POLICY FORUM: DISASTER MANAGEMENT

U.S. Policies Pertaining to Weather and Climate Extremes

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Atmospheric extremes—which include floods, droughts, severe heat and cold, and storms—have resulted in steady increases in economic costs and lives lost in the United States since the Dust Bowl days of the 1930s. Shifts in the frequency and intensity of severe weather (events lasting hours or days) and climate extremes (events persisting for months or years) could exacerbate this growing problem. Most assessments of recent increases in losses, such as from El Niño 1997 (*1*), point to society and human behavior as the primary cause. Growth of population and wealth, as well as demographic shifts to coastal areas and to expanding metropolitan areas, have collectively increased the vulnerability of the United States to losses from weather extremes (*2*).

Extremes now have an impact on all levels of government and on the insurance industry (*3*). More than 90% of the nation's natural disasters are a result of weather or climate extremes. Two impacts of the cold Midwestern winters of the late 1970s were the ouster of the mayor of Chicago and the development of regional snow removal plans (*4*). Losses associated with Hurricane Andrew in 1992 drove 11 insurance companies into bankruptcy and resulted in new laws overseeing the sale of insurance in Florida (*5*). Federal and state payouts were $4 billion for the 1988 drought, $6.2 billion for the 1993 Midwestern flood, and $6.5 billion for Hurricane Andrew. These increases are necessitating a shift from a policy focusing on costly relief assistance to one with more emphasis on mitigation and personal responsibility for living in harm's way. Policies related to extremes have followed two approaches, proactive and reactive, and emphasis on each evolved as society changed, new technologies developed, and government leadership shifted.

History of Policy on Extremes

Proactive policies attempting to anticipate and minimize losses from weather and climate extremes developed about 1800. The goal of the nation's Weather Bureau, established in 1870, was to protect life and property with a focus on storm and flood warnings; however, skills in predicting developed slowly until the mid–20th century (*6*). In the 1960s, the federal government also endorsed research and development of cloud-seeding technologies, but this policy faded when clear proof of success failed to emerge (*7*).

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Lawrence Katz carries his cat down a flooded street in West Des Moines, Iowa, in this July 1993 photo. An estimated 250,000 central Iowans were left without tap water for nearly 2 weeks in July of 1993 when flood waters closed the Des Moines water plant. The record 1993 flood caused $6 billion in losses in Iowa and losses totaling $18 billion across the Midwest, becoming the most costly flood in the nation's history.

Flooding, the nation's most damaging extreme, was the first to receive policy attention (*8*). For the past 150, years the federal government has built thousands of miles of levees and hundreds of reservoirs in a massive "structurally" based policy.

Concern over the opposite extreme—droughts—also brought structural solutions including hundreds of reservoirs and irrigation projects in the drier west beginning late in the 19th century. Record droughts of the 1930s and the presence of the New Deal government created preventive policies that involved land-use controls, conservation practices, and more reservoirs, furthering the structural approach (*9*).

Policies relating to atmospheric extremes underwent major changes after World War II. Costly proactive structural policies to prevent losses during disasters were finally recognized as unable to control all losses. A "nonstructural" philosophy emerged in national policies: move people out of hazardous areas, seek improvements in building codes and encourage use of crop and flood insurance (*10*). Rapid improvements in storm forecasting coupled with local policies led to the development of thousands of community warning systems after 1960. In addition to these proactive measures, other policies have provided assistance to those with losses. From 1800 to 1950, relief was a local government responsibility except when overwhelming losses occurred, and then state and sometimes federal aid was provided.

A series of laws beginning with the Disaster Relief Act of 1950 expanded the scope of federal responsibility (*11*). However, without objective policy criteria to define a disaster, determining which events became "disasters" and how much relief was awarded often became politically driven decisions. The first presidential declaration of a disaster occurred in 1953, and there have been more than 1000 since. Payouts have rapidly escalated over time to a total of $30 billion, with government aid to individuals and to local and state government agencies. Temporary housing, unemployment insurance, and small business loans have also been provided at government expense.

Current Policy

The massive growth of federal assistance has had a negative effect on nonstructural policies, which are based on persuading people to do the right thing—build on suitable land (not in floodplains or risky coastal areas), and to buy crop or flood insurance (*12*). Adoption of nonstructural policies largely failed—what incentive was there to do these things when govern-

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ment relief payments invariably bailed out almost everyone when a disaster occurred? However, by the 1990s, "budget-breaking" federal relief payments brought policy action by the Clinton Administration and Congress to encourage and enforce nonstructural approaches (*11*).

