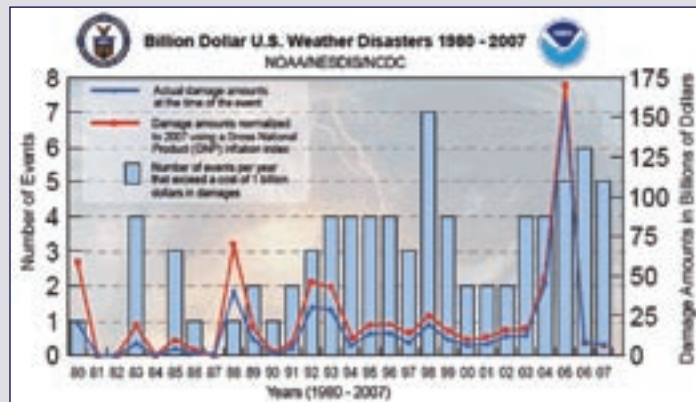


Chapter 14: ADAPTATION

BACKGROUND

- [Climate change is already under way](#). [Observed changes](#) in climate include¹: a) a .76° C increase in average global temperature; b) increasing incidence of wildfire in the American West, directly correlated to early snowpack melt; c) a 17 cm rise in sea level over the 20th century; and d) the increasing incidence of heavy precipitation events resulting in greater flooding and less groundwater recharge.
- There is a lag time of almost 30 years between when carbon is emitted and when the effects on climate are felt. Changes observed today are the result of the emissions of the 1970s. Greenhouse gas emissions today will worsen the impact of climate change in the decades to come.
- More than [75 percent of natural disasters around the world are caused directly or indirectly by weather and climate](#). Weather-related events – hurricanes, tornadoes, forest fires, floods, heavy snows and drought – cost the United States billions of dollars each year. More than one quarter of the U.S. gross national product is sensitive to weather and climate events.
- Flood damage in the United States has been escalating, increasing six-fold from the early 1900s to 2007. Flood damage now [averages more than \\$6 billion annually](#), even when the major hurricanes of 2005 (Katrina, Rita and Wilma) are excluded.
- Coastal areas are expected to be affected by rising sea levels and more intense coastal storms. More than half the U.S. population lives in the nation's 673 coastal counties. The [value of insured residential and commercial property vulnerable to North Atlantic hurricanes](#) is \$19 trillion, including \$7.2 trillion in coastal counties. That includes 79 percent of the property in Florida, 63 percent of the property in New York and 61 percent of the property in Connecticut.
- On average, the world experienced 351 major [natural disasters](#) per year from 2000 to 2006, compared to only 78 per year from 1970 to 1999.²
- Federal agencies manage over 650 million acres of land and more than 150,000 square miles of protected waters. Public assets include marine sanctuaries, coastal areas, national forests, national parks, military bases, navigation channels, flood control and water structures and electricity grids. However, government agencies managing these assets are not required to take climate change into account when making planning decisions.
- The General Accounting Office has concluded that “many agencies with responsibilities for public lands have not made sufficient progress on (climate) planning and that resource managers in general are not receiving sufficient guidance on planning for climate change.”



FRAMEWORK FOR FEDERAL POLICY

- The federal government has two principal responsibilities in adapting to global climate change. The first is to adjust to the impacts of climate change, actual or expected, in its own operations and in the public assets the government is entrusted to protect. The second is to help the rest of the nation adjust, through intelligent policy, programs and science.
- Practice “No Adverse Impact” management. Some adaptation measures, particularly in coastal areas and floodplains, may be beneficial to the group or individuals executing them but detrimental to others.³
- Projected changes in climate should be factored into every spending decision the federal government makes, ensuring that money is not wasted on projects that will need to be repaired due to predictable climate impacts.
- Public policy should not encourage non-adaptive practices, such as locating buildings and critical infrastructure in floodplains and threatened coastal areas.
- Public funds generally should not be invested in projects or practices that harm natural systems that protect human development, water supplies, agricultural lands and other essential assets from climate impacts.⁴

EXECUTIVE ACTIONS

1. Direct the National Energy and Climate Council to develop a **National Climate Change Adaptation Plan** in consultation with outside entities, as appropriate. The plan should provide a framework for [states and localities](#) that want to develop climate change [adaptation strategies](#). It should examine ways in which federal agencies coordinate action to ensure the timely dissemination of new climate projections. [It should not pre-empt state and local planning](#) for climate change adaptation. The Council should coordinate with the Departments of Transportation and Energy to develop federal guidelines for resilient infrastructure development.
2. **Charge the [Climate Change Science Program \(CCSP\) with distributing regional climate models to states and localities](#)**. Agencies at the state and local levels responsible for infrastructure planning, development and disaster response will need access to the most up-to-date information available. The CCSP should synthesize models at scales that are useful to state and local governments and act as a clearinghouse for climate impact models so states and localities have access to the most up-to-date scientific information possible, published in a form that is useful to them. The director of the CCSP should take part in the climate change Green Room, proposed in the States and Localities chapter.
3. **Ensure that federal managers with responsibilities impacted by climate will be trained and able to respond**. Direct the CCSP to develop workshops for federal managers that are regionally specific and tailored to the responsibilities of the agencies. In-person workshops may be preferred however, exploring the potential for web-based formats would be ideal both to provide continuing access to the content and to reduce travel.
4. **Direct FEMA to develop and conduct workshops for local governments on nonstructural approaches to disaster prevention** such as relocating buildings out of flood plains. Additional workshops should provide information on disaster preparedness related to the

