U.S. DEPARTMENT OF STATE
DIPLOMACY IN ACTION

Remarks on Global Water Security

Remarks

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It is my pleasure to talk to you today about "global water security" at the Erice International Seminars 46th Session focused on "The Role of Science in the Third Millennium." The growing importance of water security can be framed in two ways. First, water resources should be protected so that, on a reliable basis, there is sufficient, safe water to sustain the health and livelihoods of populations, while also increasing their resilience to water-related hazards such as floods and droughts. Second, the geopolitical dimensions of water security should be addressed by considering how water shortages, poor water quality, or floods might impact the stability or failure of states, increase regional tensions, and pose a risk to global public health and food markets, thus hobbling economic growth.

Challenges

We face Global Water Challenges across many sectors because water has many uses. At the household level, humans need sufficient, safe water for drinking and cooking; and, at larger scales, we use it for agriculture, sewage treatment, navigation, hydropower and other energy production, and industry. In the natural world, water sustains healthy ecosystems that protect biodiversity and provide a wide range of ecosystem services.

Clean water is essential for human health. Few issues are more important to economic development, environmental well-being, and human security than water and sanitation. Yet today, nearly 800 million people -- one in nine -- lack access to an improved drinking water source, and more than 1.5 billion people still lack access to improved sanitation facilities. Each year, more than four billion cases of diarrhea cause 2.2 million deaths—most are in children under the age of five. In addition to the lives lost, the total economic losses associated with inadequate clean water supply and sanitation is estimated at more than $250 billion annually.

These issues disproportionately affect women and children.The burden of tending to family members sickened by water-borne disease falls primarily on women and girls, who are also more likely to stop attending school when appropriate sanitation facilities are not available. Women and girls often bear the primary responsibility for meeting the water needs of the family. Collecting water can consume up to five hours per day and involve walking more than three kilometers, carrying over 18 kilograms of water. It is estimated that, across sub-Saharan Africa, women spend some 40 billion hours per year collecting water, hours that could be spent going to school, improving their livelihoods, and becoming the future entrepreneurs that solve water security challenges.

The challenges of water extend beyond health and impact agriculture and food security. More than 70 percent of the water used globally goes towards agriculture; in some developing countries, it's over 90 percent. As overall food demand increases with a growing population and as countries shift to foodstuffs that require more water – such as beef – already scarce water resources will be under greater pressure. To feed a growing world population, the United Nations Environment Programme estimated that 14-17% more fresh water will be needed for irrigation by 2030. And it's not just water resources under pressure – soil erosion, increasing soil salinity, nutrient depletion and the increasing affects of climate change add further complexity.

Many agrarian-based economies in the developing world are rain-fed: when it rains, lands produce and economies can grow; when it does not, countries that lack the capacity to store and save water face economic decline and food insecurity, even famine. And fish from freshwater and coastal ecosystems are a significant source of protein for more than 2.5 billion people in the developing countries. Overfishing, pollution (including agricultural run-off) and poor management have led to a decline in many freshwater fish populations and a reduction in freshwater fish species.

For the energy sector, it is clear that water and energy are inextricably linked resources that are in high demand. Water is required for energy production, and energy is necessary to convey and treat water. Shortages of one can limit the availability of the other. Water can be a source of clean, renewable, energy. In many regions of the world there is significant untapped hydropower potential. Dams can play a key role in meeting

future energy needs and along with natural infrastructure can be critical to managing and mitigating the impacts of floods and droughts.

Decisions about water are not to be taken lightly. Dams can have profound and often irreversible impacts on people and the environment. Other forms of new energy development can also have effects on existing water resources. For example, growing crops for biofuels could impact the land and water available for food production within a region. Alternatively, energy generated from renewable, lower-carbon emitting sources like wind requires little to no water.

These are the types of issues at the "water-food-energy nexus," which has been the focus of much international discussion. In fact, the U.S. National Intelligence Council's "Global Trends 2030: Alternative Worlds" report predicted that the growing water-food-energy nexus would be one of the four overarching megatrends that will shape the world in the year 2030.(1) Sound science and deliberative evidence-based decision-making that integrates across all three domains and includes all stakeholders will be essential to ensuring the long-term interests of people and the environment are protected.

Across all sectors, by the year 2025, experts predict that nearly two-thirds of the world's population will be living under water-stressed conditions as a result of increasing demand and our changing climate, including roughly a billion people facing absolute water scarcity, a level that threatens economic development as well as human health.

