

Response to Climate Change

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VII. Appendices

Appendix A: Principles for an Energy Water Future – The Foundation for a Sustainable America

Principles for an Energy Water Future

A Foundation for a Sustainable America

The nexus between energy and water is an increasingly important area for focus. There are significant societal and environmental benefits to be derived from improving coordination between the two sectors. Government should take a leadership role in this relationship and lead by example. EPA is proposing principles for government, service providers, and ratepayers to foster valuable collaboration in both the water and energy sectors to work together to meet our water and energy needs nationally and locally. The principles also serve as a reminder that rising water treatment costs or necessary tradeoffs such as stricter water treatment levels can be mitigated by efforts elsewhere such as reducing demand for energy and water.

Efficiency in the use of energy and water should form the foundation of how we develop, distribute, recover, and use energy and water. EPA supports:

- Encouraging energy and water efficiency by the ratepayer through the use of efficient products, like ENERGY STAR and WaterSense labeled products, supplemented by informed and wise use of resources.
- Improving system-level energy and water efficiency by water, wastewater, stormwater, and energy utilities and encouraging strategic investments in efficiency.
- Using full-cost rate structures while ensuring access to clean and safe water for low income households.
- Recognizing and reducing the embedded water and energy in manufactured and agricultural products.
- Relying on education and outreach, in collaboration with local communities, to be at the forefront of encouraging efficiency.

The exploration, production, transmission, and use of energy should have the smallest impact on water resources as possible, in terms of water quality and water quantity. EPA supports:

- Reducing consumption or use of water for producing energy and fuels: reduce, recover, reuse, and recycle.

- Analyzing, recognizing, and minimizing any impacts on groundwater, water quality, water quantity, and the aquatic environment, including wetlands, when choosing between sources of energy.
- Practicing good stewardship to minimize potential impacts and avoid contaminants that reduce water's value or require additional energy for treatment.

The pumping, treating, distribution, use, collection, reuse, and ultimate disposal of water should have the smallest impact on energy resources as possible. EPA supports:

- Creating an energy efficiency management plan using established energy auditing tools.
- Establishing plans to repair leaks in water distribution and wastewater collection systems.
- Using nearby water sources where available, including rain harvesting and recycled water.
- Treating water to a level that matches the end use.
- Avoiding unnecessary transport of water and wastewater for treatment or disposal.

Wastewater treatment facilities, which treat human and animal waste, should be viewed as renewable resource recovery facilities that produce clean water, recover energy, and generate nutrients. EPA supports:

- Using wastewater and associated organic solids and treatment byproducts, such as methane gas, as a source of renewable energy that can be used by treatment plants to reduce net 'on-grid' energy use or to become zero net energy consumers.
- Using wastewater for irrigation, accounting for the nutrients in the water as a way to reduce the need for additional fertilizers.
- Recycling or reusing water for appropriate uses with no resulting loss of downstream use and habitat, minimizing energy used for treatment, and becoming a reliable source for the future.
- Extracting and recycling nutrients from wastewater.

The water and energy sectors – governments, utilities, manufacturers, and consumers – should move toward integrated energy and water management from source, production, and generation to end user. EPA supports:

- Encouraging the water and energy sectors – both governments and utilities – to continue to align themselves to breakdown institutional barriers, improve transparency, and maximize efficiencies.
- Encouraging government agencies to look across missions and private utilities to look across sectors to achieve integrated energy and water management, maximize efficiencies, and avoid unintended consequences.
- Encouraging partnerships between government and service providers to leverage and expand upon existing successes and institutions.

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- Promoting transparency and collaboration related to research, funding, and policy within institutions and across sectors, which are essential and will help to leverage lessons learned and expand successes.

Maximize comprehensive, societal benefits. EPA supports:

- Articulating and recognizing the benefits for the larger sphere of influence of public and private investment – beyond direct cost savings – in energy and water efficiencies.
- Enhancing, promoting, and targeting financial incentives and other societal benefits, including market-based benefits such as rebates and government programs such as state revolving funds, taxes, and tax credits.
- Planning to build resiliency for climate change impacts on water infrastructure and water quality to minimize vulnerabilities.

