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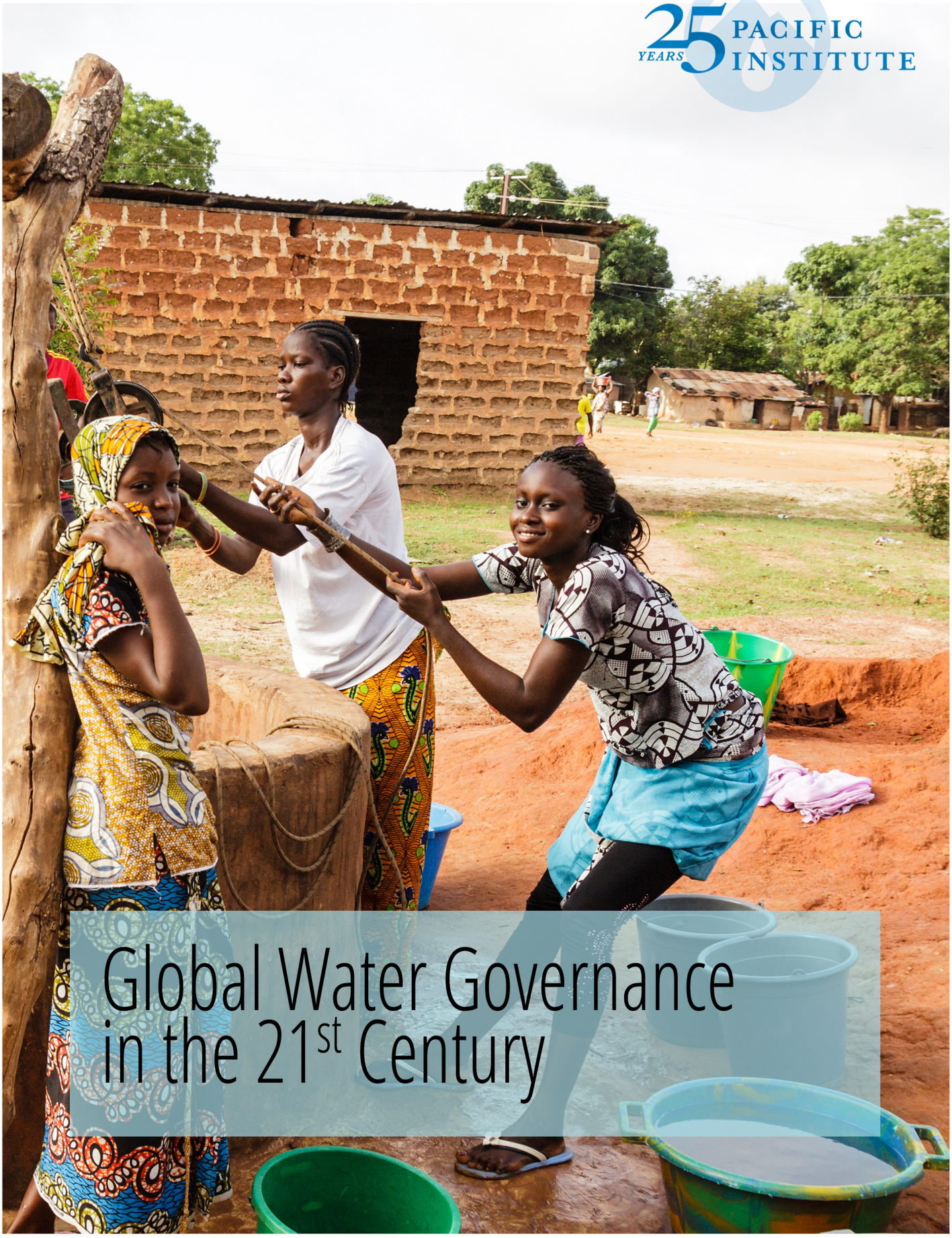

Global Water Governance in the 21st Century

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July 2013

Authors: Heather Cooley, Newsha Ajami, Mai-Lan Ha, Veena Srinivasan, Jason Morrison, Kristina Donnelly, and Juliet Christian-Smith

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Pacific Institute
654 13th Street, Preservation Park
Oakland, California 94612
www.pacinst.org
Phone: 510.251.1600
Facsimile: 510.251.2206

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About the **Authors**

Heather Cooley

Heather Cooley is the co-director of the Pacific Institute's Water Program. Her research addresses the connections between water and energy, sustainable water use and management, and the hydrologic impacts of climate change. Ms. Cooley is a recipient of the Environmental Protection Agency's Award for Outstanding Achievement and serves on the Board of Directors of the California Urban Water Conservation Council. She also serves on the California Commercial, Industrial, and Institutional Task Force. Ms. Cooley received a B.S. in Molecular Environmental Biology and an M.S. in Energy and Resources from the University of California at Berkeley.

Newsha Ajami

Dr. Newsha Ajami is a senior research associate with the Pacific Institute's Water Program. She is a hydrologist specializing in sustainable water resource management, hydrological modeling, flood and water supply forecasting, and advancing uncertainty assessment techniques impacting hydrological predictions. Prior to joining the Institute, Dr. Ajami served as a Science and Technology fellow at the California State Senate Committee on Natural Resources and Water. She has published many highly cited peer-reviewed papers in predominant journals and was the recipient of 2005 NSF award for AMS Science and Policy Colloquium and ICSC-World Laboratory Hydrologic Science and Water Resources Fellowship from 2000-2003. Dr. Ajami received her Ph.D. in Civil and Environmental Engineering from the University of California - Irvine, an M.S. in Hydrology and Water Resources from the University of Arizona, and a B.S. in Civil and Environmental Engineering from Tehran Polytechnic.

Mail-Lan Ha

Mai-Lan Ha is a research associate with the Pacific Institute's Corporate Sustainability Program. Her research focuses on international standards and corporate water stewardship programs. She brings to the Institute international development and commerce experience working at the community, national, and regional levels of Southeast Asia. Prior to joining the Pacific Institute, Ms. Ha spent two years working with local and regional NGOs out of Bangkok, Thailand, focusing on energy, investment, and environmental issues facing the six Mekong countries. Ms. Ha has also spent time working with investment and trade associations in the United States and human rights organizations in Southeast Asia. She holds a Masters of International Affairs degree from Columbia University's School of International and Public Affairs focusing on governance and non-state actors in development and a B.A. in History from the University of California, Los Angeles.

Veena Srinivasan

Dr. Veena Srinivasan is a senior research affiliate with the International Water and Communities Initiative at the Pacific Institute. Her research interests include inter-sectoral water allocation, threats to global freshwater, and impacts of urbanization on water resources. Dr. Srinivasan worked for several years in the consulting and non-profit sectors on energy, water, and forest policy issues in India. She has a Masters in Energy and Environmental Studies from Boston University and a Bachelor of Technology in Engineering Physics from the Indian Institute of Technology, Mumbai. Dr. Srinivasan has many peer-reviewed publications and has been a recipient of the Teresa Heinz Environmental Scholars Award and the National Science Talent Fellowship in India. She received her Ph.D. from Stanford University's Emmet Interdisciplinary Program in Environment and Resources.

Jason Morrison

Jason Morrison is director of the Pacific Institute's Globalization Program, which has focused on private sector environmental initiatives (particularly those related to water); performance-based regulatory innovation; and voluntary international standards. He has been conducting research on freshwater-related business risks and on sustainable water management in the private sector since 2003. Under a Memorandum of Understanding between the Pacific Institute and the UN Global Compact, Mr. Morrison serves as the Technical Director for the CEO Water Mandate, supporting the initiative with applied research, event organization, and other services. Mr. Morrison is a co-founder and current Board Member of the Alliance for Water Stewardship (AWS), a global initiative working to develop a freshwater certification program to advance responsible water practices by water providers and large-scale users. Mr. Morrison holds an M.A. from Boston University's Center for Energy and Environmental Studies and a B.A. in Philosophy from the University of California, San Diego.

Juliet Christian-Smith

Dr. Juliet Christian-Smith is a senior research associate with the Pacific Institute's Water Program. Her interests include agricultural water uses, comparative analyses of water governance structures, water reuse, and climate change. Dr. Christian-Smith is a recipient of the Environmental Protection Agency's Award for Outstanding Achievement and serves on the Executive Board of the Agricultural Water Management Council. She is also a Frontiers of Science Fellow for the National Academy of Sciences. Prior to coming to the Pacific Institute, Dr. Christian-Smith was in Portugal on a Fulbright Fellowship studying the implementation of the European Union Water Framework Directive and examining agricultural water usage in the Alentejo region. Dr. Christian-Smith holds a Ph.D. in Environmental Science, Policy and Management from the University of California at Berkeley and a B.A. in Biology from Smith College.

Kristina Donnelly

Kristina Donnelly is a research associate with the Pacific Institute's Water Program. Her research addresses the social, economic, and policy implications of water conservation, conflict management over transboundary water resources, and water policy in North America and the Middle East. Ms. Donnelly received a B.S. in Mathematics from American University and an M.S. in Natural Resources and Environment from the University of Michigan. She was the 2008/09 Sea Grant Fellow with the Great Lakes Commission in Michigan. Before joining the Institute, she worked for the Center for Transboundary Water Management at the Arava Institute for Environmental Studies in southern Israel, conducting transboundary water research and facilitating educational opportunities between Israelis, Jordanians, Palestinians, and other nationalities.

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1 Introduction

Growing pressure on the world's water resources is having major impacts on our social, economic, and environmental well-being. Even as the planet's endowment of water is expected to remain constant, human appropriation of water, already at 50%, is expected to increase further (Postel et al. 1996). Pressures on water resources are likely to worsen in response to population growth, shifts toward more meat-based diets, climate change, and other challenges. The world's water is increasingly becoming degraded in quality, increasing the cost of treatment and threatening human and ecosystem health. Furthermore, the physical availability of freshwater resources does not guarantee that a safe, affordable water supply is available to all. At least 780 million people do not have access to clean drinking water, some 2.5 billion people lack access to safe sanitation systems, and 2-5 million people – mainly children – die from preventable, water-related diseases every year.

