The Horinko Group &

The Mannie Jackson Center for the Humanities Foundation present

The Future of Transboundary Water Management –
Cooperation, Informed Decision-Making, and Empowering Local Actors

2017 Summit

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Summit Partners

Diminishing freshwater resources and water quality degradation are issues affecting nearly every region of the planet. Inequities are magnified when water sources cross national boundaries, impacting the lives of those less empowered. Globally, countries are struggling to mutually agree on how to manage common water resources. Internationally, conflict in the Middle East could hinge on water supply compromises. Domestically, challenges arise at every level – national, state, and local. This multi-dimensional overlay must be properly addressed in an interconnected manner.

The ubiquitous growth of big data has revealed significant implications for better informed water resources decision-making. Constantly improving analytics can provide operational managers and policy-makers with better informed choices. Real time monitoring, early impairment detection, tracking water contaminants and identifying sources, and the impact of drought in arid regions have game-changing value in improving negotiations across state and international borders. But, how can the over-abundance of data be managed effectively to guide decisions by science and fact, rather than conjecture and politics?

The Horinko Group, in partnership with the Mannie Jackson Center for the Humanities Foundation, the Arava Institute for Environmental Studies, and the National Great Rivers Research & Education Center, will convene thought leaders to consider key transboundary issues on intranational and international scales. The effective use of big data technologies has a role in shaping decisions affecting current and future water usage. The Summit will feature three panels, each considering use of big data management and

monitoring. The conversation will consider how technology and analytics can influence and affect consequences for all of us, with emphasis on underserved and underrepresented peoples.

Panel Summaries

Panel I: Water Diplomacy and Cooperation in the Middle East – Big Data and the Road Ahead

The first panel will focus on transboundary water management between Israel and Palestine, a region as hydrologically complex as it is politically challenging. Israeli and Palestinian water experts will describe how use of analytics has transformed from a fulcrum of entrenched positions to a link of shared management and decision-making. Further, discussion will explore the creation of shared data sets that delineate shared watersheds by leveraging existing and new technologies. Finally, the panel will explore big data use as a trust-building mechanism for establishing water governance bodies to ensure data is collected scientifically, appropriately, and fairly.

Panel II: Cooperative Federalism and the Role of States in Sustaining Western Water – Forecasting and Managing Supply

The second panel will account for current and forecasted water resource challenges facing communities and rural landscapes in the western United States. Water scarcity, changing precipitation patterns, environmental needs, and water quality issues pose staggering challenges to the adaptive capacity of an already constrained and over-allocated water system. The need for interstate cooperation and compromise regarding water resources allocation will become more evident and immediate as water supply and demand imbalances become greater. Effective collaboration and an array of existing and emerging technological, policy, and management responses will prove critical for establishing pathways for cooperative water use.

Panel III: Interstate Cooperation to Improve System and Community Resiliency in the Mississippi River Basin

The third panel will focus on the nation's most iconic large river system, the Mississippi. Panelists will describe community and interstate efforts to address key system and community stressors – water quality, sediment transfer, flood risk – and opportunities to apply big data techniques and data mining at the managerial level in a joint effort to better inform watershed-scale environmental, legal, and socio-economic decision-making, while building the adaptive capacity of local actors.

A concluding discussion amongst the panel moderators will be forward-looking, focused on future data analysis, data integration, and data visualization. Proof of concept projects will be considered for each region, accounting for social indicators and the human dimension of these natural systems.

Panel I: Water Diplomacy and Cooperation in the Middle East – Big Data and the Road Ahead

Overview

Transboundary water management between Israel and Palestine is both hydrologically complex as it is political challenging. Lack of an overarching peace agreement between Israel and the Palestinian Authority has created a situation where management of shared water resources is mired in inefficiencies and disagreement, with each party exploiting data to support their own positions. Sustainable regional water management has been hostage to the political process, but through proper use of analytics, it need not be.

In this panel, Israeli and Palestinian experts will present and discuss how data is utilized to turn away from entrenched positions toward shared decision-making. Water management must occur at a watershed level and disregard political borders that in many cases ignore hydrologic reality. The Green Line that separates Israel from the West Bank fractures watersheds flowing east to west. Israel collects data on the western portions of these watersheds, whereas Palestinians do so on the eastern portions. The lack of coordination and trust between the two results in inefficiencies and mismanagement of the scarce water resources in this arid region.

Using wastewater treatment as an example, there is a wide technological gap between Israel and the West Bank. Israel leads the world in wastewater treatment and reuse for agriculture with over 80% of domestic sewage being reused in agriculture. However, in the West Bank, wastewater treatment is only around 30% and reuse is less than 5%. The two communities share resources: untreated wastewater from the Palestinian territories, upstream from Israel, flow westward contaminating surface waters, percolating into groundwater and creating a public health hazard. Each side blames the other for the problem and for lack of solutions. The problem is due in large part to independent wastewater use data collection with little coordination. Inequality in data collection capacity between the parties exacerbates the problem, with Israel having greater capacity than that of the Palestinians. Appropriate planning for both centralized and decentralized wastewater treatment facilities in the West Bank simply does not occur.

