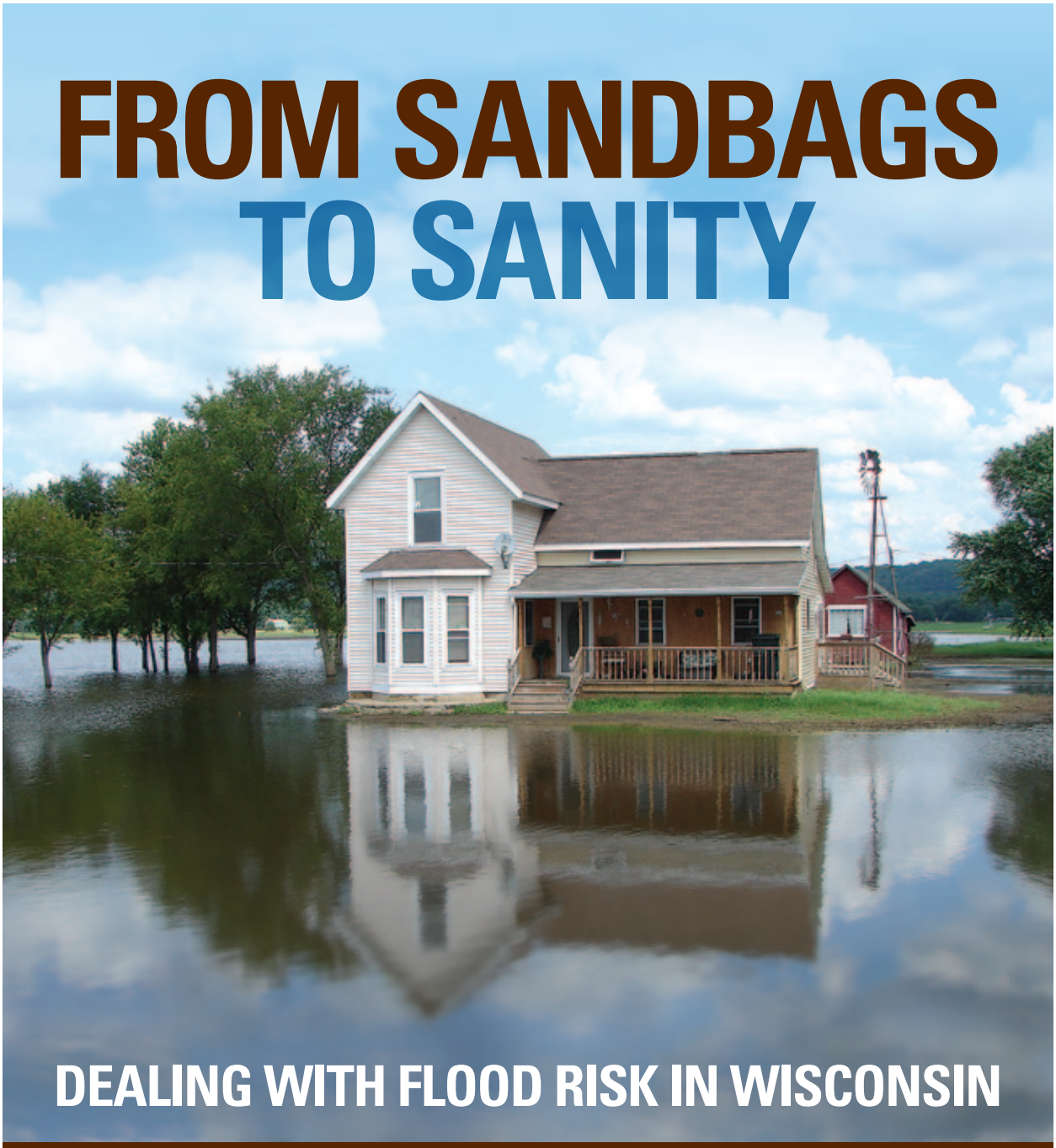
FROM SANDBAGS TO SANITY



DEALING WITH FLOOD RISK IN WISCONSIN

Conference Proceedings

Madison, Wisconsin

April 20, 2009

SUMMARIZED BY DONALD P. MOYNIHAN

From Sandbags to Sanity: Dealing with Flood Risk in Wisconsin

FROM SANDBAGS TO SANITY

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August 2010

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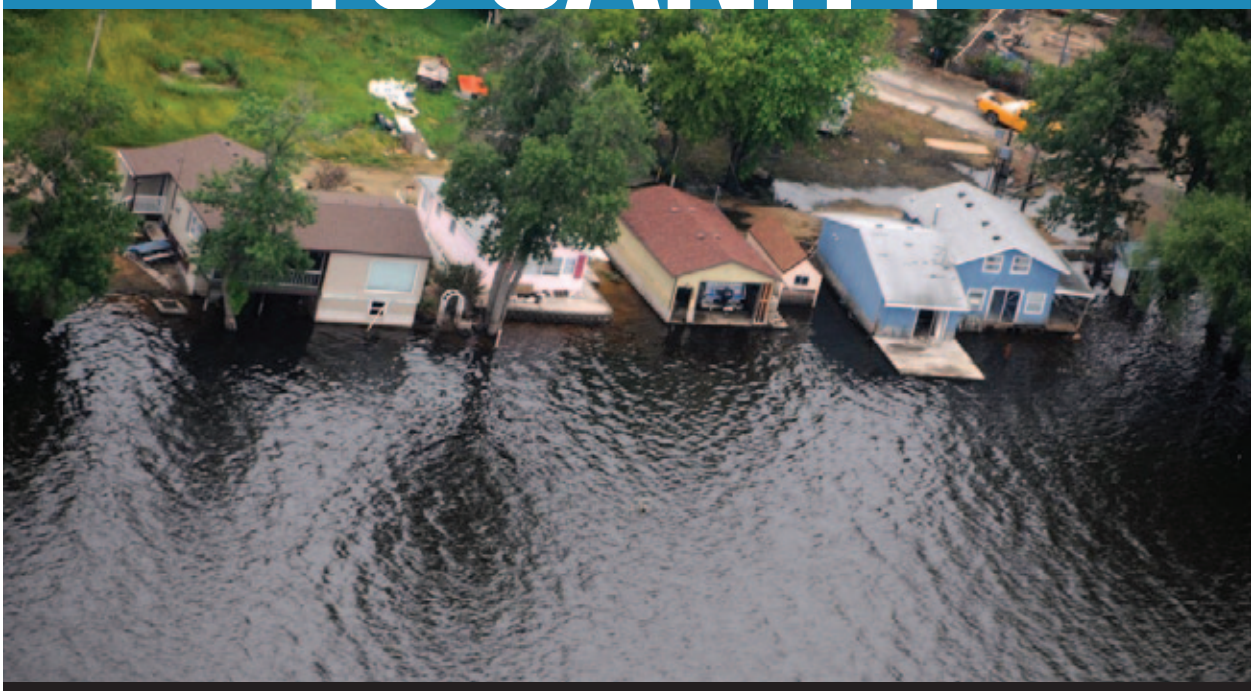


FOREWORD

Donald P. Moynihan

La Follette School of Public Affairs, University of Wisconsin–Madison

IN JUNE OF 2008 the state of Wisconsin, along with neighboring states, suffered severe flooding. Many localities relied on sandbags for protection, and the floods revealed the need for improved mitigation, preparation, response and recovery practices. The following April a group of policy experts, state and local officials, and nonprofit organizations met in Madison to review the policy implications. This document summarizes the key contributions from that conference, covering a broad range of relevant topics, such as hydrology, climate change, water quality, health impacts, mitigation options, human services and economic consequences.

One of the difficulties with natural hazards policy is that it receives the attention of policymakers and the public only in the aftermath of a disaster. When the floods recede, policymakers focus on seemingly more pressing issues. The conference in Madison and this document are both intended to remind us of the very real risks we face from floods and other disasters, and to consider policy changes that can minimize those risks. Such disasters will

occur again, and they may be exacerbated by climate change and crumbling infrastructure. As Administrator of Wisconsin Emergency Management Johnnie Smith noted at the meeting, his agency faces two certainties: "There will be more flooding. And we will be asked to help."

In the aftermath of the floods of 2008, responders did well in minimizing the suffering that resulted. Of course, there is room for improvement. Crisis response is a classic intergovernmental responsibility, requiring coordination between federal, state and local actors, and such coordination may not always run smoothly. One of the central points that emerged from the conference is that dealing with flooding is not just intergovernmental, it also requires a cross-sectoral network of different organizations who share common goals. Private actors are affected and can help in the aftermath. Nonprofit organizations, most notably through the Wisconsin chapter of Voluntary Organizations Active in Disasters, played a crucial role in response and recovery. One fundamental thing we have learned from studying how networks operate is that pre-planning and positive ongoing working relationships are crucial in preparing network members to perform well. This point seems especially relevant in the context of crises, where there is relatively little time in the aftermath of a disaster to make introductions and negotiate responsibilities and contracts.

In addition to improving response, we also need policy changes that will minimize flood-related risk in the first place. Citizens often engage in risky behavior. We move into areas that are liable to be flooded and fail to mitigate this risk or purchase insurance to compensate us if things go wrong. For some, this is simply because of ignorance of the level of risk we engage in. Existing policy may have also created a moral hazard, where individuals assume that they will be bailed out if the worst ever happens (though this perception is generally incorrect).

We clearly need to communicate risk better to members of the public. In part, this involves finding alternative ways of representing risk—for example, the use of the 100-year floodplain as a basic standard is a blunt and sometimes misleading way of representing risk. Better communication also requires better information. We need better data and models to inform our understanding of hydrology, water quality and floodplain maps. Work is progressing in this area—for example, the Wisconsin Initiative on Climate Change Impacts[1] brings together University of Wisconsin and Wisconsin Department of Natural Resources expertise to evaluate the implications of climate change for the state. Technology should also improve our capacity to develop better information.

Even with better communication, we need to structure choices so that individuals are less likely to engage in risky behavior. This could be done

[1] *wicci.wisc.edu*

through market incentives—for example, actuarial insurance rates that actually reflect risk provide an incentive to avoid hazardous locations. Creating a market incentive to retrofit housing to minimize flood damage could be achieved through partnerships with insurance companies. Governments can help to frame such incentives and can also act directly. Government purchases of land or bans on new building no-build edits would also reduce risk in hazardous locations. Smart design of infrastructure can both mitigate the risk of flooding and minimize the health effects that emerge.

The contributions that follow provide a more detailed explanation of the way forward for Wisconsin than is possible in a foreword. Others, most notably the Wisconsin Recovery Task Force, have also offered ideas for reform. Much of these ideas need legislative attention if they are to be fulfilled. In recent years a series of special legislative committees have offered specific and well-considered legislative proposals to improve how we respond to disasters. Their efforts illustrate not only the complexity of such work but also the need for a more comprehensive blueprint that incorporates not just response, but also mitigation. This issue deserves no less.

