# TOWARD EXPANDED U.S. LEADERSHIP ON GLOBAL WATER SECURITY

AUGUST 2017

*WATER 2017*

**A boy cools off in Embu, Kenya. Credit: USAID / Bobby Neptune Photography LLC**

**Acknowledgments**

Water 2017 would like to express its gratitude to the leaders in the many U.S. government agencies, non-governmental organizations, universities, corporations, civic groups, and think tanks who inspired and informed the content of this report. This work would not have been possible without their trust, thoughtful engagement, openness, and confidence. Their long-standing expertise in their fields coupled with their commitment to expanding dialogue and action on global water security enabled Water 2017 to craft this report. We thank them for their time, discernment, and continued commitment to global water security for all.

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While Water 2017 sunsets on July 31, 2017, its website and this report will remain available at www.Water2017.org. Please contact John Oldfield at joldfield@Water2017.org for further information.

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Cover photo: Water For Health - USAID provided hygiene training in addition to more water for handwashing. Photo Credit: USAID/George Fidor, Winrock International

# Toward Expanded U.S. Leadership on Global Water Security

**August 2017**

## Executive Summary

Global water security is one of the greatest challenges of our times. The growing scarcity of potable water, population growth and movement, and other factors continue to increase the severity of water challenges each year and thereby accelerate, magnify, and multiply the security threats these challenges pose to the U.S. and our allies. Therefore, we must act now to prevent and get ahead of the worst projected impacts, and devote the requisite time, attention, and resources. This sense of urgency likely will be reflected in the whole-of-government *Global Water Strategy,* which is required by the Water for the World Act of 2014, and due to the U.S. Congress by October 1, 2017. A global challenge of this magnitude requires accelerated global, regional, national, and local solutions. Greatly expanded whole-of-government and whole-of-U.S. leadership are essential to not just respond but to help prevent or mitigate the severity of such water-related threats, namely: 1) the next water-related infectious diseases from becoming pandemics and potentially reaching the shores of the U.S.; 2) water scarcity that could lead to movement within and across boundaries and/or conflict; and 3) droughts that could result in food insecurity and destabilizing famines – and, in turn, also in potential conflict.

Water 2017 is a one-year non-profit effort to encourage the U.S. Administration and Congress to prioritize global water security.[1] The recommendations contained herein are its own, yet are inspired by conversations with a range of U.S. agency officials, non-governmental organizations (NGOs), and faith-based, academic, corporate, and think tank experts. **Water 2017 proposes developing a unifying vision with a holistic approach to elevate and integrate global water security as a national priority** across the "three Ds" of U.S. foreign policy: development, diplomacy, and defense. Water 2017 is hopeful that the above-mentioned *Global Water Strategy* will take a big step in that direction.

The 2012 National Intelligence Estimate on Global Water Security identified water as a potential source of significant security challenges to the U.S. over the next decade.

### *Whole-of-Government Approach*

**The U.S. Government (USG) should heighten its leadership** on global water security at the highest levels, including at the White House and the National Security Council (NSC), and build on over a decade of strong bipartisan Congressional support. In addition:

- The **White House** and appropriate agencies should integrate global water security into the **National Security Strategy**, National Defense Strategy, National Military Strategy, Quadrennial Defense Review (QDR), and Quadrennial Diplomacy and Development Review (QDDR).

- The **President of the United States** should use cooperation on water projects as a means toward developing greater political stability among strategic partners in key regions, including the Middle East.
- The President should **catalyze a whole-of-U.S. effort** on global water security involving a broad range of stakeholders.
- Consideration should be given to **elevating the Interagency Water Working Group (IWWG),** currently led by the U.S. Department of State (State Department), to a more prominent position within the Department or perhaps to the NSC, and to establishing a parallel technical working group.

The **State Department** should expand its efforts in **hydro-diplomacy,** i.e., catalyze dialogues and cooperative water management agreements in key geographies, to build greater trust, resilience, and stability among nations and subnational stakeholders sharing transboundary river basins or aquifers. It should offer and utilize the USG's forecasting tools and technical data to help inform such dialogues and leverage the valuable skills of water experts, other non-traditional professionals (e.g., farmers, municipal officials), and key in-country stakeholders by involving them in such efforts, as appropriate.

The **U.S. Agency for International Development (USAID)** and its many partners should continue to grow and modernize their work to enhance resilience by building local, long-term capacity, strengthening institutions and the rule of law, and sharing best practices and lessons learned, with an ongoing focus on WASH and health, and water and food security in the world's poorest countries and communities. USAID's Water Team is encouraged to leverage its stakeholder relationships within and far beyond the Agency (namely, in the food, health, and educational sectors via leaders of such partnerships) to accelerate progress toward global water security for all and minimize water-related security threats.

Federal agencies that facilitate U.S. investment overseas should increase their support for commercial opportunities for innovative water and wastewater treatment technologies and services through marketing, trade venues, and public-private partnerships.

U.S. **technical agencies** should facilitate stakeholder access to: a) their virtually unsurpassed satellite imagery and remote sensing tools to help forecast droughts, floods, and disease pandemics[2] and b) other easy-to-use methods, such as stream gauges and mobile applications (e.g., to measure rainfall). **Data should be shared openly** with strategic country partners and subnational stakeholders to help them use the data to improve local decision-making processes to make their communities, economies, and societies more resilient.

> Through such technologies and capabilities, the USG has a clear opportunity to help others convert early warning into early action.

**Greater coordination within and across agencies, and among non-governmental partners, is vital** to effectively implement this strategic approach. Numerous federal, academic, think tank, corporate, and NGO resources exist, including forecasting and other data that identify the

greatest water resource-related threats, geopolitical data that identify strategic areas with the greatest likelihood for political instability, or both. Key to this effort is making sure that these informational resources are made available in multiple languages to as many stakeholders as possible, and that they are used for their intended purposes.

### *Whole-of-U.S. Approach*

Americans from across all 50 states[3] are working actively to help solve the global water challenge through thousands of U.S.-based corporations, civic organizations, faith-based groups, NGOs, and academic institutions. They are joined by state agencies, lawyers, water suppliers, and farmers who are working to address global water challenges at the global, regional, national, and local or community levels in countries in need. Federal agencies that run exchanges and partnerships should welcome and more effectively collaborate with these whole-of-U.S. stakeholders.

Water 2017 also supports the creation of the recently-proposed **"Center for Water Conflict Prevention"** to facilitate "Track II" dialogues and more.[4] Water 2017 urges greater attention and enhanced action across the whole-of-U.S. to solutions that leverage scarce resources and expand cooperation at home and with strategic partners abroad to achieve long-term global water security.

### *How to Leverage this Report*

This report contains specific recommendations for the President, the White House, the key diplomacy and development agencies, other federal agencies, the U.S. Congress, and external stakeholders. Water 2017 urges these and other stakeholders to share this report as appropriate via their online and offline communications platforms.

# Toward Expanded U.S. Leadership on Global Water Security
## Water 2017

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## Acronyms

| | |
|---|---|
| AWWA | American Water Works Association |
| AWRA | American Water Resources Association |
| CDC | Centers for Disease Control and Prevention |
| CFR | Council on Foreign Relations |
| CHRS | Center for Hydrometeorology and Remote Sensing |
| DoD | Department of Defense |
| EPA | Environmental Protection Agency |
| FEWS NET | Famine Early Warning Systems Network |
| FSI | Foreign Service Institute |
| GEO | Group on Earth Observations |
| GLOWS | Global Water Sustainability |
| GHSA | Global Health Security Agenda |
| IC | Intelligence Community |
| ICIWaRM | International Center for Integrated Water Resources Management |
| IHP | International Hydrological Programme |
| IWWG | Interagency Water Working Group |
| IVLP | International Visitor Leadership Program |
| IVP | International Visitors Program |
| MAB | Military Advisory Board |
| MCC | Millennium Challenge Corporation |
| NASA | National Aeronautics and Space Administration |
| NGO | Non-Governmental Organization |
| NIDIS | National Integrated Drought Information System |
| NOAA | National Oceanic and Atmospheric Administration |
| NEC | National Economic Council |
| NSC | National Security Council |
| OSTP | Office of Science and Technology Policy |
| PEPFAR | President's Emergency Plan for AIDS Relief |
| QDDR | Quadrennial Diplomacy and Development Review |
| QDR | Quadrennial Defense Review |
| SDGs | Sustainable Development Goals |
| SFRC | Senate Foreign Relations Committee |
| TFDD | Transboundary Freshwater Dispute Database |
| TDA | Trade and Development Administration |
| USAID | United States Agency for International Development |
| USDA | United States Department of Agriculture |
| UNESCO | United Nations Educational, Scientific and Cultural Organization |
| USG | United States Government |
| USGS | United States Geological Survey |
| USIP | United States Institute of Peace |
| WASH | Water, Sanitation, and Hygiene |

# I. Introduction

Water affects every aspect of our lives. **Water security** is commonly defined as: "the capacity of a population to safeguard sustainable access to adequate quantities of acceptable quality water for sustaining livelihoods, human well-being, and socio-economic development, for ensuring protection against water-borne pollution and water-related disasters, and for preserving ecosystems in a climate of peace and political stability."[5] Water security across the globe is essential to our survival, national security, and global security. While global water insecurity is one of the greatest challenges of our times, political will and leadership for this issue are growing. We see that this problem is both solvable, and being solved, across Africa, Asia, Latin America, and the Middle East. Much more needs to be done, however, and greater urgency is required.

Water 2017 is a one-year, non-profit effort to encourage the President of the United States, the entire Administration, and the U.S. Congress to prioritize global water security. This report focuses on what more the public sector, businesses, non-governmental organizations (NGOs), universities, and other groups and individuals across the United States (U.S.) can do to accelerate progress toward global water security for all, and get ahead of three primary global water-related challenges that are anticipated by the Intelligence Community and others to threaten U.S. national security: 1) lack of access to safe drinking water, sanitation, and hygiene (WASH), that could lead to the spread of water-related infectious diseases that could become pandemics and potentially reach the shores of the U.S.; 2) water scarcity that could lead to movement within and across boundaries and/or conflict; and 3) droughts that could result in food insecurity, destabilizing famines, and potential conflict.

> How can we get ahead of, not just react to, water-related security threats to this country and our allies?

The recommendations contained herein are those of Water 2017 and focus on potential whole-of-government and whole-of-U.S. solutions. The former include agency-specific recommendations targeted primarily at the federal agencies responsible for developing and implementing various aspects of global water security programs: the White House, the U.S. Department of State, and the U.S. Agency for International Development (USAID), which have the largest diplomacy and development roles, several other agencies, and the U.S. Congress. These recommendations are inspired by conversations with a range of U.S. agency officials and NGO, academic, corporate, and think tank leaders. This report is not intended to be exhaustive; rather it is meant to convey some key recommendations that primarily reflect insights from these recent discussions. While Water 2017 sunsets on July 31, 2017, those who have been involved in this effort will remain active in the global water security arena and available to its audience thereafter.

**To strengthen U.S. leadership on global water security, Water 2017 proposes developing a unifying vision with a holistic strategy.** This vision and whole-of-U.S. strategy will **elevate and integrate global water security** as a key component across the "three Ds" of U.S. foreign

policy – development, diplomacy, and defense – and better leverage the strengths of Americans in all 50 states.

***Whole-of-Government***

Leadership on global water security must come from the very highest levels of the U.S. Government (USG), beginning with the White House and the National Security Council (NSC), and build on well over a decade of strong bipartisan Congressional support. The White House should support and leverage **cooperation on water projects and programs as a means toward developing greater political stability,** if not peace, among strategic partners and in key regions around the world.

