INTERNATIONAL ENVIRONMENTAL LAW COMMITTEE

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A joint newsletter with the International Environmental & Resources Law Committee and the Water Resources Committee of the Section of Environment, Energy & Resources and the Europe Committee of the Section of International Law

WATER IMPACTS OF CLIMATE CHANGE

Courtesy of the 2009 UNCCD Photo Contest and Chetan Soni
Editor’s Letter

“Water, water, everywhere; Nor any drop to drink.”
-Samuel Taylor Coleridge, the Rime of the Ancient Mariner, 1798

“All good writing is swimming under water and holding your breath.”
-F. Scott Fitzgerald, undated letter to his daughter

Throughout time, writers and philosophers have expounded upon our vital dependency on fresh water and our admiration for the might of the ocean. How astonishing, then, for our generation to observe anthropogenic climate change and to predict catastrophic changes to the hydrologic cycle and increased coastal flooding due to storms and sea level rise within our lifetime.

In September 2014, at the same time that we issued the Call for Articles for this third edition of our ABA Section of International Law and Section of Environment, Energy, and Resources joint newsletter series on international environmental law and water, hundreds of thousands gathered in New York to demand that the United Nations take strong action on climate change and close the emissions gap, which is the difference between actions being taken to mitigate climate change and the actions that are needed to keep global temperatures from rising more than an average of 2 degrees Celsius.

An impressively large number of people expressed interest in contributing their thoughts on water issues, and throughout the fall and winter our Editorial Team selected the topics to be featured and worked with the authors to refine and clarify their articles. As the United Nations Framework Convention on Climate Change (UNFCCC) parties prepare to meet in Paris at the end of this year to negotiate a “protocol, another legal instrument, or an agreed outcome with legal force under the Convention applicable to all Parties” as anticipated in Durban in 2011, we hope that this newsletter will be read widely and will influence citizen support for strong policies.

At this very moment, UNFCCC parties are submitting their Intended Nationally Determined Contributions (INDCs) to the Secretariat, outlining the potential scope of their post-2020 mitigation pledges. The impact on water resources of the actions or failures to act will be profound. Our newsletter clearly demonstrates the nexus between climate change and water, underscoring how broadly and deeply water resources are affected by the status quo. In these six articles, we focus on the newest developments and provide historic context and analysis.

Alf Brandt explores the nexus between climate change and the reliability of California’s water supply, including such issues as levee vulnerability and declining snow in the Sierra Nevada, and he provides an accessible overview of recent California efforts to adapt to climate change. Alf focuses on the 2014 California water bond and describes the initiatives it funds to mitigate drought, such as water storage management and local strategies like recycled water, stormwater capture, and groundwater cleanup.
Aakruti Shah, Roya Vasseghi, and Shannon Beebe contributed a broad summary of selected water policies of the US, India, and China to underscore the variety of responses that can be adopted to address similar water supply crises across the globe. They begin by comparing national responses to the 2010 UN General Assembly Resolution declaring a human right to water and sanitation and then continue by contrasting major infrastructure investments and innovative market-based programs that seek to improve access to water under current political administrations in all three nations.

Charles E. Di Leva, Bastián Pastén Delich, and Beth Anne Hoffman generously contributed the centerpiece article of this edition which outlines the evolution of World Bank policy on water and irrigation, a highly relevant issue as the demand for water by the agriculture sector continues to grow while supplies dwindle due to climate change. The authors describe how the water global practice has moved from focusing primarily on investing in water infrastructure projects to also investing in improved agricultural management practices. The authors note the research the World Bank has done on the impact of climate change on water resources with the Turn Down the Heat series, and they provide a status update on the revision of the safeguards policies.

Ambereen Shaffie provides an insightful analysis of how the Arab Spring has affected Egypt’s openness to shared management of and access to the precious and dwindling resources of the Nile, highlighting Egypt’s negotiation of a new Declaration of Principles with Ethiopia governing the construction of the multi-billion dollar Grand Ethiopia Renaissance Dam. She also outlines possibilities for next steps for international management of the Nile, an issue of growing urgency in the region.

Daniel Magraw, Andrea Martinez, and Elodie Manuel shared some of the highlights of their remarkable report to the UN Environment Programme analyzing how regional and basin agreements all over the world can play a significant role in mitigating climate change. In addition, recently ratified agreements account for climate change, e.g., the Volta River Convention. Areas of focus in the report include the Amazon and the Guarani aquifer in South America, the Volta River basin in West Africa, the Danube in Europe, the Mekong in Southeast Asia, the US - Canada border waterways, and the Murray-Darling basin in Australia.

Finally, Barbara Cosens, Lance Gunderson, and Brian Chaffin provide highlights from their innovative academic project which explores how the law is both an obstacle to and a tool for climate change adaptation in six North American basins: Anacostia, Columbia, Everglades, Klamath, Middle Rio Grande, and Platte. This comparative view provides key insights into the role of law in adaptation.

Our attorney contributors follow in the great tradition of writers who preceded them with reflections on the importance of water to society. In our current times, the need for a call to action on climate change and water is great, and these legal experts provide road maps for understanding the challenges posed to this timeless and critical resource all over the world as they outline possibilities for addressing these challenges.

Rivers and oceans have long held the power to inspire and move us. It is no easy thing to describe science, policy, and law in a way that is accessible to a generalist and conveys the urgent need for action on climate change. These authors dove into the challenge and worked tirelessly with our Editorial Team, and we are deeply grateful for their time and efforts. It is now up to the reader to continue the conversation. Review this newsletter, consider climate change impacts on water resources in your community, and reach out to us. Just as all rivers reach the sea, all of our efforts on climate change, access to water, and sustainable development must converge.

Warm regards,
Fatima Maria Ahmad
Editor
In the years that followed, the reverse effect became apparent; climate change as a threat to the water system, which has its facilities concentrated in the Central Valley. Hurricane Katrina's destruction of New Orleans' levees drew attention to California's dependence on levees in the Central Valley. Sacramento, its state capital, became the city most at risk for flooding, due to its deteriorating levees. California's Central Valley has long suffered flood risks. Even before Americans arrived in the 1840s, Indians referred to the area as the Inland Sea because, in the winter and spring, the Valley would be covered by floodwaters from melting snow coming off the Sierra Nevada. A century ago, after hydraulic mining filled Central Valley rivers with debris, the state and federal governments created a plan to build levees to narrow the rivers and scour the debris downstream. In the last 30 years, California has built its communities right up to the levees. With climate change bringing the threat of more rain, less snow, and earlier peak streamflow, those levees suffer a greater risk of failure, flooding the communities behind the levees.

The threat to the water system appeared in the Sacramento–San Joaquin Delta, where levees create the channels that move water from Northern California (where 2/3 of California's water supply falls), to the San Francisco Bay Area, the San Joaquin Valley and Southern California (which uses 2/3 of the state's developed water supply). Delta farmers obtained their property rights by building their own private levees that would keep their land dry year-round. Since farmers drained these islands a century ago, farming practices have led to oxidation of the rich, carbon-laden peat that developed over the last 10,000 years when the Delta was a shallow wetland. Now, that subsidence has led some islands to be as much as 30 feet below the adjacent water levels, putting intense strain on these deteriorating, private levees. The state has no legal responsibility to maintain these private Delta levees. The U.S. Geological Survey estimates a 62% chance of a major earthquake in the next 25-30 years near the Delta, which could lead to multiple levee failures. The resulting deep-water body would draw seawater toward the water export pumps and preclude water exports due to high salinity levels.

The nation's leading scientists identified a more substantial climate risk to California's water supply, the declining Sierra Nevada snowpack. The Sierra had long given California its most valuable water resources, capturing snow from Pacific winter storms and holding that snow into the summer, when California's farmers needed the water for irrigation. Daniel Cayan (Scripps Institution), Michael Hanemann (UC Berkeley), Phillip Duffy (Lawrence Livermore National Laboratory) and other scientists provided water policymakers with graphs showing warming winter weather and projecting substantial loss of the Sierra snowpack – as much as 89% loss by the end of the century. Warmer winters, more rain, and less snow also threaten greater risk of catastrophic floods; a risk heightened by the Central Valley levee system's deterioration. Scientists project more "extreme weather events" in the years ahead, due to climate change.

Warmer, drier weather also threatens the health and water-producing capacity of California's Sierra watersheds. Enduring droughts exacerbate the threat of pine beetles to Sierra forests, which produce and retain much of California's water supply. California recently has seen some of its worst forest wildfires, further contributing to the deterioration of the Sierra watersheds. With less tree cover, runoff of water and soil increases, creating greater flood risk and less water storage. Recurring, record-setting warm and dry weather has brought these threats to the California water system to the forefront of water managers' attention – as well as to the attention of California voters. In November 2014, 67% of California voters approved a $7.5 billion water bond intended to increase water supply reliability.

California Adapts

The broad voter support for the 2014 water bond reflects intense public concern about California's enduring and serious drought, but also the work of water managers to prepare for droughts and adapt to a changing climate and hydrology. The water bond allocates funding to a range of water programs that address the many changes in water management that California has adopted in recent years, including integrated regional water management, recycled water, groundwater cleanup, and water storage.

Integrated Regional Water Management. The most critical adaptation tool for California water managers was
developed before climate change took center stage. California spent the 20th Century building the most sophisticated statewide water system in the world. The State Water Project (SWP) and the federal Central Valley Project (CVP), allowed water users to depend on one water project, such as the SWP or CVP, for their water supply. There was little effort to integrate the management of the different surface and underground water supplies available to users. The CVP, for example, sought to reduce groundwater depletion by Central Valley agriculture, but CVP and groundwater supplies were not managed together. When the CVP delivered full contract supply, farmers could stop using their groundwater and allow the aquifer to recover. In drought years, when the CVP reduced its deliveries, then farmers would return to their groundwater supplies. Farmers drilled their own wells and did not report groundwater use.

The integrated nature of the California water system and growing demand eventually led to California adopting “integrated regional water management” (IRWM) as a tool to manage fluctuating supplies from individual sources. Multiple water agencies within a region collaborate to create an IRWM group and set joint priorities for water infrastructure to improve water supply reliability. The agencies may create cross-connections between their systems, so if one water source runs short, the agencies can share the available resources. According to a 2014 study, 85% of water infrastructure funding comes from local agencies, but the State funds some of the regional water infrastructure through IRWM. By supporting regional water management, the State helps improve statewide water supply reliability. Statewide water systems, in combination with IRWM, help make California more resilient to water supply fluctuations, such as the current serious drought California now suffers. This resilience, in turn, may help the water system withstand climate change impacts to water supply.

Urban Water Conservation. In the last few decades, California water use has become much more efficient, especially in urban areas. Southern California's population has grown by about one-third, but continues to use the same amount of water that it did in the 1980s. Recurring droughts since the 1990s have led to enduring conservation in good water years, and continued conservation in dry years. Urban landscaping, which accounts for more than half of residential water use, has received increased attention from homeowners. Water agencies have adopted water rates encouraging water conservation and increasing costs have increased the public's perception of the value of water. With a growing public consciousness of the value of water, homeowners use better judgment in how they landscape and use water, especially in drought years. Efforts to reduce demand are an important tool to respond to the pressures climate change will have on the water system.

Flood Management. Warmer winters caused by climate change increase the risk of flooding downstream of the Sierra Nevada, in the Central Valley, which has a long history of flooding. Before Europeans arrived in California, Indians called the Central Valley the Inland Sea because it would flood during the winter and spring, spreading up to 200 miles long and 40 miles wide. A century ago, California adopted a strategy of narrowing river channels with levees, to move flood waters and sediment downstream quickly.

With more winter precipitation falling as rain instead of snow, the risk of flood increases. A warm winter Pacific storm, commonly called a “Pineapple Express,” can lead to rapid snowmelt and sudden floods, as occurred on New Year’s Day 1997. Increased flood risk has led to new strategies to reduce flood damage in the Central Valley Flood Protection Plan. These strategies include diverting floodwaters to adjacent agricultural lands, to reduce impacts on downstream cities, such as Sacramento. This strategy may benefit water supply by recharging Central Valley groundwater aquifers. Integrated flood management can make California more resilient to climate change and the increased risks of Central Valley flooding.

Water Storage Management. With warmer winters potentially reducing water storage in the Sierra snowpack, California has taken a number of steps to make its storage system resilient to climate change. Southern California built a reservoir to store imported water for drier years, and used it in 2013-14 to help meet water demand in the face of the worsening drought. The 2014 water bond included $2.7 billion for the “public benefits” of water storage projects, such as increased availability of water for instream flow and fishery needs. Water users pay the costs of their private benefits, such as irrigation water.

California also adopted a framework for groundwater management in 2014, after groundwater supplies declined substantially during the drought. The Sustainable Groundwater Management Act of 2014 requires the formation of local agencies to assess the sustainability of groundwater extraction, providing them authority to, inter alia, ensure wells are registered, measure groundwater extraction, and assess fees for extraction. However, the Act is to be implemented over a twenty-year time frame, allowing a substantial lag before sustainable use of these water resources is to be attained.

California additionally has worked to increase its real-time monitoring and management of water storage and develop water storage strategies to respond to climate change. A recent NASA/Jet Propulsion Laboratory Soil Moisture Active Passive satellite successfully launched to space in January 2015, designed to map the moisture levels in topsoil around the world to help scientists better predict droughts, floods and other weather factors that should help to reduce uncertainties in our understanding of Earth's water, energy and carbon cycles.

The Sacramento–San Joaquin Delta is ground-zero for climate change issues in the California water sector. It serves as both the heart of the California water plumb-
ing system and the most valuable estuary ecosystem on the West Coast of North or South America. Water from Northern California moves through the Delta’s existing channels to the water export pumps that move water to the San Francisco Bay Area, the San Joaquin Valley and Southern California. Oxidation of the Delta’s peat soils emits carbon that contributes to climate change, while restoring Delta wetlands recaptures carbon. Sea level rise increases the risk of Delta levee failure and seawater intrusion into the fresher parts of the Delta. While California has long worked to protect the Delta for its many uses, it has enhanced its efforts in response to climate change: improving levees; developing a tunnel to move fresh water from the Sacramento River to the export pumps; restoring wetlands to increase the elevation of Delta islands.

Delta wetland restoration offers a prime example of how California is preparing for and responding to climate change as it adapts its management of its environment. Restoring Delta wetlands can reverse Delta subsidence by wetland vegetation decaying and rebuilding the peat. Sea level rise affects where the state can establish and maintain wetlands. Wetlands lying far below sea level on subsided Delta islands will not survive a levee failure and deep-water inundation. Wetland restoration therefore focuses upstream where some elevation will allow a wetland to survive sea level rise. The Suisun Marsh, on the downstream end of the Delta, has been managed as a freshwater wetland for hunting ducks for more than a century. Sea level rise and record-high tides have led to failure of some of the Marsh’s external levees that have kept out salty water. This is one of the factors leading to a shift in policy to manage part of the Marsh as a tidal marsh, while trying to retain some upland freshwater marsh.

**Local Water Supply Options.** After focusing on moving water hundreds of miles throughout the 20th Century, California water agencies increasingly turned to development of local water supplies to meet water demand. In the last 20 years, the cost of imported water in Southern California has doubled, to almost $1,000 per acre-foot (enough water for 2 families for a year). The combination of higher imported water costs and reduced reliability have led water agencies across Southern California to look more carefully at water in their region. The 2014 water bond includes funding for water infrastructure that relies on local water supply, including:

- **Recycled Water.** Many California water agencies clean their wastewater to a high standard and then release it to rivers to flow to the ocean. In the last 25 years, California has debated the value and risks of reusing that “recycled water” for non-potable purposes. The state has adopted ambitious statewide goals for recycled water use, but some water quality regulators have limited the opportunities for re-use. While agencies throughout the state have built recycled water projects, Orange County operates the leading “indirect” recycled water program to recharge its groundwater aquifer, which water agencies use for drinking water. The Legislature has begun discussing the possibility of direct re-use, possibly even direct potable re-use, under certain conditions. With decreased reliability of the large imported water projects, due in part to climate change, recycled water has become an increasingly important tool to assure water supplies in urban areas. The 2014 water bond included $725 million for recycled water projects.

- **Stormwater Capture.** Since floods in the 1930s, Los Angeles’ primary effort to control flooding is to push floodwater out to the ocean as quickly as possible, including by lining the Los Angeles River with concrete. As a result, beaches polluted by fast-moving run-off close to the public after each storm. As stormwater regulation has advanced in the last 20 years, agencies have increasingly sought ways to reduce stormwater runoff into the rivers. That effort has led to increasing public attention to capturing rainwater or stormwater for other beneficial uses, especially groundwater recharge. The 2014 water bond included $200 million for multi-benefit stormwater projects, making stormwater capture a tool to increase water supply in a hotter or drier climate.

