

An hourglass graphic with a globe in the top bulb and a globe in the bottom bulb. The top bulb is dark grey, and the bottom bulb is light blue. The hourglass is centered on the page.

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Flood Risk Management: Levees: A Federal Primer

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June 20, 2008

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CRS Report for Congress

Flood Risk Management and Levees: A Federal Primer

Updated June 20, 2008

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Prepared for Members and
Committees of Congress

Flood Risk Management and Levees: A Federal Primer

Summary

Midwestern flooding and Hurricane Katrina have raised concerns about reducing human and economic losses from flooding. In the United States, local governments are responsible for land use and zoning decisions that shape floodplain and coastal development; however, state and federal governments also influence community and individual decisions on managing flood risk. The federal government constructs some of the nation's flood control infrastructure, supports hazard mitigation, offers flood insurance, and provides emergency response and disaster aid for significant floods. In addition to constructing flood damage reduction infrastructure, state and local entities operate and maintain most of the flood control infrastructure and have initial flood-fighting responsibilities.

Prior to the Lower Mississippi River Flood of 1927, the federal role in flood control was limited. The Flood Control Act of 1936 (19 Stat. 1570) declared some flood control a "proper" federal activity. Today, the federal agencies most involved in flood control and flood fighting and emergency response are the U.S. Army Corps of Engineers (Corps) and the Federal Emergency Management Agency (FEMA).

The 110th Congress is faced with numerous flood control issues, including responding to disasters and adjusting federal flood policies. The recent midwestern floods and Hurricane Katrina have broadened interest in fundamental review of the current approach to managing floodwaters. Questions raised are: Do current policies, programs, and practices result in an acceptable level of aggregate national risk? Do they promote wise use and investments in the nation's floodplains and coasts? Do they encourage development that puts people in harm's way? Levees represent a particular challenge in that they may encourage development in flood-prone areas, but sometimes fail or are overtopped by significant storms. Hurricane Katrina brought national attention to the catastrophic consequences when structures fail or are breached. Similarly, two major midwestern floods in the span of 15 years (one in 1993 and one in 2008) have raised concerns about structures' ability to reduce or avoid flood damages and their effects on development patterns.

The 110th Congress addressed some flood issues in the first omnibus Water Resources Development Act (WRDA) enacted after Hurricane Katrina — WRDA 2007 (P.L. 110-114). For example, WRDA 2007 requires that national water resources planning avoid the unwise use of floodplains and flood-prone areas, and requires the President to report by 2010 on national vulnerability to flood damages, including the risk to human life. This report is to include assessments of current programs and recommendations for improvements. The law also creates a Committee on Levee Safety to make recommendations for a national levee safety program. How these changes are implemented over the next few years may affect the nature of federal investment in flood and storm damage infrastructure and mitigation measures.

This report provides a primer on responsibilities for flood management, describes the role of federal agencies, and discusses flood issues before the 110th Congress. The report also discusses the legislative response to Hurricane Katrina.

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Flood Risk Management and Levees: A Federal Primer

Midwestern flooding in 2008 and Hurricane Katrina flooding in 2005 have enlivened interest in reducing the risk of flooding in communities across the nation. These large-scale events have demonstrated that not only is property damaged during floods, but also floods can represent significant risks to life and can cause economic disruption and other social hardships. The 110th Congress, like many earlier Congresses, is faced with numerous flood control issues, including responding to flood events and altering federal flood damage reduction, mitigation, and insurance policies. These issues have been brought to the fore as the Midwest experiences its second major flood in 15 years.¹

In the United States, local governments are responsible for land use and zoning decisions that direct floodplain and coastal development; however, state and federal governments also influence community and individual decisions on managing flood risk. For example, the federal government constructs some of the nation's flood control infrastructure, supports hazard mitigation actions, offers flood insurance, and provides emergency response and disaster aid for significant floods. The federal agencies most involved in flood damage reduction and flood fighting and emergency response are the U.S. Army Corps of Engineers (Corps) and the Federal Emergency Management Agency (FEMA).

This report is divided into three sections. The first describes the current intergovernmental division of responsibilities for flood management and the federal role and interest in flood management. The second provides a framework for understanding flood risk management issues and the challenge of addressing the reliability and level of protection of the nation's levees. The third section describes actions that the 110th Congress has already taken and selected remaining issues that it, and many previous Congresses, have faced.