Organizing the Madison conference and this report required the efforts of a great many people. An incomplete list of thanks includes the following. The La Follette School organizes a policy seminar each year, and I would like to thank our director, Carolyn Heinrich, for her support in making floods the central focus of our conference in 2008. I would also like to acknowledge the terrific efforts of our staff at La Follette. Bridget Pirsch and Terry Shelton organized the event, and Kari Reynolds and Barb Prigge helped me

muddle through financial logistics. Particular thanks go to Erik Viel, my tireless graduate assistant. Our sponsors provided not just financial resources but also useful substantive advice. My thanks to the Ira and Ineva Reilly Baldwin Wisconsin Idea Endowment, the Center for World Affairs and the Global Economy, the Nelson Institute for Environmental Studies, and the Institute for Research on Poverty. Special thanks go to James Hurley and the Water Resources Institute, who funded the bulk of the project costs and provided staff (Carolyn Betz, Tina Yao and Elizabeth White) who helped to prepare this report. It is notable that all of the above sponsors are part of the University of Wisconsin-Madison campus. This illustrates the breadth of interest and expertise on campus on the topic of flooding. Perhaps more importantly, it demonstrates a deep commitment to the Wisconsin Idea—the principle that the university can work in partnership with others to help to make the state a better place to live. The conference also benefited enormously from our non-UW sponsors, the Association of State Floodplain Managers, Wisconsin Eye and Wisconsin Emergency Management.

WHAT HAPPENED? A SUMMARY OF THE WISCONSIN FLOODS OF 2008

Roxanne Gray

Wisconsin Emergency Management

IN JUNE 2008, the state of Wisconsin experienced its worst disaster since the great floods of 1993. Saturated ground from heavy rainfall in the summer of 2007 and record-breaking snowfall in the winter of 2007–08 set the stage for the extensive flooding that followed in the summer of 2008. As the snow melted, rivers neared capacity and struggled to carry the water away. Torrential rains dumped 10 to 14 inches of water on many parts of southern Wisconsin from June 5–13, pushing many of the rivers past their banks.

When the floods came, Wisconsin Emergency Management (WEM) provided 700,000 sandbags, supplementing those used by local governments. The Wisconsin Department of Natural Resources (WDNR) monitored more than 200 dams for signs of failure. Hundreds of state and local roads, as well as a handful of interstate highways, were impassable and had to be closed. More than eight hundred square miles of flooded land forced thousands of people to evacuate their homes and seek refuge with family or friends. The

remaining displaced people flocked to 35 area shelters. Seven fixed feeding sites and 36 mobile feeding sites dished out 77,065 meals.

The specific cost of any disaster is difficult to ascertain accurately, but claims submitted by local officials suggested that more than 763 million dollars of damage occurred:

Homes	$ 225,293,529
Businesses	$ 76,190,722
Agriculture	$ 336,452,920
Infrastructure	$ 121,681,689
TOTAL	$ 763,618,860

LONG-TERM RECOVERY

Even as the floods were still rising, different levels of government started to work together to coordinate response and recovery. Governor Doyle requested that the federal government declare an Incident of National Significance, which was done on June 14, and eventually covered 31 Wisconsin counties. These funding sources helped to compensate individuals and businesses for damage done by the floods, while also providing support to local government for costs incurred in the response.

The Federal Emergency Management Agency (FEMA) established a joint field office to coordinate the response. Along with a handful of WEM employees, 540 FEMA personnel and 370 private contractors were on hand. Major operations included the following:

- Community Relations—sent agents to affected communities to educate the public about what types of assistance they were eligible for and how to apply for assistance.
- External Affairs—answered questions from reporters and journalists and issued press releases to media outlets.
- Intergovernmental Affairs—coordinated communications with local, state and national legislators and public administrators.
- Mitigation Outreach—set up information booths at local fairs and area businesses like Home Depot to let people know what they could do to prevent or minimize future losses.

Aid provided through various FEMA and WEM disaster recovery programs does a great deal toward helping victims return to some state of normalcy. FEMA received 40,814 requests for individual assistance and

approved $55,612,943 in funding for home repairs, rental assistance and other needs. The Small Business Administration approved 1,949 low-interest loans totaling $48,024,000. But in a major disaster, even a great deal of aid falls short of fully compensating individuals for the losses they have experienced. After the available aid is exhausted, many needs remain unmet. Ten long-term recovery committees were formed to address those needs. These committees worked closely with government agencies, Wisconsin Volunteer Organizations Active in Disasters and affected communities, hiring caseworkers and linking those in need with appropriate nonprofit organizations. For example, the Wisconsin Department of Health Services contracted with Lutheran Social Services to administer grants funding, provide crisis counseling and assign caseworkers to ensure that individuals in need received adequate short- and long-term care. (See also the paper by Lang and Leece.)

POLICY IMPLICATIONS

Governor Doyle established the Wisconsin Recovery Task Force (WRTF) to oversee the recovery process. The WRTF brought together state and federal officials to inform a series of committees on flood mitigation, business, housing, infrastructure, human needs and agriculture. The WRTF's final report was completed and submitted to the governor on October 31, 2008. Policymakers should consider the recommendations made by the WRTF as part of a broader effort to rethink our crisis response policy in the state. At time of publication, WEM is planning a follow-up report to explore unresolved issues.

For some communities, the flood illustrated that the best way to avoid a repeat of what happened is to relocate entire towns away from floodplains. For example, the town of Gays Mills was severely damaged by floods two years in a row, and it elected to relocate to higher ground. In doing so, the town benefited from advice from FEMA officials and contractors who undertook targeted technical studies; ran geographic information system (GIS) suitability analysis; and identified sustainability, economic, environmental and historical issues associated with relocation.

The floods also illustrated the need for mitigation. In 2005, the National Institute of Building Sciences estimated that for every dollar spent on flood mitigation, four dollars are saved in future damages, making mitigation a very pragmatic and cost-effective strategy. Wisconsin has long recognized the benefits of proactive and preventive mitigation efforts, reflected in the state's hazard mitigation plan. After the floods, all Wisconsin counties were eligible for the state's hazard mitigation program. But for this program to work well, it requires state and local coordination, and adequate resources.

Counties are required to have a state-approved hazard mitigation plan that is updated every five years. Currently, 53 counties (74%) have approved plans, 12 (16%) are in the planning process and 72 (10%) counties have no plan.

In the aftermath of the floods, hazard mitigation resources were used primarily for acquisition and demolition of substantially damaged structures, particularly for primary resident dwellings. Per state and local floodplain regulations, substantially damaged buildings (over 50% damage of the equalized assessed value of the structure) in the floodplain must be demolished or relocated out of the floodway. Substantially damaged buildings located on the flood fringe may be repaired/rebuilded; however, they must be elevated two feet freeboard above the 100-year flood elevation. The state received 21 applications to acquire 212 properties for more than $34 million, $3 million more than the estimated available funds. Because of the demand for resources for acquisition and demolition, there were not resources available for the 117 other applications totaling nearly $40 million for nonbuyout projects (such as stormwater or road improvements). For such projects to be pursued, more resources are needed in mitigation funding.

OVERVIEW: DEALING WITH 21ST CENTURY FLOOD CHALLENGES

Gerry Galloway

University of Maryland, former Army Corps of Engineers

FLOODS HAVE BEEN AROUND FOR A LONG TIME. Native Americans and early European settlers were forced to cope with the continuing threat of flooding just as we are today. Flooding of the Mississippi River Valley in 1927 caught the attention of legislators. Congress began to take note of the destructive impact of flooding, finding that floods "constitute a menace to national welfare." Because the nation's many rivers are major transportation conduits and vital to the economy, flood control activity by the federal government was justified under the commerce clause of the Constitution. Congress took a reasoned and logical approach to flood control, finding in the 1936 Flood Control Act that "the Federal Government should improve or participate in improvements for flood control purposes if the benefits to whomsoever they accrue are in excess of the estimated costs."

Early flood control policy focused on mitigating flood risks with levees, dams and floodways. Although engineered structures have provided

protection for millions of people and prevented billions in damages, upland and floodplain development substantially altered the natural environment and, in doing so, increased both the risks of flooding and the number of people at risk. As the risks manifested into damages and losses, the need for an alternative approach became more apparent.

IDEOLOGICAL SHIFT

In the 1942, geographer Gilbert White wrote his University of Chicago PhD dissertation advocating a shift to land use and other nonstructural measures and away from the structural approach of levees and dams that dominated flood control efforts of the time. White argued that instead of trying to control flooding in the floodplain, we should be controlling what we put in the floodplain. Around the same time, Jim Goddard at TVA coined the term "floodplain management," and together they launched a national discussion about the future of this new approach. White also called for standardizing community land use and zoning regulations and disaster relief programs; he also advocated for the development of detailed floodplain maps. Many of the provisions of the 1968 Flood Insurance Act were based on concepts from White's paper and subsequent works.

THE 1993 FLOODS

In 1993, the nation saw the largest flood of the 20th century. The availability of 24-hour cable news put the flood in front of everyone for month after month, and the nation recognized that it faced a severe flood challenge. In reaction, President Clinton formed the White House Floodplain Management Review Committee of 1993-1994 and directed that it find out why the flood happened and what should be done in response.

The committee found that the 1993 flood represented a significant hydro-meteorological event and that the resulting flood flows overwhelmed existing defenses. It noted that such major flood events are normal and will continue to occur. The committee also warned that population growth and urban development were placing more people and property at risk in the floodplain and that in spite of this risk, only a 20-30 percent of the effected population had purchased flood insurance. Since the 1993 flood, there actually has been a decline in the level of participation in flood insurance. Now, only about 10% of people have flood insurance.

WHY ISN'T THE RISK UNDERSTOOD?

In addition to the problems observed in the aftermath of the 1993 floods, there are new challenges. We do not know fully how climate change will increase the number of significant hydro-meteorological events. We also do not know the reliability of our flood defenses. The failure of levees in New Orleans demonstrates the risk of relying on aged systems, and the public tends to underestimate its risk by overestimating the reliability of such defenses.

One of the most important steps in floodplain management is communicating the risk to the public. Public awareness of flood risk can go a long way toward mitigating the possible consequences. but there are many barriers to getting the flood risk message across. One is that the memory of floods and hurricanes fades very quickly. It does not take long after a major event to see people moving into vulnerable areas. There is also a perception that the government provides protection and that the individual citizen has little responsibility. Governments lead people to believe that they are safe. Citizens see a levee and presume that it is in good condition and can handle any flood that comes along. We have about 3,500 dams in this country that are rated as unsafe, but politicians are reluctant to publicize this fact out of a concern that they would disturb citizens. Citizens also fail to understand that levees do not eliminate the risk, they merely reduce the risk. If levees are overtopped or collapse, the consequences for nearby homes would likely be catastrophic. We don't educate the citizens well about the flood challenge, and we spend even less time talking about or preparing for the disasters that could occur.

