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Research for People and the Planet

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Before the Subcommittee on Water and Power of the Senate Committee on Energy and Natural Resources

For the Hearing on Opportunities and challenges to address domestic and global water supply issues

Recommendations to Congress for Fundamental Changes in National Water Policy

December 8, 2011

Madame Chairman, Senators: I would like to thank the Committee for the opportunity to address threats and opportunities facing the Nation's freshwater resources and to offer specific recommendations for a 21st century U.S. water policy.

The water crisis around the nation and around the world is growing, presenting new threats to our economy and environment, but also offering new opportunities for better and coordinated responses. We have long known that we need coordinated federal planning for water; but such coordination remains an elusive goal. And the nation faces new water challenges such as climate change, new pollutants, and decaying infrastructure.

My written and oral testimony will address two broad issues:

1. The kinds of water challenges we face at the national and international levels, and
2. The kinds of responses we need at the federal level.

Global and National Water Challenges

There is a wide range of water challenges, but they fall into two basic categories: challenges over water availability and use, and problems associated with water quality and contamination.

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Basic Human Needs for Water Services are Unmet

Globally, the most significant and unresolved water problem is the failure to meet basic human needs for safe water and adequate sanitation for billions of people. This is the greatest development disaster of the 20th century and has been explicitly acknowledged by this body with the bipartisan passage of the Paul Simon Water for the Poor Act of 2005 and the Paul Simon Water for the World Act of 2009, which has expanded U.S. development assistance for water and sanitation. The failure to meet these basic needs means that millions of people, mostly young children, still die annually – and unnecessarily – from preventable water-related diseases. This problem is getting worse, not better. Figure 1 shows that deaths from water-related diseases worldwide are rising, not falling.

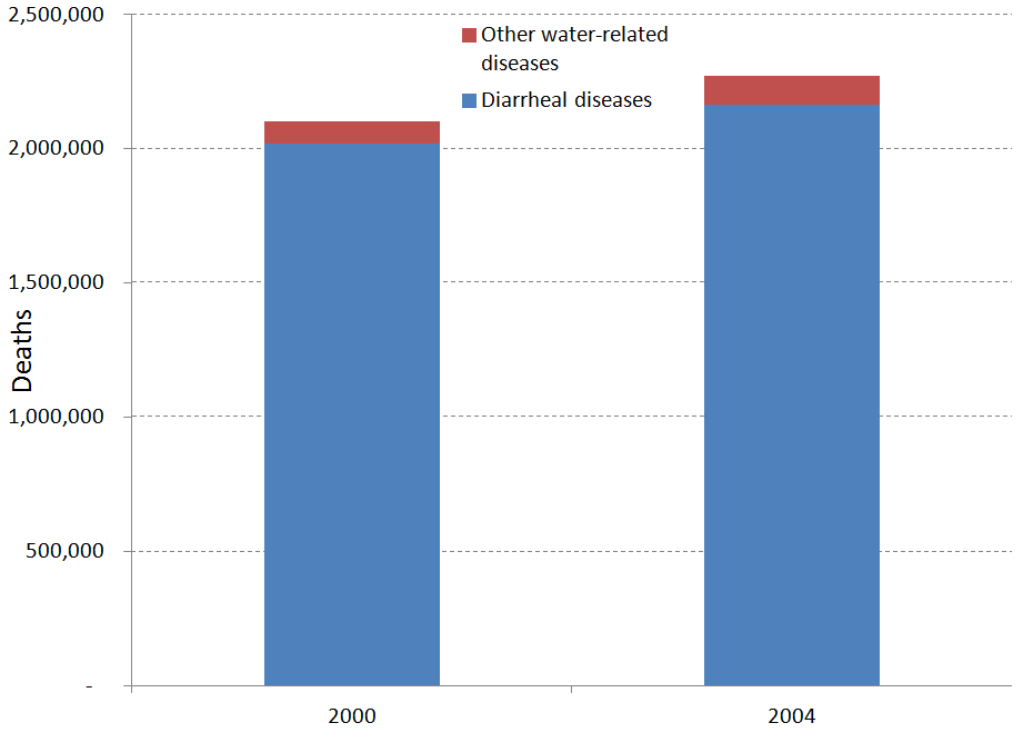

Figure 1. Number of deaths worldwide from water-related diseases in 2000 and 2004 (the last year comprehensive data were available from the World Health Organization).

We are not immune to this problem. Despite the fact that the U.S. has built one of the most sophisticated and complete municipal tap water system in the world, millions of people here, mostly in rural communities, are inadequately protected from water contamination or are drinking water with unacceptable levels of pollutants. For example, a recent assessment released by the Pacific Institute reported that between 2005 and 2008,

92 drinking water systems in California's San Joaquin Valley alone had groundwater wells with nitrate levels over the legal limit, potentially affecting the water quality of over 1.3 million residents. Far too many people in small, poor, rural agricultural communities in California's Central Valley have no option but to drink contaminated water despite more than a decade of efforts to address this problem. Indeed, many of the nation's most pressing environmental justice concerns revolve around access to safe water, or disproportionate exposure to water pollution.

A second global water challenge is climate change, and the increasingly apparent and severe impacts that climate changes will have on our water resources.[2] The natural hydrological cycle of evaporation, condensation, precipitation, runoff, and re-evaporation is a fundamental component of the Earth's climate. The scientific community, as represented by the National Academies of Science of every major nation on Earth, every major professional scientific organization, and nearly 100% of the world's climatologists, agree that humans are changing the climate in fundamental ways (see Table 1). These climate changes are increasingly threatening water systems and water resources everywhere. While the scientific facts about climate change have so far failed to lead to an adequate political response at either the national or international level, the political and policy disputes do not change the fundamental scientific reality of the threats of climate change, particularly to our water resources.