There is growing recognition that the scope and complexity of water-related challenges extend beyond national and regional boundaries and therefore cannot be adequately addressed solely by national or regional policies. In a recent report, the United Nations notes that "water has long ceased to be solely a local issue" (UN 2012). In particular, widespread water scarcity and lack of access to water supply and sanitation threaten socio-economic development and national security for countries around the world. Additionally, people around the world share and exchange water directly and indirectly through natural hydrological units and systems and through global trade, i.e., virtual water. Furthermore, climate change and the growing presence of multinational companies within the water sector play a role in globalizing water issues (Hoekstra 2006).

Over the last sixty years, a number of efforts have sought to address the many challenges facing the water sector. Early efforts to address these challenges were almost entirely based on developing large-scale, physical infrastructure, such as dams and reservoirs, to produce new water supplies. Amid a growing recognition that technology and infrastructure alone were not sufficient to address persistent water management concerns, discourse about water governance began to emerge in the early 1990s. In its first Water Development Report, the United Nations strongly stated that the "water crisis is essentially a crisis of governance and societies are facing a number of social, economic and political challenges on how to govern water more effectively" (UN 2003a).

Yet, notions of water governance have evolved over time. Throughout the 20th century, water governance efforts emphasized the local and/or regional scales, in part because water challenges were largely perceived as local issues. To date, discussions about the global dimensions of water governance have been limited. In this paper, we describe several key elements of global water governance, including the conceptual frameworks and policy priorities developed to address major water-related challenges and the organizations and organizational networks that conceive of

and/or implement those conceptual frameworks and priorities. We then briefly define some of the pathways and modalities through which these organizations and organizational networks operate. Finally, we identify key deficiencies in global water governance and provide recommendations for how it can be improved to better address major water concerns in the 21st century.

2 Global Water Challenges

Water Scarcity

Water scarcity is a major challenge, affecting every continent on the Earth (Figure 1). Water scarcity occurs when water demand nears (or exceeds) the available water supply. Nearly 20% of the world's population, or 1.2 billion people, live in areas of physical water scarcity, where water withdrawals for agriculture, industry, and domestic purposes exceed 75% of river flows (IWMI 2007). An additional 500 million people live in areas approaching physical scarcity. Another 1.6 billion people live in areas of economic water scarcity, where water is available but human capacity or financial resources limit access. In these areas, adequate infrastructure may not be available or if it is available, the distribution of water may be inequitable (IWMI 2007).

But water scarcity isn't solely a natural phenomenon; it's also a human one. Numerous human activities – such as untimely water use, pollution, insufficient or poorly maintained infrastructure, and inadequate management systems – can result in or exacerbate water scarcity. As noted by the United Nations, there are adequate water resources to meet our needs, but "it is distributed unevenly and too much of it is wasted, polluted and unsustainably managed" (UN n.d.).

Widespread declines in groundwater levels are one symptom of water scarcity. Groundwater is an important source of freshwater in many parts of the world. Some areas, however, have become overly dependent on groundwater supplies. In the last two decades, advances in well-drilling techniques have significantly reduced the cost of abstracting groundwater. Driven, in part, by these technological advancements, groundwater withdrawals have tripled over the past 50 years (UN 2012). In some areas, groundwater extraction now consistently exceeds natural recharge rates, causing widespread depletion and declining groundwater levels. A recent analysis of groundwater extraction by Wada et al. (2010) finds that depletion rates have doubled between 1960 and 2000 in sub-humid arid areas and are especially high in parts of China, India, and the United States (Figure 2). Much of the groundwater extracted supports agriculture (67%), although it is also used for domestic (22%) and industrial (11%) purposes.

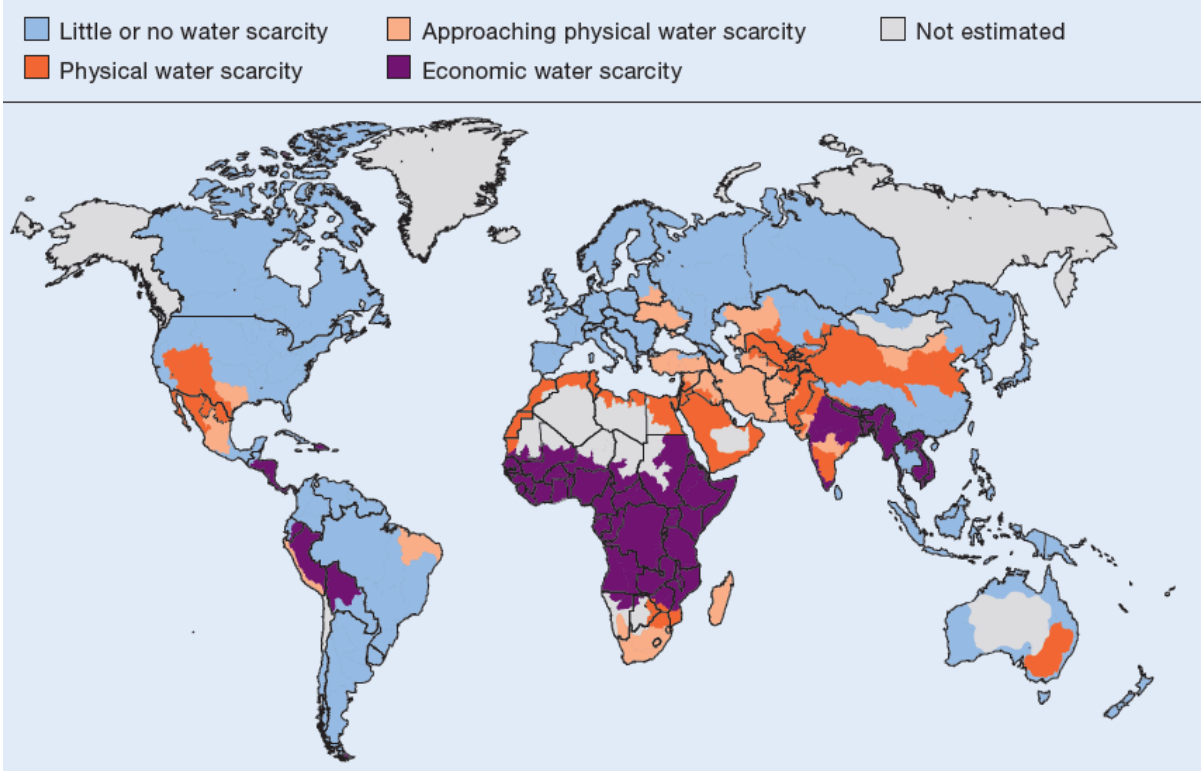

Figure 1. Areas of Physical and Economic Water Scarcity
Source: IWMI 2007

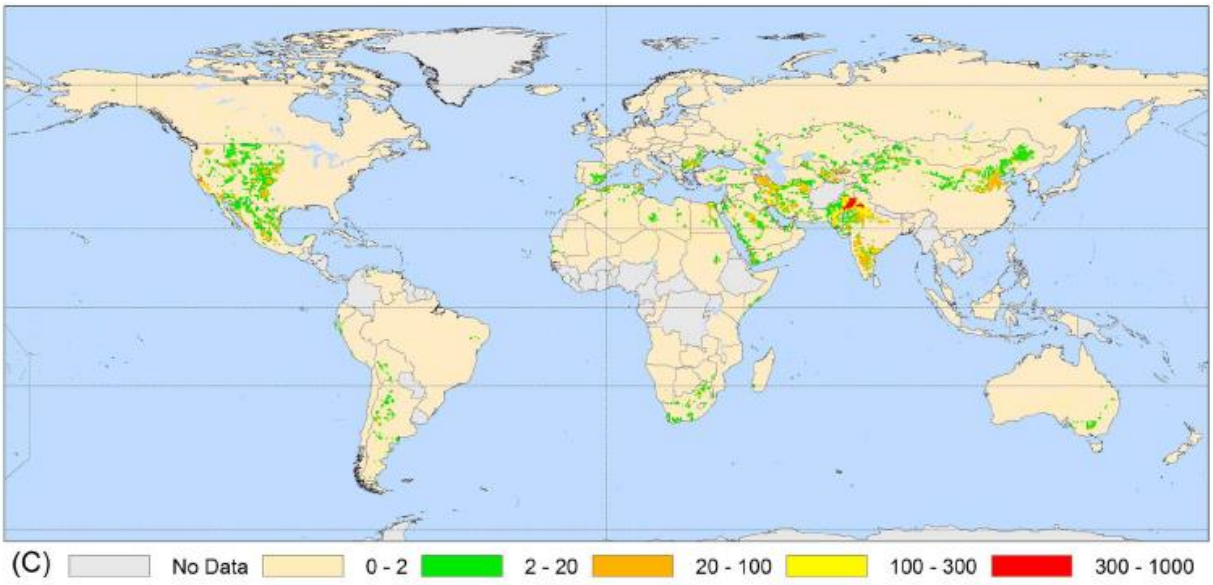

Figure 2. Global Map of Groundwater Depletion for the Year 2000
Note: This figure shows groundwater depletion for the year 2000 in sub-humid and arid areas, in units of millimeters per year. Groundwater extraction that exceeds natural recharge over large areas and long periods can lead to persistent groundwater depletion.
Source: Wada et al. 2010

Water Quality

While most water assessments emphasize water quantity, water quality is also critical for satisfying basic human and environmental needs. The quality of the world's water is under increasing threat due to population growth, expanding industrial and agricultural activities, and climate change. Poor water quality threatens human and ecosystem health, increases treatment costs, and reduces the availability of safe water for drinking and other uses (Palaniappan et al. 2010). It also limits economic productivity and development opportunities. Indeed, the United Nations finds that "water quality is a global concern as risks of degradation translate directly into social and economic impacts" (UN 2012).