Governments need to encourage a public dialogue about risk and preparation. Large numbers of people and property are at risk for flooding. Some sources estimate that 14% of nonfederal land in the contiguous 48 states is in the 100-year floodplain, and, based on participation in the National Flood Insurance Program (NFIP), more than 21,000 communities have flood-prone areas. In many of these areas, structures are unnecessarily located in the floodplain. As previously indicated, a substantial number of floodplain residents and business owners lack adequate flood insurance. Ignorance and misconceptions pertaining to flood risk are a big problem. Confusion over commonly used terminology, like the 100-year flood, can also lead people into a false sense of security. Many people believe that after the occurrence of a 100-year flood they will not see risk for another 100 years, which is not the case. The 100-year flood actually has a 1 % chance of occurrence in every year, regardless of previous occurrences. We need to communicate this risk in another way. For example, if we tell people there is a 26% chance that they will be flooded over the life of a 30-year mortgage, they may better understand their vulnerability.

COOPERATION AND SHARED RESPONSIBILITY

In the realm of floodplain management, there is no silver bullet and there are no easy answers. What should our goals be?

- Reduce flood damages.
- Protect and enhance the natural environment.
- Continue growth where appropriate.

Sustainable development and shared responsibility are the keys to economically and environmentally sound floodplain management. In order for these goals to be realized, the responsibility and costs of floodplain management must be shared among federal, state and local governments, as well as among individuals who choose to live in vulnerable areas. The first line of floodplain defense is to avoid development on the floodplain if possible. If development in the floodplain is necessary—there are no other suitable locations—the parties with vested interests must be made aware of the risks and take steps to minimize those risks when possible.

Some methods of risk reduction include:

- Holding the water where it falls on individual properties, farmlands and upstream wetlands, or behind upstream dams. There are innovative measures being explored. For example, researchers are considering how farmland that is developed in sections separated by culverts –forming a waffle-like appearance could be used to hold excess rainwater, allowing it to drain off slowly and thus reduce the amount of water flowing downstream. The farmers could be compensated for any crop losses or damages, and substantial damages could be avoided downstream. Such an approach appears economically but probably not politically feasible.
- Floodproofing by sealing the home or business from water intrusion or by elevating the structure above the expected flood height.
- Relocating endangered structures out of the floodplain.
- Acquiring marginal lands and converting them to natural storage reservoirs.
- Utilizing levees and flood walls when justified.

Damages can be mitigated by:

- Establishing early warning systems to give those in the floodplain the opportunity to evacuate with high-value property.

- Insuring those who are at risk.
- Educating present and potential floodplain occupants of their risk and steps that can be taken to minimize their risk.
- Exploiting technology to provide better maps of floodplain risks, better weather forecasts, and better information about the integrity of flood structures.

STRONG START — WEAK FINISH

Our country's first national flood control efforts in 1936 were promising, but follow-through on achievement of many of the goals has waned. In 1936 the goal was to prevent catastrophic losses and structures were built to withstand 500- or 100-year floods. Currently, we lack a comprehensive flood risk standard at the national level, and local floodplain building codes vary considerably. In some jurisdictions, you don't even need a building permit to build a levee. The only national flood standard we have today is the 100-year designation of the special flood hazard area under the NFIP. This is an insurance rating standard not a safety standard. Most new levees in the US are built against the 100-year standard. The Dutch and Japanese protect their vital economic and highly populated coastlines against the 10,000-year flood, and there is talk about increasing those standards even more. Their experts recommend a 1,250- to 2,000-year flood standard for river floodplains.

Risk is defined as the probability of an event, multiplied by the probability of protective measures holding, multiplied by the consequences. Using this definition of risk, one realizes that if you double the population behind a levee, you double the risk. Many fail to comprehend this concept of risk fully, and as a result, the United States is losing sight of its exposure to flood damages. Since 1936, our nation's protection and mitigation expenditures have been decreasing, while our risk has been increasing exponentially.

URGENT PRIORITIES

Some of the problems that contribute to our nation's vulnerability are not new but were brought to public attention in the aftermath of the 1993 flood and the Katrina disaster. Experts have identified lessons learned and have made recommendations that look remarkably similar after every major event. The 2008 Midwest floods provided another reminder of the costs of not listening to the past and of delaying necessary changes.

The condition of our nation's levees is an area of grave concern. Currently, we don't even know where all of our levees are, let alone their condition. A

detailed survey of the location and condition of the nation's levees is crucial for the identification of current risk. Unfortunately, current levee assessment techniques are time-consuming and expensive. There are new techniques being developed to sense levee integrity remotely, but they're far from completion. Floodplain research and development are underfunded, hindering the production of these rapid levee assessment tools. Some efforts are underway, led by the Army Corps of Engineers and the Federal Emergency Management Agency (FEMA), but more needs to be done.

As we build and replace levees, we need to apply the standard of "no adverse impact"—ensuring that the new structures do not negatively affect any nearby communities. The National Levee Safety Program Act of 2007 sets out a framework to deal with some of these issues, but it remains unfunded.

The United States also desperately needs to establish a national flood policy. The policy must identify the responsibilities of federal, state and local governments and the public at large. It must clearly define when levees are appropriate, how to maintain what we have built, and how much protection these levees are to provide. It must also facilitate the integration of flood protection measures with other water resource activities such as storm water management, sediment management and erosion control efforts.

We need to ensure that citizens understand that land use decisions are made at the local level in most all states. The federal government is not responsible for land use control. California recently passed a state law that moved liability for flooding in communities to the local level when local planning boards make bad decisions. Lawyers tell us that individual public officials can be liable themselves when they make an obviously poor decision about land use in the floodplain.

We need to inventory what areas are at risk in every community. Advancements in our understanding of the flooding process and new technologies have presented us with many new tools which, if used wisely, can help identify and mitigate those risks. Global positioning systems (GPS) and geographical information systems (GIS) have greatly enhanced the accuracy and accessibility of floodplain and risk maps.

If we are going to solve the flood problem, we all must be part of the solution.

- We must educate those around us about the challenge.
- We must improve our technical approaches to dealing with floods.
- We must demand that our political representatives take actions necessary to deal with floods.

HOW CAN WE QUANTIFY FLOOD RISK IN A CHANGING CLIMATE?

Ken Potter

Civil & Environmental Engineering, University of Wisconsin–Madison

TYPICAL FLOODING SCENARIOS

Not all floods are the same. Typical flooding scenarios in Wisconsin fall into one of four categories:

- Local stormwater flooding occurs when extreme rainfall, lasting for a period of minutes or hours, exceeds the capacity of an area's stormwater system, causing the water to back up into ditches, streets and homes.
- Stream or river flooding can occur after an extreme rainfall, lasting for a period of days or weeks. Spring snowmelts after a snowy winter can cause or contribute to this type of flooding as well. If these rivers or streams empty into lakes, lake flooding may follow.

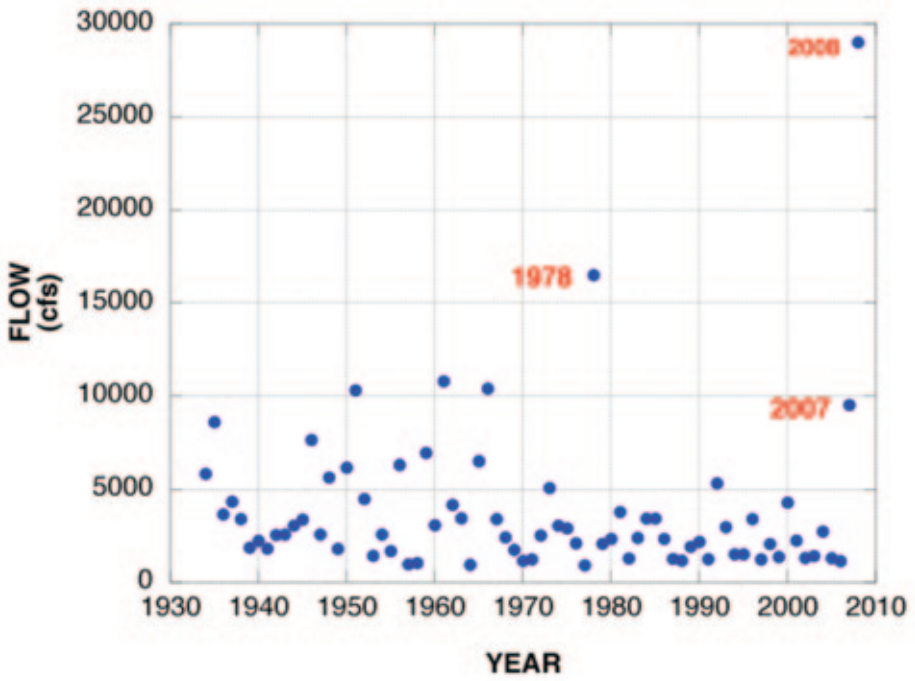
- Lakes usually have some capacity to store excess water, making them less vulnerable to brief periods of high-volume precipitation. However, heavy rainfall occurring over a period of weeks to months or brief periods of heavy rainfall occurring when the lakes are already at capacity can cause the flooding of lakes and ponds.

- The final type, groundwater flooding, is the slowest to develop, usually requiring greater than average precipitation over the course of months or years. Excess rainfall can cause the water table to rise above normal levels, flooding basements and even causing surface flooding.

Wisconsin residents and floodplain managers have grown accustomed to these typical scenarios. However, as the climate changes, so too must our expectations. Although predictions of exactly how climate change will affect Wisconsin vary depending upon the models used and the experts who interpret them, there is a general consensus that things will get worse, particularly for the southern part of the state. Experts predict that extreme rainfalls will become larger and more frequent, and the amount of rain and snow falling in the spring will also increase. These changes will increase flooding associated with all of the typical flooding scenarios in Wisconsin.

An example is the historical flood record for the Kickapoo River at Stueben. (See figure 1.) The flood there in 1978 was the record and led to the

FIGURE 1. HISTORICAL FLOOD RECORD FOR THE KICKAPOO RIVER



town of Soldier's Grove relocating to higher ground. This was an extreme flood, and most people considered it an outlier. Then the floods we saw in 2008 were significantly worse. Even though the 2008 flooding was unprecedented, we could see similar events in the future. Indeed, climate change trends suggest that such an occurrence is more likely.

ADAPTING TO CLIMATE CHANGE

As the regional climate and local weather patterns change, flood-control policies and strategies must be adapted to the new typical flooding scenarios that emerge. Policymakers need to find new approaches to design that plan for the weather patterns of the future, not the past. Before appropriate strategies for reducing vulnerability can be developed and applied, decision makers need access to quality data for analysis on which to base their decisions.