[2] See, for example, the following Senate and House testimonies and briefings:
H. S. Cooley. 2009. Testimony of Heather S. Cooley to the United States Congress Select Committee on Energy Independence and Global Warming. For the Hearing on Global Warming Effects on Extreme Weather. July 10, 2008.
http://www.pacinst.org/publications/testimony/cooley_extremeevents_7_10_08.pdf

P.H. Gleick, 2010. Testimony of Dr. Peter H. Gleick for The Congressional Select Committee on Energy Independence & Global Warming Hearing, "Not Going Away: America's Energy Security, Jobs and Climate Challenges." December 1, 2010.
http://www.pacinst.org/publications/testimony/gleick_testimony_climate_strategies.pdf

P.H. Gleick, 2011. "The Vulnerability of U.S. Water Resources to Climate Change." American Meteorological Society/American Association for the Advancement of Science (AMS/AAAS) Briefing, Capitol Hill, Washington DC. May 9, 2011.
http://www.pacinst.org/publications/testimony/vulnerability_to_climate_change.pdf.

Table 1. Position Statements on Human-Induced Climate Change

The following international Scientific Academies and Professional Societies have published official organizational statements on the issue of climate change and human influence. This list is not complete, but indicates the comprehensive and strong nature of the scientific understanding about human-caused climate change.

American Academy of Pediatrics
American Association for the Advancement of Science (AAAS)
American Chemical Society
American College of Preventive Medicine
American Geophysical Union
American Institute of Biological Sciences
American Institute of Physics
American Medical Association
American Meteorological Society
American Physical Society
American Public Health Association
American Quaternary Association
American Society for Microbiology
Australian Coral Reef Society
Australian Medical Association
Australian Meteorological and Oceanographic Society
Canadian Foundation for Climate and Atmospheric Sciences
Canadian Meteorological and Oceanographic Society
Ecological Society of America
European Academy of Sciences and Arts
European Federation of Geologists
European Geosciences Union
European Physical Society
European Science Foundation
Federation of Australian Scientific and Technological Societies
Geological Society of America
Geological Society of Australia
Geological Society of London
Institute of Biology (UK)
Institute of Professional Engineers New Zealand
Institution of Engineers Australia
InterAcademy Council
International Association for Great Lakes Research
International Council of Academies of Engineering and Technological Sciences

International Union for Quaternary Research
International Union of Geodesy and Geophysics
National Academies of: Australia, Belgium, Brazil, Cameroon Royal Society of Canada, the Caribbean, China, Institut de France, Ghana, Leopoldina of Germany, of Indonesia, Ireland, Accademia nazionale delle scienze of Italy, India, Japan, Kenya, Madagascar, Malaysia, Mexico, Nigeria, Poland, Royal Society of New Zealand, Russian Academy of Sciences, Senegal, South Africa, Sudan, Royal Swedish Academy of Sciences, Tanzania, Turkey, Uganda, The Royal Society of the United Kingdom, the United States, Zambia, and Zimbabwe.
National Association of Geoscience Teachers
Network of African Science Academies (The science academies of Cameroon, Ghana, Kenya, Madagascar, Nigeria, Senegal, South Africa, Sudan, Tanzania, Uganda, Zambia, Zimbabwe, as well as the African Academy of Sciences)
Royal Meteorological Society (UK)
World Federation of Public Health Associations
World Meteorological Organization

A third major global water challenge is the growing risk to national and international security associated with increasing competition and disputes about the allocation, use, and quality of freshwater. The U.S. intelligence community and military are increasingly concerned about the ways that water shortage, the control of internationally shared rivers, and water contamination will affect U.S. military and diplomatic policy and strategy. We know that water has played a role in political and violent conflicts in the Middle East, the Sudan, India, China, the Horn of Africa, and elsewhere.[3] The Secretaries of State for at least the past four presidential administrations have publicly addressed international water issues in one form or another.

Here in the United States, we also face a broad and growing set of freshwater challenges including growing scarcity, disputes over water allocation and use among neighboring states, unmitigated water contamination from both known and new pollutants, threats to our energy production, a clear and present danger associated with climate change, inadequate investment in critical water infrastructure and data collection systems, and, as mentioned above, threats to national security associated with water problems outside of our own borders. I describe each in more detail, below.

[3] See the Water Conflict Chronology, at www.worldwater.org, for a comprehensive list of water-related conflicts.

Water Quality is Threatened

New water contaminants are finding their way into our waterways; and many known contaminants are not adequately removed, especially from "non-point sources" such as the runoff of agricultural chemicals such as fertilizers and pesticides. Insufficient investment in technologies and infrastructure to monitor water quality and quantity, inadequate federal regulations and weak enforcement of existing water quality regulations permit unnecessary, costly, and dangerous water contamination to go unchecked.

The reality is that many communities and tribes lack access to safe water. Lack of access to clean, safe drinking water can be caused by contamination in the water, by a lack of adequate drinking water and wastewater infrastructure, such as old or nonexistent plumbing, and by outdated Federal water-quality laws that no longer reflect best available technology or information.

Investment in Maintaining and Upgrading Water Infrastructure is Inadequate

Municipalities and communities trying to provide safe tap water and reliable wastewater services are faced with billions of dollars of infrastructure needs precisely at the same time that government funding for public systems is being crippled. Farmers cannot afford to upgrade irrigation infrastructure to reduce losses and cut waste. Insufficient investment in monitoring equipment, or new piping, or water purification technologies is leading to a deterioration of national water quality and availability. Other witnesses will provide detail on national water infrastructure needs, but these needs lie at the core of national strength.

Water Disputes over Allocations and Use are Growing

Disputes over allocations of shared rivers once limited to the arid western states are now increasingly appearing in the southern and eastern U.S. Tensions between cities and farmers over water rights are rising. An example is the ongoing and unresolved dispute over the Apalachicola-Chattahoochee-Flint river systems shared by Florida, Alabama, and Georgia. Severe drought in Texas, worsened by rising global temperatures, is leading to new (or worsening existing) groundwater disputes and concerns about uncontrolled water withdrawals. The vast majority of States are now expected to have water shortages in coming years according to the General Accountability Office.[4]

[4] General Accountability Office. 2003. http://www.gao.gov/new.items/d03514.pdf. "Freshwater Supplies: States' views." GAO-03-514, Washington DC.

