of inland waterways, 9,000 miles of levees and other flood control structures, 56,000 miles of water conveyances, and 7,500 miles of improved channels. Many more projects have been authorized but not funded (and would cost possibly as much as $60-80 billion if actually constructed). Existing water projects require significant annual funding allocations for operation and maintenance, mitigation costs, and associated personnel costs; The total annual budget for these two agencies now exceeds $6 billion. The loss of ecological services and economic externalities are also part of the "cost" of these projects. And some projects present hazards to the public. Estimates of the infrastructure costs of restoring and maintaining these projects to meet current safety, health, and engineering standards range into the tens of billions. After two hundred years of accumulating projects without comprehensive reviews, a neutral and comprehensive assessment of the value of each existing water project might be useful. The model for such a process is the Defense Base Closure and Realignment and Commission, known as BRAC. The mission of BRAC is to identify military bases--which accumulated over the years and included hundreds of facilities with obsolete missions--that could be closed without harming national security. The commission has developed several lists of bases that were no longer needed; the Congress could only vote on the entire list, and could not separate out the bases in their home districts or states. As a result, hundreds of unnecessary bases were closed through five rounds of the BRAC process, resulting in an annual savings to the federal government of billions of dollars. My paper will analyze how such an approach could be applied to existing federal water projects. Such a "BRAC" assessment could develop a list of projects that do not meet modern standards of economic rationality, environmental impact, and safety. The Corps and the Bureau fully understand the need to change in fundamental ways. The Corps has a new "Campaign Plan" with the promise to "transform the way we do business" (http://www.usace.army.mil/About/CampaignPlan.aspx). The Bureau has launched a "WaterSMART" program that takes an entirely new approach to water management (http://www.usbr.gov/WaterSMART/). A BRAC-like winnowing of water projects would assist these agencies in their efforts to modernize, trim their budgets, and serve the contemporary needs of society. This paper will explore how a BRAC-like process could be applied to water projects in an effort to ensure that all federally-funded projects meet current social, environmental, economic, and engineering standards and priorities.

The Role of Geography in the Structure and Implementation of Water Governance Processes: A Case Study of the Columbia River Treaty Reviews - Kim Ogren, Oregon State University, Corvallis, OR

Ratified in 1964, Columbia River Treaty (CRT) seeks to optimize flood control and hydropower benefits received on both sides of the U.S.- Canada border. While the Treaty continues indefinitely, some of its

provisions will expire in 2024 and others will come into effect. September 2024 is also the earliest date the CRT can be terminated unilaterally, given 10 years notice. Both nations are taking the opportunity to re- evaluate management of the Columbia River based on a new set of values and knowledge while also considering new uncertainties managers of the river will face in the years to come. In the U.S., the Army Corps of Engineers and Bonneville Power Authority are recently led the CRT 2014/2024 Review to develop a recommendation to the State Department. In British Columbia, Canada, the Provincial Ministry of Energy and Mines conducted its own investigation of the CRT to deliver a recommendation to Canada's Department of Foreign Affairs, Trade, and Development. The two nations adopted different approaches in their review process as they engaged stakeholders and sovereigns to answer the question: should we recommend that our government continue, terminate, or modify the CRT? This presents a rare opportunity to investigate how nations evaluate management of a transboundary resource, in similar and different ways. In this study I investigate what socio-economic, geopolitical, and biophysical factors influence the structure, content, and implementation of the review processes in Canada and the U.S. With data collected through participant observation and focus groups, I provide insights into how context and place impacts a governance process and what that may mean for designing future water decision processes involving technical studies as well as stakeholder and/or sovereign engagement.

Development of Framework for Water Productivity for Nebraska - Chittaranjan Ray, Nebraska Water Center University of Nebraska, Lincoln, NE