- **Desalination.** California has discussed ocean desalination projects for decades, with Santa Barbara building a small one for emergencies during the drought of the early 1990s. When the drought ended, Santa Barbara put the plant into mothballs. In recent years, however, desalination has received increased attention as a small but continuous part of the water supply portfolio. San Diego County has contracted with a desalination plant developer that is building a desalination plant in Carlsbad, which is projected to start delivering drinking water in 2016. While the 2014 water bond does not allocate funding specifically to desalination, both the water recycling and regional water management chapters allow that funding to be used for desalination, if a region chooses. Like the other local projects, desalination has become a potential tool for building a region’s water supply portfolio, in light of climate change.

- **Groundwater Cleanup.** Many regions – urban and rural – rely on groundwater for their drinking water. Unfortunately, agricultural and industrial development over past decades has contaminated key groundwater aquifers. In order to recover those local water supplies for drinking and water storage, some regions have begun large-scale groundwater cleanup efforts. The 2014 water bond allocated $900 million to address ground-
water cleanup and sustainability, including implementation of the recent requirement for groundwater sustainability plans.

**Water Rights.** California's recent drought has raised the issue of how water users share shortages in a drought, but debate about how to adapt water rights to climate change will continue for many years. The water rights doctrine of “prior appropriation” requires all those with junior water rights (i.e., obtained later in time) to stop using water until the more senior water rights are satisfied. Many of California’s most senior water rights are held by farmers in the Central Valley, while the statewide water projects and cities established their water rights later in the 20th Century. But other water law doctrines may affect how the Prior Appropriation Doctrine applies in a drought or in enduring conditions of shortage due to climate change. Those legal doctrines include:

1) **Reasonable Use.** The California Constitution requires that all water diversion and use be “reasonable” in the circumstances. As the circumstances of that use changes, the judgment as to what’s reasonable can change. The State Water Resources Control Board (SWRCB) applied that doctrine to protect instream flows from drying up due to adjacent overpumping of groundwater for frost protection of wine grapes.

2) **Domestic Use Preference.** Section 106 of the California Water Code gives a preference to domestic water use over irrigation use, which accounts for about three-quarters of California’s developed water use. In the 1920s, court decisions subordinated certain irrigation rights to rights for domestic use, but the State Board has not had reason to apply this doctrine broadly.

3) **Human Right to Water.** In 2012, the California Legislature added Section 106.3 to the California Water Code to create a “Human Right to Water” for “safe, clean, affordable, and accessible water adequate for human consumption, cooking, and sanitary purposes.” State and local agencies have only just begun to determine how best to implement this “human right,” in wet or dry years.

In 2014, SWRCB took several actions to respond to the enduring and serious drought:

- Adjusted the water right conditions of the state and federal water projects in the Delta;
- Required greater conservation and water agency reporting on water conservation; and
- Ordered junior water right holders to curtail water use in favor of senior water right holders.

These actions reflect just the beginning of how California may adapt the water rights system to respond to climate change. Just as the drought orders have drawn controversy, any attempt to alter water rights due to climate change effects are likely to result in intense conflict.

**Looking to a Water Future with Climate Change**

California has started its journey toward a water future with climate change. California’s early efforts to increase the resilience of its water system have, in large part, been possible because of its need to respond to serious drought. California water leaders gained from the 10-year drought experience of Australia, in thinking about how climate change may affect California. In response to its own prolonged drought, Australia established a comprehensive system of water use metering and reporting, changed its water rights system, and created a robust water marketing and trading system.

Similar to Australia’s experience, the recent serious drought has thrust adaptation of the water system to the forefront of the public agenda. An October 2014 statewide poll showed water as Californians’ number one concern—a first in history. That concern led to overwhelming support for the 2014 water bond, which framed some of the water challenges as well as funded new programs to respond to drought and climate change. The Legislature has now incorporated climate change into most of the state’s water planning programs. Governor Brown issued a “Water Action Plan” that responds to climate change. State and local water agencies have made serious efforts to make the water system more resilient to climate change challenges.

The drought continues into 2015, with January being the driest since California started keeping weather records in the 1850s. The State Water Resources Control Board has adopted strict water conservation requirements for water agencies, leading to controversy over how to respond to the immediate climate crisis. The current restrictions, however, do not provide a long-term answer to California’s water use practices. This drought nevertheless may keep climate change at the forefront of public attention and provide an opportunity for California to continue taking the necessary steps to adapt to a changing climate.

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Rain Dance of the Eagle, Tiger, and Dragon: Comparing Strategies for Improved Water Quality and Access

Aakruti Shah, Roya Vasseghri, and Shannon Beebe

I. Introduction

On July 28, 2010, the United Nations General Assembly (“U.N.” or “Assembly”) explicitly recognized a “human right to water and sanitation” with a Resolution that “calls upon States and international organisations to . . . help countries, in particular developing countries, to provide safe, clean, accessible and affordable drinking water and sanitation for all.” When the votes were cast, 122 nations were in favor of the Resolution and zero were against it; there were 41 abstentions. Notwithstanding these good intentions, we are in the midst of a global freshwater crisis arising from uneven distribution, pollution, and overuse - all of which are worsened by population growth. Worldwide, over 700 million people lack “ready access to improved sources of drinking water.” Further, the widespread effects of climate change “from accelerated glacier melt, altered precipitation, runoff, and groundwater recharge patterns, to extreme droughts and floods, water quality changes, [and] saltwater intrusion in coastal aquifers” will “make water security even more difficult and costly to achieve” and will reintroduce challenges in countries that have previously enjoyed reliable water supplies.

Despite the recognition by many countries of a right to water and sanitation, controversies around the scope, meaning, and consequences of the right abound. Critics of the Resolution worry that governments cannot afford to shoulder the cost of providing water. However, the Assembly specified that water be “affordable,” which they defined as “not exceed[ing] 3 per cent of household income,” thus anticipating that water cannot be free. Others argue that it would be more productive to give people a property right in water because property rights are alienable and “could enrich the poor, increase the efficient use of water, and improve water supply reliability in countries with poor governance.” However, this raises another question: if water becomes a commodity, will it become a privileged service accessible only to those who can afford it?

Three global superpowers – the United States, India, and China – come to the issue of a right to water from fundamentally different and culturally informed perspectives. However, all three have attempted similar approaches to managing this important resource. Specifically, all have implemented large-scale water diversion projects to alleviate water shortages. Each nation has also harnessed market systems to address quality and access issues, using either regulatory compliance schemes or partnerships with private entities.

A. The United States: Water as a Property Right

In the United States (“U.S.”), water rights are character-
ized as property rights and there are two primary water rights systems: riparian and prior appropriation. Each state has its own variation on these basic principles. At their most basic, riparian rights derive from land ownership and they grant to owners of land along a body of water “the right to make reasonable use of the water so long as the water use does not interfere with the reasonable use of water by other riparian users” and as long as the water remains in its natural state, i.e. no storage. Therefore, shortages are shared. In contrast, prior appropriation rights are use-based, and therefore, “the first in time of use is first in right.” The U.S. does not characterize a right to water as a human right and abstained in the U.N. Assembly’s vote. The U.S. representative was described as stating that the Resolution:

 attempted to take a short cut around the serious work of formulating, articulating and upholding universal rights. It had not been drafted in a transparent, inclusive manner, and neither the Assembly, nor the Geneva process had yet considered fully the legal implications of a declared right to water. However, there has been speculation that the U.S. abstained so that U.S. governmental entities could preserve their ability to take and allocate water as they see fit. In this context, the U.S. continues to focus on water quality. On April 27, 2011, the Obama Administration released a national Clean Water Framework which “recognizes the importance of clean water and healthy watersheds to our economy, environment and communities, and emphasizes the importance of partnerships and coordination with states, local communities, stakeholders, and the public to protect public health and water quality . . . “

Despite the focus on water quality, the U.S. faces access problems. For example, in April 2015, California’s Gov. Jerry Brown “ordered mandatory water use reductions for the first time in California’s history, saying the state’s four-year drought had reached near-crisis proportions after a winter of record-low snowfalls.” The executive order directed an imposition of a “25 percent reduction on the state’s 400 local water supply agencies, which serve 90 percent of California residents” over the next year.

B. INDIA: WATER AS A HUMAN RIGHT

In India, while no water right is written into the Constitution, courts have interpreted the right to life contained in Article 21 of the Constitution as including a right to safe and sufficient water. India is a Federal Union, but water law is mostly state based since the states were given power to legislate in this area. Nevertheless, there are “restrictions with regard to the use of inter-state rivers. Further, the Union is entitled to legislate on certain issues,” including the adjudication of inter-state water disputes.

India was in favor of the Resolution. Even though Narendra Modi was not yet Prime Minister when the Resolution was adopted, it seems his views align with the Resolution. Even prior to becoming Prime Minister, when Modi was Chief Minister of Gujarat, rather than focusing on technical water quality statistics like many developed countries, he took the approach of placing a strong emphasis on human welfare, values, and duty to future generations to persuade Indians of the importance of responsible water use. On his first day as Prime Minister, he named Uma Bharti as the Minister for Water Resources, River Development, and Ganga Rejuvenation, which suggested to some that he is “placing clean water at the heart of good governance” by creating a special ministry for rejuvenating the holy river. Bharti was appointed to this position because she had been a vocal champion of the “Save Ganga” campaign to clean the river for many years. Consistent with Prime Minister Modi’s message, when he addressed the U.N. Assembly in September 2014, he acknowledged that many in India still lack basic necessities and that “comprehensive and concerted direct international action” is needed. Further, in January 2015, Prime Minister Modi and President Obama agreed to combat climate change and “work together to adjust to the adverse effects of climate change such as variations in rainfall pattern, rising sea levels and falling water tables.” In this meeting, Prime Minister Modi again emphasized how this is an ethical issue, stating “...whoever worries about the future generations has a responsibility to be conscious about climate change; [and to] adopt practices and policies which will ensure a good life and good environment for future generations.”

C. CHINA: WATER AS A STATE-OWNED RESOURCE

In contrast to the U.S. and India, water law in China primarily concerns resource utilization – it establishes who may use water and how it may be used. This use is not a property right per se. The 2002 Water Law of the People’s Republic of China establishes that “the State Council, on behalf of the State, exercises the right of ownership of water resources.” Further, the State Council under the “Three Red Lines” policy determines each province’s water quota. Then, provincial water use is delegated to local governments, who own the province’s water use rights.

China has an abundant supply of water, but resources are concentrated in the south and west, leaving the northern provinces with shortages that are now reaching crisis levels as a result of the nation’s fast growing economy. To alleviate this shortage (and after unsuccessful conservation efforts), China has been working towards increasing the quantity of water available to northern areas through massive infrastructure projects. President Xi Jinping drew attention to the newly opened South-North Water Transfer Project (“SNWTP”) in his 2015 New Year address. However, this costly solution can only provide water supply for so long. As journalists have noted: “Beijing cannot keep increasing supplies of water indefinitely. Already, the southern regions slated to pump water
northward are facing water shortages themselves." This approach “puts China's economic and ecological future at risk.” On November 12, 2014, the U.S. and China released a joint announcement on climate change, observing that, “[h]igher temperatures and extreme weather events are damaging food production, rising sea levels and more damaging storms are putting our coastal cities increasingly at risk and the impacts of climate change are already harming economies around the world, including those of the United States and China” and concluding that “smart action on climate change” will bring broad benefits, such as “improved public health and a better quality of life.”

II. Redistributing Abundance

Despite differing characterizations of water rights, these three countries have developed similar projects for moving water from areas of abundance to scarcity. The Chicago Area Waterway System (“CAWS”) in the U.S., India's National River Linking Plan (“NRLP”), and China’s South–North Water Transfer Project (“SNWTP”) all rely on a complex system of tunnels, canals, and dams to redistribute water and address shortages.

A. The United States

The CAWS constitutes one of the oldest, largest, and most controversial water diversion projects in the U.S. It consists of over 100 miles of canals and waterways and connects the Mississippi River with Lake Michigan (and therefore the rest of the Great Lakes) through the Illinois and Lower Des Plaines rivers. It also includes the Chicago River, the Calumet Rivers, the Cal-Sag Channel, and the Chicago Sanitary and Ship Canal. The project began in 1890’s to stop the flow of Chicago’s sewage through the city and into Lake Michigan, which supplied the City's drinking water. A key feature of the project was the construction of several locks that divert water from Lake Michigan into the Chicago River. Although the project greatly increased the flow of rivers downstream, the canal raised concerns about water levels in Lake Michigan, an issue that plagued navigators of the Great Lakes' shipping lanes. The Supreme Court addressed flow levels of the Chicago River in Wisconsin v. Illinois, issuing a decree to Illinois to maintain specific flow levels in its locks, so as to deprive neither the navigators of the Great Lakes nor the millions of Illinois residents who benefit from the increased water supply downstream.

The diversion of the Chicago River faces numerous challenges, such as climate change-induced reductions in precipitation and increasingly frequent heavy downpours with water shortage or droughts in the warmer months, which threaten the water quality of the CAWS and the volume of fresh water that flows into the Chicago River. It is clear that water diversion alone will not be sufficient to solve Chicago's water needs and that additional management is necessary. In a major step to increase the City's control over water quality in the CAWS, in June 2013, the U.S. Department of Justice, on behalf of the U.S. Environmental Protection Agency and the State of Illinois, moved the federal district court in Chicago to approve a December 2011 consent decree with the Metropolitan Water Reclamation District of Greater Chicago (“MWRD”). The decree requires MWRD to . . . complete a tunnel and reservoir plan (known as the Deep Tunnel or TARP) . . . [and to] add 8.3 billion gallons of storage capacity – more than quadrupling its current capacity and significantly reducing combined sewer overflows” during heavy rainfall events, which degrade water quality in the CAWS.

B. India

India’s shortage of fresh water can be attributed to a number of factors including pollution, booming population growth, over-extraction of ground water, and an increase in frequency of climate-induced floods and droughts. In line with his objective to make water quality and supply a priority, in 2014 Prime Minister Modi’s cabinet approved the first portion of the NRLP, which attempts to revive a 30-year-old plan to link over 30 rivers using 3,000 storage structures and a canal network stretching over 10,000 miles. The NRLP promises to generate 34GW of hydropower, which journalists have noted is “enough to power three cities the size of New York,” and to provide irrigation to agricultural land and transfer 1745 billion cubic meters of water annually. The NRLP also includes a plan to clean up the Ganga River within three years.

While India has many rivers, many are heavily polluted and are largely unfit for drinking. In light of this, India heavily relies on percolating groundwater as its main source of fresh water. “India's agricultural boom since the mid-1980s has been sustained by groundwater.” Yet, India has a severe deficit of groundwater in the face of its booming population, and is currently the world’s largest user of the resource. Supplies continue to diminish and farmers cannot afford to periodically dig deeper wells to access the plummeting water table.

While the NLRP is in line with the new government’s water policy, the project raises ecological, transportation, and population displacement concerns. Additionally, critics argue that the NLRP will result in decreased surface water levels, defeating India’s declared objective to rejuvenate its rivers and ignoring that many of India’s river basins are facing severe drought.