Degraded Natural Ecosystems are Worsening

Natural ecosystems such as the Everglades, the Sacramento-San Joaquin Delta, the coastal and inland wetlands of the Gulf States, delicate desert water systems, and even the fisheries of the Great Lakes are under growing threats. One of the original impetuses for the national water quality laws passed over three decades ago was the sight of Lake Erie dying and the Cuyahoga River burning on national television. Tremendous progress was made in cleaning up Lake Erie, but that progress is now being lost. The fisheries of Lake Erie and other water bodies are again threatened by the lack of federal action to protect national waterways from contamination.

Water and Energy Links Are Strong but Ignored

Water use and energy use are closely linked: Energy production uses and pollutes water; water use requires significant amounts of energy. And the reality of climate change affects national policies in both areas. Limits to the availability of both energy and water are beginning to affect the other, and these limits have direct implications for US economic and security interests. Yet energy and water issues are rarely integrated in policy. Considering them together offers substantial economic and environmental benefits.

As we enter the 21st century, pressures on both our national water and energy resources are growing. Alternative energy sources are raising new questions about the associated water risks. Producing biofuels, for examples, is water-intensive, and chemicals used to grow these crops threaten our nation's water quality. Hydraulic fracturing (fracking) of shale gas formations has the potential to greatly increase domestic production of natural gas, a cleaner-burning fossil fuel than dirty coal, and less politically costly than imported Middle Eastern oil. Yet fracking also has the potential to damage or destroy vast groundwater resources or pollute surface water, and federal oversight of these risks has fallen far behind industry efforts to expand fracking operations.

Similarly, there are growing risks that energy and electricity production will be adversely affected by limited water resources. In just the past few years, several power plants have been temporarily closed or derated (i.e., had their energy production reduced) due to drought, lack of reliable water supply, or temperature limits on rivers. New power plants have been opposed because of water scarcity concerns. Table 2 presents some recent headlines from around the U.S. of these problems. The failure to link these issues will *inevitably* lead to disruptions in the supply of both water and power.

Table 2: Some recent headlines from around the nation show the links between water and energy.

Drought Could Force Nuke-Plant Shutdowns. *The Associated Press,* January 2008
Sinking Water and Rising Tensions. *EnergyBiz Insider,* December 2007
Stricter Standards Apply to Coal Plant, Judge Rules; Activists Want Cooling Towers for Oak Creek. *Milwaukee Journal Sentinel,* November 2007
Journal-Constitution Opposes Coal-Based Plant, Citing Water Shortage. *The Atlanta Journal-Constitution,* October 2007
Maryland County denies cooling water to proposed power plant. *E-Water News Weekly,* October 2007
Water woes loom as thirsty generators face climate change. *Greenwire,* September 2007

Water and Food Links

The vast majority of water consumed in the United States (and worldwide) goes to grow food. As demands for water from cities, energy systems, and environmental restoration increase, pressure is growing on the nation's farmers to relinquish water that they have been using, often for decades. Given the limited ability to expand supplies of water, especially in the Great Plains and California where much of the nation's food is grown, this leaves only three options:

1. Take land out of production, decreasing the amount of food and fiber we produce;
2. Change the types of crops we grow away from water-intensive irrigated crops to more water-efficient crops that can flourish, at least partly, on rainfed lands; or
3. Increase the productivity of agriculture by improving water-use efficiency and reducing waste.

While farmers always weigh these three options when making decisions, the last approach is the most attractive: it permits farmers in increase yields and income while maintaining or even decreasing total water use. But improvements in water-use productivity in agriculture will require new federal policies to eliminate subsidies for some kinds of crops, raise the price of water delivered from federal irrigation systems to encourage efficiency, or provide financial assistance to farmers to invest in shifting irrigation technologies to modern systems for monitoring and delivering water.

The good news is that progress is being made in increasing water-use productivity in agriculture, and implementation of new federal policies can expand on this progress. Figure 2 shows that farmers in California have steadily increased their production of field and seed crops per unit water used. Measured another way, farmers are exploring

strategies for producing more food and money with less water. Policies that encourage these strategies and innovations should be supported.