Some of the elements needed to achieve long-term global water security are **hydro-diplomacy,** including facilitating dialogues and water-sharing agreements; capacity building; technical assistance; facilitating access by other countries to available technologies and data to empower local decision-making; and public-private partnerships with strategic stakeholders in priority countries.

**Greater coordination within and across agencies, particularly within USAID, and among partners is also vital** to executing this strategy efficiently and leveraging the range of resources that exist. Consideration should be given to **elevating the Interagency Water Working Group (IWWG),** currently chaired by the U.S. Department of State, to a more prominent position within the Department or to the NSC, and to establishing a technical working group that operates in parallel to the IWWG.

***Whole-of-U.S.***

This opportunity to catalyze and lead a whole-of-U.S. global water security effort will require both top-down leadership and a bottom-up approach. Across the U.S., people are working through thousands of corporations, NGOs, faith-based organizations, and academic institutions to address global water challenges.

> "During the next 10 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 regional tensions, and distract them from working with the United States on important U.S. policy objectives." 2012 Intelligence Community Assessment on Global Water Security

Economic opportunities exist for a wide range of U.S. companies that are selling, for instance, more advanced water and wastewater treatment technologies (e.g., ozone and ultraviolet disinfection, desalination) and less complex ones (e.g., simple residential filtration systems or disinfecting tablets). These will help create jobs, improve economic growth, and facilitate innovation for businesses domestically and within global markets, and thereby also help increase U.S. competitiveness globally. In 2011, U.S. exports of these water filtration and purification technologies alone reached **$1.8 billion**, which was up 20 percent from 2007.[6]

A broad range of stakeholders across the U.S. should redouble their efforts to facilitate trade; share technologies, lessons learned, and best practices; disseminate information; build networks and partnerships; and enhance coordination. The USG should encourage such efforts already underway and should partner more extensively to accelerate social progress and economic growth.

## II. Background on Water-related Threats

Historically, far more cooperation than conflict has occurred over water. However, countries that lack strong governance, institutions, and economies tend to be less resilient in the face of water-related threats. In fact, U.S. Director of National Intelligence Daniel Coats in recent Congressional testimony noted that "[h]eightened tensions over shared water resources are likely in some regions."[7] Both the 2012 Intelligence Community Assessment on Global Water Security and the 2017 National Intelligence Council's *Global Trends Report: Paradox of Progress* highlight the negative and destabilizing effects that water insecurity will have on countries of strategic importance to the U.S. and the increasing threat that it will pose to the U.S. and our allies should we fail to act.

> Water stress is a driver of Afghanistan opium production. The opium poppy is both highly drought resistant, requiring a fraction of the water needed by crops like wheat, and highly profitable, offering an indispensable, if illicit, lifeline to beleaguered farmers. (Hearns, Glen, "Dammed if You Do and Damned if You Don't: Afghanistan's Water Woes," in David Reed ed., *Water, Security and US Foreign Policy* (New York: Routledge, 2017))

The World Economic Forum's 2017 Global Risks Report has again ranked water crises in the top three of its high-impact risks. The growing scarcity of potable water, population growth and movement, and other factors continue to increase the severity of water challenges each year and thereby accelerate, magnify, and multiply these security threats. The connections and interdependencies between these issue areas and between water and other resources, such as food and energy, also are growing.

Water stressors can be an underlying or contributing factor that can lead to the three primary threats identified in this report (disease, conflict, famine). Inadequate access to safe drinking water and sanitation "has enormous health, economic, and social consequences."[8] We know that when people do not wash their hands with safe water and soap, and where sanitation is inadequate, the risk of the spread of disease grows substantially. Such threats have reached and will reach again the shores of the U.S. The costs of treating such disease outbreaks after they occur and preventing them from becoming global pandemics are significant.

CNA's Military Advisory Board (MAB), a group of retired three- and four-star admirals and generals, and others also have researched some of the ways in which droughts, floods, and other current and projected impacts threaten to reduce water supplies and decrease long-term agricultural productivity, which can contribute to famine, migration, and potential or actual

conflict.[9] The most vulnerable populations and least developed nations, particularly those that already have relatively weak political institutions, infrastructure, and economic security are experiencing – and will continue to experience – these impacts to the greatest extent. In turn, such events could lead to national security threats for the U.S.

Another example of drought and food insecurity serving as a "catalyst for conflict," a term coined by CNA's MAB: "Syria's ongoing conflict was preceded by five years of devastating droughts, coupled with unresponsive state institutions, and overgrazing that decimated livestock, devastated 75 percent of crops in some regions, and forced millions to migrate to urban areas. In both rural areas affected by water and land insecurity, and urban areas burdened by inadequate support systems, antigovernment forces were emboldened. It is the MAB's hope that a better understanding of these types of impacts, along with proactive efforts, can help avoid similar future conflicts."[10]

Dr. Marcus King of George Washington University's Elliott School of International Affairs also has illustrated the connections between water stress, violent extremism, instability and "the weaponization of water" in Nigeria, Iraq, and Syria. He stresses the need for improved governance, U.S. technical assistance, technological help, and more to better detect and prevent water-related crises.[11]

Given the scope of the challenges – and the fact that resource scarcity, economic and political stability, and security all are inextricably linked – the solutions can and should be implemented and scaled holistically. These types of solutions are touched on below and elaborated on in the *Recommendations Section* of this report.

## III. Key U.S. Laws Pertaining to Global Water Security and Relevant Federal Agencies' Responsibilities

A brief recap of major laws and key federal agencies involved in global water security follows to facilitate an understanding of the subsequent recommendations.

### *Major U.S. Laws That Address Global Water Security*

In 2005, the bipartisan Water for the Poor Act of 2005 (Water for the Poor Act)[12] was signed into law by President George W. Bush. The law made safe drinking water, sanitation, and hygiene (WASH) a U.S. foreign policy priority. The Water for the World Act of 2014 (Water for the World Act),[13] which passed Congress unanimously and was signed into law by President Barack Obama in 2014, builds on the Water for the Poor Act by setting principles to enhance the efficiency, effectiveness, transparency, and coordination for global WASH, integrated water resource management, water productivity for agriculture, and related efforts, including a focus on priority countries, where the needs and opportunities are greatest.

The Water for the World Act also requires a Government-wide *Global Water Strategy* to be delivered to the U.S. Congress by the President by October 1, 2017.[14] This *Global Water Strategy* is intended to help the USG, in many instances in concert with partners in other countries, increase access to safe drinking water, sanitation, and hygiene in "high priority" countries; "improve the management of water resources and watersheds in such countries;" and help "prevent and resolve, to the greatest degree possible, both intra- and transboundary conflicts over water resources in such countries."[15] Water 2017 hopes that this report will inform the implementation over the coming years of this pivotal *Global Water Strategy*, engendering more effective programming and increased appropriations from the U.S. Congress.

Related legislation, including the Global Food Security Act of 2016,[16] also acknowledges the importance of WASH to related development efforts including food security and nutrition.

***Brief Background on the Key U.S. Government Agencies Responsible for Water Security***

The **U.S. Department of State (State Department)** has an Under Secretary for Economic Growth, Energy and the Environment who oversees the Bureau of Oceans and International Environmental and Scientific Affairs' Office of Conservation and Water.[17] That Office is responsible for leading "the development and implementation of U.S. foreign policy on drinking water and sanitation, water resources management, and transboundary water and conflict issues" and leads the aforementioned IWWG.[18]

The **U.S. Agency for International Development (USAID)**[19] is "the lead implementer of U.S. water development programs internationally."[20] Since 2013, USAID has been guided by a first-ever, Agency-wide, five year *Water and Development Strategy*, which was designed "to save lives and advance development through improvements in water supply, sanitation, and hygiene (WASH), and through sound management and use of water for food security."[21] A USAID Global Water Coordinator[22] aligns WASH/water resource management efforts across the Agency. USAID's Water Office falls within the Bureau for Economic Growth, Education and Environment (E3).[23] USAID also has a Global Health/Environmental Health Team; country missions; and regional bureaus in key locations, each of which has a Water Advisor.[24]

The **Millennium Challenge Corporation (MCC)** provides multi-year support to countries committed to "good governance, economic freedom, and investments in their citizens" to reduce poverty and help achieve long-term economic growth.[25] Water-related activities frequently are significant components of MCC's Compacts.[26]

The **Centers for Disease Control and Prevention (CDC)** falls under the **U.S. Department of Health & Human Services (HHS).** CDC actively works on linkages between WASH and infectious diseases in a number of countries. CDC also is a partner in the Global Health Security Agenda, which aims to prevent, detect, and respond to health threats (e.g., Ebola, cholera).[27]

**LEADING BY EXAMPLE: In Afghanistan, mothers are trained in improved hygiene practices as part of USAID's MCHIP project. Credit: USAID, Save the Children, and Unilever/Lifebuoy**

Technical agencies, such as the **National Aeronautics and Space Administration (NASA),** with its remote sensing and earth observation tools, capabilities, and partners (e.g., the Group on Earth Observations (GEO) and GEO Global Water Sustainability (GEO GLOWS),[28] and SERVIR, a NASA-USAID joint venture[29]), the **National Oceanic and Atmospheric Administration (NOAA)** and its National Integrated Drought Information System (NIDIS),[30] and the **U.S. Geological Survey (USGS) and U.S. Army Corps of Engineers (Army Corps),** help collect, analyze, and make hydrologic and other relevant data publicly available.[31] The USAID-led Famine Early Warning Systems Network (FEWS NET) is another major recognized forecasting and monitoring tool that helps countries and regions predict food insecurity, which could, in turn, serve as an advance indicator of potential political instability.[32]

The U.S. **Department of Defense (DoD)** is involved in water security issues through direct assistance and support in the field by engineers and experts in the Geographic Combatant Commands. “The U.S. military also actively contributes to U.S. water engagement through the

projects and technical capacities of the [Army Corps] and Army Reserve."[33] By the same token, the Combatant Commands also integrate water security into their risk assessments and resource planning, and factor water scarcity into their Theater Campaign Plans.[34]

"The **Department of Commerce**, the **Overseas Private Investment Corporation**, the **Export-Import Bank**, and the **U.S. Trade and Development Agency** furnish support for U.S. investors and exporters in the water sector via such tools as loan guarantees, political risk insurance, structured finance, export credit guarantees, market research, training, and trade events."[35]

The **U.S. Environmental Protection Agency** is responsible for providing safe drinking water and protecting lakes and streams, in terms of water quality and quantity, and brings its expertise to some international cooperative efforts, such as technical assistance.[36]

## IV. Whole-of-Government and Whole-of-U.S. Recommendations and Next Steps

Myriad solutions to global water security challenges exist. However, a sense of urgency is essential to spur action now. Many U.S. public and private sector assets could be better deployed to accelerate progress toward global water security and to help prevent or mitigate the severity of water-related security threats to the U.S. and our allies. Enhanced U.S. leadership on global water security could help prevent: 1) the next water-related infectious diseases (e.g. cholera, Ebola) from becoming pandemics and potentially reaching the shores of the U.S.; 2) the likelihood of water scarcity leading to local, national, or regional conflict; and 3) water scarcity and the next droughts from leading to food insecurity, movement within or across borders, or political instability or conflict, which could, in turn, cause famine.

> **"As the paradox of progress implies, the same trends generating near-term risks also can create opportunities for better outcomes over the long term.** If the world were fortunate enough to be able to take advantage of these opportunities, the future would be more benign . . . . In the emerging global landscape, rife with surprise and discontinuity, the states and organizations most able to exploit such opportunities will be those that are resilient, enabling them to adapt to changing conditions, persevere in the face of unexpected adversity, and take actions to recover quickly." (2017 National Intelligence Council's *Global Trends Report: Paradox of Progress*)

**To strengthen U.S. leadership on global water security, Water 2017 proposes a unifying vision with a holistic approach to elevate and integrate global water security as a national priority.** These, in turn, help frame the subsequent agency-specific and whole-of-U.S. policy, technical, and economic recommendations. This Water 2017 report also contains ideas better suited to broader policy and program collaboration between and among U.S. federal agencies and global, regional, national, and local stakeholders.

