Universities Council on Water Resources
Journal of Contemporary Water Research & Education
Issue 149, Pages 1-3, December 2012

Water and International Security

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"Water, like religion and ideology, has the power to move millions of people. Since the very birth of human civilization, people have moved to settle close to it. People move when there is too little of it. People move when there is too much of it. People journey down it. People write, sing and dance about it. People fight over it. And all people, everywhere and every day, need it."

–Mikhail Gorbachev

This journal issue concerns water and international security. Regional paucity of water creates stress on communities, promotes instability and disputes, and can ignite political ambitions and military action. Our aqueous resources have been both a tool and goal of past conflict, and ominous auguries of regional water scarcity, coupled with population growth, point to future instabilities. This projected instability is due, in part, to overall water use having expanded at over double the rate of population increase over the last century.

According to the United Nations (2012), water shortages could affect 2 billion people in the next 20 years. The UN estimates that presently 700 million people in 43 countries experience water scarcity (defined as less than 1000 m^3 per person per year). Their projections indicate that by 2025, 1.8 billion will be living in countries with absolute water scarcity (defined as less than 500 m^3 per person annually) and two thirds of the global population could suffer from water stressed circumstances (less than 1700 m^3 per person annually). The UN further forecasts that water scarcity in arid and semiarid regions could displace between 24 and 700 million people (United Nations 2012). Chronic water challenges can be physical, where people do not have abundant water close by, and economic, where communities do not have the necessary infrastructure to extract and convey water from rivers, lakes, springs, and aquifers. But the bottom line is: lack of water can foment unrest. Water scarcity has become one of our greatest challenges, and the inability of some regions of the world to address this challenge portends difficulty, social unrest, and perhaps even armed conflict. This special issue of the *Journal of Contemporary Water Research and Education* addresses water's role in community stability and wellbeing.

The first article in this issue, "Case Studies on Water Security: Analysis of System Complexity and The Role of Institutions" by Jacob D. Petersen-Perlman, Jennifer C. Veilleux, Matthew Zentner, and Aaron T. Wolf, defines institutional capacity, and hydropolitical resilience and vulnerability. The authors then insightfully compare very different water basins in North America, Asia, and Africa, drawing compelling conclusions relative to future water security.

These case studies are followed by a second article entitled, "Water Modeling Technologies: A Key to Unlocking Water Conflict in the Middle East?" by Al-Sharif Nasser Bin Nasser. The Middle East is one of the most fractious, ethically and religiously divided regions of the world, and one where disputes over water have been historically contentious. The paper discusses conflict in the Middle East stemming from water disagreements, and presents the intriguing idea that water resources modeling, technology, and management can be more strategically focused in this region, reaping benefits which would promote socio-economic stability.

The third paper in this issue, "Hydrostrategy, Hydropolitics, and Security in the Kura-Araks Basin of the South Caucasus" authored by Michael E. Campana, Berrin Basak Vener, and Baek Soo

Lee examines an international river basin, in an unstable region of the former Soviet Union, with ethnic conflict and evolving bureaucracies. The countries of Armenia, Azerbaijan, and Georgia are attempting to overcome disagreements and cooperatively manage water resources of the large Kura-Araks Basin. The paper provides an unflinching explanation of the water sharing difficulties and prospects for the future.

Irrigation issues in Afghanistan are viewed from an educational point-of-view in this issue's fourth paper. "Irrigation Outreach in Afghanistan: Exposure to Afghan Water Security Challenges" by Denis Reich and Calvin Pearson. This article provides an on-the-ground, up close view of the difficulties of providing water security in a nation plagued with war, contumacy, and privation. Although this country is one of the world's 10 poorest nations, it has received approximately $60 billion in civilian aid since 2002. But Afghanis face an uncertain future, with outside funding for civilian projects anticipated to be reduced to about $4 billion per year over the next four years (Vogt and Khan 2012). Reich and Pearson document a university-based workshop on irrigated agriculture, held in Afghanistan, where food and water security are closely linked. Their paper provides an interesting set of "lessons learned" during the project and a cautionary blueprint for further educational work in the nation.

