

**WICP**

Water Information Coordination Program

**ACWI**

Advisory Committee on Water Information

WORKSHOP OF THE  
WATER RESOURCES ADAPTATION TO  
CLIMATE CHANGE WORKGROUP  
OF THE  
ADVISORY COMMITTEE ON WATER INFORMATION

MEETING REPORT AND DISCUSSION OF  
OUTSTANDING NEEDS FOR SUPPORTING  
WATER RESOURCE ADAPTATION EFFORTS

FEBRUARY 2017



**This report is a synthesis of discussions held during the January 2017 meeting of the water resources adaptation to climate change workgroup (WRACCW), which is a sub-group of the Advisory Committee on Water Information (ACWI). The report is intended to be a product of the WRACCW meeting and does not necessarily represent the views of ACWI member organizations or of ACWI as an advisory body.**



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# INTRODUCTION

The Advisory Committee on Water Information (ACWI) is chartered under the Federal Advisory Committee Act to advise the Federal Government on a broad range of topics related to water information, management, and programs.

In 2012, the Water Resources Adaptation to Climate Change Workgroup (WRACCW) was created as a subcommittee of ACWI to promote, support, and provide information for effective management and protection of water resources in the United States as the climate changes. The Workgroup also advises Federal agencies on water policy as it relates to climate change adaptation and serves as a public forum for Federal, State, Tribal, and local government organizations and public interest, industry, and professional organizations to exchange information and develop ideas concerning adapting water resources to a changing climate. More information about the Workgroup is available at: [https://acwi.gov/climate\\_wkg/index.html](https://acwi.gov/climate_wkg/index.html).

On January 10 and 11, 2017, the Workgroup meet in Herndon, Virginia, to consider key policy challenges related to climate change and water resources and to develop recommendations for the new Administration concerning priority actions that Federal agencies should take to improve water resources management in a changing climate. The agenda for the meeting is provided in the appendix to this report along with a list of Workgroup members and meeting participants. Five “policy challenges” were considered by the Workgroup:

- Promoting State Water Resources Planning for Climate Resilience
- Defining Incentives and Support for Corporate Water Resilience
- Strengthening State and Local Flood Reduction Planning, Practices and Measures
- Promoting Climate Resilience of New Federal Water Infrastructure Investments
- Improving Planning and Financing of Natural Infrastructure for Climate Resilience

Each challenge was addressed by a panel of experts and discussed by the full Workgroup. The Workgroup also considered the recommendations provided in a recent report by Federal agencies describing actions planned for the near future to support the resilience of water resources ([https://acwi.gov/climate\\_wkg/iwrcc/2016\\_nap\\_final\\_20161129.pdf](https://acwi.gov/climate_wkg/iwrcc/2016_nap_final_20161129.pdf)). Based on these discussions, panel moderators drafted short summaries of insights and recommendations for key steps the new Administration should consider to address these challenges. This report provides the summaries of discussions and recommendations in each policy challenge area. A more detailed summary of the meeting is available at: [https://acwi.gov/climate\\_wkg/index.html](https://acwi.gov/climate_wkg/index.html).

This report was considered and adopted by the Workgroup at a February 9 meeting. The Workgroup also voted to forward the report to the full ACWI. The report, however, is a description of the discussions occurring at the meeting; it has not been endorsed by organizations or agencies represented on the Workgroup.

An executive summary of the recommendations offered in the report is provided below.

### **POLICY CHALLENGE 1: Promote State Water Resources Planning for Climate Resilience**

1. Maintain and promote platforms for discussion and problem solving of water issues, such as the Advisory Committee on Water Information
2. Ensure continuity of existing long-term basic water monitoring programs
3. Strengthen existing monitoring and data networks and develop new networks
4. Develop better products and tools that help decision-makers use water data
5. Facilitate State compliance with Federal laws to advance more effective integrated water resources planning

### **POLICY CHALLENGE 2: Define Incentives and Support for Corporate Water Sustainability**

6. Continue to provide high-quality data to support corporate water stewardship initiatives
7. Develop opportunities for government/industry partnerships and collaboration to solve water resource challenges

### **POLICY CHALLENGE 3: Strengthen State and Local Flood Risk Reduction Practices**

8. Expand floodplain mapping and support State and community efforts to reduce flood risks
9. Place more emphasis on assisting people to either relocate to higher ground or elevate their property to decrease their long-term vulnerability to flooding
10. Fully implement the Federal Flood Risk Management Standard
11. Help more communities to participate in the National Flood Insurance Program (NFIP) Community Rating System (CRS)
12. Motivate stakeholders to invest their own resources and innovate to develop resilient plans that maximize long-term economic value
13. Encourage a balanced approach to planning green and gray infrastructure projects

### **POLICY CHALLENGE 4: Promote Resilience of New Federal Infrastructure Investments**

14. Leverage existing legislation to support proactive steps for hazard and flood mitigation
15. Promote a holistic, systems approach for infrastructure
16. Coordinate infrastructure reviews
17. Expand funding for research and strengthen verification of new technology

### **POLICY CHALLENGE 5: Improve Planning and Financing of Natural Infrastructure**

18. Prioritize use of restoration and nature-based solutions to water resources problems in Federal planning and construction
19. Protect existing natural systems and floodplains to the maximum extent possible by ensuring that Federal permitting and other actions do not damage natural systems
20. Advance scientific, engineering, and economic information on use of restoration and nature-based solutions and publicize the efficacy of these solutions
21. Provide more flexible, cross government funding sources and partnerships to expand the use of restoration and nature-based solutions and recognition of benefits