**Vision:**

A high level, unifying vision for enhanced U.S. leadership will help accelerate progress toward global water security for all and minimize water-related security threats. This vision should:

- Elevate and prioritize global water security as a key issue of strategic importance for U.S. development, diplomacy, and defense/national security;
- Underscore the necessity of water as a vital component of virtually all sectors of the global economy, society, and security; and
- Recognize, leverage, and deploy the significant strengths of U.S. stakeholders in the global water sector.

**Holistic Approach:**

A holistic, strategic, solutions-oriented approach to global water security will help elevate and integrate global water security across the "three Ds" of U.S. foreign policy – development, diplomacy, and defense – throughout the USG, and among private sector, academic, faith-based, and NGO stakeholders. This whole-of-U.S. strategy should elevate and "mainstream water security into key national security and foreign policy [including development and diplomacy, or "hydro-diplomacy,"] planning and decision-making processes for strategic regions of the world."[37]

This need likely will be met by the *Global Water Strategy* required to be delivered to the U.S. Congress by the President by October 1, 2017. Considering the October 1 deadline, this report is written to inform the *Global Water Strategy's* implementation over its five-year lifespan.

> "Malnutrition, weak healthcare systems, conflict, migration, poor governance, and urbanization will worsen the emergence, spread, and severity of disease outbreaks. The emergence of a severe global public health emergency is possible in any given year and can have negative impacts on the security and stability of a nation or region. . . . The World Bank has estimated that a severe global influenza pandemic could cost the equivalent of 4.8 percent of global GDP, or more than $3 trillion, during the course of an outbreak." (U.S. Director of National Intelligence Coats, Statement for the Record, Senate Select Committee on Intelligence, May 11, 2017)

Nevertheless, a whole-of-U.S. strategy should accelerate progress toward global water security for all, continuing to prioritize WASH, and should:

- Utilize a comprehensive approach (e.g., ecosystems, basins, watersheds) toward integrated water resources management, transboundary water resource management, and related transboundary issues.

- Integrate global water security across other sectors (e.g., energy, global health, agriculture) at the planning and management levels and beyond.[38] Despite the siloed nature of federal agencies and the Congressional funding process, adopting a more cross-sectoral, systems-oriented approach is vital. Such integration should better take into account national security and diplomacy challenges and opportunities, and should be informed by continuously-improving forecasting and predictive tools.
- Build on plans and efforts already underway within and across federal agencies, and incorporate potential enhancements to those efforts. Implementation of this whole-of-U.S. strategy should recognize and leverage state, local, and non-governmental stakeholder efforts, including ways to enhance coordination and collaboration among these groups.
- Contain goals, actionable objectives, targets, timeframes, metrics, monitoring, evaluation (including post-program cycle), and reporting elements, as well as periodic public and private reviews, and updates to Congress and the White House.

This whole-of-U.S. strategy must be flexible and adaptable, considering the nature of water challenges across the globe. While it must be comprehensive in nature, it also needs to play to the many strengths of the U.S., and therefore should provide a framework that guides the U.S. to:

- Prioritize hydro-diplomacy, including initiating, convening, and nurturing dialogues among stakeholders that typically might not get along, and catalyzing and strengthening water-sharing agreements;
- Help build resilience in the WASH space and beyond by enhancing in-country capacity, sharing best practices and lessons learned, and strengthening institutions and rule of law (e.g., see recent USAID contractual awards[39] under the *Water and Development Strategy*);
- Disseminate innovative water-related technologies and capabilities and provide technical assistance; and
- Share data and solutions openly with partners in other countries to help them detect and prevent future threats before they become crises.

The U.S. also should prioritize and commit to focusing on key areas at an appropriate scale (e.g., ecosystems, watersheds, basins, regions) and in appropriate timeframes, for example, five to ten or more years. Each basin is unique and the degree to which U.S. involvement will add value will vary by basin.

This strategic approach also should involve partnerships across the globe, recognizing and leveraging the strengths and commitments that public and private stakeholders bring to bear, alongside those of local, national, and regional actors abroad.

A global challenge of this magnitude requires accelerated global, national, and local solutions, with bolder whole-of-government and whole-of-U.S. leadership.

***Whole-of-Government Recommendations***

Following are Water 2017's whole-of-government recommendations.

**The President of the United States and the White House:**

To implement this vision and ensure a strategic, holistic strategy on global water security, leadership must come from the very highest levels of the USG, beginning with the President of the United States (the President) and the National Security Council (NSC), and build on the strong bipartisan Congressional support for this issue. The White House and the NSC should look to prior whole-of-government and whole-of-U.S. programs that have demonstrated successes (e.g., the President's Emergency Plan for AIDS Relief) as potential models, at least in part, for an overarching global water security initiative. The President should use cooperation on water projects and programs as a means toward developing greater political stability, promoting peace, and advancing prosperity among strategic partners and in key regions around the world. The President also should catalyze a whole-of-U.S. effort on global water security involving a broad range of stakeholders from across the country.

Decision-makers should leverage the multiple resources that exist to help determine the next five, ten, or more transboundary basins or aquifers that deserve consideration for an expanded effort. Such resources include but are not limited to:

- Oregon State University's Transboundary Freshwater Dispute Database (TFDD) and its "Basins at Risk" projections for the likelihood of conflict or cooperation in the world's 263 transboundary basins (see *Whole-of-U.S. recommendations)*
- The Council on Foreign Relation's (CFR) "Global Conflict Tracker"
- Various Intelligence Community Assessments
- IScience's Global Water Monitor & Forecast, using its Water Security Indicator Model (WSIM)
- World Resources Institute's *Aqueduct Water Risk Atlas*
- A recent Atlantic Council publication on global water security
- Priority countries established in the Water for the World Act and in USAID's *Water and Development Strategy*

U.S. scientific and technical capabilities, including NASA's satellite, remote sensing, and Earth observation tools and capabilities (e.g., GEO/GEO GLOWS), the NASA-USAID joint venture SERVIR, the USAID-led FEWS NET, and other resources help to better forecast water-related threats.

The President and relevant agencies should integrate global water security into national security, defense, and diplomacy strategies and studies (e.g., National Security Strategy, National Defense Strategy, National Military Strategy, Quadrennial Defense Review (QDR), Quadrennial Diplomacy and Development Review (QDDR)). Water 2017 urges the Administration to hire, empower, and fund global water security experts at the NSC, National Economic Council, the Office of Science and Technology Policy (OSTP), and in key federal agencies where such expert

"point" people are not already in place. These experts will help execute this cross-cutting global water security agenda more effectively.

Lack of coordination within and across stakeholders is a key challenge, but not new, as the following statement underscores. "Because of this lack of coordination across agencies, there is no ability or incentive for systematic monitoring and evaluation of ongoing U.S. government projects, coordination across government functions, development of common metrics, or potential for pooled investment and programs. Cross-project agreements and information sharing are for the most part ad hoc."[40] Thus, **greater coordination within and across agencies, and among partners, is vital** to executing this strategy efficiently and leveraging the range of resources that exist.

**Interagency Efforts:**

Water 2017 deems that the current iteration of the Interagency Water Working Group[41] (IWWG) would benefit from: 1) stronger top-down leadership (e.g., the President, National Security Adviser, and Secretary of State), 2) being more robustly staffed and resourced, and 3) being significantly more empowered. Consideration also should be given to elevating the IWWG to a more prominent position at the U.S. Department of State or to an interagency policy committee at the NSC that would include senior agency officials from across the government. A more empowered, resourced, staffed, and elevated IWWG would have greater potential to bring federal agencies together to better identify water challenges proactively; design whole-of-government solutions to accelerate progress to help achieve global water security, including universal coverage of safe drinking water and sanitation; and provide appropriate financial, technical, and human resources to the correct set of agency stakeholders to implement such solutions. A technical working group that operates in parallel to the IWWG should be established. Water 2017 encourages individual federal agencies to collaborate on smaller scales (e.g., two to five agencies) to tackle discrete global water challenges.

> "Pragmatic policies are necessary to address global water issues, such as elevating the importance of water at the highest levels in the U.S. government; supporting enhanced data collection, analysis, and early warning efforts; investing in building institutions to manage transboundary rivers and domestic water supplies; and developing public-private partnerships to increase water supplies, water conservation, and to waterproof at-risk infrastructure. At the same time, policymakers should keep in mind the need to `do no harm.' In some instances, direct U.S. involvement could be appropriate. In others, the United States will be better served by working with partners to shore up its interests." (Busby, Joshua, *Water and U.S. National Security*, "Overview," Council on Foreign Relations, January 2017)

**Agency-Specific Recommendations:**

**U.S. Department of State (State Department)**

Direction needs to come from the top, namely, from the Secretary of State, to elevate the importance of global water security and to drive action on this topic across the Department in Washington, DC and in Embassies across the globe, especially in countries prioritized by the Water for the World Act and USAID's *Water and Development Strategy*. The Secretary of State's Office of Global Partnerships, USAID's Global Development Lab, and other entities across the federal government should expand their efforts to partner with Americans across all 50 states, both for better program design and implementation, and to better leverage U.S. taxpayer dollars.

*Conducting Hydro-Diplomacy: Facilitating Dialogues and Strengthening Water-Sharing Agreements and the Rule of Law*

**The State Department should leverage water more effectively as a means toward dialogue and toward building greater trust and stability,** if not peace, among neighbors. For example, in many instances (though not all), the State Department has a strategic advantage and thus is well-suited to launch or lead dialogues on water-related issues, or furnish **"diplomatic support to reduce water conflicts"** in strategic instances among nations and stakeholders sharing a water basin or aquifer, particularly where these countries may not get along and would benefit from external engagement.[42]

Currently, approximately one-half of the world's 263 international river basins lack a cooperative water management agreement, and only a handful of the world's 600 transboundary aquifers have such agreements in place, according to the *Global Trends* report.[43]

According to the 2017 Global Trends Report, "more than 30 countries—nearly half of them in the Middle East—will experience extremely high water stress by 2035, increasing economic, social and political tensions."

Having a water-sharing agreement or other collaborative mechanism in place tends to be one major factor in helping to ensure and maintain long-term stability among countries and subnational stakeholders in a transboundary river basin. When looking at factors that could contribute to greater cooperation or conflict, such agreements, combined with strong governance, institutions, and economies, help make countries more resilient in the face of water-related threats.

USG involvement in transboundary water agreements in some cases will be public and, in other cases, will remain confidential. Where feasible and appropriate, the State Department, as well as USAID and other agencies, of course should leverage host governments' resources and capabilities as well as those of donors and international financial institutions (IFIs) to facilitate such agreements and other relevant activities and to incorporate global water security into other sectoral action plans. Water 2017 encourages the State Department to prioritize global water security in its relationships with the

World Bank (through the U.S. Executive Director at the World Bank) and other international financial institutions.

*Building Capacity on Global Water Security, Leveraging Embassy Resources, and Enhancing Diplomacy*

Water 2017 believes that prioritization of water security-related efforts in host countries by U.S. Ambassadors and USAID Mission Directors will help get "buy in" from embassy and mission staff as well as by host governments and local partners, and would potentially drive a focus on water as a key component of bilateral or multilateral relationships. Thus, the State Department should consider elevating the issue of global water security within Foreign Service Institute (FSI) training courses. It should use visitor exchanges, such as the **International Visitor Leadership Program (IVLP)**, to help build capacity for ministry officials in priority countries.[44] For all of these activities, the State Department should draw on the vast array of public and external U.S. stakeholders, including academic experts and those outside of traditional water resource-related fields, such as U.S. municipal officials and farmers, making this a whole-of-U.S. effort. Involving in-country stakeholders is also vital.