Appendix B: Goals and Strategic Actions: Lead Offices⁶

Infrastructure: In the face of a changing climate, resilient and adaptable drinking water, wastewater, and stormwater utilities (i.e., the water utility sector) ensure clean and safe water to protect the nation’s public health and environment by making smart investment decisions to improve the sustainability of their infrastructure and operations and the communities they serve, while reducing greenhouse gas emissions through greater energy efficiency.

Goals and Strategic Actions		Lead Office (& Partners)
Goal 1: Build the body of information and tools needed to incorporate climate change into planning and decision making.	SA1: Improve access to vetted climate and hydrological science, modeling, and assessment tools through the Climate Ready Water Utilities program.	OGWDW (OWM)
	SA2: Assist wastewater and water utilities to reduce greenhouse gas emissions and increase long-term sustainability with a combination of energy efficiency, co-generation, and increased use of renewable energy resources	OWM (OGWDW)
	SA3: Work with the states and public water systems, particularly small water systems, to identify and plan for climate change challenges to drinking water safety and to assist in meeting health based drinking water standards.	OGWDW
	SA4: Promote sustainable design approaches to provide for the long-term sustainability of infrastructure and operations.	OWM (OGWDW)

⁶ OGWDW=Office of Groundwater and Drinking Water; OWM=Office of Wastewater Management; OWOW=Office of Wetlands, Oceans and Watersheds; OST=Office of Science and Technology; OW IO=Office of Water Immediate Office

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Goals and Strategic Actions: Lead Offices (cont.)		
Goal 2: Support Integrated Water Resources Management to sustainably manage water resources.	SA5: Understand and promote through technical assistance the use of water supply management strategies.	OWM (OGWDW)
	SA6: Evaluate and provide technical assistance on the use of water demand management strategies.	OWM (OGWDW)
	SA7: Increase cross-sector knowledge of water supply climate challenges and develop watershed specific information to inform decision making.	OW IO (All OW Offices)
Watersheds & Wetlands: Watersheds are protected, maintained, and restored to provide climate resilience and to preserve the ecological, social, and economic benefits they provide; and the nation's wetlands are maintained and improved using integrated approaches that recognize their inherent value as well as their role in reducing the impacts of climate change.		
Goals and Strategic Actions		Lead Office (& Partners)
Goal 3: Identify, protect, and maintain a network of healthy watersheds and supportive habitat corridor networks.	SA8: Develop a national framework and support efforts to protect remaining healthy watersheds and aquatic ecosystems.	OWOW
	SA9: Collaborate with partners on terrestrial ecosystems and hydrology so that effects on water quality and aquatic ecosystems are considered.	OWOW
	SA10: Integrate protection of healthy watersheds throughout the NWP core programs.	OWOW
	SA11: Increase public awareness of the role and importance of healthy watersheds in reducing the impacts of climate change.	OWOW
Goal 4: Incorporate climate resilience into watershed restoration and floodplain management.	SA12: Consider a means of accounting for climate change in EPA funded and other watershed restoration projects.	OWOW
	SA13: Work with federal, state, interstate, tribal, and local partners to protect and restore the natural resources and functions of riverine and coastal floodplains as a means of building resiliency and protecting water quality.	OWOW