Researchers are progressing in their capacity to estimate the impact of climate change on flood patterns in ways that are specific enough to modify existing policies and rules regarding the design and development of new infrastructure in regard to stormwater and floodwater. As these models become more reliable, they can help pinpoint what areas are vulnerable. The next logical step is to develop and apply appropriate strategies to reduce

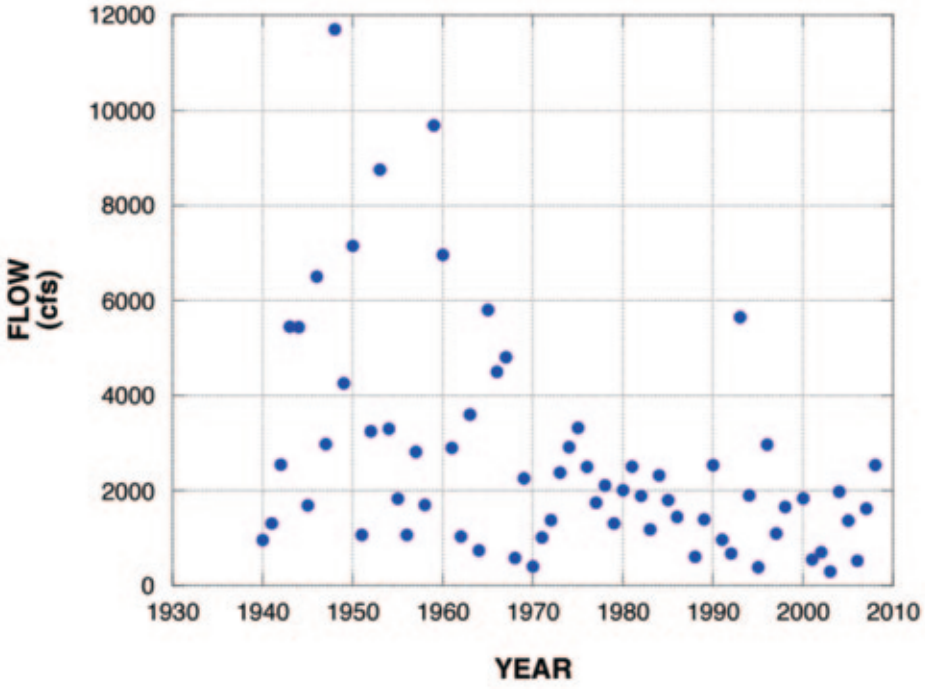
vulnerability to acceptable levels. This should be done in a way that recognizes the impact of the changing climate, rather than relying on outdated assumptions or data. Policies and rules that govern the design and development of new infrastructure should recognize the need to control the new risks posed by stormwater and floodwater.

In Wisconsin, researchers and policymakers have begun to work together to start the process of adapting to climate change. In June 2007, the Wisconsin Initiative on Climate Change Impacts was established as a partnership between the University of Wisconsin and the Wisconsin Department of Natural Resources. Its goals are to assess climate change impacts in Wisconsin, to evaluate potential economic effects and to recommend strategies for adoption. The scope of the initiative is broad and includes impacts on natural resources, wildlife, fisheries, forests and agriculture. We hope that this partnership will provide technical information that will inform mitigation and infrastructure policies.

LAND USE AND LAND MANAGEMENT

Climate change is an important factor in understanding why floods happen. But we should also recognize that historically, changes in land use and land management have been the most important factor affecting flood damages in Wisconsin, and the United States in general. For example, agricultural development, particularly in southwest Wisconsin, led to huge increases in flooding and flood damage. In the early parts of the 20th century, farmers were using agricultural methods developed in Europe. Although the topographical features were similar, European meteorological conditions differed significantly from those in the United States, making their methods poorly suited for the severe thunderstorms and heavy rainfall common in the Midwest. The combination of a hilly sloping landscape, inappropriate farming methods and heavy rainfall led to significant flooding and erosion in the early and mid-20th century. Fortunately, the United States recognized and reacted to the growing erosion and flood threats with a coherent national effort. The Natural Resources Conservation Service and the Soil Conservation Service were established to combat erosion and flooding. These agencies began working with farmers in the Coon Creek watershed of southwestern Wisconsin to transform the square, eroding fields into what one sees today—a conservation showplace of contouring, strip-cropping, terracing and wise land use that benefits the soil, air and water, as well as the plant, animal and human life of the whole watershed. As a result, the incidence of severe floods began to significantly taper off, as illustrated by figure 2, which provides a record of flooding along a Wisconsin river.

FIGURE 2. HISTORICAL FLOOD RECORD EAST BRANCH OF THE PECATONICA RIVER



Another example of the interaction between land use and flooding vulnerability is the spread of urbanization. Urbanization, especially along waterways and in floodplains, greatly increases local flooding as well as flooding of streams and lakes. Because a large portion of our cities and towns have developed on or near major waterways for easy access to transportation, irrigation and drinking water, urban flooding is a very common and expensive problem that many communities struggle to overcome. For example, the Menomonee River Valley in Milwaukee County incurred $96 million in flooding damages from 1997 to 2000. In response, the Milwaukee Metropolitan Sewerage District (MMSD) is currently engaged in nine separate mitigation projects, one of which is an $84 million retention basin. These expensive projects, whose effectiveness is uncertain, could have been avoided with early recognition of the impacts of urbanization and subsequent adoption of mitigation practices and floodplain management.

GAPS IN WISCONSIN POLICY

In spite of the state's long history of managing floods, many policy gaps exist in the field of floodplain management. These gaps hinder mitigation efforts

and allow developers to put even more residents at risk. Failure to close these gaps will increase floods and flood damages in the future, independent of climate change.

- First, statewide management of the stormwater impacts of development is inadequate. There are statewide policies concerning the quality of stormwater runoff from new developments into rivers, streams and lakes, but the quantity is not regulated. Some counties and communities, such as Dane County, have enacted regulations limiting increases in the amount and rate of stormwater runoff from new developments, but many do not.
- At all levels of government, there is little to prevent development in areas susceptible to groundwater flooding. State and local governments desperately need the power to regulate and prevent new development in vulnerable areas like reclaimed wetlands. Currently, the lack of regulation allows developers to build in areas known to be at risk. Those that purchase the homes usually have little idea of the risk they face.
- Land conservation in agricultural areas is largely voluntary unless cost-sharing funds are available. Without regulation, it is very difficult to prevent the adoption of land use and management practices that could drastically increase floods.

HOW CAN WISCONSIN CREATE MARKETS FOR HOUSEHOLD FLOOD HAZARD MITIGATION?

Ray Burby

City & Regional Planning, University of North Carolina–Chapel Hill

THE WISCONSIN FLOOD PROBLEM

Since 1982, every Wisconsin county has had at least one flood disaster, and 19 counties have had more than 20. Currently, there are 15,160 flood insurance policies in force and more than $2.3 billion in residential property at risk for flooding. Many at risk lack sufficient flood insurance coverage, and increasing the number of insured would certainly help those homeowners recover in the event of a future flood. However, flood insurance by itself does nothing to reduce risk; it simply budgets for existing risk. In order for communities to reduce flood damage, methods that reduce risk must be included when looking for comprehensive reductions of flooding damages. What can government do to energize the marketplace and private actors to invest in such in forms of mitigation?

Short of relocation, there are two means by which individuals can protect themselves from flooding—wet floodproofing and dry floodproofing. Wet

floodproofing attempts to protect vital household components from flood damage by elevating them or constructing waterproof compartments to house them. The interior of a home that is wet floodproofed may still flood, but the crucial components of the home will remain dry and functional, drastically reducing repair costs and time. Common types of wet floodproofing include:

- Raising heating, ventilation and air conditioning (HVAC) equipment above likely flood levels.
- Constructing miniwalls to protect HVAC equipment in basements.
- Relocating living spaces to the second floor of the structures.

Dry floodproofing attempts to keep water out of the home altogether. Common dry floodproofing methods are:

- Elevating the structure above expected flood levels.
- Sealing openings in basements to make them watertight.
- Installing plumbing upgrades to prevent sewer backup.
- Constructing berms around the home to keep out floodwaters.
- Wrapping the home in plastic sheeting.

LOW CONSUMER DEMAND

A conundrum that policymakers face is that while there is much that homeowners could do to reduce exposure to flood threats, there is a lack of demand for all types of hazard-reducing retrofittings, not just for flooding. A survey on the prevalence of various types of retrofitting found that:

Earthquake Retrofitting	9% of homes retrofitted in California counties 25% of homes retrofitted after Loma Prieta earthquake
Flood Retrofitting	15% of homes retrofitted in Illinois and Wisconsin 16% of homes retrofitted in 10 cities nationwide
Hurricane Retrofitting	37% of homes retrofitted after Hurricane Andrew

Two major factors contributing to the low demand are cost and uncertainty. Retrofitting a home is an expensive investment, and it can take years

for the returns to be realized. These high up-front costs can lead to inaction by many homeowners. Uncertainties about the actual flooding risk, the effectiveness of floodproofing measures and the ability for investments in floodproofing to be reflected in the resale value of the home can also lead to inaction. How can we create a market for self-protection when there is so little demand?

PRINCIPLES FOR ENCOURAGING INVESTMENT IN SELF-PROTECTION

Over the past couple of decades, public awareness campaigns and new technical developments have been successful in increasing home retrofitting for a number of different health, safety and economic issues. By studying successful examples of changing homeowner behavior in areas such as reducing dangerous radon gas and improving energy efficiency, we see four principles emerge.

1. Develop technology to measure and demonstrate benefits of home retrofits to improve performance—instead of just encouraging individuals to make changes, provide specific information on how change benefits them.

2. Market aggressively to induce homeowner participation—use a variety of media and actors, and target those with the most to gain from taking self-protective action, e.g., providing free radon tests for parents.

3. Create a supply of third-party services—this involves training the private and nonprofit sector to provide services.

4. Ease homeowner investment—various loan, grant and tax credit programs can help to defer the upfront costs of the investment, particularly for low-income homeowners.

"MY SAFE FLORIDA HOME": AN EXEMPLAR FOR WISCONSIN

Plagued by chronic and repeated hurricanes, the state of Florida employed the principles described above in developing the "My Safe Florida Home" mitigation program. The goal of the program is to make homes and buildings more resistant to hurricane and wind damage. Recognizing the scope of the problem, Florida leveraged its resources and partnered with insurance companies, nonprofits and local governments to identify and implement solutions. First, rating systems and resilience standards were developed.

- A 100-point scale of home hurricane wind resistance was formulated.
- Cost-effective mitigation actions (e.g., roof retrofits, roof-to-wall connectors and exterior opening fortification) were identified.
- Standard procedures for on-site inspection, diagnosis and cost estimates were established.

This was followed by a public awareness campaign. Homeowner-specific information was made accessible and distributed via brochures, door hangers and bill inserts and though the program's Web site. Direct outreach by Florida insurance companies increased consumer awareness. Thousands of free on-site inspections and diagnoses were conducted. These free individual audits were one of the most crucial components of the program. The audits provided homeowners with information on their vulnerabilities, how they could be remedied, the relative costs and benefits, means to pay for retrofitting, and contractors to carry out retrofits.

To ensure quality and gain consumer trust, standards and training requirements were established for firms who wished to perform these functions. This resulted in 600 home inspectors and 3,000 contractors receiving specialized training and certification to perform the inspections and conduct the retrofitting. Contractors were offered training manuals and bulletins on the standards developed by the state. To prevent the delivery of subpar services by unqualified and uncertified contractors, a list of certified firms and inspection services was maintained and made accessible to the public.

To alleviate some of the financial burden, various types of incentives were created to encourage homeowner action. Matching grants of up to $5,000 were offered to low- and moderate-income families. The state insurance commission mandated that insurance companies offer premium reductions for homeowners who make improvements. Another key aspect of the program is that the state government leveraged resources by partnering not just with private actors but also with local governments and nonprofits, such as Habitat for Humanity. Grants were also offered to nonprofits providing inspection and retrofitting services to approximately 4,000 low- to moderate-income families.