# POLICY CHALLENGE #1

## PROMOTE STATE WATER RESOURCE PLANNING FOR CLIMATE CHANGE RESILIENCE

**ABSTRACT:** *State agencies play a central role in water resources management and some States have developed water resources management plans with strong climate adaptation elements while others have not. What incentives or practices should the Federal Government adopt to promote wider development of climate resilient water management plans by States?*

### RECOMMENDATIONS:

1. Maintain and promote platforms for discussion and problem solving of water issues, such as the Advisory Committee on Water Information
2. Ensure continuity of existing long-term basic water monitoring programs
3. Address opportunities to strengthen existing monitoring and data networks and develop new networks
4. Develop better products and tools that help decision-makers use water data
5. Facilitate State compliance with Federal laws to advance more effective integrated water resources planning

With a changing climate, promoting water resource planning at the State level is crucial to maintaining resiliency. Thriving municipalities, attracting and keeping industries, growing agriculture, ensuring vibrant recreation opportunities and a healthy environment all rely on safe and reliable water.

**Maintain and Promote Platforms for Discussion of Water Problems:** Waters are primarily protected by local, State, and Federal programs. Interstate and intrastate organizations are key players in staying attune to resource issues and planning for the future. Providing platforms for ample communication, coordination, and problem-solving, among mission-focused organizations enable resiliency and preparedness to deal with issues. **Platforms for discussion and problem solving of water issues, such as the Advisory Committee on Water Information, are critical for effective protection of State water resources.**

States and their political subdivisions administer water rights, operate water supply and flood control projects, manage environmental in-stream flows, administer State water quality and drinking water programs, and administer regulatory programs on behalf of the Federal Government (e.g.; Clean Water Act, Safe Drinking Water Act). Good decisions will continue to need reliable and ample water data. States have very limited funding for data collection and processing. Priorities within State resources and programs are regularly challenged by timing, funding, statutory requirements, and are often determined by urgency or emergency.

To ensure that States have the data they need to support effective water resources planning, Federal agencies need to foster collaboration and coordination in management of existing water data systems as well as provide for modernizing the way data is collected to improve and expand the applications for which data are used. Coordination of data efforts, when provided

by the Federal Government, enhances State staff time and resources available for planning with the data as well as States' abilities to make sound recommendations and decisions.

**Sustain and Strengthen Existing Water Data Networks:** Water data networks, such as the Natural Resources Conservation Service (NRCS) snow surveys program, U.S. Geological Survey (USGS) streamgaging and groundwater monitoring network programs, and National Weather Service Co-operative Observer Program provide an indispensable record of changing water resources from which to evaluate changes over time. **Ensuring continuity of existing long-term basic water monitoring programs is crucial for State and local water management.**

In addition, **Federal agencies should strengthen existing water data networks and develop new networks**, such as agricultural weather networks for monitoring evapotranspiration and other variables used for irrigation scheduling to improve agricultural water use efficiency. Presenting existing data from new perspectives, and allowing for data to be interpreted differently if appropriate (for example, downscaling), instead of planning for a water resource future based on historical readings and practices that were not influenced by a changing climate, will contribute to more successful State resiliency planning and adaptation abilities. Federal agencies should also consider opportunities to improve metrics for the economic value of water and the economic benefits of adequate supplies of clean water.

**Help Decision-Makers Use Water Data Effectively:** Raw data generated by water monitoring networks can be difficult to interpret or apply to a specific decision. **Federal programs also need to develop better products and tools that help decision-makers use water data**, such as improving the skill of the National Oceanic and Atmospheric Administration's (NOAA) sub-seasonal to seasonal precipitation outlooks to support more efficient operation of water supply and flood control infrastructure both now and in the future. Similarly, Federal guidance for flood frequency analysis (Bulletin 17B) to support engineering and planning decisions needs to be updated to incorporate climate non-stationarity. Improving these tools is especially helpful for non-Federal decision-makers.

**Facilitate State Compliance with Federal Laws to Advance More Effective Integrated Water Resources Planning:** Integrated water resources planning efforts always take more time and resources but usually result in a more relevant and useful product. In addition to improving Federal water data and tools, **Federal agencies should facilitate State agency compliance with the requirements of Federal laws with a particular focus on assisting States in situations where water resources planning implicates multiple Federal statutes** (e.g.; where a drinking water supply project might implicate both Endangered Species Act and Clean Water Act requirements). Reducing the time that States must spend on navigating such Federal requirements could further enable integrated planning and would be helpful to prevent time and resources from being consumed by non-planning activities.



## POLICY CHALLENGE #2

# DEFINE INCENTIVES AND SUPPORT FOR CORPORATE WATER SUSTAINABILITY

**ABSTRACT:** *Corporate sustainability programs have the potential to improve water use by the private sector and promote more climate resilient investments related to water. What programs, incentives, or support can the Federal Government undertake to strengthen corporate water sustainability and encourage corporate adoption of water sustainability programs and practices?*

### RECOMMENDATIONS:

6. Continue to provide high-quality data to support corporate water stewardship initiatives
7. Develop opportunities for government/industry partnerships and collaboration to solve water resource challenges

Businesses have an interest in water sustainability and in working collaboratively on water resource management. Drivers of water sustainability vary by sector and individual company, but typically include—

- operational efficiency;
- supply chain stability;
- commitment to a healthy environment for employees, customers, neighbors, and other stakeholders; and
- the need to preserve a company’s social license to operate.

Corporate resilience, which companies conventionally might express as business continuity, is a key strategic goal.