**U.S. Agency for International Development (USAID) Headquarters, Regional Bureaus, and Country Missions**

USAID for the past few years has carved out a significant leadership role on the global water stage, made possible in part by significant bipartisan support from the U.S. Congress, which includes two major global water laws and significantly increased funding over time. The quality and effectiveness of USAID's programming in the global water sector continues to improve today, as evidenced in part by the results highlighted in the Agency's recent reporting.[45]

> In FY14 and FY15, USAID provided 7.6 million people with improved access to drinking water, 4.3 million people with improved sanitation, and over 3.1 million with improved agricultural management.

Most importantly, Water 2017 urges USAID, its Water Team, and colleagues in the food security and global health arenas to progress in this same direction, with a predominant focus on the two Strategic Objectives of the Agency's *Water and Development Strategy*: namely, WASH and health, and water and food security. Water 2017 also urges the U.S. Congress to continue to grow its support and oversight for such pivotal efforts.

USAID should ensure that global water security is incorporated into USAID Headquarters, field mission, and regional bureau strategic planning efforts, policies, and programs in a cross-cutting manner. USAID's Global Development Lab, the Secretary of State's Office of Global Partnerships, and other entities across the federal government should further leverage public-private partnerships, both to better leverage U.S. taxpayer dollars and for better program design, implementation, and success.

*Enhancing Internal and External Communications*

USAID, including field missions and regional bureaus, and its contractors, should better communicate and disseminate key results of programs involving water (e.g., WASH and health, gender, governance; and, water and food security/nutrition), including the programs' benefits in terms of accelerating progress toward universal coverage of safe drinking water and sanitation and helping to prevent or mitigate the severity of water-related security threats. Water 2017 recommends that communications from USAID and its Water Team include significant outreach efforts to the general public and to the U.S. Congress, e.g., through a strengthened Bureau for Legislative and Public Affairs.[46] In addition, USAID's many partners in the U.S. and across the developing world should help amplify the Agency's messages and program results.

> USAID provided over one-quarter of a million households in Ethiopia with drought-tolerant seeds in the face of an extremely severe drought in 2016 and helped over 4 million people with access to safe drinking water, health and nutritional support, and emergency food assistance. Such efforts have helped reduce extreme poverty and build resilience among Ethiopia's "most vulnerable people to help them cope with recurring droughts." Doing so has helped prevent drought from leading to food insecurity, famine, and/or conflict. ("USAID Deploys Disaster Assistance Response Team to Ethiopia for Drought Response")

*Reinforcing and Expanding Capacity Building and Technical Assistance Efforts*

USAID is redoubling its efforts to design, catalyze, and finance water-related training and technical assistance programs. Water 2017 encourages the continuation of such efforts in a manner that leverages limited funds and staff while bolstering host country and/or regional capacity, ownership, and greater long-term protection of resources to help prevent or mitigate water-related threats. This holds true particularly in countries identified as high priority per the Water for the World Act and USAID's *Water and Development Strategy*.[47] For example, the Country Development Cooperation Strategy[48] for each high priority country should clearly include a focus on water security/WASH, as appropriate to that country and as agreed upon by local stakeholders. USAID is encouraged to work with the MCC (see *MCC Recommendations*) in countries where Compacts exist, and in regional Compacts, should

> Small sums of USAID WASH funding are being leveraged with funding from other donors to help local farmers, landlords, chiefs, and other stakeholders learn innovative, "low tech" methods to help them better determine water, stream, and soil quality, and water availability. Such capabilities will help foster local empowerment, resilient resource management, and greater decentralization of ownership and potential political stability. Building local capacity and sharing lessons learned has enabled some projects to expand to additional river basins or communities within a country, or to other parts of Africa. (USAID Southern Africa, "Resilience in the Limpopo Basin Program" (RESILIM), Fact Sheet)

these come to fruition (with additional authority needed from the U.S. Congress through legislation).

USAID should re-examine the extent to which it is leveraging the strengths of U.S. non-governmental global water experts and others outside of traditional water fields (e.g., lawyers, farmers) that could contribute substantially in partner countries. The State Department should be a strong ally in pursuing this opportunity.

In host countries, responsibility for WASH and water resources often falls to different ministries (e.g., water, health, environment, resources, infrastructure, and so forth).[49] USAID representatives and stakeholder partners should engage all of the relevant ministries to ensure an integrated approach within and across these ministries, including a comprehensive focus at the watershed or basin level.

Easy-to-use, "low tech" solutions, such as rainwater harvesting and storage, are likely among the best to address many of the water-related challenges being faced today. USAID should continue to help fund such technologies or projects, because they often require small amounts of financial resources, relatively speaking, that can yield multiple benefits many times over for local populations, especially for women and girls. In other words, these investments have positive "ripple effects" in terms of impacts on girls' education, empowerment, and abilities to earn a living and contribute to their broader society.

*Using Technical Support Tools to Enhance Program, Budgetary, and Planning Process Efficacies*

USAID, the White House, the NSC, the State Department, NASA, and NOAA should better coordinate to ensure the USG is taking full advantage of U.S. technical decision support tools, including the USAID-led Famine Early Warning System Network (FEWS NET), and other remote sensing and satellite capabilities to enhance program efficacy and planning processes, and help get ahead of the next water-related security threats, such as exceptional droughts.

> In certain countries or regions, USAID already meets and coordinates regularly with USGS and NASA and with the help of FEWS NET, is drawing from shorter-term disaster response experience to move toward a longer-term, more proactive, resilient planning approach that involves stakeholders from the top down and bottom up, with an eye toward integrated and appropriate basin- or catchment-scale approaches.

Consideration also should be given to better aligning multi-year program planning cycles (including the forthcoming *Global Water Strategy*) and country strategies (i.e., Country Development Cooperation Strategies) with forecasts and modeling predictions from such tools. Most importantly, these tools should be made available in appropriate formats and languages to local stakeholders across the developing world, along with financial and technical assistance to provide the requisite skills, so they obtain maximum value from using these tools and capabilities.

**Centers for Disease Control and Prevention (CDC)**

The Centers for Disease Control and Prevention currently undertakes significant work with safe drinking water, sanitation, and hygiene (WASH) across the world to reduce disease and death and alleviate poverty.[50] CDC also is a partner in the Global Health Security Agenda (GHSA) which aims to prevent, detect, and respond to health threats.

Water 2017 urges CDC, and the U.S. Department of Health & Human Services (HHS) more broadly, to strengthen their efforts to better identify and get ahead of current and potential disease threats caused by inadequate WASH.

CDC should continue to provide technical and financial assistance through the GHSA and other multilateral and bilateral efforts, including the United Nations Children's Fund (UNICEF), with a particular emphasis on the clear linkages between inadequate WASH and the prevention of numerous diseases. The CDC should continue to help identify effective areas for intervention and scaling up of projects or programs.

*Enhancing Integration, Coordination, and Partnership Efforts*

- Consideration should be given to integrating WASH more extensively with health programs and policies and into relevant activities in health facilities, schools, and other institutions to help prevent water- and sanitation-related diseases (so they do not become pandemic) and other water security-related threats.
- CDC should intensify its work with other agencies, as well as with NGOs, IFIs, and other relevant stakeholders to share lessons learned from experiences with fighting various diseases (e.g., Ebola, cholera) and working globally with partners to integrate WASH elements into a range of programs.
- CDC should expand its leadership as a prominent member of the IWWG, including hosting an IWWG meeting in Atlanta at its Headquarters.
- CDC is encouraged to look for additional collaborative opportunities, e.g., Skoll Global Threats Fund and CDC Africa, to support WASH and other disease prevention efforts across the globe.[51] Water 2017 also urges a meeting between the head of CDC Africa and the African Ministers' Council on Water to discuss openings to collaborate on these types of activities.[52]
- As a leading public health agency, the CDC is encouraged to act on the recent World Health Organization (WHO) report[53] highlighting a lack of WASH in health care facilities across the globe and the concomitant health risks. Health care facilities with which CDC and its partners are engaged should also be learning facilities, making clear the benefits of WASH – especially hygiene.

*Improving Communication Efforts*

The CDC should communicate, across the USG (including to the U.S. Congress) and more broadly, its efforts to identify and get ahead of (rather than just respond to) diseases related to inadequate WASH, as well as the ability of WASH to contribute to U.S. and global health, disease reduction, and poverty alleviation objectives. Health officials at CDC and beyond should be encouraged to prioritize and communicate the importance of hand washing and other sanitation-related issues.

**U.S. Technical Agencies – Collecting Data, Sharing Information, and Solving Problems**

U.S. technical agencies have virtually unsurpassed capabilities to collect and analyze data that can help forecast droughts, famines, floods, conflicts, and disease pandemics. Just a few examples of such tools and capabilities include the National Aeronautics and Space Administration's (NASA) satellite imagery, remote sensing, and earth observation capabilities, including the NASA-USAID joint venture, SERVIR,[54] Group on Earth Observations (GEO), and the GEO Global Water Sustainability (GEOGLOWS);[55] the National Oceanic and Atmospheric Administration's (NOAA) National Water Center in Alabama and National Integrated Drought Information System (NIDIS);[56] the U.S. Geological Survey's (USGS) and the U.S. Army Corps of Engineers' (Army Corps) tools; and the USAID-led Famine Early Warning System Network (FEWS NET). The USG should leverage external stakeholders' resources.

**Data can and should be shared openly** with other countries and partners across the globe. In addition, **information sharing** is essential: knowledge of an upcoming drought, for example, could empower local citizens to harvest and store water in natural aquifers far in advance, and enable farmers to better manage existing water and soil resources to help grow crops to prevent famines. "Low tech" approaches, such as stream and rain gauges, well monitoring tools, and mobile applications (apps), such as "iRAIN" (further described under the recommendations for the *Army Corps*), might be more appropriate for households, villages, schools, or health care facilities in other countries, so they can operate and maintain these tools on an ongoing basis, thereby increasing their importance and value. Water 2017 is confident that the USG has an opportunity to expand on its efforts to get these data and tools to key government partners and other local stakeholders across the globe who can use these resources to make their communities, economies, and societies more resilient.

> Through such technologies and capabilities, the USG has a clear opportunity to help others convert early warning into early action.

More coordination is needed across U.S. technical agencies and among other entities providing similar services in the public and private sectors. Increased coordination with technical counterparts in developing countries will prove useful in converting early warning to early action. Technical agencies should coordinate more with the State Department and foreign ministries to better leverage their respective authorities and convening powers. For a related

proposed concept outside of the USG that pertains to coordination, see the **"Internet of Water"** networking and coordination idea in the *Whole-of-U.S. Recommendations Section*.

**U.S. Geological Survey (USGS) and the U.S. Army Corps of Engineers (Army Corps) – Cooperative Efforts and Capacity Building**

The USGS uses NASA data and other resources, including oil and gas exploration data and mapping, as well as water flow data, to help farmers in drought-stricken nations drill productive wells, better deploy limited financial resources, and better manage their limited water resources. These flow data and maps can be used to provide objective information to facilitate in-country dialogues that also could involve the State Department, as reflected in those recommendations.

The USGS has worked for decades in the Mississippi River Basin and Gulf Coast area employing solutions involving natural plants, wetlands, marshes, and other more natural approaches to floodplain management. They now are facilitating exchanges with stakeholders from other basins, as illustrated further here. A number of similarities exist between the **Mississippi River Commission** in the U.S. and the **Mekong River Commission. The cooperative efforts underway can be viewed as a model** that could be replicated in priority river basins elsewhere around the world, where appropriate.