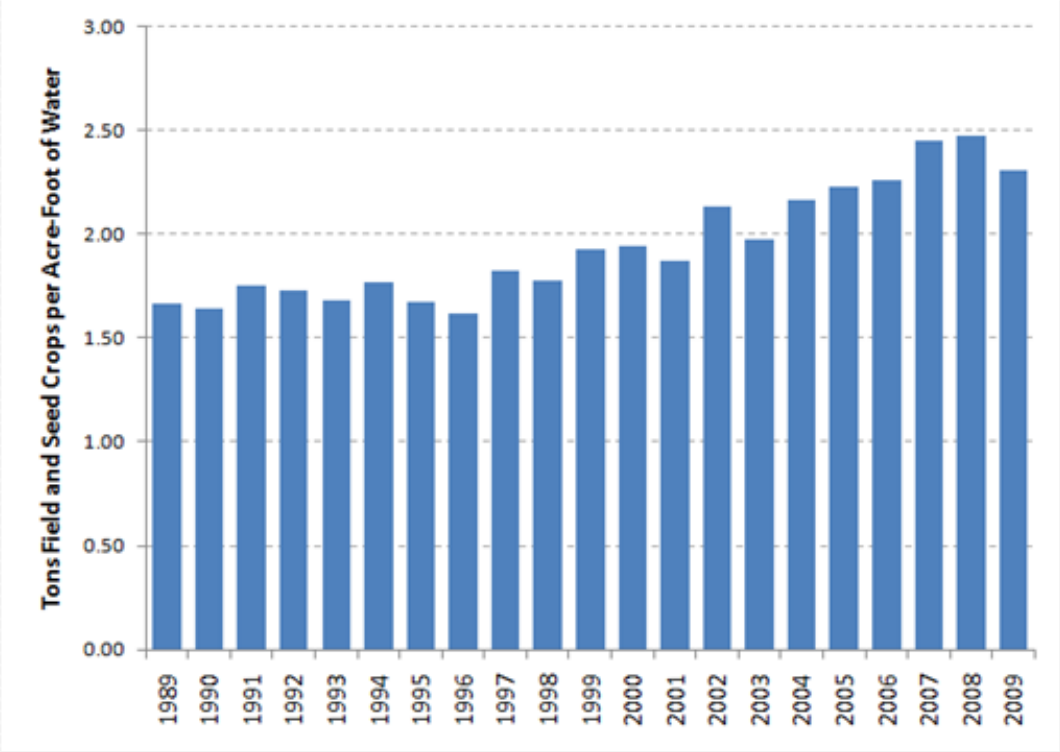

Figure 2. The productivity of water use to grow field and seed crops in California has increased from around 1.7 tons per unit of water used to nearly 2.5 tons per unit water between the late 1980s and 2009. (Source: Gleick et al. 2011.)

Federal Coordination over Water is Lacking

Responsibility for water is spread out over many federal agencies and departments, operating with little overall coordination. Over 30 federal agencies, boards, and commissions in the United States have water-related programs and responsibilities. The nation's complex legal and institutional framework for water management has evolved over two centuries, and has never undergone comprehensive review and integration. The result is an incomplete and often inefficient approach to water management at the federal level that has been noted by numerous past commissions, advisory boards, and councils.

It is Time for a 21st Century U.S. Water Policy

The role of the federal government in solving our water problems is rightly limited: Many of our water problems are local, and must be resolved at the local and regional level. But the responsibility to develop and implement appropriate national policies is not being adequately fulfilled by the diverse federal agencies responsible for them. Part of the problem is confusion over authority. Part of the problem is the failure of executive branch in recent years to request sufficient funds to protect and manage our water resources, or of the legislative branch to appropriate and allocate those funds. Part of the problem is old water legislation that has not been updated to account for the realities of the 21st century and for recent advances in our scientific and technical understanding of both water problems and solutions. I offer here several specific recommendations for developing a 21st century United States water policy, recently produced from research conducted over the past several years with colleagues at the Pacific Institute. [5]

Recommendation 1.
Federal water-related agencies and programs are fragmented and require better coordination.

The persistent and emerging challenges of the twenty-first century demand an integrated and comprehensive approach to national water policy. One possibility is to reconstitute a National Water Commission to provide up-to-date advice to the executive and legislative branches. The United States has not had a comprehensive water commission in place for 30 years, since the 1968 National Water Commission reported to the President and Congress in 1973. Moreover, we have never had a water commission with the authority and responsibility to review and recommend policies for the role of the U.S. in addressing international water issues. Nor has such a commission ever addressed the new challenges of climate change. Such a commission could be very valuable.

We recommend the following actions to move toward better integration of federal water programs:

- Congress should re-evaluate the jurisdiction over water management, funding, and protection in Congressional committees. Current jurisdiction is split among different committees, often with competing or contradictory objectives.

[5] See, J. Christian-Smith and P.H. Gleick (editors), 2012, A 21st Century U.S. Water Policy (in press, Oxford University Press, New York), and J. Christian Smith, P.H. Gleick, and H. Cooley, 2011, "U.S. Water Policy Reform," in P.H. Gleick (editor) The World's Water, Volume 7 (Island Press, Washington D.C.), pp. 143-155.

- The Office of Science, Technology, and Policy's Committee on Environment, Natural Resources, and Sustainability should develop a national strategy for water protection. Such a strategy would:
  - Develop a National Water Council or Roundtable on Water, similar to the existing National Ocean Council and Roundtable on Climate Information and Services,
  - Define how to assess existing pressures and potential threats to interstate surface and groundwater, and
  - Recommend amendments, or new legislation, to bring interstate groundwater basins under the EPA's regulatory authority.
- U.S. river basin commissions should be re-instituted as a more rational locus for organizing water-management responsibilities and should be tasked with developing river-basin management plans that become a gateway for federal funding. For example, grants for improved water management that are now dispersed through separate agencies and programs, e.g., the Farm Service Agency, the Environmental Protection Agency (such as the State Revolving Loans), the U.S. Bureau of Reclamation's grant program, and others, could instead include scoring criteria that prioritizes projects developed through the comprehensive river basin management plans.
- A national water commission or council comprised of diverse non-federal experts and including leaders of the environmental justice movement should be formed to recommend policies and principles for sustainable water management in the 21st century. The commission's first task should be to develop guidance documents for the river basin commissions in terms of creating scientifically rigorous, participatory river basin management plans. In addition, a national water commission could make recommendations for reducing the risks of international tensions over shared water resources, including how to resolve concerns with Mexico and Canada over shared water systems. These recommendations would be valuable in other international river basins where U.S. experience, international stature, and expertise can be effective.

Recommendation 2.
The nation lacks, and must develop, an adequate understanding of water supply, use, and flows.

In 1889, the U.S. Geological Survey (USGS) began measuring the flow in the nation's rivers and continues to play a leading role in data collection, analysis, and management. Other federal agencies, such as NOAA and NASA, collect data critical for protecting the nation from extreme weather events, including flooding and droughts. Unfortunately, a vast amount of water data are still not collected, and large numbers of existing data collection systems are being lost. In 2009 alone, nearly 100 long-term stream gages were discontinued due to budgetary constraints and Congress has failed to adequately support funding for some vital satellite systems, such as the Joint Polar Satellite System (JPSS),

raising the specter of a loss of advance warning for extreme weather events. This represents a direct threat to health and safety of U.S. citizens and the economy. It is critical for Congress to provide consistent funding for comprehensive water data collection programs.

