

Promoting Water Security in Central Asia through International Research Partnerships

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UTILIZING SCIENCE TO ADVANCE DIPLOMACY

Science forms an important nexus with diplomacy and international relations. First, science in diplomacy supports foreign policy objectives. Second, diplomacy for science utilizes international relations to facilitate and advance cross-border scientific and engineering relationships and programs. Third, science for diplomacy leverages scientific and technical cooperation to bolster relations between and among countries. The term science diplomacy captures these three relationships.¹

Another way to conceptualize science diplomacy is utilizing science—either directly or as a platform—to connect governments, as well as people. Science, technology, engineering, and related fields are often viewed as apolitical and neutral. Often, when citizens and governments disagree with a foreign leader's action or a foreign policy, the citizens and government uphold national academies, universities, and other scientific enterprises.² Two historical examples highlight science diplomacy in action. Japan-U.S. relations became strained at the end of World War II. In the early 1960s, President Kennedy incorporated science and technology into diplomacy, focusing on science in diplomacy and science for diplomacy. Specifically, a Japan-U.S. science and technology agreement was created at that time, which formed the conduit for a stronger relationship between the two countries.³ Focusing on science for diplomacy, the U.S. supported researcher cooperation between the Soviet Union and the U.S. Around the time the Soviet Union was dissolving, strong technical relationships among scientists and engineers helped pave the way for better government relations.

These bilateral and multilateral collaborations often emphasize basic science—studying a specific research question. However, another aspect of science diplomacy and international development encourages scientists and engineers to focus on economic growth through technology commercialization and research application. Science, engineering, and education are tremendous and powerful tools for economic growth. Specifically, once countries establish basic research

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programs, and apply this research to create new products and jobs, economic growth can be ignited. Thus, science diplomacy extends beyond connecting scientists and engineers and supports other aspects of these collaborations.

Science diplomacy also is visible in senior government positions. In the U.S., current practice holds that the U.S. Department of State and the U.S. Agency for International Development (USAID) employ science advisers to the agency heads. The Science and Technology Adviser to the Secretary of State and the Science and Technology Adviser at USAID both are non-political appointments. These science scholars act in an advisory capacity, and support all three aspects of science diplomacy. In particular, these advisors directly engage and connect science, technology, and engineering in the U.S. with governments, universities, national academies, civil society organizations, and people around the world.

Scientists also are employed in foreign policy and international development agencies in both the U.S. and other governments, harnessing science diplomacy to improve international relations and development program assistance. Science diplomacy can be a very effective tool in the area of water security.

UNDERSTANDING WATER SECURITY CHALLENGES IN CENTRAL ASIA AND AFGHANISTAN

Water security is a major challenge facing Central Asia, and has only recently garnered mainstream news attention.⁴ A major U.S. Senate Foreign Relations Committee Report brought these challenges to the fore in U.S. foreign policy discourse.⁵

Current water resources management practices and geopolitical trends threaten stability across the region. Shortages from hydropower demand, pollution, and irrigation inefficiencies; forecasting limitations due to floods and climate change broadly; dated and incomplete water-sharing treaties, borders, and allocation models; and other factors such as poverty, social tensions, environmental degradation, ineffective leadership, weak institutions and external government influence together increase the risk of state failure across the region.

Historically, the Central Asian countries have focused on national, short-term interests, rather than regional, long-term planning. This behavior is reinforced by the international water treaty stalemate (i.e., a post-Soviet framework for broader transboundary water sharing has yet to be created),⁶ as well as the “hydro-politics” of water (e.g., the word “water” itself can be a lightning rod in some Central Asian countries). Tensions between the upstream countries (Afghanistan, Kyrgyz Republic, and Tajikistan) and downstream countries (Kazakhstan, Turkmenistan, and Uzbekistan) are inextricably linked to the dissolution of the Soviet Union. Under Moscow coordination and decrees, the five Central Asian countries participated in water-energy sharing arrangements, which did not include Afghanistan. Today, these extant agreements form the basis of water governance, water use practices, and assumptions regarding water rights. Acknowledging this history is important to Afghanistan.