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Goals and Strategic Actions: Lead Offices (cont.)		
Goal 5: Watershed protection practices incorporate Source Water Protection to protect drinking water supplies.	SA14: Encourage states to update their source water delineations, assessments or protection plans to address anticipated climate change impacts.	OGWDW
	SA15: Continue to support collaborative efforts to increase state and local awareness of source water protection needs and opportunities, and encourage inclusion of source water protection areas in local climate change adaptation initiatives.	OGWDW
Goal 6: EPA incorporates climate change considerations into its wetlands programs, including the CWA 404 program, as appropriate.	SA16: Consider the effects of climate change, as appropriate, when making significant degradation determinations in the CWA Section 404 wetlands permitting and enforcement program.	OWOW
	SA17: Evaluate, in conjunction with the U.S. Army Corps of Engineers, how wetland and stream compensation projects could be selected, designed, and sited to aid in reducing the effects of climate change.	OWOW
Goal 7: Improve baseline information on wetland extent, condition, and performance to inform long term planning and priority setting that takes into account the potential added benefits for climate change adaptation and carbon sequestration.	SA18: Expand wetland mapping by supporting wetland mapping coalitions and training on use of the new federal Wetland Mapping Standard.	OWOW
	SA19: Produce a statistically valid ecological condition assessment of the nation's wetlands.	OWOW
	SA20: Work with partners and stakeholders to develop information and tools to support long term planning and priority setting for wetland restoration projects.	OWOW

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Goals and Strategic Actions: Lead Offices (cont.)

Coastal and Ocean Waters: Adverse effects of climate change along with collective stressors and unintended adverse consequences of responses to climate change have been successfully prevented or reduced in the ocean and coastal environment. Federal, tribal, state and local agencies, organizations, and institutions are working cooperatively; and information necessary to integrate climate change considerations into ocean and coastal management is produced, readily available, and used.

Goals and Strategic Actions		Lead Office (& Partners)
Goal 8: Collaborate so that information and methodologies for ocean and coastal areas are collected, produced, analyzed, and easily available.	SA21: Collaborate so that synergy occurs, lessons learned are transferred, federal efforts effectively help local communities, and efforts are not duplicative or at cross-purposes.	OWOW
	SA22: Work within EPA and with the U.S. Global Change Research Program and other federal, tribal, and state agencies to collect, produce, analyze, and format knowledge and information needed to protect ocean and coastal areas and make it easily available.	OWOW
Goal 9: Support and build networks of local, tribal, state, regional and federal collaborators to take effective adaptation measures for coastal and ocean environments through EPA's geographically targeted programs.	SA23: Work with the NWP's larger geographic programs to incorporate climate change considerations, focusing on both the natural and built environments.	OWOW (Regions)
	SA24: Address climate change adaptation and build stakeholder capacity when implementing NEP Comprehensive Conservation and Management Plans and through the Climate Ready Estuaries Program.	OWOW
	SA25: Conduct outreach and education, and provide technical assistance to state and local watershed organizations and communities to build adaptive capacity in coastal areas outside the NEP and Large Aquatic Ecosystem programs.	OWOW
Goal 10: Address climate driven environmental changes in coastal areas and provide that mitigation and adaptation are conducted in an environmentally responsible manner.	SA26: Support coastal wastewater, stormwater, and drinking water infrastructure owners and operators in reducing climate risks and encourage adaptation in coastal areas.	OWOW
	SA27: Support climate readiness of coastal communities, including hazard mitigation, pre-disaster planning, preparedness, and recovery efforts.	OWOW
	SA28: Support preparation and response planning for impacts to coastal aquatic environments.	OWOW

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Goals and Strategic Actions: Lead Offices (cont.)		
Goal 11: Protect ocean environments by incorporating shifting environmental conditions and other emerging threats into EPA programs.	SA29: Consider climate change impacts on marine water quality in NWP ocean management authorities, policies, and programs.	OWOW
	SA30: Use available authorities and work with the Regional Ocean Organizations and other federal and state agencies through regional ocean groups and other networks so that offshore renewable energy production does not adversely affect the marine environment.	OWOW (Regions)
	SA31: Support the evaluation of sub-seabed sequestration of CO ₂ and any proposals for ocean fertilization.	OWOW
	SA32: Participate in interagency development and implementation of federal strategies through the NOC and the NOC Strategic Action Plans.	OWOW
Water Quality: Our Nation's surface water, drinking water, and ground water quality are protected, and the risks of climate change to human health and the environment are diminished, through a variety of adaptation and mitigation strategies.		
Goals and Strategic Actions		Lead Office (& Partners)
Goal 12: Protect waters of the United States and promote management of sustainable surface water resources.	SA33: Encourage states and communities to incorporate climate change considerations into their water quality planning.	OWOW
	SA34: Encourage green infrastructure and low-impact development to protect water quality and make watersheds more resilient.	OWM (OWOW)
	SA35: Promote consideration of climate change impacts by National Pollutant Discharge Elimination System permitting authorities.	OWM
	SA36: Encourage water quality authorities to consider climate change impacts when developing wasteload and load allocations in TMDLs where appropriate.	OWOW
	SA37: Identify and protect designated uses that are at risk from climate change impacts.	OST (OWM)
	SA38: Clarify how to re-evaluate aquatic life water quality criteria on more regular intervals; and develop information to assist states and tribes who are developing criteria that incorporate climate change considerations for hydrologic condition.	OST