We recommend full appropriation for the Secure Water Act (P.L. 111-11) to conduct an urgently needed national water census. A national water census will deliver information nationwide on water availability and water use throughout the country, including water used for vital food production and thermoelectric power generation. The Act authorized $20 million for the national water census effort but the money has never been fully appropriated. This is a key priority not only for improving the nation's data collection but also to provide valuable information to states about water availability and water use.

Recommendation 3.
More appropriate economic strategies can create more sustainable water-use patterns.

Water pricing is often thought of as a local or state concern, and indeed, most financing of water systems is and should remain local. However, as the largest wholesaler of water in the west, federal agencies such as the U.S. Bureau of Reclamation also play an important role in setting water rates. Forty years ago, the last National Water Commission recommended discontinuing the subsidization of new irrigation projects, writing:

> "Direct beneficiaries of Federal irrigation developments should pay in full the costs of new projects allocated to irrigation."

Nearly four decades later, this recommendation has largely been ignored. The U.S. should reform pricing policies that subsidize the inefficient use of water and continue to cost the taxpayers money. The Central Valley Project Improvement Act passed by Congress in 1992, required the Bureau of Reclamation to institute tiered water rates to encourage conservation, but their current rate structure is ineffective. It should be reformed, and this requirement for conservation pricing should be extended to other federal projects in a way that provides incentives for improving water-use practices.

We recommend new federal financing strategies to improve the administration of water-related laws. Rather than simply expanding federal investment, we recommend a three-pronged approach: (1) encourage more local investment through continued funding at or above current levels for state revolving funds; (2) encourage the adoption of marginal cost pricing by water utilities, and (3) raise fees on polluters to be re-invested in agencies that regulate water pollution. Similar economic tools are increasingly being used

worldwide to discourage unsustainable water practices. In order to ensure that all people have access to water to meet their basic needs at an affordable price we suggest the creation of a Low Income Home Water Assistance Program within State Revolving Loan programs.

Recommendation 4.
Water policies and infrastructure should be designed to evolve with changing climatic conditions.

There is a well acknowledged need to evaluate both the implications of climate change for the nation's water resources and appropriate technologies and water management strategies for coping with unavoidable impacts of climate change. In 2009, the Government Accountability Office (GAO) reports that although many federal resource managers understand that climate change impacts are important to the resources that they manage, they have not yet incorporated climate change projections, mitigation, or adaptation efforts into planning.[6] While there has been increased collaboration on improving data collection and information dissemination in regard to the impacts of climate change on water supply, there is still a lack of a coordinated national strategy.

The passage of the Secure Water Act (2009) calls for the establishment of a Climate Change and Water Intra-governmental Panel, which primarily focuses on downscaling climate data and conducting individual basin studies (beginning with the Colorado, Yakima, and the Milk/St. Mary River basins). This is critical in terms of enhancing our scientific understanding of climate change impacts, but such mitigation and adaptation efforts should be accelerated and expanded. The Council on Environmental Quality's Interagency Climate Change Adaptation Task Force finds that "there still are significant gaps in the U.S. government's approach to climate change adaptation and building resilience." The federal government should develop national strategy for climate change adaptation to now-unavoidable impacts. Such a strategy would:

- Define a protocol to analyze the climate resiliency of federal agency actions.
- Conduct a national inventory to identify the most promising opportunities to modify federal dam operations in the United States in light of climate change.
- Require agencies to integrate energy and water efficiency efforts (also addressed below).
- Identify priority areas for coordinated government response.

[6] Government Accountability Office (GAO). 2009. Climate Change Adaptation: Strategic Federal Planning Could Help Government Officials Make More Informed Decisions. GAO-10-113. http://www.gao.gov/products/GAO-10-113.

Recommendation 5.
Existing Federal water laws should be updated and adequately enforced.

Congress must modernize the antiquated Clean Water Act and Safe Drinking Water Act – two foundational pieces of federal legislation passed originally with bipartisan support, and immensely popular with the American people.

Once modernized, federal regulations must be enforced. There is an overwhelming assumption that safe, affordable water for drinking and household use is available to all residents in the US. This is false. Violations of our nation's water laws have become routine – a recent survey of national water quality data found that more than 50% of regulated facilities violated the Clean Water Act, but enforcement actions against polluters were infrequent.[7] Clear and immediate action is needed to expand enforcement efforts against violations of established water law.

We recommend the following changes to the Clean Water Act and the Safe Drinking Water Act to improve the protection of public health:

- Tighten controls on point sources to better reflect the Clean Water Act's goal of zero discharge of pollutants.
- Update technology standards to reflect current best available technologies and encourage innovation.
- Create stricter penalties for violating NPDES permits, levying fines that are sufficiently large to make polluting no longer a viable cost of doing business and by rescinding or denying renewal of permits of repeat violators.
- Update the Safe Drinking Water Act's standard-setting regulations to make them more protective of human health. Despite continued emergence of new contaminants in drinking water, regulations have barely changed and have not incorporated the risks of synergistic impacts. Standards should be updated to include the additive effects of common mixtures of chemicals.
- Bring bottled water quality standards and enforcement under the authority of the EPA rather than the FDA and make the standards consistent with tap water standards.
- Integrate implementation and enforcement of the Clean Water Act and Safe Drinking Water Act to make most efficient use of resources.
- Expanding the authority and administration of the Clean Water Act to regulate non-point source pollution and groundwater quality.

[7] K. Russell and C. Duhigg. 2009. "Clean Water Act Violations: The Enforcement Record." The New York Times, September 13, 2009.

- Restoring the traditionally broad scope of the Clean Water Act to bring water bodies such as ephemeral streams and wetlands with no "nexus" to a navigable water body back under its jurisdiction.
- Integrating equality of access to safe drinking water into the Safe Drinking Water Act's mandate.