Major Drivers of Water Quantity and Quality and Their Vulnerabilities

The first is biophysical and refers to the natural supply of water above and below ground, in lakes and rivers, and in rainfall. The variability (e.g., seasonal and annual rainfall and snowmelt) and extremes (e.g., heavy rainfall, floods, and droughts) of these biophysical drivers are a key aspect of water security. We have long records of this variability and we know that these can be influenced, for example, by large-scale climate phenomena such as El Niño and La Niña patterns.

Climate change could greatly exacerbate the variability and extremes around the biophysical drivers. Some regions will get wetter; others drier; glaciers will recede; snow-packs may decline (reducing natural water storage for many regions of the world) and sea levels will rise. Rising sea levels, storm surges, flood damage, and saltwater intrusion will threaten freshwater supplies.

Greater water run-off from more frequent and more intense precipitation events is likely to carry more pollutants into water systems. Greater variability in rainfall will increase the likelihood of extreme weather (floods and droughts), threatening both people and economies. Floods, droughts, famine, and water-related epidemics now account for over 90 percent of water-related natural disasters world-wide – often with profound humanitarian and economic consequences; with climate change such impacts are likely to increase.

The second driver of water quantity and quality is the set of human actions in the water sphere that include agriculture, industry, and water infrastructure like dams and irrigation systems. The threats to stability of this set of drivers are many – and include population growth, poverty, environmental degradation via such phenomena as urbanization, pollution, increased soil salinity, overutilization of groundwater. Another set of threats includes ineffectual leadership and weak policy frameworks and political institutions.

It is beyond the scope of my talk to address all of these issues – my point here is to acknowledge the myriad of complex human factors that combine to threaten global water security.

Scientific and Geopolitical Sides of Water Security

One of the unusual parts of my position at the Department of State is that I have the chance to see both the scientific and the geopolitical sides of many issues. From where I sit and what I read, it is clear that water issues are likely to become an increasing threat to peace and security.

In late 2011, in response to a request from the Secretary of State, the U.S. intelligence community undertook an analysis of water security and issued a National Intelligence Estimate titled "Global Water Security and Its Implications for U.S. National Security."(2) One of the report's conclusions was that, "…during the next ten years, many countries important to the United States will experience water problems – shortages, poor water quality, or floods – that will risk instability and state failure, increase tensions, and distract them from working with the United States on important policy objectives."

The report also concludes that as water shortages become more acute beyond the next 10 years, water in shared basins will increasingly be used as leverage over neighbors to preserve water interests. Over the next 10 years depletion of groundwater in some agricultural areas will cause food productivity to decline, resulting in food shortages that pose a risk to national and global food markets. Shortages of water from now to 2040 were predicted to harm economic output where countries do not have sufficient clean water supplies to generate electrical power or to maintain and expand their manufacturing and resource extraction sectors.

Solutions To Ameliorate Global Water Challenges

I believe that Diplomatic and Development approaches hold great promise. I'll start with Diplomacyapproaches. Disagreements over water are inevitable. The key is to keep these disagreements from escalating into violent conflict. Historically, countries have trended towards cooperation over water rather than conflict. This makes water a useful diplomatic tool for building trust and cooperation.

The United States and many other nations are now engaged in “Water Diplomacy.” This is essential both to ensure water issues are getting the appropriate attention at the national, regional, and global levels and to bring countries together in cases where water is, or may become, a source of tension.

One approach to water diplomacy is through multilateral partnerships – such as United States efforts with the G8 and Sanitation and Water for All activity – to focus global attention and hold countries accountable to their commitments.

Diplomatic engagement can also help pave the way for cooperation – rather than conflict – over water. These are tricky issues. Water is seen as a sovereign issue, and there are many cases where outside intervention is not wanted; these problems are often embedded within a much broader set of environment, development, political, and financial challenges.

There are times where diplomatic engagement can make a meaningful difference. This could be capacity building or technical assistance so that the parties have a common understanding of the challenges and potential solutions; it could be legal or facilitation support; and – in some cases – it could be putting forward solutions together that no party could risk putting forward on its own.

An example of a diplomatic effort being led by the State Department is the U.S. Water Partnership. In 2012, the Department of State, along with 27 other U.S. Government agencies and nongovernmental partners launched the U.S. Water Partnership to mobilize U.S. knowledge, expertise, and resources to improve water security throughout the world – particularly in developing countries.

The partnership, which now has over 60 members and has leveraged $600 million in project commitments, aims to improve service for water, sanitation and hygiene, advance integrated water resource management, increase efficiency of water use, and improve governance via stronger public and private institutions, policies and processes.