Water quality concerns are widespread, although the true extent of the problem remains unknown. It is estimated, however, that in developing countries, 90% of sewage and 70% of industrial waste is discharged into waterways without any treatment at all (UN 2003b). Asian rivers are the most polluted in the world, and bacteria levels from human waste in these rivers are three times higher than the global average. Moreover, lead levels in these rivers are 20 times more than rivers in industrialized countries (UNESCO 2005).

Drinking Water and Sanitation Access

The failure to provide safe drinking water and adequate sanitation services to all people is perhaps the greatest development failure of the 20th century. In an attempt to remedy this failure, the United Nations established the Millennium Development Goals (MDGs), eight targets designed to tackle extreme poverty by the year 2015. At the direction of United Nations member countries, UN organizations and multilateral and bilateral development agencies have worked to achieve these goals by 2015. While many of the MDGs are widely acknowledged to be associated with water, including those related to improving gender equality and reducing child mortality, target 7C specifically aims to reduce by half the proportion of the population without sustainable access to safe drinking water and basic sanitation by 2015. Although not without their critics, the MDGs have served to highlight the importance of water, sanitation, and hygiene for improving health and economic opportunities (UN 2012).

Significant progress has been made in improving access to drinking water. In 1990, 76% of the global population had access to an improved drinking water source, whereas by 2010, this number had grown to 89% (WHO and UNICEF 2012). The global population, as a whole, is on track to meet the MDG drinking water target; however global aggregates hide large regional disparities. For example, while India and China have made significant progress, sub-Saharan Africa, where only 61% of the population has access to an "improved water source," is unlikely to achieve the MDG drinking water target (Figure 3). Additionally, coverage in the least developed countries is worse than in other developing countries. Finally, even within countries, there are disparities between urban and rural communities and between the rich and the poor (WHO and UNICEF 2012).

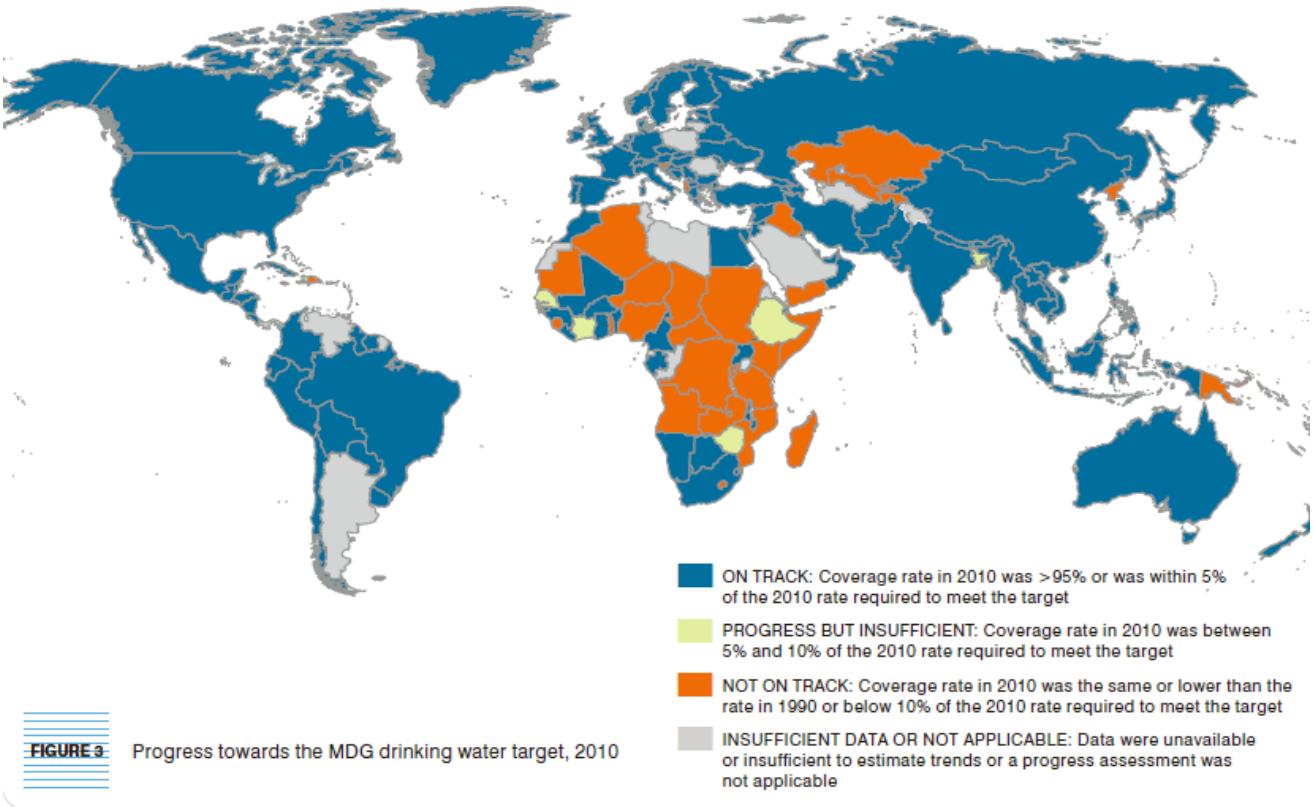

Figure 3. Progress Toward Achieving the MDG Drinking Water Target, 2010
Source: WHO and UNICEF 2012

Therefore, even with this progress, access to an improved drinking water source remains out of reach for many people. An estimated 780 million people do not have access to basic water service (WHO and UNICEF 2012). Additionally, the MDG drinking water target is based on access to an "improved supply" of water with little or no consideration of affordability or whether the quality of the water is actually safe for consumption. For example, naturally occurring arsenic pollution in groundwater affects nearly 140 million people in 70 countries on all continents (UN 2009). In Bangladesh alone, nearly 70 million people are exposed to groundwater contaminated with arsenic beyond World Health Organization recommended limits (UN 2009).

Less progress has been made in achieving the MDG sanitation targets. In 1990, nearly half of the global population had access to improved sanitation. By 2010, the percent of people with access to improved sanitation increased to 63%. An estimated 2.5 billion people still lack access to improved sanitation (WHO and UNICEF 2012). The global population is not on track to meet the sanitation target, and coverage is especially low in sub-Saharan Africa and in southern Asia.

Water and Ecosystems

Freshwater ecosystems are among the most extensively altered systems on Earth. Rivers, streams, and lakes have been subjected to chemical, physical, and biological alteration as a result of large-scale water diversions, introduction of invasive species, overharvesting, pollution, and climate change (Carpenter et al. 2011). An estimated 20–35% of freshwater fish are vulnerable or endangered, mostly because of

habitat alteration, although pollution, invasive species, and overharvesting are also to blame (Cosgrove and Rijsberman 2000). About half of the world's wetlands have been lost since 1900, and much of the remaining wetlands are degraded (Zedler and Kercher 2005). Freshwater ecosystem conditions are likely to continue to decline unless action is taken to address acute threats and better manage freshwater resources.

Globalization and Virtual Water Flows

Globalization is characterized by the production and movement of goods and services around the world, and water is a key ingredient either directly or indirectly in almost every good produced. Consequently, the movement of goods effectively results in the movement of water around the world. Existing patterns of trade, however, are not necessarily water-efficient. Many factors are at play when global trade decisions are made, and water is rarely one of them. The concept of "virtual water" – which measures the amount of water embedded in the production of food and other products – has been introduced as a way to evaluate the role of trade in distributing water resources. By allowing those living in water-scarce regions to meet some of their water needs through the import of water-intensive goods, some have argued that international trade can provide a mechanism to improve global water-use efficiency (Allan 1993). Others, however, have posited that it simply externalizes the environmental burden of producing a particular product. In any case, the facts suggest that countries' relative water endowments are not dictating global trade patterns. Indeed, three of the world's top ten food exporters are considered water scarce, and three of the top ten food importers are water rich (World Economic Forum Water Initiative 2011). Furthermore, globalization increases dependency on others for essential goods and increases vulnerability to external water scarcity (Hoekstra and Mekonnen 2012).

Climate Change

Rising greenhouse gas concentrations from human activities are causing large-scale changes to the Earth's climate. These climatic changes will have major implications for global water resources (Box 1). As temperatures rise, the flows of water in the hydrologic cycle will accelerate. In short, climate change will intensify the water cycle, altering water availability, timing, quality, and demand. Indeed, all of the major international and national assessments of climate changes have concluded that freshwater systems are among the most vulnerable, presenting risk for all sectors of society (Compagnucci et al. 2001, SEG 2007, Kundzewicz et al. 2007, Bates et al. 2008). An IPCC technical report on freshwater resources released in 2008 concludes "water and its availability and quality will be the main pressures on, and issues for, societies and the environment under climate change" (Bates et al. 2008).

A community's vulnerability to climate change will depend upon the magnitude of the impact, the sensitivity, and adaptive capacity. As noted by Frederick and Gleick (1999), "the socioeconomic impacts of floods, droughts, and climate and non-climate factors affecting the supply and demand for water will depend in large part on how society adapts." The poor and those living in developing countries are the most vulnerable because they have fewer social, technological, and financial resources to adapt (UNFCC 2007).