Companies, non-governmental organizations (NGOs), and water stewardship professionals have developed tools, frameworks, and protocols to help companies assess vulnerability to water and climate risks. Many companies interested in water stewardship start the process by assessing risk and vulnerability related to water and climate. Companies that identify significant water risk then identify and implement actions to reduce risk and vulnerability.

Companies heavily invested in water stewardship and efficiency initiatives often participate in collaborative efforts around water resource management with NGOs, State and local governments, and other stakeholders. These collaborations help align corporate and community risks, and enable companies to work with policymakers to develop strategies for addressing the risks collectively “beyond the fence line” and even at the watershed level. Companies can help governments understand the business case and return on investment for water resource investments. The government can engage and inform the public about

corporate water stewardship initiatives to enhance the business case for additional resilience and water resource protection programs.

The Federal Government can take several steps to encourage companies to assess and address water sustainability and climate change challenges.

**Support Corporate Water Stewardship with High-Quality Water Data:** Many of the existing tools and protocols that have been developed to help companies assess vulnerability and demonstrate good water management and climate resilience rely on government monitoring networks and data sets to provide information about streamflow, water quality, watershed conditions, and climate trends and predictions. **The Federal Government needs to continue to provide high-quality data to support corporate water stewardship and efficiency initiatives.** More specifically, the Federal Government should—

- continue investment in government monitoring networks to ensure data completeness, reliability, and continuity including—
  - new investment to enable data collection at more frequent intervals;
  - regular upgrades and updates to statistical, analytical, and sampling methodologies to enhance data reliability; and
  - increased effort to reduce uncertainty (e.g.; when projecting future conditions);
- promote more collaboration between government and industry (particularly with companies in the technology sector) for the purpose of developing and integrating “smart” technologies into monitoring networks; and
- increase availability of “right-scaled” data and information (e.g., at the watershed level) to improve the effectiveness of corporate mitigation strategies and more accurately assess progress toward shared goals.

**Support Partnerships and Collaboration: The Federal Government needs to develop opportunities for government/industry partnerships and collaboration to solve water resource challenges.** The Federal Government can convene partners across Federal, State, and local governments, academia, NGOs, water users from various sectors, and other water resource managers and stakeholders to develop strategies for addressing risks related to water. A key objective of these partnerships should be to achieve consensus on shared goals and on appropriate metrics for measuring progress. Partnerships and collaboration can—

- result in “scaled-up” initiatives for addressing water and climate risks, thereby leveraging company and government resources to generate impact that companies cannot achieve on their own;
- address trust deficits that may exist by demonstrating multi-sector buy-in and enhancing the credibility of corporate and government programs; and
- enhance the dialogue between the government and industry about water stewardship and adaptation.

## POLICY CHALLENGE #3

### STRENGTHEN STATE AND LOCAL FLOOD REDUCTION PLANNING, PRACTICES, AND MEASURES

**ABSTRACT:** *Flooding is the cause of significant loss of life and property across the country and climate change is likely to increase flooding in river systems and coastal areas. What should Federal agencies do to support or promote development of local and State plans, practices, or measures that will reduce the harm caused by increased flooding?*

#### RECOMMENDATIONS:

8. Expand floodplain mapping and support State and community efforts to reduce flood risks
9. Place more emphasis on assisting people to either relocate to higher ground or elevate their property to decrease their long-term vulnerability to flooding, rather than rebuilding in the same at-risk location
10. Adopt necessary changes in policy to fully implement the Federal Flood Risk Management Standard
11. Help more communities to participate in the Community Rating System program
12. Motivate stakeholders to invest their own resources and innovate to develop resilient plans that maximize long-term economic value
13. Encourage an integrated and balanced approach to planning green and gray infrastructure projects

The Workgroup discussed actions Federal agencies can take to help States and localities reduce flood damages and strengthen their economies by improving floodplain planning policies, sharing information, and motivating stakeholders.

**Expand and Strengthen Floodplain Mapping:** Approximately one-third of the Nation has not had flood maps prepared by the Federal Emergency Management Agency (FEMA), and only 18 percent of FEMA flood maps have been updated to show both the "100" and "500-year" floodplains. **The Federal Government should continue updating floodplain maps, as well as mapping flood hazard areas not yet mapped, to help States and communities improve efforts to reduce flood risks and the impacts of flooding.** More specifically, the Federal Government should take the following steps:

- **Complete Flood Risk Mapping:** The Federal Government should implement the flood risk mapping recommendation of the Association of State Floodplain Managers:  
"Complete flood risk mapping for the entire nation and fully fund and implement the National Flood Mapping Program (NFMP) as authorized by Congress in the 2012 National Flood Insurance Program Reform (at \$400 million/year budget from appropriated funds), and fund map maintenance and regular map updating as continuation of the NFMP".

- **Map Areas of Expected Future Flood Risk:** Flood management planning is further complicated by uncertainties associated with sea level rise and changes in flood probabilities as increased rainfall events and patterns change over time. The FEMA Technical Mapping Advisory Council's has recommended that the National Flood Mapping Program supplement its flood maps with a map layer showing expected future flood risk. New York City will be the first location where FEMA develops these maps, incorporating information about future risk of sea level rise and coastal storm surge.
- **Expand Flood Information Available to Communities:** Several Federal agencies have piloted software to help planners identify flood zone risks, such as USGS' Colorado Flood Database and NOAA's Coastal Flood Exposure Mapper. In addition, FEMA collects a great deal of historical data on flood damages and costs through the National Flood Insurance Program (NFIP). These data, however, are not readily available to the public. FEMA should publish more of its data related to the National Flood Insurance Program (e.g.; data on flood insurance damages, policies, repetitive and severe repetitive loss properties, and community compliance with NFIP provisions) and develop comprehensive tools that help identify historic flood areas and future flood risks.