For addressing development challenges, I see a tremendous amount of promise. In May of 2013, the United States Agency for International Development (USAID) formally launched its first ever, five year (2013-2018) Water and Development Strategy. The Strategy aims to save lives and advance development through improvements in water supply, sanitation, and hygiene (WASH) programs and through sound management and use of water for food security. By integrating all of its considerable water investments (which totaled $558M in 2011) within these two overlapping strategic objectives, USAID hopes to increase its already significant impact in the water area.

USAID’s water portfolio has a richness of activities that are all adapted to the unique needs of each country, and all told, a set of programs that is improving the lives of tens of millions of people. Three overarching themes in USAID’s Water and Development Strategy are using a resiliency approach, leveraging partnerships, and harnessing the power of science, technology, and innovation.

Sustainable management of water resources is a key component of USAID’s efforts to build resilience at household and community levels in developing countries. Resilient communities, in the face of stresses and shocks, can take anticipatory action to sustain access to sufficient, quality water for health and food security. Resilient communities are able to anticipate droughts or floods and so reduce the risks of water-related disaster, and they employ science, technology, and good governance to manage climate change effects on water supply and use. And in the event of a water crisis, such communities are able to respond effectively and build back better than before.

Resiliency and effective governance of water resources are also essential aspects of conflict mitigation, particularly in arid areas where conflict over water resources can contribute to instability and exacerbate chronic vulnerability.

Another key strategy for USAID in the water sector has been to build partnerships. Over the past five years, in the International H2O Alliance with Rotary International, USAID and Rotary have worked with local organizations to complete more than 15,000 interventions in nearly 500 urban and rural communities in the Dominican Republic, Ghana, and the Philippines, ranging from hygiene training and rural water systems to urban wastewater treatment.

A new exciting partnershipis the Securing Water for Food: Grand Challenge for Developmentto be launched by USAID and the Swedish International Development Cooperation Agency in early September during World Water Week in Stockholm. The two agencies have offered this challenge to identify and accelerate science and technology innovations and market-driven approaches that improve water sustainability to boost food security. The focus of this effort will be on three areas, water efficiency and reuse, water capture and storage and salt water intrusion.

Science, Technology, and Innovation

And this brings me to the overarching theme of the role of science, technology, and innovation in development. USAID has embraced science, technology, and innovation as key drivers of identifying scalable solutions. Recognizing that there is no ‘one-size-fits-all’ solution, the Water and Development Strategy calls for demand-driven, locally grown approaches and technologies in order to accelerate achievement of USAID objectives in the water sector. This work, often undertaken in partnership, is already well underway, and includes:

The WASH for Life Initiative is a four-year, $17 million partnership with the Bill & Melinda Gates Foundation which uses USAID’s Development Innovation Ventures program to identify, test, and help transition to scale evidence-based approaches for effective WASH services in developing countries. One innovative example is a one-year pilot by a Massachusetts Institute of Technology team to build a network of 60 low-cost latrines for residents of a slum in Nairobi, Kenya. The program collects waste daily and processes it as fertilizer and biogas. It aims to expand 50-fold to reach

more than one half million slum dwellers – creating jobs and profit, while aiming to reduce diarrhea by 40 percent in target areas.

Another example is the University of Colorado Boulder/USAID Research Partnershipthat assesses snow and glacier contributions to water resources originating in the high mountains of Asia that straddle ten countries. They use remote-sensing satellite data from NASA, the European Space Agency, and the Japanese Space Agency to develop time-series maps of seasonal snowfall amounts and recent changes in glaciers.

Such science and technology-related development efforts are being made worldwide, not just by the United States Government, and involve a wide range of different partners. For example, a partnership between World Resources Institute (WRI) and the Coca-Cola Company has brought high-resolution water availability data into the public domain.

After recognizing that water shortages could threaten its access to clean water, the life-blood of its business, Coca-Cola spent years building a comprehensive global data set on water availability around the world. This data includes sophisticated hydrological models of where water stress is most acute now and projections for water risks in the future. Coca-Cola released its water data to WRI when it realized that its water information could have a greater impact as a comprehensive, public platform than when only used internally.

Moving beyond diplomacy and development solutions, it is clear that the growing human demand for water will put increased pressure on managing water holistically across a broad range of competing needs. The National Intelligence Estimate on Global Water Security concluded that from now until 2040, improved water management (e.g., pricing, allocations) and investments in water-related sectors (e.g., agriculture, power, water treatment, water storage, and delivery) will afford the best solutions for addressing water problems.

Managing water requires hardware, be it a community tap, a drip irrigation system, a pit latrine, desalination, or a wastewater treatment plant. As we build capacity, we need to invest in basic infrastructure to meet needs and better manage water resources.