C. China

Mao Zedong first envisioned China’s SNWTP in the 1950s as a plan to “borrow a little water from the south.” The SNWTP aims to direct water from China’s southern provinces to drought-plagued areas of high urban density in the northern provinces, where scarce water supplies are being strained by heavy pollution and a booming population. Climate change is contributing to extreme rains and flooding as well as warmer temperatures and water shortages affecting the agricultural sector. The goal of the SNWTP is to reduce the “over-withdrawal of ground-
water and supply more water to industry, cities, and China’s breadbasket in the north.\footnote{69}

Although the project originated with Mao Zedong in the 1950s, “[s]erious planning for the project . . . didn’t start until the droughts in the 1990s.”\footnote{70} The plan largely consists of new dams and water diversions and “will reroute roughly 45 billion cubic meters of water annually across the country.”\footnote{71} President Xi Jinping has made the SNWTP a priority for his administration.\footnote{62} The middle leg of the project opened on December 12, 2014, piping water through a series of canals to transport water from central China to major cities in the north, such as Beijing and Tianjin.\footnote{63}

China’s SNWTP raises some of the same issues as India’s NRLP, including population displacement\footnote{64} and transportation difficulties.\footnote{65} The SNWTP also threatens to contaminate clean bodies of water with already-polluted rivers.\footnote{66} Further, the SNWTP could lead to increased desalination costs due to saltwater from the sea filtering into the Yangtze’s estuary and higher wastewater management costs.\footnote{67}

### III. Maximizing Clean Water Resources Through Markets

Like infrastructure projects, water markets can act as powerful tools for nations and communities to improve water quality and access. Over the past two decades, the U.S., India, and China have developed localized water markets in historically neglected water bodies: the Chesapeake Bay in the U.S., the Ganga River and tributaries in India, and the Yellow River in China. The water quality of each suffers from a combination of agricultural and industrial pollution, reduced flow due to overuse, and climate-change induced sea level rise.\footnote{68}

Water markets are primarily powered by government-imposed compliance schemes, by private profit incentives, or by a combination of the two. These strategies can also be thought of as Payments for Watershed Services (“PWS”): heavy polluters or downstream residents pay lighter users or upstream residents, either for pollution credits or improvements in water quality that are otherwise available only at greater expense.\footnote{69} Each of these market systems depends upon strong data collection and education to create consistent demand for high quality water at a low financial and environmental cost.\footnote{70}

### A. Markets Created by Government Regulation: The United States

The most common type of PWS in the U.S. relies on a federal regulatory scheme requiring polluters to meet water quality standards by reducing pollution through, among other means, pollution offsets such as payments for pollution “credits.”\footnote{71} Braced against enforceable limits under the U.S. Clean Water Act,\footnote{72} the U.S. Environmental Protection Agency (“EPA”) sets Total Maximum Daily Loads for pollution received by water bodies,\footnote{73} and works in partnership with states to create Watershed Imple-

mentation Plans that ensure local discharges comply with federal standards.\footnote{74} States can then regulate individual entities and set up markets for trading pollution credits, as Virginia has done to reduce nutrient discharge to the Chesapeake Bay, an important natural resource on the Atlantic coast.\footnote{75}

For decades the Bay has struggled with nutrient pollution, leading to algal blooms, dead spots, and reductions in biodiversity.\footnote{76} In 2005, Virginia implemented a credit market to manage pollution discharges from point source wastewater treatment plants and industrial facilities,\footnote{77} and expanded the program between 2009 and 2012 to include municipal storm sewer systems, construction sites, and some agricultural operations, including some non-point sources.\footnote{78} The Nutrient Credit Exchange Program allows those permitted entities that not only comply with their permits but also realize discharge reductions to certify the reductions as credits and sell them to other dischargers that are unable to reduce effluent levels below permitted amounts.\footnote{79}

A 2014 EPA evaluation of Virginia’s water quality program found that the 2012–2013 “Offsets and Trading” section of the regulations achieved all permitting milestones, a regulatory achievement.\footnote{80} And without indicating causation, the Virginia Department of Environmental Quality’s annual Nutrient Loads summary from 2014 indicates that net phosphorus and nitrogen loads fell below permitted amounts across all river basins,\footnote{81} ostensibly an improvement over 2007 levels, when only two basins managed a net reduction in one nutrient.\footnote{82}

While farmers, sewage treatment plants and other entities in the Chesapeake Bay region say they are successfully implementing reductions in a variety of programs similar to Virginia’s, critics argue that “pay to pollute” schemes will result in greater, not fewer, discharges because of difficulty in measuring discharge from non-point sources like farms.\footnote{83} Experts suggest that stronger monitoring and verification, reporting based on numerical rather than narrative data, and equal incentives for participating localities will be critical tools for improving the effectiveness these programs.\footnote{84} They likewise recommend that trading ratios be kept higher than one-to-one, i.e., that dischargers be forced to realize more reductions than the amount for which they are permitted to sell credits, to offset measurement uncertainty and foster strong credit value.\footnote{85}

### B. Markets Driven by Private Profit

In contrast to the U.S. system, another category of PWS involves profit-driven transactions outside a regulatory scheme, in which private entities voluntarily pay upstream landowners for forest conservation, water saving installations, or other water quality improvements.\footnote{86} There are many systems for accomplishing this type of transaction, including direct payments, market exchanges built on water credits, or person-to-person businesses supported by corporations.\footnote{87}
1. India

India has successfully experimented with several PWS projects. In one example of community-level cooperation, two village governments in the 210-hectare catchment area of Himachal Pradesh collaborated to address stream siltation caused by livestock eroding stream banks. Beginning in 2003, the cattle-breeding village of Ooch, upstream from the crop-growing village of Kuhan, signed an eight-year agreement whereby Kuhan villagers paid cash and provided saplings to Ooch, whose members agreed to graze their animals away from riparian areas, to plant trees and grasses, and to build brushwood dams for trapping silt. With the resulting improvements in irrigation flows, Kuhan villagers saw their crop yields grow sixfold within two years, a strong return on their PWS investment.

India has also developed water markets outside the usual PWS framework. A micro-financed, person-to-person water market along the Ganga River presents an example of how public–private cooperation can alleviate lack of access to potable water. Since at least 2012, for-profit companies have worked in remote villages to fund start-up costs for water vending entrepreneurs, who sell water purified by solar-powered reverse-osmosis. Charitable and public groups work alongside commercial companies and water-vending entrepreneurs to spread awareness of the link between contaminated water and water-borne illness. This system creates business opportunities for villagers, improves access to high quality water, and increases demand for that water. Within two years of the project’s start, the region experienced decreased incidence and school absenteeism. The human angle of this example demonstrates an important point common to all water market systems: solid data and public awareness of the hidden costs of polluted water are key to creating demand for clean and abundant water, the first essential component of a sustainable water market.

2. China

China is developing government-moderated programs for both water use permitting and PWS systems. With the Three Red Lines Policy set up in 2010, China created a national program to manage water accessibility and quality. In 2014, the Ministry of Water Resources announced that seven provinces along the Yellow River would begin hosting pilot markets for water rights trading, likely in early 2016. Smaller scale water projects are already operating in agricultural areas along the Yellow River under the auspices of the Yellow River Conservancy Commission. For example, the Conservancy successfully transferred the costs of water-saving canal linings and expensive canal repairs needed in Hangjin’s agricultural districts to downstream industrial beneficiaries of the stronger flow.

Anecdotal evidence indicates that voluntary farmer involvement in the Yellow River programs has been low. However, the creation and evolution of a national legal framework are positive steps. And individual cities are moving forward independently with traditional PWS regulatory systems. Shanghai, for example, increasingly prone to flooding due to sea level rise, has earmarked funds for sanitation, monitoring and discharge control investments. New projects, such as a reservoir and pipeline along the Huangpu River to serve Shanghai’s suburbs, began in earnest earlier this year under a discharge permitting program administered by the Shanghai Environmental Protection Bureau.

IV. Conclusion

Driven by expanding populations and climate change, the current global freshwater crisis is spurring governments to reassess their management of water resources, both internationally and domestically. Fundamental differences exist in the way water rights are characterized in different countries – whether they are a property right, human right, or a state-owned resource – which impacts management of this precious resource. While China and India have joined the U.N. Resolution to declare a human right to water, the U.S. has abstained, indicating that further consideration and international cooperation are needed. Though they differ on their approaches to water as a human right, each nation is building a system that balances written or unwritten commitments to “safe, clean, accessible, and affordable drinking water and sanitation for all” against commercial water uses. In California, for example, new across-the-board restrictions on non-essential applications, such as lawn and golf course watering, are balancing citizens’ basic water needs against commercial interests as the State faces drought conditions, increasing population pressure, and resulting overuse of the region’s limited resources.

Governments often look to infrastructure projects to improve water quality and accessibility. For example, China has been working on its SNWTP project to supply the arid northern regions with water from the water-rich south, while the CAWS project in Chicago, Illinois and the NLRP in India serve similar functions. But strained as they are by growing economies, governments cannot afford to shoulder the full cost of providing access to high quality water. Although infrastructure projects address immediate needs, based on current trends and given the unpredictable effects of climate change, they may not be sufficient to address the freshwater shortage long-term. Each project brings with it ecological, transportation, population displacement, and other concerns, adding to the overall strain on freshwater supplies, even in those areas where water is currently abundant.

Longer-term solutions may include public–private partnerships and small-scale PWS systems in which governments maintain a strong enforcement role while private entities fuel innovation, such as the nutrient pollution trading program in Virginia’s Chesapeake Bay region, the stream siltation reduction project in Kuhan, India, and...
the canal improvement project in Hangjin, China. In examining the United States, India, and China's responses to growing water scarcity, these examples of water management strategies demonstrate that "an integrated approach will be critical to mitigate social, economic, and environmental impacts" of growing populations and climate change.\textsuperscript{109}

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9 Id.


48 Prabhu, supra, at note 44.


51 Prabhu, supra, at note 44. Transferring large amounts of water to India’s drier regions annually has ecological implications including oxygen depletion, altering pH levels, increased salinity, disease vectors, the spread of pollution from pesticides and fertilizer leaching into the water remains, and even seismic implications. Interrupting the existing water flows may be damaging as well. Varying water flows necessary for channel maintenance of riparian vegetation, bird breeding, wetland flooding, cycling of organic matter from river banks and fish migration, algae control and water quality maintenance, the NLRP may not address these issues.

52 Id. While the NLRP would result in a waterway grid connecting the Brahmaputra to the Vaippar, linking canals and potentially providing an alternate means of transporting goods within India, reducing pressure on roads and railways, critics question whether the canals would have sufficient water to maintain a water way.

53 Id. The NLRP is estimated to displace 600,000 people by the conclusion of the project. India has been slow to compensate displaced people in the past, taking up to ten years to compensate person displaced due to large scale infrastructure projects.

54 See id.; see also Chaudhary, supra, at note 21.


59 See Lily Kuo, supra at note 56; see also Leavenworth supra, at note 57.

60 See Larson, supra, at note 57.


62 See Larson, supra, at note 57.

63 See International Rivers, supra, at note 59.

64 See Kuo, supra at note 56. Similar to India, potential shortages in the Yangtze River could have negative impacts on Yangtze River Transportation.

65 Id.

66 See Kuo, supra at note 56.


68 Craig Hansen et al., Forests for Water: Exploring Payments for Watershed Services in the U.S. South, WORLD RESOURCES INSTITUTE ISSUE BRIEF 2, 4 (Feb. 2011), available at http://pdf.wri.org/forests_for_water.pdf. Hansen et al. also introduce a third category of PWS: payments by governments for public goods, see id. at 7. We limit our scope to the first two categories in this discussion.

69 See, e.g., Rebecca Bundhun, Pure Water Demand in Rural India Creates a Growing Industry, THE NATIONAL, 1 (Feb. 23, 2014), available at http://www.thenational.ae/business/industry-insights/technology/pure-water-demand-in-rural-india-creates-a-growing-industry (quoting a Forbes executive, “[w]hen people [become] aware there is the need for safe drinking water, their health is better, productivity is better, then the answer of providing water purifiers in the houses comes. We work on advocacy to create the understanding and mindset.”) See also, Zhu Lixin, Experts Look to Clean Up Chaohu Lake, CHINA DAILY, 1 (Feb. 28, 2014), available at http://www.chinadaily.com.cn/china/2014-02/28/content_17314242.htm (quoting a UK expert, “poor understanding at all levels - lack of coordinated data, no long term monitoring program and not knowing where to target efforts - present major problems for pollution-curbing endeavors worldwide”).

70 See Hansen, supra note 69, at 6.

71 33 U.S.C. §1251 et seq.


75 Chesapeake Bay Program, Nutrients: How Do Excess Nutrients Enter the Chesapeake Bay?, available at http://www.chesapeakebay.net/ issues/issue/nutrients/index (last visited Mar. 29, 2015).


78 Adrienne Kotula & Peggy Sanner, Nutrient Pollution Trading, Virginia
Some Insights on the Role of the World Bank in Water and Agriculture Against the Backdrop of Climate Change

Charles E. Di Leva, Bastián Pastén Delich and Beth Anne Hoffman

INTRODUCTION

The demand for water by agriculture is ever-growing. World Bank data indicates that irrigation accounts for more than twice the combined water use by municipal and industrial purposes. Food and Agriculture Organization data show that agriculture is responsible for 70% of global freshwater withdrawals and about 90% of water consumptive use. These numbers resonate even more as water consumption for agriculture is expected to increase about 11% by 2050 in comparison to 2005 levels.

Agriculture is essential to fight poverty and achieve food security, particularly for developing countries, where economic growth from agriculture has been two to four times more effective at reducing poverty than growth originating in other sectors. The outlook to 2050 anticipates that in order to support a world population that could reach 9 billion, agriculture will have to produce 50% more food to satisfy the nutritional necessities of this population. Climate change will hinder the world’s capacity to respond to these challenges, potentially exacerbating water scarcity and curtailing crop yield. Each degree Celsius increase in global temperature may potentially reduce grain crop yield by 5%. There is growing evidence that warming close to 1.5°C is already locked-in the atmosphere due to past and predicted greenhouse gas emissions.

Against this backdrop, it is important for countries to build climate resilience as well as implement policies destined to avoid and manage conflicts that unfold as water resources become scarcer. The World Bank has increased its financing for climate change activities and pioneering approaches to deal with various water activities while adhering to the Bank’s safeguard policies. This article briefly addresses some of the major issues arising from climate change and its effect on water resources and agriculture laying out the Bank’s involvement in these sectors. It starts by briefly discussing the evolution of the World Bank’s policies for water and irrigation. It later describes some of the impacts of climate change, particularly for water and agriculture. It then addresses the Bank’s agenda on climate change and the directions adopted for the agricultural sector as it pertains to water resources. The paper also provides some examples of the measures for agricultural water management being implemented at the project level. Finally, it briefly addresses the World Bank environmental and social safeguard policies and their relevance in dealing with project impacts, along with some of the major features in the ongoing safeguard review process.

BRIEF OVERVIEW OF THE WATER SECTOR AT THE WORLD BANK

While most of the planet is covered with water, only a minimal portion is available to satisfy human needs. Just 3% of the world’s supply is freshwater and of that percentage two-thirds is locked in glaciers or buried in deep underground aquifers, meaning that only 1% is readily available for human use. Available freshwater is unevenly distributed throughout the globe and is required for diverse uses, including human consumption, sanitation, industrial purposes, agriculture, and environmental conservation, among others. Agricultural usage is particularly intensive, as crops require large quantities of water to be produced. When water is used for irrigation, it produces a loss on the hydrological cycle, compromising its availability for other uses. These circumstances place water resources as a potential source of conflict over competing uses across the regions of the world.

The World Bank has financed projects in the water sector almost since its creation, although its approach towards the sector has evolved over time. During the 1980s, water infrastructure projects were prevalent in the Bank’s overall water portfolio; this focus on infrastructure would present important challenges for the Bank in relation to environmental, social, and financial sustainability. The Bank shifted to a more comprehensive approach with its 1993 Water Resources Management Policy Paper, which marked a shift away from purely water infrastructure and toward management of water utilities, irrigation, rural water systems, water resources, and land use. In 2001, the World Bank committed to helping partner countries achieve the Millennium Development Goals, a number of which are related to water usage or have a water component, such as the eradication of extreme poverty and hunger and environmental sustainability.

In 2004, the Bank published its Water Resources Sector Strategy (hereinafter the “Strategy”), aimed at continuing on the major ideas introduced in 1993 Policy Paper. The Strategy builds upon three principles:

- **Ecological principle:** The river basin is the unit of analysis, and water needs to be managed con-
junctively with more attention paid to environmental concerns.

- **Institutional principle**: Participation of every stakeholder, including the State, the private sector and civil society is necessary. Additionally, it argues for the implementation of the principle of subsidiarity, which promotes the decentralization of water resources management.

- **Instrument principle**: Efficiency is recognized as a key to improve water allocation and enhancing quality due to the water resources scarcity.

The Strategy was one of the first to highlight the impact of climate change on water availability. It also recognized that many water conflicts occur due to the pressure that agriculture exerts on water resources, particularly irrigation. The Strategy proposed several “on the farm” measures to better manage water resources in agriculture, including increasing the productivity of water and infrastructure, scaling up user associations and ensuring that they are representative of all farmers, modernizing formal irrigation institutions and the framework in which they operate, and explicitly addressing the political economy of reforms, among others.

All of these measures reflect an understanding of the above-cited principles, however, there are two important aspects that are worthy of further acknowledgement, namely: (i) the focus on institutional capacity-building that allows farmers to participate in water management and decision-making, and (ii) the necessity of viewing agricultural water management as one aspect of a larger issue of ecological equilibrium.

In 2010, the World Bank’s Independent Evaluation Group (“IEG”) conducted an evaluation of the World Bank’s water portfolio between the years 1997 and 2007. Overall, IEG recognized a positive evolution in the portfolio, though it also found some shortcomings. There were increasing efforts to advance water efficiency in agriculture, oriented toward improving the value of agriculture production per unit of water consumed through increasing yields and reducing non-beneficial water use as well as through the promotion of alternative crops that reduce demand on the irrigation system. IEG found that ninety-seven projects had some water efficiency component, such as improving the efficiency of irrigation systems through rehabilitation and better management systems for water delivery, the adoption of specific irrigation techniques, increasing canal flow capacity to reduce water lost through evaporation, and training in equipment maintenance, among others. However, success was seen as variable and efficiency improvements were not necessarily found to decrease water consumption.