Flood Management Responsibilities: A Federalist Division

Recent major flooding events have drawn attention to ongoing debates about how to improve management of flood risk and the roles and responsibilities of

¹ Major flooding in the Midwest is reported to be in the range of a 400-year to 500-year flood; however, most levee protection is built to withstand a 100-year flood. These flood-year designations, however, do not indicate how often an area may flood. Rather, they are based on the chance that an area may flood in any given year. For example, the term *100-year flood* is the flood elevation that has a 1% chance of being equaled or exceeded *annually*. It is *not* the flood that will occur once every 100 years; 100-year floods can occur more than once in a relatively short period of time. Likewise, a 500-year flood is five times less likely to occur in any given year than a 100-year flood (0.2% chance of flooding).

individuals, communities, and the various levels of government. As with many other policy areas, the federal system has resulted in public functions for flood damage reduction being shared by all levels of government. Local governments are responsible for land use and zoning decisions that direct floodplain and coastal development; however, numerous federal and state flood policies and programs influence local and individual decision-making. The federal government also funds some flood and storm damage reduction measures, manages a flood insurance and mitigation program, and provides disaster assistance.² It also generates essential data through mapping and other efforts.

Levees may be built by federal, state, or local entities (including private entities at the local level). Generally, levees are maintained by a local entity, with some exceptions. Local levee districts are generally the first entities responsible for monitoring levee conditions during flooding. The levee districts are also the first entity responsible for emergency response. If a flood or other emergency exhausts the levee district's flood fighting resources, the district typically contacts the state. The state will contribute its flood fighting resources to the local effort; as the state's resources are exhausted, it typically will contact the Corps for assistance under the Corps' emergency response authority.

Federal Role and Interest in Reducing Flood Damages. The federal role in flood control began in the late 19th century. Prompted by devastating floods in the Mississippi River basin, Congress created a commission to oversee the development of a levee system to control the river's flow. The Mississippi River Flood of 1927³ and floods in the mid-1930s, ushered in a modern era of federal flood control investment. The Flood Control Act of 1936 (19 Stat. 1570) declared flood control a "proper" federal activity in the national interest.⁴ Section 1 of the act established the following policy:

It is hereby recognized that destructive floods upon the rivers of the United States, upsetting orderly processes and causing loss of life and property, including the erosion of lands and impairing and obstructing navigation, highways, railroads, and other channels of commerce between the States, constitute a menace to national welfare; that it is the sense of Congress that flood control on navigational waters or their tributaries is a proper activity of the Federal Government in cooperation with States, their political sub-divisions and

² For information on the evolution of federal disaster aid, see U.S. Senate Task Force on Funding Disaster Relief, *Federal Disaster Assistance*, S.Doc. 104-4 (1995). For information on federal programs providing disaster assistance, see the CRS Disaster Assistance and Recovery Web page at [http://apps.crs.gov/cli/cli.aspx?PRDS_CLI_ITEM_ID=2432].

³ For more information on the response to the Mississippi River Flood of 1927, see CRS Report RL33126, *Disaster Recovery and Appointment of Recovery Czar: The Executive Branch's Response to the Flood of 1927*, by Kevin R. Kosar.

⁴ The Beach Nourishment Act of 1956 (P.L. 84-826) expanded the federal role in constructing projects for hurricane, storm and shoreline protection, such as seawalls and the periodic placement of sand on beaches to control erosion. The Flood Control Act of 1950 (64 Stat. 170) began the Corps' emergency operations by authorizing flood preparedness and emergency operations.

localities thereof; that investigations and improvements of rivers and other waterways, including watersheds thereof, for flood-control purposes are in the interest of the general welfare; that the Federal Government should improve or participate in the improvement of navigable waters or their tributaries including watersheds thereof, for flood-control purposes if the benefits to whomsoever they may accrue are in excess of the estimated costs, and if the lives and social security of people are otherwise adversely affected.

As with many other policy areas, the federal system has resulted in public functions for flood damage reduction being shared by all levels of government. Since the mid-1980s, local project sponsors (often local governments or special levee and drainage districts) share construction cost of federal flood control projects and are fully responsible for operation and maintenance. Local entities (and sometimes state entities) may construct flood control infrastructure independently from the federal government, and are responsible for land use and zoning decisions guiding development in floodplains and coastal areas.