anticipated local impact of climate change; adaptive designs and low-carbon materials for local infrastructure; and, post-disaster recovery strategies that help reduce future greenhouse gas emissions and vulnerabilities.

5. **Focus research on local, economic and social impacts of climate change.** The [National Research Council](#) reports that more attention is needed to understand the regional, local, social and economic impacts of climate change in order for state and local officials to better prepare. The President should direct agencies participating in the Climate Change Science Program to strengthen their research in these areas and fully support the [recommendations of the University Corporation for Atmospheric Research](#). Those recommendations include \$9 billion in additional funding between 2010 and 2014 to improve the Earth observing system, increase data analysis capabilities and support basic and applied Earth sciences research. (See Climate chapter for additional information.)
6. **Increase the federal emphasis on disaster prevention.** The new FEMA especially needs to emphasize disaster prevention to reduce the loss of life and property, the impact on communities and the cost to taxpayers from extreme weather events, flooding and other disasters. The President should require the director of FEMA to chair an interagency task force that would identify, coordinate and strengthen federal programs that help communities prepare for and prevent the effects of natural disasters. The task force should address: a) how federal programs can better restore natural systems, including wetlands and river meander, that prevent or reduce the severity of natural disasters; b) changes in national model building codes so buildings can better withstand extreme weather events while still providing for energy-efficient, sustainable design (see Buildings chapter for more information); and c) how mapping and land use can be made more adaptive to respond to changes in climate.
7. **Direct FEMA to work closely with professional organizations such as the [National Emergency Management Association](#) and the [Association of State Floodplain Managers](#) to improve intergovernmental cooperation on disaster prevention** and to determine whether unfolding climate impacts require modifications in federal disaster response. Among the improvements should be a consensus protocol to identify federal/state/local authorities in disaster prevention and response. The Association of State Floodplain Managers has prepared a letter to the candidates with further recommendations for national flood policy, available [here](#).
8. **Maintain adequate numbers of National Guard troops in the United States to respond to national emergencies.** Had more National Guard troops been available domestically instead of deployed overseas, keeping peace and order in the immediate aftermath of disasters such as Hurricane Katrina would have been easier, reducing the death toll and the damage to property.
9. **Improve preparedness for water-related disasters and plan for emerging trends:**
 - a) Direct the National Oceanic and Atmospheric Administration (NOAA), FEMA, the United States Geological Survey (USGS), the EPA, the Corps of Engineers (and other appropriate agencies) to organize a joint task force to identify needs and strategies for better preparedness for floods, droughts, hurricanes, violent thunderstorms, tornados and other water-related events and trends.
 - b) Develop a national **Floodplain Management Act** to identify and strengthen federal, state, tribal and local government roles and responsibilities, and to support coordination to foster wise floodplain management for protection and restoration of ecosystem functions,

foster improved public safety and water quality and to incorporate modern climate science, sea-level rise, shoreline erosion and changes in land and water management (such as urbanization, land cover, runoff characteristics) into overall floodplain planning.

- c) Direct NOAA and USGS to develop a comprehensive needs assessment (including budget recommendations) and updated methodologies to improve prediction capacity for climate, weather and flood events, including monitoring and analysis, professional resources, satellite capacity, etc. (For example, current flow frequency methodologies are based only on past flow histories, without climate change factors. These were developed in the 1970s under the Water Resources Council and have not been updated since 1982.)
- d) Increase federal support for information systems in the federal budget for programs such as the USGS National Streamflow Information Program, the Cooperative Water Program, river/stream gauging systems, satellite imaging and data management systems.

10. Update key federal floodplain and wetland directives under Executive Orders 11988 and 11990 to reflect anticipated impacts from intense precipitation events as well as the impact on hydrology of land development from recent decades.

11. Direct FEMA to create special Climate Adaptation Zones in areas most susceptible to adverse climate impacts. Businesses, institutions, infrastructure and buildings within the zones would be given priority for federal funding related to adaptation. The Small Business Administration would give priority attention to small businesses that provide goods and services related to adaptation. FEMA would give priority attention to the zones for disaster preparedness and response.

12. Direct the Department of Homeland Security to develop a web-based directory of resources to help local governments prepare for and respond to extreme weather events, public health emergencies and other climate-related impacts. Direct FEMA to develop a SimCity-type web-based video game to build local response skills.