From 2006 to 2008, these efforts resulted in more than 200,000 free home inspections and 40,000 retrofit assistance grants.

WHAT ARE THE HEALTH DANGERS OF CONTAMINATED FLOODWATER?

Sandra McLellen

The Great Lakes WATER Institute, University of Wisconsin–Milwaukee

THE QUALITY OF WATER used for consumption and irrigation and the general health of ecosystems is an issue of growing global concern. Twenty percent of the world's population lacks clean drinking water, and as a result, 3.4 million people die from water-related disease annually. In the United States we are relatively fortunate. Since inception of the Clean Water Act, there has been a significant reduction in the amount of fecal pollution entering our waterways due to sewage overflows and agricultural runoff. In addition, contaminated drinking water is not a major concern because of stringent treatment of source water. However, there are still significant domestic water quality issues in the United States impacting lakes, rivers and groundwater from agricultural runoff, sewage overflows and urban stormwater runoff, particularly during periods of heavy rainfall or flooding.

Urbanization and poor planning are the cause of much of the water quality issues facing the United States. Before cities and sewer systems were built

and the ground was paved, rain fell and was absorbed by forests and grasslands. Today, many of those ecosystems have been damaged or eliminated, thereby compromising nature's flood control and water filtration systems and challenging us to find new ways to deal with rainwater management and contamination.

WHAT IS IN URBAN STORMWATER?

Flooding causes entire sewer systems in urban areas to overflow into the streets. As rainwater flows over our city streets and parking lots and though our system of stormwater pipes and viaducts, it picks up and carries with it any and all of the chemicals and contaminants in its path. These include but are not limited to fecal bacteria (both human and animal), pathogens, heavy metals, pesticides, herbicides and fertilizers.

This water receives no treatment, so any chemicals, pesticides, metals, nutrients or sediments it picks up along the way will also be discharged into rivers and lakes. Stormwater from heavy rainfall can contaminate the shorelines of recreational waters, causing their closures. Standing water from flooding can threaten the health of large populations.

Human waste is routed to sewage treatment plants via a completely separate network of pipes, and therefore, fecal matter theoretically should not be present in the water discharged into rivers via the stormwater system. But stormwater testing commonly detects the presence of human feces in the runoff. The Environmental Protection Agency recommends using *E. coli* as a fecal indicator when testing water for human fecal matter. The desired level of E. coli ranges from 0-100 CFU/100 ml. Public health is threatened when levels rise above 235 CFU/100 ml. A high level of *E. coli* could indicate the presence of other contaminants like enteroviruses, caliciviruses, coxsakie A & B, hepatitis A, *Shigella ssp* and *Salmonella ssp*. When a sewage system overflows, we can take for granted that there will be significant fecal contamination of the water. However, testing after a relatively light rainfall also often shows high levels of contamination.

Levels of *E. coli* contamination during baseflow conditions and times of significant rainfall from Milwaukee into Lake Michigan. Under baseflow conditions, we have a relatively clean system, with the exception of occasional spikes at beach areas. When there is mild to moderate rainfall—not heavy enough to cause flooding or sewage overflows—we still see much higher elevations of *E. coli*, sometimes up to 100 times the recommended limit.

BUILDING OUR CITIES

When there is a sewage overflow, the rates of contamination are even higher than those illustrated above, but they dissipate quickly into Lake Michigan, and so are hard to track. The message here is not that dilution is the solution to pollution, but that we need much more sensitive measures and models to track contamination in coastal waters in such conditions.

We also need to better track the sources of bacteria in stormwater in order to understand why stormwater runoff is so frequently contaminated. Research at the Great Lakes WATER Institute finds that significant levels of human-specific bacteria are present in the majority of stormwater runoff events tested, which means that sewage is regularly infiltrating stormwater, even without sewage overflows caused by flooding. This can be the result of cross-connections between sewage and stormwater pipes. It may also be because aged sewer systems are in poor shape and, as a result, are leaking into nearby stormwater systems. Fixing these problems will be expensive, but necessary.

Investing in sewage and stormwater infrastructure has clear benefits. Back in the 1990s, Milwaukee was averaging 50–60 major sewage overflows per year. Milwaukee started improving the infrastructure of its stormwater system and reduced the average annual number of overflows to about three per year. However, if climate change results in more extreme storms, this number will increase because the system is simply not built for the volume of rainfall that we saw in June of 2008.

There is still much to learn. We still do not know exactly what kind and how much pollution is being pumped into the lake, where all of the pollution goes and what long-term effects this will have on the ecosystem. One clear lesson is that we need to rethink how we build our cities. Too often, stormwater management is an afterthought. Once an infrastructure is in place, it becomes very difficult to retrofit the system in an efficient way. From the planning stage, the stormwater question needs to be central.

WHAT ARE THE HEALTH EFFECTS OF FLOODING ON HOUSING?

Tom Anderson

Wisconsin Department of Health Services, Retired

Addressing the public health needs of areas affected by a disaster is a critical goal in responding to and recovering from any disaster. Flooding can have both short-term and long-term effects on health. Contaminated water is unsafe to drink. Mold and mildew are common in flooded houses and can cause respiratory problems for residents. These dangers must be quickly identified and communicated to citizens. The resources, expertise and cooperation of many different agencies and departments from multiple levels of government are needed in this task. Just as critical is the capacity to coordinate. In Wisconsin, public health is a partnership between the state and 93 local public health departments. Local public health agencies are the lead agencies for managing public health emergencies in their respective jurisdictions, and if able, they lead disaster recovery and response efforts in their communities with the support of state, federal and nongovernmental organization entities.

As waters began to rise in early June of 2007, water quality quickly became a problem. Wastewater treatment plants diverted 90 million gallons of raw sewage into rivers and streams.

From June 8 to September 3, 2,547 well samples were tested for water safety; 29% were deemed unsafe due to coliform bacteria and 4.5% were unsafe due to the presence of E. Coli bacteria. An estimated 41,000 faced mold and mildew problems that are likely to exacerbate breathing problems over the winter.

The health dangers of unsafe water brought together an intergovernmental and cross-sectoral network of responders. The Division of Public Health in the Wisconsin Department of Health Services (DHS) acted as a link between the federal and local governments. The division created an agreement with the U.S. Department of Health and Human Services to dispatch specialist public health service teams. These teams worked with state and local responders, helping sample potentially infected water, disinfect wells and conduct environmental health assessments. The state worked to provide online information to residents about basic steps to take to minimize the danger, while making free laboratory services available for individuals who had received water testing kits from local governments. The state also won a crisis counseling grant from the federal government to help victims cope with and recover from emotional and psychological hardship.

The actors involved in the response network also included nongovernmental responders. For example, the DHS worked closely with Wisconsin Volunteer Organizations Active in Disasters (WIVOAD) to provide a safety net for individuals with unmet needs. (See also the paper by Lang and Leece for additional detail.) Three AmeriCorps teams worked in six counties assisting with debris removal from public and private property; mold remediation was conducted in 144 homes.

Given the collaborative nature of post-crisis health problems, the need to prepare coordination before the crisis occurs becomes vital. More pre-planning at the county level, in conjunction with local human services and locally active volunteer organization, can facilitate the response and recovery process. If the contracts and fiscal relationships that are necessary in post-crisis response are established in the pre-crisis stage, it helps provide stability and reduce the time devoted to negotiating these relationships as the crisis unfolds.

Once a crisis occurs, communication is vital. In Wisconsin, we have used the Incident Command System approach to foster coordination between organizations. One basic rule of that system is establishing daily communication, and in the days after the flood there were daily conference calls between the Division of Public Health staff and local public health officials to obtain information on local impacts and assess current needs, issues and response options.

WHAT IS THE ROLE OF NON-GOVERNMENTAL ORGANIZATIONS IN DISASTERS?

Keith Lang, Lutheran Social Services
Terri Leece, Salvation Army

NON-GOVERNMENTAL ORGANIZATIONS (NGOs) are a crucial part of the response and recovery networks that serve disaster victims. Some NGOs, like the American Red Cross and the Salvation Army, participate directly during the response phase, setting up emergency shelters and assisting with evacuations, but they also help during the recovery phase, addressing the human side of the disaster.

Deaths, injuries, heroic rescues and damage reports are often the focus of media coverage during a disaster. These are well communicated to the public and tracked by policymakers. The emotional toll a disaster has on a community may be less visible, but it is also a part of the story. For many of those Wisconsin residents affected by flooding in 2007 and again in 2008, stress and anxiety become an ongoing challenge.

Wisconsin Volunteer Organizations Active in Disasters (WIVOAD) is a network of NGOs ready to step in and begin the long process of recovery

following a disaster. An existing network of service providers expedites this process by bringing together a variety of capacities and makes coordination between these organizations easier.

WIVOAD IN RESPONSE AND RECOVERY

During the initial response, members of WIVOAD went to the state's Emergency Operations Center, where they communicated needs to member organizations, coordinated resources and provided updates to government personnel on activities of WIVOAD member organizations. In practice this meant providing basic aid, such as flood buckets, and opening shelters and preparing food. In addition, WIVOAD also worked with the Wisconsin Emergency Management (WEM) and the Federal Emergency Management Agency (FEMA) to bring in additional resources from regional and national partners, such as the American Red Cross.

After the response phase ended, WIVOAD began implementing the long-term recovery process. Prior to the 2008 flooding, WIVOAD had developed a long-term recovery manual based upon long-term recovery activities in response to the 2007 flooding. This provided a blueprint that allowed recovery efforts to begin as soon as possible. WIVOAD also had in place a long-term recovery committee based upon the previous years flooding. This allowed WIVOAD to reach out to additional communities that were impacted by 2008 flooding to assist them with developing a long-term recovery committee that focused on specific and important recovery services, such as financial donations, crisis counseling and volunteer coordination. WIVOAD also developed a memorandum of understanding with local governments that identified the capacity of its member agencies and established expectations for local long-term recovery committees. This process served as the basis for development of long-term recovery committees that served residents within the 30-county area impacted by flooding.

One of the most basic lessons throughout this process is the importance of pre-planning and establishing working relationships in advance, with clear identification of responsibilities. The process of working with both state and county Emergency Operations Centers worked well, in large part because of the positive working relationship that WIVOAD has with county and state emergency officials. In implementing long-term recovery at the local level, it is also a significant help to have those working relationships in place. Wisconsin communities that do not have local chapters of WIVOAD are at a disadvantage. When governments have taken the time to plan ahead and set up procurement processes with NGOs, recovery activities are able to move more quickly. The main advantage of having existing working rela-

tionships in place is that it reduces the amount of time, confusion and conflict involved in creating the administrative processes, smoothing the path by which victims of disasters get the help they need.