IEG also found increased support for the creation of Water User Associations (“WUAs”) within Bank operations, which relates to the issue of institutional capacity. Generally speaking, WUAs are organizations managed by water users (including farmers and other stakeholders), and are aimed at decentralizing the water management process by involving water users in administering the proper use of water resources. Sixty-two Bank-financed projects created or supported WUAs during the assessed period, of which three-quarters were reported to be working efficiently at the project closure. Some of the problems encountered in WUAs were lack of technical capacity and insufficient training, which led to a lack of willingness by farmers to participate and uncertainty over rights and obligations of WUA members. An important lesson drawn for WUAs is their potential to decentralize water management, thereby providing water users with a sense of empowerment that might benefit efficiency, household income, and enterprise-creating investment.

Following on IEG’s evaluation, the Bank focus in the water sector shifted toward improving agricultural water management. The World Bank unit for water policy and technical oversight conducted an annual review of the World Bank’s water portfolio in FY2013. A total of 521 water-related projects were active during FY2013 with US$550 billion in net project commitments. The Bank approved 423 new projects in FY2013 of which 22% were water-related projects. The total lending for these new projects was US$7.8 billion. In the irrigation and drainage sector, there were 125 active projects with a total lending of US$12.1 billion in 2013. Of the 27 new approved projects, 64% intended to take action on climate change.

As of July 2014, the World Bank began operation under a new management structure focused on fourteen global practices, which includes a water global practice and an agriculture global practice. The structure aims to bring together Bank expertise and developing new and innovative solutions for these areas. It also introduces climate change as a cross-cutting solution area within this new structure.

**Impacts of Climate Change in Water and Agriculture**

The Fifth Report from the Intergovernmental Panel on Climate Change (hereinafter “IPCC”) reinforced the long-standing scientific consensus on the imminent threat of climate change. The IPCC affirmed that “[h]uman influence on the climate system is clear and recent anthropogenic emissions of greenhouse gases are the highest in history.” The Panel anticipated major impacts on rural areas, particularly “on water availability and supply, food security, infrastructure, and agricultural incomes, including shifts in the production areas of food and non-food crops around the world.”

Similarly, the World Bank’s “Agriculture Action Plan” (hereinafter “AAP”) notes that climate change will exacerbate drought, water scarcity and extreme weather events, which are already responsible for making it harder to produce food, increased food prices and volatility in the food market. Moreover, there is growing evidence that climate change is already disrupting rainfall patterns, feeding powerful windstorms and generating longer and more severe droughts. In 2010, approximately
There is also reported uncertainty over the impacts on crop yield in agriculture for this century, although it is clear that warming and droughts are major threats. Some studies have projected an increase in agricultural yields in high latitudes, while substantial losses were projected for tropical and subtropical regions in all major crops. This includes possible losses for wheat and maize that may exceed 50% on average for large parts of tropical areas. Anticipated social impacts of climate change for food security come from the reduction in the affordability of food and/or variability of food prices. These changes are projected to impact low income and food importing countries in Africa, Latin America and the Caribbean (specifically Northeastern Brazil and parts of the Andean region), Central Asia and the Middle East and North Africa region.

South Asia is another region that will be significantly impacted. Water in the region comes mainly from the monsoon precipitations and the Hindu Kush and Himalayan mountain complex which are covered by glaciers. Together, they are the primary sources of upstream freshwater for many of the river basins of South Asia. The Indus, the Ganges, and the Brahmaputra basins alone provide water resources for close to 750 million people. Regrettably, there is already evidence that the Himalayan glaciers are retreating which might substantially affect water availability in the region. Additionally, population growth in India is projected to reduce gross per capita water availability from 1,820 m$^3$ per year in 2001 to about 1,140 m$^3$ per year in 2050. This is a significant drop considering that agriculture accounts for almost 18% of the region's GDP; 50% of the region's population depend directly on agriculture for work and food purposes. With regional freshwater withdrawal rates reaching above 90% for agriculture, food production will remain water-intensive even with better water management and usage, which makes South Asia particularly vulnerable to the effects of climate change.

**The World Bank's involvement in Climate Change, Agriculture and Water Management**

The previous section provided examples of the potentially disruptive effects of climate change and the magnitude of the challenges further ahead. The World Bank has been mindful of these challenges and has supported the international community’s efforts since the adoption of the United Nations Framework Convention on Climate Change (hereinafter “UNFCCC”) in 1992, when the Bank became the Trustee of the Convention’s Financial Mechanism. In 2000, the World Bank became the trustee and manager of the Prototype Carbon Fund, the first fund destined to pilot the mechanisms developed under the Kyoto Protocol. Currently, the Bank assumes the management of more than ten climate funds, providing its expertise and enabling mobilization of climate finance to developing countries for different sectors, including water and agriculture.

Last year, the World Bank augmented its involvement in climate-related issues at the international level. Echoing on the IPCC's latest report, the Bank led a process in which 73 countries and more than 1,000 businesses called for a set price on carbon during the September 2014 UN Climate Summit in New York. While the climate negotiations were being held in Lima last December, World Bank President Dr. Jim Yong Kim called on world leaders to set an ambitious goal toward the 2015 Paris Climate Conference where a new international climate regime will be negotiated. Put forward that the Paris agreement should be binding for countries and should provide a clear pathway to zero net emissions before 2100. The Bank was also at the forefront of the green bonds market, achieving the sum of US$7 billion in issued bonds in 2014. The proceeds of these bonds go to finance projects that are selected by environmental specialists following the Bank’s eligibility criteria for low carbon and climate resilient development, including food security programs and stress-resilient agricultural systems. In November 2014, the Climate Investment Funds, for which the Bank acts as Trustee and implementing agency along with other Multilateral Development Banks, extended their operations for two more years and accumulated pledges for over US$8 billion, making it the largest active climate finance mechanism. The Green Climate Fund (GCF) recently surpassed this target, with US$10 billion in capital; the GCF, for which the Bank hopes to be an implementing entity, should become operational during 2015.

Many of the climate-related challenges that are specific to agriculture are identified and incorporated in the latest World Bank’s "Agriculture Action Plan" (hereinafter “AAP”) for the years 2013 – 2015. The Plan provides more emphasis on improving resilience in agriculture and rural livelihoods through climate-smart agriculture. The AAP details the lessons learned from previous years which, in turn, inform the actions proposed in the AAP. The AAP also includes many of the recommendations of the IEG report on the water portfolio referenced above. In particular, improved irrigation performance is recommended with regard to agricultural water resource management. This recommendation includes groundwater, which has been increasingly used for irrigation purposes.

For the current period, the projected investment in the
sector across the World Bank Group is expected to reach around US$8 to US$10 billion. A focus on long-term action is to be encouraged in five thematic areas: (i) raising agricultural productivity and its resilience through support for better land and water management in irrigated and rainfed areas; (ii) linking farmers to markets and strengthening value chains to improve market access and trade; (iii) facilitating rural non-farm income through improving the rural investment climate and soil development; (iv) reducing risk, vulnerability and gender inequality through support for risk management mechanisms, greater transparency in food markets, and improving women’s access to services, resources and opportunities; and (v) enhancing environmental services and sustainability.45

These areas are aligned with the World Bank strategy on water management and irrigation discussed above. Furthermore, these thematic areas respond to the pressures arising from climate change. Climate-smart agriculture will promote better land and water management as well as the development and adoption of more drought and flood tolerant plant varieties. Additionally, more use of landscape approaches will be encouraged in Bank operations, including projects that combine agriculture, water, forestry, and biodiversity.46

Under the plan, two million hectares in new and improved irrigation and drainage services are expected. The key climate resilience actions are to increase the share of World Bank agriculture lending supporting climate change adaptation. As of FY2011–12, climate resilience activities comprised 31% of total agricultural lending, including improved agricultural management practices, and the development and adoption of more drought and flood-tolerant varieties. Similarly, the percentage of agricultural lending that supports climate change mitigation reached 20% in FY2011–2012.47

Among the type of measures proposed by the Bank to support improved agricultural water management are:48

- Strengthening water management in rainfed areas through a combination of measures ranging from technological interventions, such as water harvesting and other water control and water capture infrastructure, to the provision of better climatic information and innovative approaches that allow farmers to better cope with the risks posed by climate variability.
- Improving watershed management practices, in particular in rainfed areas, and reforestation in upper watersheds to reduce soil erosion and enhance water capture.
- Expanding new irrigated areas, especially in the Africa region, with a focus on viable smallholder and small-scale, community-managed irrigation as well as public-private partnerships.
- Rehabilitating and modernizing existing irrigated areas, including large-scale systems.
- Strengthening irrigation services, including for women, as well as supporting water user associations and the decentralization of management functions, and more sustainable operation and maintenance of irrigation systems.
- Strengthening systems for water rights allocation and improving water pricing.
- Putting a stronger focus on assessing water resource availability in the longer-term and promoting irrigation water conservation, including through better monitoring and modeling.
- Improving river basin and groundwater management through institutional development and a move toward more integrated water management.

In the next section we will examine some specific examples where some of these measures have translated into specific projects. Finally, it is important to mention that some of the Bank-financed projects also receive finance from initiatives where the Bank provides fiduciary, managing, and/or technical capacity. This includes the Global Agriculture and Food Security Program Trust Fund (GAF-SP), a multilateral mechanism that has received pledges for US$1.35 billion to work in sustainable agriculture and which helps reinforce the goals of the AAP.49

**Some Examples of Measures Proposed for Water Management and Agriculture**

In 2006, the North China Plain Water Conservation Project was successfully closed.50 This project followed on the Irrigated Agriculture Water Saving Program, an earlier Bank–financed project that focused largely on investment in irrigation infrastructure, but did not succeed in reducing the pace of groundwater overdraft. The Chinese Government requested Bank assistance for a water conservation project that could test and demonstrate ways to achieve the country’s policy goals. The Project’s development objectives were to: (a) increase farmer incomes, enhancing beneficial use of water resources and agriculture production capacity, (b) increase the value of agriculture production per unit of consumed water through increasing yields and reducing non–beneficial water losses, and (c) establishing mechanisms for sustainable use and management of water resources in irrigation areas.51 Additionally, the Project aimed at returning groundwater use to sustainable levels through a combination of planning, investment and incentives. Finally, the Project pursued the introduction of WUAs, marking the first time in China that these types of institutions assumed responsibility over parts of the irrigation system.52 The Project supported “integrated improvements to over 100,000 hectares of irrigated land worked by 257,000 farm households in the provinces of Hebei and Liaoning and in the municipalities of Beijing and Qingdao”53 Agricultural production per unit of water consumed increased by 60% to 80%, and non–beneficial water use was reduced by
a sixth. Groundwater overdraft was reduced by 30 percent. WUA-managed areas covered 62,800 hectares, which accounted for about two-thirds of the project area and included over 500 established WUAs.

More recently, the Framework for Adaptation to Climate Change in the Water Sector project in Mexico also successfully closed in 2013. Finance was provided through a development policy loan, which are governed under Operational Policy 8.60 on Development Policy Financing. Development Policy Financing supports a Country's program of policy and institutional actions that promote growth and sustainable poverty reduction. The Mexico case is an excellent example of how Development Policy Loans can help countries build institutional capacity and policies to support climate-smart agriculture.

The Mexico project's development objectives were to: (a) strengthen the institutional framework and monitoring capacity in integrated water resources management, and (b) mainstream adaptation to climate change in water programs. At the time the project closed, both objectives were reported to have been largely achieved. Among the key results of the project were the transfer of functions and responsibilities from Mexico's National Water Commission to river basin organizations, which are able to participate in the formulation of regional policy and programs. A total of 26 River Basin Councils were established with representation from key stakeholders in the sector, including state and municipal governments, water users, civil society and non-governmental organizations.

Support was provided to increase water availability information, with information published for 627 river basins, which increased the number of covered river basins from 91 to 722. A program for modernization and technology upgrades for irrigation incorporated new criteria allowing the improvement of productivity of irrigation districts which increased from 1.41 to 1.86 kg per m³ between 2007 and 2012, compared to the original target of 1.66 kg per m³. The project also piloted a program to use treated water for irrigation, resulting in a total of 7,807 hectares being irrigated only with treated water. Finally, new regulations were promoted for the conservation of groundwater resources through artificial recharge of aquifers. The water authority now publishes water availability for 653 aquifers, tripling the amount of covered aquifers for which it provides information.

Another good example is the ongoing Land Husbandry, Water Harvesting, and Hillside Irrigation Program in Rwanda, which was approved in 2009. The project receives finance from several sources, including an International Development Association Grant from the World Bank and co-finance from the U.S. Agency for International Development and the Canadian International Development Agency. According to the Project Appraisal Document, agriculture is at the core of Rwanda's economy, as it provided 80% of employment, 63% of foreign exchange earnings and accounted for about 39% of the country's GDP. The Project aims at introducing sustainable land husbandry measures for hillside agriculture by transforming hillside intensification with a view to increasing productivity in an environmentally sustainable manner. The Project seeks to focus on high-valued horticultural crops with the strongest marketing potential on irrigated portions of hillsides. The Project also sets participation and ownership by women and men as a goal, which is consistent with the AAP goal of reducing gender inequality. Finally, it aims to strengthen farmer organizations and cooperatives for sustainable hillside intensification and marketing by improving their governance, management and market.

**How the World Bank Addresses Water Issues in its Sponsored Projects**

The World Bank addresses water issues that arise at the project level, in part, through its environmental and social safeguard policies. One of the issues the Bank has to deal with is the possibility that a riparian state may raise an objection when a project has a potential impact on an international waterway in which they have an interest. The World Bank first faced this issue around sixty years ago, when Turkey objected to an irrigation project on the Orontes River (shared with Syria and Lebanon) in Syria, which was going to receive financial support from the Bank. Turkey's argument was that the project would reduce the river's flow thus harming its interests.

Following this objection, the Bank developed its policy for Projects on International Inland Waterways, which would later evolve into Operational Policy 7.50 for Projects on International Waterways ("OP 7.50"). OP 7.50 establishes a procedure that requires borrowers to notify other riparian States when a project on international waterways is proposed aiming at addressing this aspect at the earlier stage of the process. The Policy has the following relevant features:

- Applies to hydroelectric, irrigation, flood control, navigation, drainage, water and sewerage, industrial, and similar projects that involve the use or potential pollution of international waterways, thus encompassing water availability and quality.
- Rests on the principles of cooperation and goodwill of riparian States as essential principles to address water issues at the international level.
- It applies to upstream and downstream riparians.
- Includes surface water and groundwater resources. Initially, the policy did not apply to groundwater and it does not list groundwater as an international waterway; however, the Bank has consistently applied the Policy to projects in international groundwater resources since 1990.

The Policy allows other riparians to provide their views...
on the project during project preparation. In case they have objections, the Bank may appoint one or more independent experts to examine the issue, although it retains authority on whether to proceed with financing for the project. This mechanism is used rarely. In the 1980s, Ethiopia objected to the Bank providing finance for a multipurpose dam in Somalia (the Baardhere Dam Project), which included the construction of irrigation and drainage systems. Independent experts concluded that the project’s impacts were properly addressed and the Bank decided to proceed with financing the project. However, shortly afterwards, the political situation in Somalia worsened and the Bank subsequently suspended the project. Finally, the Policy establishes some exceptions in cases where there is no foreseeable impact on other States’ interests.

There are many potential environmental problems that can exert a negative effect on water resources, including deforestation, watershed degradation, encroachment on recharge areas, pollution from point and nonpoint sources, inadequate environmental flows, droughts and floods, and others. Although OP 4.01 covers projects that involve the potential pollution of an international waterway, it does not provide a framework to address these other impacts. To deal with these and other issues, the World Bank has a set of environmental and social safeguards, which are briefly presented below.

**Operational Policy 4.01 on Environmental Assessment** (hereinafter “OP 4.01”) requires Bank-financed projects to be executed in an environmentally sound and sustainable manner. It contains a series of environmental management tools including environmental assessment. OP 4.01 is very comprehensive, encompassing every environmental component (e.g., air, water, and land), human health and safety, social aspects (involuntary resettlement, indigenous peoples, and physical cultural resources), and transboundary and global environmental aspects.