Stakeholders exist at many levels and contribute to and/or are impacted by the increasing pressures on both water basin supply and demand. Major actors include government policymakers and ministers, international water organizations, international donors, universities and water researchers, technically skilled water resource personnel, future government and academic leaders, and end-users: farmers, households, women and youth, local water basin councils, and water user associations. Interaction and coordination among these groups, especially in a regional context, have been inadequate.

Geopolitical events circumscribe water cooperation. Required border delineation with ascension to the Eurasian Economic Union also could diminish potential cooperation. Shifting exchange rates as currencies free float may preclude creation of a price for water. Speculation that Russia wants to control regional waters through influence in the Kyrgyz Republic and Tajikistan is mounting. These national interests undermine regional cooperation. The Central Asian water community is insular in nature, lacks investment in the next generation of leaders, and provides limited continuing education for current leaders. And, understanding of integrated water resources management (IWRM) principles is minimal. Hydropolitical instability ensues across the region and within countries.

Central Asia and Afghanistan populations rely heavily on water for agriculture. Dated agriculture practices in the region exacerbate demand pressure on basins (e.g., irrigation through field flooding, lack of water monitoring equipment, and deteriorated irrigation infrastructure for water). Nearly seventy-nine percent of water is lost in the region through these inefficiencies, compared with an average of sixty percent across developing countries.

The price for water (if one exists) is well below market value. The perception of water as a common resource is pervasive throughout the region. Unchanged practices will lead to intensified water shortages, reduced available arable land, inoperable irrigation networks, clogged water distribution canals, widespread soil salinization, and potential food shortages.

Hydropower is prevalent in the region. While hydropower does not consume water directly, evaporation from reservoirs, disruption of flow, and diminished farmland from the reservoir footprint all decrease available water supply, and natural ecology of rivers is altered. Increased hydropower demand may lead to strained relations between countries (e.g., Tajikistan-Uzbekistan and Roghun Dam).⁷

Many do not understand the relationship among water, energy, environment, and food, a nexus that increasingly is receiving international donor attention. Without environmental protection, loss of groundwater, increased erosion, excessive sedimentation with damaged watersheds, rising water temperatures, and lack of aquifer replenishment will become common.

Another significant hydro-political challenge is that existing agreements from the Soviet era compromise Afghanistan; the country has no authority to increase water withdrawals from shared basins without receiving mutual consent of its northern neighbors. Few regional water-sharing agreements exist, and none

covers all six countries. Regionally-led institutions have limited capacity and political commitment to draft and implement sustainable water policies. Many leaders have been in roles since Soviet times, though the recent death of Uzbekistan's President Karimov is shifting the regional balance.

Small basin councils and water user associations exist in several watersheds, with capacity varying widely. Their ability to implement or create water management agreements, however, is diminished due to minimal investment in current and future IWRM leadership, poor to no water monitoring technology, data collection, basin mapping, and data-sharing capabilities. Livelihoods are compromised through continued overexploitation of water resources and the inability to plan for climate change resilience and disaster risk reduction (DRR).

Increasing temperatures due to climate change will shift the rate and timing of snow and glacier melt earlier in the year, with greater water volume in the major rivers of Central Asia and Afghanistan. Over time, the trend is forecast to reverse, with water supply decreasing. Globally, this region is one of the most prone to climate change. The projected thirty percent growth in population over the next forty years will drive demand, leading to decreased availability of water for agriculture, sanitation, and energy, and increased water pollution. Narrowly-focused economic development strategies and low economic diversification translates into a region heavily dependent on hydropower and agriculture for livelihoods.

If these threats remain unabated or unresolved, then absent water-sharing agreements, tariffs, and organizations, overexploitation of water resources will continue. Water security will be compromised and the potential for regional hydro-political conflict will escalate.