Box 1: Climate Change in Austalia's Murray Darling Basin

The Murray Darling Basin is an important agricultural area that is highly vulnerable to climate change. The basin is the country's main agricultural region, producing almost 40% of the nation's food supply (Hafi et al. 2009). Agriculture is mostly supported by infrastructure constituting the Snowy Mountain Scheme, where 16 major dams, 145 km of tunnels, 80 km of aqueducts, and 7 major power stations divert 50% of the basin's water for consumptive use (Quiggin et al. 2010, Cooley et al. 2009). The scheme was intended to make the region more water secure. Australia's Chief Hydrologist, however, has argued that the project may have actually increased the vulnerability of the basin's farmers to water scarcity by creating an artificially inexpensive source of a perceived secure water supply (Cooley et al. 2009). The region is already prone to extreme climate variability, and climate change is expected to reduce rainfall and increase evaporation rates (Quiggin et al. 2010). Australia's Bureau of Meteorology now projects that within two-to-three decades, drought will occur twice as frequently and be twice as severe (Schneider 2009).

In 2007, in the midst of another long drought, Australia reformed its water management system through the 2007 Water Act. The Act established the Murray-Darling Basin Authority (MDBA) and required the development of a basin plan. The Act allows the MDBA to set limits on human consumptive water use after necessary environmental flows have been met. Specifically, the act requires the MDBA to take social and economic factors into account when developing the Basin Plan; however, the Act gives primacy to consideration of "international agreements," including several environmental treaties, including the Ramsar Convention on Wetlands and the Convention of Biological Diversity. The MDBA estimated that current diversions would need to be reduced by 22% to 29% in order to meet the requirements of the Act, an estimate that has sparked outrage in the farming community (Kildea and Williams 2011).

Water-Energy-Food Nexus

Throughout the 20th century, the close connections between water, energy, and food were largely unknown or ignored in policy decision-making. Water, energy, and food systems, and the governance institutions set up to manage them, were often separated by well-defined silos, and managers rarely communicated with one another. Water systems were often designed and constructed with the assumption that energy would be cheap and abundant and vice versa. Likewise, food systems have been operated as though both water and energy scarcity or costs would not constrain production. We now understand this is no longer true: these critical resources are closely interconnected and a growing interest in the water-energy-food nexus highlights the need to better understand and manage these interdependencies.

- Agriculture is a major user of water, accounting for 70% of all freshwater withdrawals. Agriculture is also a major user of energy, and food prices are sensitive to energy prices due to the use of fertilizers, pesticides, and transportation to distribute products. Meeting the food and fiber demands for a growing population that is simultaneously shifting toward a more water-intensive diet will require a rethinking of how water is used.

- Energy is a major user of water. In the United States, for example, thermo-

electric power plants account for nearly 50% of all freshwater withdrawals (Kenny et al. 2009). Newly proposed energy sources, such as biofuels, are placing additional strains on local water resources and global food systems.

- Large amounts of energy are required to capture, treat, distribute, and use water. Population growth and climate change are prompting some to consider importing water over longer distances, accessing or developing more marginal, lower quality supplies that require extensive treatment.

Failure to consider these linkages in policy and decision making can lead to unintended consequences. Biofuels, for example, have emerged as an alternative to traditional, fossil-fuel-based energy sources, and many governments have instituted mandates and incentives to promote their development. The European Union has committed to converting 10% of their transportation fuel to biofuels by 2020 (UN 2012). In 2009/2010, nearly 40% of domestic corn use in the United States was for fuel (USDA 2010). However, first-generation biofuels, which represent the vast majority of biofuels produced today, are water- and chemical-intensive, and their development increases pollution of and competition for limited water resources. Additionally, biofuels compete with food crops for land and water resources, contributing to increased food prices and threats to food security. The impacts of increasing biofuel production makes clear that national decision-making is linked to global agricultural output, food prices, and water availability.

3 The Emergence of Global Water Governance

Over the last sixty years, a number of efforts have sought to address the many freshwater-related challenges humanity faces. Early efforts to address these challenges were almost entirely based on developing large-scale, physical infrastructure, such as dams and reservoirs, to produce new water supplies. Amid a growing recognition that technology and infrastructure alone were not sufficient to address persistent water management concerns, discourse about water governance began to emerge, in particular at the Dublin Conference in the early 1990s (Rogers and Hall 2003). Shortly thereafter, at the Second World Water Forum in The Hague in 2000, water governance was identified as one of the highest priorities for action. And in its first Water Development Report, the United Nations strongly stated that the "water crisis is essentially a crisis of governance and societies are facing a number of social, economic and political challenges on how to govern water more effectively" (UN 2003a).

Notions of water governance (and of governance in general) have evolved over time. Early thinking about water governance was based on highly centralized systems that emphasized the role of governments in water management. Today, the term "water governance" is used more broadly to describe "the range of political, social, economic and administrative systems that are in place to develop and manage water resources, and the delivery of water services, at different levels of society" (UN 2003a). More specifically, water governance refers to formal and informal processes that allow for the determination and negotiation of objectives, setting of standards, and resolution of disputes among disparate voices in order to address challenges and meet objectives at local, sub-national, and national levels (Roy 2011).

Throughout the 20th century, water governance efforts emphasized the local and/or regional scales, in part because water challenges were largely perceived as local issues. However, there is growing recognition that the scope and complexity of water-related challenges extend beyond national and regional boundaries and therefore cannot be adequately addressed solely by national or regional policies. In particular, widespread water scarcity and lack of access to water supply and sanitation threaten socio-economic development and national security for countries around the world. Additionally, people around the world share and exchange water directly and indirectly through natural hydrological units and systems and through global trade, i.e., virtual water. Furthermore, climate change and the growing presence of multinational companies within the water sector play a role in globalizing water issues (Hoekstra 2006).

Despite the need, discussions about global water governance (GWG) have been limited. Water governance studies that have taken a broader perspective have largely focused on transboundary water resources (see Schmeier 2010). GWG has also been discussed within other more prominent global governance challenges (notably climate change and energy) and within discussions of global development objectives

(Florini and Sovacool 2011, Jones et al. 2009, and Tropp 2007). However, there has been little-to-no discussion about GWG that looks more holistically at global water challenges and the structures and approaches needed to meet these challenges.

One of the few definitions of GWG comes from a 2008 study that defines it as "the development and implementation of norms, principles, rules, incentives, informative tools, and infrastructure to promote a change in the behavior of actors at the global level in the area of water governance" (Pahl-Wost et al. 2008). Thus, GWG focuses on the processes of international cooperation and multilateralism. It comprises formal and informal instruments – including global governmental and non-governmental organizations, regimes, actors, frameworks, and agreements – created to balance interests and meet global water challenges that span national and regional boundaries. GWG informs how challenges are being tackled (or not) at the regional and international levels among various players (from governmental bodies to civil society organizations) and suggests opportunities and barriers to meeting global objectives. GWG also facilitates interaction and dialogue among key players to inform the development of solutions to problems at local, national, and regional levels to ease global pressures.

Elements of Global Water Governance: The What, Who, and How

The previous section of this report introduced global water governance. In this section, we provide additional detail on several key elements of GWG. Specifically, we identify the conceptual frameworks and policy priorities established by GWG to address major water-related challenges, e.g., the "what" of GWG. We then describe the organizations and organizational networks that conceive of and/or implement those conceptual frameworks and priorities, e.g., the "who" of GWG. Finally, we briefly identify some of the pathways and modalities through which these organizations and organizational networks operate, e.g., the "how" of GWG.

The What: Conceptual Frameworks and Policy Priorities

Conceptual frameworks and policy priorities refer to efforts or approaches developed to address major water-related challenges. These frameworks have evolved over time and will continue to do so as our understanding of the water cycle evolves, new issues emerge, and societal priorities change (Figure 4). For example, early water management efforts were largely focused on the construction of large-scale, centralized infrastructure, notably dams and river diversions. This approach, referred to as the "hard" path, produced enormous benefits, such as clean water supplies, irrigation, and improved human health (Gleick 2003). By the late 1970s, however, the colossal social and environmental impacts of dams became clear and dam construction began to slow.

Beginning in the 1980s, new approaches emphasizing improved management began to emerge. In 1992, water sector exports met at the International Conference on Water and the Environment at Dublin and developed the "Dublin Principles," which deemphasized "infrastructure development" and focused instead on improved management (Muller 2010). This shift eventually led to the emergence of Integrated Water Resources Management (IWRM), defined as the coordinated development and management of water, land, and related resources in order to maximize economic and social welfare without compromising the sustainability of vital environmental systems. IWRM as a conceptual framework remains prevalent today, although effective implementation continues to be its main challenge.

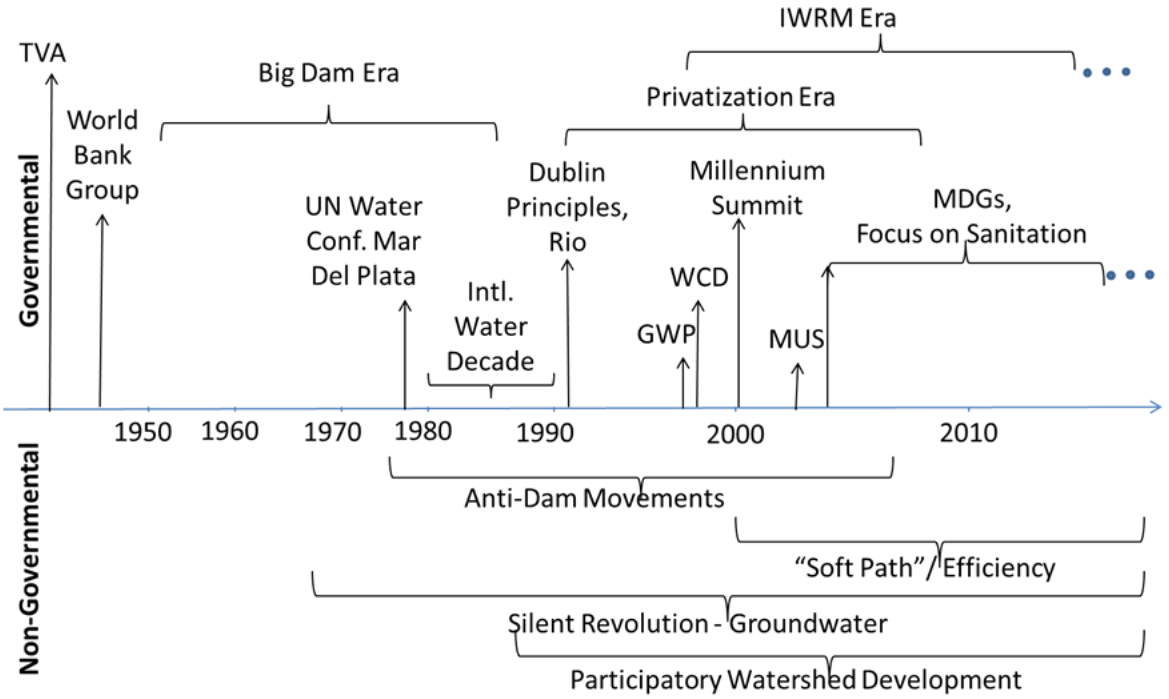

Figure 4. Timeline Highlighting Key Conceptual Frameworks for Water Resource Development and Management