OP 4.01 is the umbrella policy of the Bank’s safeguards and a key instrument to assess and manage a project’s impacts, including those that might be produced by agriculture on water resources. It requires countries to account for environmental and social issues in an integrated way, to analyze project alternatives, and to take into account a country’s national legislation and its agreed-upon international environmental commitments, among other considerations. The Bank may require public consultation and disclosure of a project’s implications. Toward this end, the “borrower provides relevant material in a timely manner prior to consultation and in a form and language that are understandable and accessible to the groups being consulted”. Additionally, the Bank may also trigger Operational Policy 4.04 on Natural Habitats and Operational Policy 4.36 on Forests, which specifically guard against impacts on those resources.

In terms of social safeguards, besides OP 4.01, the Bank requires application of its Operational Policy 4.10 on Indigenous People, for those projects proposed for Bank financing which might affect indigenous communities. Borrowers are required to engage in a process of “free, prior, and informed consultation”, with the aim of attaining broad community support and, when impacts cannot be avoided, borrowers are required to minimize, mitigate or compensate the communities for the adverse effects of the projects. The Policy facilitates meaningful consultations with indigenous communities, including those that might rely upon agriculture, in a culturally-adequate manner.

It is also important to mention Operational Policy 4.12 on Involuntary Resettlement, which acknowledges the disruptive effect that a project might have not just with respect to physical relocation of people, but also regarding economic and social impacts that might occur due to restrictions on access to resources. This is very relevant for water projects as they might have negative effects on people living in the project area. The Policy requires borrowers to avoid or minimize involuntary resettlements if feasible, exploring all viable alternative project designs. If it is not feasible to avoid resettlement, resettlement activities should be executed as sustainable development programs, with the aim of allowing communities to receive sufficient resources to enable them to share in project benefits. Resettlement planning has to involve people throughout the consultation process and provide them with opportunities to participate in planning and implementing resettlement programs.

The Bank also has Operational Policy 4.07 on Water Resources Management, which provides priority areas for the Bank in assisting borrowers to achieve water resources management in a manner that is economically viable, environmentally sustainable, and socially equitable. Among the priority areas defined in the policy are: (i) developing a comprehensive framework for designing water resource investments, policies, and institutions; (ii) decentralizing water service delivery, involving users in planning and managing water projects, and encouraging stakeholders to contribute to policy formulation; (iii) avoiding the waterlogging and salinity problems associated with irrigation investments; and (iv) establishing strong legal and regulatory frameworks to ensure that social concerns are addressed, environmental resources are protected, and monopoly pricing is prevented.

In 2012, the Bank adopted Operational Policy 9.00 on Program-for-Results Financing (hereinafter “OP 9.00”). OP 9.00 introduces a new finance product aimed at promoting sustainable development and improving the efficiency and effectiveness of Bank-financed development activities. Under this policy, Bank-financed projects disburse against the achievements of verified results specified as disbursement-linked indicators. Prior to Project approval, the Program is fully assessed; this assessment includes an environmental and social system assessment of the country as may be applicable or relevant in a particular country, sector, or Program circumstances. The
Bank utilizes this type of financing to support countries’ initiatives and improve the sustainability of their policies, and towards that end, it has been instrumental in financing water projects and climate-smart agriculture.

Since October 2012, the World Bank has been reviewing its environmental and social safeguards. This review, which is still ongoing, is being undertaken by the World Bank to respond to the need to better address the environmental and social issues of its country partners, "(…) to deliver better environmental and social outcomes in the projects and programs the Bank supports, to ensure treatment and coverage of environmental and social impacts and risks, to strengthen the ability to monitor and supervise actual impacts on people and the environment, and to better meet the varied needs of borrowers, and help strengthen country frameworks and institutions to deliver sustainable results on the ground".72

In July 2014, the World Bank Board’s Executive Committee on Development Effectiveness allowed the release of a first draft proposal for consultation, without endorsement.73 The consultations have taken place throughout the world and have involved States, civil society organizations, and other international organizations, among different stakeholders. Some features of the draft include, as follows:

- It provides a coherent and systematic environmental and social framework, which includes a Vision Statement, the World Bank Environmental and Social Policy, Environmental and Social Standards (which replace safeguards), Environmental and Social Procedures (under preparation), and non-mandatory guidance and information tools.

- It requires the inclusion into environmental and social assessments of those risks and impacts related to climate change and other global threats to the environment; any material threat to the protection, conservation, maintenance and rehabilitation of natural habitats and biodiversity; risks of project impacts falling disproportionately on disadvantaged or vulnerable groups; and any prejudice or discrimination toward individuals or groups in providing access to development resources and project benefits, particularly in the case of disadvantaged or vulnerable groups.

- It introduces a standard on resource efficiency and pollution prevention, with specific actions to address water consumption for projects with high water demand, including detailed water balance, identification of opportunities to improve water use efficiency, and benchmarking operations to available industry standards on water use efficiency, among other actions.

- It introduces a standard on biodiversity to better address the interrelations between the different components of the environment.

- It introduces a specific standard for information disclosure and stakeholder engagement, aiming at establishing clearer rules and engaging communities at the earlier stage of the projects.

The new draft for an environmental and social framework raises the bar and can increase the sustainability of Bank-financed projects. In terms of agricultural water management, it has the potential to set a stronger focus on climate change at the project level, with the assessment of the potential for mitigation and adaptation within the project helping to build climate-resilient agriculture. Improved focus on biodiversity will allow better integration of landscape approaches (integrated consideration of agriculture, land, forest, and water) into projects. Finally, the enhanced approach toward social issues in the new draft should allow for improved inclusion of all people that might be affected by the project, including vulnerable groups.

The safeguard policies review is an ongoing process, and final versions have yet to be agreed upon by the World Bank Board of Executive Directors. Finally, it is important to note that the revision process excludes OP 7.50 which will remain as it is currently designed at this time.

Conclusion

Climate change has potentially disruptive effects on the world that cannot be underestimated. Negative effects will be stronger in those countries that lack the capacity to respond adequately to changing circumstances. Agriculture could be massively impacted as crop production requires extensive use of water, which is already a scarce resource and might become even more scarce as the global temperature continues to rise. These causal chains might end up bringing about dire consequences, considering population growth and the essential role of agriculture in providing growth, jobs and food security around the globe.

In the last few years, the World Bank has been identifying, proposing and encouraging countries to adopt new policies to build into their projects with the aim of better addressing the relationship between agriculture and water resources. Integration of environmental concerns, landscape approaches, and improved governance through the creation of WUAs are measures that merge institutional and technical responses to build climate-smart agriculture. The projects in China and Mexico provide examples of the type of results the Bank is trying to help countries obtain.

With regard to the impact of agriculture at the project level, the Bank’s safeguard policies provide an adequate framework to integrate the interests of other States as well as stakeholders in relation to the legal, environmental and social effects of agriculture. The safeguard policies require compliance with countries’ national legal frameworks and observance of their ratified international environmental treaties. The ongoing policy review prom-
ises to do more, by providing a systematic and socially inclusive framework to address project impacts, while incorporating specific requirements to assess the potential of projects to support climate change mitigation and adaptation.

The World Bank’s efforts alone will not lead the world onto a climate-resilient path. It is important for the UNFCCC process to be successful and produce an ambitious agreement by the end of 2015 that guides the world in keeping the global temperature increase under two degrees Celsius. The private sector has to increase its investments in sustainable agriculture, along with civil society. In the end, addressing climate change requires a global effort in which everyone has to be involved.

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4 Id. at xv.
5 Id.
6 Id.
9 FAO, supra note 2, at 2.
10 The World Bank, supra note 8, at 3.
11 Id.
13 The World Bank, supra note 8, at 4.
15 Id. at 13-14.
16 The World Bank, supra note 8, at 32.
17 Id.
18 Id. at 50.
19 Id. at 50 – 51.
20 Id. at 51.
22 Id. at 57.
24 Id. at 16.
25 The World Bank, supra note 3, at xv.
26 The World Bank, supra note 8, at x.
27 Id.
28 World Bank Group, supra note 7.
29 World Bank Group, supra note 7, at 15.
30 Id. at 14.
31 Id. at 16.
32 Id. at 27.
34 Id.
35 Id. at 119.
36 Id. at 125.
37 Id. at 127.
40 Id.
41 Id.
42 Id. at 19.
43 These measures are reproduced from the Bank’s Agriculture Action Plan, id. at 28-29.
44 For more information on the Global Agriculture and Food Security Program (GAFSP), see GAFSP, http://www.gafspfund.org/ (last visited Apr. 26, 2015).
47 Id. at 3.
48 The World Bank, supra note 8, at 33.
49 Id.
50 The World Bank, supra note 50, at 4.
53 Id. at 9.
54 Id. at 10.
55 Id. at 12.
56 Id. at 11.
57 Id.
Arab Spring to Arab Drought: Securing International Cooperation Over the Nile River Basin

Ambereen Shaffie

I. Introduction

The Nile River Basin lies in one of the driest and least economically developed regions on earth. The river is the primary source of water for eleven countries. There is no doubt that the Nile is under threat from overuse, climate change, pollution, and poor water resource management and efficiency. The nations that share the Nile’s limited freshwater supply have yet to sign a binding treaty addressing basin-wide water management. However, several states have signed two important sub-regional documents, the 2010 Cooperative Framework Agreement (CFA, or the Entebbe), and the 2015 Declaration of Principles on the Grand Ethiopian Renaissance Dam (GERDP, or GERD Principles). Neither text proposes a comprehensive water regime, partially because each stakeholder presents varied capabilities, needs, and interests. So why are these two documents significant? They represent an important phase of a process to develop a basin-wide treaty and secure regional cooperation. The effectiveness of these treaties (and of all future cooperative efforts) is contingent on understanding and influencing the dominant riparian nation – Egypt – and its interests, motivations and capabilities.

As the most powerful country in the region both militarily and economically, Egypt has long argued that controlling the Nile is essential to its national security. In fact it has frequently threatened war to coerce states into accepting the status quo. It also claims a historical right to monopolize the Nile based on two twentieth-century treaties. The remaining basin states view these treaties as “colonial relics” that ignore the contemporary river basin principles of equitable use and allocation. For instance, they allocate nearly all of the Nile’s water to two downstream nations, Egypt and Sudan, while excluding the other basin countries as signatories. Egypt recently used its status to try to stymie the CFA. Treaty negotiations stalled when Egypt refused to compromise on language in the CFA limiting its own usage, and therefore did not ratify it.

However the riparian nations now appear to be challenging Egypt’s hegemony. Six upstream states have ratified the CFA already. Against this backdrop of decades-old conflict, this March, Egypt, Ethiopia, and Sudan reached an agreement on the GERD Principles. The Principles represent a promise to secure mutual cooperation and gains from the construction of a multi-billion dollar dam that Egypt staunchly opposed until this year. Furthermore, Uganda and Tanzania are also planning or constructing large water projects. Tanzania is planning to build a 105-mile pipeline that will draw water from one of the Nile’s main sources, Lake Victoria. Make no mistake, Egypt fears yet another potential coup in the Arab Spring – this time a coup of its water monopoly.

This paper contends that internal and external forces in the region once again present Egypt with a choice between conflict and cooperation, but that Egypt is at last willing to sacrifice some control over the Nile. If this is indeed true, then global actors, particularly the World Bank, should seize the opportunity to use soft power to encourage Egypt to ratify and implement the CFA.

II. Challenges to the CFA: The Nile’s Water Supply is Scarce and in High Demand

A. Nile Supply

At 6,695 kilometers, the Nile is generally considered the longest river in the world. It flows through eleven countries – Rwanda, Burundi, the Democratic Republic of the Congo, Tanzania, Kenya, Uganda, Eritrea, Ethiopia, South Sudan, Sudan, and Egypt. The total area of the Nile Basin is 3.18 million square kilometers, approximately 10% of the African continent. The two main tributaries of the Nile are the Blue Nile and the White Nile, and approximately 85% of the Nile’s water originates in the Ethiopian Highlands and the plains of Eastern Sudan.

Despite its length, the Nile carries less water than other major rivers, such as the Congo, Amazon and Yangtze. The volume of water in the Nile varies across seasons and

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67 Id. at 595–596.
68 For an explanation of impacts for upstream riparians, see Salman M.A. Salman, Downstream Riparians Can Also Harm Upstream Riparians: The Concept of Foreclosure of Future Uses, 35:4 WATER INTERNATIONAL 350 (2010).
69 See, supra, note 66, at 603.
71 The WORLD BANK, supra note 8, at 3.
locations, with an annual flow at the Aswan Dam of approximately 84 billion cubic meters (BCM). One factor that accounts for variable water supply is evaporation, which is generally high compared to other river and lake basins. For example, Ethiopia experiences evaporation of about 500 BCM annually. This combined with variable rainfall across seasons and years contributes to the high risk of drought in the entire region. Climate change will likely accelerate this process, leaving the Nile countries more vulnerable to an already uneven water flow. Climate change contributes to a diminishing water supply, and without immediate action its effects cannot be mitigated. Projects involving man-made reservoirs could help maintain a more consistent water supply. In fact, there could be significant opportunity for state and international initiatives to incentivize the creation of reservoirs. However, the viability of these projects is limited by the cost, particularly for just the initial environmental impact assessments. Experts have presented various solutions to improve water use efficiency (WUE) in the context of increased competition for water. These solutions draw upon economic, engineering, and technical fields. As it stands, the Nile's water supply is at best fixed and at worst decreasing.

B. Nile Demand

The Nile's 84 BCM is being withdrawn to the maximum extent possible. Demand above capacity is an immediate problem some basin countries will face by 2050, including Burundi, Kenya, Rwanda, Egypt, Ethiopia, Tanzania and Uganda. By 2025, almost all of the basin countries will face a significant water shortage. Although Sudan's limited population and plentiful rainfall protects it from scarcity in the near future, it will still have to deal with the practical reality of sharing the river with its water-scarce neighbors.

Egypt uses the most water from the Nile by far, withdrawing 68.3 BCM per year. Sudan and South Sudan withdraw a combined 37.1 BCM per year. No other country withdraws even 6 BCM per year, and five countries in the basin withdraw less than one BCM. This does not mean that other countries do not need the water, simply that prior treaties unfairly blocked their claim to reasonable usage. In fact, "demands for access to the Nile's water resources from upper riparian states have been increasing." Ethiopia uses under one percent of the water although the Nile accounts for sixty-eight percent of its available water resources within the country. While approximately 200 million people directly rely on the Nile for water, domestic and industrial use accounts for just two BCM per year.

Instead, the vast majority of water withdrawn from the Nile is used in agriculture. About 80% of all water use in the basin is for agricultural production, while 86% of the water Egypt withdraws is diverted to agricultural usage. Therefore, water quality is crucial to these countries, and especially to Egypt. The Nile's water quality is generally poor, with the lack of basin-wide environmental regulation resulting in widespread nutrient pollution and bacteriological contamination. As a result, extensive treatment is necessary to make the water safe for human use.

Water scarcity has made food shortages increasingly common in the region, which could further cause instability and conflict. The Egyptian government has estimated that by 2017, it will need 15 BCM of water more than its existing water resources can supply. Furthermore, the demand for water is increasing due to population growth and economic development. The population of the basin countries is expected to double in the next forty years from 429 million in 2012, to approximately 945 million people, which will drive a corresponding increase in agricultural and industrial demands for water. In Egypt, 95% of the population live in the Nile Valley, and that population is growing at a rate of approximately one million every nine months.

In addition, while the upstream basin countries previously minimally used the river, primarily due to pressure from Egypt, they are now beginning to plan development projects – most notably the major dams – that could reduce downstream flows. Ethiopia and Uganda are planning to construct new hydropower stations, and Tanzania has begun a massive multi-billion dollar pipeline that would extract drinking water from the Nile.
I. THE CURRENT TREATIES AT ISSUE THAT GOVERN THE NILE

A. THE NILE WATERS AGREEMENT OF 1929

The Nile Waters Agreement of 1929 resulted from Britain's desire to reserve the Nile for Egypt's use. The agreement was negotiated between Egypt and Britain, with Britain nominally representing Sudan, Kenya, Uganda, and Tanganyika (now Tanzania). Under the agreement, Egypt agreed to allow Sudan to utilize the Nile in an amount that would "not infringe Egypt's natural and historical rights in the waters of the Nile and its requirements of agricultural extension..." As a practical matter, this agreement allocated Egypt 48 BCM and Sudan 4 BCM of water. No other basin state was allocated a share, and renegotiation required Egypt and Sudan's joint permission. Furthermore, the agreement conferred on Egypt both an unrestricted right to withdraw water from the Nile and the authority to prevent all other countries from engaging in any activity that would "reduce the quantity of water arriving in Egypt, or modify the date of its arrival, or lower its level." Despite its obvious inadequacies, Egypt continues to rely on this agreement, including its purported veto power, which remains a controversial component of Nile management. Egypt claims because the 1929 Agreement has risen to the level of international customary law, it binds all non-party states. However, the CFA unfortunately makes no mention of overriding this agreement.