The **Army Corps** and others are working on products that could help connect some of the previously-mentioned remote sensing and satellite-based tools with water resource applications. For example, meteorological (temperature and precipitation) forecasting is being combined with agricultural (soil moisture) and hydrological (stream flow) data. Such efforts should be enhanced through continued cooperation with universities, water managers, and local NGOs at the community or village level, as well as with IFIs and others (e.g., see Princeton University example under the recommendations for the *Whole-of-U.S.*).

The **Army Corps' Institute for Water Resources (IWR)** and **International Center for Integrated Water Resources Management (ICIWaRM)** recently collaborated on a **mobile app for cell phones called "iRAIN"** that can be used by a wide range of individuals to help easily collect rainfall data, share these data through social media, and feed them into existing remote sensing and other tools to help estimate global rainfall "in near real time." Such tools are "low tech" and can help improve planning and management for droughts and floods. (Army Corps' IWR, "iRAIN: New Mobile App Supports Water Management around the World," Communications Update, November 28, 2016, www.iwr.usace.army.mil)

The Army Corps' partners in this endeavor consist of: **University of California (UC) Irvine's** Center for Hydrometeorology and Remote Sensing (CHRS) and the United Nations Educational, Scientific and Cultural Organization's (UNESCO) International Hydrological Programme (IHP),[57] and build on "high-resolution satellite precipitation products" that also involved NASA, NOAA, and other entities.[58]

**National Aeronautics and Space Administration (NASA)**

NASA has remote sensing and satellite tools and capabilities, such as the NASA-USAID joint venture, **SERVIR.** Water 2017 urges continued funding for satellites that help collect water-related data.[59] NASA also supports the **Group on Earth Observations (GEO) and the GEO Global Water Sustainability (GEOGLOWS)**, which "provides a framework for effectively mobilizing Earth Observation assets to contribute to mitigating water challenges on various scales" across the globe. GEOGLOWS "seeks to use Earth observations and associated tools and assets to decrease regional tensions and the risk of instability and state failure."[60] NASA should continue to play a leadership role in helping to make data as widely available and transparent as possible. It should provide technical assistance to priority countries in collaboration with USAID, Department of State, and other agencies, and perhaps via the Interagency Water Working Group, its successor, or a parallel technical working group, if established.

> A recent article underscores the value of NASA's satellite imagery technology in the world's driest regions to help detect and manage water resources to grow crops, and to help prevent famine and political instability that could result. "At a time when droughts are growing more frequent and populations are booming from Yemen to Morocco, some suggest salvation by satellite might be the region's best chance of averting catastrophe." To elaborate, "if we can use satellite images to identify suitable water and places with the right soil for agriculture," that could be a game changer. "[I]t's space technology's capacity to better regulate water usage, and therefore grow more food with fewer resources, that's really excited the science community." Rachael McDonnell of the modeling adaptation section of the Dubai-based International Center for Biosaline Agriculture (ICBA) has referred to **NASA's Landsat** program as **"the Land Rover Defender of the data world."** (Emphasis added) (Schwartzstein, Peter, "How NASA's Satellites Can Help Solve the Middle East Water Crisis," *Newsweek*, June 11, 2017)

**National Oceanic and Atmospheric Administration (NOAA)**

- NOAA should expand the deployment of its integrated decision support tools and other relevant informational resources to key partners across the globe.
- Consideration should be given to sharing with relevant global partners to a greater extent the data produced by the National Integrated Drought Information System (NIDIS). Having information from NIDIS can empower and transform local communities by helping them better plan and prepare for extreme droughts and thereby improve their water and food resource management, and, in turn, increase their water security, which can lead to behavioral and other changes across societies.
- NOAA's "National Water Center in Alabama could be instrumental in demonstrating how [these] data can inform decision-making at all levels of government, here and abroad."[61]

**U.S. Department of Defense (DoD)**

Water challenges, as identified in the 2012 Intelligence Community Assessment on Global Water Security and elsewhere, cause, accelerate, and/or magnify a number of security threats to the U.S. and our allies. The Secretary of Defense, with information and analyses from the IC, has an opportunity to integrate water security into decision-making processes across the U.S. Department of Defense (DoD), including into the Quadrennial Defense Review (QDR). The Secretary of Defense should also encourage the White House/NSC to add water security both as a potential threat and solution in its security-related policy deliberations.

As DoD looks to prevent fragile and/or failing states from becoming further destabilized from droughts, famines, disease, or conflict, water imbalances should be among the factors considered across the Department to determine both the causes of and the solutions to these security threats. The Secretary of Defense and policy planning offices should **systematically** incorporate water security into Department-wide policy planning efforts, as should individual Combatant Commands.

DoD should consider using its authority under the National Defense Authorization Act (NDAA) for Fiscal Year 2017 to transfer limited funds to other federal agencies to implement or support water-related foreign assistance programs that DoD cannot carry out, but that contribute to ongoing security cooperation efforts under Theater Campaign Plans.

**U.S. Department of Agriculture (USDA)**

**Capacity Building:** The International Visitors Program (IVP) is designed to provide specialized on-the-job training in the U.S. for a range of key representatives, e.g., students and technicians, from other countries. Overseas counterparts are given opportunities to gain first-hand technical knowledge, for example, of "ecosystem-based assistance," so they can then share relevant practices in their home countries.[62] Funding for such efforts comes from USAID, donor governments, IFIs, foundations, and/or individuals.

USDA should consider incorporating water resource management and related issues into the IVP, to the extent this is not already occurring. Doing so will facilitate cooperation and help ensure greater access to safe drinking, sanitation, and improved water management in priority countries.

**Millennium Challenge Corporation (MCC)**

The MCC designs and oversees agreements or "Compacts" with priority countries and has host country counterparts and programs that focus on a range of infrastructure development and related areas. Water and sanitation infrastructure have been and are key to several previous and current Compacts. MCC should continue to prioritize water in its Compacts, because water makes significant contributions to progress in many other development sectors, such as health,

education, and energy. This recommendation will take on extra urgency if and when MCC receives authority from the U.S. Congress to enter into more than one agreement with a country at one time (i.e., "concurrent" Compacts), which also would enable the creation of regional Compacts.[63]

**U.S. Department of Commerce – Market Access for U.S. Goods and Services**

Many innovative drinking water and wastewater treatment technologies, ranging from irrigation to filtration, desalination, and water efficiency, including "smart" water meters, currently exist that must be deployed more broadly as a critical component to help solve the significant water challenges being faced today across the globe. The U.S. is at the forefront of innovative technological development in this space.

> "We need to make every dollar of our limited foreign aid resources count by addressing problems where we can have a real impact on people's lives. By focusing our efforts on clean water and sanitation, we can save lives, improve public health and provide stability in vulnerable communities throughout the world." – Senator Bob Corker

Consideration should be given to ensuring that the U.S. Department of Commerce, U.S. Trade and Development Administration (TDA), USDA, and other U.S. overseas marketing and foreign trade efforts, such as trade missions, involve leaders in water and wastewater, as well as nontraditional experts that can facilitate the transfer of innovative water and wastewater treatment technologies and services to other countries. For example, city or municipal water officials might have licensing or other water-related products or services that would benefit other countries. Numerous other entities across the U.S. likely would have members, consultants, or representatives that also could add value to such missions, such as the U.S. Water Partnership, the American Water Works Association, and the Water Environment Federation.

**U.S. Congress**

Elevating and integrating global water security across the U.S. foreign policy and national security architecture would benefit from increased Congressional appropriations for multiple agencies and may require additional authorizing legislation. Members of Congress also should urge the White House and a number of federal agencies, including DoD, to prioritize global water security across their policies, programs, and budgets.

- Congress also could work closely with the White House to position water security as a means toward more comprehensive peace agreements. Such efforts currently are underway in the Middle East[64] and could be pursued elsewhere, potentially incorporating the support of NGOs (i.e., multi-track diplomacy).
- Congress could launch a Global Water Caucus, strengthening the capacity of the Congress and individual Members.
- The Senate and House Intelligence Committees should urge the Intelligence Community to continue to track threats related to water imbalances (i.e., too much, too little, too dirty), and make those findings public.

***Whole-of-U.S. Recommendations***

Americans are working actively to help solve the global water challenge through thousands of U.S.-based corporations, civic organizations, faith-based groups, NGOs, and academic institutions. They are joined by state agencies, lawyers, water suppliers, farmers, and many others who are working to address water challenges at the global, national, and local or community levels in countries in need.

Leaders from these organizations should seek to collaborate with the State Department, USAID, and other federal agencies involved with overseas partnerships and exchanges.

State Department and USDA visitors' programs (IVLP and IVP, respectively), and USAID technical assistance efforts, should draw on such technical expertise, including through professional associations and other venues (e.g., through the American Water Works Association (AWWA), American Water Resources Association (AWRA), American Society for Civil Engineers, Geological Society of America, and U.S. Water Partnership) at a greater scale and scope than currently occur. Many public-private partnerships and projects with overseas counterparts have been taking place for many years and should be encouraged and expanded.

> "The U.S. government has not fully utilized the capabilities of U.S. civil society, universities, and the private sector to anticipate and address water-related problems around the world." (Busby, Joshua, *Water and U.S. National Security*, "Overview," Council on Foreign Relations, Overview, January 2017)

**Center for Water Conflict Prevention:**

An opportunity exists to create a **"Center for Water Conflict Prevention,"** as recently proposed, to facilitate "Track II" dialogues and other activities. Such a Center could provide leadership by hosting roundtables for overseas diplomatic and technical leaders, senior Administration officials, Ambassadors, Members of Congress, and other cross-sectoral groups of public and private sector representatives. It also could support Administration and Congressional efforts in the water security arena. In addition, it could convene appropriate stakeholders and facilitate scenario development and "gaming" exercises to help the U.S. stay ahead of water security-related threats. Such efforts would help build trust and likely would help enhance coordination among the diverse stakeholders that exist in the global water security and related arenas. This proposed Center would be able to draw on the technical resources and tools the U.S. possesses, and could be housed at a location such as the Woodrow Wilson International Center for Scholars or the U.S. Institute of Peace.[65]

**Information Sharing, Technical Cooperation, and Improved Coordination:**

Water 2017 underscores the range of water resource experts across the U.S. that can and should be more engaged to help get ahead of global water security threats. Several universities lead in providing programs and resources in this arena, as well, including:

- **Oregon State University (OSU)** has a Program in Water Conflict and Transformation, led by Professor Aaron Wolf, that includes the **Transboundary Freshwater Dispute Database (TFDD) and its "Basins at Risk" project,** which identifies a range of criteria to help determine the likelihood for cooperation or conflict in the world's 263 transboundary basins. OSU now also offers a joint master's degree program on water cooperation and peace with the UNESCO-IHE Institute for Water Education in The Netherlands and the University for Peace in Costa Rica.[66]
- **Princeton University,** in cooperation with UNESCO and others, has developed African and Latin American Flood and Drought Monitors that incorporate meteorological, soil moisture, and stream flow data, available at: stream.princeton.edu. As noted earlier, the Army Corps (with its "iRAIN" mobile app) and other federal agencies are working on similar types of efforts.

As examples of some of the major civil society water-related partnerships and projects efforts based out of just one state, **citizens of Tennessee were involved in the following activities abroad:**

- The Nashville-based organization, **Healing Hands International,** has drilled more than 350 wells in Ethiopia, 130 wells in Haiti, and has completed dozens of other projects in India, Nigeria, Zambia, Zimbabwe, and Honduras, providing water to a total of more than 1 million people;
- The Tennessee-based global ministry, **Living Waters for the World,** installed 823 water systems in 25 countries throughout North America, South America, Eastern Europe, Southeast Asia, and Africa; and
- Members of the **Rotary Club of Memphis**, Tennessee participated in projects that involved installing clean water systems in developing countries.