Water in Central Asia and Afghanistan is a focus for bilateral actors, donor organizations, private foundations, civil society organizations, and international financial institutions, including the Aga Khan Foundation, Asian Development Bank, European Development Bank, European Union, Germany's international development organization (GIZ), Swiss Development Corporation (SDC), United Kingdom Department for International Development (DFID), United Nations (UNDP, UNECE, UNFAO, UNRCCA), and The World Bank Group. These entities work at multiple levels (i.e., regional, national, local) with myriad stakeholders to address water challenges. To circumvent geo-political challenges, donors frame water discussions under less controversial topics such as climate change, DRR, energy, or resource management to avoid repetitive and confrontational national positions in reaction to "water" issues. In addition, the emerging Sustainable Development Goals (SDGs) have the potential to expand significantly the focus of water in the post-2015 development agenda.

SUPPORTING DIPLOMACY THROUGH INTERNATIONAL RESEARCH PARTNERSHIPS

USAID is the major U.S. Government (USG) foreign assistance agency. The agency is focused on helping nations end extreme poverty and promote democratic, resilient

societies. Over the past five years, including the Office of Science & Technology, reorganized to form the U.S. Global Development Lab. “The Lab” discovers, tests, and scales breakthrough solutions with a diverse set of public and private partners to address critical challenges in international development. One key aspect of this approach is the support of scientific and technological research through the Partnerships for Enhanced Engagement in Research (PEER) Program. PEER is a competitive, peer-reviewed award program that invites scientists and engineers in developing countries to apply for funds that foster research and capacity-building activities on topics of importance to USAID.

The PEER Program works closely with the U.S. science, technical, and engineering community, including the following partner agencies: National Aeronautics and Space Administration (NASA), National Institutes of Health (NIH), National Oceanic and Atmospheric Administration (NOAA), National Science Foundation (NSF), U.S. Department of Agriculture (USDA) Agricultural Research Service, U.S. Forest Service (USFS), USDA National Institute of Food and Agriculture, U.S. Geological Survey (USGS), and the Smithsonian Institution. The U.S. National Academies of Sciences, Engineering, and Medicine is an important partner in the PEER Program. The Academies manages the peer-reviewed grant proposal review process, disburses awards, and monitors progress of the multi-year grants. Quarterly updates are available to the public on the PEER Program website.⁸

Through PEER, The Lab leverages financial investments for scientific and engineering research and training already committed to federal partner agencies to support USAID’s development priorities. Developing country researchers are required to partner with a USG-funded researcher from the start of the PEER award application process. For example, a USG-funded National Science Foundation researcher can serve as a PEER partner for a developing country researcher if she will contribute to the scientific merit and impact of the PEER project through expertise, skills, methodologies, laboratory access, and/or synergies with ongoing research projects. Thus, PEER award recipients benefit from the skills, laboratory access, and other resources of their USG-supported partner. Both the PEER applicant and the USG-supported researcher benefit from one another’s expertise, and partner on truly collaborative research.

For the past five years, USAID has issued a call for PEER award proposals. Each call includes a general category (i.e., science and engineering research broadly), as well as specific areas of study. Examples of these focus areas include: assessment of fish natural history in the Lower Mekong River, analysis of tuna fish stocks in the South China and Sulu-Sulawesi Seas, impact of environmental contaminants globally, research on education and educational practices to improve decision-making in Haiti, understanding of health implementation science globally, and water security in Central and South-Central Asia.

IMPROVING WATER SECURITY THROUGH INTERNATIONAL RESEARCH COLLABORATIONS

For the past twenty years, USAID has provided programmatic assistance to the Central Asian countries to address water challenges. This has focused primarily on agriculture, sanitation, sub-basin level water management, transboundary governance, basin-level data platforms, regional policy dialogs – some in cooperation with The World Bank, and technical exchanges. Water-related USAID programs in Afghanistan have focused on clean drinking water access, irrigation infrastructure rehabilitation, and watershed management through ecosystem protection. These programs complement those of other federal agencies and Department of State diplomatic interventions. However, a more direct approach – using science diplomacy – to address regional water challenges is needed.