The impetus for federal and state attention to flooding comes from multiple sources. For instance, flooding often can occur regionally, and flood control works of one community can exacerbate or, alternatively, mitigate flood risk in other areas. Some federal and state actions attempt to alter individual and community behavior to account for flooding risks and losses. Most individuals discount the probability of loss from infrequent events, even if those events may cause significant losses and disruption. In general, many local decision makers do not view environmental hazards, such as flooding, as serious problems, in comparison to the many other problems that local governments are expected to address.⁵

Principal Federal Agencies. As previously noted, the Corps and FEMA are the principal federal agencies involved in flood damage reduction and flood fighting and emergency response. Other federal agencies also are involved with flood damage reduction projects, such as the U.S. Department of Agriculture's Natural Resources Conservation Service, the Department of the Interior's Bureau of Reclamation, and the Tennessee Valley Authority.

At the direction of Congress, the Corps is authorized to participate in the cost-shared planning and construction of flood damage reduction projects, such as building levees and floodwalls to reduce damages from coastal and riverine flood hazards. The Corps is responsible for much of the federal construction investment in flood control and storm protection infrastructure. It has constructed nearly 9,000 miles of the nation's roughly 15,000 miles of levees. Corps involvement in flood control construction is predicated on the project being in the national interest, which is determined by the likelihood of widespread and general benefits, a shortfall in the local ability to solve the water resources problem, the national savings achieved, and precedent and law.⁶

⁵ R. Burby, "Hurricane Katrina and the Paradoxes of Government Disaster Policy," prepared for *Annals of the American Academy of Political and Social Science* (March 2006).

⁶ This is described in the Corps' *Digest of Water Resources Policies and Authorities* (continued...)

Generally, after construction by the federal government, this infrastructure is turned over to a local entity for operation, maintenance, repair, and rehabilitation. The Corps, however, has retained responsibility for roughly 900 miles of levees, primarily along the Mississippi River and for multi-purpose dams. FEMA has various programs, such as its Hazard Mitigation Grant Program and its Flood Mitigation Assistance Program, that promote flood mitigation actions, such as assisting in removing vulnerable structures from floodplains and other activities that reduce the impact of a flood disaster.

The Corps performs most of the federal inspections of levees. Levee inspections are conducted for participation in two federal programs. The first is the Corps' Rehabilitation and Inspection Program. This program provides federal assistance for repairing levees damaged during floods. The Corps is to conduct annual (or semi-annual) inspections of levees for initial inclusion in the program and for continued eligibility for assistance. The Corps also often performs the inspections to certify a levee's reliability for a 100-year flood under FEMA's National Flood Insurance Program (NFIP).⁷

Congress gave the Corps emergency response authority that allows the agency to fight floods and other natural disasters. P.L. 84-99 (33 U.S.C. §701n) provides the Corps authority for emergency response and disaster assistance. It authorizes disaster preparedness, advance measures, emergency operations (disaster response and post-flood response), rehabilitation of flood control works threatened or destroyed by floods, protection or repair of federally authorized shore protection works threatened or destroyed by coastal storms, emergency dredging, and flood-related rescue operations. These activities are limited to actions to save lives and protect improved property (public facilities/services and residential or commercial developments).⁸ FEMA can also direct the Corps and other agencies to undertake activities in response to flooding and other national emergencies, as part of FEMA's implementation of the National Response Framework.⁹

⁶ (...continued)

Engineering Pamphlet EP 1165-21-1 (1999).

⁷ As discussed earlier, the term *100-year flood* is the flood elevation that has a 1% chance of being equaled or exceeded *annually*. It is *not* the flood that will occur once every 100 years; 100-year floods can occur more than once in a relatively short period of time. The 1994 "Galloway Report" (see note 15) uses an analogy of a bag of 100 marbles where 99 are clear and 1 is black. Every time you pull out a black marble would be equivalent to a 100-year flood, but the black marble is replaced and the bag is shaken up before you draw again. So, it is possible, but not likely, you might draw the black marble two or three times in a row or with greater frequency than only one time in 100 draws.

⁸ Although the Corps' account paying for these activities may receive some appropriations in the annual Energy and Water Development Appropriations acts, this initial appropriation is often supplemented with emergency appropriations specific to the emergency being addressed.

⁹ For more information, see CRS Report RL33053, *Federal Stafford Act Disaster Assistance: Presidential Declarations, Eligible Activities, and Funding*, by Keith Bea.