PROJECT RECOVERY

An illustration of how a NGO is able to aid individuals after disaster is "Project Recovery." The project, administered by Lutheran Social Services (LSS) of Wisconsin and Upper MI, Inc., is funded by a FEMA Crisis Counseling Grant and supports community recovery through outreach. The program's philosophy is that with support people will find a new normalcy in their lives. LSS recruited and trained outreach staff to assist and guide residents through the recovery process by helping them to better understand the normal range of emotional reactions to a disaster and provide them with various coping methods. LSS assigned outreach teams, each under the supervision of qualified mental health care professionals, to provide services within the 30 counties included in the 2008 Presidential disaster declaration. These outreach teams were composed of residents of the counties that they served. Their role was to provide ongoing emotional support and education to flood survivors. They canvassed areas impacted by flooding and provided a link to the long-term recovery process as well as educating survivors about the phases of disaster reactions. When appropriate, they referred flood survivors to other resources, including government support disaster recovery programs and WIVOAD resources.

CHALLENGES

NGOs see firsthand the human costs of flooding and can offer a distinct viewpoint on how to improve policy to help victims. The following long-term challenges need to be addressed:

- Responding to long-term public health issues that are a result of the flooding—mold, contaminated wells, septic systems. The Long-Term Recovery Committees have limited resources that are insignificant compared to the needs of families. For example, the cost of removing mold from a single home can be $10,000, while committees generally have a budget of about $30,000.
- Clarifying the roles and responsibilities of the multiple government agencies and volunteer organizations. Many local responders were not familiar with concepts of long-term recovery or with WIVOAD. This makes it a challenge to build a response capacity. In some cases, local governments chose

not to provide liability coverage for volunteers helping in their communities because of the costs involved.

- Providing outreach and information to the public about recovery services and how to access them. Media coverage is often focused on the most affected, which makes communicating to families that have been affected more difficult.

- Ensuring that federal, state, local, community/faith-based organizations and WIVOAD are working together to coordinate their respective activities. Disasters generate fewer donations than in the past, requiring recovery networks to work together to maximize effectiveness.

- Creating a long-term recovery committee requires development of an administrative/fiscal process that can be time consuming and can slow down the recovery process. WIVOAD hopes to improve the long-term recovery process by ensuring that response and recovery activities are well coordinated and responsive to the needs of local emergency managers.

In addition to challenges, there are also recommendations that emerge from the 2008 floods.

- Training with county emergency management directors on the long-term recovery process and roles of the volunteer organizations: This helps to build substantive knowledge on recovery and establish working relationships before instead of after a disaster. WIVOAD plans to focus on establishing and maintaining partnerships with local communities and state agencies to increase local recovery capacity before an event.

- Educating the public about the state's 2-1-1 information hotline. The hotline provides families with information not just about resources available after the disaster but also information on long-term recovery.

- Establishing a dedicated funding source for case managers and long-term recovery services. WIVOAD employs recovery case managers to help ensure that victims do not fall through the cracks and receive the assistance they need. Federal funding for long-term recovery case managers is desperately needed. Local governments simply do not have the money to hire their own.

ECONOMIC CONSEQUENCES OF FLOODS IN DEVELOPED AREAS

Daniel Alesch

University of Wisconsin–Green Bay

THE ECONOMIC CONSEQUENCES of floods, and disasters in general, are difficult, if not impossible, to quantify accurately. Communities are complex systems, with political, social and economic dynamics. This complexity makes it very difficult to predict how a particular community will be affected. Even after an event, the full array of consequences may not be realized for many years. However, thinking about how the economic dynamics play out after a disaster provides some useful insights.

EVENTS AND THEIR CONSEQUENCES

It all starts with an event, be it a flood, earthquake or another type of disaster. From the event, immediate losses of property and life are sustained and vary in degree depending upon the magnitude, duration and scope of the event and the exposure and vulnerability of the community. These immediate losses are the easiest to calculate and often receive the bulk of attention.

It is easy to overlook the secondary effects that ripple through each system in the aftermath, setting off a chain reaction. Shortly after the event, the immediate effects begin to manifest into systemic community consequences. The demographics of the location inevitably change. For communities that already were struggling economically, the disaster may provide the impetus to increase the outflow of individuals and businesses. Others may stay and attempt to start over. Many local businesses temporarily close, either for repairs or lack of staff. Those that reopen weeks or months later often find themselves in a completely different business environment. The population they once served may have different needs, lack the resources to satisfy former wants, or may have left altogether. A local business might struggle on to serve this new population for years before finally closing.

Larger businesses, especially those that export their goods and services or are not locally owned, are often enticed with tax breaks or subsidies by distant unaffected communities and opt to relocate rather than rebuild. When this happens, jobs are lost. Those businesses that resist the temptation to flee face significant setbacks. It may be weeks or months before they are able to resume normal operations. In the meantime, their competitors pounce on the opportunity to capture their share of the market. For example, after an earthquake affected Port of Kobe in Japan, competitors won much of the trade into the port, and kept it even after the port was rebuilt.

Of course, there is often a great deal of money spent in rebuilding, but the benefits of this spending often do not accrue to local businesses. Workers may have left the area because of housing losses, and local businesses may have collapsed. Large outside contractors arrive and provide services, meaning that most of the economic benefits of rebuilding are experienced elsewhere.

A key point that emerges from understanding the dynamics of disaster recovery is that recovery does not imply returning to the past. Everything changes after a disaster. Longtime residents and businesses leave, and new residents and businesses move in. What emerges is something new. This requires us to re-examine our notion of recovery. For the society that emerges, rather than seeking to return to the community's pre-event state, recovery efforts should focus on building a viable economic, social and political system that is geared for the post-disaster environment.

Another key point is that the economic costs of a disaster are greater than the direct costs of rebuilding infrastructure or compensating owners for immediate business losses, such as the crops lost that year. They also include the long-term ripple effects of a transformed economic environment for that community. These ripple effects take years to fully assert themselves and are difficult to track. Estimating the costs of a disaster is, therefore, inevitably complex and imprecise. Even with a perfect and complete understanding of

the impacts, translating impacts into economic costs will depend on the criteria and definitions used. For example, do you count the monetary damage to a house or the repair costs? The cost of rebuilding or replacing is highly variable depending on when the work is done and the circumstances under which it is done.

REDUCING ECONOMIC DAMAGES: PREVENTION IS BETTER THAN CURE

A fundamental conclusion is that the surest path to reducing costs and ensuring recovery is prevention, i.e., reducing our exposure to flooding and our vulnerability to damage should flooding, despite our precautions, result in adverse consequences. Most of the adverse cascading consequences can be prevented by reducing immediate losses from natural hazard events. We know more about how to effectively reduce exposure than we do about how to rebuild the economy of a distressed community. This makes mitigation the critical tool for reducing losses and helping to ensure recovery.

Both state and local governments have critical roles in encouraging people to make the right choices to reduce exposure and vulnerability. There are a number of different ways a community can reduce its exposure to flooding.

- Wetlands, wooded hillsides and other natural means of flood reduction should be preserved and enhanced wherever possible.

- Vulnerable assets can be eliminated through buyout or relocation programs.
- States can reduce the vulnerability of structures by establishing and strictly enforcing statewide building codes and provisions.
- Infrastructure vulnerability should be reviewed regularly, and assistance should be provided for communities that lack the resources to do it on their own.
- Governments should also get out of the business of subsidizing informed risk-takers. Those who "must" build in vulnerable areas should bear the full cost of doing so.
- States should also strongly encourage, if not force, full participation in the National Flood Insurance Program.
- At the very least, new construction in vulnerable areas should be required to purchase insurance against losses.
- Those communities or individuals that choose to ignore their vulnerability should have their aid eligibility drastically reduced or completely eliminated.

SUMMARY OF WISCONSIN RECOVERY TASKFORCE

Diane Kleiboer

Wisconsin Emergency Management

A KEY JOB OF STATE EMERGENCY OFFICIALS is to identify and utilize federal resources that become available after a disaster. Anticipating fierce competition for the additional funding among the affected states, Governor Doyle, in conjunction with Wisconsin Emergency Management (WEM), established the Wisconsin Recovery Taskforce (WRTF) to identify needs and eligible projects so as to better position the state for the obtaining of its fair share of the money. This worked well, in large part because of the pre-existing working relationships between state and federal officials that go back as far as the floods of 1993. The WRTF is composed of six committees, each responsible for a particular segment of the recovery effort. Each committee identified what had been done so far and also ongoing challenges and specific policy recommendations. The WRTF therefore represents a policy blueprint for mitigating, responding to and recovering from the type of disasters we saw in 2008, and I encourage all who are interested in this

topic to read the full report.[1] The following is a summary of each committee's major findings and recommendations.

AGRICULTURE

Agriculture is a vital part of Wisconsin's economy and, as such, decreased productivity due to disasters can substantially affect the greater economy. Quickly and accurately identifying agricultural losses is crucial for predicting what those effects might be. Unfortunately, Wisconsin lacks a comprehensive damage assessment process. The agricultural damage assessment process in place is geared toward quickly developing a general sense of the magnitude and scope of the event. These assessments are performed by local emergency managers and are designed to be done quickly, usually within the first 24 hours of an event. WEM uses these reports for guidance in determining what types of aid or assistance, if any, they are going to request from the Federal Emergency Management Agency (FEMA). Once initial assessments are made, local emergency managers shift their attention to other tasks and the damage assessment process pretty much stops.

Wisconsin's limited damage assessment capability makes it very difficult to merely determine the actual amount of crop losses, let alone the event's economic effect on the entire industry. Greater cooperation from federal agencies or more resources would mediate this problem. The U.S. Department of Agriculture Farm Services Division is responsible for determining an event's effect on the agricultural industry but are reluctant to share that data because of the impacts such information could have on the commodities market. WEM is working with the UW-Extension to develop their own comprehensive agricultural damage assessment process, but any process they come up with will be of little use without additional staff to implement it.

BUSINESS

As with agriculture, it became apparent that we do not have a comprehensive process for identifying business losses. (See also the paper by Alesch.) This information is crucial for identifying unmet needs and allocating available resources. For example, WEM had access to a large amount of funding through the U.S. Department of Housing and Urban Development (HUD) Community Development Block Grant program, but because we didn't know which businesses needed additional aid and which did not, it became difficult to identify legitimate uses of the funds.

[1] The full report is available at *http://rtf.wi.gov/LinkClick.aspx?fileticket=Bix1qlkAtVg%3d&tabid=36&mid=481*

HOUSING

One popular misconception, fueled by media coverage, is that the federal government's disaster assistance programs will fully compensate homeowners. This is simply not the case, and we need to communicate more realistic expectations. The size of the unmet needs faced by homeowners grows if FEMA judges that damages were the result of deferred maintenance. For example, many homeowners were denied aid because of old cracked foundations or worn-down roofs. This policy should be re-examined because it makes it less likely that victims can be returned to any sort of home.

WEM is aggressively pursuing the acquisition of substantially damaged homes in vulnerable areas, especially in poor rural communities. Unfortunately, the buyout price is based on the home's pre-disaster value (and existing mortgage) minus any insurance or FEMA funds already received. This price can total far less than is required to buy or rebuild, which gives homeowners an incentive to stay in their current location. Affordable housing needs to be found for those in this situation.

Another problem is housing the large number of displaced residents, especially those in small rural communities. WEM wanted to avoid using the FEMA trailers at all costs and fortunately, with the help of local, regional and national partners, they were able to find safe and secure housing for everyone.