In 2015, the PEER Program issued a special call for proposals to address transboundary water research in Central and South-Central Asia. This focus area aimed to improve regional water security challenges, and encouraged scientists and engineers from Afghanistan, Kyrgyzstan, Pakistan, Tajikistan, Turkmenistan, and Uzbekistan to apply for funding. Specifically, this call for proposals focused on supporting multi-year research projects in the Amu Darya and Kabul River Basins that incorporated one or more of the following approaches:

- Creating a hydrograph by pairing historical and modern climate data.
- Assessing and identifying best practices for landscape stabilization in watersheds
- Identifying best methods for groundwater recharge in specific geologic environments.
- Projecting climate change impacts on water flow
- Forecasting climate change impacts on snow and glacier melt
- Projecting climate change impacts on vegetation cover in watersheds
- Determining lateral river migration rate and/or migration propensity of transboundary rivers
- Forecasting water availability and use
- Investigating socioeconomic, policy, or legal topics, such as water rights and climate change impact on transboundary water treaties and water sharing.

Additionally, PEER encouraged projects that incorporated regional and cross-border collaborations, engagement with Kazakhstan, and scientific and engineering capacity-building. As with all PEER calls for proposals, female researchers were strongly advised to apply. Unique to this call for proposals, awardees were expected to participate in semi-annual regional forums with invited guest experts, government leaders, and other PEER researchers from Central and South-Central Asia to share progress, engage stakeholders, and advance the research agenda and capacity on their project topics.

TRANSLATING RESEARCH INTO IMPACT

Since PEER's launch five years ago, the Program has supported over 250 projects involving scientists and engineers in 50 countries. Across Central and South-Central Asia, eighteen research proposals have been supported: Afghanistan (six awards), Kyrgyzstan (two awards), Pakistan (three awards), Tajikistan (two awards), and Uzbekistan (five awards).¹⁰

In 2014 and 2015, special proposal-writing workshops to foster competitive grants were held at U.S. Department of State Embassies and USAID Missions. Country and regional science advisors from USAID, as well as Washington, D.C.-based colleagues participated in these workshops. Interest in PEER grew tremendously over the two years. For example, in Afghanistan, eight researchers attended the first proposal-writing workshop (2014). Two attendees were successful, and received awards, sharing their research plan with the Government of Afghanistan's leaders, senior U.S. Embassy and USAID staff, and university colleagues in a formal event at the U.S. Embassy in Kabul. In 2015, thirty-five Afghani scientists and engineers joined the second proposal-writing workshop. Four proposals earned PEER awards.

Research funded spans the gamut of water security topics, such as flood magnitude prediction, climate change vulnerability assessment, drought monitoring, water treaties, and glacial melt patterns. Some awards feature a research consortium, with scientists and engineers from multiple Central and South-Central Asia countries. Awardees span independent research entities in Afghanistan and Pakistan; regional organizations such as the International Center for Biosaline Agriculture, International Water Management Institute, Regional Environmental Centre for Central Asia (CAREC), and Scientific Information Committee of the Interstate Coordination Water Commission (SIC-ICWC); universities in Afghanistan and Kyrgyzstan; and national academy of sciences in Kyrgyzstan and Tajikistan. U.S. partners include NASA, USDA, USGS, University of California, University of Colorado, University of Idaho, University of Nevada, University of New Hampshire, West Virginia University, and Johns Hopkins University. Female researchers constitute fifty percent of recipients.

The first regional forum was held in September 2015 in Astana, Kazakhstan, bringing together nine researchers from Afghanistan, the Kyrgyz Republic, Pakistan, Tajikistan, and Uzbekistan. Major objectives were for scientists and engineers to present transboundary water resources research, build an international community of scholars, and discuss the challenges of conducting research in Central and South-Central Asia. In addition to sharing their research plan and initial findings with colleagues, the PEER awardees also participated in a regional convening held by the USGS entitled "Developments in Integrated Water-Resource Data and Remote Sensing Applications in Support of Resource Assessments in Central Asian Countries." This convening brought together government scientists and water managers from all five Central Asian countries and Afghanistan. Both the forum and convening represented science diplomacy in action. The second regional forum

will be held in fall 2017, and will bring together all eighteen PEER awardees, as well as international experts and non-government organizations.