**Encourage Elevation or Relocation:** It has been estimated that between 4 and 13 million people in the United States could be displaced by rising sea levels by the end of this century. Flooding is not just a coastal problem, as flooding has also increased in many other parts of the country due to increased intensity of rainfall events and is projected to become more frequent or severe in the future. The 30,000 most flood prone properties in the NFIP have been flooded and rebuilt an average of five times at a cost of \$5 billion. These properties account for 0.6 percent of insured properties, but 10.6 percent of all losses paid out by NFIP. Every dollar spent on avoiding future damages returns four dollars in benefits and avoided losses.

In light of these trends, **Federal agencies, particularly FEMA, should place more emphasis on assisting people to relocate to higher ground or elevate their property to decrease their long-term vulnerability to flooding, rather than rebuilding in the same at-risk location.**

**Implement Federal Flood Risk Management Standard:** The recently adopted Federal Flood Risk Management Standard adds a margin of safety above the "100-year" flood elevation and is an important step toward protecting public buildings, facilities, and infrastructure, as well as the Federal taxpayer. This standard updates a previous flood protection standard that had been in effect since the 1970s. The updated standard also directs agencies to account for sea level rise and future climate impacts, where practicable, and requires agencies to first consider areas outside of the floodplains of rivers and coastal areas whenever possible. **All Federal agencies that have not already done so should adopt the necessary changes in policy to fully implement the Federal Flood Risk Management Standard.** Note that this recommendation also supports the goal of making Federal water infrastructure investments more resilient to climate change (see Policy Challenge #4).

**Help Communities Participate in the Community Rating System:** NFIP's Community Rating System (CRS) is an incentive program that encourages community flood risk reduction actions. Flood insurance policy holders in CRS communities receive a reduced insurance premium.

FEMA has expanded the Community Rating System to encourage communities to adopt a wider range of flood resilience programs and practices. Despite these benefits, only 1,391 communities participate in CRS, out of more than 22,000 communities who are part of the National Flood Insurance Program (NFIP). **FEMA should help more communities to participate in the CRS program.** Some key steps toward this goal include—

- educating local decision-makers and their staffs on the dollars saved by keeping people out of harm's way, the potential changes to flood hazard areas, and how they are part of a larger watershed system that can be affected by upstream development decisions;
- allowing counties and regional municipal organizations to participate in the program, rather than just municipalities; and
- assisting communities with the initial administration costs of participating in the program by returning some portion of insurance premium reductions now available to homeowners directly to local governments.

**Encourage Innovation:** Federal agencies making grants for floodplain development and protection should **encourage innovation by continuing to ensure linkage between funding and plans that motivate stakeholders to invest their own resources and innovate to develop resilient plans that maximize long-term economic value.** The Department of Housing and Urban Development (HUD) and FEMA have both sought innovative ways of accomplishing this:

- HUD partnered with nonprofits and the philanthropic sector to launch the “Rebuild By Design Hurricane Sandy Design Competition”. On a national scale, in 2016, HUD’s National Disaster Resilience Competition awarded \$1 billion in block grants to eight States and five localities for resilient housing and infrastructure projects in States and communities recently affected by major disasters.
- FEMA is currently considering a “Disaster Deductible,” to encourage State investments in flood hazard mitigation before disaster strikes. This would establish a predetermined level of State disaster funding or investment in resilience before FEMA will provide additional assistance through the Public Assistance program following a disaster.

**Promote Green Infrastructure:** EPA and other Federal agencies currently provide technical information on "green" or "natural" infrastructure as well as the economic, environmental, and social benefits of using this approach to reduce flood losses. In many cases, a combination of green and traditional gray infrastructure is most feasible. **Federal, State, and local policy should encourage a balanced approach to planning green and gray infrastructure projects.** Many areas are good sites for incorporating natural infrastructure measures, while in urban areas, high real estate values and compact development patterns can make using a combination of gray and green infrastructure more challenging. Life cycle cost-benefit analysis of gray and green infrastructure ensures that all the economic and environmental costs and benefits of both structural and non-structural approaches are considered. Even where green infrastructure has less per-dollar flood benefit than gray designs, its environmental and social benefits can still make it more valuable if included in the cost/benefit analysis.

## POLICY CHALLENGE #4

### DEFINE PRIORITIES AND CRITERIA FOR CLIMATE RESILIENT FEDERAL WATER INFRASTRUCTURE INVESTMENTS

**ABSTRACT:** *A new Administration may consider a major investment in infrastructure, including upgrading of water infrastructure. What policies, priorities, and criteria might the Federal Government adopt to make these new investments as climate resilient as possible? What other kinds of support should the Federal Government undertake to encourage this?*

#### **RECOMMENDATIONS:**

14. Leverage existing legislation to support proactive steps toward hazard and flood mitigation
15. Promote a holistic, systems approach for infrastructure
16. Coordinate infrastructure reviews
17. Expand funding for research and strengthen verification of new technology

The Nation's water infrastructure is aging and deteriorating, with many water pipes and mains having been built over 100 years ago. The American Society of Civil Engineers gave our drinking water and wastewater infrastructure a grade of "D" in their most recent Report Card for America's Infrastructure. It is estimated that a water main breaks every two minutes. The effects of climate change only exacerbate these challenges.

As agencies undertake projects to replace and modernize these aging assets, it is imperative that these significant investments are resilient and cost-efficient. Resilient and reliable infrastructure is able to respond and bounce back from natural disasters, it builds in redundancies, and vulnerabilities are minimized to the greatest extent possible.