American schoolchildren are participating in global water activities: H2O for Life provides service learning opportunities for schoolchildren across the U.S. and matches them with schools in Africa, Asia, and Latin America to work together to solve local WASH challenges.

Consideration should be given to forming stronger, more coordinated, efficient, and effective networks and ensuring that relevant stakeholders across the globe are made aware of them and use them for their intended purposes. For example, the **Universities WASH Network** is an effort designed to strengthen the contributions of American universities to the WASH sector and build more effective partnerships with the USG.[67]

The Nicholas Institute for Environmental Policy Solutions at **Duke University,** in partnership with the Aspen Institute, has proposed a "three-step plan to design and launch an `***Internet of***

***Water'*** **–** a network of interconnected data producers, hubs, and users – that will enable real-time collection and transmission of water-related data and information, a prerequisite for revolutionizing how water resources are managed to address water problems such as extreme flooding, scarcity, and contamination as well as to restore aquatic systems."[68]

This effort underscores the point that water-related experts, and data and informational resources should be linked, where feasible, and made widely available among both public and private sector stakeholders.

Water 2017 applauds and encourages the expansion of whole-of-government and whole-of-U.S. efforts with respect to global water security, and urges stakeholders to better leverage scarce resources and maximize public-private partnerships at home and abroad, never losing sight of the ultimate goal: global water security for all.

# Appendix of Additional Agency-Specific and Whole-of-U.S. Recommendations

***Whole-of-Government***

**U.S. Department of State (State Department):**

- The Secretary of State should ensure that the Department's Special Advisor for Water Resources (a position required by the Water for the World Act) is empowered and has adequate resources to execute his/her responsibilities.[69]
- Global water security should be elevated and incorporated into the Quadrennial Diplomacy and Development Review (QDDR).[70] With input from the Intelligence Community, the Secretary of State and other relevant State Department officials should work to ensure that water-related security threats are incorporated into internal intelligence materials, as needed, that are distributed to relevant bureaus, offices, and embassies.
- Consideration should be given to elevating the importance of global water security in the Department's Office of Policy Planning (S/P), including through cables and other guidance, and within the Department's regional Assistant Secretary positions. S/P could convene roundtables, in conjunction with an empowered Interagency Water Working Group, on the three water-related security threats identified herein and potential cross-cutting solutions.
- Consideration should be given to having global water security addressed by the Department's Foreign Affairs Policy Board (FAPB).[71]
- A fully-resourced "water team" at the State Department should further leverage its convening power by helping to ensure that developing countries have access to the data they need to get ahead of water-related threats; this can be done more comprehensively with support from across the USG.
- In facilitating the development of water-sharing agreements, joint management structures (or "agreements") with incentives for downstream countries could prove extremely useful in resolving conflict or preventing or mitigating the likelihood for conflict.

*Building Capacity on Global Water Security, Leveraging Embassy Resources, and Enhancing Diplomacy*

- The Foreign Service Institute (FSI) should consider increasing the quantity, quality, and formats of trainings on global water security offered to Ambassadors, Deputy Chiefs of Mission, Foreign Service Officers, and Foreign Service Nationals.
    - The FSI should continue to invite global water experts from across the USG (prioritizing USAID) and external stakeholders to lead training sessions.
    - Global water security challenges, their cross-cutting implications, and opportunities should feature prominently in topical (e.g., technology, health, economics) and

regional studies courses. Trainings should also incorporate case studies on water resource issues and interactive (e.g., scenario planning or "gaming") exercises, as appropriate.

- Consideration should be given to conducting more exchanges with ministry or other host country counterparts to help further enhance the capacities of various country ministries on water-related threats that ultimately could threaten political stability.
    - Relatedly, specific consideration should be given to having more State Department (Bureau of Educational and Cultural Affairs) **International Visitor Leadership Program (IVLP)** exchanges focused on or incorporating water security issues.[72] Through the IVLP, for example, Vietnamese representatives traveled to southern Louisiana to study relevant water resource management issues, because Vietnam (Mekong River Basin) and Southern Louisiana (Mississippi River Basin) share similar habitats.[73] The State Department should also try to catalyze longer-term exchanges, as many water leaders from across the developing world would benefit from longer exposure to U.S. policies and programs.
    - Importantly, embassies, USAID, and country/regional entities should participate in and help lead such efforts, as should the Army Corps, other U.S. technical agencies, and other less traditional stakeholders, as appropriate.
    - Water 2017 believes that prioritizing water security-related efforts in host countries by U.S. Ambassadors and USAID Mission Directors will help get "buy in" from embassy and mission staff as well as by host governments and local partners, and would potentially drive a focus on water as a key component of bilateral or multilateral relationships. Because responsibility for water resources often falls to different ministries (e.g., natural resources, infrastructure, health) in host countries, engaging all of the relevant ministries and non-government stakeholders and having a unified and holistic watershed or basin approach is important, to the extent feasible.
    - Water 2017 encourages U.S. Ambassadors to make host country governments more aware of the extent to which U.S.-based human, technical, and financial resources are available, including via U.S. professional associations (e.g., the American Water Works Association (AWWA), the American Society of Civil Engineers (ASCE), the Geological Society of America) and consultants from the public-private U.S. Water Partnership's (USWP) Water Consultants Program, to help them solve their own water challenges.

The State Department also should use its valuable convening capabilities to strengthen basin- or aquifer-specific partnerships, perhaps in conjunction with other international meteorological or hydrologic organizations (e.g., the World Meteorological Organization), and should incorporate relevant forecasting and predictive tools from the outset to help inform such dialogues.

**USAID:**

*Facilitating a Holistic, Integrated, Cross-sectoral Approach to Enhance Global Water Security*

USAID Headquarters, field missions, and regional bureaus should continue to move toward a more comprehensive, strategic approach that incorporates integrated water resources management *and* takes into account the linkages between issues, resources, programs, and sectors (e.g., WASH and health, water and food security, water and energy efficiency) from the outset. This approach should leverage funding streams, including from donor governments, IFIs, and corporate and philanthropic stakeholders, toward solving these multi-disciplinary water security challenges. It should integrate development assistance with humanitarian assistance, where appropriate. Such integrated, cross-sectoral efforts to help get ahead of water-related threats appear to be gaining prominence at USAID and warrant ongoing reinforcement.

**Incorporating development with humanitarian response assistance:** In some instances, an integrated approach to development assistance (including water resource management, access to safe drinking water) and humanitarian response assistance will be appropriate and effective to enhance planning, preparedness, and resilience, with direction from Headquarters and implementation at the regional and country levels. This could involve coordination within and across multiple USAID bureaus and offices responsible for food security, water and sanitation, health, economic development, and disaster assistance, as well as regional bureaus, and country missions, and relevant international organizations. The goal would be to have proactive, long-term measures in place to mitigate, for example, the worst impacts of a projected drought and associated potential negative "ripple effects" (e.g., famine, potential conflict).

*Enhancing Internal and External Communications*

USAID should better communicate and disseminate the key results of programs that are underway involving water (e.g., water and food security/nutrition, WASH and gender, WASH and health), including their benefits in terms of helping to prevent or mitigate the severity of water-related security threats. Identifying indicators and other means to measure and clearly communicate cross-sectoral successes can be difficult; however, doing so is vital to better demonstrate multiple benefits, leverage scarce resources, and more readily transfer lessons of the importance of integrating water into other program efforts (e.g., energy, agriculture, food security, health).

*Reinforcing and Expanding Capacity Building and Technical Assistance Efforts*

- USAID in-country and/or regional officials should work with host country and regional partners to identify institutional gaps and help bridge them in ways that make the most sense from a local perspective.

- USAID should consider additional efforts that could mobilize local private and public finance (e.g., its Development Credit Authority and Domestic Resource Mobilization (DRM)).[74]

*Using Technical Support Tools to Enhance Program and Budgetary and Planning Process Efficacy*

- USAID should assume a stronger leadership role in the IWWG and should position itself as a resource to other agencies, where opportunities to collaborate exist.
- USAID and CDC should collaborate more frequently and effectively on policies and programs designed to limit the spread and severity of infectious diseases related to inadequate WASH across the globe.
- USAID, the State Department, NASA, and NOAA should coordinate more to ensure the USG is taking full advantage of U.S. remote sensing capabilities to get ahead of the next water-related security threats, such as exceptional droughts.
- Annual budgets should be developed with multi-year strategic plans in mind and analyzed in conjunction with forecasting and other predictive tools, for example, drought maps and forecasts, to perhaps better anticipate changes in resource needs that could arise.

**CDC:**

*Enhancing Integration, Coordination, and Partnership Efforts*

- CDC could enhance its working relationship with the Pan American Health Organization (PAHO)[75] to promote behavioral change (e.g., with respect to sanitation) and improve water storage and household water treatment. Technological solutions and behavioral change are critical to long-term prevention of sanitation-related diseases and related potential impacts.
- To help increase the effectiveness and impact of the IWWG, CDC could host an IWWG meeting at its Atlanta-based Headquarters and invite key local stakeholders, such as representatives from Emory University's Center for Global Safe WASH[76], CARE, and Coca-Cola (and/or its foundation), to participate, as appropriate.
- A stronger, better-resourced partnership between CDC and USAID is particularly encouraged; additional stakeholders could include CDC Africa and the Skoll Global Threats Fund.

*Improving Communication Efforts*

- Health officials should be encouraged to prioritize and communicate the importance of hand washing and other sanitation-related issues, due to the potentially life-saving importance of doing so. A key component of this effort could be a focus on WASH in health care facilities, a significant global shortcoming recently identified by the World Health Organization.[77]

**Technical Agencies (NASA, NOAA, USGS, Army Corps):**

The USG should provide more technical assistance to ensure that global water data are disseminated widely, particularly to strategic country partners, and used for their intended purposes.

- Data can and should be ***shared openly*** **with other countries and partners across the globe,** in such a way that national, regional, and local government officials, civil society organizations, and citizens are able to use these data to develop their own water strategies and plans.
- **Information sharing** is essential: knowledge of an upcoming drought, for example, could empower local citizens to store water in natural aquifers far in advance and enable farmers to better manage existing water and soil resources to help grow crops to prevent famines.
- **More coordination** likely is needed: 1) across U.S. technical agencies and among other entities providing similar services in the public and private sectors; 2) with technical counterparts in developing countries to help convert early warning into early action; 3) between technical agencies, the State Department, and foreign ministries to better leverage their respective authorities and convening powers.
- Easy-to-use **mobile applications** ("apps"), such as "iRAIN," (mentioned elsewhere in this report), and the privately-developed "mWater,"[78] help collect and disseminate various rainfall, stream flow, water, health, and a host of other data.

**USGS:**

A number of similarities exist between the **Mississippi River Commission** in the U.S. and the **Mekong River Commission. The cooperative efforts underway can be viewed as a model** that could be replicated in other priority river basins elsewhere around the world, where appropriate.

- USGS and the Army Corps could engage in the Mekong River Commission to a greater extent, which could help offset Chinese influence in this Basin and Region and help foster more positive relationships there. In doing so, the USG should help the local partners develop their own vision, strategic plan, and process through which to coordinate the science and engage a broader segment of society, with an eye toward ensuring the Mekong River ecosystem survives for future generations.
- The two Commissions are looking to continue to share comparisons of respective natural river properties and functions and more natural, "low technology" solutions with one another. Integrated, basin-wide ("system," where practicable) approaches and analyses will be helpful to these Commissions – and in other similar situations.
- The USGS and Army Corps are well positioned to share lessons learned from these regional planning efforts that include a range of stakeholders, including NGOs, communities, and others.