13. Direct FEMA and the United States Department of Agriculture (USDA) to assess government exposure to flood and crop risks based on projected changes in climate. Since 1980, [taxpayer exposure under the Federal Crop Insurance Program has increased 26-fold to \\$44 billion. Taxpayer exposure in the National Flood Insurance Program \(NFIP\) has quadrupled since 1980, approaching \\$1 trillion in 2005. The program had to borrow more than \\$17 billion from the Treasury to pay claims following Hurricanes Katrina, Rita and Wilma.](#) The two agencies should also analyze the implications for future insurance rates, identify prevention measures that may be taken to mitigate climate-exacerbated flood conditions and explore the feasibility of insuring second homes to the same level of protection a primary residence receives.

14. Reform the National Flood Insurance Program: The NFIP is currently using maps to project risk that reflect floods that have already occurred and which may be significantly underestimating flood risks in some regions of the United States. The program should:

- a) Require that:
 - i. flood insurance is actuarial depending on specific locations, not regions. If low-income assistance is necessary, it should be provided through the Department of Housing and Urban Development.
 - ii. new buildings constructed in high-risk areas do not qualify for flood insurance;

- iii. new FEMA floodplain maps, reflecting new areas of risk, are used when assessing insurance rates;
 - iv. Once the owner of a building in a flood-prone area has made one total loss claim to the NFIP, he or she will not be able to make another one, regardless of whether he chooses to rebuild in the flood plain or not;
 - v. if a building permit is sought for an area deemed to be at high risk of a climate-related incident (flood, hurricane, etc), the applicant is provided with the best climate-impact information available at the time. Once a decision has been made to go ahead, the applicant should waive the ability to recoup public money in the event of a natural disaster.
- b) Reform and integrate levee policy, which is under shared jurisdiction between the U.S. Army Corps of Engineers, FEMA, Natural Resources Conservation Service (NRCS) and the Department of the Interior; give priority to undeveloped land for flood management; and use structural protection only as a last resort for already developed areas; and anticipate and plan for future watershed development, extreme weather and sea-level rise. Additional specific recommendations from the Association of State Floodplain Managers can be found [here](#) and [here](#).

LEGISLATIVE ACTIONS

- 15. Propose Congress return FEMA to independent-agency status.** FEMA was brought under the Department of Homeland Security after September 11, 2001. The additional layer of bureaucracy appears to have hindered agency efforts to respond to major disasters. The agency should have a more direct reporting relationship to the White House and be led by a strong director with extensive experience in disaster preparedness, response and recovery. The President should direct FEMA to update flood plain maps to reflect true risk based on projected and observed changes in disaster patterns and vulnerable areas. Pre-existing levees may be inadequate to protect against potential flooding; new floodplain maps must reflect this to show true risk.⁵
- 16. Propose a National Climate Change Adaptation Fund** in the amount of one third of the carbon permit auction revenues. \$1.5 billion of this fund should go to funding the Climate Adaptation Extension Service, outlined below. The rest should be made available to state and local governments in the form of block grants that can be used toward climate-specific adaptation programs. (For example, elevating a coastal roadway to be more reliable in the face of sea level rise and storm surge.) This fund will also support the climate adaptation program discussed in the States and Localities chapter.
- 17. Establish a Climate Adaptation Extension Service**, similar to the USDA extension service with a mission of, “Advancing an understanding of climate change and supporting research into adaptation needs and methods.” This service will be funded by the Climate Change Adaptation Fund and will be responsible for sponsoring research programs at public colleges and universities on climate change mitigation and adaptation best practices. The service will also be responsible for educating private citizens as well as city planners and others at local levels whose responsibilities are climate sensitive. Finally, the service should sponsor forums on regional best practices as determined by localities.

- 18. Oppose legislation that delays the release of updated floodplain maps.** Some legislative proposals have sought to delay or impede the release of new maps that show vastly expanded flood plains. Delaying the release of these maps to communities needlessly exposes prospective homeowners to risk while only artificially increasing property value temporarily. These maps must be released as soon as they are completed so communities can plan accordingly.
- 19. Increase support for information systems** in the federal budget for programs such as the USGS National Streamflow Information Program, the Cooperative Water Program, river/stream gauging systems, satellite imaging and data management systems.

¹ Examples taken from the IPCC 4th Assessment Report Summary for Policy Makers.

² Nathaniel Gronewald, "United Nations: Rising Frequency of Natural Disaster Raises Economic Insecurity," ClimateWire, July 2, 2008.

³ Examples include groin fields or other methods of hard stabilization in coastal areas that can interrupt natural flows of sediment, exacerbating erosion in other areas.

⁴ Marshlands and barrier islands move naturally in response to severe storms and are able to act as buffers to storm surges. However, years of mismanagement in the Mississippi River basin resulted in the loss of protective areas along the Louisiana coast. Hurricane Katrina's storm surge would have likely been partially abated had these structures remained intact.

⁵ Chad Berginnis, "Top 3-5 Ideas to Tell the President," E-mail to Bill Becker, Executive Director, PCAP, July 10, 2008.