The rapid advances over the past decade in the growth of GIS-enabled web applications, online data entry systems, data mining and management, cloud mobility and smart phones have made it possible to generate quality water management data on an unprecedented scale and in a cost-effective manner. Data can also be leveraged to overcome political disagreements and mistrust, if it is collected, analyzed, and presented in a democratic manner. Ultimately, in this manner, data can be used as an instrument to promote peace.

Presentations

The panel will discuss how to establish joint data sets that define all the shared watersheds in terms of available technology, leveraging new technologies, especially in terms of information technology and remote sensing, and the water governance bodies that need to be instituted to collect data scientifically, appropriately, and fairly. The discussion of proposed governance will address building upon existing bodies such as that of the Joint Water Committee, with a view toward improving upon a decade of political wrangling.

Panel II: Cooperative Federalism and the Role of States in Sustaining Western Water – Forecasting and Managing Supply

<u>Overview</u>

This decade has witnessed significant drought conditions in the western United States. The National Climate Assessment predicts drought trends will likely intensify over this century and beyond. Meanwhile, population in the western states is increasing rapidly and the region continues to support significant agricultural production. Although coping with drought is a western way of life, projections for continued severe drought will test existing practices and policies.

The resilience of past development and current water law will be put to the test. Water scarcity, changing precipitation patterns, environmental needs and water quality issues, pose staggering challenges to the adaptive capacity of an already constrained and over-allocated water system. The need for interstate cooperation and compromise regarding water resources allocation has become more evident and immediate as water supply and demand imbalances become greater. Effective collaboration will prove critical for establishing pathways to sustainable water use.

Protecting environmental flows presents a unique challenge. Ongoing drought conditions pose a serious challenge to the adaptive capacity of endemic species. Natural resources agencies and partners are advocating for short- and long-term strategies to promote ecosystem health. However, financial constraints and the severity of this challenge are limiting success. Ultimately, forward-thinking investments in resilience will enable continued economic prosperity in the western states, but many water users—particularly agriculture and ecosystems—will face extreme and daunting obstacles. Analytics are informing this effort.

<u>Presentations</u>

The panel will review current and forecasted water resource challenges facing western U.S. communities and rural landscapes. An array of existing and emerging technological, policy and management responses will be presented that are available to promote short-term solutions to drought and long-term resilience to climate change impacts. Regional distinctions, uniqueness and similarities will be accounted for across the arid Southwest, the Rocky Mountains, and California.

Panel III: Interstate Cooperation to Improve System and Community Resiliency in the Mississippi River Basin

<u>Overview</u>

The Mississippi River is the nation's best known river system. It has served as a social and cultural gathering point for centuries. Today, it retains its importance by providing the essential needs of thousands of communities, sustaining commerce, recreation, inspiration, and even the most basic necessity of drinking water supply for millions. The river's ecosystems provide environmental services that foster diverse biological communities integral to our national character.

Mississippi River water quality is of paramount importance for the sustainability of these values and uses. There is no question that human activities across the basin have an adverse effect on water quality. Manufacturing, urbanization, timber harvesting, and agriculture alter river functions. Hydrologic modifications further enable human ecosystem alteration. Degradation of water quality results in increasingly complex community impacts.

The related concern of sedimentation presents a regional dichotomy: the upper Mississippi experiences an influx, while reduced sediment in the southern reach contributes to the loss of protective coastal wetlands. Water quality is further impaired by sediment influx. Excess nutrient loading, primarily from nitrogen and phosphorus based fertilizers, taxes ecosystems throughout the basin. While agrichemicals unquestionably increase yield furthering food security, water quality impacts cannot be overlooked.

In addition to water quality stressors, water quantity affects Mississippi River communities. In contrast with the issues of depletion and shortage in the western U.S., flood risk and flood damage are a dominant concern. The social cost of flood protection and pre-disaster mitigation point to the pressing need for a course correction in floodplain management and upland stormwater retention. Too often, regulated floodway encroachment and altered hydrology mask cost externalities and beg for more balanced methods that would restore natural hydrology. Ultimately, the goal of preserving communities and their local cultures must be approached realistically.

A comprehensive system to address issues associated with water quality and quantity can be informed by intelligent use of data. The ten mainstem Mississippi River states have varying priorities and devote different levels of resources to data collection. A more integrated effort is slowly taking hold. Efforts such as the Gulf Hypoxia Task Force and the Upper Mississippi River Basin Association's Water Quality Task Force are calling greater attention to the need for sharable data and new approaches to monitoring and data analytics. Through the Mississippi River Basin Healthy Watersheds Initiative (MRBI), the U.S. Department of Agriculture-Natural Resources Conservation Service and its partners are working with producers and landowners to implement voluntary conservation practices that improve water quality, restore wetlands, enhance wildlife habitat, and sustain agricultural profitability in the Mississippi River basin.