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Goals and Strategic Actions: Lead Offices (cont.)		
<p>Goal 13:</p> <p>As the nation makes decisions to reduce greenhouse gases and develop alternative sources of energy and fuel, work to protect water resources from unintended adverse consequences.</p>	<p>SA39: Continue to provide perspective on the water resource implications of new energy technologies.</p>	<p>OWM (OGWDW)</p>
	<p>SA40: Provide assistance to states and permittees to assure that geologic sequestration of CO₂ is responsibly managed.</p>	<p>OGWDW (OWOW)</p>
	<p>SA41: Continue to work with States to help them identify polluted waters, including those affected by biofuels production, and help them develop and implement Total Maximum Daily Loads (TMDLs) for those waters.</p>	<p>OGWDW (OWOW, OWM)</p>
	<p>SA42: Provide informational materials for stakeholders to encourage the consideration of alternative sources of energy and fuels that are water efficient and maintain water quality.</p>	<p>OWM (OW IO)</p>
	<p>SA43: As climate change affects the operation or placement of reservoirs, work with other federal agencies and EPA programs to understand the combined effects of climate change and hydropower on flows, water temperature, and water quality.</p>	<p>OWM</p>
<p>Goal 14:</p> <p>Collaborate to make hydrological and climate data and projections available.</p>	<p>SA44: Monitor climate change impacts to surface waters and ground water.</p>	<p>OWOW (OGWDW)</p>
	<p>SA45: Collaborate with other federal agencies to develop new methods for use of updated precipitation, storm frequency, and observational streamflow data, as well as methods for evaluating projected changes in low flow conditions.</p>	<p>OW IO</p>
	<p>SA46: Enhance flow estimation using National Hydrography Dataset Plus (NHDPlus).</p>	<p>OWOW</p>

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Goals and Strategic Actions: Lead Offices (cont.)		
Working With Tribes: Tribes are able to preserve, adapt, and maintain the viability of their culture, traditions, natural resources, and economies in the face of a changing climate.		
Goals and Strategic Actions		Lead Office (& Partners)
Goal 15: Incorporate climate change considerations in the implementation of core programs, and collaborate with other EPA Offices and federal agencies to work with tribes on climate change issues on a multi-media basis.	SA47: Through formal consultation and other mechanisms, incorporate climate change as a key consideration in the revised NWP Tribal Strategy and subsequent implementation of CWA, SDWA, and other core programs.	OW IO
	SA48: Incorporate adaptation into tribal funding mechanisms, and collaborate with other EPA and federal funding programs to support sustainability and adaptation in tribal communities.	OW IO
Goal 16: Tribes have access to information on climate change for decision making.	SA49: Collaborate to explore and develop climate change science, information, and tools for tribes, and incorporate local knowledge.	OW IO
	SA50: Collaborate to develop communication materials relevant for tribal uses and tribal audiences.	OW IO
Cross-Cutting Program Support		
Goals and Strategic Actions		Lead Office (& Partners)
Goal 17: Communicate, Collaborate, and Train.	SA51: Continue building the communication, collaboration, and training mechanisms needed to effectively increase adaptive capacity at the federal, tribal, state, and local levels.	OW IO
Goal 18: Track Progress and Measure Outcomes	SA52: Adopt a phased approach to track programmatic progress towards Strategic Actions; achieve commitments reflected in the Agency Strategic Plan; work with the EPA Work Group to develop outcome measures.	OW IO
Goal 19: Identify Climate Change and Water Research Needs	SA53: Work with ORD, other water science agencies, and the water research community to further define needs and develop research opportunities to deliver the information needed to support implementation of this <i>2012 Strategy</i> , including providing the decision support tools needed by water resource managers.	OST (OW IO)