In addition, many of the nation's waterworks and regulations were created before we fully understood the extent and value of the ecological services provided by intact river systems. New legislation is needed to ensure that these benefits (and the water required to sustain them) be given equal consideration with other project purposes, similar to the 1986 amendments to the Federal Power Act that gave habitat conservation goals "equal consideration" with power and development interests.

Recommendation 6.
Twenty-first century water management must encompass decentralized solutions such as water demand management, stormwater capture, recycled water, greywater, and other nontraditional approaches.

There are several other key actions Congress can take to ensure that national water policy is far more comprehensive, modern, effective, and efficient.

- Increase efforts to promote the use of water-efficient technologies and practices through updated federal standards for appliances and fixtures, along with expanded education and technical assistance. Federal water-efficiency standards were created by the EPA over two decades ago; these standards should be more frequently updated to reflect advances in technology.
- Technical assistance programs to landowners, such as the Farm Service Agency should be specifically targeted at accelerating the adoption of water conservation and efficiency practices in priority agricultural areas.
- Federal agencies should support community-based organizations that play a central role in ensuring the involvement of affected residents by increasing programs to technical assistance providers working on critical water issues, such as EPA's program to support small water systems and the NRCS' Watershed Protection and Flood Prevention Program.
- Target federal spending through State Revolving Loans and other programs on demand management and infrastructure that increases the productive use of water.

Recommendation 7.
Federal water policies must be integrated with other policies, including energy, agriculture, and climate change.

As noted earlier, there are strong links between the water sector and other sectors, including energy and food production. The water sector is a major energy consumer and future trends suggest that this demand could grow due to more energy-intensive water supplies and treatment technologies, e.g. desalination.

Conversely, smart national policies can help address both water and energy challenges. For example, as shown in Figure 3, strategies that promote renewable energy and alternative cooling systems in the western United States can, over the next two decades, reduce water withdrawals for energy production by far more than 50% -- a tremendous improvement in water efficiency. In particular, the Pacific Institute research recommends that federal water policy:

- Phase out irrigation, energy, and crop subsidies that promote wasteful use of water and energy.
- Pursue new appliance standards and smart labeling of water efficient appliances that save money, water, and energy.
- Promote research and development that will help traditional energy sources reduce water withdrawals and consumption.
- Promote research and development for renewable energy sources that use little to no water.
- Use alternative water sources such as reclaimed or saline water for power plant cooling.

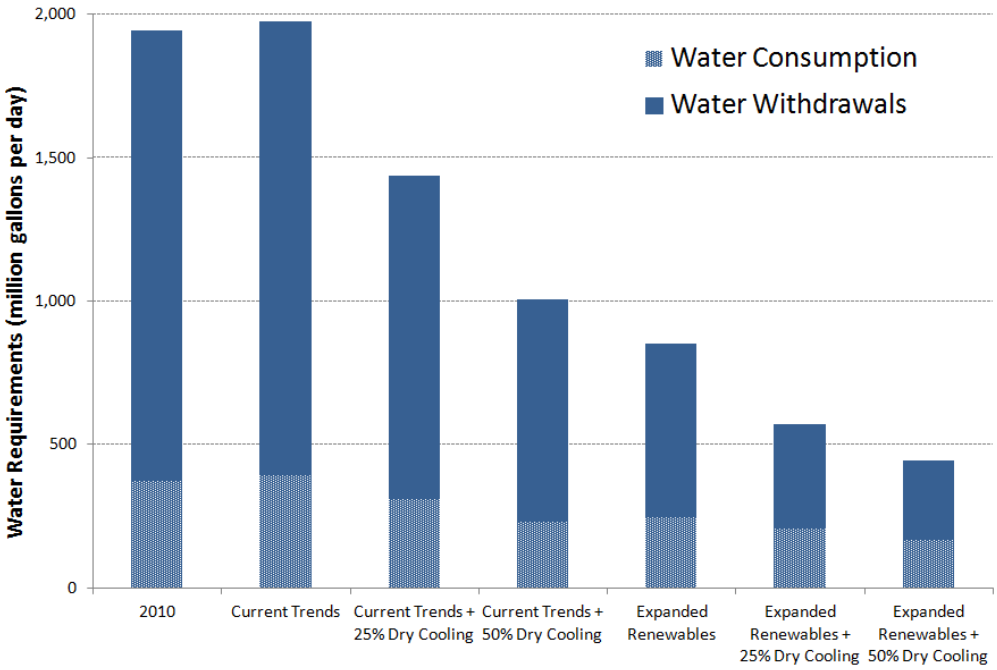

Figure 3. Water demands to produce energy could shrink rather than grow, if the nation invests in non-fossil fuel energy systems and advanced cooling systems. This graph is from a new analysis for the intermountain west of the United States (H. Cooley et al. 2011, "Water for Energy," Pacific Institute, Oakland, California).

The National Academy of Sciences should be asked to conduct an in-depth analysis of the impact of energy development and production on the water resources of the United States. The Secretary of the Interior and the Administrator of the Environmental Protection Agency should work together to identify the best available technologies to maximize water and energy efficiency in the production of electricity and other energy resources, including evaluating the energy used in water storage and delivery operations in major Reclamation projects.

Recommendation 8.
Fully incorporate environmental justice principles into federal water policy.