Summits and forums have played an important role in establishing the global conceptual frameworks and policy priorities highlighted above (see the Appendix for a list of major water-related conferences and events). In particular, they include UN-convened meetings around sustainable development, such as the UN Conference on the Environment and Development in 1992, the UN Summit of 2000, and the most recent Rio+20 Summit in 2012. These meetings provide direction on the water challenges and issues that need to be addressed by the global community, such as the major push to meet MDGs for access to water and sanitation; a new emphasis on good governance in the water sector; understanding the importance and implications of water and other sustainable development efforts (such as in energy, education, health); and the relationship between climate change and water. Concurrently, other government forums such as the G8 Ministerial meetings develop action plans (in particular, the 2003 G8 Water Action Plan) that commit the world's major economies to facilitate the pathways (e.g., commitments to financing, capacity building, etc.) to address these challenges. Besides these state-led processes, other forums, such as the World Water Forums and World Water Week, also provide an arena for the global community to exchange information, identify challenges, and offer possible solutions toward meeting global objectives.

The Who: Global Water Governance Organizations and Organizational Networks

A variety of organizations are engaged in GWG. Early efforts of such organizations within the water sector were largely focused on professional meetings, some of which resulted in the formation of professional societies "to construct common intellectual spaces, share expertise, and stimulate and promote research" (Varady et al. 2009). By the mid-1950s, engineers, water managers, and scientists organized themselves into "respected, well-subscribed" professional

societies, some of which remain active today (Varady et al. 2009). Shortly thereafter, and in the wake of the Second World Water Forum, intergovernmental organizations' focus on water began to take root, the first of which was the International Hydrological Programme (IHP). Over the past two decades, formal organizations with a global focus have proliferated and now include a much broader mix of actors, including professional societies, intergovernmental organizations, donor agencies, private-sector groups, NGOs, and research institutes (Table 1). These groups perform a wide variety of functions, such as conducting basic and applied research, monitoring and evaluation, generating ideas and concepts, and transferring knowledge and information.

Organizational networks are playing an increasingly important role in global water governance. For example, Global Action Networks (GANs) are multi-stakeholder networks organized around a specific issue. These networks share several characteristics; in particular, they operate globally, involve robust cross-sector engagement, focus on action and learning, and leverage the flexibility afforded by their network structure to create social value (Centre on Asia and Globalisation 2008). For example, the Water Footprint Network is a multi-stakeholder action network comprised of government agencies, UN bodies, private sector actors, academia, and civil society groups that is leading efforts to use water footprint assessments to address major issues associated with globalization and virtual water flows.1 Its genesis as a multi-stakeholder initiative has enabled it to innovate, draw on, and develop guidelines and tools that enable a better understanding of the challenge and thus to formulate a response through partnerships with governments and the private sector. Likewise, the Alliance for Water Stewardship (AWS) is developing a global water stewardship standard formulated through a multi-stakeholder process. Like the Forest Stewardship Council, AWS is a global action network that draws its legitimacy from its multi-stakeholder structure, enables action and learning, and creates social value. Other networks playing a more prominent role in global water governance include Blue Planet Network, UN CEO Water Mandate, and Freshwater Action Network.

The How: Global Water Governance Pathways

Global water governance organizations and networks operate through several pathways to develop and implement strategies. It is through these action pathways that local and national water governance systems and players are empowered and engaged in problem solving and can support on-the-ground implementation efforts. These pathways and tools can change as new global water priorities emerge, communities and global players evolve, and new technologies and practices come to the fore. The following are some of the key pathways that have been historically pursued (to varying degrees of success) to address global water challenges:

- establishing international water agreements and laws;
- financing water resource management and service delivery efforts;
- establishing and socializing minimum and best practices for water resource development and management;
- facilitating technology and knowledge transfer and conducting education and outreach programs; and
- collecting, monitoring, and evaluating water-related data.

[1] A water footprint is "spatially and temporally explicit indicator of direct and indirect water use of consumers and producer" (Water Footprint Network, 2012).

Table 1. Selection of Global Water Organizations and Organizational Networks

International Professional Societies	
• International Association of Hydrological Sciences (IAHS) • International Association for Hydraulic Research (IAHR) • International Water Resources Association (IWRA) • International Water Association (IWA)	• International Water History Association • International Commission on Irrigation and Drainage • International Hydropower Association (IHA) • Water Environment Federation (WEF)
Intergovernmental Organizations	
• UNESCO • United Nations Development Programme (UNDP) • Consultative Group on International Agricultural Research (CGIAR) • International Hydrological Programme • World Health Organization (WHO) • United Nations Children's Fund (UNICEF)	• World Meteorological Organization (WMO) – Hydrology and Water Resources Programme • World Water Assessment Programme • UN-Water • United Nations Environment Programme (UNEP)
Global Data and Research Organizations	
• GEMS/Water Programme • Global Energy and Water Cycle Experiment • Group on Earth Observations (GEO) • Global Water System Project (GWSP)	• Flow Regimes from International Experimental and Network Data (FRIEND) • Global Applied Research Network
Donor Agencies	
• World Bank • Asian Development Bank • African Development Bank	• Global Environment Facility • Inter-American Development Bank • Private philanthropic foundations
Non-Governmental Organizations	
• WaterAid • International Water Management Institute • IRC International Water and Sanitation Centre • Stockholm Environment Institute • Stockholm International Water Institute • World Water Council	• Global Water • Water for People • Oxfam • Food and Water Watch • International River Network • Pacific Institute
Global Action Networks	
• Global Water Partnership • Water Footprint Network • Water Integrity Network • Freshwater Action Network	• UN CEO Water Mandate • Alliance for Water Stewardship • Blue Planet Network

Note: The organizations and organizational networks included here are intended to provide an indication of the range of groups working on global water issues. This list is not meant to include all organizations working within this sector.

4 Evaluating the Effectiveness of Global Water Governance Today

Our current GWG system was established when approaches to water resource development and management were different than those encountered today (Jury and Vaux 2007). Persistent and emerging water challenges suggest that an assessment is needed to determine how GWG efforts can be improved to more effectively address 21st century water challenges and to leverage opportunities afforded by new thinking and innovative technologies. We describe below some key GWG deficiencies and provide recommendations on how GWG can be improved to better address major freshwater concerns.

Intergovernmental Organizations Lack Clear Leadership and Coordination

A large number of organizations exist to address water challenges in various scales – particularly the United Nations system, multilateral lending institutions, and regional basin organizations – all working on different aspects of water management and service delivery. While global summits and forums have helped identify major challenges and issue areas, implementing coherent action is hampered by differing agendas among organizations and agencies that overlap in some areas but not others.

At the international level, leadership and coordinated action within the water sector could emerge from the United Nations system of agencies and programmes. UN-Water was created in 2003 to serve as the inter-agency coordinating mechanism to promote coherence and coordination of UN system actions and other non-traditional partners and stakeholders (e.g., public and private sectors and civil society) related to the implementation of the international agenda defined by the Millennium Declaration and the World Summit on Sustainable Development. UN-Water, however, has several deficiencies. In particular, it "does not have a strong mandate" nor does it make centralized policies (Pahl-Wost et al. 2008). UN-Water also has its own focus areas (water and climate change, water quality, water supply and sanitation, and transboundary water), which fails to address the full range of water-related challenges. Additionally, inadequate resources, especially personnel and funding, have hampered UN-Water's ability to foster collaboration among the large number of agencies and programmes that focus on different water-related issues and challenges (e.g., UNESCO, UNEP, UNICEF, UNDP, and the Food and Agriculture Organization).

The lack of clear leadership manifests itself in several ways. In particular, bilateral funding agencies are more likely to focus their efforts on their own priorities. For example, the German development agency, GIZ, has spent considerable resources on addressing the food-water-energy nexus, climate change, and access to water and sanitation. The US Agency for International Development (USAID), on the other hand, is focused on biodiversity, food security, climate change, and water access and sanitation. While all of these efforts are aligned with global

priorities, lack of coordination can hinder their effectiveness.

Recommendation: Secure a sustainable funding source and a stronger mandate for coordinating intergovernmental organizations.

The global nature of water-related challenges requires clear leadership and coordination. Intergovernmental agreements fostered at world summits and forums require capable intergovernmental organizations to play the leading role in coordinating effective action. The United Nations system, as the sole global governance organization with the legitimacy and authority of member governments, must lead. UN-Water offers a potential starting point, given its existing mandate to coordinate action. To fulfill its mission however, it (or any other intergovernmental mechanism established to coordinate action) must be given the resources and an empowered mandate to do so. This requires governments to fulfill pledges made at previous UN summits (such as the 2002 Johannesburg Summit) to ensure financial resources are made available. It also requires political will from the UN to provide a stronger mandate for the organization and the ability to overcome traditional interagency rivalry that hampers cooperation.