Today, there is no interstate compact governing the Mississippi River. Law is an essential set of data whose understanding will be essential to the generation of a stakeholder-derived legal framework. Law governs the water quality of the Mississippi

River and its tributaries as well as discharges into the watercourses. Each state has independent authority to grant water rights and allocate water use among competing water users. To build a unified approach to the Mississippi, legal data will be important to a clear understanding of existing approaches and potential challenges.

A general lack of adequate monitoring and performance assessment remains a material weakness in these undertakings. But, interstate collaboration is being fostered and data sharing and standardization are fast becoming a priority. Big data will have a growing place in predictive modeling and ultimately lead to a more intelligent and informed approach to water quality and quantity management, and will assist in informing transboundary governance strategies.

Presentations

This panel will frame Mississippi River basin challenges focusing on system and community resiliency and interstate efforts to address key system and community stressors – water quality, sediment transfer, and flood risk – as well as the legal platform ultimately supporting collaborative governance. Panelists will provide strategies and programs that are responding to system challenges that involve interstate cooperation and big data applications including new emerging technologies and analytics. The panel will also reflect on the capacity building implications of big data analytics and how it can empower state and local governments, the business community, and citizens of the basin as we enter an era of growing resource scarcity and climate uncertainties.

Luncheon Keynote: Empowering Local Actors to Enhance Community and System Resiliency along the Atlantic Coast Line

Brigadier General William H. Graham, Commander and Division Engineer, North Atlantic Division, U.S. Army Corps of Engineers

As Division Commander, BG Graham oversees an annual program of more than $5 billion to plan, design and construct projects to support the military, protect America's water resources, mitigate risk from disasters, and restore and enhance the environment. He is also responsible for a variety of Division engineering and construction activities for international, federal, state and local governments and agencies in more than a dozen Northeastern states as well as overseas.

BG Graham will discuss the threat presented by unresolved inter-jurisdictional water resource issues, particularly as we enter an era of resource scarcity and population growth. The need for scientific research to better inform management and policy development is acute. Lacking a national water policy, the need to position local actors to immediately take steps to transform how we relate to water in order to attain community and natural system resiliency should not be pushed further into the future. Beyond research and local adaptive capacity building, there is the need for greater cooperation across boundaries and to better assess and appreciate the human condition.

Path Forward and Wrap-Up

Overview

Which river basins are running dry, and why? Researchers are gathering and analyzing satellite, atmospheric, on-the-ground and historic data to create mapping tools and models that are helping governments and others improve agriculture and conserve water.

Countries are taking on their own big data projects to better plan for the future. Sri Lanka, for example, recently began mapping many of its primary river basins and modeling climate risks to develop a comprehensive flood and drought mitigation plan. In the Dominican Republic, a project created a spatial database of the country's entire irrigated properties. The data allows water managers to better maintain the country's extensive irrigation canal systems, conserve water, and create equity among water users.

Satellites gather vast amounts of data used at global and local scales. Satellites track atmospheric patterns, precipitation, and ocean currents. Combined with weather data, researchers are using satellite data to develop better forecasting and risk-management tools to help farmers make more informed decisions, and to help governments better plan for droughts and floods. Satellite data also can be used to precisely map landscapes and analyze soils or assess crop yields, among many other uses.

Meanwhile, greater data gathering and computing power is allowing researchers to develop drought-resistant crop breeds, better understand climate change and create models that help us understand risks and opportunities. Much data is flowing in agriculture, creating numerous opportunities to increase food production without compromising limited water resources.

Sensors are one of the biggest sources of big data, and the water sector is particularly rich in sensor data. The Nutrient Sensor Challenge exemplifies one effort to advance sensor technology. The Challenge is an innovative effort to accelerate the market for the development, adoption, and use of sensors to measure nitrate and orthophosphate in water. The goal is to encourage development of sensors that are affordable, reliable, and can provide accurate real-time data. The Challenge, which seeks to accelerate these new technologies to commercial availability, is being sponsored by the Alliance for Coastal Technologies (ACT). ACT is a partnership of research institutions, state and regional resource managers, and private sector companies, supported by U.S. National Oceanic and Atmospheric Administration (NOAA) and the U.S. Environmental Protection Agency funding, whose purpose is to develop, improve, and apply sensor technologies to study and monitor coastal environments.

Many challenges remain to ensure the data flows efficiently and to those who need it most. The efficient and effective use of analytics will provide a sound framework for future decisions. Ultimately, big data can, and should, lead to a more equitable and sustainable allocation of scarce water resources.