Appendix C: List of Abbreviations

ACWI	Advisory Committee on Water Information	LCCs	Landscape Conservation Cooperatives
ASR	Aquifer Storage & Recovery	LID	Low Impact Development
AWWA	American Water Works Association	LIDAR	Light Detection And Ranging
BLM	Bureau of Land Management	MPRSA	Marine Protection, Research and Sanctuaries Act
BOEMR	Bureau of Ocean Energy Management, Regulation & Energy	MWDs	Municipal Water Districts
CCAWWG	Climate Change Adaptation Work Group	NAP	National Adaptation Plan
CCL	Contaminant Candidate List	NDWAC	National Drinking Water Advisory Council
CEQ	White House Council on Environmental Quality	NEP	National Estuary Program
CMSP	Coastal Marine Spatial Planning	NEPA	National Environmental Policy Act
CRE	Climate Ready Estuaries	NHDPlus	National Hydrography Dataset Plus
CREAT	Climate Resilience Evaluation and Awareness Tool	NMFS	National Marine Fisheries Service
CRWU	Climate Ready Water Utilities	NOAA	National Oceanic and Atmospheric Administration
CT4CW	Coming Together for Clean Water	NOC	National Ocean Council
CWA	Clean Water Act	NPDES	National Pollutant Discharge Elimination System
DMR	Discharge Monitoring Report	NPDWR	National Primary Drinking Water Regulations
DOE	Department of Energy	NPS	National Park Service
DOT	Department of Transportation	NRC	National Research Council
DWSRF	Drinking Water State Revolving Fund	NWCA	National Wetland Condition Assessment
EAT	Energy Audit Tool	NWI	National Wetland Inventory
ESA	Endangered Species Act	NWP	National Water Program
FEMA	Federal Emergency Management Agency	OAR	Office of Air and Radiation
GAP	General Assistance Program	OCSP	Office of Chemical Safety and Pollution Prevention
GHG	Greenhouse gas	OGC	Office of General Counsel
GI	Green Infrastructure	OGWDW	Office of Ground Water and Drinking Water (OW)
HAB	Harmful algal bloom	OITA	Office of International and Tribal Affairs
HUC	Hydrologic Unit Code	OM&R	Operations, maintenance and replacement
HUD	Housing and Urban Development	OP	Office of Policy
HWQS	Hydrologic and Water Quality System	ORD	Office of Research and Development
ICCATF	Interagency Climate Change Adaptation Task Force	OST	Office of Science and Technology (OW)
IPCC	Intergovernmental Panel on Climate Change		
IWRM	Integrated Water Resources Management		

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OSTP	White House Office of Science & Technology Policy	TMDLs	Total Maximum Daily Loads
OSWER	Office of Solid Waste and Emergency Response	USFWS	U.S. Fish and Wildlife Service
OUST	Office of Underground Storage Tanks (OSWER)	UIC	Underground Injection Control
OW	Office of Water	USACE	U.S. Army Corps of Engineers
OWM	Office of Wastewater Management (OW)	USBR	U.S. Bureau of Reclamation
OWOW	Office of Wetlands, Oceans and Watersheds (OW)	USDA	U.S. Department of Agriculture
RISAs	Regional Integrated Sciences and Assessments	USDW	Underground source of drinking water
SAP	Synthesis and Assessment Product	USFS	U.S. Forest Service
SDWA	Safe Drinking Water Act	USGCRP	U.S. Global Change Research Program
SWAQ	Subcommittee on Water Availability and Quality	USGS	U.S. Geological Survey
		WQS	Water quality standards
		WUE	Water Use Efficiency

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