A Flood Risk Framework

Hurricane Katrina and recent midwestern flooding demonstrate that not only property damage but also significant risks to life, economic disruption, and other social hardships occur during floods. Flood risk is a composite of three factors:

- *vulnerability*, which allows a threat to cause consequences (e.g., level of protection provided by levees and dams, their reliability, and location within a floodplain);¹⁰
- *threat* of an event (e.g., probability of a Category 5 hurricane storm surge or a 200-year flood affecting a particular location); and
- *consequence* of an event (e.g., property damage, loss of life, economic loss, environmental damage, reduced health and safety, and social disruption).

Reducing Vulnerability and the 100-Year Flood. In the United States, the 1% annual chance flood, more commonly known as the 100-year flood, is a standard often used as a basis for identifying, mapping, and managing flood hazards. For example, the NFIP and most state and local governments use location in the 100-year floodplain or similar coastal zone inundation areas as triggers for various requirements. The 100-year flood standard was established at the recommendation of a group of experts in the late 1960s. “It was selected because it was already being used by some agencies, and it was thought that a flood of that magnitude and frequency represented a reasonable probability of occurrence and loss worth protecting against and an intermediate level that would alert planners and property owners to the effects of even greater floods.”¹¹ The adoption of the 100-year flood standard in many respects guides perceptions of what is an *acceptable level of vulnerability*. The 100-year flood standard is a vulnerability standard, and not a risk standard. Thus, the question of whether the 100-year flood standard combined with current threat and consequence information results in an *acceptable level of risk* remains largely unaddressed; this question is especially relevant for low probability, high consequence events such as a Category 4 hurricane hitting a major urban center.

The attempt to provide at least 100-year flood protection often drives local floodplain management and infrastructure investments, resulting in a measure of equity within and across communities. That equity in vulnerability, however, results in uneven levels of risk because flooding of different communities has different consequences, such as differences in the potential loss of life, social disruption, structures damaged, and economic impact because of variations in land use and development patterns.

¹⁰ For more information on this three-part hazard risk framework, see CRS Report RL32561, *Risk Management and Critical Infrastructure Protection: Assessing, Integrating, and Managing Threats, Vulnerabilities, and Consequence*, by John Moteff.

¹¹ Association of State Flood Plain Managers, *Reducing Flood Losses: Is the 1% Chance (100-year) Flood Standard Sufficient?* (Washington, DC: 2004).

The National Flood Insurance Program does not differentiate between 100-year flood protection provided by a flood control structure and flood protection resulting from natural topography and hydrology. As a result, development behind levees and downstream of dams providing 100-year flood protection is not designated as located in a “special flood hazard area,” thus freeing occupants from flood insurance requirements. While the NFIP largely presumes that levees, dams, and other flood control structures will not fail, their presence does not entirely eliminate an area’s vulnerability to flooding.

The *residual flood risk* behind levees or downstream of dams remains largely unaccounted for in the NFIP and often is not incorporated into individual, local, and state decision-making. Residual risk is the portion of risk that remains after flood control structures have been built and other damage-reducing measures have been taken. Risk remains because of the likelihood of the measures’ design being surpassed by floods’ intensity and of structural failure of the measures. Often when the designs of flood control structures are surpassed or when structures fail for other reasons, the resulting flood is catastrophic, as shown by the floodwall breaches in New Orleans (LA) with Hurricane Katrina in 2005. The damaging consequences of floods increase as development occurs behind levees and below dams; ironically, this development may occur because of the flood protection provided. The nation’s risk in terms of lives lost, economic disruption, and property damage is increased by overconfidence in the level and reliability of structural flood protection.

Next Step: A Risk Management Approach? Investments in flood control measures, such as dams and levees, and emergency response activities have resulted in a decreasing trend (excluding the deaths associated with Hurricane Katrina and most recent midwestern floods) in lives lost to flooding since the 1920s; during the same period, property damage due to flooding has been increasing. Through the NFIP, the federal government attempts to promote flood-hazard awareness and damage-reducing practices, as well as to assist individuals in managing flood losses. While this produces clear benefits for moderate floods, some stakeholders are concerned that structural flood control measures and the NFIP together may contribute to a false sense of security for individuals and communities. This sense of security may foster decisions to locate in potentially hazardous areas, thus increasing the national vulnerability to flood losses.

The 2008 midwestern floods and Hurricane Katrina have contributed to interest in fundamental reexaminations of the approach to managing floodwaters. Some of the questions raised are: Do current policies, programs, practices, and investments result in an acceptable level of aggregate risk for the nation? Do they promote wise use and investments of the nation’s floodplains and coasts?