Utilities have been preparing to make these investments for infrastructure resilience but it is not without cost. The National Association of Clean Water Agencies and the Association of Metropolitan Water Agencies estimate that it will cost water and wastewater utilities \$448 to \$944 billion through 2050 to adapt to climate change. These adaptation expenses come at a time when water utilities of all sizes across the country are already facing mounting costs to maintain and operate their infrastructure amidst tightening budgets and concerns about rate affordability.

Yet, despite the significant upfront costs, making resilient infrastructure investments is cost-effective. Emphasizing resilience upfront in the design and planning process results in water infrastructure projects with lower lifecycle costs and greater ability to withstand the effects of Mother Nature including storms, floods and drought. In New York City, investments are prioritized by watershed protection, infrastructure upgrades, monitoring and evaluation, and green infrastructure. For example, New York City adopted a Green Infrastructure Plan in 2010

when it found that the strategy would reduce combined sewer overflow volumes at significantly less cost to New Yorkers than the traditional infrastructure strategy. Similarly, after Hurricane Sandy, New York found that investing \$315 million in protecting wastewater facilities from future storms could save the City \$2.5 billion from repeated flood damages.

Economic growth across the Nation requires resilient infrastructure. Businesses cannot afford an interruption in water service and therefore they recognize water availability and water service as a top priority. Aging water infrastructure is a risk to the Nation's economy, but also presents a tremendous opportunity to reinvest and rebuild in a resilient manner and also rethink how we manage water, life's most precious resource.

With that in mind, there are several steps the Federal Government should consider when investing in water infrastructure to strengthen resilience.

**Leverage Existing Legislation to Support Proactive Steps Toward Hazard/Flood Mitigation:**

Many water agencies are taking proactive steps towards hazard/flood mitigation and the Federal Government should incentivize more agencies to do the same. It is far more costly to respond to natural disasters, such as Hurricane Sandy, that can wreak havoc on infrastructure systems than to put systems in place ahead of time that can withstand these events. **Existing financing programs such as State Revolving Loan Funds and the Water Infrastructure Financing Authority (WIFA) should allow for funds to be used for hazard mitigation and other proactive measures that can boost resiliency outcomes.** Funds should also be matched at the State or local level to better leverage existing dollars. Finally, the recent bipartisan passage of the WRDA bill in Congress should be applauded and upheld for incorporating resilience standards.

**Promote a Holistic, Systems Approach for Infrastructure:** The Federal Government also has an opportunity to think holistically when it comes to infrastructure upgrades and strengthening management and operation practices to improve resilience. Some of the most resilient infrastructure responds to multiple threats. Stormwater is impacted by the way that roads are designed, water and sewer pipes running underground can be repaired when a road is being dug up, and green infrastructure can be integrated into transportation and other infrastructure designs – these are just a few examples of how infrastructure overlaps and there are ways to coordinate projects between departments to achieve better outcomes. **This is done at a local level to a limited extent and the Federal Government could lead the way in expanding these more coordinated approaches.**

EPA's advancement of integrated planning, by which a local government may approach waste- and storm-water obligations holistically and prioritize risks, may provide a framework for water utilities to consider climate change adaptation in a broad range of infrastructure planning. To date, integrated planning typically has been done within the confines of the Clean Water Act. A more robust cost-benefit analysis of projects across the water resources spectrum to include drinking water infrastructure that would also incorporate parameters and co-benefits such as ecosystem services, minimizing flooding and sewer backups, and improved reliability across infrastructure sectors could be helpful in this regard.

**Coordinate Infrastructure Reviews:** Long-lead times in getting multiple project approvals can slow project implementation and add to costs. **The Federal Government should look for opportunities to coordinate reviews and permitting, using partnerships, to improve project planning without diluting environmental protections or the environmental review process.** Coordinating an approach across Federal agencies for non-regulatory programs that support resilience—such as grant funding requirements could help advance resilient projects. The more Federal agencies can holistically support multiple outcomes or cross-sector solutions to resilient challenges before they are needed, rather than waiting until after a disaster, the better.

**Expand Funding for Research and Strengthen Verification of New Technology:** Small and large water utilities alike can benefit from research and new technologies as a way to boost capacity, reduce costs, and build resilience to a changing climate and other challenges. For a utility, failure to provide and treat water safely and reliably is not an option and they cannot afford to try new methods that are not proven or tested. **There is an opportunity for the Federal Government to spur innovation in this sector by providing research dollars and large-scale testing and evaluation to validate new ideas and technologies.** Design competitions, innovation grant programs, and technology clusters could all prove beneficial in ensuring that the next generation of infrastructure investments are resilient and based on the best information available.



## POLICY CHALLENGE #5

# IMPROVE PLANNING AND FINANCING OF NATURAL INFRASTRUCTURE FOR CLIMATE RESILIENCE

**ABSTRACT:** *Building the adaptive capacity of water resources to a changing climate will require investing in the natural infrastructure needed to strengthen watershed resilience to flooding and drought and help fish, animals, and plants adapt to changing climatic conditions. What should the Federal Government do to promote planning and financing for such natural infrastructure?*

### RECOMMENDATIONS:

18. Prioritize use of restoration and nature-based solutions to water resources problems in Federal planning and construction
19. Protect existing natural systems and floodplains to the maximum extent possible by ensuring that Federal permitting and related actions do not damage natural systems
20. Advance scientific, engineering, and economic information on the use of restoration and nature-based solutions and publicize the efficacy of these solutions
21. Provide more flexible, cross government funding sources and partnerships to expand the use of restoration and nature-based solutions and recognition of benefits

For decades, Federal water resources planning has focused primarily on the use of gray infrastructure (e.g., levees, dams, dikes, revetment, river channelization) to address flooding and other water resources problems. Federal permitting has also approved extensive construction in the Nation's waters. While these projects and permits have provided benefits, they have also caused significant—and often avoidable—harm to rivers, coasts, wetlands, and floodplains and the many vital and free services those resources provide. The health of these already degraded systems continues to decline due to rising sea levels, rising water temperatures, salt water intrusion, invasive species, and the increasing frequency and intensity of extreme drought and storm events.