HUMAN NEEDS

As with damage assessments, funding is a constant challenge for all aspects of recovery. This is an area where we know of specific practices that can help protect the physical and mental health of citizens, but finding adequate resources is a problem. In particular, the Human Needs Committee identified the need for funding for recovery case workers, treatment of contaminated wells and mold removal. (See also the papers by Anderson and by Lang and Leece.) The committee also calls for county and state agencies to adopt and use Aid Matrix, a software package that helps to match aid donors and recipients.

INFRASTRUCTURE

The flooding of 2008 caused extensive local, county, state and interstate road closures and infrastructure damage. Such damages are expensive to repair, and in many cases local communities found themselves unable to cover the costs.

Fixing this infrastructure requires resources. Even though FEMA offers cost-sharing for infrastructure repair, such resources proved beyond the capacity of many local governments that had already spent much of their road budget to deal with record snowfall from the previous winter and were limited in their capacity to raise taxes because of state levy limits. Governor Doyle asked the president to forgo the local government financial matches due to extenuating circumstances, but exemptions were granted only for emergency protective services. FEMA needs to rethink their cost-sharing policies and find ways to accommodate extenuating circumstances. State legislators have already acted to relax levy limits in the aftermath of disaster. (See also the paper by Ballweg.)

Determining funding eligibility for damages to local flood control dams was another source of conflict. FEMA will not pay to repair dams that could be funded by another federal agency, which in this case is the Natural Resources Conservation Service. But this agency did not have enough money in its budget to fund the repairs. This gap left some small communities with the daunting task of finding millions of dollars to repair the dams they rely on for flood control.

MITIGATION

Wisconsin is nationally recognized for having one of the best mitigation programs in the country. WEM aggressively works to identify hazards and implement solutions. WEM regularly surveys communities to gauge their receptiveness to mitigation efforts, such as new land use regulations or buyout programs. WEM recognizes the importance of public awareness of hazards and preparedness.

Currently, there are no state agencies that are able to offer the amount of support smaller communities need for the development and execution of long-term recovery plans. Wisconsin needs to provide these communities with personnel who can assist them in the grant writing process so they can receive the aid to which they are entitled.

WEM had a number of difficulties utilizing FEMA's Public Assistance Program for mitigation purposes. The Stafford Act allows FEMA to uses program resources for infrastructure mitigation where it appears to be cost effective, but opportunities to use resources in this way have not been sufficiently utilized. FEMA personnel have not been aggressive in identifying potential mitigation programs, and instead have relied upon state or local officials to bring such projects to their attention. A more proactive approach by FEMA would result in a more systematic investment of resources and reduce the potential for repeated infrastructure failure.

CONCLUSION

Looking to the future, there are a number of areas where improvements can be made. In most of these areas resources are a crucial component. Mitigation opportunities in both the pre- and post-disaster phases should be exploited. The state's damage assessment capabilities need to be strengthened across all damage categories. The various recovery partners need to find ways to meet needs that exceed federal disaster aid.

Emergency management programs need to be strengthened at both the local and state level. Often, county emergency management programs are the first to be cut from the budget, and many emergency managers are forced to perform more than one county-level function. County emergency managers need to be dedicated, full-time professionals if we want their performance to meet our high expectations. For this to happen, legislators and local governments must be made to recognize the importance of the emergency management function.

SUMMARY OF THE SPECIAL LEGISLATIVE COUNCIL

Rep. Joan Ballweg

Wisconsin State Legislature

FLOOD POLICY IS PART OF THE BROADER EFFORT to prepare for and minimize crises. The Joint Legislative Council is a 22-member legislative committee made up of 11 Senators and 11 Representatives, including all of the legislative leaders in the two houses and parties. Every two years, the council appoints special committees to study issues in depth, develop legislative recommendations and report these recommendations back to the council in the form of draft legislation. Two years ago, I served as chair of a study committee on disaster preparedness, and more recently I have been vice-chair of the Special Legislative Committee on Emergency Management and Continuity of Government. The committee membership included four legislators and eight citizen members, all of whom had expertise on emergency management issues.[1]

[1] Full details of the committee, including hearings and proposed legislation, can be found at *http://www.legis.state.wi.us/lc/committees/study/2008/EGOV/index.htm.*

The Special Committee was directed to do three things:

1. Recodify ch. 166, the emergency management chapter of the statutes, to modernize and reorganize the chapter and make needed substantive changes.

2. Recommend statutory language on issues relating to continuity of legislative operations, including lines of succession, an alternate seat of government for the Legislature, and virtual participation in legislative sessions.

3. Review the Uniform Emergency Volunteer Health Practitioners Act for possible adoption in Wisconsin.

The full committee held its final meeting on April 2, 2009, and voted to recommend several pieces of legislation to the Joint Legislative Council. The Special Committee voted to recommend to the Joint Legislative Council a variety of pieces of legislation. As of time of this writing, two major items had already been passed:

- A $1 million general purpose revenue appropriation in each year of the upcoming biennium for the state disaster relief program.

- A relaxing of local levy limits up to the amount a locality levies to pay the unreimbursed expenses related to a declared emergency.

Four other major items have been voted out of relevant house committees but are awaiting action in the Senate.

- SB 226/ AB 316: This is the main ch. 166 emergency management recodification bill. The bill contains provisions on diverse subjects relating to emergency management, including:

  - Liability and licensure of emergency volunteers.

  - State disaster assistance program changes.

  - Three provisions relating to agricultural emergencies.

  - Computation of school days when school is closed because of emergencies.

- Variances for statutory and rule requirements governing hospitals during emergencies.
- Public works mutual assistance.
- Emergencies relating to computer or telecommunications systems.

- SB 227/ AB 317 contains the following legislative continuity provisions:
  - Interim successors for legislators. The trigger for succession would be that 25% of the legislators were unavailable. Issues of quorum, representation and leadership are addressed.
  - Virtual legislative sessions and committee meetings. We must embrace technology to be able to meet in the case of a pandemic or other disaster.
  - Temporary seat of government for the legislature. A constitutional amendment is required to allow the legislature to meet at a location other than the Capitol if necessary.
- SB 229/ AB 319 puts in place the statutes relating to regional structural collapse teams. Funding for the teams, in addition to billing the responsible party for a collapse, may come at a later time.
- SJR 39/ AB 59 is a joint resolution proposing an amendment to the Wisconsin Constitution to remove archaic language regarding continuity of government only in emergencies "resulting from enemy action in the form of an attack."

I would also like to discuss what has been happening with the FEMA Region V Regional Advisory Council (RAC). Regional and National Advisory Councils were mandated by Congress as part of the review of the response to Hurricane Katrina. Region V consists of six states—Wisconsin, Minnesota, Illinois, Ohio, Indiana and Michigan. Each state has three or four state members on the RAC. Johnnie Smith, the Wisconsin Emergency Management administrator, a county emergency management director and I are the three Wisconsin representatives.

Several of the concerns I've heard mentioned during the seminar today are also items that have been issues for the RAC. First, I serve on the Public/Private Partnership Subcommittee. We need to work with business to help government in time of emergency but also need to prepare so that business can get back to work in times of emergency. I believe we also need to partner with Wisconsin Volunteer Organizations Active in Disasters (WIVOAD), who offer research and information that is available and valuable to the public. Not every state and federal agency needs to develop their own materials. There are other private resources for preparation. The Institute for Business and Home Safety is subsidized by the insurance industry, but I find their publication, "Open for Business," to be an excellent template for business continuity planning.

Second is the concern over public expectations. Education of the public is needed so they are aware that preparedness is their responsibility too.

Third, the process of intergovernmental funding for disasters can be improved. Both the RAC and the National Advisory Council have subcommittees on Stafford Grants. The purpose is to review the application and formulas to work better for local and county governments.

Fourth, we need to provide better descriptions and information regarding FEMA applications. I have asked the RAC to plan how to advise businesses of the qualifications necessary to receive aid through the Small Business Administration. Businesses in my district that were affected by the floods in 2008 told me how misleading they felt the application process was. FEMA Region V administrators have assured me they will look into and solve the problems with this application process.

SUMMARY AND NEXT STEPS

Larry Larson

Association of State Floodplain Managers

IMAGINE THAT WE ARE IN THE YEAR 2050. A flood on the scale of the 2008 floods occurs in Wisconsin. But this time there is no major media coverage. There is no emergency response. All this is because there is no real disaster. People and property are no longer in the floodplain. This is the type of vision we need to have if we are to deal effectively with the threats of flood in Wisconsin.

Wisconsin was once a leader in hazard mitigation, but we are falling behind even as risk increases. Back in the 1960s Wisconsin was a pioneer in planning and floodplain regulations. The state continued to be a leader until the 1980s, looking for ways to mitigate risk and respond to floods. But we are now falling behind other states. We have failed to modify legislation dealing with floods.

At the same time, we know a lot more about how to manage flood risk than we did 40 years ago, but we need to put that knowledge into practice.

- Land use management: The key to dealing with floods is land use management, and the key to land use management is pragmatic regulation based on reliable data. Special legislative committees have done fine work in proposing ways to adjust legislation to improve response, but the same level of attention has not been paid to prevention via land use management.

- Better data and smarter data use: Data are critical and are the key to making smart decisions. We need to collect, archive and analyze relevant data. We often don't share data very well. For example, access to flood insurance claims data would greatly benefit local officials in their flood mitigation, planning and regulatory efforts. But FEMA is reluctant to share this data. Good data require investment, and this investment is justified in cases where it will allow us to develop accurate hydrologic models and GIS maps. Our risk assessment data, methodology and mapping all need to be updated and maintained. The Wisconsin Department of Natural Resources has a good mapping staff, but they need support and resources in order to be effective.

- Public perception of risk: We have a situation today in which most citizens do not believe flood insurance is necessary. Most citizens have little awareness of their home's level of risk. Those that do think about risk often do not understand it very well. Many assume that if they are just outside a 100-year flood line they are at zero risk, and many inside that line assume they have just a 1% risk. Government generally does not help. Members of Congress have fought to prevent FEMA from issuing new floodplain maps because they are worried that constituents will be placed in a floodplain.

- Actuarial insurance is the best way to get people to make wise choices; however, we subsidize insurance and externalize the risk to the taxpayers. In effect, taxpayers who live in safe areas are subsidizing those who live in risky areas. This is an unintended, unfair and irrational policy consequence of how we have designed land use policy, usually because of a pro-development philosophy. The question shouldn't be whether development is good or bad, but who pays the costs? As it stands now, states with lots of development in risky areas, such as Texas, Florida and California, are going to be subsidized by states like

Wisconsin. We need to stop subsidizing the development of vulnerable areas.

- Mitigation is the best way to reduce risk. We have heard this continuously. In terms of flood vulnerability and risk, Wisconsin is better off than many states, thanks to past mitigation policies and the nature of the state's terrain.

- Map tomorrow's floodplain, not yesterday's floodplain. Outdated floodplain maps are used for development decisions. Then, 20 years later there is more run-off, and a flood occurs. This is predictable and should be incorporated into floodplain maps. Some communities already map to future conditions. Some of these future conditions we should consider come from changing or new development, but some are also coming from climate change.