To this end, the State Department launched the Nexus Dialogue on Water Infrastructure with the International Union for Conservation and Natural Resources and the International Water Association. The goal is to change the way in which the global community manages physical and natural infrastructure for greater economic, social, and environmental benefits and to improve food and energy security. Regional dialogues are happening in Nairobi, Bogota, and Bangkok and a rich collection of best practices and lessons learned being developed that can help guide future water-related infrastructure development.

Sound water resources planning and management, multi-purpose infrastructure (e.g., dams that both produce power and offer flood protection), better management of natural systems (e.g., flood plains), and improved water monitoring, prediction, and early warning systems can help people prepare and mitigate the impacts of many water-related disasters.

Science and Engineering Solutions

The U.S. National Intelligence Council also issued a 2011 report entitled “Impacts of Technology on Freshwater Availability to 2040.” While the report did not identify a “silver bullet” technology that would greatly reduce water shortages in the near term, it did identify likely science and technology advances in the area.

Since 70% of world’s water use is in agriculture – the greatest potential for relief from shortages comes from this sector. Advances in large-scale drip agriculture are the most likely means to relieve water shortages for agriculture. Drip agriculture delivers water directly to the crop plant and can be a great improvement over conventional irrigation where much of the water goes to evaporation and to weeds.Another promising approach in agriculture will be developing drought-resistance and salt-resistance in crop plants, which has been the focus of much research and could yield commercialization within the next three decades.

Technological advances may also help increase the supply of freshwater. Chief among these is likely to be the membrane technology involved in desalination and water purification. Reverse osmosis membrane desalination requires less energy than distillation and so has come to dominate. The report found that the greatest promise lay at the intersection of several rapidly developing technologies: nanotechnology (e.g., carbon nanotube membranes), biotechnology (e.g., biomimetic membranes), electrochemistry (e.g., to reduce membrane fouling), and renewable energy technologies (e.g., to reduce energy cost of desalination by using waste or low-grade heat or wind, tidal or solar-powered systems).

The report indicated approximately 20 percent of the global water supply is used by industry in power plants (hydroelectric and thermoelectric), oil refineries, mines, and by other industries that use water as a solvent or for steam generation.

I am an optimist about the role of science and technology in addressing our global challenges and helping to build a peaceful, secure, and prosperous world. I believe large-scale research investments will make a difference. I am also encouraged by some of the newer approaches to finding solutions. Here are a few illustrative examples:

a. The U.S. National Science Foundation has partnered with the Bill and Melinda Gates Foundation for several years on BREAD (Basic Research to Enable Agricultural Development), funding grants to support innovative basic scientific research designed to address key constraints to smallholder agriculture in the developing world. Numerous grants have been made in the area of drought resistance of crop plants. This year they held a new type of open competition – a BREAD Ideas Challenge – to stimulate new thinking by making cash prizes of $10,000 each for the best ideas.

One of the winners is Matthew Wallenstein, a scientist at Colorado State University who studies soil microbes. Drought is a well-known and frequent challenge faced by smallholder farmers across the developing world. Considerable efforts have gone toward developing drought-tolerant crops, but the drought tolerance of microbes living in the soil, which supply nutrients, prevent pathogens, and promote crop health, has not yet received much attention. Wallenstein's challenge is to develop knowledge, methods, and tools to identify drought-productive microbiomes and facilitate their use by smallholder farmers.

b. In 2011, the World Bank, NASA, and several information technology partners teamed up for a Water Hackathon in 12 cities around the world, to help bring safe water to the hundreds of millions who lack it. The Hackathon teamed up software engineers, development experts, philanthropists, and environmental engineers – who identified 103 specific challenges, then generated more than 60 possible solutions. Some of those solutions received start-up funding and are being field-tested now.

c. Blue Planet Network's goal is to solve critical unmet water sector challenges by helping organizations and individuals that are working to end the global safe drinking water crisis. It does this via its funding platform, connecting the public, funders (individuals, companies, foundations, and governments), and project implementers who work to provide clean water around the world. Their technology platform strengthens collaboration, monitoring, and analysis so impact can be measured and solutions shared.

My talk has just covered the tip of the iceberg on the myriad of issues associated with global water security. I want to leave you with my two main points. First, water security poses great and complex challenges to us all at local, regional, and global scales. And second, the tools of diplomacy and science hold great potential to ameliorate these challenges and so give me optimism for the future.

Note: I wish to thank Elizabeth Lyons, Aaron Salzberg, and Carol Lynn MacCurdy of the U.S. Department of State for their invaluable help in preparing this talk.

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(1) **http://www.dni.gov/index.php/about/organization/national-intelligence-council-global-trends**

(2) **http://www.dni.gov/files/documents/Special%20Report_ICA%20Global%20Water%20Security.pdf**