It is imperative that the Federal Government embrace a new paradigm for water resources planning and permitting that protects both communities and water resources. Using restoration and nature-based approaches to solve water resource problems whenever possible lets nature work for people and can be a cost-effective way to protect communities from storms and floods, create jobs and economic opportunities, and increase resiliency of waters.

Healthy natural systems that support diverse populations of fish and wildlife are a major economic driver. The U.S. Fish and Wildlife Service reports that in 2011, fishing, hunting and wildlife-associated recreation contributed \$145 billion to the economy. Restoration projects are important creators of jobs that are inherently local. Restore America's Estuaries reports that coastal restoration "can create more than 30 jobs for each million dollars invested" which

is “more than twice as many jobs as the oil and gas and road construction industries combined.”

**Prioritize Use of Restoration and Nature-based Solutions:** A key step the Federal Government can take to strengthen water resources management is to **make restoration and nature-based solutions a priority in Federal planning and construction to address water resource problems.** In the event that robust planning establishes that gray infrastructure is necessary, nature-based features which provide better outcomes and values should also be included. The Army Corps of Engineers should utilize restoration and nature-based solutions where they can provide appropriate outcomes and benefits and are cost-effective. The Corps should use concepts embedded in the *Principles, Requirements, and Guidelines for Federal Investments in Water Resources* currently applicable to all other Federal agencies.

**Protect Existing Natural Systems and Floodplains:** Existing natural systems and floodplains should be protected to the maximum extent possible by **ensuring that Federal water resources activities and Federal permitting do not damage natural systems** and do not encourage development in floodplains and high risk areas. Permitting requirements should be strictly applied to prevent damage to natural systems that reduce flood damages.

**Advance Scientific, Engineering, and Economic Information on Nature-Based Solutions and Ecosystem Goods and Services:** The Federal Government needs to expand efforts to develop information on the use of restoration and nature-based solutions and demonstrate the application of these approaches. **This work should include scientific studies of the use of these practices in differing circumstances and the development of engineering performance data, practices and methods that can support the wider implementation of the practices.** Long-term monitoring of restoration and nature-based water resources activities should also be carried out to guide adaptive management activities and learn for the future. Federal agencies should use pilot and demonstration projects to demonstrate restoration and nature-based approaches to diverse Federal agencies and stakeholders. Policies may need to be modified to encourage innovation needed to develop more creative solutions that allow flexibility.

In addition, more **information is needed concerning the economic characteristics of restoration and nature-based solutions to water resource problems, including costs and quantified benefits of ecosystem goods and services.** Federal agencies should develop methods for benefit-cost analyses that evaluate how various project plans fully incorporate the evaluation of ecosystem goods and services (including gains in ecosystem services as a project benefit and losses of ecosystem services as a project cost) and a project’s life-cycle costs, including the costs of operating, rehabilitating, and decommissioning gray infrastructure.

**Provide More Flexible Funding Sources:** The Federal Government should provide more flexible funding sources for natural infrastructure and coordinate across government funding sources and partnerships to expand the use of restoration and nature-based solutions. For example, the Federal Government should promote the use of post-disaster grants to support restoration and nature-based solutions in lieu of, or in combination with, rebuilding gray infrastructure, where appropriate.

# APPENDICES

**FINAL AGENDA**  
**Meeting of the Climate Change and Water Resources Workgroup**  
**of the**  
**Advisory Committee on Water Information (ACWI)**  
**January 10-11, 2017**  
**Crowne Plaza Dulles in Herndon, Virginia (Washington DC area)**

**OBJECTIVES OF MEETING**

- Consider key policy challenges related to climate change and water resources including:
  1. Promoting State Water Resources Planning for Climate Resilience
  2. Defining Incentives and Support for Corporate Water Resilience
  3. Strengthening Local Flood Reduction Planning, Practices and Measures
  4. Promoting Climate Resilience of New Federal Water Infrastructure Investments
  5. Improving Planning and Financing of Natural Infrastructure for Climate Resilience
- Develop recommendations for the new Administration concerning key actions that Federal agencies should take to address these and other challenges for improving water resources management in a changing climate.
- Review existing Federal agency plans and priorities for climate change adaptation for water resources, including the White House “Climate Opportunities” report and the interagency report on climate and water resources (i.e.; “Looking Forward” report).
- Agree on process for providing recommendations to full Advisory Committee on Water Information and conduct other Workgroup business.
- Inform Workgroup members about Workgroup mission and climate change interests and activities of member organizations and nonmembers.