ENVISIONING A FUTURE OF WATER-BASED (“BLUE”) PEACE

In Central Asia, during the Soviet Union, significant resources were dedicated to science and engineering through support to national academies of science and universities, and well-paying research and teaching positions. Present challenges facing these countries include limited available funding for science and engineering, and retirement of many senior researchers educated in “the Soviet System.” These researchers have strong technical abilities, significant scientific literature understanding, superb prowess in their field of study, and vast international connections. However, youth are leaving the region to pursue education and research opportunities.¹¹ Some return with the education they received abroad, and represent the next generation of scientists and engineers in governments, universities, and independent organizations. However, many remain in China, Russia, Europe, and the United States. In addition, data shows a definite decrease in terms of young people pursuing science and engineering. The region risks a “brain drain” in technical areas.¹²

To address complex regional challenges such as water security, it is critical to have all possible actors solving problems, and all minds at the diplomatic table. When more educated people engage in Central and South-Central Asia transboundary water, the better and more long-lasting the solution. While PEER represents one important approach and clearly leverages science for diplomacy, water education in the region often does not equate to university training.

For example, transboundary water management in Central Asia involves meetings at the local level, with local water councils leading decisions. One or two women often are on the council, but childcare obligations mean that these women often cannot attend the meetings. Their presence and perspective is critical, as women use water differently than men, just as the elderly use water differently than youth. It is essential to have the best and broadest representation possible.

The Aral Sea Basin Programme 3 (ASBP3), launched by the Executive Committee of the International Fund for Saving the Aral Sea (EC-IFAS) and endorsed by all Central Asian countries and major donors, incorporates IWRM principles, such as water pricing, treatment, hydropower efficiency, and regional capacity building in water governance, measurement, forecasting, and education. Implementing the ASBP3 will facilitate regional cooperation, overcome overexploitation of shared water resources, and improve water management efficiency at the local and country levels. Countries may be motivated by the growing size of the North Aral Sea after completion of a dam; however, the overall geographic area is impacted by acute desertification with the loss of sea surface. Turkmenistan, the next EC-IFAS host (three-year rotations) may invite Afghanistan to join formally, rather than hold observer status, launching a holistic ASB dialogue.

International donors are building on country conversations and regional “hydro-diplomacy” dialogues launched by The World Bank in 2014. This goodwill, networking, and facilitated, holistic debate could result in a regionally-led strategy and policies on water resources management that includes all five countries and Afghanistan. In addition, the OSCE and EU may expand engagement with Central Asian countries, with particular focus on water and energy, providing additional voices in this space. It has been suggested that the SIC-ICWC could be quite effective; the organization has collected a rich amount of data on regional water use.

In 2015, the Government of the Islamic Republic of Afghanistan and the Government of Turkmenistan signed declarations outlining areas for cooperation, which includes science and technology. Focusing on hydro engineering may be an opportunity to facilitate water-sharing advances between these countries. In addition, the Government of the Islamic Republic of Afghanistan has launched a special transboundary division under its Energy-Water Ministry.

Also in 2015, the world convened in Dushanbe for the High Level International Conference on the Implementation of a Decade for Action: Water for Life, 2005-2015. This represented the first time that international donors, water ministers, and citizens from all six countries attending the meeting began to demand a change of watercourse. The Conference utilized the full spectrum of science diplomacy to address water security: science in diplomacy, diplomacy for science, and science for diplomacy.

Another means to foster population resilience and regional stability is to build on regional agriculture research programs that support climate-resilient crops, irrigation infrastructure modernization, and water use monitoring. Reducing the hydro-politic through creation of region-wide DRR-based solutions is another opportunity to facilitate broad cooperation. All of these solutions are possible through the use of science in diplomacy, science for diplomacy, and diplomacy for science.