B. 1959 AGREEMENT ON THE FULL UTILIZATION OF THE NILE WATERS

In 1959, Egypt and Sudan reached another agreement, which gave Egypt 55 BCM and Sudan 18 BCM of the Nile's annual 84 BCM flow. The agreement stated that in the event the Nile's supply was greater than 84 BCM in a given year, the surplus would be split equally. Once again, no other country in the basin was allocated a share, although Egypt and Sudan did agree to consider sharing water on a case-by-case basis. As with the 1929 agreement, Egypt continues to use the agreement to support its claim to a monopoly over the Nile's water. This prompted an Egyptian water minister to declare that, "[u]ntil the agreement of 1959 is null and void, cooperation will be unsustainable.

C. THE NILE BASIN INITIATIVE AND THE COOPERATIVE FRAMEWORK AGREEMENT

Created in 1999, the Nile Basin Initiative (NBI, or the Initiative) was formed to negotiate a comprehensive Nile treaty that addressed the water needs of all riparian states. The NBI is an example of a sustained collaboration among technical and scientific experts to build a basin-wide regime. The Initiative members drafted the CFA in 2010. As a result, the NBI is deservedly viewed as a major diplomatic breakthrough in the region. In the CFA, NBI members expressed their agreed-upon intent "to achieve sustainable socio-economic development through the equitable utilization of, and benefit from, the common Nile Basin water resources." This marked a significant shift in rhetoric on the part of Egypt and Sudan, and another step toward cooperation. The Initiative also set up the Nile Council of Ministers (Nile-COM), made up of a group of water ministers from all the basin states, as its highest decision-making body.

The NBI institutionalized regional cooperation in various ways. First, it drafted the CFA to incorporate modern principles of water law, and to welcome all basin states (particularly upstream countries) as signatories. Second, the NBI's expressed vision of sustainable and equitable water management represented a rhetorical shift from Egypt's saber-rattling. Third, it increased cooperation on mutually beneficial infrastructure projects between Egypt and others on a bilateral basis, such as projects related to flood preparedness, irrigation and drainage, watershed management, desertification control, and energy transmission. Finally, by promoting trust and speaking to uniform, common regional interests, it laid a foundation for further cooperation.

Yet some still view the CFA as a "transitional arrangement designed to foster communication until a permanent framework is in place." Currently, only six upstream states are signatories. In 2010, Ethiopia, Uganda, Tanzania, Rwanda, and Kenya signed the CFA, under which they agreed, "not to significantly affect the water security of any other Nile Basin State." In 2011, Burundi also signed. Additionally the CFA did not specify water allocation, the biggest issue at the heart of conflict for the Basin.

As previously mentioned, Egypt and Sudan attempted to block negotiations. They conditioned ratification of the CFA on changing a provision to require basin states, "not to adversely affect the water security and current uses and rights of any other Nile Basin State" [emphasis added]. The proposed change was not included; and Egypt and Sudan did not sign onto the treaty. At the time, Egyptian Minister of Water, Mohamed Bahaa El-Din also cited two other sticking points: (1) Egypt wanted decision-making status in the Nile River Basin Commission, and (2) it wanted to be notified immediately of any Nile projects prior to construction. At the same time, El-Din almost comically noted Egypt's cooperative streak, using the example of Egypt approving the Bujagali Hydroelectric Power Station in Uganda. Ultimately, Egypt continues to maintain that the CFA simply does not trump the 1929 and 1959 Agreements.

D. THE AGREEMENT ON DECLARATION OF PRINCIPLES ON THE GERD (GERD PRINCIPLES)

In April 2011, Ethiopia began construction of what will likely be Africa's largest dam on the Blue Nile, the GERD. The nearly $5 billion hydroelectric dam will flood 1700 square kilometers of area bordering Sudan, and will employ about 8,000 Ethiopian workers. Ethiopia maintains high hopes that the GERD will break its cycle of poverty and famine. Although the dam could generate up to
an estimated 6,000 megawatts of power, outside experts believe the varied flow of the river will prevent consistent power production. However, not all elements of local society laud the project. In response to both domestic and international criticism, Ethiopia agreed to an international "Panel of Experts" to assess environmental impacts of the large-scale dam. The ten-member tripartite-appointed panel produced a secret report, a copy of which was leaked in 2013 to the nonprofit International Rivers. To its credit, the report highlighted some potential negative consequences raised by outside experts, and called for "a full transboundary environmental and social impact assessment (TESIA)...conducted jointly by the three countries."70

Internally, the dam’s potential negative effects have not been extensively evaluated. While much attention is given to the dam’s impact upon Egypt’s economy, few articles highlight the impact upon Ethiopia’s farming and mining communities, which depend on access to the river for their livelihood.71 One report estimates that the dam would "displace approximately 20,000 people in Ethiopia,"72 although it does not specify the demographics of the displaced population. Financing of the dam has also been controversial. The government boosted nationalist pride by campaigning to build the dam largely without foreign assistance. Accordingly, a state-owned utility Ethiopian Electric Power oversees the construction. Aside from a $1 billion loan from China, the government has raised about $357 million from Ethiopians.73 It aggressively marketed “patriotic” bonds to Ethiopians abroad, government employees, and local citizens. About 8,500 workers live at the project site and work almost seven days a week, making approximately $32.68 per month.74 Some were pushed to buy bonds “through a system that deducts straight from their [already meager] paychecks.”75

The government also campaigned Ethiopians living domestically and abroad to donate to the cause. Whether local Ethiopians who subsist on meager salaries will see a return on their investment remains to be seen. Furthermore, while Ethiopia will be able to profit from exporting energy (under Principle 6) and recoup its costs, it may not be able to fully exploit that energy for its own purposes.

Externally, the dam presents water security issues. Technical experts and Egypt’s leaders expressed alarm that the GERD would cut off flow for an entire year while the dam is filled, allowing Sudan to irrigate more water and thus impacting Egypt’s supply.76 The dam primarily draws on the Nile's flow for its power, except when the reservoir must be filled immediately after the dam is built. That process could take five to seven years. The reservoir holds 63 BCM, approximately as much as Egypt typically uses in a year, and filling it too rapidly or during a year of low rainfall could cut Egypt’s supply drastically.77 It is important to understand that the same phenomenon took place when Egypt built the Aswan Dam, and it took additional time to eventually see the dividends.

Ethiopia has arguably addressed Egypt’s concerns in several ways. Ethiopian leaders offered to cover most of the dam’s costs while allowing Egypt still to benefit towards a vision of comparative advantage. Ethiopia has publicly advocated and presented the mutual benefits and economic gains from the GERD, only to be met largely with silence from Egyptian leaders. Finally, it agreed to the GERD Principles, which defer to an international team of experts to make recommendations on the best way to proceed in filling the reservoir and administering the dam, while still balancing the needs of each country.

Despite initial hesitation, in January 2015, Egyptian President el-Sisi met with Ethiopian Prime Minister Hailemariam Desalegn to establish a joint commission to oversee the implementation of the GERD.78 The commission was set up to examine the GERD’s impact upon Sudan, and Egypt’s allocation and water rights. President El-Sisi was “intent on reaching an accommodation with Ethiopia over the Nile.” On March 23, 2015, water ministers from Egypt, Ethiopia, and Sudan reached an agreement on the GERD,79 which outlines the core principles of mutual cooperation.80 Most of the aspirational principles are theoretically excellent, and closely follow portions of the United Nations Watercourses Convention, which came into force just last year.

But Ethiopians take issue with language in the GERD Principles that seems conciliatory. In particular, Principle 1 calls for “cooperation in understanding the water needs of upstream and downstream countries.” Principle 5 dictates that with respect to the filling of the reservoir and dam operation policies, the three countries must rely upon the findings of a Tripartite National Technical Committee “[t]o inform [the] downstream countries, Egypt and Sudan, on any urgent circumstances that would call for a change in the operations of the dam, in order to ensure coordination with downstream countries’ water reservoirs.” Principle 6 gives downstream countries priority to purchase the GERD-generated energy. Critics claim that Ethiopia too readily accepted language preserving the colonial status of the downstream nations, which undermined its own sovereignty.81 The language is similar to the controversial proposed CFA provisions referenced above. Ultimately there is an unanswered question (among many others): will Ethiopia will be able to exploit the GERD for its own irrigation and power production, or will it be exploited as a labor force for a new source of cheap energy for the downstream nations?

It is as yet unclear whether the GERD Principles fully account for either country’s concerns.82 What is clear is that we will see “key negotiations” – and key intergovernmental research – regarding the reservoir and the dam’s impact upon the Nile River Basin.83 What is also clear is that the GERD Dam will take compromise on the part of all countries involved, and particularly Egypt and Ethiopia.

The GERD Principles also have implications for Egypt with respect to the CFA. The Principles arguably hold “great significance for future agreements to be reached on the Nile,”84 and signal that future cooperation on the
CFA is possible. At the same time, “[t]he possibility for Egypt and Sudan to sign the CFA is wide, but this doesn’t mean the process is simple.”

IV. The Opportunity

A. A Paradigm Shift: Conflict to Cooperation

The question remains: if Egypt does not sign the CFA, is a water war looming? Many commentators have theorized that competition for the Nile will drive Egypt to war with one or more basin states. This claim is not without good reason. In 1979 Anwar Sadat said, “The only matter that could take Egypt to war again is water.” In 2007, the Egyptian military reportedly created a “standing Nile force” and developed contingency plans to intervene if any basin country threatened to reduce Egypt’s water security, and that every drop of water taken from the Nile “would be defended by a drop of Egyptian blood.”

However, to date there has been no armed conflict over water in the Nile River Basin, and after resisting the CFA, Egypt has changed its tack, most recently by signing the GERD Principles. Particularly in the wake of the Arab Spring that began in 2011, there is evidence that Egypt is ready to bargain albeit grudgingly, particularly on water allocation.

In fact, the effects of the Arab Spring still reverberate in Egypt and in the region. The recent political upheaval includes the fall of President Hosni Mubarak’s decades-long rule, the Muslim Brotherhood’s brief reign, frequent tense military clashes with the public throughout, the military coup of President Mohammed Morsi, and the eventual election of current President Abdel Fattah el-Sisi. President el-Sisi rose in political ranks first as a military chief during the Arab Spring. While in that role, he led the military in overthrowing and jailing then-President Morsi. In November 2013, Mr. Morsi and other senior Muslim Brotherhood officials were tried for their actions during the 2012 protests. On April 21, 2015, Mr. Morsi was convicted of the detention and torture of protestors, and was sentenced to 20 years in prison. Protests still occur over his imprisonment, and the imprisonment of numerous protestors. In short, the Arab Spring has destabilized Egypt and weakened its position as a military and diplomatic power.

Egypt is now in a position to see the wisdom – and necessity – of cooperating over its most vital natural resource. The Arab Spring “made it unclear if Egypt is willing or able to enforce its long-held dominance of the region.” While Egypt was “preoccupied with its own survival” during that time period, Ethiopia unilaterally began construction of the GERD.

President El-Sisi then continued a momentum to engender better relations with the riparian states that was building even throughout the Arab Spring: in 2013, former Vice President of Egypt Mohamed ElBaradei held talks with Sudan and Ethiopia, concluding that the only way forward was to cooperate on the basis of building dams up to global high-tech standards. During Mr. Morsi’s brief rule, he traveled to Ethiopia in 2012, reversing a long-standing ban former President Hosni Mubarak had maintained against traveling to other riparian nations.

This momentum, combined with President el-Sisi’s pragmatism and desire to remain in power, is a sign that Egypt may be able to muster the political will to sign the CFA. However, skepticism surrounding Egypt’s “cooperation” is warranted. It is no secret that Egypt previously expressed its interest in regional efforts and then failed to substantiate its rhetoric with action, such as when it refused to compromise on the CFA. And, “there is no binding principle of international law that compels the parties to cooperate.

B. Economic Analysis of the Paradigm Shift

An economic approach to international law may additionally bolster arguments for Egypt’s cooperation and compliance with the CFA. From an international law or doctrinal perspective, Egypt stands to gain nothing by relinquishing its claim to power under the old treaties. Similarly, in the context of the GERD Principles, Ethiopia will continue to work with Egypt on the downstream effects of the dam as long as Egypt can threaten military retaliation. From an economic perspective, “[t]he more dependent states are on their international river, the more interest they have in cooperation.” The caveat is that “[b]eneficial international cooperation...will only happen if there are [actual] costs for violating international law.”

The costs could include retaliation (institutional or political), reputational costs, or sanctions. Institutional retaliation may include a state’s refusal to work with Egypt in a multilateral setting, while political retaliation could take the form of economic sanctions or restructure of foreign aid requirements. The latter could prove very powerful, given that Egypt receives significant foreign aid from the United States and other international institutions. With respect to multilateral settings, the basin nations will likely continue to sign sub-regional agreements, which are often easier to broker and govern. This may create smaller upstream blocs of power to counterbalance Egypt’s power. These sub-regional agreements will likely center around a proliferation of new water projects, when the upstream countries finally seize the opportunity to overcome poverty by harnessing the power of the Nile.

In summary, pure unilateral action does not benefit Egypt, and that is why it continues to cooperate despite its past rhetoric to the contrary. The benefits that Egypt could gain from the CFA outweigh the costs of maintaining the
status quo. Keeping this in mind, the international community can increase the likelihood of a successful outcome by exploiting current events to encourage it to sign onto the CFA.

C. AN OPPORTUNITY FOR THE WORLD BANK

One cannot influence large-scale change solely by implementing new laws. Similarly, “[t]here is no reason to believe that the introduction of the Nile Basin CFA could single-handedly change the dynamics of the Nile hydro-politics.” However multilateral institutions can enhance cooperation, and facilitate the CFA. The World Bank (the Bank) has an opportunity encourage Egypt to ratify the CFA.

Most success stories for basin-wide agreements boasted significant third-party or NGO involvement, including the NBI. In addition to technical experts, third-party mediators can help to incentivize cooperation and the conflict-resolution process, and find a middle ground between seemingly disparate positions. A third party such as the World Bank can level the playing field for the weaker basin countries, yet speak to the common interests, needs, and motivations that Egypt shares with the region. The Bank is a strong candidate to facilitate interest in the CFA for several reasons.

First, the Bank has negotiated transnational water treaties in the past, including one related to the Indus River. India (similar to Egypt) had asserted total sovereignty over the Indus River while Pakistan sought equitable use for many years. The Bank successfully mediated the 1960 Indus Waters Treaty, which allowed both countries to use the waters. To spark negotiations, a senior Bank official invited the Prime Ministers of both countries to sit down and agree to a set of principles as the basis for a future agreement. The Bank proposed the principle “that problems of the basin should be solved on a functional and not on a political plane, without relation to past negotiations and past claims.” Once the countries agreed to this foundational principle, they were able to proceed. The Bank then required that each country appoint a senior engineer to set forth plans for development of the Indus River. It organized a “consortium of donors to support development in the Indus basin, which raised close to $900 million, in addition to India’s commitment of $174 million.” As a result of the Bank’s role as an active mediator between India and Pakistan, the two nations agreed to and signed a bilateral agreement resolving the dispute. While the circumstances and countries involved in negotiating the Indus River treaty are different than those governing the Nile, it is worth it to consider asking the Bank to mediate discussions between Egypt and the current signatories to the CFA. The Bank can also play a role in mediating talks over appropriate amendments to the CFA, to make the treaty more palatable to Egypt.

Second, the Bank has standing in the region and a history of supporting the NBI. The World Bank has a mandate to support the work of the NBI since the initiative’s inception, as lead development partner and as administrator of the multi-donor Nile Basin Trust Fund (NBT). The NBI established the NBT, which the World Bank manages. The NBT is the main funding source of basin countries hoping to develop water and infrastructure projects. Finally, the Bank funds several of its own water initiatives, which are carried out in equal partnership with the NBI. It is an ideal time for the Bank to establish an exploratory committee regarding how to help Egypt sign onto CFA, or whether amendments are necessary, appropriate, and realistic. Where negotiations break down, as in the past, the Bank can act as a neutral yet informed party. Additionally, the Bank could establish a presence at the Nile-2002 Conference Series, which are annual meetings where experts from each basin state gather to present research and papers. The Conference is a rich environment that attracts key scholars and researchers to share data on the Nile River Basin. Unfortunately, the findings are not widely disseminated, nor are they exchanged in an organized manner. Opening the Conference to the World Bank might spur collaborative research efforts and perhaps, with time, viable water project proposals.