Recommendation: **Promote greater collaboration to build understanding and coordinate action.**

To effectively address the interlinked nature of the problems, it is imperative that water-related action not be led from within a silo but rather by a deep understanding of the cross-sector issues, e.g., taking into consideration development, energy, biodiversity, food security, etc. Building this understanding requires close, continuous collaboration among the different organizations and individuals involved. UN-Water's 2013 theme of International Cooperation is a positive step in that direction. Government-led efforts to encourage participation by actors through multi-stakeholder processes (such as the parallel meetings at Rio+20) are key to promoting this collaboration. Likewise, the UN's current approach to developing the Sustainable Development Goals is also encouraging (Box 2). By instituting a process that brings together development agencies, civil society groups, and the private sector to define water-related goals and potential actions, the process promotes better understanding that can lead to more coordinated action.

Box 2: Moving from MDGs to SDGs

The UN Millennium Development Goals (MDGs), adopted in 2000 at the Millennium Summit, set key development targets to be met by the year 2015. The MDGs include targets for eradicating poverty and hunger, achieving universal primary education, promoting gender equality and empowering women, reducing child and maternal mortality, combating HIV/AIDS and other diseases, ensuring environmental sustainability, and forming a global partnership for development. Many countries are on track to achieve a significant number of the goals, effecting a transformation in the quality of life of hundreds of millions of people. The MDG framework has been enormously successful in uniting donor attention and allowing the development community to join forces in meeting major global challenges. It has helped to set global and local development priorities and to focus action at all levels of society. Furthermore, it has shifted policy attention beyond economic development to include social and environmental well-being. Implementation and achievement of MDGs demonstrated that uniting the global community behind a list of concrete targets could galvanize action and lead to dramatic impacts.

Yet, studies show that progress toward meeting the MDGs has been mixed, and more work is needed. Progress has been non-uniform geographically and stronger on some targets than others. Countries in Asia, for example, have consistently performed better in meeting the MDG targets, while sub-Saharan Africa lags behind. Similarly, strong progress has been made in terms of poverty reduction, access to education, decreasing gender disparities, and providing access to improved water sources, while the targets on hunger, maternal health, and sanitation are unlikely to be met. Additionally, there have been significant disparities between the rich and poor and between rural and urban populations (ODI 2010).

Some of the challenges in achieving the MDGs reflect the global water governance failures identified in this report. In particular, funding was inadequate and too narrowly focused on capital investments; little funding was available to support ongoing operation and maintenance costs. Decisions on what and how to build were often developed in a top-down manner without adequate community input. Additionally, efforts were often not coordinated across sectors.

As the 2015 deadline for the MDGs approaches, development experts are already in the process of developing the next set of goals. One of the main outcomes of the Rio+20 Conference was the agreement by member States to initiate a process to develop a set of Sustainable Development Goals (SDGs), which will build upon the Millennium Development Goals and converge with the post-2015 development agenda. In particular, it was decided to establish an "inclusive and transparent intergovernmental process open to all stakeholders, with a view to developing global sustainable development goals to be agreed by the General Assembly."

Box 2 continues on the next page

Box 2: Moving from MDGs to SDGs (continued)

The wording of the proposed SDGs is still evolving, but there is an opportunity to influence their scope. Here, we provide several recommendations for the SDGs.

- **Firm support and commitment from the global community is needed.** Effective engagement of the global community is essential to facilitate implementation and provide a sustainable and stable funding source. This should be addressed during the development of SDGs.

- **The sustainable development targets should be flexible and adaptive.** In order for the goals and targets to be implemented effectively, they need to be flexible enough to be tailored for the local, national, and regional needs and priorities. The SDGs, however, must also remain aspirational and be based on aggressive targets.

- **The SDGs implementation plan must include ongoing monitoring of progress toward achieving defined outcomes.** The development of SDGs should include a comprehensive process to develop clear and consistent methodology to closely monitor and measure success at all socio-economical levels and for each geographic region.

- **SDGs should promote knowledge, data, and technology sharing.** Building local knowledge, experience, and skill can empower communities and lead to more effective technology transfer that is inspired by local solutions and involvement. Timely access to data and analysis could also stop exploitation of local natural resources and promote sustainable growth and development.

- **Civil society groups at every level need to be engaged and included in the process.** In order to facilitate effective communication and coordination across scales, empower poor and disadvantaged communities, and effectively monitor progress, SDGs should be inclusive and based on broad stakeholder engagement from a geographically and economically diverse group.

Role of Non-governmental Processes is Unclear

Today, a study of global governance cannot be limited to merely governmental or intergovernmental processes. The rise and influence of a broad range of new actors, with their own sources of authority and power, are indicative of a more complicated global governance structure. These actors, who come from the private, non-governmental, academic, and media sectors, act independently or increasingly in networks to bring about new thinking and solutions. Although these new global governance actors have fostered innovation, they also raise concerns, particularly around their legitimacy, accountability, and relationship with existing public governance structures. There are concerns that some of these new initiatives may be undermining government-led efforts, operating outside of local priorities, or, in the case of some privately led initiatives, engaging in policy capture. Their centers of authority or for whom they speak have also been a subject of debate. Although it is clear that these actors will continue to play an important role in global water governance, considerations will need to be made to understand what their role should be vis-à-vis government-led efforts.

Recommendation: **Explore and develop guidelines and principles to help govern non-governmental processes.**

The rise of non-governmental processes requires clear guidance as to how these new processes should interact with existing government-led processes. Realizing that these processes can potentially undermine one another, some organizations, such as the UN CEO Water Mandate, have developed guidelines and principles to govern how the private sector engages in water policy (see, for example, the *Guide to Responsible Business Engagement with Water Policy*). More efforts like these are needed to ensure that civil society and private sector efforts and initiatives complement existing government-led processes.

Some potential overarching principles developed for sustainability standards systems (many of which are Global Action Networks) that could serve as starting points for further exploration include the following (Ward and Ha 2012):

- **Respect** the unique roles of governments and states.
- **Engage** public sector actors.
- **Support** sharing of information and resources with public sector actors.
- **Build on** existing public sector and international norms.
- **Assess and review** the range of public sector implications and relationships.

As more actors become involved, additional effort will be needed to better understand and define the roles and responsibilities of the actors in order to leverage each actor's unique capabilities.

Lack of Transparency and Accountability Limits the Effectiveness of Water Sector Investments and Fosters Corruption

The water sector lacks transparency and adequate participation from key stakeholders, especially marginalized communities, that then leads to an accountability deficit and can result in ineffective or inefficient management strategies and investments. A 2008 report by the Water Integrity Network and Transparency International finds that a lack of transparency and participation also leads to rampant corruption across the water sector, including in water management, drinking water and sanitation service provision, irrigation, and hydropower development. The water sector is especially prone to corruption due to the complex system of agencies responsible for its management and delivery; the growing presence of private actors and informal providers that operate in legal grey zones (where the actors are the de facto water service providers allowed to operate by governments but who may not have official license); and the large sums of money required for infrastructure investments. Addressing the issue is especially challenging because of the general focus within the sector on technological solutions rather than governance. The report further finds that the poor and most vulnerable are the most likely victims because they are more exposed to the informal sector (where corruption is more prevalent) and have limited resources and avenues to voice their concerns. This, in turn, exacerbates corruption because those most affected by it are unable to call for greater accountability (WIN 2008).

Recommendation: **Adopt new standards, codes, and best practices for water resource development and management to promote greater transparency and participation.**

Water resource development and management are guided by a series of standards, codes, and best practices. These standards, codes, and practices, which include both mandatory and voluntary initiatives, must provide the regulatory framework that brings about greater transparency, promotes participation and oversight to tackle corrupt practices, and develops best practice guidance where regulatory frameworks are weak or poorly implemented. Both governments and Global Action Networks (GANs) can play a key role in their formulation. For example, Kenya has adopted a human-rights-based approach to the water sector that places an emphasis on transparency and participation. Likewise, the UN CEO Water Mandate released its *Corporate Disclosure Guidelines: Public Exposure Draft* in an effort to promote greater transparency in the private sector's water use and allow stakeholders to better evaluate this use. These efforts are encouraging; however, more can and should be done.

Recommendation: **Promote capacity building and increase participation in water management.**

To bring about greater participation and better implementation of frameworks that promote transparency, serious effort is needed to build the capacity of government officials and civil society groups, especially community-based organizations. Governments and GANs can provide technical know-how and financial resources to ensure that local government officials and community-based organizations, two groups with an intimate knowledge of local problems, can be key advocates for change. For example, the Freshwater Action Network focuses much of its efforts on providing capacity building to its civil society members in order for them to engage in decision-making processes, call for greater transparency, and hold government and private sector actors accountable.

Recommendation: **Empower communities through long-term and short-term education and outreach efforts.**

Education and outreach promotes greater understanding about a particular issue and can help promote change by redefining acceptable behaviors and social norms. Knowledge is power; hence it can empower communities, especially the poor and most vulnerable, to demand change and accountability. While education and outreach efforts often occur at the local level, global efforts can provide educational tools, platforms, and strategies on how to plan effective educational programs. For example, UNESCO's Institute for Water Education (IWE), established in the Netherlands in 2003, was developed to educate and train professionals and build the capacity of sector organizations, knowledge centers, and other institutions in developing countries and countries in transition. These efforts are needed at every scale. Household- and community-scale efforts can promote behavioral changes and can facilitate grassroots support and demand for better regulations and enforcement and bring about transparency and accountability. Education and capacity building at larger scales can promote effective watershed, national, and international interventions to develop better standards, regulation, and enforcement.