## TUESDAY JANUARY 10

8:30           **REGISTRATION OPENS**

9:00           **WELCOME and OPENING REMARKS**

Co-chairs Paul Freedman; Water Environment Federation and Jeff Peterson; US Environmental Protection Agency

9:10           **WORKGROUP INTRODUCTIONS**

Each Workgroup member will be asked to give a short introduction that includes:

- Name and organization you represent
- One of your organization's most significant climate change adaptation activities or accomplishments

10:00          **PRESENTATION AND DISCUSSION: *Looking Forward: Priorities for Managing Freshwater Resources in a Changing Climate***

White House Council on Environmental Quality; Charles Kovatch; Deputy Associate Director for Water

10:30          BREAK

10:45          **POLICY CHALLENGE 1: PROMOTING STATE WATER RESOURCE PLANNING FOR CLIMATE CHANGE RESILIENCE**

*ABSTRACT: State agencies play a central role in water resources management and some States have developed water resources management plans with strong climate adaptation elements while others have not. What incentives or practices should the Federal Government adopt to promote wider development of climate resilient water management plans by States?*

PANEL:

- Association of State Drinking Water Administrators; Brandon Kernen
- Groundwater Protection Council; Marty Link; Nebraska Department of Environmental Quality
- Western States Water Council; Jeanine Jones; California Department of Water Resources

Moderator; Association of Clean Water Administrators; Jeff Manning; North Carolina Department of Environmental Quality

12:00          **NETWORKING LUNCH** (Lunches on site for a nominal fee or Bring Your Own)

1:00

**POLICY CHALLENGE 2: IDENTIFY FEDERAL INCENTIVES AND OTHER SUPPORT TO STRENGTHEN WATER ELEMENTS OF CORPORATE SUSTAINABILITY AND CLIMATE RESILIENCE PLANS**

*ABSTRACT: Corporate sustainability programs have the potential to improve water use by the private sector and promote more climate resilient investments related to water. What programs, incentives, or support can the Federal Government undertake to strengthen corporate water sustainability and encourage corporate adoption of water sustainability programs and practices?*

**PANEL:**

- World Resources Institute; Paul Reig; Associate; Water Program and Business Center
- Pacific Institute/UN CEO Water Mandate; Jason Morrison; President and Corporate Sustainability Program Director
- Coca-Cola; Jon Radtke; Water Resource Sustainability Manager

Moderator; Kathryn Buckner; President; Council of Great Lakes Industries

2:30

**BREAK**

2:45

**POLICY CHALLENGE 3: PROVIDE SUPPORT AND CREATE INCENTIVES FOR LOCAL FLOOD REDUCTION**

*ABSTRACT: Flooding is the cause of significant loss of life and property across the country and climate change is likely to increase flooding in river systems and coastal areas. What should Federal agencies do to support or promote development of local and State plans, practices, or measures that will reduce the harm caused by increased flooding?*

**PANEL:**

- Association of State Floodplain Managers; John McShane; Environmental Scientist
- American Water Resources Association; Carol Collier; Senior Advisor for Watershed Management and Policy
- Natural Resources Defense Council; Rob Moore; Senior Policy Analyst, Water Program

Moderator; American Society of Civil Engineers; Mitch Heineman; CDM Smith

4:00

**BREAK**

4:15

**POLICY CHALLENGE 4: DEFINE PRIORITIES AND CRITERIA FOR CLIMATE RESILIENT FEDERAL WATER INFRASTRUCTURE INVESTMENTS**

*ABSTRACT: A new Administration may consider a major investment in infrastructure, including upgrading of water infrastructure. What policies, priorities, and criteria might the Federal Government adopt to make these new investments as climate resilient as possible? What other kinds of support should the Federal Government undertake to encourage this?*

PANEL:

- Water Utility Climate Alliance; Allen Cohen; New York City Department of Environmental Protection
- National Association of Clean Water Agencies (NACWA); Kristina Surfus; Manager, Legislative Affairs
- Association of Metropolitan Water Agencies; Erica Brown; Chief Strategy and Sustainability Officer

Moderator: US Water Alliance; Emily Feenstra; Deputy Director

5:30

**END OF DAY ONE;** No host bar; dinner on your own

**WEDNESDAY JANUARY 11**

8:30

**COFFEE AND NETWORKING**

9:00

**DAY ONE SUMMARY AND DAY 2 REMARKS:** Paul Freedman; Co-chair; ACWI Climate Change Workgroup

9:15

**POLICY CHALLENGE 5: FINANCING INVESTMENTS IN NATURAL INFRASTRUCTURE FOR CLIMATE RESILIENCE**

*ABSTRACT: Building the adaptive capacity of water resources to a changing climate will require investing in the natural infrastructure needed to strengthen watershed resilience to flooding and drought and help fish, animals, and plants adapt to changing climatic conditions. What should the Federal Government do to promote planning and financing for these natural infrastructure investments?*

Examples of natural infrastructure include:

- dune systems providing storm surge buffers;
- wetlands to build flood and drought resilience;
- corridors that allow fish, animals, and plants to migrate as the climate changes;
- conventional infrastructure that allows for continuity of corridors across obstacles such as highways (e.g.; a tunnel under a highway or fish passage/obstacle removal).

**PANEL:**

- The Nature Conservancy; James Hague; Senior Water Policy Advisor
- Association of State Wetland Managers; Marla Stelk; Policy Analyst
- US Army Corps of Engineers; Rachel Grandpre; Physical Scientist, Institute for Water Resources

Moderator; National Wildlife Federation; Jan Goldman-Carter; Director, Water Resources Program

10:30 **BREAK**

10:45 **POLICY CHALLENGE REPORTS AND WORKGROUP DISCUSSION**

1. Promoting Climate Resilience of New Federal Water Infrastructure Investments
2. Defining Incentives and Support for Corporate Water Resilience
3. Strengthening Local Flood Reduction Planning, Practices and Measures
4. Promoting State Water Resources Planning for Climate Resilience
5. Improving Planning and Financing of Natural Infrastructure for Climate Resilience

*ABSTRACT: Each moderator provides a ten minute summary of the policy challenge discussion and identifies key ideas or recommendations to be developed in the coming weeks; workgroup discussion.*