A discussion of the World Bank must account for the viewpoint that such first-world institutions are “obsolete.” The traditional “North-South” divide, or the gap between developed and lesser-developed countries, has narrowed. Lesser-developed countries have more economic power and diplomatic clout – and that trend will continue, as evidenced by the recent China-backed Asian Infrastructure Investment Bank, a “competitor to the Western-dominated World Bank and Asian Development Bank.” Whatever the form or composition of this “new world order,” the relevant global actors should seek to create incentives for cooperation over the Nile River, for the sake of all countries concerned.

IV. CONCLUSION

One way to fairly allocate the Nile water and protect it from environmental degradation is a more comprehensive legal framework that includes all riparian states as signatories. This does not mean that sub-regional agreements or specialized river basin organizations are superfluous. While all the Nile Basin nations seem to support a comprehensive treaty, efforts to have all countries sign onto the CFA have proven unsuccessful, primarily because “Egypt has dug in its heels” regarding key provisions. The GERD Principles affirmed sub-regional cooperation, and perhaps paved the way to Egypt becoming a signatory to the CFA.

While Egypt has enjoyed an unchallenged property right without having to pay for the privilege, its sociopolitical landscape has evolved since the Arab Spring began in 2011. Riparian states have challenged Egypt’s hegemony in the form of various hydroprojects, notably the GERD. Furthermore, climate change and environmental factors provide internal pressure by reducing water supply, just as population and external factors drive water demand higher. In this context, it seems that given the pressure to
choose between war and cooperation, Egypt may finally choose the latter and ratify the CFA. The World Bank could play a decisive role in moving Egypt toward this outcome.

Perhaps then the vision of “Africa rising on the strength of its own abundant resources” can be blended with the vision that, “[w]e drink from the same Nile River water, which makes us live in harmony and cohesion.” The CFA is no silver bullet, and neither is the GERD Declaration. However, both documents serve as proof of the paradigm shift from conflict to cooperation. This paradigm shift, if supported, can and will pave the way for greater stability, economic prosperity, and environmental sustainability for all the Nile Basin countries.

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3 Water resource management is the coordinated development and management of water resources in a sustainable, optimal, and equitable way.
4 Although the GERDP is not a legal agreement per se, it is sometimes referred to as the “Agreement on the Declaration of GERDP”.
5 Brunée and Toope define regime as a “constellation of patterned activity that comes to induce expectations as to appropriate behavior among actors with a given identity.” Brunée and Toope, supra note 1, at 109. This paper defines “regime” as a governing system consisting of internal laws (both written and customary), and the international institutions that cooperate to implement those laws. The system is shaped by the “constellation” of activities performed by transnational organizations, customs, and laws, as well as individual states.
6 The classic frustration with international law is a lack of enforcement mechanisms. As a result, “[r]esearch questions about the efficacy of international law, the operation of international institutions, the preferences of states, and the motivations for state behavior – questions often foreclosed by a narrow focus on international law doctrine – are now being increasingly asked and answered.” Daniel Abebe, Egypt, Ethiopia, and the Nile: The Economics of International Water Law, 15 CUR. J. INT’L L. 27, 29 (2014).
7 Sudan, another downstream country, also refused to sign.
9 Joseph Nye defines soft power as “the ability to shape others preferences.” In contrast, hard power is the ability to get what one wants from another. In international relations, soft power is to diplomacy as hard power is to the use of force.
11 Id. at 55.
12 Id. at 37; Note that some estimates range as low as 74 BCM.
For a full text of the Principles of the Nile Project, see supra note 1, at 132-37.


For a more comprehensive discussion of “[t]he story of change” in Egypt and the Basin, see Brunée and Toope, supra note 1, at 132-37.

Scott O. McKenzie, Egypt’s Choice: From the Nile Basin Treaty to the Cooperative Framework Agreement, an International Legal Analysis, 21 TRANSNAT’L L. & CONTEMPORARY PROBLEMS 571, 595 (2012). McKenzie notes that Egypt “publicly states its desire to work with other Member States, but its actions indicate indifference in furthering the goals of the CFA.”

Id.

Abebe, supra note 6, at 39.


Abebe, supra note 6, at 41.

Id.

State of the Nile River Basin Report, supra, note 10. In fact, “[t]here is ample scientific evidence showing that the lower riparian states would benefit from a basin-wide cooperative framework.” Ibrahim supra, note 23, at 310. This report discusses numerous ways in which Egypt would benefit from a comprehensive Nile treaty.

Ibrahim, supra note 23, at 307.

Wiebe, supra note 35, at 753.


Id.

Freitas, supra note 17, at 2.


Id.

Azarva, supra note 36, at 459.

Warner, supra note 7l.

Climate Change and Regional and Basin Agreements

Daniel Magraw, Andrea Martinez & Elodie Manuel

Roughly 400 water agreements exist around the world at the basin and regional (multi-basin) level. These agreements are managed and implemented by executive authorities known as regional and basin authorities (RBAs). In general, regional and basin agreements historically have tended to focus on the transboundary issues relating to the watercourse they pertain to, rather than on global issues. Moreover, these agreements do this with specific attention to local conditions, values and political realities. This focus is understandable and indeed is one of the values of regional and basin approaches. At the same time, global climate change has important implications for the availability, quality, and access to fresh water on a local level. For example, climate change is likely to affect the availability of fresh water as the amount and timing patterns of precipitation are disrupted and the strength and duration of storms intensify; these could affect river flows, sediment in lakes and rivers, and recharge of aquifers. In addition, climate change will lead to migration, consisting of both internally displaced persons and international refugees; and these migrants will likely create additional demand for water in some places and stress existing water governance structures. Because climate change has impacts on fresh water availability, quality and access at the basin level, it is both natural and essential that attention to climate change is growing on the part of the managing bodies of these basin and regional agreements, particularly as recognition of the time-sensitive imperative to protect the environment of the basin increases.

To understand this situation, we recently completed a study of regional and basin agreements and international law, including the United Nations Framework Convention on Climate Change (UNFCCC), for the United Nations Environment Programme (UNEP). We presented our report in November 2014 to the first International Environment Forum for Basin Organizations in Nairobi, Kenya, which was organized by the International Network of Basin Organizations (INBO). We found that water agreements at the basin and regional level are beginning to address climate change mitigation and adaptation through the activities of their managing bodies. We are pleased to provide the following introduction to our report, with a sampling of some of our findings. We invite you to review the full report, which is available on the UNEP website.

As background, our study examined seven regional and basin water agreements: the Amazon Cooperation Treaty, the Danube River Convention, the Guaraní Aquifer Agreement, the Mekong River Agreement, the Murray–Darling Basin Agreement, the Volta River Convention, and the 1909 Canada–United States Boundary Waters Treaty. We examined how these agreements address selected international water law principles and how that treatment relates to the implementation of the UNFCCC and seven other global multilateral environmental agreements, which are the following: the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes, the Convention on Biological Diversity, the Convention on Migratory Species, the Ramsar Convention on Wetlands, the Stockholm Convention on Persistent Organic Pollutants, the UN Convention on Combating Desertification, and the UN Convention on the Non-Navigational Uses of International Watercourses.

For context, it is helpful to examine the nature of the regional and basin agreements we studied. In terms of geographic scope, the Guaraní Aquifer Agreement underlies parts of more than one basin, the 1909 Boundary Waters Treaty is a regional watercourse agreement, and the other five agreements examined in the study are basin-specific. In terms of levels of government, the Murray–Darling Basin Agreement is entirely within one country (Australia), the 1909 Boundary Waters Treaty is bilateral, and the rest are multilateral. In terms of hydrographic focus, the Guaraní Aquifer Agreement relates to an aquifer and the others pertain to both surface water and groundwater. In terms of geographic location, the agreements are from every continent except Antarctica. The temporal range is vast, ranging from an agreement that is more than 100 years old, i.e., 1909 Boundary Waters Treaty, to one that was negotiated in 2010 and is not yet in force, i.e., the Guaraní Aquifer Agreement. The Volta River Convention focuses primarily on the establishment and structure of an institutional authority, whereas the Amazon Cooperation Treaty is more multi-faceted, and the 1909 Boundary Waters Treaty has become much more comprehensive over the last 106 years of its existence.

What follows is a sampling of some of the findings of our report.

Amazon Cooperation Treaty

The eight Amazonian countries that are Parties to the Amazon Cooperation Treaty, i.e., Bolivia, Brazil, Colombia, Ecuador, Guiana, Peru, Suriname, and Venezuela, in 1995, established the Amazon Cooperation Treaty Organization (ACTO), which was implemented in 1998. Pursuant to its constitutive document ACTO through its secretariat may participate as an observer in meetings of UNFCCC bodies. ACTO’s relationship with the UNFCCC secretariat relates to capacity building, technical cooperation, identification of connected activities, and studies.
GUARANÍ AQUIFER AGREEMENT

All the Signatories to the Guaraní Agreement, i.e., Argentina, Brazil, Paraguay, and Uruguay, are Parties to the Kyoto Protocol and are committed to using alternative sources of energy that do not emit high levels of GHGs. The Guaraní Aquifer Agreement is not yet in force. Two of the primary drivers behind the agreement were to map and develop the Guaraní aquifer and reduce greenhouse gas (GHG) emissions in light of climate change. In particular, adequate access to and conservation of underground water is of even greater value under climate change conditions because underground water does not evaporate as atmospheric temperature rises. Furthermore, it was thought that the countries could generate geothermal energy from the Guaraní aquifer. The efforts made to reach the Guaraní Aquifer Agreement also set the groundwork for the joint Global Environment Fund (GEF)-UNEP Plata Basin Project. It is the first GEF international watercourse project that is specifically meant to address climate adaptation, in addition to other transboundary issues. It is clear that climate change and the Guaraní Aquifer Agreement are inherently interconnected.

MURRAY–DARLING AGREEMENT

In 2008, Australia established the Murray–Darling Basin Authority (MDBA) to manage the Murray–Darling Agreement. As provided in the Australian Water Act of 2007 in which the agreement is embedded, the MDBA developed a Basin Plan for managing the basin. The purpose of the Basin Plan includes giving effect to the UNFCCC to the extent it relates to the use and management of water resources in the basin. For example, the management objectives outlined in Chapter 5 of the Basin Plan include ensuring “that water-dependent ecosystems are resilient to climate change and other risks and threats”. Chapter 4 of the plan describes measures to be taken in order to address risks to the availability of water resources, including risks related to climate change and its effects. MDBA does not formally deal directly with the UNFCCC secretariat, however. That is done by the relevant officials in the Australian government. MDBA officials interact informally with relevant MEA secretariat officials in the context of international conferences and other international meetings.

VOLTA RIVER CONVENTION

The Parties to the Volta River Convention, i.e., Benin, Burkina Faso, Cote d’Ivoire, Ghana, Mali and Togo, established the Volta Basin Authority (VBA) as the managing authority. The VBA is engaged in several efforts related to climate change. In 2013, a Transboundary Diagnostic Analysis undertaken by the UNEP–GEF Volta Project with respect to the Volta basin identified climate change as one of the main factors contributing to transboundary problems in the region. Consequently, the VBA established an Observatory for Water Resources and Associated Ecosystems for the purpose of determining the current state of the basin through monitoring climate change, amongst other conditions. As part of the Observatory, the VBA reached out to a variety of stakeholders and identified approximately 45 national NGOs as potential participants. Another ongoing initiative that the VBA is involved with is the West African Science Service Centre on Climate Change and Adapted Land Use (WASCAL). The German Federal Ministry of Education and Research initiated this program in order to establish, in collaboration with its West African partners, a hub of knowledge on “climate change and adapted land use in West Africa.” By training graduate students, undertaking research, and setting up a competence center, the program is generating knowledge and building capacity in the region to address present and future land management issues brought on by climate change and weather conditions.

Like many other managing authorities of regional and basin agreements, the VBA does not interact directly with the UNFCCC secretariat. Its partners and the governments of the Parties are in direct contact with that secretariat. Other regional and basin authorities such as those related to the Aral Sea, Mekong River, Nile River and Lake Titicaca participated in an October 2014 workshop in Geneva on climate change and water. In that same vein, the VBA participates in international conferences on climate change, such as the 2014 Fourth Annual Conference on Climate Change and Development in Africa (organized by the UN Economic Commission for Africa), which authorities from other basins also attended.

1909 BOUNDARY WATERS TREATY

The 1909 Boundary Waters Treaty between Canada and the United States established the International Joint Commission (IJC) as the managing authority of the treaty. The treaty only contains one paragraph on pollution and, being over a century old, is understandably silent on climate change. Notwithstanding this spare foundation, the IJC is involved in a number of forward-looking programs, including the International Water Initiative (IWI). In 2009, the IJC identified climate change and vulnerability as an “emerging issue” that requires attention through the IWI. The IJC directed that IWI boards include climate change in their strategic planning process. Some IWI boards reported that they were observing “climate variability” while others reported “noticeable trends.” The International Upper Great Lakes Study prepared under the IWI reviewed climate trends (including modeling of climate scenarios on levels and outflows) and concluded that scientific consensus appears to indicate that “the border area may experience significant climatic changes in the coming decades.” Moreover, the environmental focus of the IJC has been significantly strengthened by subsequent agreements, the most recent of which is the 2012 Protocol to the Great Lakes Water Quality Agreement, which specifically references climate change. It contains the goal of “coordinating efforts to identify, quantify, understand and predict the climate change impacts on
the quality of the Waters of the Great Lakes, and sharing information that Great Lakes resource managers need to proactively address these impacts. These activities are nascent. Regarding the UNFCCC, as with many managing authorities of regional and basin authorities, the IJC has not directly engaged with the UNFCCC secretariat. Rather, the governments of Canada and the United States deal formally with the secretariat and other aspects of the UNFCCC. The 1909 Boundary Waters Treaty is an example of a regional and basin agreement that has evolved to address threats posed by climate change.

**CONCLUSIONS**

Our study revealed an increasing appreciation of the need to protect watercourses and their ecosystems in order to achieve a broad range of goals, such as meeting basic human needs and achieving economic and social progress. RBAs are paying increasing attention to the need to mitigate climate change and to manage its impacts although activities related to this vary widely. By and large, the RBAs do not deal directly with UNFCCC bodies, leaving that to the governments of the Parties to their respective treaties. RBA officials and staff do participate in international workshops regarding climate change, however, and seem aware of the importance of climate change to their mandates. The breadth and variety of water agreements at the basin and regional level reflect their potential for playing a significant role in dealing with climate change. We examine the agreements in more detail in our full report, which is available for public review.

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3. The study was sponsored by the United Nations Environment Programme (UNEP) and was conducted from May to September 2014.
23. Id.
25. Id. at annex 9, pt. A.

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Legal systems, while establishing boundaries and fostering economic and social goals, are nevertheless inherently adaptable and responsive to new challenges. In the context of climate change, law provides a pragmatic perspective on how we might alter water governance to better prepare for accelerated rates of change and surprise as the water-related impacts of climate change unfold. The Adaptive Water Governance Project (AWG Project) is a synthesis project with the National Socio-Environmental Synthesis Center under funding from the National Science Foundation that was borne out of the first conference bringing together legal and resilience scholars in November 2010. The AWG Project explores the role of law in achieving water governance that is capable of facilitating management, adaptation and transformation in the face of climate change. It builds on the work of resilience scholars, proponents of adaptive governance and climate scientists, by asking four questions concerning the role of law in adaptive water governance: (1) What is the role of law in setting boundaries by identifying approaching thresholds or tipping points in a resource system? (2) What is the role of law in creating either a disturbance or window of opportunity in which adaptive forms of governance may emerge? (3) What is the role of law in presenting barriers to adaptive forms of governance? And (4) what is the role of law in actively facilitating adaptive forms of governance?

To answer these questions, the AWG Project assessed the resilience of six North American water basins (Figure 1): Anacostia, Columbia, Klamath, Everglades, Middle Rio Grande, and Platte. The results of these six assessments and an introductory article were published in January 2015 in the first Natural Resources & Environmental Law Edition of the Idaho Law Review. This article provides a brief summary of the initial AWG project findings.

**Resilience and Adaptive Governance: Definitions**

A major challenge of interdisciplinary research is to develop a common language and understanding of concepts to facilitate communication in a collaborative project. The following paragraphs describe the understanding of resilience and of adaptive governance used by the AWG team.

**Resilience:** Resilience is a property of complex systems such as ecosystems or even human brains. Rather than displaying a continuous interaction of structure and function around one particular configuration or state, complex systems can organize into discrete stable states or regimes, each with inherent range of variability. Multiple alternative regimes are possible for systems, and, in the case of ecosystems, each ecological regime provides different ecosystem services. Once a regime shift occurs, it may be difficult to recover (or restore) the original structure and function (e.g. eutrophication of a lake may lead to persistent hypoxic zones). Environmental governance undertaken with an understanding of resilience must, therefore, account for non-linear, abrupt change as well as obstinacy and inertia to change.