Failure to Adopt Broad-Based Agreement on Transboundary Watercourses

Many rivers, lakes, and groundwater aquifers are shared by two or more nations and most of the available freshwater of the Earth crosses political borders, ensuring that politics inevitably intrude on water policy. Indeed, international river basins cover about half of the earth's land surface, and

about 40% of the world's population relies on these shared water sources. Since transboundary watersheds traverse political and jurisdictional lines, heterogeneous and sometimes conflicting national laws and regulatory frameworks make management a major challenge, particularly when no single national government has authority over another. As such, transboundary water management often requires the creation of international guidelines or specific agreements between riparian states.

While the value of transboundary watershed treaties has regularly been demonstrated, there are political and financial constraints that make their adoption difficult in many parts of the world. In 1997, the UN General Assembly adopted the Convention on the Law of the Non-navigational Uses of International Watercourses. This UN Convention sets forth principles for equitable and reasonable utilization of international watercourses and for equitable participation. More than a decade after its adoption by the vast majority of the General Assembly of the United Nations, however, the Convention has not yet obtained the necessary number of signatures to enable it to enter into force and effect. As of January 2013, 29 countries have ratified or acceded to the Convention; 35 signatures are needed for the Convention to enter into force.

Recommendation: **Bring the UN Convention on the Law of the Non-Navigational Uses of International Watercourses into force.**

As much as we hope that treaties will be developed in all transboundary watersheds to foster cooperation and collaboration among all riparian states, there are political and financial constraints that make this difficult in many areas of the world. Therefore, adopting an effective international legal framework is a critical step for addressing future challenges. The 1997 United Nations Convention on the Law of the Non-Navigational Uses of International Watercourses represents an important contribution to the strengthening of the rule of law regarding the protection and preservation of international watercourses and should be brought into force.

Existing Interbasin Agreements Lack Flexibility

Global climate change will pose a wide range of challenges to freshwater resources, altering water quantity, quality, system operations, and imposing new governance complications. For countries whose watersheds and river basins lie wholly within their own political boundaries, adapting to increasingly severe climatic variability and changes will be difficult enough. When those water resources cross borders and implicate multiple political entities and actors, sustainable management of shared water resources in a changing climate will be especially difficult and requires active coordination, engagement, and participation of all the actors sharing the basin. In particular, most transboundary water agreements are based on the assumption that future water supply and quality will not change. Moreover, most treaties and international agreements fail to include adequate mechanisms for addressing changing social, economic, or climate conditions (for an early analysis of this problem, see Goldenman 1990 and Gleick 2000).

Recommendation: **Improve flexibility of existing inter-basin agreements.**

No two water treaties are the same. Each is developed under unique circumstances, addresses different concerns, and has a particular set of constraints. Additionally, climate change will affect each basin differently. As a result, each treaty must be evaluated to determine what flexibility mechanisms currently exist and where significant vulnerabilities remain. This process should be started before a problem arises so as to improve the atmosphere for cooperation and negotiation. Additionally, transboundary watershed countries should consider

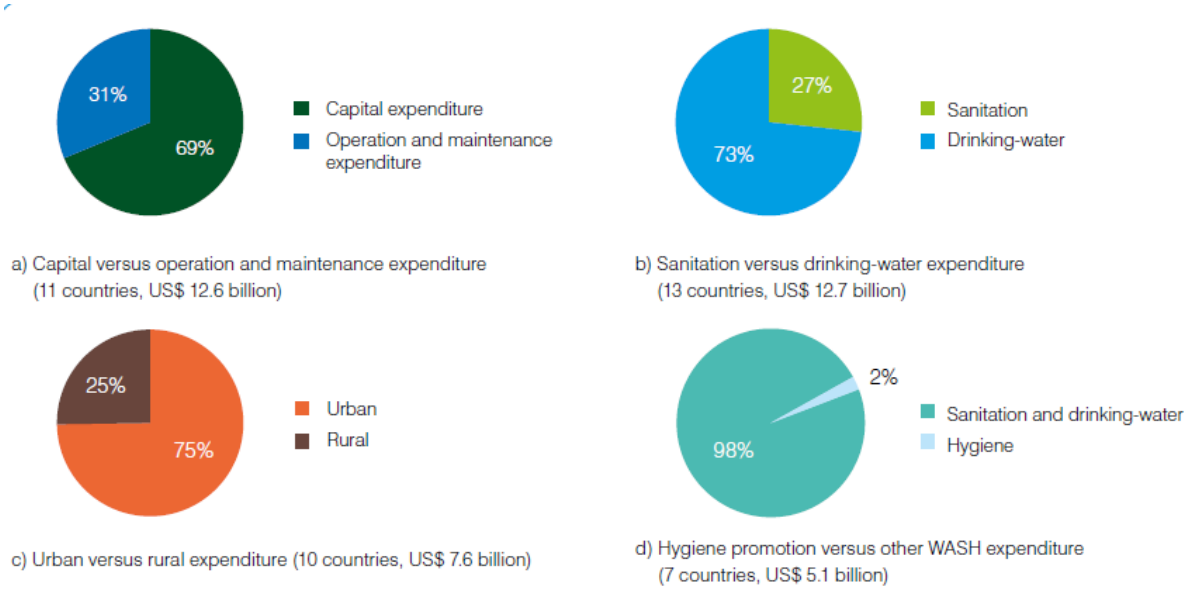

Figure 5. Breakdown of Water and Sanitation Delivery Expenditures Across Different Categories
Note: Estimates are based on a limited number of surveys and while suggestive of overall trends, should be viewed with caution.
Source: WHO 2012

incorporating provisions into existing treaties to allow for greater flexibility in the face of change, including: (1) creation of flexible allocation strategies and water quality criteria; (2) agreement on response strategies for extreme events, i.e., floods and drought; (3) development of clear amendment and review procedures to allow for changing hydrologic, social, or climatic conditions or in response to new scientific knowledge; and (4) establishment of joint management institutions that can, for example, facilitate a climate vulnerability and adaptation assessment (Cooley and Gleick 2011).

Water Sector Funding is Inadequate and Too Narrowly Focused

The international community, including the major economies and international organizations, has played a significant role in funding water-sector improvements, especially in developing countries. Yet, funding remains inadequate and too narrowly focused. Funding commitments made by major economies at the 2002 Johannesburg Summit and among the G8 countries have thus far not materialized. Additionally, a recent survey conducted by the World Health Organization (2012) finds that overall funding for the water sector is low – and is skewed toward capital expenditures for drinking water systems in urban areas (Figure 5). Expenditures for sanitation, operation and maintenance costs, and rural systems are much lower.

Recommendation: **Develop financing mechanisms to support ongoing operation and maintenance costs.**

Funding is needed to support ongoing operation and maintenance costs. Currently, insufficient funding is available for the operation and maintenance of the constructed infrastructure or to support the people and institutions needed to manage it effectively. As a result, systems are poorly managed or fall into disrepair, increasing the long-term costs. Additional funding is needed to support the ongoing operation and maintenance of new and existing water-related infrastructure.

New Funders Fail to Abide By Environmental and Social Lending Standards

For much of the 20th century, the World Bank, the Asian Development Bank, intergovernmental agencies, and bilateral donors were the main funders of large-scale infrastructure in the developing world. In recent years, new economic realities and players have emerged. Commercial banks and energy and construction companies in the global South are playing an increasingly important role and are fundamentally changing water resources management. For instance, McDonald et al. (2009) report that Chinese financial institutions, state-owned enterprises, and private firms were involved in at least 93 major dam projects overseas. These new players – predominantly energy and construction companies from Thailand, Vietnam, China, Russia, and Malaysia – have not adopted internationally accepted environmental and social lending standards and norms. Furthermore, these new funders have forced the World Bank and Asian Development Bank to reconfigure their own lending practices to further dilute their environmental and social safeguards (Molle et al. 2011).

Recommendation: **Establish new lending standards and compliance strategies**

Commercial banks and energy and construction companies play an increasingly important role in financing water resource development projects. In many cases, these new players do not meet even the World Bank's standards – already weaker than the recommendations by the World Commission on Dams (WCD). The failure to abide by social and environmental lending standards poses a threat to local environmental and social systems. New environmental and social lending standards are needed to ensure that lending promotes sustainable development objectives. The new players, along with civil society organizations, should be included in crafting and designing these new standards in order to ensure compliance.

Knowledge and Technology Transfer Efforts Remain Largely Top-Down

Over the past several decades, water-related knowledge and technological innovation have grown tremendously, with new techniques and ideas emerging from government bodies, independent research institutions, and academic bodies around the world. The challenge lies in getting this knowledge and technology to places that can implement them. Intergovernmental processes to foster technology and knowledge transfers – mainly through forums such as the Water Environment Federation's Technical Exhibition and Conference (WEFTEC) and the like – have predominantly been top-down in manner. There is growing recognition, however, that even innovative technologies that are thought to be highly effective may not be appropriate everywhere. Each technology is developed and crafted according to local circumstances, which can differ dramatically from one region to another. As a result, an off-the-shelf approach to technology and knowledge transfers may not lead to the desired outcome and/or may lead to unintended consequences. Implementation of Green Revolution concepts to industrialize agriculture in the Punjab region of India provides an example of a top-down, single-focus transfer of knowledge and technology that has led to several unintended consequences (Box 3). Today, the state of Punjab is trying to manage these problems by revisiting and reforming state agricultural policy and regulations using a more bottom-up technology and knowledge transfer approach (Tiwana et al. 2007).

Box 3: Groundwater Depletion in Punjab

Implementation of Green Revolution concepts to industrialize agriculture in the Punjab region provides an example of how top-down, single-focus transfer of knowledge and technology has led to several unintended consequences. The Punjab region experienced an intentional transformation in agricultural practices following the Green Revolution of the 1960s. Changes in cropping patterns, water use, and fertilizer use helped Punjab to become the country's "bread basket"; today, the region produces 20% of the country's wheat and 12% of the rice on only 1.5% of the land (Columbia Water Center n.d.). Part of this success can be attributed to government subsidies that provide free electricity to farmers in Punjab and heavily subsidized electricity in other parts of the country (Sarkar 2012). Between 1950 and 2000, the number of irrigation wells outfitted with diesel or electric pumps increased from 150,000 to nearly 19 million (Shah 2009). This new network of decentralized groundwater users and application of fertilizers, however, has resulted in falling water tables and reductions in groundwater quality (Shah 2009, Kumar et al. 2007).