- Most importantly, the USG and overseas partners could apply a similar basin or commission "pairing" approach in other priority basins, as resources (human, technical, financial) become available.

**Army Corps:**

The existing tools (into which the "iRAIN" mobile app data are fed) were developed by **University of California (UC) Irvine's** Center for Hydrometeorology and Remote Sensing (CHRS) and the United Nations Educational, Scientific and Cultural Organization's (UNESCO) International Hydrological Programme (IHP),[79] and build on "high-resolution satellite precipitation products" that also involved NASA, NOAA, and other entities.[80] Water 2017 believes these agencies and external stakeholders should work to develop even more sophisticated tools, for instance, that are higher in resolution, and to apply them, perhaps as a pilot project, to one or more medium- or small-scale basins, as the technology becomes available, to even more accurately measure rainfall and forecast floods or droughts. Water 2017 also encourages the Army Corps, USGS, and NASA to continue to leverage their roles and relationships with international organizations and in-country national and subnational partners to further enhance data sharing and technical assistance to help other countries better solve their own water challenges.

The World Meteorological Organization (WMO) appears to be conducting hydrological monitoring and forecasting, and cooperates with the UNESCO-hosted International Hydrological Programme (IHP). This type of collaboration could lead to greater integration of weather and water resource data.

As noted under the *Interagency Recommendations*, consideration should be given to establishing a technical counterpart to the IWWG that could be led by technical agencies, such as USGS or the Army Corps. The IWWG and/or this parallel group could facilitate the implementation of the aforementioned recommendations.

**NASA:**

- Water 2017 urges NASA to continue to improve its remote sensing capabilities for global water challenges and to continue to work with the State Department and USAID to share these globally. NASA also should make the U.S. Congress aware of its expertise in global water security and its need for sustained funding.
- Water 2017 urges continued support for NASA's satellite and related technical tools and capabilities, including the NASA-USAID joint venture, SERVIR.[81]
- NASA should work with USGS and the Army Corps to continue to leverage their respective roles and relationships with international organizations and in-country national and subnational partners to help other countries better solve their own water challenges with access to these data and capabilities, as mentioned under the recommendations for the *Army Corps*.

- NASA likely should play a more active role in the IWWG to inform the group of NASA's capabilities. The *Interagency Recommendation* to create a parallel technical group to the current IWWG is worth noting, as well. As mentioned just above, the IWWG and/or this parallel group could facilitate the implementation of technical assistance, data sharing, and pilot projects.

**NOAA:**

- NOAA could provide technical input into USAID in-country training programs to better leverage respective strengths and scarce resources; USGS and the Army Corps are also potential contributors to such an effort.
- Consideration should be given to sharing to a greater extent the lessons and impacts, including behavioral changes, from having data produced by the National Integrated Drought Information System (NIDIS)[82] with global partners, including groups that work on water resources management. In this instance, having information from NIDIS can empower and transform local communities by helping them be able to better plan and prepare for extreme droughts and thereby improve their water and food resource management, and, in turn, increase their water security, which can lead to behavioral and other changes across societies.
- NOAA perhaps could expand its role with GEO and GEOGLOWS.
- NOAA could help develop and/or implement case studies and other scenario planning types of exercises that help priority country counterparts better manage risks from extreme weather events.
- As mentioned elsewhere, NOAA should provide greater input into the IWWG and/or a new parallel technical working group.

**U.S. Department of Defense (DoD):**

- Military and intelligence leaders should consider developing more scenarios or "gaming"-type exercises regarding potential water security threats and solutions.
- DoD has the opportunity to use its new authority (per the Fiscal Year 2017 National Defense Authorization Act) to transfer funds to other agencies to implement programs that support security cooperation efforts under Theater Campaign Plans. Some of this funding could go to USAID or the State Department for water security efforts in fragile states, for example, African countries bordering the Lake Chad Basin.

**U.S. Congress:**

- Including global water security in Aspen Institute's Congressional Program would be useful. This Program brings Staff and Members together to discuss pressing topics in informal, bipartisan, off-the-record settings, which can help identify areas of agreement on topics that often are otherwise contentious.

- Consideration should be given to an increase in and more targeted funding for the agencies and programs pertaining to global water security specified herein in their respective appropriations bills to prevent various water-related security threats to the U.S. and its allies. This could include funding for the WASH and related activities specified in the Water for the World Act, which traditionally is funded in the State and Foreign Operations Appropriations bill. Funding outside of traditional water agencies for critical programs, tools, and services and across siloed programs is also vital.
- Annual federal spending bills should be developed with Agency multi-year plans in mind and analyzed in conjunction with drought maps and forecasts, as an example, to perhaps better anticipate changes in resource needs that could arise.

***Whole-of-U.S.***

Ample opportunities exist to expand public-private global water partnerships, for example, through the State Department's Office of Global Partnerships and USAID's Global Development Alliances. Commercial finance providers could partner with USAID's Development Credit Authority on innovative financial transactions.

*Information Sharing, Technical Cooperation, and Capacity Building*

There are many academics and institutions (beyond those included in the body of this report) across the U.S. with whom the USG should consider partnering or with whom the USG should help connect policymakers, farmers, and water consultants in developing nations to further strengthen in-country capacity and leverage human resources to help achieve global water security for all. For example, the University of Nebraska-Lincoln's School of Natural Resources houses the aforementioned National Drought Mitigation Center (NDMC),[83] which offers "resources related to international drought indicators, remote sensing, forecasts and advisories, water resources, and data,"[84] including some that are global-scale and country-specific.[85] A brief and partial list of experts would include Michael Campana (hydrogeologist at Oregon State University); Christine Moe (Emory University); Josh Busby (University of Texas at Austin); David Kreamer (University of Nevada, Las Vegas); Braimah Apambire (Desert Research Institute); Peter McCornick (Director, Water for Food Institute, University of Nebraska); Jenna Davis (Stanford University); and David Sabatini (University of Oklahoma).

# Endnotes

[1] While Water 2017 sunsets on July 31, 2017, those who have been involved in this effort will remain active in the global water security arena and available to this report's audience.

[2] Examples of such tools include the NASA-led Group on Earth Observations Global Water Sustainability (GEO GLOWS); NASA-USAID's joint venture, SERVIR; the National Oceanic and Atmospheric Administration's (NOAA) National Water Center in Alabama and National Integrated Drought Information System (NIDIS); U.S. Geological Survey (USGS) and U.S. Army Corps of Engineers (Army Corps) tools; and the USAID-led Famine Early Warning System Network (FEWS NET).

[3] Water In Your State: http://water2017.org/water-in-your-state.html

[4] Goodman, Sherri, Ruth Greenspan Bell, and Nausheen Iqbal, "Global Water and National Security: Why the Time Is Now," Woodrow Wilson International Center for Scholars' Environmental Change and Security Program (ECSP), New Security Beat, February 6, 2017, https://www.newsecuritybeat.org/2017/02/global-water-national-security-time/

[5] United Nations University (UNU), UNU-Institute for Water, Environment and Health (UNU-INWEH), and the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP), *Water Security & the Global Water Agenda – A UN-Water Analytical Brief,* October 2013 (Revised version), page 1, http://www.unwater.org/app/uploads/2017/05/analytical_brief_oct2013_web.pdf

[6] David, Andrew, and Mihir Torsekar, "U.S. Exports of Water Filtration and Purification Equipment Show Significant Growth," U.S. International Trade Commission (USITC) Executive Briefings on Trade, September 2012, page 1, https://www.usitc.gov/publications/332/WaterFiltration9_17_12.pdf

[7] https://www.dni.gov/files/documents/Newsroom/Testimonies/SSCI%20Unclassified%20SFR%20-%20Final.pdf

[8] USAID, *Safeguarding the World's Water,* Report of Water Sector Activities, Fiscal Year 2015, page 11, https://www.usaid.gov/sites/default/files/documents/1865/safeguard_2016_final_508v4.pdf

[9] CNA's Military Advisory Board (MAB), *National Security and the Threat of Climate Change,* 2007, page 20, https://www.cna.org/CNA_files/pdf/National%20Security%20and%20the%20Threat%20of%20Climate%20Change.pdf

[10] CNA's Military Advisory Board (MAB), *National Security and the Accelerating Risks of Climate Change,* May 2014, pages 13-14, https://www.cna.org/cna_files/pdf/MAB_5-8-14.pdf

[11] Marcus Dubois King, "The Weaponization of Water in Syria and Iraq," The Washington Quarterly 38, no.4 (2015); Marcus King, "Water Stress, Violent Instability, and Extremism in Nigeria," in David Reed ed., *Water, Security and U.S. Foreign Policy* (New York: Routledge, 2017)

[12] Water for the Poor Act, https://www.govtrack.us/congress/bills/109/hr1973

[13] Water for the World Act, https://www.congress.gov/bill/113th-congress/house-bill/2901

[14] Water for the World Act, Section 6, https://www.congress.gov/113/plaws/publ289/PLAW-113publ289.pdf

[15] Water for the World Act, Section 6, https://www.congress.gov/113/plaws/publ289/PLAW-113publ289.pdf

[16] Global Food Security Act of 2016, https://www.congress.gov/bill/114th-congress/senate-bill/1252

[17] https://www.state.gov/e/

[18] https://www.state.gov/e/oes/ecw/water/index.htm

[19] A USAID Strategy Implementation Group in Washington, DC provides technical, policy, and thought leadership, and a Water Sector Council, which consists of Deputy Assistant Administrators from Headquarters and key regional bureaus, and is chaired by the Global Water Coordinator, is responsible for reviewing implementation accomplishments and serves as a resource to the Strategy Implementation Council. *USAID Water and Development Strategy Implementation Field Guide,* March 2014

[20] Engelke, Peter and David Michel, *Toward Global Water Security: US Strategy for a Twenty-First-Century Challenge,* Atlantic Council's Brent Scowcroft Center on International Security and U.S. Water Partnership, August 2016

[21] *USAID Water and Development Strategy Implementation Field Guide,* page 5

[22] https://www.usaid.gov/who-we-are/organization/james-peters

[23] https://www.usaid.gov/who-we-are/organization/bureaus/bureau-economic-growth-education-and-environment/office-water

[24] *USAID Water and Development Strategy Implementation Field Guide,* https://www.usaid.gov/sites/default/files/documents/1865/Strategy_Implementation_Guide_web.pdf

[25] Millennium Challenge Corporation (MCC), https://mcc.gov/about

[26] MCC – Water, Sanitation, and Irrigation, https://mcc.gov/sectors/sector/water-and-sanitation

[27] https://www.cdc.gov/healthywater/global/index.html

[28] The Group on Earth Observations (GEO) and the GEO Global Water Sustainability (GEOGLOWS) "provides a framework for effectively mobilizing Earth Observation assets to contribute to mitigating water challenges on various scales" across the globe. GEOGLOWS "seeks to use Earth observations and associated tools and assets to decrease regional tensions and the risk of instability and state failure." GEOGLOWS also involves leadership from NOAA and USGS. *Source:* GEO, GEO 2016 Transitional Work Program, "GEOGLOWS," https://www.earthobservations.org/activity.php?id=54

[29] SERVIR (which is derived from the Spanish word "to serve") is a joint initiative of NASA and USAID that provides "satellite-based Earth monitoring, imaging and mapping data, geospatial information, predictive models and science applications" and decision support tools to help strengthen the abilities of governments and other development stakeholders in parts of Africa, the Mekong River Basin, and the Himalayas through collaborations with over 200 institutions in water-security related areas

[30] The NOAA-led National Integrated Drought Information System (NIDIS) is an inter-agency effort designed to coordinate federal, state, local, and academic partnerships to coordinate drought research and support a drought early warning system (DEWS). NIDIS runs the Global Drought Information System (GDIS) to help share drought-related information with other countries, to better prevent "water, food, and national security hazards." NIDIS also is involved with the National Drought Mitigation Center (NDMC), which is housed at the University of Nebraska, and which provides several global drought forecasting and monitoring tools.