On the surface, the village near Khujand, Tajikistan looks similar to its neighbors. Men stand near the canal, wearing the traditional kalpak hats, children play in the river, and women bake *fatir*, the round flaky Tajik bread. But unlike other communities along the Isfara River, this village is addressing water availability challenges, rather than ignoring them. The local small basin water management council, supported by the USAID and CAREC, works with a similar council across the border in the Kyrgyz Republic. Together, they hope to mitigate the myriad water challenges facing the region. To mitigate decreasing water supply and increasing water demand, they are integrating globally-accepted IWRM principles – such as water pricing, measurement, and irrigation efficiency, as well as regional capacity-building in water governance and education. In particular, IWRM-based agriculture interventions, such as planting low water intensity crops and measuring water use also will reduce the risk of water-related conflict. Together, these approaches will facilitate regional cooperation, surmount overexploitation of water resources, and improve efficiency of water management at the local and national levels. It is critical

for the international community to guide this process, positioning water as a means for regional cooperation and economic growth.

Growing capacity using IWRM principles, aligning development programs with diplomatic outreach, approaching water as part of an energy-environment-food-water nexus, and coordinating international donor efforts and host government strategies have the potential to transform water from a source of tension and future conflict to a blue peace emanating from water-based solutions.

NOTES

¹ Vaughan C. Turekian, and Norman P. Neureiter, "Science and Diplomacy: The Past as Prologue," *Science & Diplomacy* 1, no.1 (Winter 2012): 1-5.

² Pew Research Center, Global Attitudes and Trends 2012.

³ U.S.-Japan Conference on Cultural and Educational Interchange (CULCON), June 12, 2008. <http://culcon.jusfc.go>

⁴ Rustam Qobil. "Will Central Asia Fight Over Water?" BBC News. October 25, 2016, <http://www.bbc.com/news/magazine-37755985>; Catherine Putz, "What Can Be Done About Central Asia's Water and Electricity Woes," *The Diplomat*, October 27, 2016. <http://thediplomat.com/2016/10/what-can-be-done-about-central-asias-water-and-electricity-woes/>; David Trilling, "Water Wars in Central Asia," *Foreign Affairs*, August 24, 2016, <https://www.foreignaffairs.com/gallerys/2016-08-24/water-wars-central-asia>

⁵ Staff Report, "Avoiding Water Wars: Water Scarcity and Central Asia's Growing Importance for Stability in Afghanistan and Pakistan," *United States Senate Foreign Relations Committee*, February 2011.

⁶ "International Freshwater Treaties Database," Oregon State University. <http://transboundarywater.geo.orst.edu/database/interfreshtreatdata.html>

⁷ Casey Michel, "Tajikistan's Rogun Dam Rankles Uzbekistan," *The Diplomat*, July 2, 2016. <http://thediplomat.com/2016/07/tajikistans-rogun-dam-rankles-uzbekistan/>

⁸ USAID, "Peer Cycle 6 Call for Pre-Proposals Announced," December 3, 2016. www.nationalacademies.org/peer

⁹ "Central Asia Energy-Water Development Program," *The World Bank*, December 3, 2016. <http://www.worldbank.org/en/region/eca/brief/caewdp>

¹⁰ "PEER Comprehensive Project List," *The National Academy of Sciences, Engineering, Medicine*, December 3, 2016. http://sites.nationalacademies.org/PGA/PEER/PGA_161128

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¹² Rafis Abazov, "Central Asia's Skilled Migrants: Brain Drain or Brain Gain?" *The Central Asia-Caucasus Analyst*, July 22, 2010. <https://www.cacianalyst.org/publications/analytical-articles/item/12100-analytical-articles-caci-analyst-2010-7-22-art-12100.html>; Marina Kayumova, "Emigration of 'Creme de la crème' in Uzbekistan. A Gender Perspective," *The Central Asia Fellowship Papers*, no. 8 (Winter 2015: 1-15).

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