Despite government attempts to regulate groundwater development, overexploitation of groundwater and excessive nutrient loading persist. Today, the Punjab region is one of the most groundwater stressed areas in India (Rodell 2009). The government continues to invest millions in developing and rehabilitating surface water canals and reservoirs, although farmers increasingly rely on privately owned groundwater pumps (Shah 2009, Sarkar 2012). Serious consideration of the energy-irrigation nexus is needed if the government wants to curb groundwater overdraft and pollution.

Recommendation: **Promote open-access knowledge transfer.**

Over the past few decades, there has been tremendous growth in the technologies available for transferring knowledge and information. Geospatial technologies, the Internet, and mobile devices are just a few of the technologies available to improve communication. Although the reliance on such technologies must be carefully considered given the global variations in their application and use, they can provide tremendous opportunity for new ways of connecting information to water users and connecting water stakeholders and researchers with one another and with decision makers. Global institutions can play an important role in facilitating the use and distribution of these new technologies. Extending access to new and emerging scientific findings can enable and empower the local research community to better understand and identify local problems and design or demand specific solutions to improve local water governance (Jury and Vaux 2005). There is also a need for better communication of complicated scientific knowledge to policy- and decision-makers in order to influence development of comprehensive management strategies and inform the policy-making process.

Recommendation: **Facilitate effective technology transfer by engaging local communities in the decision-making process.**

Empowering local communities to identify their water issues and solutions allows them to select an approach that more closely aligns with their social and cultural realities. On-site education and capacity building plays a major role in facilitating successful and effective bottom-up or horizontal technology and knowledge transfer. Especially in the regions with very limited access to and understanding of state-of-the-art technological solutions or institutional capacity to provide local technological learning, international institutions such as Institute for Water Education

(IWE) can facilitate capacity building and educational efforts to further implementation and operational learning of imported technologies. Also, continuous monitoring and performance assessment of a transferred technology can provide an opportunity to adjust and calibrate implementation and operational process to prevent undesirable outcomes. Global institutions can also facilitate focused R&D investment, especially by the developed world with financial resources, to advance technologies and make them more accessible to the developing world.

Recommendation: **Improve understanding and communication of risk and uncertainty.**

The uncertainty inherent in hydrologic and water resource management systems is unavoidable. Yet, the development of management practices and strategies rely heavily on future supply and demand predictions, which are fraught with uncertainty. Water resources managers around the world use various supply and demand predictions in their decision-making processes. A better understanding of the uncertainties and risks associated with them can lead to the development of more effective planning and management strategies that reflect these limitations. New decision-support tools should include an uncertainty assessment component, which would offer an array of decisions and the uncertainty and risk associated with them in order to provide an opportunity for adaptive and flexible management approaches. Effective communication of these uncertainties and risks to policy makers and the general public is also an important element of adaptive and flexible water resource management practice (UN 2012).

Data Collection Efforts are Inadequate

Good data and ongoing monitoring activities are the cornerstones of effective water management and governance. We now live in an information era, and vast amounts of water data are collected in different ways and at a variety of temporal and spatial scales, from local stream gages to global satellites. Current attempts at information sharing, such as UN-Water's Activity Information System, Documentation Center, and Key Water Indicator Portal, provide key data necessary to tackle the water challenges identified earlier. Despite these improvements, there are still regions lacking basic water data and information. Even when the data are collected, it is often not widely available or the quality of data is poor. Efforts are needed to improve the collection, compilation, and reporting of comprehensive water-related data.

Recommendation: **Develop a centralized, global water data portal.**

The rational management of water resources is predicated on the availability of comprehensive data. Capacity needs to be developed in all countries to collect, manage, and analyze water information. Where these resources are missing, they should be provided through international aid or other mechanisms. Also, as developing countries undergo economic transitions, monitoring and reporting need to be integrated into new laws. These efforts would benefit from a centralized, global water portal to assemble the reported data, especially when the local government lacks the financial or technological capacity to provide such services. Finally, international data protocols, standard data formats, and sharing arrangements are needed in order to increase comparability of data worldwide.

Recommendation: **Leverage new data collection technologies.**

New local data collection and monitoring efforts are emerging that engage stakeholders through "crowd-sourcing" or reporting information through electronic devices. Mobile connectivity is outpacing fixed landline phones and access to computers, especially in many developing countries that lack telephone network infrastructures. New monitoring efforts that use cellphones and other RSS technologies, e.g., WASH SMS, capitalize on widespread and rapidly growing use of mobile devices throughout the world to facilitate the flow of information between communities, government entities, and service providers. These data can provide timely information on local water systems, including the availability and quality of water. These small-scale, local data collection and reporting efforts should be encouraged.

5 Conclusions

Throughout the 20th century, water governance efforts emphasized the local and/or regional scales, in part because water challenges were largely perceived as local issues. There is growing recognition that the scope and complexity of water-related challenges extend beyond national and regional boundaries and therefore cannot be adequately addressed solely by national or regional policies. However, there has been little-to-no discussion about global water governance that looks more holistically at global water challenges and the structures and approaches needed to meet these challenges.

In this paper, we define global water governance, identify key deficiencies, and offer recommendations for how it can be improved to better address major water concerns in the 21st century. These recommendations include the following:

- Secure a sustainable funding source and a stronger mandate for coordinating intergovernmental organizations.
- Promote greater collaboration among organizations engaged in water governance to build understanding and coordinate action.
- Explore and develop guidelines and principles to govern non-governmental processes, thereby ensuring that they are legitimate, accountable, and have relationships with existing public governance structures.
- Adopt new standards, codes, and best practices for water resource development and management to promote greater transparency and participation.
- Promote capacity building and increase participation in water management for local, regional, and national government entities and civil society groups.
- Empower communities through long-term and short-term education and outreach efforts.
- Bring the UN Convention on the Law of the Non-Navigational Uses of International Watercourses into force.
- Improve the flexibility of existing inter-basin agreements in response to changing social, economic, and climatic conditions.
- Develop financing mechanisms to support ongoing operation and maintenance costs of water-related infrastructure and people and institutions needed to manage it effectively.
- Establish new environmental and social lending standards and compliance strategies for new funders within the water sector.
- Promote open-access knowledge transfer.

- Facilitate effective technology transfer by engaging local communities in the decision-making process.

- Improve understanding and communication of risk and uncertainty.

- Develop a centralized, global water data portal.

- Leverage new data collection technologies, such as through "crowd-sourcing" or reporting information using electronic devices.

We conclude that the global dimensions of water governance are difficult and complex issues. Such governance, and the institutional structures that accompany it, are complicated by local, regional, and national factors. Indeed, there is no single practice or policy that will "solve" the water challenges facing the world today. This paper, however, provides several paths forward to more efficient and effective structures and policies in an effort to promote a more robust and sustainable approach to global water governance in the 21st century.

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Appendix

As shown in Table A-1, the number of water-related events and designated time periods has grown markedly since the late 1990s. Additionally, a variety of other global forums, including the World Economic Forum and the G20 Summit, are increasingly focusing on water-related issues, highlighting the growing recognition that water issues are intricately connected to economic and social development.

Table A-1. Major Water-Related Events, 1965 - present

Event	Date	Location
International Hydrological Decade	1965-1974	Worldwide
UN Conference on the Human Environment	1972	Stockholm, Sweden
Ist World Water Congress	1973	Chicago, USA
IInd World Water Congress	1975	New Delhi, India
UN Conference on Water	1977	Mar del Plata, Argentina
IIIrd World Water Congress	1979	Mexico City, Mexico
International Drinking Water Supply and Sanitation Decade	1981-1990	Worldwide
IVth World Water Congress	1982	Buenos Aires, Argentina
Vth World Water Congress	1985	Brussels, Belgium
VIth World Water Congress	1988	Ottawa, Canada
VIIth World Water Congress	1991	Rabat, Morocco
International Conference on Water and the Environment	1992	Dublin, Ireland
UN Conference on Environment and Development (Earth Summit)	1992	Rio de Janeiro, Brazil
World Water Day	1993 – present	Worldwide
VIIIth World Water Congress	1994	El Cairo, Egypt
First World Water Forum	1997	Marrakech, Morocco
IXth World Water Congress	1997	Montreal, Canada
International Conference on Water and Sustainable Development	1998	Paris, France
Second World Water Forum	2000	The Hague, Netherlands
UN Millennium Summit	2000	New York City, USA
Xth World Water Congress	2000	Melbourne, Australia
International Conference on Freshwater	2001	Bonn, Germany
World Summit on Sustainable Development	2002	Johannesburg, South Africa
International Year of Freshwater	2003	Worldwide

Continued on next page

Event	Date	Location
Third World Water Forum	2003	Kyoto, Japan
XIth World Water Congress	2003	Madrid, Spain
Commission on Sustainable Development, Sessions 12 and 13	2004, 2005	New York City, USA
International Water for Life Decade	2005-2015	Worldwide
XIIth World Water Congress	2005	New Delhi, India
Fourth World Water Forum	2006	Mexico City, Mexico
World Water Week	2007 – present	Stockholm, Sweden
International Year of Sanitation	2008	Worldwide
XIIIth World Water Congress	2008	Montpellier, France
Fifth World Water Forum	2009	Istanbul, Turkey
XIVth World Water Congress	2011	Porto-De-Galinhas, Brazil
Six World Water Forum	2012	Marseille, France
Rio+20	2012	Rio De Janeiro, Brazil
International Year of Water Cooperation	2013	Worldwide

Source: Adapted from Varady et al. (2008) and Varady et al. (2009)