Water for agriculture is increasing becoming a contentious issue in the western United States. Diversions of surface water for industrial and municipal supply that was once used for irrigation and the depletion of aquifers are some of the challenges faced by irrigated agriculture. The extensive High Plains Aquifer (HPA) is experiencing unprecedented depletion in selected areas, mostly in its southern extent. The pumping stress is much more than the natural recharge and this rate of pumpage will not be sustainable to the foreseeable future. However, the aquifer is relatively deep and more productive in Nebraska. It has not experienced the same problems as the neighboring southern states except for certain areas that are close to the boundary of the aquifer. Nebraska has effectively managed pumping from HPA through its network of Natural Resource Districts (NRD). The water use for crop and animal production within Nebraska is also variable. The state uses both ground water and surface water sources for irrigation using a combination of furrow, sprinkler, and subsurface drip irrigation. Energy sources include grid power and diesel. We present a framework of water productivity for rainfed and irrigated corn and soybean rotation for Nebraska in which the use of the amount of water for unit yield of these crops is calculated. Additionally, we present the water productivity for animal agriculture (beef, chicken, and swine). While it is not mandatory for irrigators to report the amount of pumpage (not all irrigation wells are metered), the NRD and energy providers (such as the public power districts in Nebraska) are able to estimate the water pumped based on hours of energy use and the pump size. Additionally, many irrigators also cooperate the local NRDs and report either metered data or pumping time/electric meter data. Water productivity is reported at various scales - farm, basin (or NRD specific) and state. The results of this framework will show efficiency gaps for crop production.

Streamflow Prediction for Micro-Hydropower Generation at Ungauged Sites - Maya Atieh, University of Guelph, Hamilton, ON, Canada (co-authors: B. Gharabaghi, R. Rudra)

Micro-hydropower (MHP) generators have been receiving a great deal of attention from both private and public sectors. However, there are inadequate records of hydrological data for optimum design of such projects in ungauged headwater streams, in Ontario. The Ontario Flow Assessment Tools (OFAT) III is a new online spatial application tool that automates a series of labour intensive hydrology tasks using

data packages, known as Ontario Integrated Hydrology Data, to provide a collection of related elevation and mapped water features for hydrology applications, such as streamflow assessment. This research project evaluates and improves the suitability of (OFAT) III through identifying the main sources of uncertainty and quantifying the magnitude of the inherent error associated with streamflow assessment in ungauged basins. Following, an integrated approach that employs the (OFAT) III datasets and the Water Survey of Canada historic hydrometric data at over 150 stations across Ontario are used for generation and classification of key catchment characteristics that most effectively influence streamflow statistics. A regionally-trained and validated single feed forward back propagation neural network model that addresses runoff and baseflow separately is developed. This project develops a hybrid artificial neural network model that incorporates both data and model intensive approaches to improve the accuracy of streamflow assessment tools for ungauged basins and hence prevent MHP plants from being turned off. The research findings can be employed across Ontario and particularly useful for remote ungauged sites in northern Ontario.

Analyzing the Interconnectedness of Energy and Water Sustainability Issues: Findings from a Quantitative Study – Chu Chu, Center for Energy & Environmental Policy, University of Delaware, Newark, DE (co-authors: J. Lee, K. Zame)

Securing energy and water supply is one of the most fundamental issues in modern society.
These two essential resources are interconnected in various aspects including environmental, economic, and equity dimensions. The close relationship between water and energy bases on facts that energy production requires substantial water input and that water supply also necessitates non-trivial energy input. In the U.S., thermoelectric power water withdrawals in 2005 accounted for 49 percent of the total water use,
41 percent of the total freshwater withdrawals for all categories, and 53 percent of the total fresh surface water withdrawals. In terms of energy intensity for water, approximately 3-4 percent of the U.S. annual energy use is related to drinking water and wastewater systems (EPA, 2013). Until now, in spite of their clear interconnectedness, there have been minimal attempts to manage water and energy resources with integrated policies. Although several studies have explored quantifying the interrelationship of energy and water by analyzing water intensity of energy production and energy intensity of water supply, most of them focused on only one side of this interrelationship. Instead, our study will look at both sides of the energy-water nexus. As water and energy intensity associated with the two sectors are largely different depending on study area's geographical and economic characteristics, it is critical to approach such issues at a micro level. To this end, this study intends to pay attention to water-stressed and/or energy- stressed states in the U.S. and identify potential solutions to those scarcity issues through integration of water and energy policies. To be specific, two states will be selected as our case study based on the criteria of in-state water and energy availability and current related policies.
Using empirical water and energy intensity factors, this study will use a scenario analysis to estimate the total annual water consumption associated with energy production and energy consumption for water. Our analyses aim to show how much water and energy can be conserved through achieving water- and energy-related policy targets such as renewable portfolio standards, energy efficiency resource standards, and water conservation policies. By conducting quantitative analyses of business-as-usual and policy scenarios, the present study will ultimately assess the synergic effects that soft path approaches bring to bear on the nexus between energy and water at the state level.