Risk management is being increasingly viewed as a method for setting priorities for managing some hazards in the United States. Because floodplain and coastal development are largely managed by local governments, some aspects of national flood risk management likely would be unwelcome and infeasible, and could be perceived as resulting in an inequitable distribution of flood protection. For example, if floods in large urban concentrations are perceived as representing a greater risk for the nation, federal resources may be directed away from protecting smaller communities and less-populated states. Two of the concerns raised in discussions

of greater emphasis on risk analysis in the development and design of specific projects are that risk analysis may result in lower levels of protection being implemented in some areas, and that information and knowledge are insufficient to perform an adequate analysis. However, an argument can be made that the federal government has an interest in reducing risks resulting in national consequences, and in prioritizing federal involvement and appropriations accordingly.

Factors complicating the determination of the nation's flood risk include changing conditions and incomplete information. For example, many flood control projects were built decades ago using the available data, technologies, and scientific knowledge of the period that may have underestimated flood hazards for particular areas. Similarly, there are issues with changes in risk over time due to processes such as land loss, subsidence, sea-level rise, reduced natural buffers, urban development, and infrastructure aging. For existing dams, there is some information on consequences of failure as measured by loss of life, economic loss, environmental loss, and disruption of lifeline infrastructure (such as bridges and power grids); however, the database with this information only tracks the amount and type of losses, not the likelihood of failure.¹²

A risk-reduction approach for organizing federal flood-related investments likely would incorporate many structural and nonstructural flood management measures already being considered and implemented, but change their priority and mix. Options considered in a risk-centered approach may include shifting federal policy toward wise use of flood-prone areas (e.g., rules or incentives to limit some types of development in floodplains), incorporating residual risk and differences in riverine and coastal flood risk into federal programs (e.g., residual risk premiums as part of the National Flood Insurance Program), creating a national inventory and inspection program for levees, promoting greater flood mitigation and damage mitigation investments, re-evaluating operations of flood control reservoirs for climate variability and uncertainty, and investing in technology and science for improved understanding of flooding threats.

The Levee Challenge. Hurricane Katrina brought national attention to the issue of levee and flood wall reliability and different levels of protection provided by flood damage reduction structures, particularly those protecting concentrated urban and population centers. A 1982 National Research Council report stated that levee overtopping or failure was estimated to be involved in approximately one-third of all flood disasters, and that the nation's dam inspection program suggests that a large percentage of locally built levees are likely poorly designed and maintained.¹³ How to address levee reliability and various levels of protection remains at issue.

Many levees protecting today's communities and agricultural investments originally were planned and constructed beginning nearly a century ago (or more than a century ago) by local interests attempting to reclaim land to make it productive for

¹² For information on dam safety, see CRS Report RL33108, *Aging Infrastructure: Dam Safety*, by Nic Lane.

¹³ National Research Council, *A Levee Policy for the National Flood Insurance Program*, (U.S. Dept. of Commerce: Oct. 1982).

agriculture and other uses. Rather than each landowner building separate levees, landowners often consolidated their resources by forming a levee district. As a consequence of this history, many of today's physical constructions and configurations, as well as institutional arrangements, for flood protection have roots distinct from their current use as flood protection for development. Most levees currently are operated by a levee district or some other special or general local government. For the most part, municipalities serving concentrated urban populations have assumed flood control responsibilities, while special levee districts remain abundant in rural and agricultural areas. Note, however, that there are exceptions to this generality.

An issue that may limit government entities' interest in levee construction, maintenance, and possibly inspection responsibilities is liability for flood damages. A principal source of concern may stem from the uncertainty related to the implications of *Paterno v. State of California*, which held the State of California liable for a levee it did not build, but operated as part of a state-sponsored levee system.¹⁴ The issue of federal liability for damages is discussed in CRS Report RL34131, *Federal Liability for Hurricane Katrina-Related Flood Damage*, by Cynthia Brougher and Kristina Alexander.

Flood Management Issues in the 110th Congress

A Legislative Response to Katrina's Lessons: Factoring in Safety.