The fifth paper in this issue is by Elizabeth J. Kistin Keller and is entitled, "Critiquing Cooperation: Transboundary Water Governance and Adaptive Capacity in the Orange-Senqu Basin." In this article, Dr. Keller looks at transboundary agreements in south-central and southwestern Africa when circumstances change and existing agreements must be modified. She engagingly lays out the rich, interactive history of bilateral water agreements and a basin-wide treaty between Lesotho, Botswana, South Africa, and Namibia, and discusses the institutional flexibility of the nations, their improving ability to manage data, the lack of a strong system for intersectoral planning, and regional power asymmetries that affect agreements. Keller's article gives some hope and direction to joint basin scale planning among nations.

Mexico's water challenges are discussed in the sixth article in this issue by Brian H. Hurd. Entitled, "Climate Vulnerability and Adaptive Strategies along the Rio Grande/Rio Bravo Border of Mexico and the United States," Dr. Hurd's article extends the discussion of water security to food security and irrigated agriculture, energy security, and Mexico's vulnerability to likely climate change scenarios. This is a provocative look at potential drivers for instability and unrest in a populous North American country that shares a border, and some of its opportunities and adversities, with the United States.

The seventh article is a view from the U.S. military perspective. U.S. Armed Forces face numerous challenges and are rigorously addressing energy and resource issues, of which many directly or indirectly affect operational efficacy in providing national defense. Directives have been established anticipating response to climate change (153 U.S. naval bases would be susceptible to sea level rise), innovatively reducing energy consumption (the single largest user of energy in the U.S. is the military), and promoting water conservation (Alley 2012). This paper zeros in on the Army's approach to developing a sustaining domestic water policy. The authors, Paul Koch and Mark Kodack focus on community water policies for the military in the U.S. in their article, "Development of an Army Water Security Strategy: Stateside Component."

Suzanne Pierce, Reed Malin, and Eugenio Figueroa Benavides explore the roots of unrest over water and its relation to mining and energy in the Atacama Desert of South America in her article, "Sustained Dialogue for Ground Water and Energy Resources in Chile" In this eighth article of the issue, she effectively advocates solving resource disputes by revisiting and addressing long-term, underlying disagreements and mismatched community values. Particularly, they introduce innovative socio-technical approaches to resolution which blend dialogue and deliberation with the reflective consideration of history and cultural beliefs, and versatile scientific information display and management, in seeking solutions to community unrest over resource development.

The last article, "The Past, Present, and Future of Water Conflict and International Security" by the issue editor, is an overview of the water security challenges facing the world. The article reviews difficulties in supplying clean water throughout the world, how water has been both a strategic tool and object of conflict in the past, recent trends toward regional water conflict, and potential ways to move positively forward and increase international security.

The localized competition between burgeoning population and reliable water supply may emerge as a primary criterion for peace in the world. Will paucity of water incite communities, enflame those seeking an economic development advantage over others, help stir up smoldering antagonisms, and become a war-cry for those impatient with what Tennyson referred to as "the long, long cancer of peace?" Certainly the potential for calamity will continue as long as privation exists, and thirst drives individuals to the frantic, rough edge of civility.

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David K. Kreamer is a Professor of Geoscience, and also Graduate Faculty in the Departments of Civil and Environmental Engineering, and Environmental Studies, and is past Director of the interdisciplinary Water Resources Management Graduate Program at the University of Nevada, Las Vegas. He also serves as faculty in the Hydrologic Sciences Program at the University of Nevada, Reno. His Ph.D. is in Hydrology from the University of Arizona, and he was an Assistant Professor in Civil Engineering at Arizona State University. David's research includes environmental contamination, spring sustainability, and clean water supply in developing nations. He has given over 150 invited lectures, seminars and workshops in recent years for U.S. Environmental Protection Agency, U.S. Bureau of Land Management, the National Ground Water Association, and the Superfund University Training Institute, presented short courses for over half the States or Commonwealths in the U. S., and lectured for other groups such as City of Phoenix, University of California Extension, and Hanford Nuclear Site. He has given presentations at over 40 Universities, and has spoken in Europe, Asia, the Caribbean, Pacific island nations, South America, Africa, and the Middle East. He serves as Director of the National Ground Water Association's Division of Scientists and Engineers, is Vice President for North America for the International Association of Hydrogeologists, and serves on the Board of Directors of the Universities Council on Water Resources. He can be contacted at dave.kreamer@unlv.edu.

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