- Map risk, not the 100-year hazard. Currently, our policy is to map the one flood having a probability of once in a 100-years, and then show developers how to build there. This is not the right approach and has not served to reduce flood losses. Instead flood losses have multiplied in the last century. So let's try something else. Instead of mapping the hazard, we should be mapping the risk. And instead of showing people how to build in risky areas, let's create no-build zones. Wisconsin does have good policies with respect to no-build zones.

- Stop new development in risky areas; mitigate old development. What do we do with all of the homes and infrastructure already in high-risk areas? This is the most difficult aspect of land use policy. We should seek to mitigate potential damage to these structures. Dealing with new developments should be the easy and inexpensive part. But to do so, communities will have to resist the temptation of short-term tax base increases with long-term bigger costs by developing in risky areas, and instead strive for sustainable, low-risk development.

- Risk communication and accountability. Some believe that if people fully understood their risks, they would adjust their behavior appropriately. However, communication needs to be supplemented with real accountability mechanisms. Insurance based on unsubsidized actuarial rates is one such mechanism. As long as individuals think that they can externalize their risk

to the taxpayers, they will not change their behavior. But this runs against the trends in the politics of crisis policy. As a society we increasingly have come to expect government, and especially the federal government, to bail out risk-takers. In reality, disaster assistance rarely comes close to making individuals whole again, but we do not communicate this point.

Flooding policy is like a 12-step program. The first step is admitting we have a problem. If nothing else, the floods of 2008 reminded us that we do indeed have a problem. Once we acknowledge this problem, many of the solutions, such as those outlined above, become clear. But they still involve tough choices. It takes leadership.

PRESENTER BIOGRAPHIES

DANIEL ALESCH

University of Wisconsin-Green Bay

For the past thirty years, Dan Alesch has been conducting policy-related disaster research—research on their consequences, mitigation politics and policy, and business and community disaster recovery. For the past fifteen years, he and his colleagues have tracked the experiences of more than two dozen communities across the country that experienced one or more disasters.

For more than a decade, Dan was a senior social scientist and project manager at the Rand Corporation, a not-for-profit think tank headquartered in Santa Monica, California. Rand asked him to be the on-site manager for a housing allowance experiment it was conducting in Brown County, Wisconsin. Years later, as the experiment was completed, Dan joined the faculty at the University of Wisconsin-Green Bay as an associate professor of political science and environmental administration. Alesch also headed the professional programs in business and a graduate program in administrative science at UW–Green Bay.

Now an emeritus professor, Dan continues to conduct research, publish books and articles, and speak on the consequences of disaster across the United States as well as in Europe and Asia. He is active in local governmental affairs and not-for-profit organizations. For more than two decades, he has been a member and president of the Green Bay Metropolitan Sewerage District Commission.

TOM ANDERSON

Wisconsin Department of Health Services, Retired

Although he has recently retired, Tom Anderson was department of health services emergency coordinator for the Wisconsin Department of Health Services (DHS) at the time of the workshop.

From 2003 until his retirement, he served as the alternate representative for the state health officer on the Wisconsin Homeland Security Council. Previously he represented the Department of Health and Family Services on the State Emergency Response Board, which served to oversee chemical emergency planning in Wisconsin, as the public health representative from

1990–1998. He is familiar with local government in Wisconsin as he was elected and served as chair of the town of Blooming Grove in Dane County from 1997 to 2005.

Tom worked for the department for 35 years and has been a registered sanitarian in Wisconsin since 1976.

JOAN BALLWEG

Wisconsin State Legislature

Elected to the Wisconsin State Assembly in 2004 and re-elected since 2006, Joan Ballweg represents Wisconsin State Assembly District 41st. She served as vice-chair of the Wisconsin Legislative Council's Special Committee on Emergency Management & Continuity of Government during the last session.

RAY BURBY

City & Regional Planning, University of North Carolina–Chapel Hill

Ray Burby is a fellow of the American Institute of Certified Planners and is a member of numerous professional organizations. He has been an author or editor of 14 books and published extensively in planning and policy journals including, among others, Journal of the American Planning Association, Journal of Planning Education and Research, Journal of Policy Analysis and Management, Land Economics, Environmental Management, and Journal of Environmental Planning and Management.

He has received many research grants and is currently principal investigator on a study of urban growth boundaries funded by the National Science Foundation and P.I. on another NSF-funded project designed to improve the quality of applied research on disasters and mitigation of natural and technological hazards. He has taught courses in land use and environmental planning, development impact assessment and development management.

GERRY GALLOWAY

Department of Civil & Environmental Engineering, University of Maryland

Gerry Galloway is a professor of engineering and an affiliate professor at the School of Public Policy at the University of Maryland, where his focus is on water resources policy and management.

A civil engineer, public administrator, soldier, educator, and geographer, he has led and managed large organizations in successfully executing a variety of important water resources activities. He has broad experience in

dealing with water management issues both within the United States and internationally. He has served as a consultant to the Executive Office of the President, and has assisted the US Water Resources Council, the World Bank, the Organization of American States, TVA, the Corps of Engineers, several states, and various other organizations in water resources related activities. He led the White House Study of the Great Mississippi Flood of 1993, and in 2006 and 2007, led flood-related studies for FEMA and the state of California.

ROXANNE GRAY

Wisconsin Emergency Management

Roxanne Gray has worked for Wisconsin Emergency Management for 34 years; since 1994 she has been the state's hazard mitigation officer. She has served in a variety of positions in the division, including that of assistant natural disaster planner and an assistant radiological emergency response planner.

As the state's hazard mitigation officer she is responsible for coordination of the state's Hazard Mitigation Program, including the administration of the pre-disaster mitigation, hazard mitigation grant, flood mitigation assistance, repetitive flood claims, and the severe repetitive loss programs as well as development and updates to the state of Wisconsin's Hazard Mitigation Plan.

DIANE KLEIBOER

Wisconsin Emergency Management

Diane Kleiboer supervises the state's Hazard Mitigation Program, which is aimed at reducing the impacts of disasters before they occur. As part of this program, Wisconsin Emergency Management provides grant funds to communities to undertake projects, such as the acquisition of floodprone properties, elevating or floodproofing vulnerable structures, and retrofitting buildings to make them disaster resistant. She also supervises the Public Assistance Program which is made available after a Presidential Disaster Declaration and assists local governments and certain private non-profit entities in recouping costs for public infrastructure damages or for protecting lives and property.

In her years with WEM, Diane has served on a number of Governor's task forces, including most recently the Wisconsin Recovery Task Force organized to deal with the 2008 floods; those organized in response to statewide droughts and the Great Lakes high water levels. She also chairs the Interagency Working Group, which is an adjunct group to the State Homeland Security Council.

TERRI LEECE

Salvation Army

Terri Leece is the disaster services director for the Salvation Army's Wisconsin/Upper Michigan Division. She has worked for the Salvation Army for 13 years and has been the disaster services director for the past 6 years.

In addition to assisting with disasters in Wisconsin, she responded to the Grand Forks Floods in 1997 and served at Ground Zero following the 9/11 attacks. Terri served as the chairperson for the Wisconsin Voluntary Organizations Active in Disasters (WIVOAD) from 2004—2008. She was responsible for facilitating the coordination of its member organizations in their response during a disaster and throughout the recovery phase.

In 2007 she assisted the WIVOAD in establishing its own 501c3. Terri continues to serve as chairperson of the WIVOAD Long Term Recovery Committee overseeing 10 Regional Long Term Recovery Committees. She also serves on the Wisconsin Citizen Corp Council.

KEITH LANG

Lutheran Social Services

Keith Lang is the director of Project Recovery, a FEMA funded crisis-counseling program that provides outreach services to disaster survivors impacted by Presidential declarations as a result of flooding in Wisconsin in 2007 and 2008. He has been with Lutheran Social Services of Wisconsin and Upper Michigan since 2007 and is chairperson of the Wisconsin Voluntary Organizations Active in Disaster.

Prior to his current position, Keith served as the Disaster Mental Health and Emergency Human Services coordinator for the Wisconsin Department of Health and Family Services from 1996 until 2004. His prior experience in disaster-related activities included responding to the Weyauwega train derailment, Siren and Ladysmith tornados, 2004 Wisconsin flooding and resettlement of Hurricane Katrina survivors to Wisconsin. From 2004 to 2007 he directed the Disaster Human Services Project funded by the Wisconsin Division of Public Health providing training, technical assistance and consultation to Wisconsin County Human Services Departments and private agencies. He has written and managed six previous FEMA crisis-counseling grants and administered a Center for Mental Health Services Emergency Mental Health Capacity Expansion Grant issued to the state in 2003 and 2004. In 2003 he was invited to serve as a member of a national focus group sponsored by the U.S. Department of Health and Human Services to create mental health all-hazards disaster planning guidance to states.

LARRY LARSON

Association of State Floodplain Managers

Larry Larson is a founding member of Association of State Floodplain Managers, Inc., established in 1977. He was the national chair from 1979-82 and has volunteered as the executive director since 1982, until it became a half-time paid position in February 1997. As the executive director he served as an agent of the association in accordance with the directives of the board of directors and the guidelines of the constitution and bylaws of the association. He is a registered Professional Engineer in Wisconsin and California.

SANDRA MCLELLAN

Great Lakes WATER Institute, University of Wisconsin–Milwaukee

Sandra McLellan is an associate scientist at the Great Lakes WATER Institute. Her primary research focus is the connections between environmental processes and human health. Urban coastal areas are greatly impacted by pollution sources including stormwater runoff and sewage overflows. Often times, pathogens are present that can contaminate our beaches and drinking water supplies. The overall goal of her research is to inform policy and devise management strategies for sustainability of urban coastal environments.

DONALD MOYNIHAN

La Follette School of Public Affairs

Donald Moynihan is Associate Director of the La Follette School of Public Affairs and Associate Professor of Public Affairs. His research examines the application of organization theory to public management issues such as performance, budgeting, homeland security, election administration, and employee behavior. In particular, he studies the selection and implementation of public management reforms.

KENNETH POTTER

Civil & Environmental Engineering, University of Wisconsin–Madison

Ken Potter's research focuses on providing a technical basis for the sustainable use of aquatic resources and for the restoration of degraded aquatic resources. This research is strongly interdisciplinary, involving

faculty and students from the earth, life, and social sciences, as well as from engineering. Research methods include the use of field measurements and hydrologic modeling.

The growth of urban areas is a primary threat to aquatic resources. "Low-impact development" offers a potential way to accommodate population growth without sacrificing environmental quality. One promising strategy is to construct impervious and pervious areas so as to maintain natural rates of infiltration and groundwater recharge. Dr. Potter's research involves both the design and evaluation of various strategies for low-impact land development.

The restoration of degraded aquatic systems requires the re-establishment of natural flow rates and water levels. Dr. Potter's research includes assessment of hydrologic conditions, under past, present, and alternative future conditions. He is particularly interested in the exchange of water between surface and subsurface systems.

ROBERT M. LA FOLLETTE
SCHOOL OF PUBLIC AFFAIRS
University of Wisconsin-Madison

WRI
University of Wisconsin

WAGE

UNIVERSITY OF WISCONSIN-MADISON
Center for World Affairs
and the Global Economy