In the first omnibus Water Resources Development Act (WRDA, which is the legislative authorization vehicle for the Corps) enacted after Hurricane Katrina — WRDA 2007 (P.L. 110-114) — Congress addressed a number of policy changes and authorized numerous flood and storm damage reduction projects and project modifications. WRDA 2007 included the following provisions specifically related to flood-related policies:

- *Water Resources Principles and Guidelines* (§2031) — This provision states a national water resources planning policy that includes avoiding unwise use of floodplains and flood-prone areas, and requires the Corps to update by 2010 the guidelines it uses for planning and implementing Corps water resources projects.
- *Water Resources Priorities Report* (§2032) — This provision requires the President submit to Congress a report by 2010 on the vulnerability of the nation to flood damages, including the risk to human life, which is to include assessments of current programs and recommendations for improvements.
- *Planning* (§2033) — This provision makes changes to Corps planning activities, including requirements that the economic analysis of flood damage reduction

¹⁴ See *Paterno v. State of California*, 2003 Cal. App. LEXIS 1771 (2003) *pet. for rev. denied*, 2004 Cal. LEXIS 2253 (Mar. 17, 2004); see also *Arreola v. County of Monterey* 2002 Cal. App. LEXIS 4319 (2002) *pet. for rev. denied*, 2002 Cal. LEXIS 6194 (Sept. 18, 2002).

projects consider the risk that remains behind levees and floodwalls, upstream and downstream impacts, and equitable analysis of structural and nonstructural alternatives.

- *Safety Assurance Review* (§2034) — This provision requires that the design and construction of Corps flood and storm damage reduction projects be independently reviewed by experts to assure public health, safety, and welfare.
- *National Levee Safety Program* (Title IV) — This title creates a Committee on Levee Safety to make recommendations to Congress by mid-2008 for a national levee safety program; however, the committee has not yet been funded. The title also requires the Corps to establish and maintain a database with an inventory of the nation's levees by 2009 and to inspect federally constructed and other levees.

How these changes are implemented over the next few years may affect the nature of the federal investment in flood and storm damage infrastructure and mitigation measures.

Selected Remaining Issues. The 2005 hurricane season and the 2008 midwestern floods have focused the nation's attention once again on issues that flood experts have debated for decades. The devastation of these events renewed public concerns about reliability of the nation's aging flood control levees and dams. The debate over what is an acceptable level of risk — especially for low-probability, high-consequence events — and who should bear the costs to reduce the flood risk (particularly in the case of levees) is taking place not only in the affected states, but nationally. The concerns being raised range widely, including interest in providing more protection for concentrated urban populations, risk to the nation's public and private economic infrastructure, support for reducing vulnerability by investing in natural buffers, equity in protection for low-income and minority populations, consistency in and the form of flood insurance and disaster aid, and the level of federal, state, and local investment in structural and nonstructural flood damage reduction measures.

Response to the 2005 hurricane season and previous midwestern floods included discussions of expanding mitigation activities (such as floodproofing structures and buyouts of structures on the most flood-prone lands), investing in efforts to restore natural flood and storm surge attenuation, and assuring vigilant maintenance of existing flood control structures, as well as interest in new and augmented structural flood protection measures. Although major flood events, generally spur these discussions, the policy changes implemented often are incremental.¹⁵ The 110th

¹⁵ After the Midwest Flood of 1993, the Interagency Floodplain Management Review Committee was directed to evaluate the performance of floodplain management and make recommendations in current policies and programs of the federal government. The resulting 1994 report, titled *Sharing the Challenge: Floodplain Management in the 21st Century*, often (continued...)

Congress, like previous Congresses, faces a challenge in reaching consensus on whether and how to proceed on anything other than incremental change because of the wealth of constituencies and communities affected by federal flood policy. Another practical challenge is the division of congressional committee jurisdictions over the federal agencies and programs involved in flood mitigation, protection, and response.¹⁶

There are many questions that remain about how events unfolded in the aftermath of Hurricane Katrina, and much information that is still needed to understand how to apply and communicate nationally the lessons in the Gulf and midwestern states learned about flood risk and disaster preparedness and response. Although there is no way to protect against all flood risk, many contend that more information is needed to evaluate flood risk, to understand the reliability and residual risk of structural flood protection, and to incorporate the full range of flood consequences into local, state, and federal decision-making and programs.

¹⁵ (...continued)

called the “Galloway Report,” for the Committee’s chair, includes the Committee’s recommendations; the report is available at [<http://eros.usgs.gov/sast/2P-00526.PDF>].

¹⁶ Several different congressional committees could potentially claim jurisdiction over elements of comprehensive change in federal flood policy. For a discussion of jurisdictional issues in the House, see CRS Report 98-175, *House Committee Jurisdiction and Referral: Rules and Practice*, by Judy Schneider; for Senate jurisdiction, see CRS Report 98-242, *Committee Jurisdiction and Referral in the Senate*, by Judy Schneider.