**Adaptive Governance:** Governance refers to the means through which political actors choose goals and make decisions and the means through which they take action to achieve those goals; thus, governance includes not only the laws, regulations, policies, and processes of government, but the formal and informal institutional frameworks in which government acts and private actors take a role in the political process as well as the societal norms that influence policy decisions. Adaptive Governance is simply governance that allows adaptive processes to emerge. Adaptive Governance is appropriate when the system is complex (e.g. lies within multiple jurisdictions), the system faces change with a degree of uncertainty (e.g. climate change) and the system is approaching a potential threshold or regime shift as evidenced by increasing conflict over resources (e.g. litigation), increasing scarci-
ty, or actual identification of an approaching threshold by law or science (e.g. listing of species).

The AWG project in general assessed governance needs in six North American river basins within the context of three potential governance trajectories: (1) maintenance of the current benefits of the system; (2) adaptation to reduce vulnerability resulting from loss of system resilience; and (3) navigation of transformation in the face of either an inevitable or desired regime shift. We found that most of our North American basins fall into the second category except for the Middle Rio Grande which may be undergoing an ecological transition in the face of extended drought and the Anacostia which has already transitioned to an urban basin and efforts to restore water quality and aesthetic amenities must take place within an engineered system.

THE ROLE OF LAW IN THE GOVERNANCE OF WATER BASINS IN A CHANGING CLIMATE

Considerable scholarship has developed through empirical observation of the emergence of adaptive forms of governance to solve common pool problems in the face of uncertainty. Rather than reproduce or critique those frameworks, the AWG Project sought to extract those aspects relevant to legal systems by asking: what role may the law play in either preparing a system for adaptive governance or facilitating the adaptive governance process? For further exploration of our basin assessments in the context of the three governance regimes, we refer the reader to the Spring 2015 NREL Edition of the Idaho Law Review. The following paragraphs discuss key aspects of our findings in the context of each of the six basins.

ANACOSTIA RIVER WATERSHED

The Anacostia River runs through Washington, D.C. before entering the Potomac River. The watershed, which extends into Maryland, is largely urban and is home to a million or so residents. As a result of extensive water pollution from land use changes and other sources, the waters of the river are highly degraded. Thus, the Anacostia has transitioned from a natural to an urban watershed in which restoration efforts will require intensive human intervention. One adaptive response has been efforts at restoring water quality under the Clean Water Act. Implementation of this act and subsequent litigation has led to the emergence of local, watershed organizations, thus law has played the role of a disturbance in this watershed with adaptive efforts arising in response to litigation. The Anacostia governance structures are multi-scalar across space (i.e. federalist), and are embedded in larger scale restoration programs (Chesapeake Bay). This provides much of the knowledge and funding necessary for local capacity building and response. Increased resources for the emerging local organizations will be necessary to enhance adaptive capacity as the watershed responds to climate change.

COLUMBIA RIVER BASIN

The might of the Columbia River in the Pacific Northwest was tamed during the first half of the 20th century by large federal investments in dam infrastructure to achieve the social objectives of flood control, navigation, irrigation and hydropower. Thus, regional investment by larger scale levels of government has led to enhanced social benefits. By the later half of the century, the assertion of rights by Native American tribes led to their engagement in governance of fisheries. This major capacity building by formerly marginalized communities was made possible by the recognition of rights in federal court and funding for salmon recovery as a result of the Endangered Species Act. However, there has been a lag in change in dam operations to reflect the new voice at the table. Economic and social development has been largely successful, but its achievement through optimization renders the basin vulnerable to changing climate. While the Endangered Species Act has led to capacity building and influenced governance, it has also constrained the flexibility of managers to meet recovery goals of salmonid populations. In the Columbia River, the scale of governance extends to the international level. Current renegotiations of the treaty with Canada may be an opportunity for increasing management flexibility.

FLORIDA EVERGLADES

The Florida Everglades is a biologically rich, subtropical wetland social-ecological system that supplies water to about 8 million people, a multi-billion dollar agriculture enterprise, and the conservation of biodiversity. Over the past century, the system has successfully promoted economic and social development. But like the Columbia River, this has come at an environmental cost measured in the listing of a dozen endangered species and the imperiled Everglades National Park. As a result, the Everglades Restoration Act of 2000 calls for an adaptive management approach to recovering this vast ecosystem. The Everglades system has many of attributes necessary for adaptive governance such as identified thresholds, the authority to experiment (e.g. adaptive management), and a diversity of institutions. Implementation of adaptive governance, however, is hindered by overly prescribed planning and litigation – leaving the social-ecological system of the Florida Everglades very constrained in its capacity to adapt to climate change. In both the Columbia River Basin and the Florida Everglades, rigid management at higher levels and failure to balance stability of economic investment with flexibility to adjust management measures have formed impediments to implementation of a more flexible adaptive governance.

KLAMATH RIVER BASIN

The Klamath River Basin in south central Oregon and Northern California has been the stage for a classic western water conflict between Native American Tribes, commercial and recreational fishing interests, and environmental groups on one side, and irrigators relying on a
federal reclamation project on the other. The basin’s geography consists of an arid upper basin with rivers, lakes and marshes supporting irrigated agriculture and a lower basin that drains mountainous, forested terrain and provides significant salmon spawning habitat. Between the upper and lower basin, the drainage necks down to pass through the Cascade Mountain Range, while crossing the state line between Oregon and California and providing ideal sites for the development of hydroelectric dams—four of which were developed in the mid-20th century, completely blocking fish passage to the upper basin. Although conflict over water and fish management in the Klamath Basin reached a stage of public protest in 2001, the continued role of law, in particular the Endangered Species Act and the assertion of Native American reserved water rights, has since served as the catalyst for emergence of local adaptive solutions. In a “window of opportunity” created by legal triggers such as relicensing of the Klamath hydropower projects and resolution of Native American water rights, basin communities began to shape a new direction based on collaboration and other aspects of adaptive governance. These solutions, however, remain vulnerable if not institutionalized formally through the legal process.

**Middle Rio Grande Watershed**

The Middle Rio Grande in central New Mexico runs from Cochiti Dam near Santa Fe to Elephant Butte Reservoir south of Albuquerque. Irrigation water rights are held by Native American Pueblos, communities that date to Spanish settlement and current Anglo-Americans. The water is regulated to provide water downstream to both Texas and Mexico, but past management has been modified to protect endangered aquatic species in the river. The interaction of changing social and ecological conditions including: over-allocation of water pursuant to the prior appropriation doctrine; lax management including lack of adjudication to determine relative water rights; development of groundwater hydrologically connected to the river to serve growing urban populations with a lag time yet to be fully felt in the surface flows; separation of the river from the floodplain; and extended drought due to climate change that is not only reducing water supply but altering the upland forest ecosystem and fire regime—have all combined to place the Middle Rio Grande system very close to a threshold. Rigid political adherence and economic dependency on the existing development places the watershed’s society in a vulnerable position. Transition without economic dislocation will require local leadership and capacity building as well as federal investment to restore some of the watershed’s ecologic capacity to adapt and to reduce the degree of water dependency.

**Platte River Basin**

The central Platte River basin in south-central Nebraska has evolved since pre-European settlement, to a system of water laws, policies, and infrastructure designed to meet social needs of irrigation and flood control. The post-European development has come at a high ecological cost to the system including aquatic and riverine habitat degradation and the listing of several endangered species. Recent responses to ecological degradation include a tri-state and federal collaborative Platte River Recovery and Implementation Program with the capacity to coordinate an adaptive approach to system-wide ecological restoration. The Platte River Recovery Program is a first step towards applying an adaptive management approach to restoration at the social-ecological system scale. Implementation of adaptive management can be operationalized through nesting policy in a resilience framework coordinated across scales and different jurisdictions.

All of the basin assessments illustrate an increasing attention to public input and participation in resource decision making. The recognition of treaty-based water and fishing rights of Native Americans in both the Klamath and Columbia Rivers have led to increased participatory capacity from formerly marginalized populations. The emergent collaborative process among irrigators and Native American tribes in the Klamath basin illustrates both the change in power distribution and participatory capacity resulting from litigation and thus its role in opening a window to collaborative processes. This, in turn, has led to consideration of changes in basin management that may enhance general resilience in the face of climate change by focusing attention on the restoration of impaired ecosystem services.

**Synthesis**

Through assessment of these six river basins, the AWG Project has developed an approach to inquiry into the role of law focused on three aspects of governance: structure, capacity, and process.

**Structure**: Structure refers to the multi-level, multi-scalar response needed in the face of uncertainty and requires attention to polycentricity (i.e. overlapping authorities); nesting across spatial scales (e.g. federalism); subsidiarity (used in its original meaning to further individual empowerment within the context of a government that plays “a significant role in fostering the conditions for its implementation”); and integration (referring to both the concept of integrating water resources management across sectors that influence water allocation, quality and land development, and to integration of regulation of physically connected resources such as ground and surface water).

The relation among federal, state, tribal and local governments in the United States lends itself to a structure that is conducive to this type of multi-level, multi-scalar response. Thus we see the results of federalism with strong investment of federal dollars in water development, and a regulatory role in both water quality in all of our basins, and a major influence on water management from federal species protection in the Columbia, Klamath, Middle Rio Grande, Platte and Everglades. We also see that elevating
all issues to the federal level can create a rigidity trap. The attempts at restoration of the Everglades system including implementation through adaptive management illustrates that rigid attention to hierarchy and control at a higher, external level, may present a barrier to adaptability. In contrast, the Klamath basin regionally-based collaboration among tribal and irrigation interests illustrates the federal role in providing both a forum for recognition of formerly marginalized rights as well as facilitation and resources for local resolution of water scarcity issues.

**Capacity:** Capacity encompasses both the resources and authority to respond to change (adaptive capacity), and the right and resources to have a role in decision making (participatory capacity). While attempts have been made to implement adaptive management in both the Columbia River Basin and the Florida Everglades, rigid management at higher levels and failure to balance stability for economic investment with flexibility for adjustment of management measures have formed impediments to implementation.

All of the basin assessments illustrate an increasing attention to public input and participation in resource decision making. The recognition of treaty-based water and fishing rights of Native Americans in both the Klamath and Columbia River assessments have led to increased participatory capacity from formerly marginalized populations. The emergent collaborative process among irrigators and Native American tribes in the Klamath basin illustrates both the change in power distribution and participatory capacity resulting from litigation and its role in opening a window to collaborative processes. This in turn has led to consideration of changes in basin management that may enhance general resilience in the face of climate change by focusing attention on the restoration of impaired ecosystem services.

**Process:** The basin assessments suggest that the tension between the need for flexibility in the face of change and the need for economic stability presents a major barrier to adaptive governance. The AWG Project explores process elements in administrative law as a means to resolve this tension relying primarily on elements of good governance as an essential factor of societal resilience. Social resilience requires that the processes used to achieve adaptive governance incorporate elements of “good governance” focused on equity and justice, captured through the lens of legitimacy and inclusiveness. Inclusiveness is addressed by participatory capacity discussed above. Legitimacy is addressed through processes that place bounds on the exercise of discretion in implementation of flexible management; that consider both biophysical and socio-economic timeframes in setting periods for adjustment; that establish processes to ensure accountability in adjustment of goals; and that provide an avenue for broad, inclusive public input.

These process elements of “good governance” in association with adaptive governance are the least well-developed in our study basins. The origin of adaptive management in scientific literature has led to less attention to the impact of flexibility and adjustment on society. Nevertheless, collaborative processes emerging through settlement of Native American water rights in the Klamath, international treaty review in the Columbia, and watershed organizations in the Anacostia shed some light on both the value and pitfalls associated with inclusive collaboration. The development of tools for integrating processes of good governance into adaptive governance is one of the recommendations the Adaptive Water Governance project will contribute.

**Conclusion**

The assessments of six North American water basins illustrate that with the onset of climate change some of the water supplies relied on in North America are close to irreversible thresholds that, once crossed, will alter availability of natural ecosystem services and the adequacy of engineered infrastructure, potentially impairing existing water-based economies. The AWG project goal is to identify the legal tools necessary for adaptive governance, but it is also clear from the basin assessments that major investment in conservation, green infrastructure, ecological restoration, and re-operation of dams and flood control infrastructure, will be necessary to increase the adaptability of water-based economies in the face of climate change. Once major investment occurs in water infrastructure, it tends to be highly resistant to change. Such inertia is due in part to strong incentives to tinker rather than transform infrastructure, and economic and cultural dependency on extant laws and institutions. Thus, while the massive investment in water infrastructure of the 20th Century vastly improved the lives of several generations of North Americans, the legacy effect is to lock in future generations to infrastructure that is obsolete in terms of the water supply and demand of the coming century, the values of the people who live in these basins, and thus the future economic stability of water dependent communities. In this call for investment, we echo the recent recommendations from the Johnson Foundation in its report on a six-year study of U.S. water systems. It is clear that the ability of those benefiting from the status quo to stall change through litigation and political channels and to obtain federal level subsidies for continued optimization may be moving some basins perilously close to a threshold (e.g. Everglades). Re-analysis of the role of federal investment in water development away from human designed optimization and toward flexibility and experimentation will be key factors in developing adaptive capacity. Nothing short of major investment in re-engineering these systems to modernize them for the 21st Century and a process that recognizes the ongoing need for innovation and investment will suffice.
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1 The Adaptive Water Governance Project is a synthesis project on Social-ecological System Resilience, Climate Change, & Adaptive Water Governance, co-chairs Cosens, B. and Gunderson, L., with the National Socio-Environmental Synthesis Center (SESNUC) under funding from the National Science Foundation DBI-1052875, see http://www.seesync.org/project/water-people-ecosystems/adaptive-water-governance. The authors would like to thank the people at SESNUC for their support and encouragement through this project.


7 Melinda Harm Benson et al., Water Governance Challenges in New Mexico’s Middle Rio Grande River Valley: A Resilience Assessment, 51 IaSOA L. Rev. 195 (2014).


9 The Natural Resources & Environmental Law Edition of the Idaho Law Review is a peer reviewed law journal that welcomes interdisciplinary articles and encourages submission of articles of 10,000 words or less.


11 Note, we also use the term regime shift in the context of social systems, and although collapse and transformation of social systems is documented, there is not (at least at this point) a clearly defined finite set of alternative states.


15 See Arnold et al., supra, note 3.

16 See Cosens & Fremier, supra, note 4.

17 See Gunderson et al., supra, note 6.

18 See Chaffin et al., supra, note 5.

19 See Harm Benson et al., supra, note 7.

20 See Birge et al., supra, note 8.


27 Our initial thoughts on these areas of inquiry for analyzing legal systems are published at Barbara Cosens, et al., Identifying Legal, Ecological and Governance Obstacles, and Opportunities for Adapting to Climate Change, 6(I) SUSTAINABILITY 2338-2356 (2014), available at http://www.mdpi.com/2071-1050/6/4/2338. This article continues the development of this approach.


NOTES & ACKNOWLEDGEMENTS

This third volume of the Special Edition Newsletter Series on Water was a joint effort between the ABA Section of International Law (SIL) and the ABA Section of Environment, Energy, and Resources (SEER) through their four constituent committees: the SIL International Environmental Law Committee (IELC), SEER International Environmental and Resources Law Committee (IERLC), SEER Water Resources Committee, and SIL Europe Committee. Volunteers from each of these committees served as the Editorial Team for this newsletter and provided invaluable expertise during the editing process. Special thanks to Anna Mance, Editor of the previous two publications—Volume 1: Water: Global Perspectives (Summer 2014) and Volume 2: Water: Regional Perspectives (Fall/Winter 2014). SIL IELC Co-Chairs Kim Smaczniak and Renee Martin-Nagle also went above and beyond in reviewing each article and providing feedback in the editing process.

As an introduction for new readers, the SIL IELC serves as a forum for lawyers from private practice, industry, non-profits, academia and government to explore developments in international environmental law and their implications for law, diplomacy, scholarship, and legal education. We also coordinate with other SIL committees to explore the relationship between our field and other legal specialties such as international human rights law and international energy and natural resources law. We also partner with relevant committees in other ABA Sections, particularly the SEER IERLC. Special thanks to the SEER Water Resources Committee and the SIL Europe Committee for being new co-sponsors for this third volume.

Reflecting the growing importance of water in a changing world, the Winter 2015 Issue of the SIL International Law News will have a theme of “Water and Climate Change.” Proposals will be accepted until October 1, 2015. For more information, please contact lisa.comforty@americanbar.org.

We encourage you to get involved with the ABA and join us. For more information, please contact the 2014-15 Co-Chairs of our committees:

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