12:00 **WORKING LUNCH** (Lunches on site for a nominal fee or Bring Your Own)

1:00 **ACWI CLIMATE WORKGROUP MANAGEMENT** (and summary reports of breakouts if applicable)

*ABSTRACT: ACWI Climate Workgroup Co-chairs Paul Freedman and Jeff Peterson lead a discussion of Workgroup goals, activities, and operations for 2017.*

- Discussion of Process for Reporting Meeting Results to Full ACWI
- Discussion and Approval: 2016 *Workgroup Annual Report* to full ACWI
- Discussion and Approval: 2017 *Workplan* to Full ACWI
- Election of Federal and Non-Federal Co-chairs for the Workgroup
- Other Business Items

2:30 **ADJOURN**



<b>ACWI WRACC MEMBERSHIP</b> (Workgroup Members participating in 2017 meeting highlighted in yellow)		
Federal Agencies	Representative	Alternate
Army Corps of Engineers, Institute for Water Resources	Rachel N. Grandpre	
Centers for Disease Control	Joan Brunkard	
Council on Environmental Quality	Charles Kovatch	
Department of Agriculture, Natural Resources Conservation Service	Noel Gollehon	Aliya Haq Mike Wilson
Department of Agriculture, Forest Service	Chris Carlson	
Department of Energy	Craig Zamuda	
Department of Homeland Security, Federal Emergency Management Agency	Mark Crowell	Paul Huang
Department of Interior, U.S. Geological Survey	Stacey Archfield	
Department of Interior, Bureau of Reclamation	Kenneth Nowak	
Department of Interior, U.S. Fish and Wildlife Service	Tamara McCandless	
Environmental Protection Agency	Jeff Peterson Federal Co-Chair	Karen Metchis
National Oceanic and Atmospheric Administration; National Weather Service	Ernie Wells	Chris Bunner
National Oceanic and Atmospheric Administration; Climate Program Office	Nancy Beller-Simms	

State, Tribal, and Local Government Organizations	Representative	Alternate
Association of Clean Water Administrators	Jeff Manning, NC DENR	
Association of Metropolitan Water Agencies (AMWA)	Erica Brown	
Association of State Drinking Water Administrators (ASDWA)	Brandon Kernen, NH Dept of Environmental Services	Deirdre Mason, ASDWA
Association of State Floodplain Managers	John McShane	Shana Udvardy (Union of Concerned Scientists)
Association of State Wetland Managers (ASWM)	Marla Stelk	Jeanne Christie
Groundwater Protection Council	Mike Paque, Groundwater Protection Council	Mary Musick
National Association of Clean Water Agencies (NACWA)	Kristina Surfus	Cynthia A. Finley
National Association of County Planners	Judy Francis, NC DENR	
National Tribal Water Council	Dave Fuller, Port Gamble S'Klallam Tribe	
Water Utility Climate Alliance	Keely Brooks, Southern NV Water Authority	Laurna Kaatz, Denver Water
Western States Water Council	Jeanine Jones, Dept. of Water Resources, Sacramento, CA	

<b>Public and Academic Organizations</b>	<b>Representative</b>	<b>Alternate</b>
<b>American Rivers</b>	Gary Belan	Fay Augustyn
<b>American Society of Civil Engineers</b>	Eric Loucks	Mitchell Heineman
<b>American Water Resources Association</b>	Carol R. Collier, Drexel University	Lisa Engelman
<b>American Water Works Association (AWWA)</b>	Adam Carpenter	
<b>CERES</b>	Karen Yacos	Anisha Anantapadmanabhan
<b>CUAHSI</b>	TBD	
<b>National Ground Water Association</b>	Michael Block, Metropolitan Water District, Tucson, AZ	Paul Gruber
<b>National Wildlife Federation</b>	Melissa Samet	
<b>Natural Resources Defense Council</b>	Rob Moore	
<b>North American Lake Management Society</b>	Nancy Turyk, University of Wisconsin - Stevens Point	Dennis McCauley, Great Lakes Environmental Center
<b>The Nature Conservancy</b>	Jimmy Hague	
<b>Pacific Institute</b>	Heather Cooley	Jason Morrison
<b>U.S. Water Alliance</b>	Radhika Fox	Judson Greif
<b>Water Environment Federation</b>	Paul L. Freedman, LimnoTech Non-Federal Co-Chair	

## Others participating in 2017 Workgroup meeting:

Alcalde	Sharon	DOI, U.S. Geological Survey
Battles	Andrew	Science to Action Fellowships
Berry	David	Sustainable Water Resources Roundtable
Bronson	Stan	Florida Earth Foundation
Buckner	Kathryn	Council of Great Lakes Industries
Cohn	Alan	Water Utility Climate Alliance
Engelman	Lisa	American Water Resources Association (AWRA)
Escudero	Marisa	U.S. Environmental Protection Agency
Feenstra	Emily	U.S. Water Alliance
Goldman-Carter	Jan	National Wildlife Federation
McCormick	Ron	DOI, Bureau of Land Management
McFeely	Mikko	Assn of Metropolitan Water Agencies (AMWA)
Nasir	Irqa	U.S. Environmental Protection Agency
Norton	Wendy	DOI, U.S. Geological Survey
O'Malley	Robin	DOI, U.S. Geological Survey
Olsen	Carolyn	USDA, Natural Resources Conservation Service
Radtke	Jon	Cocoa-Cola
Reig	Paul	World Resources Institute
Santell	Stephanie	U.S. Environmental Protection Agency
Zhang	Harry	American Water Resources Association (AWRA)