Resilient Infrastructure, Institutions, and Information

Integrating Climate Adaptation into Water Management Decisions through the AGWA Decision Support System (DSS)

Climate change is a strengthening, palpable force for the water community globally. While we have always managed water with uncertainty, the novelty of climate change presents new challenges for how we integrate climate impacts and adaptation in our work. These challenges are significant because much of the effort in water management focuses on designing infrastructure and institutions and anticipating demands over climate-relevant timescales. New questions are emerging:

- How do we define sustainable water management over long timescales?
- Can we design and operate dams or manage freshwater protected areas over decades or centuries?
- Can we design investment and finance strategies that balance uncertainty and risk from rapidly evolving conditions?
- How do we balance nexus issues around water for food and energy security given a dynamic climate and evolving ecosystems?
- How do we bridge the global gap in access to clean water and adequate sanitation in a way that ensures sustainability and promotes both health and economic growth?
- How do institutions maintain integrity as they cope with social, economic, and environmental changes that require robust, complex, and flexible responses?

Particularly in the developed world, ample evidence exists to show that our decisions from the nineteenth and twentieth centuries have already diverged from local and regional climate, while the same methodologies that created mismatched infrastructure and institutions are now being used in the developing world for a second “golden age” of rapid water infrastructure expansion. Poor investments made now in Africa, Asia, and South America are likely to plague if not undermine economies and ecosystems and lay the seeds for conflict, inequity, and environmental degradation for future generations. These issues are urgent and important. Decisions about long term water management are made every day in every nation, and many of these decisions are not resilient.

However, effective expertise has been coalescing in many fields in the past decade. Thought leaders in a variety of disciplines have been gathering lessons, applying research, and testing non-stationary hypotheses for useful action. However, this expertise has in most cases remained isolated and separated within disciplinary and institutional or sectoral silos. The time is now ripe to constrain and coordinate these lessons and to integrate these perspectives into an evidence base that can harvest existing tools and approaches. We need a synthesis of best-practice water resources management that can be presented in a format accessible for water managers and water planners and inform resilient strategic and tactical decisions and actions. And this synthesis must be capable of functioning in a reliable, coherent, and consistent manner in the developing world, where data and governance limitations often present barriers under even stationary approaches.
AGWA (the Alliance for Global Water Adaptation) was founded in September 2010 by a broad coalition of multilaterals, various levels / branches of local, national, and UN government groups, a wide range of civil society organizations, researchers, and key components of the private sector. The AGWA steering committee includes representatives from the USACE, TNC, the University of Massachusetts, SIWI, and the World Business Council for Sustainable Development. Non-voting members of the steering committee include Seattle Public Utilities and Deltares Research Institute.

The Decision Support System (DSS)

As a network, AGWA has come together to fill the decision-making gap by making contributions from multiple perspectives and disciplines. Our fundamental goal is to provision tools, partnerships, and technical assistance to improve operational decision-making, governance, and analytical processes in water resources management, with a focus on the scales relevant to climate adaptation and climate change. As a first concrete product of this collective effort, we are developing a Decision Support System (DSS) to guide water management planners, investment officers and practitioners to make use of existing tools, research, and dataproducts into an evidence-based system to inform water management decision-making processes.

Philosophically, AGWA has arisen as a result of dissatisfaction with the past decade of experimentation of top-down approaches to climate adaptation. Climate models provide coarse but reasonably accurate information about variables such as air temperature, but most aspects of the water cycle (e.g., monthly/seasonal precipitation, extreme event frequency/severity) are associated with levels of uncertainty that are difficult to reconcile with technical water management needs (Fig. 1). The “AGWA approach” is characterized by decision scaling, stakeholder-driven assessment and governance needs, a definition of resilience that spans infrastructure, community, and eco-hydrological limits, economic analyses capable of signaling optimal decisions, and financial mechanisms capable of supporting mainstreamed practices. Decision scaling is a relatively new approach to constraining uncertainty that emphasizes a bottom-up approach, which uses known or inferred system-specific knowledge and multiple lines of evidence (climate models in conjunction with metered data, paleo records, qualitative estimates) in order to build confidence in realized and potential climate impacts.

The DSS will ultimately be an evolving methodology, ultimately using crowd-sourced content and development feedback mechanisms to reflect the rapid mobilization of evidence and research now emerging globally, delivered via open-source software. The DSS is based on a generalized water management decision tree to facilitate adoption by water managers and planners. We are especially
interested in assisting in supporting resilient water management in the data-poor regions of the developing world.

DSS Structure and Process

The DSS has three linked teams: content workstreams, software development, and implementing partners. All three teams have initiated their work as of January 2013, with some working now for up to one year.

The content workstreams for the DSS reflecting the diversity of knowledge critical to making more resilient decisions through four clusters (Fig. 2):

- Hydrology and climate science (coordinated by the USACE and the University of Massachusetts)
- Economics and finance (coordinated by the World Bank, SIWI, the OECD, and the EIB)
- Engineering and ecology (coordinated by CI, the USACE, the IDB, and WWF)
- Governance (coordinated by the US Department of State, Environmental Law Institute, and Pegasys)

These workstreams contribute both individual and synthetic components to the overall DSS.

The software development team is coordinated by the Stockholm Environment Institute (SEI), which has previously developed technical water management applications such as WEAP and LEAP, though other members of AGWA will also contribute.

The implementing partners represent a commitment to the goals and deployment of the DSS. These partners have agreed to facilitate the testing and piloting of the DSS before launching the public version. Implementation began in December 2012 but is expected to continue for at least one year. Implementing partners include the Water Convention under the UNECE (the Dniester, spanning Ukraine and Moldova) as well as USACE and US AID sources (Thailand, Mongolia, Iowa, Peru, and Bolivia); other projects (Mexico, Jordan) are in negotiation and we expect the numbers to grow rapidly by the middle of 2013. In all cases to date, funding has been arranged by the implementing partners.

Funding Secured & Sources: To date, AGWA’s operating cost have been supported through in-kind contributions by members of the network, such as staff time, flight costs, project implementation, publications, and meeting expenses. AGWA’s core hosting costs have been supported by a private donor to CI’s Center for Environment and Peace. An informal estimate of three institutions in October 2012 — the USACE, the World Bank, and CI — suggested that in-kind contributions for the previous year had totaled over about 650k USD in total for these organizations alone. However, while these contributions have been significant and represent a substantial investment and faith in both AGWA and the DSS, by themselves in-kind contributions are unlikely to be sufficient to carry the DSS.