Recent extremes have been of two general types: extremely costly weather events such as Hurricane Andrew of 1992 and the great Midwestern flood of 1993, or a sequence of climate events (four severe winters in 1976–1980, the drought of 1987–1989, or the 1990–1996 period with 72 weather catastrophes that each exceeded $100 million in insured losses). How and when these extremes occurred, as well as the impacts they created, have helped define recent policy reactions. Mitigation as opposed to recovery payments emerged as a policy theme. For example, major floodplain damages and $10 billion in farm losses associated with the flood of 1993 led to new laws that drastically changed the federal flood insurance program and the crop insurance program (*13*). As a result of $16 billion in insured losses due to Hurricane Andrew, the insurance industry has seriously considered seeking government involvement to serve as a backup for excessive future losses that the insurance industry cannot handle (*14*). Insurers have been seeking to formalize a government role as the reinsurer of last resort, and the federal government has been considering how best to get involved (*15*). Building codes have been enhanced in Florida and other states (*16*).

The Natural Hazard Reduction Program of the Clinton Administration represented a major move to mitigate losses and to reduce disaster costs, and to help accomplish this goal, the government has joined with the property insurance industry to improve disaster reduction (*17*). In an effort to address problems caused by temperature extremes, government policies have also focused on various issues such as helping to fund energy costs for the poor, establishing public shelters for protection during extremes, setting energy price controls, and encouraging conservation practices. An emerging excellent thrust is "energy efficiency," which has the added benefit of minimizing emissions of carbon dioxide to lessen the potential for global warming.

In a global context, U.S. policies for dealing with extremes have been more complex and sophisticated than those in most other nations. Most other nations rely on relief assistance, often undergirded by U.S. funds, for dealing with losses. The United States has also exported its policy of structural approaches to assist many developing nations. Canada passed comprehensive emergency preparedness legislation in 1988, defining government actions in natural disasters, and further established an emergency preparedness agency to promote mitigation and coordination during disasters. The United States and Japan have established a panel to deal jointly with problems associated with high winds, typhoons, and seismic disturbances.

Future Policy Directions

Endeavors to control damage and to provide assistance should continue to be a part of government policy, but some structural policies, like those that once required continuing construction of electric power systems by utilities, have ended, and others should change. Agricultural policies should continue to encourage adaptation (wise land use, better seed varieties, etc.); water policy should deemphasize construction and resource control (reservoirs, diversions, dams, etc.) and policies to protect society must emphasize warning systems and mitigative actions (stronger buildings, better insulation, and shelters).

Future assistance should not rely on political decisions about which events deserve assistance and how much relief is needed. Emerging policies emphasizing personal responsibility for actions, as reflected in the crop and flood insurance changes in 1997, will need more incentives. Such policies also will need to be enforced by the insurance industry and should involve a partnership of local, state, and federal entities and the private sector (*18*). The Subcommittee on Natural Disaster Reduction identified major issues that need scientific attention to help reduce future losses, and these include studies to better estimate losses, to more effectively adapt new technologies that mitigate losses, to improve prediction of weather hazards like hurricanes, to define the effect of global change on hazards, to define impacts of disasters on natural ecosystems, and to assess the vulnerability of critical infrastructures (*19*).

Most loss of life during recent extremes has been attributed either to location in inadequate facilities or questionable personal actions after receiving a warning such as driving a vehicle into a heavily flooded highway (*13*). Education is needed to create greater awareness of dangers and individual responsibility. Insurance coverage related to extremes should become a requirement for those deciding to live in high-risk areas.

If extremes increase with time owing to changes in climate, society and its systems will have to adapt. Regardless of a change in climate, population growth and increasing vulnerability of the nation's infrastructure mean that losses will continue to increase, a clarion call for mitigative efforts. The property insurance industry fears the potential for massive, financially crippling losses, and "market-based" approaches and new federal policies are likely (*16*). One obvious need is for the design of systems and structures having greater flexibility and to reduce infrastructure vulnerability. This includes using diverse and better adapted crop strains, more efficient irrigation, floating docks in major harbors, stronger homes and structures, and new infrastructure, particularly in aging urban areas. Highly vulnerable infrastructures include communications, electricity and natural gas supply systems, water supply and sewage treatment systems, and transportation. Sustainability and wise land use have been largely ignored in most public policies dealing with natural hazards (*20*). Policies with incentives for "doing the right thing" are necessary.

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