Many federal agencies, including EPA and Department of the Interior, already have the statutory ability to address the concerns raised by environmental justice communities in permitting, project review and construction, and financing activities. Through the work of the National Environmental Justice Advisory and other efforts of the Office of Environmental Justice, there are many documents providing guidance on how to achieve

this in a variety of agencies. However, a renewed effort must be made to fully integrate environmental justice into federal water policy, which would use benchmarks of measurable progress towards eliminating water-related disproportionate impacts in low-income communities and communities of color and have a clear system of evaluation and accountability. Some of the key elements of such an effort include, but are not limited to:

- Hiring staff explicitly charged with environmental justice assessments of policies and projects and providing training for other policy staff, such as permit writers;
- Assessing disproportionate impacts in any proposed project, policy, or permit, ranging from NPDES permits to Bureau of Reclamation dam operations, and modify or cancel proposed projects, policies, or permits if disproportionate burdens cannot be reduced;
- Ensuring water quality permits and programs, such as the Underground Injection and the Total Maximum Daily Load programs, are based on numeric standard that are protective of the most sensitive populations.
- Prioritizing grants for environmental justice communities within existing water-related funding programs. Programs such as the Clean Water State Revolving Fund, the Safe Drinking Water Revolving Fund, and the USDA Rural Loan and Grant program should prioritize funding and expand current program specifically for low-income communities and communities of color to fund critical water supply, water quality, and wastewater projects.
- Conducting an environmental justice review of federal water-related funding programs. Entities receiving federal funding should be required to demonstrate collaboration with affected communities and ongoing efforts to address disproportionate impacts in order to continue receiving funding. This would apply to programs to both grant and loan programs such as US Department of Agriculture's Environmental Quality Incentives Program, State Revolving Funds, but also Bureau of Reclamation agricultural water delivery programs such as California's Central Valley Project.
- Addressing long-standing tribal water claims.

Recommendation 9.
Other important federal government actions: The federal government must lead by example.

The federal government should lead by example, establishing new rules and targets for its own operations. We recommend that:

- All federally managed buildings must meet or exceed WaterSense standards for fixtures and appliances.

- The federal government should set a target encouraging half of federally managed buildings to utilize recycled water, storm water, or greywater sources by 2025.
- All federal water projects should evaluate the risks of climate change and develop plans for modifying physical infrastructure or operating procedures to reduce these risks.

Some Good News

The assumption that a growing economy and growing population must, inevitably, demand more and more water without limit now turns out to be wrong. In the past several decades in the United States, quietly and without fanfare, the nation has been improving the productivity of water use, growing more food and producing more goods and services without increasing the demand for water.

Figure 4 shows this remarkable change, plotting gross domestic product with total water withdrawals over the past century. In the late 1970s and early 1980s, demand for water began to level off and even decline; on a per-person basis, the nation uses far less water today per person than in 1980. This is a tremendous increase in water "productivity" as shown in Figure 5, which plots total economic value per unit water. This measure of productivity has grown tremendously in the past two decades, showing that limits to water availability do not mean economic hardship or suffering. Indeed, additional investment in physical infrastructure of water treatment and delivery systems has the potential to create hundreds of thousands of new jobs nationwide.

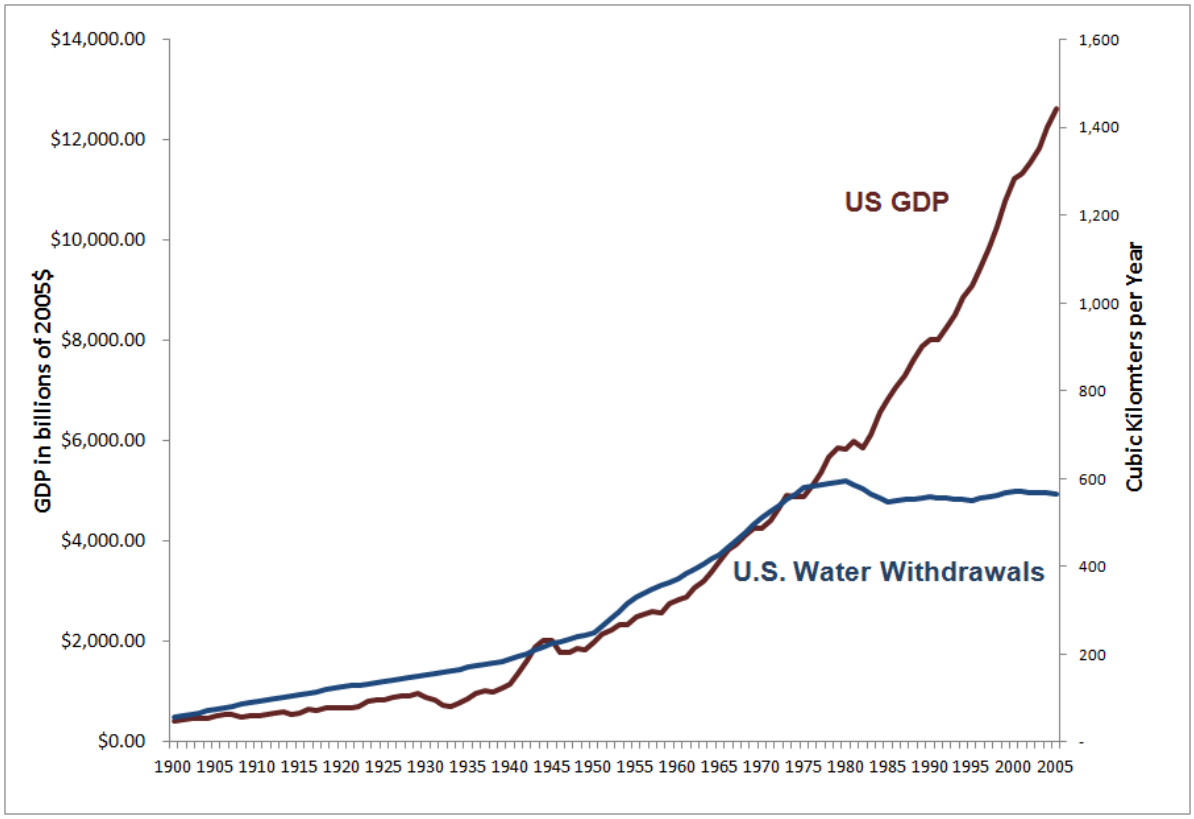

Figure 4: Total gross domestic product (GDP) of the United States in billions of 2005 dollars plotted with total U.S. water withdrawals plotted in cubic kilometers of water per year. Note that water withdrawals in the U.S. peaked around 1980 and have declined since then with no adverse impact on economic growth.