[31] *Atlantic Council Report*, page 9

[32] FEWS NET "is a leading provider of early warning and analysis on acute food insecurity" in over 30 of the World's most food-insecure countries. FEWS NET works with NASA, NOAA, USDA, and USGS, as well as "national government ministries, international agencies, and NGOs" to produce these forward-looking, timely reports and maps and is working with its partners "to improve classification, remote sensing, and other aspects of food security analysis."

[33] *Toward Global Water Security: US Strategy for a Twenty-First-Century Challenge*, pages 9-10

[34] "National Security Implications of Climate-Related Risks and Changing Climate, Submitted in Response to a Request Contained in Senate Report 113-211, accompanying H.R. 4870, the Department of Defense Appropriations Bill 2015"

[35] *Toward Global Water Security: US Strategy for a Twenty-First-Century Challenge*, page 9

[36] U.S. Environmental Protection Agency (EPA), https://www.epa.gov/international-cooperation/international-priorities

[37] Goodman, Sherri, Ruth Greenspan Bell, and Nausheen Iqbal, "Global Water and National Security: Why the Time Is Now," Woodrow Wilson International Center for Scholars' Environmental Change and Security Program, New Security Beat, February 6, 2017

[38] Christian-Smith, Juliet, and Peter Gleick, with Heather Cooley, et. al., *A Twenty-First Century US Water Policy,* 2012, pages 299-301

[39] See: *Water 2017 Brief: USAID Vehicles Summary*

**[40]** Reed, David, Karin Krchnak, and Chris McGahey, "A Chronic Crisis, Now Acute: WWF's Recommendations for the First U.S. Global Water Strategy," Woodrow Wilson International Center for Scholars' Environmental Change and Security Program , New Security Beat, March 16, 2017

[41] More on the Interagency Water Working Group: https://www.state.gov/e/oes/ecw/water/index.htm

[42] *A Twenty-First Century US Water Policy,* page 283

[43] https://www.dni.gov/index.php/global-trends-home

[44] The IVLP is a renowned professional exchange program. "Through short-term visits to the United States, current and emerging foreign leaders in a variety of fields experience this country first-hand and cultivate lasting relationships with their American counterparts. Professional meetings reflect the participants' professional interests and support the foreign policy goals of the United States." Typically, these consist of four communities over three weeks and are theme based. *Source:* U.S. Department of State, Bureau of Educational and Cultural Affairs, IVLP, https://eca.state.gov/ivlp

[45] https://www.usaid.gov/sites/default/files/documents/1865/safeguard_2016_final_508v4.pdf

[46] https://www.usaid.gov/who-we-are/organization/bureaus/bureau-legislative-and-public-affairs

[47] https://www.usaid.gov/sites/default/files/documents/1865/USAID_Water_Strategy_3.pdf

[48] https://www.usaid.gov/results-and-data/planning/country-strategies-cdcs

[49] To elaborate, one of the challenges that might be encountered is that in countries in which responsibility for water resources management falls to a water or environmental ministry, that ministry likely would have familiarity with water-related threats, but would be relatively weak and/or underfunded. However, if such responsibility falls to a finance or infrastructure ministry, planning capabilities and funding might be greater, but they might have less knowledge of water-related issues.

[50] https://www.cdc.gov/healthywater/global/

[51] http://www.cdcafrica.com/

[52] http://amcow-online.org/index.php?lang=en

[53] http://www.who.int/water_sanitation_health/publications/wash-health-care-facilities/en/

[54] SERVIR (which is derived from the Spanish word "to serve") is a joint initiative of NASA and USAID that provides "satellite-based Earth monitoring, imaging and mapping data, geospatial information, predictive models and science applications" and decision support tools to help strengthen the abilities of governments and other development stakeholders in parts of Africa, the Mekong River Basin, and the Himalayas through collaborations with over 200 institutions in water-security related areas. *Source:* NASA, "SERVIR Overview," https://www.nasa.gov/mission_pages/servir/overview.html

[55] The Group on Earth Observations (GEO) and the GEO Global Water Sustainability (GEOGLOWS) "provides a framework for effectively mobilizing Earth Observation assets to contribute to mitigating water challenges on various scales" across the globe. GEOGLOWS "seeks to use Earth observations and associated tools and assets to decrease regional tensions and the risk of instability and state failure." GEOGLOWS also involves leadership from NOAA and USGS. *Source:* GEO, GEO 2016 Transitional Work Program, "GEOGLOWS," https://www.earthobservations.org/activity.php?id=54

[56] The NOAA-led National Integrated Drought Information System (NIDIS) is an inter-agency effort designed to coordinate federal, state, local, and academic partnerships to coordinate drought research and support a drought early warning system (DEWS). NIDIS runs the Global Drought Information System (GDIS) to help share drought-related information with other countries, to better prevent "water, food, and national security hazards." *Source:* NIDIS, Global Drought Information System, https://www.drought.gov/gdm/. NIDIS also is involved with the National Drought Mitigation Center (NDMC), which is housed at the University of Nebraska (see *Whole-of-U.S. Recommendations*), and which provides several global drought forecasting and monitoring tools. *Source:* NDMC, University of Nebraska, "Institutional Partnerships," http://drought.unl.edu/AboutUs/InstitutionalPartnerships.aspx.

[57] ICIWaRM "acts as the Secretariat of the UNESCO IHP's "Global Network on Water and Development Information for Arid Lands (G-WADI) program on behalf of IHP. This program is intended to create a global network to improve water resource management in these areas, promote an integrated basin management approach, and build capacity. *Source:* Army Corps' IWR, "iRain: New Mobile App Supports Water Management around the World," Communications Update, November 28, 2016, www.iwr.usace.army.mil

[58] U.S. ACE IWR, "iRain: New Mobile App Supports Water Management around the World," Communications Update, November 28, 2016, www.iwr.usace.army.mil

[59] Thompson, Andrea, "Trump Budget Cuts `Critical' NASA Missions," *Scientific American,* April 1, 2017, https://www.scientificamerican.com/article/trump-budget-cuts-ldquo-critical-rdquo-nasa-climate-missions/

[60] GEOGLOWS also involves leadership from NOAA and USGS. *Source:* GEO, GEO 2016 Transitional Work Program, "GEOGLOWS," https://www.earthobservations.org/activity.php?id=54

**[61]** Goodman, Sherri, Ruth Greenspan Bell, and Nausheen Iqbal, "Global Water and National Security: Why the Time Is Now," Woodrow Wilson International Center for Scholars' Environmental Change and Security Program, New Security Beat, February 6, 2017, https://www.newsecuritybeat.org/2017/02/global-water-national-security-time

[62] USDA, NRCS, "International Visitors Program" Fact Sheet, https://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/national/programs/alphabetical/international/?cid=nrcs143_008445

[63] The MCC currently is "statutorily prohibited from entering into more than one compact at a time with a country," which also hinders MCC's ability to enter into regional and other multi-country agreements, including the early stages of their development. *Source:* MCC, "Proposed Legislative Changes," https://www.mcc.gov/resources/story/story-cbj-fy2016-proposed-legislative-changes. Thus, various efforts have been underway to amend the Millennium Challenge Act of 2003 (e.g., the African Growth and Opportunity Act and Millennium Challenge Act Modernization Act (AGOA and MCA Modernization Act)), and annual Congressional spending bills, https://www.govtrack.us/congress/bills/115/s832/text

[64] "Trump envoy Greenblatt facilitates historic Israeli-Palestinian water deal," http://www.jpost.com/Israel-News/Politics-And-Diplomacy/Israel-PA-agree-on-water-deal-499575

[65] Goodman, Sherri, Ruth Greenspan Bell, and Nausheen Iqbal, "Global Water and National Security: Why the Time Is Now," Woodrow Wilson International Center for Scholars' Environmental Change and Security Program, New Security Beat, February 6, 2017, https://www.newsecuritybeat.org/2017/02/global-water-national-security-time/

[66]http://www.transboundarywaters.orst.edu/images/Water%20Peace%20Joint%20Masters%20Programme/WCAP_Handout_FINAL.pdf

[67] http://uwashnetwork.org/

[68] https://nicholasinstitute.duke.edu/water/publications/internet-water-sharing-and-integrating-water-data-sustainability?utm_source=newsletter&utm_medium=email&utm_campaign=june2017

[69] "Water for the World Act of 2014," Section (4)(e)(2), https://www.congress.gov/113/plaws/publ289/PLAW-113publ289.pdf

[70] The QDDR is a joint study by the U.S. State Department and USAID on global security, and development and diplomatic trends, priorities, and so forth. *Source:* U.S. Department of State, The Quadrennial Diplomacy and Development Review, https://www.state.gov/s/dmr/qddr/

[71] https://www.state.gov/s/p/fapb/

[72] The IVLP is a renowned professional exchange program. "Through short-term visits to the United States, current and emerging foreign leaders in a variety of fields experience this country first-hand and cultivate lasting relationships with their American counterparts. Professional meetings reflect the participants' professional interests and support the foreign policy goals of the United States." Typically, these consist of four communities over three weeks and are theme based. *Source:* U.S. Department of State, Bureau of Educational and Cultural Affairs, IVLP, https://eca.state.gov/ivlp

[73] http://www.mrcmekong.org/news-and-events/news/mekong-and-mississippi-river-commissions/

[74] DRM is: "the process through which countries raise and spend their own funds to provide for their people. . . . the long-term path to sustainable development finance. DRM not only provides governments with the funds needed to alleviate poverty and deliver public services, but is also a critical step on the path out of aid dependence." *Source:* USAID, "Domestic Resource Mobilization," https://www.usaid.gov/what-we-do/economic-growth-and-trade/domestic-resource-mobilization. DRM can involve public or private sources; U.S. agencies leading the DRM effort are: USAID, the U.S. Department of Treasury, and the Millennium Challenge Corporation.

[75] http://www.paho.org/hq/

[76] http://www.cgswash.org/

[77] http://www.who.int/water_sanitation_health/facilities/healthcare/en/

[78] http://www.mwater.co/

[79] ICIWaRM "acts as the Secretariat of the UNESCO IHP's "Global Network on Water and Development Information for Arid Lands (G-WADI) program on behalf of IHP. This program is intended to create a global network to improve water resource management in these areas, promote an integrated basin management approach, and build capacity. *Source:* Army Corps' IWR, "iRain: New Mobile App Supports Water Management around the World," Communications Update, November 28, 2016, www.iwr.usace.army.mil

[80] U.S. ACE IWR, "iRain: New Mobile App Supports Water Management around the World," Communications Update, November 28, 2016, www.iwr.usace.army.mil

[81] NASA, "SERVIR Overview," https://www.nasa.gov/mission_pages/servir/overview.html

**[82]** NIDIS runs the Global Drought Information System (GDIS) to help share drought-related information with other countries, to better prevent "water, food, and national security hazards." *Source:* NIDIS, Global Drought Information System, https://www.drought.gov/gdm/. (More on NIDIS can be found in *Sections III and IV of this report, under Technical Agencies*.)

[83] The NDMC works with the NOAA-led National Integrated Drought Information System (NIDIS), as well as with USAID, and is supported by USDA in developing drought-related decision-making tools. It has research partnerships with NOAA and USGS as well as partnerships with other national and international organizations.

[84] NDMC, University of Nebraska, "Monitoring Tools," http://drought.unl.edu/MonitoringTools.aspx.

[85] NDMC, University of Nebraska, "International Early Warning," http://drought.unl.edu/MonitoringTools/InternationalEarlyWarning.aspx