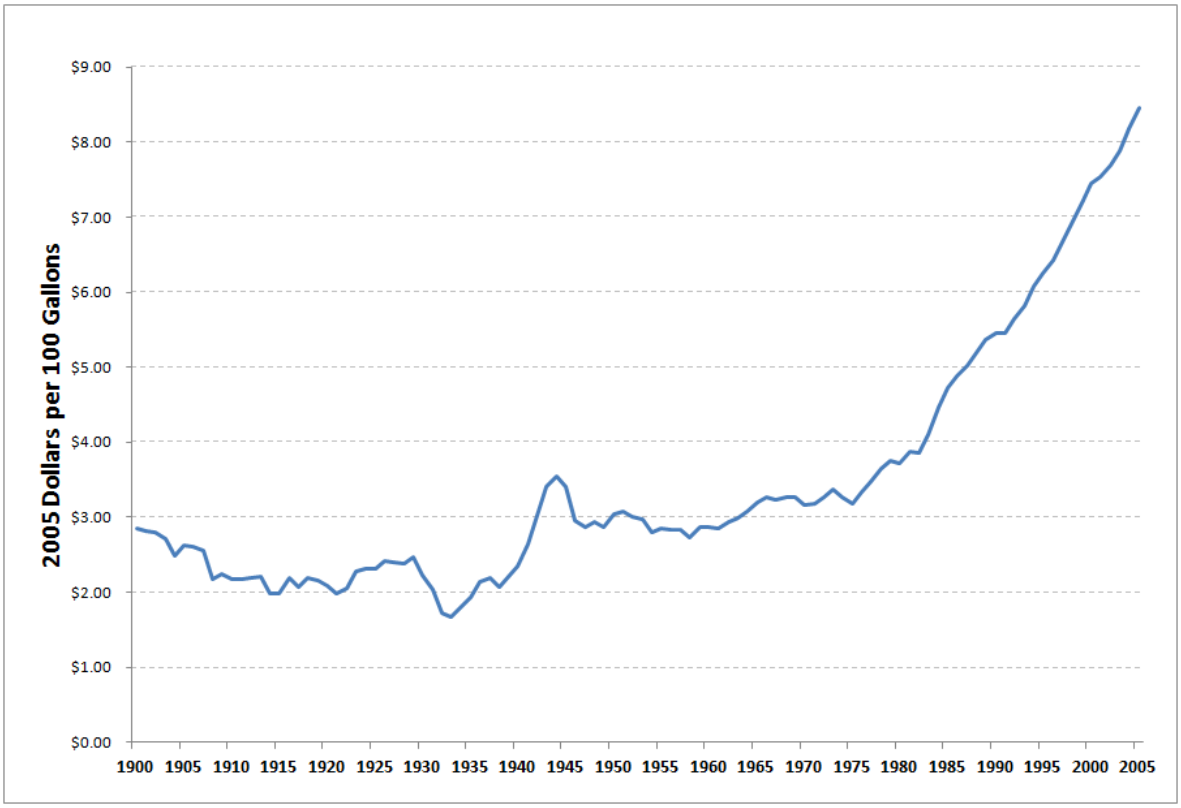

Figure 5: Water "productivity" in the United States measured in 2005 dollars per 100 gallons of water. Note that overall productivity has increased dramatically since 1980.

Conclusions

The 21st century brings with it both persistent and new water challenges, including growing human populations and demands for water, unacceptable water quality in many areas, weak or inadequate water data collection and regulation, and growing threats to the timing and reliability of water supply from climate change. Several countries have reformed their water policies to better address these challenges. While the political and cultural contexts of these reforms have varied, water reforms offer the potential to meet economic demands for water with less water through solutions that focus on “soft path” water solutions including water conservation and efficiency, smarter water pricing, new technology, and more participatory water management.

The United States has not followed suit and continues to rely on fragmented and outdated water policies based on a patchwork of old laws, competing institutions, and aging infrastructure. This testimony offers specific recommendations for Congress drawing on

the unique characteristics of the United States water system together with insights drawn from experience around the world, in an effort to help identify a more effective and sustainable approach to federal water management.

I congratulate you for considering this vital issue and for helping to raise national attention on the need to re-evaluate and re-focus efforts on sustainably managing the nation's precious freshwater resources.

Thank you for your attention.

Dr. Peter H. Gleick

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Biography for Dr. Peter H. Gleick

Dr. Peter H. Gleick is co-founder and President of the **Pacific Institute** in Oakland, California. The Institute is one of the world's leading non-partisan policy research groups addressing global environment and development problems, especially in the area of freshwater resources. Dr. Gleick was described by the San Francisco Chronicle in 2009 as "arguably the world's leading expert on water." His research and writing address the hydrologic impacts of climate change, sustainable water use, water privatization, and international conflicts over water resources. His work on sustainable management and use of water led to him being named by the BBC as a "visionary on the environment" in its *Essential Guide to the 21st Century*. In 2008, Wired Magazine called him "one of 15 People the Next President Should Listen To."

Dr. Peter H. Gleick produced some of the first research on the implications of climate change for water resources. He has also played a leading role in highlighting the risks to national and international security from conflicts over shared water resources. He produced some of the earliest assessments of the connections between water and political disputes and has briefed major international policymakers ranging from the Vice President and Secretary of State of the United States to the Prime Minister of Jordan on these issues. He also has testified regularly for the U.S. Senate, House of Representatives, and state legislatures, and briefed international governments and policymakers.

Dr. Gleick received a B.S. from Yale University and an M.S. and Ph.D. from the University of California, Berkeley. In 2003 he received a MacArthur Foundation Fellowship for his work on global freshwater issues. In 2006 he was elected to the U.S. National Academy of Sciences, Washington, D.C. and his public service includes work with a wide range of science advisory boards, editorial boards, and other organizations. Gleick is the author of more than 80 peer-reviewed papers and book chapters, and nine books, including the biennial water report ***The World's Water*** published by Island Press (Washington, D.C.).